QPM Energy Project

Matters of National Environmental Significance (MNES) Preliminary Documentation

Prepared for QPM Energy Pty Limited

July 2023

QUEENSLAND PACIFIC METALS

EMM

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Matters of National Environmental Significance (MNES) Preliminary Documentation

QPM Energy Project

QPM Energy Pty Ltd

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Version	Date	Prepared by	Approved by	Comments
V1	26 July 2022	Andrew Jensen	Sandra Walters	
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V4	9 March 2023	Andrew Jensen	Anna McRae Susan Lodge	Updated MNES report to reflect further information required for assessment by preliminary documentation.
V5	11 May 2023	Andrew Jensen	Dylan Falconer	Updated MNES report to reflect adequacy review comments.
V6	1 June 2023	Andrew Jensen	Anna McRae	Updated MNES report to reflect adequacy review comments.
V7	24 July 2023	Andrew Jensen	Susan Lodge	Updated MNES report to reflect submitter comments.

Approved by

Susan Lodge
Associate Environmental Consultant
24 July 2023

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Executive Summary

The QPM Energy Project (the Project) involves the design, construction, and operation of a gas compression facility (GCF) and a high-pressure pipeline that links the proposed GCF to the nearby existing North Queensland Gas Pipeline (NQGP).

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gathering lines from existing adjacent mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where in turn it will be depressurised and distributed, by a third party, to industrial users, including QPM's Townsville Energy Chemicals Hub (TECH) Project.

The purpose of this report is to describe the Project, present results of desktop ecological assessments and the field ecology surveys. Environmental values prescribed at a Commonwealth level as matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are the focus of this report.

The report includes an assessment of the potential environmental impacts that may occur to MNES as a result of the Project, and proposed avoidance and mitigation measures. The estimated residual impacts have then informed significant impact assessments and a referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) pertaining to the Project's potential impacts on MNES listed under the EPBC Act.

The proposed high-pressure pipeline is situated over two properties – Denham Park (two Lots) and Dabin Station (one Lot) – comprising the following lot/plans – Lot 23 on SP262530, herein named Lot 23, Lot 11 on SP262530, herein named Lot 11, and Lot 2 on SP214117, herein named Lot 2. The high-pressure pipeline also crosses Lot 100 on SP235905 (Goonyella rail system) which will be underbored with no surface impacts and also crosses underneath the Sunwater Moranbah and Eungella pipelines.

The Project area also includes a 40 m buffer from the proposed high-pressure pipeline corridor which is 30 m in width (total width surveyed along the alignment is 110 m). This buffer also intersects a small portion of Lot 14 on CP846391 on Burton Downs, herein named Lot 14, and Lots 23, 11 and 2.

The proposed gas compression facility is located on Dabin Station Lot 2, and is also buffered by 40 m, for the purpose of this ecological assessment.

Based on desktop assessments and multi-seasonal field ecology surveys, the following MNES are considered 'known' or 'likely' to occur within the Project area:

- Brigalow TEC (mapped during field surveys)
- Ornamental Snake (confirmed during field surveys)
- White-throated Needletail (confirmed during field surveys along old alignment)
- Squatter Pigeon (confirmed during field surveys)
- Migratory birds – Fork-tailed Swift and Latham's Snipe.

During early stages of Project design, and following ecological surveys of the Project area, QPM Energy has sought to avoid and minimise ecological constraints and other impacts (e.g. noise) in locating facilities. For example, the alignment sought to avoid mapped areas of regulated vegetation. Wherever practicable, cleared areas including along fencelines and firebreaks were used. Additionally, the location of the compressor facility is in an area of non-remnant vegetation, with shrubby regrowth and weedy understorey.

The construction and operation of the Project will result in the removal of vegetation, and disturbance of existing ground conditions on either a temporary or permanent basis. The assessment identified potential initial (i.e. unmitigated) impacts that may occur to MNES as a result of the Project, prior to mitigation measures being implemented. The implementation of mitigation measures has decreased the residual risk of all the potential impacts listed. Avoidance and minimisation have been prioritised as the most effective measure.

A 'significance of residual impacts' assessment was undertaken of the Project's potential impacts on MNES that have been confirmed to be present or are considered likely to occur within the Project area. The assessment was made against applicable guidelines including EPBC Act *Significant Impact Guidelines 1.1* (DoE 2013a) and determined that the Project is expected to have a significant, residual impact on Ornamental Snake.

On 3 November 2022, a delegate of the Minister for the Environment determined that the Project to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed by preliminary documentation. The controlling provisions were determined to be listed threatened species and communities (Sections 18 and 18A of the EPBC Act). A request for information (RFI) was then issued by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) 21 November 2022. This report responds to the RFI.

On 25 May 2023, DCCEEW provided second round adequacy review comments to the Project's Preliminary Documentation. Version 6 of this report addresses the response to these adequacy review comments.

Abbreviations

Abbreviation	Term
ALA	Atlas of Living Australia
BD status	Biodiversity status
BOM	Bureau of Meteorology
BVG	Broad vegetation group
CAMBA	China-Australia Migratory Bird Agreement
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and the Environment (now DCCEEW)
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water (previously DAWE)
DES	Department of Environment and Science
DERM	Department of Environment and Resource Management (now DES)
DEWHA	Department of the Environment, Water, Heritage and the Arts
DNRME	Department of Natural Resources, Mines and Energy (now DoR)
DoE	Department of the Environment (now DCCEEW)
DoEE	Department of the Environment and Energy (now DCCEEW)
DoR	Department of Resources
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (now DCCEEW)
DTMR	Department of Transport and Main Roads
EMM	EMM Consulting Pty Ltd
EMP	Environmental Management Plan
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESD	Ecologically sustainable development
ESCP	Erosion and Sediment Control Plan
EVNT	Endangered, vulnerable or near threatened
GTRE	Ground-truthed regional ecosystem
HVR	High value regrowth
IECA	International Erosion Control Association
JAMBA	Japan-Australia Migratory Bird Agreement
MNES	Matters of National Environmental Significance
PMST	Protected matters search tool
RE	Regional ecosystem

Abbreviation	Term
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SPRAT	Species Profile and Threats Database
TEC	Threatened ecological community
TSSC	Threatened Species Scientific Committee

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1 Introduction

1.1 Background

EMM Consulting Pty Ltd (EMM) has been commissioned by QPM Energy to undertake ecological assessments for the proposed QPM Energy Project (the Project), comprising a Gas Compression Facility and high-pressure pipeline. EMM has worked collaboratively with QPM Energy to ensure that the Project design is sensitive to ecological constraints and maximises beneficial environmental outcomes. EMM's work has included desktop ecological assessments, flora and fauna field surveys, design advice and environmental impact assessment.

On 3 November 2022, a delegate of the Minister for the Environment determined that the Project to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and will be assessed by preliminary documentation. The controlling provisions were determined to be listed threatened species and communities (Sections 18 and 18A of the EPBC Act). A request for information (RFI) was then issued by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) 21 November 2022.

1.2 Purpose of this report

The purpose of this report is to describe the Project, present results of desktop ecological assessments and the field ecology surveys. Environmental values prescribed at a Commonwealth level as matters of national environmental significance (MNES) under the EPBC Act are the focus of this report.

The report includes an assessment of the potential environmental impacts that may occur to MNES as a result of the Project, and proposed avoidance and mitigation measures. The estimated residual impacts have then informed significant impact assessments and a referral to DCCEEW pertaining to the Project's potential impacts on MNES listed under the EPBC Act (EPBC 2022/09329).

This report addresses the information request provided by DCCEEW on 21 November 2022.

This report addresses the adequacy review comments provided by DCCEEW on 25 May 2023.

1.2.1 Further information requested by DCCEEW

Table 1.1 lists the additional information requested by DCCEEW and identifies the section/s of the report where the updated/additional information can be located.

It should be noted that information contained in this report has been previously provided as part of the *Matters of National Environmental Significance (MNES) Assessment Report*, dated August 2022 (MNES Assessment Report) which accompanied the Project referral. For the purpose of responding to the RFI, the MNES Assessment Report has been replicated and updated (as appropriate) for ease of referencing and to provide a standalone report addressing the RFI.

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
1	**Description of the action**	
1.1	The location, boundaries and size (in hectares) of the disturbance footprint and of any adjoining areas which may be indirectly impacted by the proposal, including nearby vegetation, as well as clearly defined lot boundaries. Include mapping and coordinates.	Sections 1.3, 4.2, 8.3, 8.4.1, Figure 1.1, Figure 1.2 and Figure 3.1
1.2	A description of all components of the action, including the anticipated timing and duration (including start and completion dates, if known) of each component of the project. In addition, any components which were included in the referral material, but are no longer part of the proposed action, must be clarified.	Section 4.4 to 4.13
1.3	A description of the operational requirements of the action, including any anticipated maintenance works.	Section 4.4.3 and 4.5.3
1.4	If available, provide an indicative layout plan for the project area, including the: (i) key infrastructure (ii) the waste gas gathering lines from adjacent mining tenures (iii) the clean water pipeline returning water to existing mine water management system(s). If available, include mapping and coordinates for each of the above.	Sections 1.3, 4.2, 4.4 to 4.7 and Figure 3.1
1.5	Include updated information if any changes have been made to the project since the referral documentation was submitted.	No changes have been made to the Project.

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
2	**Habitat assessment**	
	Background Based on the information provided in your referral, and other available information, the department considers that the listed threatened species identified below may be significantly impacted by the proposed action: • Ornamental Snake (Denisonia maculata) – Vulnerable • Squatter Pigeon (southern) (Geophaps scripta scripta) – Vulnerable. Please note, it is the proponent's responsibility to be aware of any changes to the distribution of listed threatened species and ecological communities, and information available in the Species Profile and Threats (SPRAT) Database. The proponent must ensure that a recent Protected Matters Search Tool (PMST) report has been generated and considered before finalising the draft preliminary documentation. The department does not accept the consideration of only Queensland Regional Ecosystem (RE) mapping to determine habitat for listed threatened species. Further, habitat assessments must not only consider remnant vegetation. Habitat assessments must be informed by desktop and field surveys (in accordance with departmental guidelines or as defined by best practice surveys), and with reference to relevant departmental documents (e.g. approved Conservation Advices, Recovery Plans, draft referral guidelines and Listing Advices, and the SPRAT Database), including published research and other relevant sources. Where habitat assessments depart from departmental information, adequate justification must be provided to substantiate their suitability to the assessment.	Section 7.3, Section 7.6, Section 10.3, Section 10.4
2.1	Species/communities general information.	
2.1.1	Provide a habitat assessment for relevant listed threatened species and communities. Please note an assessment must be undertaken regardless of whether the species was recorded in the project area or not.	Section 7.6, Section 10.3, Section 10.4
2.1.2	Identify and describe known historical records of the listed threatened species and ecological communities in the broader region. All known records must be supported by an appropriate source (i.e. Commonwealth and State databases, published research, publicly available survey reports, etc.), the year of the record and a description of the habitat in which the record was identified.	Section 6.7, 6.8, Appendix C, Figure 6.2
2.1.3	Provide detailed mapping of suitable habitat for all listed threatened species and communities in a broader area than just the project area footprint (for example, adjacent to, and where relevant, downstream of the project). Ensure the mapping: • is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e. does not only illustrate relevant Queensland Regional Ecosystems) • includes an overlay of the project disturbance footprint • includes known records of individuals derived from desktop analysis and field surveys • is provided separately as attachments in JPEG format.	Section 7.6, Figure 7.5–Figure 7.8

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
2.1.4	Include an assessment of the adequacy of any surveys undertaken (including survey effort and timing). In particular, the extent to which these surveys were appropriate for the listed threatened species or community and undertaken in accordance with relevant departmental survey guidelines	Section 5.2, 5.3, Table 5.1
2.1.5	Attach all relevant ecological surveys referenced in the referral and preliminary documentation as supporting documents to the preliminary documentation.	Chapter 7, Appendix F, Appendix G
2.2	**Species specific information**	
	Ornamental Snake (*Denisonia maculata*) – Vulnerable	
2.2.1	Provide the definitions used for preferred habitat and suitable/connectivity habitat, noting the department will consider all habitat in its impact assessment. Discuss how these definitions align with the habitat definitions provided in the SPRAT Database, the Conservation Advice and the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (2011).	Section 7.6.4, Section 10.3.5
2.2.2	A discussion of vegetation composition and structure on relevant land zones (i.e. riparian vegetation, gilgai mounds and depressions, Brigalow TEC (both remnant and regrowth areas), cracking clay soils and microhabitat features).	Section 7.2.1, Section 7.6.4, Section 10.3.5
2.2.3	A discussion of habitat use requirements (e.g. shelter/refuge, foraging, dispersal, etc.), including consideration of known important habitat and suitable habitats.	Section 7.6.4, Section 10.3.5
2.2.4	If not already included, please note that habitat mapping rules for the Ornamental Snake should include floodplains, undulating clay pans and along the margins of swamps, lakes and watercourses. It also occurs on adjoining areas of elevated ground and has been recorded in woodlands and open woodlands of coolabah, poplar box, and brigalow, and in fringing vegetation along watercourses. The species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai and depressions, but also lake margins and wetlands.	Section 7.6.4, Figure 7.5, Section 10.3.5
2.2.5	Details and locations (including a map) of known food sources (i.e. frog species).	Figure 7.5
2.2.6	The total area (in hectares) of each identified habitat type (e.g. shelter/refuge, foraging, dispersal, etc).	Section 7.6.4, Section 8.4.1, Section 10.3.5, Figure 7.5

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
3	**Impact assessment**	
	Background The proposed action is considered likely to have impacts to listed threatened species. The department notes that an assessment of potential direct, indirect and consequential impacts of the proposed action is provided in the referral and variation documentation, in accordance with relevant departmental policies and guidelines, including the SPRAT Database. The department considers the proposed action may result in, but is not limited to, the following impacts: • fauna injury or mortality • habitat loss and fragmentation • alteration of hydrology and water quality • potential spills of hazardous materials • increased light and noise pollution • habitat degrading processes such as edge effects (e.g. weed invasion).	Noted. See responses below.
3.1	Listed threatened Species and Communities.	See responses below.
3.1.1	An assessment of the likely impacts associated with the proposed action, including construction, operation and maintenance of the project.	Chapter 8 and Chapter 10
3.1.2	Include the direct and indirect loss and/or disturbance of threatened species individuals and habitat as a result of the proposed action. This must include the quality of the habitat impacted and quantification of the individuals and habitat area (in hectares) to be impacted.	Sections 8.4.1, 8.4.2, 9.12, 10, Table 8.2 and Appendix K
3.1.3	An assessment of the impacts of habitat fragmentation in the project area and surrounding areas, including consideration of species' movement patterns.	Sections 8.4.2(i) and Chapter 10
3.1.4	An assessment of the likely duration of impacts to protected matters as a result of the proposed action.	Section 8.4
3.1.5	A discussion of whether the impacts are likely to be repeated, for example as part of maintenance.	Section 4.4.3, 4.5.3, 8.4
3.1.6	A discussion of whether any impacts are likely to be unknown, unpredictable or irreversible.	Sections 8.4 and 9.12, Appendix K
3.1.7	Justification, with supporting evidence, for how the proposed action will not be inconsistent with: • Australia's obligations under the Biodiversity Convention, the Convention on Conservation of Nature in the South Pacific (Apia Convention), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). • A recovery plan or threat abatement plan.	Section 8.1

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
4	**Avoidance, Mitigation and Management Measures**	
	Background Avoidance and mitigation measures are the primary methods of eliminating and reducing significant impacts on protected matters. Where possible and practicable, it is best to avoid impacts. Even if it is not possible to completely avoid a protected matter there may be ways to reduce the impact. If impacts cannot be avoided, then they should be minimised or mitigated as much as possible. Avoidance and mitigation measures must be investigated thoroughly as a part of the assessment and be supported by evidence to demonstrate likely success. The SPRAT Database, and associated statutory documents, may provide relevant mitigation measures for protected matters. Management commitments by the person proposing to take the action must be clearly distinguished from recommendations or statements of best practice made by the document author or other technical expert. Relevant management plans should be included as appendices to the preliminary documentation. Sufficient detail must be provided in each plan to ensure an assessment can be undertaken as to their likely suitability and effectiveness. Please note, the department is likely to recommend to the Minister (or delegate) that the conditions of approval require relevant plans to be approved and implemented prior to the commencement of the proposed action.	Chapter 9, Appendix H – Appendix L
4.1	A detailed summary of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of the proposed action on relevant protected matters (including any measures required through other Commonwealth, State and/or local government approvals). Proposed measures must be based on best available practices, appropriate standards, evidence of success for other similar actions and supported by published scientific evidence. All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed measures. All proposed measures must also be drafted to meet the 'S.M.A.R.T' principle: • S – Specific (what and how) • M – Measurable (baseline information, number/value, auditable) • A – Achievable (timeframe, money, personnel) • R – Relevant (conservation advices, recovery plans, threat abatement plans) • T – Time-bound (specific timeframe to complete).	Chapter 9
4.2	Information on the timing, frequency and duration of the proposed avoidance, mitigation and management measures to be implemented.	Section 9.3 to Section 9.12, Appendix H to Appendix L
4.3	To the extent reasonably practicable, provide any alternative routes for the proposed pipeline with consideration of habitat avoidance, including a comparative description of the impacts of each alternative on protected matters (e.g. gilgai habitat).	Sections 4.3, 7.2.1, 7.3.1

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
4.4	The referral states that, except for the gas compression facility, the remainder of the infrastructure will be installed underground. Please provide confirmation as to the extent of under-boring to be undertaken for the proposed pipeline, including a consideration of the feasibility of avoiding habitat for protected matters through the utilisation of under-boring.	Sections 4.5.1 and 4.5.2
4.5	The referral states that during construction of the proposed pipeline a 30 m wide right of way access will be utilised and reduced to a 15 m wide right of way during operations. Provide an assessment of possible impact avoidance through alternative right of way access designs, including, for example, consideration of the utilisation of single lane access with the provision of vehicle turn-outs or short overtaking lanes.	Sections 4.3, 4.5.1, 4.5.2, 4.13 and Table 4.2
4.6	Details of specific and measurable environmental outcomes to be achieved for relevant protected matters, including an assessment of the expected or predicted effectiveness of the proposed measures.	Table 12.1
4.9	Any statutory or policy basis for the proposed measures, including reference to the SPRAT Database and relevant approved conservation advice, recovery plan or threat abatement plan, and a discussion on how the proposed measures are consistent with relevant plans.	Chapters 9 and 10, Appendix H to Appendix L
4.11	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed measures and demonstrate that environmental outcomes will be, or have been, achieved.	Chapters 9 and 10, Appendix H to Appendix L
4.12	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the environmental outcomes have not been, or will not be, achieved.	Chapters 9 and 10, Appendix H to Appendix L
5.0	**Rehabilitation requirements**	
5.1	The details of any rehabilitation activities proposed to be undertaken, including any activities required through other Commonwealth, State and/or local government approvals. All commitments must be drafted using committal language (e.g. 'will' and 'must') when describing the proposed activities.	Appendix K
5.2	The proposed final landform, including rehabilitation completion criteria, and its relation to the pre-disturbance vegetation community. Include an assessment of the expected or predicted effectiveness of the proposed rehabilitation activities.	Appendix K
5.3	Provide detailed mapping of the project site that clearly identifies areas to be rehabilitated	Appendix K
5.4	Information on the timing, frequency and duration of proposed rehabilitation activities to be implemented, including anticipated time to completion.	Appendix K

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
5.5	Details of ongoing management and monitoring programs, including timing, to validate the effectiveness of proposed rehabilitation activities and demonstrate that completion criteria will be, or have been, achieved.	Appendix K
5.6	Details of tangible, on-ground corrective actions that will be implemented, including timing, in the event that monitoring programs indicate that the completion criteria have not been, or will not be, achieved.	Appendix K
6	**Offsets**	
	Background Environmental offsets are measures that compensate for the residual significant impacts of an action on the environment. Offsets provide environmental benefits to counterbalance the impacts that remain after consideration of avoidance and mitigation measures. Offsets do not reduce the impacts of an action, and are not intended to make proposals with unacceptable impacts acceptable. It is important to consider environmental offsets early in the assessment process. Correspondence with the department regarding offsetting is highly encouraged. The department's EPBC Act Environmental Offsets Policy (2012) (Offsets Policy) is available at: www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy. Include a draft Offset Strategy (OS) or a draft Offset Area Plan (OMP) as an appendix in the preliminary documentation for assessment and approval. If an offset area has been nominated, then provide an OMP. If not, provide an OS. Please note, the department is likely to recommend to the Minister (or delegate) that the conditions of approval require the environmental offset/s or the OMP be approved and implemented prior to the commencement of the proposed action. Based on the referral information, the department considers the proposed action is likely to have a residual significant impact on, at a minimum: • 55.68 ha of Ornamental Snake habitat.	Appendix M
6.1	An assessment of the likelihood of residual significant impacts occurring on relevant protected matters, after avoidance, mitigation and management measures have been applied.	Table 10.1 and Appendix M
6.2	A summary of the proposed environmental offset and key commitments to achieve a conservation gain for each protected matter.	Chapter 11 and Appendix M
6.3	If an offset area has not been nominated, include a draft OS as an appendix to the preliminary documentation. The draft OS must meet the information requirements set out in Appendix B.1.	Appendix M
6.4	Where offset area/s have been nominated, include a draft OMP as an appendix to the preliminary documentation. The draft OMP must meet the information requirements set out in Appendix B.2, and must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (2014), available at: www.environment.gov.au/epbc/publications/environmental-management-plan-guidelines.	Not applicable

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
7	**Ecologically sustainable development (ESD)**	
7.1	A description of how the proposed action meets the principles of ESD, as defined in section 3A of the EPBC Act. The following principles are principles of ecologically sustainable development: • decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations • if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation • the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations • the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making • improved valuation, pricing and incentive mechanisms should be promoted.	Section 12.2
8	**Economic and social matters**	
8.1	An analysis of the economic and social impacts of the action, both positive and negative.	Chapter 13
8.2	Details of any public consultation activities undertaken and their outcomes.	Section 13.2.1 and Table 13.1

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
8.3	Details of any consultation with Indigenous stakeholders. **Indigenous engagement** Identify existing or potential native title rights and interests, including any areas and objects that are of particular significance to Indigenous peoples and communities, possibly impacted by the proposed action and the potential for managing those impacts. Describe any Indigenous consultation that has been undertaken, or will be undertaken, in relation to the proposed action and their outcomes. The department considers that best practice consultation, in accordance with the Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act (2016) includes: • identifying and acknowledging all relevant affected Indigenous peoples and communities • committing to early engagement • building trust through early and ongoing communication for the duration of the project, including approvals, implementation and future management • setting appropriate timeframes for consultation • demonstrating cultural awareness. Describe any state requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action with regards to Indigenous peoples and communities.	Section 13.2.2
8.4	Projected economic costs and benefits of the project, including the basis for their estimate through cost/benefit analysis or similar studies.	Section 13.1
8.5	Employment opportunities expected to be generated by the project (including construction and operational phases).	Sections 4.11 and 13.1
9	**Environmental record of person(s) proposing to take the action**	
9.1	Include details of any past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against: • the person proposing to take the action • for an action for which a person has applied for a permit, the person making the application • if the person is a body corporate—the history of its executive officers in relation to environmental matters • if the person is a body corporate that is a subsidiary of another body or company (the parent body)—the history in relation to environmental matters of the parent body and its executive officers.	Chapter 14

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
Appendix A	**Preliminary documentation content, style and formatting requirements**	
A1	**Content requirements**	
A1.1	Be a stand-alone document containing sufficient information to avoid the need to search out previous or supplementary reports.	Noted
A1.2	Enable interested stakeholders and the Minister to easily understand the consequences of the project on matters of national environmental significance (MNES).	Noted
A1.3	Be written so that any conclusions reached can be independently assessed. Include all key claims, findings, proposals and undertakings in the main document.	Noted
A1.4	Refer to all relevant standards, policies and other guidance material published by the department. Any instances where published guidance is not followed must be justified. Where no Commonwealth standards exist, state government and industry standards may be useful.	Noted
A1.5	Include the names, roles and qualifications (where relevant) of all persons involved in preparing the preliminary documentation.	Appendix B
A1.6	Include a copy of this request for information and a cross-reference table indicating where the information fulfilling this request is included in the preliminary documentation (e.g. Section 4.2.2 and Appendix A, Section 2.1).	Refer cover letter and this table.
A1.7	The preliminary documentation must state the following for all information provided: • the source and date of the information • how the reliability of the information was tested • the uncertainties (if any) in the information • the guidelines, plans, and/or policies considered.	Noted
A2	**Format and style requirements**	
A2.1	Be in a suitable format to be published in hardcopy (A4 or A3 size, with maps and diagrams in A4 or A3 size and in colour) and published in electronic format (e.g. MSWord or PDF) on the internet.	Noted
A2.2	Include detailed technical information, studies or investigations necessary to support the information in the stand-alone document as appendices.	Noted
A2.3	Be objective, clear, succinct, avoid technical jargon and, where appropriate, be supported by maps, plans, diagrams, data or other descriptive detail.	Noted

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
A2.4	Reference all sources using the Harvard standard of referencing. Ensure that other supporting documents (e.g. academic studies, regulatory standards) are publicly accessible, with electronic links provided where possible.	Noted
A2.5	Redact the names and contact details of departmental officers.	Noted
A2.6	Not contain any commercial in confidence markings. If the preliminary documentation contains sensitive information, please discuss this with the assessment officer.	Noted
A3	**Ecological data provision**	**Noted**
A3.1	The preliminary documentation must include an appendix of occurrence records (both sightings and evidence of presence) for all listed threatened and migratory species identified during field surveys for the proposed action. This data may be used by the department to update the relevant species distribution models that underpin the publicly available Protected Matters Search Tool (PMST).	Appendix A
A3.2	The species occurrence records must be provided in accordance with the department's Guidelines for biological survey and mapped data (2018) using the department's Species observation data template. Sensitive ecological data must be identified and treated in accordance with the department's Sensitive Ecological Data – Access and Management Policy V1.0 (2016) or subsequent revision.	Appendix F
Appendix B	**Information requirements for EPBC Act Offset Proposals**	
B1	An Offset Strategy (OS) is like a proof-of-concept for an offset proposal. It demonstrates suitability and feasibility, and commits to a timeframe. When impacts and offsets are well understood and suitability of the proposed offset is high, an OS may not be required.	Chapter 11 and Appendix M

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
B1.1	Details of the residual impacts to protected matters as a result of the proposed action. This must include the methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to the impact site for each relevant protected matter, including: • total area of habitat (in hectares) • habitat quality (e.g. using the Queensland Government Guide to determining terrestrial habitat quality: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy [2020]). A methodology that is suitable for the species in question must be used to assess habitat quality (i.e. approved by the department or supported by literature), noting the same scoring mechanism must be used at both the impact site and the offset site. Please note, if using the above Guide to determining terrestrial habitat quality, the 'absence of threats' component of the score must only contain indicators that reflect the current habitat quality of the site (e.g. presence of pest species). Indicators that instead relate to a site's potential future condition must be excluded (e.g. risk of clearing or development). It is important to avoid confounding the presence of threats at a site that might affect the future state of a site, with those affecting its current state. These threats are appropriately dealt with in consideration of future risk of loss in the Offsets Assessment Guide and so should not be included in the score for current habitat condition.	Chapter 11 and Appendix M
B1.2	Details of the potential offset area/s (including a map) to compensate for the residual impacts of the proposed action on relevant protected matters.	Chapter 11 and Appendix M
B1.3	Specific details of the nature of the conservation gain to be achieved for relevant protected matters, including the creation, restoration and revegetation of habitat in the proposed offset area/s.	Chapter 11 and Appendix M
B1.4	Details, with supporting evidence, of how the environmental offset/s meets the requirements of the EPBC Act Environmental Offsets Policy (2012) (Offsets Policy), available at: www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy.	Chapter 11 and Appendix M
B1.5	The methodology, with justification and supporting evidence, used to inform the inputs of the Offsets Assessment Guide in relation to each potential offset area/s for each relevant protected matter, including: • time over which loss is averted (maximum 20 years) • time until ecological benefit • risk of loss (%) without offset • risk of loss (%) with offset • confidence in result (%). Please note, risk of loss should not include consideration of stochastic events (e.g. bushfires), activities that contribute to changes in habitat quality scores or impacts that would otherwise require an offset under any relevant legislation.	Chapter 11 and Appendix M

Table 1.1 Information requested by DCCEEW

#	Information required	Location in report
B1.6	Evidence that the relevant protected matter, and/or their habitat, can be present in the potential offset area/s.	Chapter 11 and Appendix M
B1.7	Information about how the potential offset area/s provides connectivity with other relevant habitats and biodiversity corridors.	Chapter 11 and Appendix M
B1.8	Details and execution timing of the mechanism to legally secure the environmental offset/s (under Queensland legislation or equivalent) to provide enduring protection for the potential offset area/s against development incompatible with conservation.	Chapter 11 and Appendix M

1.2.2 Adequacy review response

Table 1.2 lists the adequacy review comments on the PD and identifies the section/s of the report where the updated/additional information can be located.

It should be noted that information contained in this report has been previously provided as part of the *Matters of National Environmental Significance (MNES) Assessment Report* v2, dated August 2022 (MNES Assessment Report) which accompanied the Project referral, and the updated *MNES Assessment Report v4*, dated March 2023 relevant to information request response. For the purpose of the responding to the adequacy review comments, the MNES Assessment Report was replicated and updated (as version 6) for ease of referencing and to provide a standalone report addressing the adequacy review response.

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
General content, format and style	Draft management plans	**First adequacy review comment:** It is the department's preference to review draft management plans and finalise these during the assessment process. Will draft management plans be provided in the draft PD? **Second adequacy review comment:** The department notes that draft management plans have been provided with the draft PD. Will further changes be made to these management plans? Or can these plans be considered the final version for assessment by the department? If they are final, please remove draft markings from the documents. If they are to remain drafts, will the final versions be provided to the department prior to the assessment stage? Please note that plans must be approved by the department prior to commencement of the action. To avoid delays the department recommends all plans are finalised prior to assessment.	The following draft management plans have been prepared for the Project and previously issued with the PD Report, listed in the formal response and cover letter provided on 13 March 2023: • Vegetation Management Plan (Appendix H) • Fauna Management Plan (Appendix I) • Environmental Management Plan (Appendix J) • Rehabilitation Strategy (Appendix K) • Construction Weed and Pest Management Plan (Appendix L). To assist in the assessment, these items have been re-provided and are attached to this correspondence. It is common practice to prepare draft management plans for assessment by an administering authority (at both a State and Commonwealth level), given there are factors at play which prevent the finalisation of environmental management plans until primary approvals are obtained and construction contractors are procured. The draft management plans provided with the PD are therefore considered final for the purpose of this DCCEEW assessment. The management plans prepared with the PD will be finalised with consideration of the following activities: • receipt of DCCEEW conditions of approval • receipt of Environmental Authority (Queensland licence to operate) conditions of approval • engagement of the construction contactor, and alignment with their construction environmental commitments, roles and responsibilities. It is understood and acknowledged that any plan revisions must be approved by DCCEEW prior to commencement of the action.

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
Description of the action	The project crosses into four different Lot areas which are referred to frequently in the PD. However, these Lot areas are poorly defined in mapping provided and boundaries are easily confused with roads.	Please provide a separate map more clearly defining each specific Lot that covers the project area.	To assist in clarity and understanding of extent of the Project area, a revised Figure 1.1 has been prepared. This updated figure has been based on Figure 1.1 (Project area) contained within the PD v4 report and: • Contains the following datasets: – Project area and proposed disturbance footprint – cadastral boundaries (property boundaries) – infrastructure (roads, rail, water pipelines). • Impacted properties have been highlighted, shaded and labelled. • Labels have been updated, larger font and bolder formatting.
	Waste gas lines from mine sites and returning water lines are not indicated (e.g. Figure 3.1) and are only referred to in the text in general terms in the construction summary.	Please clarify if these lines are part of the pipeline construction. If so, include them in mapping and provide a more detailed explanation on their construction. Also please ensure that the construction clearance for right-of-way (ROW) is covered in the estimated vegetation clearance calculations.	Infrastructure that will supply waste coal seam gas to and return water from the Gas Compression Facility (GCF) will be the responsibility of the supplier and does not form part of this assessment. 3rd party gas suppliers will either operate under existing approvals or will be required to amend/seek new approvals to supply the GCF. The high-pressure pipeline easement is a 30 metre (m) right of way (ROW) during construction and a 15 m ROW during operations. The 30 m ROW forms part of the Project footprint and is included in the vegetation clearing calculations.

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
Habitat Assessment	Mapping of species and TEC habitat is focused on the project area only.	**First adequacy review comment:** Provide detailed mapping of suitable habitat for listed threatened species and communities within the broader 'study area' identified in the draft PD (Figure 1.2). Ensure the mapping: • Is specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e. does not only rely on relevant Queensland Regional Ecosystems). • Includes an overlay of the project disturbance footprint. • Includes known records of individuals derived from desktop analysis and field surveys. Please also include habitat mapping for the Greater Glider. **Second adequacy review comment:** In order for the department to adequately assess the potential impacts to MNES, we require an understanding of habitat within the broader 'study area'. The department notes that conducting ground-truthing within the 'study area' is not feasible. Mapping using desktop resources, as is shown in Figure 7.2 of Appendix M (Offset Strategy), would suffice as long as it is sufficient to indicate areas of potential habitat for MNES in the broader study area.	This report defines the study area for the assessment as a 20 km buffer from the Project disturbance footprint – this constitutes a land area of 68,349.18 ha. Providing detailed mapping which is derived from ground-truthing (fieldwork) of the wider study area is not practicable nor warranted. Instead, field work has been undertaken within the Project area (180 ha) which encapsulates the Project disturbance footprint (65.05 ha). DCCEEW's comment regarding the use of Regional Ecosystems (REs) is acknowledged; however, we note the assessment within the PD Report does not only rely on REs to inform habitat assessments. Rather habitat assessments have been informed by a combination of desktop assessment and field survey. The assessment methodology is detailed in Chapter 5 of the PD Report and specifically identifies the following as informing the assessments: • Desktop reviews, including: – DCCEEW Protected Matter Search Tool (PMST) – DES Wildlife Online – Queensland Department of Natural Resources, Mines and Energy (DNRME) regulated vegetation mapping (remnant, high value regrowth (HVR) and non-remnant) – DES Certified Regional Ecosystem Mapping – Atlas of Living Australia (ALA) – eBird to access records of threatened bird species and migratory birds that occur in the study area – DES Protected Plants High Risk Trigger Mapping – DES Essential Habitat mapping – current aerial imagery and historical aerial imagery supplied by QImagery – DES Wetland mapping – Department of Agriculture and Fisheries (DAF) Waterways for Waterway Barrier Works Mapping

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
			– the EPBC Listing advice and/or Conservation Advice for relevant TECs, to identify analogous REs. • Field surveys, including: – Quaternary site assessments. – BioCondition assessments. – Threatened ecological communities, assessment against key diagnostic characteristics and conditions thresholds. – Threatened flora, informal searches informed by records of threatened grasses. – Pest flora, informed by PMST and Wildlife online. – Habitat assessments, across 35 sites involving the recording of habitat attributes focussing on habitat requirements for the Ornamental Snake, Squatter Pigeon, Koala, Greater Glider and wetland-dependent species. The existing habitat mapping is derived from available Commonwealth and State databases and is fit for purpose. Background research and desktop ecological assessments have been completed within this area to provide an understanding of the broader ecological values, landscape features, vegetation communities and threatened species present. This included evaluation of multiple data sources as detailed in Section 5.1 as well incorporating field survey findings. The Project area (defined as – disturbance footprint plus buffer) has been surveyed on multiple occasions. Survey locations, timings and methods used are detailed in Section 5.2. Timing and methods for seasonal fauna surveys were guided by the applicable State and Commonwealth survey guidelines. A summary of the fauna survey effort implemented and consistency with applicable survey guidelines is provided in Table 5.1.

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
			Habitat mapping has been prepared for those MNES that have been identified (post consideration of desktop assessments and field ecology surveys results) as being 'known' or 'likely' to occur in the Project area. As Greater Glider is considered unlikely to occur in the Project area no habitat mapping has been prepared for this species. Refer Section 7.6.7. Additional information has been included in the PD Report (Section 7.6) to illustrate potential habitat within the broader study area for the following MNES: • Brigalow TEC • Ornamental Snake • Squatter Pigeon • Koala.
	Habitat for the Squatter Pigeon has been deemed unsuitable in most of the project area because it is too weedy and densely vegetated.	Please provide mapping of the broader 'study area' identifying all squatter pigeon habitat divided into breeding, foraging and dispersal. Included in this mapping, please provide an overlay identifying areas which are considered to be too densely vegetated to provide suitable habitat.	In addition to the above commentary habitat mapping has been previously prepared for Squatter Pigeon (refer Figure 7.6 and Section 7.6.5). Habitat has been mapped following DCCEEW criteria for: • Breeding habitat – any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5, 7) and within 1 km of a suitable, permanent or seasonal waterbody. • Waterbodies have been mapped to include stream order 1 and above as well as dams identified on site and through aerial imagery. Foraging habitat – any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5, 7) and within 3 km of a suitable, permanent or seasonal waterbody. • Waterbodies have been mapped to include stream order 1 and above as well as dams identified on site and through aerial imagery. Areas considered unsuitable for the species (dense weedy groundcover) have been excluded from mapping entirely. Therefore, some foraging areas have been added additionally to the potential breeding habitat to capture the cleared tracks that the species has been observed foraging on or is likely to forage on but does not form breeding habitat (open tracks with little ground cover).

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
			• Dispersal habitat – any forest or woodland occurring between patches of foraging or breeding habitat that facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies, and areas of cleared land less than 100 m wide linking areas of suitable breeding and/or foraging habitat.
			As well as mapped remnant and regrowth vegetation communities (using ground-truthed mapping in the Project area) some non-remnant areas have been mapped as dispersal habitat for this species, as scrub is present and the species could move through these areas between patches of breeding or foraging habitat.
	The draft PD has assessed habitat and impact to the Koala based on the superseded 'EPBC Referral guidelines for the vulnerable Koala'.	Please conduct a new habitat and impact assessment for the Koala based on the following guidance material. Identifying habitat for the endangered Koala – DCCEEW (2022) https://www.dcceew.gov.au/environment/epbc/publications/identifying-habitat-for-the-endangered-koala A review of koala habitat assessment criteria and methods (dcceew.gov.au) (2021) https://www.dcceew.gov.au/sites/default/files/documents/review-koala-habitat-assessment-criteria-and-methods-2021.pdf	An updated assessment and supporting Figure 7.7 has been produced (this has replaced previous version of Figure 7.7).

Table 1.2 Response to DCCEEW Adequacy Review Comments on the PD

PD Guideline Section	Draft PD Issue	Department's Response	QPM Energy Response
Impact Assessment	The impact assessment has been based on the project footprint which has been defined as 'areas permanently required for infrastructure'. It does not cover the total area to be cleared (permanent and temporary disturbance).	Please clearly identify total hectares to be cleared for both permanent and temporary disturbance.	This comment references a partial statement from Section 8.3 and has not been understood in the context of the PD Report and definitions provided. Chapter 4 specifically defines Project Footprint as: Project disturbance footprint – the location of the proposed pipeline, GCF and ancillary facilities and the area which will be directly disturbed by the project. The Project disturbance footprint definition is inclusive of permanent and temporary disturbance areas – for instance the 30 m ROW required for the high-pressure pipeline during construction. For context Section 8.3 highlights: The Project disturbance footprint has been defined based on the Project Description in Section 4, to provide a maximum direct impact area. The Project footprint mapped and assessed within this report includes areas permanently required for infrastructure. The total Project disturbance footprint is approximately 65.05 ha. QPM Energy will not clear any additional areas beyond those maximum disturbance limits identified. The GCF footprint is 6 ha. The buried pipeline reduces to an area of 30 ha which is predominantly existing farm tracks, firebreaks and pulled cleared pasture.
Avoidance, Mitigation and Management Measures	Table 9.1 and other locations in the draft PD use the phrase 'within 12 months of clearing'.	Please clarify what is meant by 'within 12 months of clearing'. Does it mean '12 months prior to clearing'?	This statement is intended to mean **within the 12 months prior to clearing.**
Ecologically Sustainable Development	-	The department considers the information provided is adequate.	Noted.
Economic and Social Matters	-	The department considers the information provided is adequate.	Noted.

1.2.3 Response to submitter comments on the PD

Table 1.3 lists the submitter comments on the PD and provides a response to the comments received. Where relevant, Table 1.3 also identifies where further information related to a submitter comment is located within the PD.

It should be noted that information contained in this report has been previously provided and for the purpose of the responding to submitter comments the PD has been replicated and revised (to version 7) for ease of referencing.

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
Contributions to climate change through GHG emissions		
1	The Project will negatively contribute to climate change and global warming through greenhouse gas (GHG) emissions resulting from the proposed activities.	The Project involves capturing and converting methane in waste coal mine gas (a greenhouse gas) that would otherwise be released into the atmosphere. The Project will provide a beneficial use for coal mine waste gas beyond flaring and venting that is currently used to dispose of extracted methane. Beneficial use of the gas avoids additional greenhouse gas emissions when used to generate energy or chemicals which would otherwise use coal or natural gas. It significantly reduces global greenhouse gas emissions when compared to vented methane which has a GHG intensity of 80 over the first 20 years compared to carbon dioxide. The GHG intensity is 27 times more potent than carbon dioxide over 100 years. The extremely high early years intensity makes methane reduction a high priority target. Methane is responsible for around 30% of the rise in global temperatures since the Industrial Revolution, and rapid and sustained reductions in methane emissions are key to limiting near-term global warming and improving air quality. Reducing fugitive coal mine methane will be essential for Queensland to meet its targets for GHG reduction of 30% emissions reduction below 2005 levels by 2030 and zero net emissions by 2050. Tackling methane emissions from the energy sector represents one of the best near-term opportunities for limiting global warming because the pathways for reducing them are well known and often cost-effective. The resources sector has the know-how and resources to take quick action. The Project is an example of a facility which captures gas, creates a beneficial use which avoids methane venting and flaring which also loses methane to atmosphere. The facility will provide an important step for miners to meet targets and to reduce greenhouse gas emissions in the Northern Bowen Basin which is an area noted for its regionally important high quality metallurgical coals and very high gas content mines. It will position metallurgical coal miners to produce cleaner coal and continue to enhance Australia's importance and role in producing higher quality premium coal products for export. Based on the above QPM Energy believes the Project will present a net reduction in GHG warming potential through the conversion of fugitive methane gas emissions to carbon dioxide.
2	Requests further detail is provided on:	-

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
2a	• The proposed sources of the coal mine methane.	QPM Energy has identified the following as potential supply locations for waste coal mine gas: • Wards Well Coal Mine (Stanmore SMC) • North Goonyella/Eaglefield Mine (Peabody (Bowen)) • Arrow – Potential Commercial Area (PCA) 258 Exploration Wells overlying Wards Well Southeast Mine (Stanmore SMC) • Arrow – Northern end of Petroleum Lease (PL) 486 (overlying Red Hill Coal Mine, held by BHP Coal). Additional pre-mine drainage opportunities exist in locations further afield; however, the above are being investigated owing to co-location opportunities, existing approvals, established operations, and potential for commercial agreements. Infrastructure that will supply waste coal seam gas to the GCF, from any of the above sites, will be the responsibility of the supplier and does not form part of the Project.
2b	• The longevity of the mines and the volumes of the coal mine methane to be extracted from each of the coal mines.	Potential supply locations for waste coal mine gas are listed in QPM Energy's response to Item 2a. The final supply location is yet to be confirmed. The GCF will be designed to receive waste coal mine gas at a normal pressure of 138 kilopascals gauge to the specification outlined in Table 4.3.
2c	• An assessment of the environmental impacts of the additional infrastructure required that are not covered in the current assessments.	It is noted that the Project has two connections to infrastructure owned by third parties, being: • North Queensland Pipeline (NQGP) - existing infrastructure with approved tenure and related environmental authority in place. • Waste gathering lines operated by the waste coal seam gas supplier – will be subject to approvals at the relevant waste coal mine gas supplier location. The assessment contained within the PD is limited to the impacts from Project activities described in Section 4 as it relates to Project area and defined battery limits (detailed in Section 4.2). Any activities and/or development beyond those defined within the PD may be subject to additional approvals where existing approvals are not in place.

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
2d	• Confirmation that the facility is only for the collection of coal mine methane and not part of a staged expansion of the coal seam gas development in the Bowen Basin.	The Project proposes to collect waste coal mine gas at the proposed GCF via waste gathering lines located at adjacent coal mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where in turn it will be depressurised and distributed, by a third party, to industrial users, including QPM's Townsville Energy Chemicals Hub (TECH) Project. The Project will be limited to the activities described in Section 4 as it relates to Project area and battery limits (detailed in Section 4.2). Any activities and/or development beyond those defined within the PD will be subject to additional approvals.
2e	• Decarbonisation plans for the QPM TECH Project which will be the recipient of the gas from this Project.	The NQGP will transport compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's TECH Project. The QPM TECH Project does not form part of this Project and is subject to independent assessment and approvals. Further information related to the QPM TECH Project is available at https://epbcpublicportal.awe.gov.au/all-referrals/project-referral-summary/?id=2bd764e0-ef06-ec11-80c8-00505684c137
Impacts on listed threatened species and communities and listed migratory species		
3	It is recognised that the initial footprint of the Proposed Action will reduce by nearly half after construction is completed and that land will be rehabilitated. However, the Proponent recognises that the vegetation re-established over the pipeline cannot be deep-rooted and thus, limits the rehabilitation of that area to grasslands. This does not restore the original vegetative profile of the area and therefore, will impact on the biodiversity of the Project Area.	During construction, the right of way (ROW) for the high-pressure pipeline will be 30 m wide and will shrink to 15 m wide during operations. As the high-pressure pipeline will be located underground, previous land use activities will be able to be resumed; however, deep rooted vegetation will not be able to be established given the risk of potential damage to the high-pressure pipeline (refer Section 4.5.3). Progressive rehabilitation activities are detailed in Section 4.13. The impact assessment addresses direct and irreversible impacts related to vegetation and habitat clearance (refer Section 8.4.1) and has quantified the areas that will be cleared as a result of the Project (refer Table 8.2). Additionally, in defining the Project footprint, a desktop route selection process was undertaken that considered the highly constrained nature of the landscape and the performance needs of the infrastructure. The Project footprint was selected as the most suitable for the following reasons: • extensive site selection and investigations, including consideration of numerous alternative alignments in the vicinity of the current proposed alignment • proposed alignment presents optimal location reflecting MNES/MSES values, surrounding land uses, and third party stakeholders • alignment avoids highest value ecological communities • alignment avoids underground mine developments and crosses established infrastructure at existing nominated locations

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
		• alignment largely follows existing cleared areas, disturbed and cleared fence lines and existing fire breaks • access roads are incorporated into the high-pressure pipeline alignment to reduce additional disturbance footprint • uses an existing 290 km NQGP to transfer natural gas to consumers • project beneficially uses coal mine waste gas emissions from existing coal mine operations to displace fossil fuels and avoid methane flaring and venting. The site selection process is detailed in Section 4.3.
4	The Project is located in the Isaac River Catchment in a region with many coal mines and a growing number of gas facilities. QPM notes that cumulative impacts are unknown and unpredictable, and that most of the impacts caused by the Project are permanent. We appreciate that it is challenging to determine how many small impacts to wildlife habitat can be tolerated before the conservation status of any species is impacted. We do note that the in this region, there have been many species placed on the endangered species list due to cumulative impacts. The Australian government has committed to protecting wildlife from extinction – being listed as endangered is the next step closer to extinction and hence all habitat becomes critical to protect.	Potential impacts from the Project are listed in Section 8.4. They include: • loss of habitat as a result of vegetation clearing • habitat fragmentation • fauna injury or mortality during vegetation clearing • fauna injury or mortality as a result of vehicle strike • disturbance to wildlife during construction as a result of noise, light and vibration • erosion and sedimentation which may impact on water quality • potential spills of hazardous materials • increase in numbers of pest animals and weeds due to increased vehicle movements and opening up areas of remnant vegetation from clearing for infrastructure • elevated bushfire risk due to increase in activities on site that may cause a fire to start • alteration of hydrology and water quality. Direct impacts are detailed in Section 8.4.1 and indirect impacts are detailed in Section 8.4.2. These sections identify the Project phases where the impact may occur. QPM Energy agrees that some impacts from the Project will be unavoidable. In assessing Project impacts and identifying mitigation measures, QPM Energy has proposed measures that are proven to be successful or are considered standard practice. Mitigation measures which have not been proven, or are not known to be successful, have not been identified in management actions. Without evidence of the effectiveness of mitigation, the precautionary principle has been applied. Management principles are discussed in Section 9.1. Where a significant residual impact has been identified offsets have been proposed (refer Chapter 11).

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
5	QPM is required to offset, at a minimum, 227 ha of ornamental snake habitat under the EPBC Act, and 12.16 ha of endangered regional ecosystem 11.4.9 under the *Environmental Protection Act 1994* (Qld). Offsets are typically of minimal success, short duration, and certainly do not address the cumulative impacts from the loss and disturbance of habitat in areas such as the Bowen Basin.	Chapter 11 identifies that QPM Energy is proposing to deliver environmental offsets through a staged approach with direct land-based offsets preferred for both Ornamental snake and Endangered RE 11.4.9. A Draft Environmental Offset Strategy has been prepared and attached to the Preliminary Documentation as Appendix M. This document outlines how offsets will be delivered in accordance with Commonwealth and State requirements. Based on completed significant residual impact assessments it has been concluded that the Project may require the following offsets: • Ornamental Snake (MNES) – a preliminary offset estimate of 227 ha as a result of an area of impact involving 36.05 ha of preferred habitat and 19.62 ha of connectivity/dispersal habitat. • Endangered RE 11.4.9 (MSES) – a preliminary offset estimate of 12.16 as a result of an area of impact of 3.04 ha. While the offset areas are yet to be secured, the process of site/s selection is underway with preliminary sites identified and landholder consultation commenced. Following feedback from landholders the list of preliminary sites will be shortlisted and field assessment will occur to confirm site suitability. An Offset Area Management Plan will be prepared, for approval by the Commonwealth, prior to construction and will be: • legally secured • managed by QPM Energy in accordance with OAMP and landholder agreements.
6	It is recommended that the Project:	-
6a	• Identifies and secures the tenure of the proposed land-based offset habitats to provide certainty that the loss and fragmentation of threatened species and communities can be justified.	QPM Energy is currently in the process of securing an offset site. Site selection has advanced with preferred sites identified and landholder consultation underway. The Draft Environmental Offset Strategy (refer to Appendix M of the Preliminary Documentation) outlines how offsets will likely be delivered in accordance with Commonwealth and State requirements and establishes the process and criteria for site selection to allow the identification of properties that are likely to contain areas of habitat of the required offset values.

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
6b	• Prepares a Rehabilitation Management Plan before project commencement and not leave this until 12 months prior to decommissioning.	The Rehabilitation Strategy for the Project is included in Appendix K. The purpose of this Rehabilitation Strategy is to describe the rehabilitation activities proposed for the Project, seeking to achieve a safe, non-polluting stable landform for areas used in construction not required in operation. The strategy describes rehabilitation objectives of areas within the Project area not required for operation which will be managed to restore current land uses, including restoration of habitat for threatened fauna species. The Rehabilitation Strategy applies to construction, operational and decommissioning activities. The Rehabilitation Strategy includes the following requirement (as referenced in the submission): *A final Rehabilitation and Decommissioning Management Plan required as part of the State approvals will be developed and submitted to the relevant authority 12 months prior to decommissioning occurring.* This requirement is specifically related to the decommissioning of the Project. During construction progressive rehabilitation and reinstatement activities will occur, this process is detailed in Section 4.13 and Chapter 4 of Appendix K. Additionally, the Project may also be subject to a form of financial assurance in accordance with Queensland Government requirements. This is known as an Estimated Rehabilitation Cost (ERC) and based on the likely costs and expenses that the Queensland Government may incur when taking action to rehabilitate or restore and protect the environment because of environmental harm that an activity may cause.
6c	• Commits to the progressive restoration of existing vegetation communities in all areas of the pipeline easement that can be rehabilitated as soon as possible after construction is completed.	During construction progressive rehabilitation and reinstatement activities will occur, this process is detailed in Section 4.13, and Chapter 4 of Appendix K.

Table 1.3 QPM Energy Response to Submission/s

#	Submitter comment	QPM Energy response
Stranded assets		
7	QPM anticipates the lifespan of these facilities to be 25 years. However, the referral fails to take into consideration the further expansion of cleaner and cheaper renewable energy resources. Climate-related asset stranding due to changes to energy demand from the implementation of new technology and the enforcement of stricter climate policies should be taken into consideration by the proponent and for the approval. As climate legislation and policies tighten around the use of fossil fuels there is substantial possibility that the requirement for the Project will decline and even potentially disappear before the end of its project lifetime. The risk of these assets becoming stranded is considerable as Australia strives for net-zero-emissions in-line with international agreements. The Project justification relies on the assumption that fossil fuel industries will continue to be a prominent supply of energy for the next 25 years, not taking into consideration the impromptu uptake of cheaper, cleaner energy sources such as renewables. This could therefore, result in the assets becoming stranded and the disruption of habitat for no social or environmental benefit.	Section 4.12 highlights that the Project will have an average design life of more than 25 years. Design life refers to the life expectancy of the infrastructure. The Project does not assume that fossil fuel industries will continue to be a prominent supply of energy. Regardless, when, and if, the Project is no longer required, it would be decommissioned in accordance with the regulatory requirements and accepted environmental best practices at that time. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant and all pipeline valves and metering stations) and the restoration of associated disturbed areas. A Rehabilitation Strategy for the Project is included in Appendix K and requires that a final Rehabilitation and Decommissioning Management Plan be developed and submitted to the relevant authority 12 months prior to decommissioning occurring.

1.3 Project location

The proposed high-pressure pipeline is situated over two properties (Denham Park and Dabin Station), comprising the following lot/plans – Lot 23 on SP262530, herein named Lot 23, Lot 11 on SP262530, herein named Lot 11 both located on Denham Park, and Lot 2 on SP214117 located on Dabin Station, herein named Lot 2. The pipeline also crosses Lot 100 on SP235905 (Goonyella rail system) which will be underbored with no surface impacts and also crosses underneath the Sunwater Moranbah and Eungella pipelines.

The Project area also includes a 40 m buffer from the proposed high-pressure pipeline corridor which is 30 m in width (total width surveyed along the alignment is 110 m). This buffer also intersects a small portion of Lot 14 on CP846391 located on Burton Downs, herein named Lot 14, and Lots 23, 11 and 2.

The proposed gas compression facility and access road is located on Lot 2, and is also buffered by 40 m, for the purpose of this ecological assessment.

The location of the Project is shown in Figure 1.1. The study area for the ecological assessment (a 20 km buffer from the Project area) is shown on Figure 1.2.

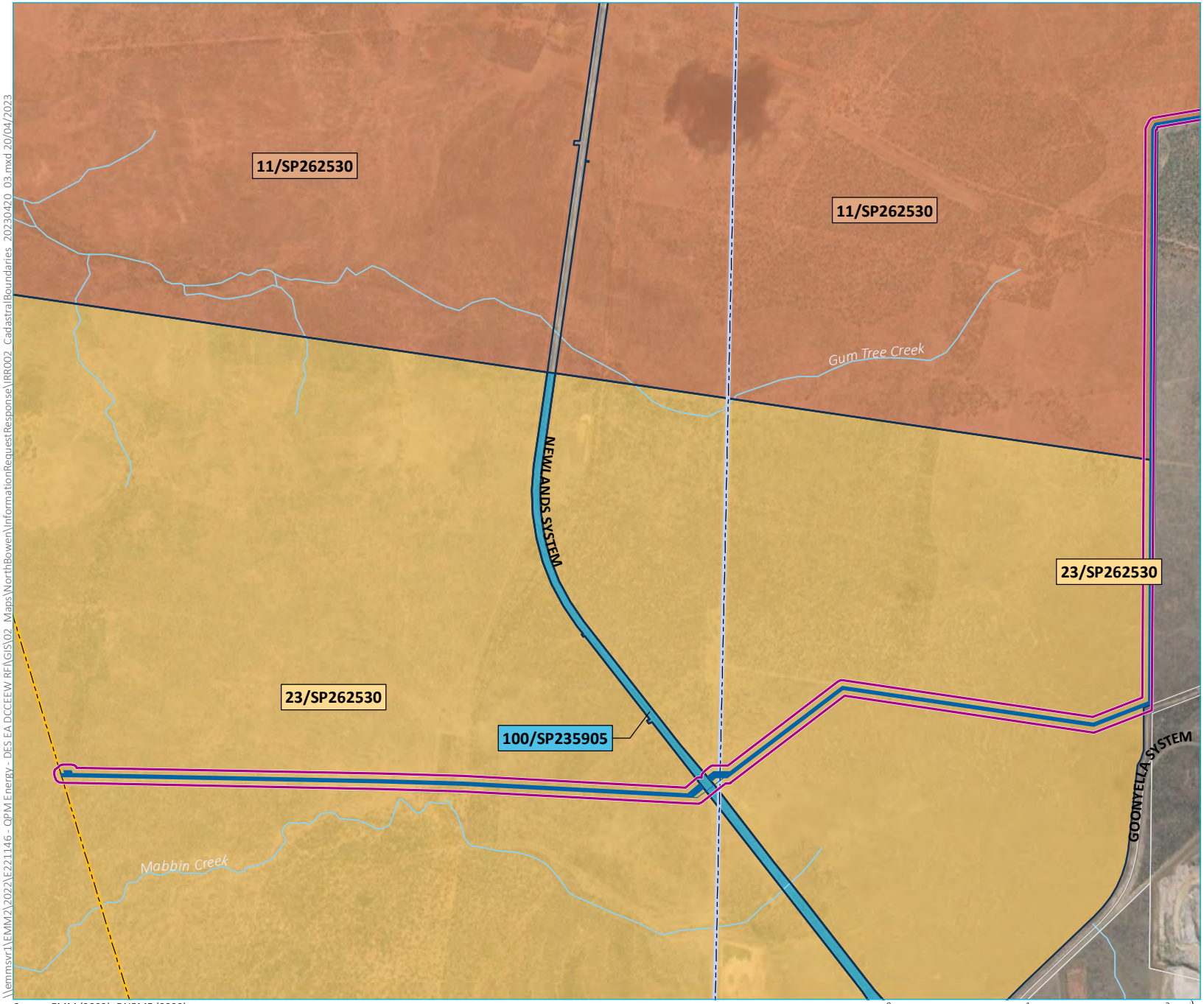
For the purpose of this report, the following definitions are used:

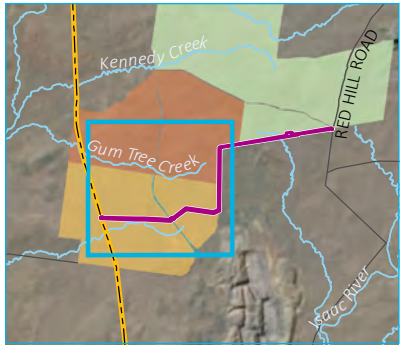
- Project footprint – the location of the proposed pipeline, GCF and ancillary facilities and the area which will be directly disturbed by the project.
- Project area – is the project footprint within a 40 m buffer from the pipeline corridor, GCF and access track.
- Study area – 20 km buffer from the project footprint.

1.4 Pre-referral meetings

A pre-referral meeting was held on 15 July 2022 with attendees from QPM Energy, EMM and DCCEEW. The purpose of the meeting was:

- for DCCEEW to be introduced to the Project
- to provide a summary of the scope of environmental assessments being undertaken to facilitate assessment at Local, State and Commonwealth levels
- to present findings of the baseline data gathered, potential impacts and the impact management philosophy
- to discuss the adequacy of the information gathered to facilitate referral under the EPBC Act.





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Water pipeline
- Minor road
- Watercourse/drainage line
- Cadastral boundary
- Impacted property boundary

Impacted property

- 11/SP262530 (Denham Park)
- 23/SP262530 (Denham Park)
- 2/SP214117 (Dabin)
- 100/SP235905 (Operational rail corridor)

Impacted properties
Map 1 of 2

QPM Energy Project
Information Request Response
Figure 1.1

EMM
creating opportunities

Source: EMM (2023); DNRME (2022)

0 1 2 m

GDA 1994 MGA Zone 55

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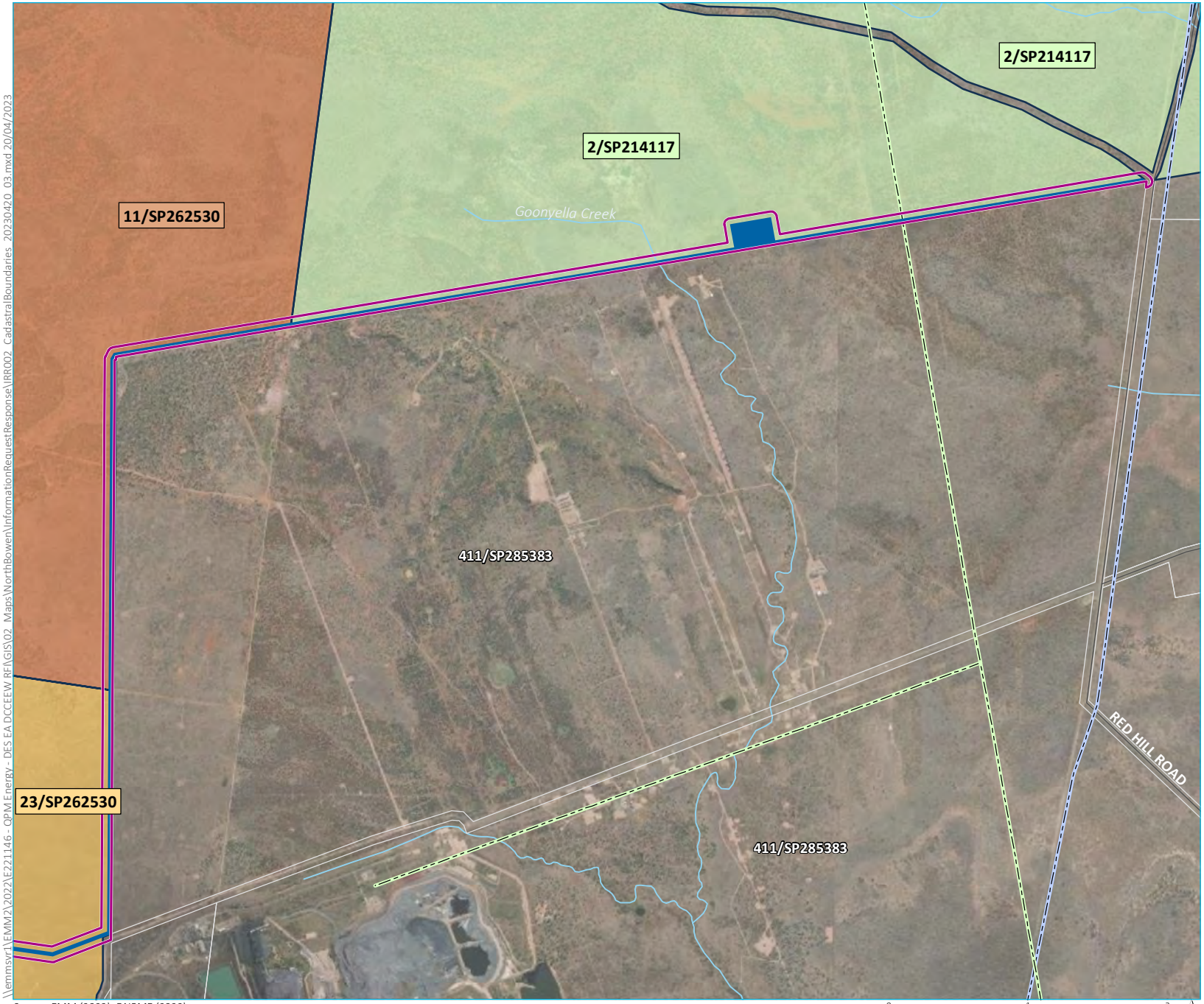

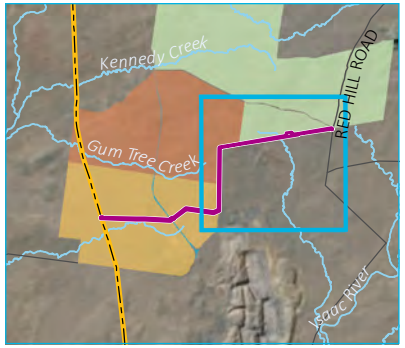

KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Water pipeline
- Electrical transmission line
- Minor road
- Watercourse/drainage line
- Cadastral boundary
- Impacted property boundary

Impacted property

- 11/SP262530 (Denham Park)
- 23/SP262530 (Denham Park)
- 2/SP214117 (Dabin)
- 100/SP235905 (Operational rail corridor)

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Source: EMM (2023); DNRME (2022)

0 1 2 m

GDA 1994 MGA Zone 55

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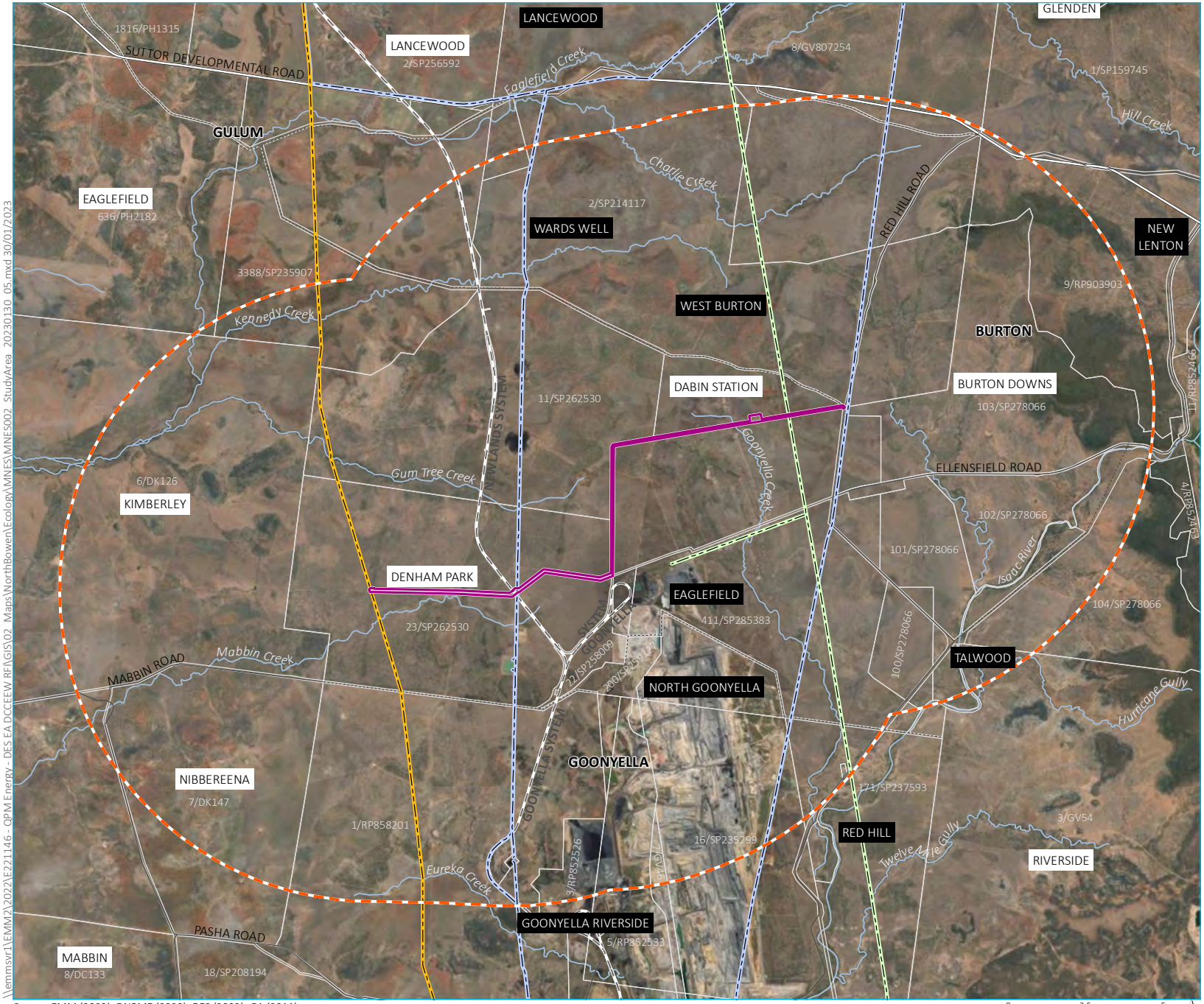
Impacted properties
Map 2 of 2

QPM Energy Project
Information Request Response
Figure 1.1

EMM
creating opportunities



KEY

- Ecology study area
- Project area
- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

Ecology study area

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

0 2.5 5 km

GDA 1994 MGA Zone 55

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QPM Energy Project
MNES Preliminary Documentation
Figure 1.2

EMM creating opportunities

2 Legislative context

Primary approvals for the Project are being sought under the EPBC Act and the *Environmental Protection Act 1994* (QLD) (EP Act). These approval processes are being progressed concurrently.

A summary of the key legislation, policies and guidelines that have informed the design and implementation of field ecology surveys and impact assessments is provided in the following sections.

2.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's central piece of environmental legislation that provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance (MNES).

If a proposed development or other action ('proposed action') is likely to have a significant impact upon an MNES, then it must be referred for assessment under the EPBC Act. MNES under the EPBC Act are:

- World Heritage Properties
- National Heritage Places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- the environment, where nuclear actions are involved
- a water resource, in relation to coal seam gas and large coal mining developments
- the environment, where actions proposed are on, or will affect Commonwealth land and the environment
- the environment, where Commonwealth agencies are proposing to take an action.

Desktop assessments and flora and fauna surveys completed to date have included an assessment of the presence of threatened ecological communities (TECs) and targeted surveys for listed flora and fauna species under the EPBC Act.

2.1.1 Matters of National Environmental Significance – Significant Impact Guidelines 1.1

Under the EPBC Act an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on an MNES. The *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* (DoE 2013a) outline a 'self-assessment' process, including detailed criteria, to assist persons in deciding whether or not referral may be required and if the proposed action may have a 'significant' impact on MNES.

The EPBC Act includes a requirement that where a significant impact to an MNES is assessed as likely to occur, an environmental offset is required to compensate for that impact.

2.1.2 EPBC Act referral guidelines for the Koala

On 12 February 2022, the Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) was listed as endangered under the EPBC Act. Following this listing event, the 'EPBC Act referral guidelines for the vulnerable koala' and associated policy documents are no longer current. Therefore, the *Significant Impact Guidelines 1.1* have been utilised in determining whether a significant impact on Koala is likely. Nonetheless these guidelines still provide valuable contextual information.

The extent of proposed development activities and Koala habitat quality will determine whether the Project should be referred to the Commonwealth DCCEEW to comply with obligations under the EPBC Act for potential impacts to Koala.

2.1.3 EPBC Act Environmental Offsets Policy

Environmental offsets are required to be delivered in accordance with the *EPBC Act Environmental Offsets Policy* (DoEE 2012). The Environmental Offsets Policy outlines the Australian Government's approach to the use of environmental offsets ('offsets') under the EPBC Act. Offsets are defined as measures that compensate for the residual adverse impacts of an action on the environment. Where appropriate, offsets are considered during the assessment phase of an environmental impact assessment under the EPBC Act (DoEE 2012).

Avoidance and mitigation measures are the primary strategies for managing the potential significant impact of a proposed action. Offsets do not reduce the likely impacts of a proposed action, but instead compensate for any residual significant impact. Where significant impacts are found to occur to MNES, and environmental offsets are required, an offsets package should be provided. An offsets package is a suite of actions that a proponent undertakes in order to compensate for the residual significant impacts to the identified MNES. It can comprise a combination of direct offsets and other compensatory measures.

Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain (DoEE 2012). To support any offset assessments that may be required it will be important to evaluate the specific MNES attributes that occur within the proposed disturbance area (e.g. whether foraging habitat or breeding habitat) and the habitat quality of mapped habitat areas. This information is required to inform offset calculations.

2.2 Queensland Environmental Protection Act 1994 (EP Act)

The Project will require a material change of use for an environmentally relevant activity (ERA). The ERA will require an environmental authority (EA) to be issued under the *Environmental Protection Act 1994* (QLD) (EP Act). As part of the application, an environmental impact assessment is required to be undertaken to assess the potential for environmental impacts, and identify how those impacts will be avoided, reduced and mitigated. As part of the impact assessment, the presence of matters of state environmental significance (MSES) within the proposed impact areas will need to be identified, and determination made as to whether the proposed actions would result in a 'significant' residual impact to MSES. If a significant impact is considered likely to occur to MSES, environmental offsets will be conditioned through the EA, and they will need to be delivered in accordance with the *Environmental Offsets Act 2014* (EO Act). This will be assessed applying the *Significant Residual Impact Guideline* (DEHP 2014).

2.3 Queensland Vegetation Management Act 1999 (VM Act)

The purpose of the VM Act is to regulate the clearing of native vegetation in a way that conserves remnant vegetation in declared areas, ensures clearing does not cause land degradation, prevents the loss of biodiversity and maintains ecological processes.

Under the VM Act Res are assigned one of three statuses which are:

- Endangered RE
- Of Concern RE
- Least Concern RE.

These statuses are taken from the RE description database, and respective definitions are provided in the Act. Within this report, the definition of an RE follows that described by Sattler and Williams (1999) i.e. “a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil”. Both VM Act status and biodiversity status of Res have been included.

2.4 Queensland Nature Conservation Act 1992 (NC Act)

For a proposed activity that will have an unavoidable impact on breeding places of protected animals (which include all classes of native wildlife including least concern), a Species Management Program (SMP) is required to be prepared and approved by the Department of Environment and Science (DES) under the NC Act. DES has prepared an Information Sheet that outlines when a SMP is required. Animal breeding places are defined in this document as: a bower; burrow; cave; hollow; nest; or other thing that is commonly used by the animal to incubate or rear the animal’s offspring.

A Low Risk SMP can authorise tampering with animal breeding places for least concern species. A High Risk SMP will authorise tampering for all fauna breeding places including colonial breeders, special least concern and Critically Endangered, Endangered, Vulnerable and Near Threatened (CEEVNT) species. The duration of the SMP must be identified and must be relevant to the activity being undertaken and allow for a periodic review of the program. The standard term for an SMP is three years.

The purpose of an SMP is to:

- assess the threats to native animal breeding places resulting from a planned activity
- incorporate management actions that will avoid or minimise both the immediate and the long-term impact of removing or altering an animal breeding place
- set monitoring and reporting requirements that demonstrate the management actions in the SMP are effectively implemented and produce the intended results.

The seasonal terrestrial ecology surveys have included habitat assessments and identification of animal breeding places. This information will be used at a later date to support the preparation of an SMP as required.

2.5 Queensland Environmental Offsets Act 2014

In Queensland there is an offsets framework governed by a range of legislation, policies and guidelines to support a determination as to when environmental offsets are required, and how they are to be delivered. A summary of the framework and guiding principles that apply are summarised below.

The Queensland Offsets Framework includes:

- *Environmental Offsets Act 2014* (Qld) (EO Act)
- Environmental Offsets Regulation 2014 (Qld) (EO Regulation)
- *Queensland Environmental Offsets Policy* (QEOP) (version 1.6)
- *Significant Residual Impact Guideline* – for prescribed activities under NC Act, EP Act and Marine Parks Act (DEHP 2014).

Under the Queensland Environmental Offsets Framework an environmental offset is required when a significant, residual impact occurs to an MSES. MSES are prescribed in Schedule 2 of the EO Regulation and include:

- endangered and vulnerable flora and fauna species under NC Act and their habitats
- special least concern fauna species under NC Act and their habitats
- endangered and of concern REs under VM Act
- essential habitat (mapped by DES)
- REs that intersect with wetlands and watercourses
- connectivity values
- wetlands of high ecological significance
- protected areas (including nature refuges)
- declared fish habitat areas and waterways providing for fish passage
- legally secured offset areas.

To support a determination if the Project will result in a significant, residual impact to MSES the proposed activity is to be assessed under the *Significant Residual Impact Guideline* (DEHP 2014).

2.6 Biosecurity Act 2014

The *Biosecurity Act 2014* provides a legislative framework to manage pest flora and fauna, diseases and environmental contaminants, to address the impacts they have on the economy, environment, agriculture, tourism and society.

The Act prohibits or restricts the introduction and spread of declared plant and animal pests within Queensland.

Field ecology surveys identified the presence of pest plants and animals within the Project area.

2.7 Fisheries Act 1994

Development that has potential to impact on fish passage may require approval under the *Planning Act 2016*. Waterway barrier works may inhibit the free movement of fish along waterways and onto floodplains, injure fish and affect fish health and habitat. Waterways for the purposes of the Fisheries Act are defined by the Queensland Government mapping layer *Queensland Waterways for Waterway Barrier Works.* It is recognised this layer may not be accurate on the ground therefore the responsibility for ensuring appropriate procedures are employed rests with the user. Waterways are colour coded based on level of risk. Streams higher in the catchment generally have reduced habitat area and steeper slopes supporting smaller populations of fish, therefore these are of lower risk than larger streams lower in the catchment.

2.8 Survey guidelines

The timing and survey methods adopted for the seasonal flora and fauna surveys were guided by applicable State and Commonwealth survey guidelines. Vegetation community survey methods were consistent with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*, Version 5.1 (Neldner et al. 2020).

Targeted fauna surveys were designed and implemented in accordance with the following guidelines:

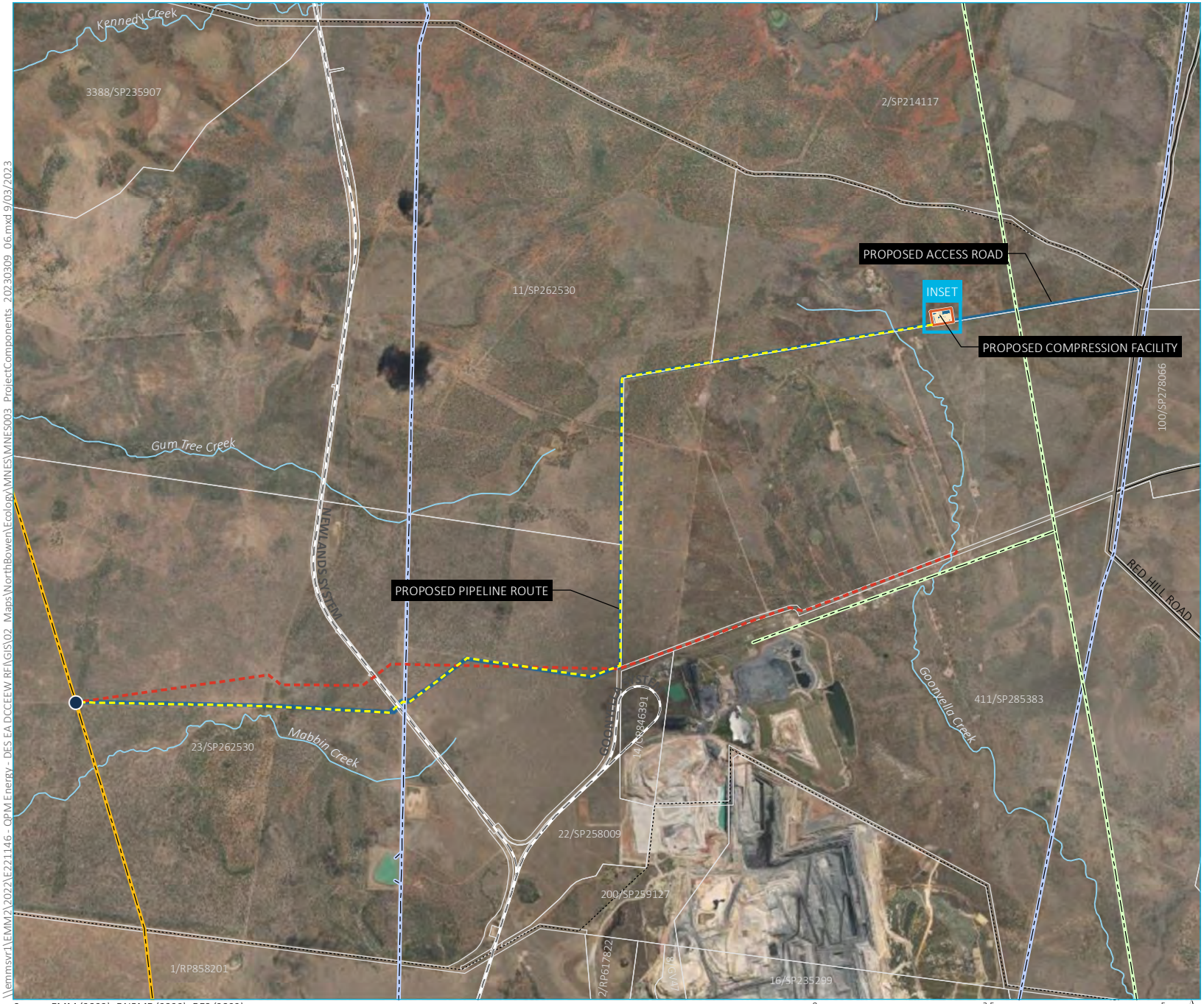
- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* – Version 3.0 (Eyre et al. 2018)
- *Survey guidelines for Australia's threatened reptiles* (DSEWPC 2011a)
- *Survey guidelines for Australia's threatened mammals* (DSEWPC 2011b)
- *Survey guidelines for Australia's threatened bats* (DEWHA 2010a)
- *Survey guidelines for Australia's threatened birds* (DEWHA 2010b)
- *Survey guidelines for Australia's threatened frogs* (DEWHA 2010c)
- *Referral guidelines for the vulnerable Koala* (DoE 2014)
- *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPC 2011c).

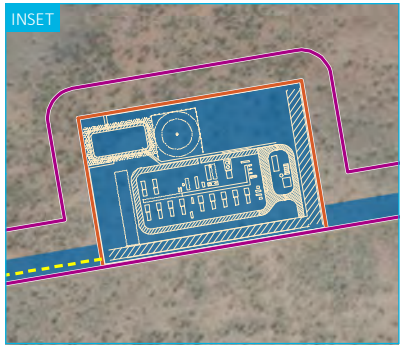
3 Existing environment

3.1 Surrounding land use and environment

The following provides a description of the surrounding environment:

- Rural land used for cattle grazing.
- Established mining and heavy rail precinct, with Goonyella Riverside Mine (BMA) and North Goonyella Mine (Peabody) and other mines nearby mining high grade metallurgical coal for export markets. The mining region is noted for high gas content coal seams which require pre-mine gas drainage to permit safe operations.
- Predominantly flat terrain with undulations, some cracking clays leading to gilgai (i.e. mounds and depressions formed on shrink-swell cracking clay soils). Water accumulates seasonally in the depressions.
- Located at the top of two sub-catchments – Isaac River (East) into the Fitzroy Catchment and Suttor River (West) into the Burdekin Catchment.
- Substantial areas cleared with some remnant vegetation and regrowth identified. Native grass pastures have been supplemented with significant Buffel Grass intrusion.
- Location of one homestead located approximately 7.4 km to the west of the GCF and represents the closest inhabited location:
    - Dabin Station homestead is largely derelict and is not occupied.
    - Denham Park Station is freehold and Dabin Station is leasehold land.





KEY

- Hot tap
- Project area (see inset)
- Proposed pipeline route
- Old pipeline route (March 2022 surveys)
- Proposed compression facility layout
- Proposed compression facility
- Proposed disturbance footprint

Existing environment

- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

Source: EMM (2023); DNRME (2022); DES (2022)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

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Project components

QPM Energy Project
MNES Preliminary Documentation
Figure 3.1

EMM
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3.2 Bioregion/sub-region

The Project area is located in the Brigalow Belt North Bioregion and Northern Bowen Basin sub-region (Figure 6.3).

3.3 Hydrology

The Project area is divided by the Burdekin Basin and Fitzroy Basin. The western part of the alignment is in the Burdekin Basin catchment and generally drains into the Suttor River and heads north. The eastern part of the alignment is in the Fitzroy Basin catchment and drains into the Isaac River.

The buried high-pressure pipeline alignment crosses Goonyella Creek on Dabin Station, Lot 2, which is a stream order 1 watercourse. Within the Project area, Goonyella Creek is an ephemeral drainage feature with no discernible banks.

Watercourses within the study area are shown in Figure 1.2.

3.4 Geology/soils

3.4.1 Geology

Based on detailed 1:100,000 scale surface geological mapping, the study area is characterised predominantly by Late Tertiary and Quaternary unconsolidated sediments (colluvium and alluvium). Key geological units include:

- Late Tertiary and Quaternary alluvium (TQa) comprising red-brown mottled, poorly consolidated sand, silt, clay and minor gravels are dominant surface unit in the western half of the study area.
- Late Tertiary and Quaternary colluvium and residual deposits (TQr>Tb) is the dominant surface unit in the eastern portion of the study area (including the GCF) and consists of clay, silt, sand, gravel and soil.
- Tertiary Basalt (Tb) is mapped along a section of the proposed high-pressure pipeline to the west of the GCF.
- Underlaying much of the project area (but of limited relevance due to the depth of disturbance) is the sedimentary units of the Permo-Triassic aged Bowen Basin.

Bore logs located within proximity to the proposed high-pressure pipeline were reviewed. Four registered bores approximately 900 m to the east of the proposed high-pressure pipeline centreline (bores 81152, 162179, 81093 and 81151) indicate from drillers logs that the base of the alluvium occurs at depths from 60 m below ground level (mbGL) to 80 mbGL.

In the vicinity of the eastern portion of the proposed high-pressure pipeline and GCF, registered bores 162630, 162631 and 162632 located approximately 900 m to 1,700 m to the south indicated compacted fill/topsoil and alluvium to approximately 1.0 to 4.5 mbGL depth. Basalt and mudstone was then encountered underlying this thin alluvium layer.

3.4.2 Soils

Based on the Queensland soils atlas (1:2 million scale), the main soil types in the study area include:

- grey self-mulching cracking clays (CC33) in the western half of the study area
- red massive earths (My28) through much of the central portion of the study area and immediately west of the GCF
- black self-mulching cracking clays (Ke19) in the western portion of the study area and in the vicinity of the GCF and to the east.

Site specific investigations of soil types were completed by QPM Energy in May and June 2022 which are detailed in the soil technical assessment report for the Project. Vertosols and Kandosols were identified as the dominant soils type.

i Acid sulfate soils

There are no acid sulfate soils (ASS) mapped in the study area, as per the *Guidelines for the Use of Acid Sulfate Soil Risk Maps* (DLWC 1998). The Australian Soil Resource Information System (ASRIS) ASS mapping (Fitzpatrick R, Powell B, and Marvanek, S 2008) has mapped the study area as Cq (p4), Extremely Low Probability of Occurrence, the lowest probability allocation. Inland (ASS) theoretically has the potential to occur within the study area in association with any waterway where suitable conditions prevail (such as sulfate salinised areas in inland regions with anoxic conditions and abundant organic matter). Such conditions are generally rare and associated predominantly with sustained anoxic aquatic environments, like inland lakes, not minor ephemeral waterways which characterise the study area.

3.5 Elevation

Surface elevations across the Project area range from approximately 290 m Australian Height Datum (AHD) at the high-pressure pipeline entry to the NQGP to approximately 330 m AHD at Red Hill Bluff, 2 km west of the GCF. Generally, the terrain is flat open grazing country, particularly in the western areas of the Project.

4 Project description

4.1 Project overview

The Project involves the design, construction, and operation of a GCF and a high-pressure pipeline that links the proposed GCF to the nearby existing and operational NQGP.

The Project proposes to collect waste coal mine gas at the proposed GCF via waste gas gathering lines located at adjacent coal mines. At the GCF, waste coal mine gas will be dehydrated and filtered, with the remaining clean gas then compressed and transported via high-pressure pipeline to the existing and operational NQGP. The NQGP will then transport the compressed gas north to Townsville, where it will be depressurised and distributed, by a third party, to industrial users, including QPM's TECH Project.

Access to the GCF will be provided via the construction of a 2.8 km all-weather access road from Red Hill Road.

Ancillary activities will also occur within the defined project area.

4.2 Project area and battery limits

Table 4.1 summarises the key components of the Project.

Table 4.1 Project area

Component	Description
Gas Compression Facility	• Captures and converts waste coal mine gas to clean gas. • Proposed to be located at Dabin Station on the southern boundary of Lot 2 SP214117 and 2.7 km west of the Red Hill Road reserve. • Sited on a 200 m by 300 m area. • 6 ha disturbance footprint.
High-pressure pipeline	• High-pressure pipeline to transport clean gas from the GCF to the NQGP. • 16.8 km in length, running along cleared areas, fence lines and fire breaks along property boundaries. • During construction, a 30 m wide construction right of way (disturbance area of 51 ha). • During operations, a 15 m wide operating easement (disturbance area of 25 ha) from 3.2 km from the GCF.
Access road	• Road to provide all-weather access to the GCF from Red Hill Road reserve. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint.

The Project is defined by limits which include:

- road connection to Red Hill Road
- GCF inlet flange/s to the facility from gas gathering systems on adjacent mining tenures
- connection to the NQGP (via hot tap)
- GCF clean water pipeline flange returning water to the relevant existing mine water management system
- rainfall run-off from an on-site settling basin
- high-pressure pipeline easements (30 m wide right of way (ROW) during construction and reduced to 15 m ROW during operations from 3.2 km from the GCF boundary).

4.3 Project definition and refinement

In defining the Project footprint, a desktop route selection process was undertaken that considered the highly constrained nature of the landscape and the performance needs of the infrastructure. Option 2 was determined to be the preferred option.

The current alignment was determined the most suitable for the following reasons:

- extensive site selection and investigations (August 2021 through to June 2022), including consideration of numerous alternative alignments in the vicinity of the current proposed alignment
- proposed alignment presents optimal location reflecting MNES/MSES values, surrounding land uses, and third party stakeholders
- alignment avoids highest value ecological communities
- alignment avoids underground mine developments and crosses established infrastructure at existing nominated locations
- alignment largely follows existing cleared areas, disturbed and cleared fence lines and existing fire breaks
- access roads are incorporated into the high-pressure pipeline alignment to reduce additional disturbance footprint
- uses an existing 290 km pipeline (NQGP) to transfer natural gas to consumers
- project beneficially uses coal mine waste gas emissions from existing coal mine operations to displace fossil fuels and avoid methane flaring and venting.

In addition to the development that has been undertaken with regards to the surrounding mines and major infrastructure, further structures such as fences, domesticated animal shelters, feed lots and farm tracks have been identified with the assistance of the land lessee. The Project has taken these items into consideration for the alignment of the high-pressure pipeline and GCF. Where these structures are impacted, agreements with the land/asset owner will be sought prior to construction.

Table 4.2 describes the options considered and summarises the findings of the desktop assessment process.

Table 4.2 Desktop route selection process

Option	Constraints	Advantages	Disadvantages	Preference
1	Strategic cropping land identified in two sections of the route, including where the existing hot tap (Wards Well) is located. Crossing of first order stream, waterway barrier works approvals apply. Horizontal directional drilling (HDD) on the existing rail. Contaminated land soil sampling within the rail corridor as it will be listed on the Environmental Management Register (EMR).	Existing hot tap (Wards Well) available therefore does not require approximately $200k spend to install one a new hot tap. Potentially runs alongside a farmer's track.	Longest pipeline route at approximately 18 km. Farmers track not a gazetted road. Lengthy process with approvals within strategic cropping land. Mapped waterway crossing. 2 x HDD under boring required for the existing rail.	3

Table 4.2 Desktop route selection process

Option	Constraints	Advantages	Disadvantages	Preference
2	HDD (under boring) on the existing rail. Contaminated land soil sampling within the rail corridor as it will be listed on the EMR. QPM will not be permitted onto the rail corridor – sub-soil will be 3 metres below the lowest level.	Only one HDD under boring required at the existing rail. Pipeline avoids ecological mapping constraints and groundwater dependant ecosystems (~100 m buffer). Better utilisation of fence lines and firebreaks to minimise disruption. Access to an existing Sunwater pipeline offtake valve previously used to build the Newlands rail line. Only one creek crossing (Goonyella Creek) via open trenching.	New hot tap to be installed at a cost of approximately $200k.	1
3	HDD (under boring) on the existing rail. Proposed route runs alongside an existing easement adjacent to a railway corridor with potential wayleave applications. Contaminated land soil sampling within or adjacent to the rail corridor as it will be listed on the EMR.	Existing 60 m wide easement exists running adjacent the rail corridor and towards to NQGP. A possible non gazetted road (Mabbin Road) existing on the last 3km of the proposed route. Potentially no requirement to obtain landholder approval as it appears to be within an easement for the full length.	New hot tap to be installed at a cost of approx. $200k. Pipeline route is approximately 14.5 km. Intersects *remnant of concern* vegetation and runs adjacent to *remnant – endangered* vegetation. 2 x HDD under boring required for the existing rail and water pipeline. Approval to work within road/rail reserve and construct pipeline potentially requires a two staged process which may be time consuming – approval to construct, then approval for the logistics. Potential for more contaminated land soil sampling for the entire easement as it may be listed on the EMR considering it is adjacent to the rail corridor.	2

The alignment will continue to be optimised within the defined Project footprint, maximising design opportunities and minimising impacts (so far as is reasonably practicable) to sensitive receptors and environmental constraints. For the purposes of this assessment, the worst-case, maximum likely disturbance area has been assessed, with the expectation that any future design optimisations will further reduce potential impacts.

In particular, minimising the width of the right of way and extent of underboring has been explored and implemented so far as reasonably practicable. The width of the pipeline disturbance is already at a minimum, and has been increased in some areas to reflect more complex underboring requirements and crossing of infrastructure e.g. water pipelines.

4.4 Gas Compression Facility

4.4.1 Design

The GCF, located on Dabin Station, adjacent to North Goonyella Mine, will receive gas at a normal pressure of 138 kilopascals gauge (kPag) from the upstream field system, and deliver at a maximum delivery pressure of 15,300 kPag. Waste coal mine gas will be dehydrated using a high boiling point Tri-Ethylene Glycol (TEG) dehydration unit to remove water vapour in the incoming gas and produce distilled water. The incoming as is filtered to remove particulates.

The clean dry gas will be compressed using small 5.5 terajoule per day (TJ/d) compressor units powered by gas-fired turbocharged engines using clean gas.

The GCF will receive waste coal mine gas in accordance with Table 4.3.

Table 4.3 Specification of waste coal mine gas received

Component	Unit	Typical
Methane	mol%	97
Ethane	mol%	0.0234
Nitrogen	mol%	1.6625
Oxygen	mol%	0.151
Carbon Dioxide	mol%	1.1408
Helium	mol%	0.0037
Hydrogen	mol%	0.0004
Argon	mol%	0.0181
Water	ml/Sm^3	133
Molecular Weight	Kg/kmol	16.59
Heating Value	MJ/Sm^3	36.66
Wobbe Index	MJ/Sm^3	48.4

The GCF is proposed to include:

- gas filtration
- gas compression
- gas dehydration
- custody transfer metering
- gas flare
- oily water separation
- clean water transfer to adjacent mines

- utilities.

The GCF will be powered by two gas engines, each with 100% capacity. A further backup diesel generator is installed for emergencies.

Each compressor will be powered by a reciprocating gas engine, operating under the rates described in Table 4.4.

Table 4.4 Reciprocating gas engine – fuel burning rate

Item	Units	Estimate
Molar density	kmol/m3	0.0447 (based on gas composition)
Molar Mass	kg/kmol	16.5923 (based on gas composition)
Density	kg/m3	0.7420 (at 0 degrees C)
Fuel rate	Nm3/hr	354 (peak rate (100%))
Fuel rate – mass flow	kg/hr	262.67

4.4.2 Construction

Construction of the GCF will occur in three stages and include the following activities:

- mobilisation of construction equipment
- establishment of the 2.8 km access road from Red Hill Road to the Project footprint
- establishment of access to water supply, via the high-pressure pipeline corridor
- site bulk earthworks including cut and fill and compaction to design levels
- installation of steel piles and concrete pads
- installation of all equipment items, skids and buildings
- installation of associated steel structures, prefabricated piping, electrical equipment, instrumentation and controls
- supply and install communication and controls infrastructure
- demobilisation of construction equipment
- rehabilitation of temporary disturbance areas
- pre-commissioning and commissioning of GCF.

4.4.3 Operations

i General

Typical operations will involve minor maintenance, calibrations, inspections, equipment performance checks, or equipment repair if needed. Operational activities will be typically carried out during daylight hours, unless an emergency requires urgent works at night. The operator will carry out inspections ranging from daily inspections to more rigorous inspections that may vary from one month to four years apart, dependent on the works and in conformance with detailed maintenance and operational integrity plans.

Callout for unplanned activities or responding to process upset may occur throughout the operational life of the facility. The response time for operators to arrive on site for intervention is expected to be one hour. Key operating data and equipment operating status will be viewable from site Supervisory Control and Data Acquisition (SCADA) system. The control system setpoints and functions can be remotely changed or tuned from site SCADA. In general, site SCADA is the local control room which works the same as the remote Main Control Room.

This facility is designed to fail in a safe position. Some process equipment can be remotely started or stopped from site SCADA. During operation gas flow and pressure would be monitored from the GCF and at the gas delivery points.

ii Water and filtered waste

Oily water from the operation of the compressors will be collected in a closed drain system which is predominantly supplied from the blowdown from the GCF's compressor units. Other sources of water include slug catcher water from incoming low-pressure gas and oily water from the pig cleaning operation returned to site.

The closed drain system will collect and de-gas the liquids discharged from the process equipment.

A set of oily water transfer pumps are provided that will manage the liquid level in the closed drain drum. Oily water is transferred to the Oily Water Feed Tank for further processing.

An oily water separation unit will screen the oil content of the water down to an acceptable level (<10 parts per million (ppm)) so that the treated (clean) water can be returned to the coal mine operator.

The oily water separation unit will be operated as on/off by the level control in the main tank. A pair of produced (clean) water transfer pumps discharge the clean water from the Water Loadout Tank to the 350 KPa field header at the site fence. The gas supplier connects their field pipes to the header at the site boundary to accept and return the water to their handling system.

Clean water is also extracted from the waste coal mine gas at the GCF by vapour absorption using TEG. High boiling point TEG is recovered by distillation in the TEG unit. Recovered heat and TEG are reused in GCF processes. Clean water with a low boiling point relative to TEG is recovered (separated) by condensing water vapour from the top of the TEG recovery distillation column. The water is pumped back to the coal mine's pre-mine drainage facility via the Water Loadout Tank to meet their responsibility for water produced on the mine site.

Incoming solid particles are coal dust. The particles are separated in the oily water separator into the oily sludge.

The inlet filer coalescer will filter the incoming gas received from the slug catcher by removing any entrained water in aerosol mist form as well as solids to meet the compressor received gas specification. The coalescer will be designed for a solid removal efficiency of 99.98% > 0.3 µm, and a liquid droplet removal efficiency of 99.7%> 0.3 µm.

The coalescer is equipped with an automatic drain system to discharge the water from the vessel's lower liquid knock-out section and the upper coalescing section to the closed drain system.

The vessel will be fitted with a pressure safety valve to meet code requirements. The vessel will utilise a davit arm and chain block to remove the filter access flange and filter element cage to allow for efficient filter replacement and inspection.

A coalescer bypass line is provided for short-time bypass when undertaking filter element change-out. The maximum acceptable pressure drop across the coalescing filter will be determined by the minimum station inlet pressure and the minimum compressor suction pressure.

4.5 High-pressure pipeline

4.5.1 Design

The high-pressure pipeline will traverse from the outlet of the GCF, moving generally west for 4.5 km before turning south for 4.5 km and then heading west for 8 km, finishing at the Hot Tap connection to the NQGP.

The high-pressure pipeline, constructed in accordance with AS2885 – 1997, will be sized for the full 24 Petajoule per annum (PJ/a) which is intended to be the plant capacity at full operation. It will cross Goonyella Creek, Denham Park access track, two water pipelines (Sunwater Burdekin and Eungella pipelines) and the Newlands to Goonyella Rail System before connecting with the NQGP.

The design for the high-pressure pipeline is DN200, ASME Class 900 with the line pipe material proposed to be in accordance with API 5L with X52 PSL2 HFW material specification. The design including pipe diameter and class will be refined in detailed design studies.

Corrosion protection for this line will be a 3-layer polyethylene coating system and cathodic protection system. A split hot tap tee will be specified to meet the mechanical requirements for the material and pressure rating of the NQGP at the connection location. The fitting will be welded to the high-pressure pipeline and the hot tap will be carried out under strict operating conditions.

The minimum depth of cover through this area will range between 750 to 900 mm. Crossings will be deeper, between 2,000 and 3,000 mm. The rail crossing will require a depth of cover of 3,000 mm below the lowest points which could be optical fibre within the rail corridor.

There are four crossing points proposed:

- Goonyella Creek at 460 m – will be crossed using conventional dry season open cut and remediation operations in accordance with waterway crossing regulations.
- Farm access road at 5,320 m – will be crossed using conventional trenching methods.
- Sunwater pipelines (side by side) at 12,008 and 12,012 m – the allowable crossing method permits the pipelines to be exposed via excavation and the high-pressure pipeline to be located under the pipelines at a 90-degree alignment to the Sunwater pipelines.
- Newlands to Goonyella Rail System at 12,080 m – access to the 70 m rail easement is typically not permitted, consequently thrust boring is required below the entire easement width. This would take place from the western side. Above rail access for vehicles is nominated via a conveniently located existing crossing 50 m south of the rail crossing. The potential crossing depth must be 3 m below the lowest point in the crossing. This will require potentially a 3 to 4 m deep working platform for equipment to carry out the boring operation. Based on a 4 to 1 batter, access to the trench may be 16 m. Consequently, the working width in the vicinity of the rail has been increased to 50 m.

4.5.2 Construction

The 16.8 km high-pressure pipeline would be constructed in accordance with AS2885-1997 Part 1 Pipelines Gas and Liquid Petroleum. A conventional ROW width of 30 m has been identified to facilitate construction operations. Additional width is required in the vicinity of the Newlands to Goonyella Rail System.

The high-pressure pipeline would comprise lengths of coated steel pipe to be welded together and buried with a depth of cover of at least 750 mm to 900 mm.

Construction activities for the high-pressure pipeline would involve:

- clearing of vegetation and stockpiling of topsoil containing the seed bank on the furthest edge of the ROW
- grading of the ROW and stockpiling adjacent to the Seed Bank. This will establish a safe construction working area
- separation and stockpiling of topsoil and subsoil
- creation of a trench in which to lay the high-pressure pipeline. This would be undertaken by a trenching machine, rock saws, or excavator and may involve rock hammers or blasting in hard rock terrain. Spoil will be placed to the other side of the trench to retain passing lanes and operating areas to string pipe for welding and burying
- welding of pipe sections together to form 'a string' approximately 1 km in length
- placing the high-pressure pipeline string into the trench and placing padding (e.g. screened trench sub-soil) around the pipe to protect the coating from external damage
- returning the subsoil and topsoil to their original horizons
- testing the integrity of the high-pressure pipeline (hydrotesting) by filling it with water and pressurising it to above the operating level
- clearing up and restoring the construction ROW and all temporary facilities.

Restoration would be undertaken in such a way as to ensure that:

- topsoil cover containing the original seed bank is re-established and all land and waterways disturbed by Project activities are returned to a stable condition as soon as possible after construction
- land is returned as close as possible to its previous productivity
- stable landforms are re-established to original topographic contours
- natural drainage patterns are reinstated
- erosion control measures (e.g. contour banks, filter strips) are installed in erosion prone areas
- the pre-construction environment is reinstated, and disturbed habitats recreated with the exception of a 15 m easement in which the high-pressure pipeline is located where deep-rooted tree growth is discouraged. Typically for a large part of the high-pressure pipeline easement, this corresponds to existing cleared land, cleared fenceline and firebreaks located across existing cleared land.

A Pipeline Restoration Management Plan will be prepared by QPM Energy prior to construction commencing.

4.5.3 Operations

Inspection of the high-pressure pipeline easement for issues such as erosion, weeds, subsidence, and lack of revegetation or third-party activity would be carried out on a regular basis using ground access via the easement. This would also include periodic inspection of the corrosion protection (cathodic) system.

The high-pressure pipeline would be operated with a maximum allowable operating pressure of 15.3 megapascals (MPa). An allowance for a conventional 30 m construction right of way has been made. Post-construction, the easement will shrink to a 15 m operating width after 3.2 km from the GCF.

Given that the high-pressure pipeline would be underground, land users would be able to resume previous land use activities on top of the high-pressure pipeline provided that they did not include excavation activities. Whilst deep rooted vegetation cannot be re-established directly across the high-pressure pipeline, due to the potential for damage to the high-pressure pipeline, grasslands can be re-established.

Hydrostatic testing procedures, including water sourcing and disposal, will be determined during the detailed design and construction phase.

Disposal of hydrostatic testing water will depend on the initial water quality, nature of any additives, the rate of application, the site of application and the robustness of the receiving ecosystem. The preferred method of use is to recycle water for hydrotesting down the high-pressure pipeline as it is constructed.

The disposal of the water will occur via the Council regulated water treatment facility.

4.6 Other ancillary activities and project components

Other ancillary activities and project components are listed in Table 4.5.

Table 4.5 Other ancillary activities and project components

Component	Description
Access road	• Road to provide all-weather access to the GCF from Red Hill Road. • 2.8 km long and 30 m wide. • 8 ha disturbance footprint. • Red Hill Road is a key connection between Suttor Development Road, 16 km to the North, and Goonyella Road, 36 km to the South. Both join the Peak Downs Highway providing access to East Coast. The shortest route is via Suttor Development Road, being 45 km shorter in travelling to Mackay. • The proposed access road follows the existing fence line between Dabin Station and Burton Downs and will upgrade existing formed farm tracks. • The access road will be constructed initially to support heavy traffic during construction which has the major traffic load. It will be maintained thereafter for operational traffic loads. A trafficable width of 15 m will be formed, with a cleared width of 30 m to support wide load vehicles.
Fencing	• The GCF will be contained within a securely fenced compound. • 2.0 m high chain wire type, with gates of a similar design.
Pipeline scraper facility	• Used to accept a cleaning unit (“pig") inserted into the high-pressure pipeline to remove pipe wall build-up and contaminants as it moves down the high-pressure pipeline under pressure from compressed gas behind it.
Pipeline pig receival facility	• A Pig Receival station is installed adjacent to the NQGP connection which is used to accept a cleaning unit inserted into the high-pressure pipeline to remove pipe wall build-up and contaminants as it moves down the high-pressure pipeline under pressure from compressed gas behind it. The ‘pigging’ activities will occur intermittently throughout the operation of the high-pressure pipeline and will be subject to the noise assessment. • The facility is approximately 15 m x 20 m.
Water/sewer	• Rainwater captured from building roofs and collected in rainwater tanks for general use. • Run-off from site process areas will be directed to a low velocity settling area prior to discharge to overland flows. • Four temporary ablution blocks.

Table 4.5 Other ancillary activities and project components

Component	Description
Switch room	• A switch room will be provided for the station control, communications equipment, and power distribution system. The switch room will be elevated with access stairs and platform to provide ease of access. Smoke detection will be provided in the switch room.
Control room	• The control room/office will contain office space with desks and a SCADA station to monitor the facility operation and status.
Utility air system	• Utility air will be provided by 2 x 100% air compressors with desiccant dryers installed to remove any liquids, and receivers sized for the engine starter, and instrument air consumption requirements.
Compressor and engine lubricating oil storage	• Oil storage with pumps will be provided for both the gas compressors and engines. • Day tanks will be manually filled as required. • Bunded.
Fire safety	• Fire and gas detection will be provided for the compressor packages within the facility. There will be safety showers with a water tank provided in the facility. Gas and flame detectors are provided around major equipment such as the compressor packages and TEG reboiler. • Major equipment such as compressor and TEG dehydration packages will be supplied with skid bunds incorporated into the base frame. The lubricating oil storage tanks will be self-bunded. Concrete bunding is only provided for the oily water package.
Electrical	• Packaged gas fuelled generators, 2 x 100% arrangement, will be provided to supply site power and lighting requirements, LV switch room, control room and workshop. • A packaged diesel generator will also be provided as a back-up. A control system will be provided to manage the generator operation and loading. The diesel generator will be sized for just the essential power requirements until the gas engine is restarted. • General down lighting will be provided throughout the facility to ensure safe levels of illumination for operations and thoroughfare. The compressor packages and key equipment will have local lighting provided. • All instruments will be provided with a sunshade. • A local PLC will be used for process control and allow for communication of data and signals. A high integrity PLC will be installed and dedicated for the process safety and shutdown functions. • A flow computer will look after custody transfer metering calculations for billing. • Communications in this area will be by 4G data network and will incorporate redundant networks for reliability.
Station fencing and security	• The Site will be contained within a security fenced compound. The fence will be a 2.0 m high chain wire type, with gates of a similar design.
Chemical storage	• Fuels and chemicals used on site are: – Lubricants – Triethylene glycol – diesel. • Stored in bunded facilities. • Fuels and chemicals are supplied to site via fuel/chemical tanker.

4.7 Water management

The objectives of the stormwater management approach are to avoid impacts to receiving waters on and off-site. The key features of the proposed stormwater management approach include measures to:

- locate the GCF to avoid disturbance to existing watercourses and overland flow paths
- undertake grading to minimise earthworks and minimise changes to existing flow paths

- divert upslope runoff around infrastructure
- implement surface drainage measures to control runoff generated within the GCF
- implement rock rip rap where flow concentrations cannot be avoided
- control stormwater discharge and existing overland flow paths to avoid proposed wastewater effluent management areas
- stabilise disturbed and operational areas, favouring use of hardstand and equivalent impervious surfaces
- implement sediment and erosion controls
- capture runoff from buildings in rainwater tanks for use on site, to minimise demand for imported water.

4.8 Supporting third party infrastructure

Supporting infrastructure provided by third parties is summarised in Table 4.6.

Table 4.6 Supporting third party infrastructure

Component	Description
Water/sewer	• Construction water will be purchased from Sunwater under commercial arrangements and be drawn from the Burdekin Moranbah Pipeline using an existing take-off valve established to supply water to construct the Newlands System. The Sunwater pipeline is located on Denham Park. Water will be trucked to site and along the pipeline using water trucks. • Fresh water for amenities during construction and operation will be supplied by a commercial contractor sourcing water from an Isaac Regional Council truck filling station at Moranbah.
Accommodation	• The temporary construction workforce will be housed in existing regional accommodation camps, with mobilisation and demobilisation of the workforce to and from the region, either via drive in drive out (DIDO) or fly in fly out (FIFO) from Moranbah airport for each roster.

4.9 Construction timing and ramp up

The Project is designed to be constructed in three stages (refer Table 4.7) to match the ramp-up in demand for waste coal mine gas. The design process will consider future capacity so that connection can be made with no major safety, constructability, or operability issues.

Construction of Stage 1 is scheduled to commence in the second half of 2023, pending relevant approvals. Subsequent stages will be installed to align with ramp-up of QPM's TECH Project and third-party demand. Construction of the high-pressure pipeline and facility will take approximately twelve months, followed by a commissioning phase which may take up to 3 months.

Table 4.7 Project staging

Stage	Activities
Stage 1	• Deliver 8 PJ/a (22.8 TJ/d). • GCF receives gas at a normal pressure of 138 kPag (20 psig) from the upstream field system and delivers at a maximum pressure of 15,300 kPag into the NQGP. • Facility includes compression for 8 PJ/a with key equipment (Inlet Slug Catcher, Filter Coalescer, Flare, Tri-ethylene Glycol (TEG) Package) sized for 12 PJ/a. • All main facility headers, high-pressure pipeline and pig receiver will be sized for 24 PJ/a.
Stage 2	• Deliver 16 PJ/a (45.6 TJ/d). • Additional compressors will be installed based to deliver 12 PJ. Beyond 12 PJ, additional Inlet Slug Catcher and Filter Coalescer similar to Option 1, additional compression packages to achieve 16 PJ/a, and additional 12 PJ/a TEG package. • Additional metering and fuel gas skids to support the additional 12 PJ/a.
Stage 3	• Deliver 24 PJ/a (68.5 TJ/d). • Additional compression packages will be installed to achieve 24 PJ/a.

The ramp up is based on the below flowrates (refer Table 4.8).

Table 4.8 Design rates

Design rates	Units	Stage 1	Stage 2	Stage 3
Facility capacity	PJ/y	8	16	24
Facility design flowrate (min/max)	TJ/d	22.8 +7%	45.7 +7%	68.5 +7%

4.10 Construction and operational hours

Construction activities are anticipated to take place between 7:00 am and 6:00 pm, seven days per week.

During the commissioning phase, activities will also take place between 7:00 am and 6:00 pm, seven days per week, however for the final two weeks, commissioning activities will be 24 hours per day.

The diesel generator is anticipated to operate for two weeks in the year, and the flare is expected to be operational for a maximum of 24 hours in a year and spread across multiple occasions.

4.11 Workforce

4.11.1 Construction

Anticipated workforce numbers are included in Table 4.9.

The temporary construction workforce is expected to be accommodated in existing regional accommodation camps, with mobilisation and demobilisation of the workforce to and from the region, either via drive-in/drive-out (DIDO) or fly-in/fly-out (FIFO).

Table 4.9 Anticipated workforce

Entity	Average workforce	Peak workforce
Project team	4	10
Earthworks	10	15
Piling	6	6
SMPEI construction	30	40
High-pressure pipeline	12	12
Pre-commissioning and commissioning	12	14

4.11.2 Operations

The GCF is expected have one daytime operator for scheduled maintenance, inspection activities and other routine tasks. This role will be supported by three trained staff.

Operating personnel will live in the surrounding area and transfer to site on a roster arrangement.

If local personnel are not available for the permanent operations, DIDO personnel will be employed and accommodated at existing facilities in the region either mining camps or with local housing. If DIDO personnel are unavailable, FIFO personnel will be hired with similar accommodation arrangements.

4.12 Decommissioning

The operating team will monitor the condition of equipment up to and beyond the end of life to ensure equipment is sound and fit for further service. Continued operation beyond the nominal design life will be subject to specific equipment condition and plant fitness assessments to meet regulatory standards and performance requirements. The compressor station will be decommissioned when there is no further economic potential to continued use.

The GCF and pipeline have an average design life of more than 25 years. It is expected that the GCF and pipeline life will be extended through integrity management. When, and if, the proposed Project is no longer required, it would be decommissioned in accordance with the regulatory requirements and accepted environmental best practices at that time. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant and all pipeline valves and metering stations) and the restoration of associated disturbed areas.

The GCF equipment and plant would be transported off site and re-used and/or recycled if in an appropriate state. All residual, non-suitable equipment would be removed from site and disposed of at a facility licenced to accept the waste. All building foundations and access tracks would be removed and rehabilitated (dependent on agreements made with relevant landholders).

At the time of decommissioning, a decision will be made regarding the opportunities for future use of the pipeline. The following two options will be considered:

- Moth-balling – this would involve depressurising the pipeline, capping and filling with an inert gas (such as nitrogen) or water with corrosion inhibiting chemicals. The cathodic protection would be maintained to prevent the pipe corroding.

- Abandonment – this could involve purging the pipe of natural gas, disconnecting it from the manifolds and NQGP, and removing all above ground facilities. The pipe would then be filled with water and left to corrode in-situ. Removing the pipe from the ground is unlikely to be an environmentally or commercially viable option. A detailed rehabilitation management plan (RMP) would be developed and implemented in consultation with landholders and the regulatory agencies at the time of abandonment.

The RMP will be submitted 12 months prior to decommissioning commencing. As informed by the RMP, consultation with relevant landholders and, where considered necessary, irregular site inspections will occur post-decommissioning to ensure rehabilitation of disturbed areas is effective.

4.13 Rehabilitation

Clean-up, restoration, and rehabilitation will occur in a 2 staged approach for the Project. Generally, clean-up and rehabilitation will involve removal of foreign material (construction material and waste), surface contouring and respreading topsoil. Existing seed stock within the topsoil is expected to naturally revegetate the disturbed easement. The removal of trees will be offset through the planting of tube stock shrubs or native grasses sourced from local nurseries where considered necessary.

4.13.1 Progressive rehabilitation during construction

Rehabilitation will occur progressively and as soon as reasonably practicable be undertaken throughout the life of the proposed project. The target for successful rehabilitation is to ensure that reinstatement of vegetation is equal to or better that pre-construction status, except where permanent operational access is required.

Progressive rehabilitation and stockpiling of soils near the site of excavation will be conducted to minimise potential blending of topsoil with other material. Mulching of green waste will be completed throughout the construction phase of the project and stockpiled for use in rehabilitation and erosion and sediment control within the authorised construction area (although unlikely, mulch stockpiles are to be no greater than 10 m wide and higher than 2 m). All potential microhabitats features (e.g. rocks and fallen logs) will be relocated or stockpiled for use in rehabilitation. Watercourse rehabilitation will be consistent with surrounding environment and contours of the channel at the time of construction.

The aim of the progressive rehabilitation and reinstatement is to ensure that the environment is safe, non-polluting and self-sustaining. The intention is to minimise additional management throughout the operational phase of the project. Ongoing inspection for the management and removal of invasive weed species will be completed throughout all phases of the rehabilitation process. Rehabilitated areas are to be tracked via GIS.

Where feasible to do so, the landscape will be rehabilitated to pre-existing contours with natural drainage lines restored and protected (if required). In certain cases, rehabilitation will be tailored to prior site-specific conditions in consultation with the landholder. To promote vegetation regrowth and promote and protect against the loss of topsoil, the pipeline 30 m wide construction corridor Right of Way (RoW) surface will normally be lightly scarified prior to the respreading of topsoil.

4.13.2 Operational phase

The construction ROW will shrink to a 15 m wide operating easement, 3.2 km from the GCF. This width will typically include farm tracks and firebreaks alongside a fence line plus four metres to the other side of the pipeline to allow pipeline remediation and protection from deep-rooted trees. This approach will maintain inspection traffic to an existing farm track which will enable the remaining area to become largely rehabilitated. This approach was developed with the assistance of the farm lessee to minimise long term impacts by using existing farm management practises and corridors.

Given that the pipeline would be underground, land users would be able to resume previous land use activities on top of the pipeline provided that they did not include excavation activities. Whilst deep rooted vegetation cannot be re-established within the operating easement, due to the potential for damage to the pipeline's coating, grasslands can be re-established and no long term impacts would be expected to sensitive ecosystems.

Rehabilitation will be undertaken in accordance with best practice and will ensure that:

- topsoil cover is re-established and all land and waterways disturbed by project activities are returned to a stable conditions as soon as practicable after construction
- land is returned as close as possible to its previous productivity
- stable landforms are re-established to original topographic contours
- natural drainage patterns are reinstated
- erosion control measures (e.g. contour banks, filter strips) are installed in erosion prone zones
- the pre-construction environment is reinstated and disturbed habitats recreated
- fences and gates are restored
- pipeline marker signs are installed.

5 Methodology

5.1 Desktop assessments

Background research and desktop ecological assessments have been completed to provide an understanding of the broader ecological values, landscape features, vegetation communities and threatened species associated with the Project area.

Geographic boundaries of the searches undertaken, and the subsequent assessment results are defined as the following:

- Project area: area surveyed – e.g. pipeline corridor and compressor facility plus buffer (Figure 1.1).
- Study area: a 20 km buffer from the Project area (Figure 1.2).

The desktop assessment was completed through evaluation of a range of information sources regarding the potential ecological values that may occur across the study area. Data sources reviewed include:

- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matter Search Tool (PMST) (Appendix A.1)
- DES Wildlife Online (Appendix A.2)
- Queensland Department of Natural Resources, Mines and Energy (DNRME) regulated vegetation mapping (remnant, high value regrowth (HVR) and non-remnant)
- DES Certified Regional Ecosystem Mapping
- Atlas of Living Australia (ALA)
- eBird to access records of threatened bird species and migratory birds that occur in the study area
- DES Protected Plants High Risk Trigger Mapping
- DES Essential Habitat mapping
- current aerial imagery and historical aerial imagery supplied by QImagery
- DES Wetland mapping
- Department of Agriculture and Fisheries (DAF) Waterways for Waterway Barrier Works Mapping
- the EPBC Listing advice and/or Conservation Advice for relevant TECs, to identify analogous QLD REs that are mapped within the Project area.

5.2 Field surveys

An initial walkover of the Project area was undertaken over four consecutive days between 6–9 December 2021 by a team of two EMM ecologists, led by Sandra Walters and supported by Daniel Kelly. The walkover included general habitat assessments, incidental threatened flora and fauna searches and vegetation community assessments across the Project area.

The site walkover was completed on Lot 411 and 14 only, as land access to Lot 23 was not available for the December survey.

Further field ecology surveys were undertaken across the Project area between 7–12 March 2022 by a team of four EMM ecologists, led by Sandra Walters and Andrew Jensen and supported by Daniel Kelly and Elliot Leach.

The survey in March represents a late wet season/autumn seasonal survey for the Brigalow Belt bioregion under the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre et al. 2018). At this time temperatures are decreasing but it is typically before the onset of cold winter nights, and coincides with an active period for fauna including dispersal and migration of many species. It is also more likely to be moist from summer rainfalls, than during the spring to early summer period, and overlaps with grass reproduction and propagation, which is important for granivores. Late wet season is also suitable timing for undertaking vegetation community surveys and certain targeted searches for threatened flora species as summarised in Section 6.8.1.

A subsequent field survey was completed by a team of two EMM ecologists, led by Sandra Walters and supported by Elliot Leach between 28 June 2022 and 1 July on Lot 11 and Lot 2. These surveys focussed on verification of regional ecosystems present, potential for TEC and species habitat mapping.

A final field survey was completed by a team of two EMM ecologists, led by Elliot Leach and supported by Rachel Scott between 21–24 November 2022 on Lot 11 and Lot 2, to undertake spotlighting for MNES species potentially present, particularly Koala, Greater Glider and Ornamental Snake.

Curricula vitae of field team members are provided in Appendix B.

5.2.1 Survey methods

Field survey methods included a range of survey techniques including spotlighting for nocturnal mammals and birds, deployment of Anabat detectors for recording of echolocating insectivorous bats, diurnal bird surveys, habitat assessments, active searches and verification of vegetation community mapping by ground-truthing REs. Records were taken of incidental observations during surveys.

The following sections outline in more detail the surveys completed, methodologies used and the total survey effort. Survey sites for the current Project area are illustrated in Figure 5.1 and Figure 5.2. Survey sites for the previous alignment on Lot 411 are shown in Figure E.1 and Figure E.2.

i Flora

Flora surveys were conducted in conjunction with fauna surveys across four consecutive survey days during the December 2021 surveys and across five consecutive days during the March 2022 surveys. The revised alignment was surveyed over four days in June. A desktop constraints assessment as part of the gap analysis (EMM 2021) was undertaken prior to field surveys to identify the presence of potential significant environmental values such as Endangered or Of Concern REs, TECs or protected flora species that have the potential to occur within the Project area. Desktop results informed the flora survey locations. The results of the desktop assessment are summarised in Chapter 6.

a Quaternary site assessments

The vegetation community surveys were undertaken using quaternary assessments consistent with the *Methodology for Surveying and Mapping Regional Ecosystems and Vegetation Communities in Queensland*, Version 6.0 (Neldner et al. 2022). The objective of these assessments was to ground truth REs, determine their conditional status (remnant and non-remnant) and overall extent.

Data collection associated with quaternary assessments included the following:

- dominant species across all identified strata
- height and cover of the Ecologically Dominant Layer

- condition (remnant or non-remnant)
- connectivity with nearby habitats
- presence of weed species.

Forty-three quaternary survey sites were completed across the Project area during December 2021 (Figure 5.1), an additional 17 in March 2022 and a further 52 quaternary sites in the revised alignment in June 2022 (Figure 5.1). Survey sites were selected to ensure all patches of mapped regulated vegetation were surveyed, as well as representative areas of regrowth and non-remnant areas. Quaternary sites were also placed where regulated vegetation mapping was not consistent with the vegetation present on site (e.g. had been cleared, regrown or was a different vegetation community to that mapped). The flora surveys were completed in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*, Version 6.0 (Neldner et al. 2022).

Quaternary vegetation assessments are used to rapidly identify REs and their corresponding condition. Information collected includes dominant species in all applicable strata and structural attributes including stratum heights and canopy cover percentage. Validation of the geological landform is also performed for land zone designation of each vegetation community although this is also typically informed by geological surface mapping and state pre-clear RE mapping.

b BioCondition assessments

In a limited number of circumstances, RE condition (i.e. remnant/non-remnant) was difficult to verify utilising quaternary assessments, due to the naturally open structure of the vegetation community, abundance of weed species, or previous disturbance through clearing activity. In those instances, a BioCondition assessment was completed, to allow the site characteristics to be determined quantitatively and compared to the benchmark for the relevant RE. BioCondition data was collected in accordance with the methodology described in *BioCondition – A condition assessment framework for biodiversity in Queensland, Assessment Manual* (Eyre et.al, 2015).

c Threatened ecological communities

Threatened Ecological Communities (TECs) potentially occurring within the Project area were identified via the PMST search. The EPBC listing advice for each, and certified Regional Ecosystem Mapping was reviewed, to identify whether any REs that are analogous to the TEC(s) were mapped within the Project area.

The field survey method to confirm TECs included an assessment against the key diagnostic characteristics and condition thresholds of each TEC, where conditions allowed. These are discussed further in Section 7.2.3.

d Threatened flora

Informal searches for potentially occurring threatened flora species were undertaken across the Project area. High-risk trigger mapping exists at the eastern end of the Project area (refer Figure 5.1), associated with records of the threatened grass *Dichanthium queenslandicum* (endangered EPBC Act, vulnerable *Nature Conservation Act 1992* (QLD) (NC Act)) within 5 km of the alignment. With the exception of the non-native Buffel Grass (*Cenchrus ciliaris*), the majority of grasses were not in flower during the December 2021 field survey, however were flowering in March and June 2022.

No formal protected plant meanders applying the *Queensland Protected Plant Survey Guidelines* for areas within 'high risk' trigger mapping under NC Act were proposed for the field survey program. This was due to the fact survey results are only valid for 12 months. However, incidental records were made when both flora and fauna teams were performing respective field surveys and formal surveys will be undertaken in appropriate timeframes.

Informal meanders for protected plants were completed while traversing the Project area to complete alternative flora surveys. Meanders were primarily undertaken in the Project footprint and within suitable habitat for candidate threatened species.

Where a threatened flora species or possible threatened flora species was recorded, a direct count or estimate (where high densities were present) was undertaken (including mapping the population extent within the Project area), and a specimen was collected for submission to the Queensland Herbarium for confirmation if necessary (e.g. for species difficult to identify).

If a threatened flora species was detected, the following additional details were noted:

- number of individuals (GPS coordinate for each individual or patch)
- habitat description
- photos of individuals and habitat.

e Pest flora

PMST and Wildlife Online searches were used to identify pest flora listed as a 'Restricted Matter' under Queensland's *Biosecurity Act 2014* and/or Weeds of National Significance known and potentially occurring within the Project area. Presence of these, and any others not identified in desktop searches were recorded in the field.

f Habitat assessments

Habitat assessments across the Project area were completed at 43 sites in December 2021 (Figure E.1), 15 sites in March 2022 and a further 20 sites in the revised alignment during June 2022 (Figure 5.1). The aim of habitat assessments is to identify key habitat features such as nests, tree hollows, fallen woody debris, gilgai habitat and availability of surface water, to support an assessment of threatened fauna species that may occur in the Project area and habitat mapping.

Habitat assessments included the recording of the following habitat attributes:

- the presence of fallen logs, leaf litter, rocks
- vegetative groundcover
- presence of cracking soils and gilgai habitat
- presence rocky overhangs, caves, decorticating bark
- foraging resources such as native grasses, preferred food trees for Koalas etc
- available water sources
- animal breeding places such as hollow-bearing trees, dens, and nests
- presence and abundance of weeds
- signs of pest animals.

Habitat assessments focussed on habitat requirements for the Ornamental Snake, Squatter Pigeon, Koala, Greater Glider and wetland-dependent species. The assessments included recording of cracking clay soil and gilgai habitat, land uses, grassland quality and composition, including proportions of exotic/native groundcover (grass to herb ratio), areas of bare ground, presence of native and exotic grasses, connectivity and proximity to water. These were guided by the information presented in the EPBC Act significant impact guidelines for the target species and/or their Species Profile and Threats Database (SPRAT) description.

ii Fauna

Fauna surveys were conducted in conjunction with flora surveys across four consecutive survey days during the December 2021 surveys, across five consecutive days/nights during the March 2022 surveys and across four consecutive nights during the November 2022 surveys. During the site walkover of the revised alignment over four days in June 2022, fauna surveys were limited to incidental observations and habitat assessment for threatened species. A desktop constraints assessment as a part of the gap analysis (EMM 2021) was undertaken prior to field surveys to identify the presence of significant environmental values such as threatened fauna species that have the potential to occur within the Project area. Desktop results informed the fauna survey locations. The results of the desktop assessment are summarised in Chapter 6.

Survey sites were selected based on the different vegetation community types and desktop review information to stratify habitat types across the Project area and determine target species for survey. Site selection was further refined in the field depending on the site conditions and habitat features present. Representative sites were placed in both remnant and non-remnant areas.

Based on initial desktop assessments the following threatened fauna were targeted during site surveys:

- *Denisonia maculata* (Ornamental Snake)
- *Geophaps scripta scripta* (Squatter Pigeon (southern))
- *Rostratula australis* (Australian Painted Snipe)
- *Hirundapus caudacutus* (White-throated Needletail)
- *Phascolarctos cinereus* (Koala)
- *Petauroides volans volans* (Greater Glider)
- *Egernia rugosa* (Yakka Skink)
- *Cuculus optatus* (Oriental Cuckoo)
- *Calidris acuminata* (Sharp-tailed Sandpiper)
- *Gallinago hardwickii* (Latham's Snipe)
- *Apus pacificus* (Fork-tailed Swift).

Fauna survey methods are outlined below.

a Diurnal bird surveys

Five diurnal bird surveys (standardised 20 minute counts) were undertaken over four days in December 2021 (on Lot 411 only, which is now excluded from the Project area – see Figure E.2), along with an incidental list of all avifauna encountered across the survey period. During March and June 2022, an incidental bird list was kept over the respective five and four survey days whilst completing diurnal flora surveys. The GPS location and number of individuals of threatened species (squatter pigeon) was recorded for each encounter across all survey periods. Surveys were stationary or meanders and were predominantly located close to watercourses and in areas of native vegetation. Assessments were performed at different times of the day to maximise detection of all species present. Bird surveys took place post dawn, at noon and mid/late afternoon. Target species were continuously searched for during travel around the Project area and while completing other surveys totalling 266 person-hours of survey time (80 person-hours in December 2021, 120 person hours in March 2022 and 66 person-hours in June 2022).

b Nocturnal surveys

Five nights of non-intrusive nocturnal surveys were conducted in March 2022 using spotlights (Figure E.2 and Figure 5.2). Nocturnal surveys targeted Ornamental Snake, Australian Painted Snipe, Koala and Greater Glider. Total nocturnal survey effort was 50 person hours over five nights. This included spotlighting and assessment of hollow-bearing trees for occupation by owls and mammals. Tree searches targeted Koala and Greater Glider. Spotlighting involved walking through areas of potential habitat (i.e. native woodland or forest) with powerful spotlights and shining them into the canopy to try and identify eye-shine of active avian, mammal or reptile species. The spotlights were also periodically shone onto the ground to identify reptiles or amphibians that may be foraging on the ground surface.

Spotlighting for Ornamental Snake comprised meanders through suitable gilgai and Brigalow habitat, scanning the ground with spotlights for the species.

Nocturnal surveys in November 2022 targeted arboreal mammals such as Koala and Greater Glider, as well as Ornamental Snake in areas of gilgai and Brigalow habitats.

Spotlighting involved walking through areas of potential habitat (i.e. native woodland or forest) with powerful spotlights and shining them into the canopy to try and identify eye-shine of active avian, mammal or reptile species. The spotlights were also periodically shone onto the ground to identify reptiles or amphibians that may be foraging on the ground surface.

Spotlighting for Ornamental Snake comprised meanders through suitable gilgai and Brigalow habitat, scanning the ground with spotlights for the species.

Spotlighting searches of gilgai, Brigalow habitats and eucalypt woodlands in November 2022 totalled 60 person-hours over four consecutive nights.

Survey locations are shown in Figure E.2 and Figure 5.2.

c Hollow bearing tree records

Hollow bearing trees were recorded where observed across the Project area during December 2021 and March 2022. Time constraints in June 2022 prevented this data being collected in the revised alignment although general observations of abundance were made as part of habitat assessments described in Section 5.2.1(i). Data recorded included:

- tree species
- tree diameter at breast height
- number of hollows

- size of hollows – small (<5 cm), medium (5–20 cm), large (>20 cm) and very large (>40 cm)
- any observation notes (i.e. species using hollow).

d Anabat detector

Microbats rely on echolocation for orientation and foraging, and though the calls of almost all species are outside the range of human hearing, they can be detected by a bat detector. Bat detectors are typically installed orientated into open areas along a potential flyway, e.g. an animal track or waterway. The devices are set to automatically record and store bat calls between dusk and dawn each night. The resulting library of recorded calls are then processed by an experienced technician and identified to species level where possible.

Three Anabats (Anabat Express Passive Bat Detector, Titley Scientific) were deployed over five nights across the Project area in March 2022 (Figure E.2 and Figure 5.2), for a total of 15 detector nights. Seven separate sites were surveyed, with one site sampled for five nights, four sites sampled for two nights and two sites sampled for one night.

e Pitfall and funnel trapping

Trapping was conducted over four consecutive nights in March 2022, as per the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*, V3.0 (Eyre et al., 2018). Trapping comprised two sites with pitfall traps and funnel traps and three sites with funnel traps only, and targeted potential areas of Ornamental Snake habitat to supplement spotlighting effort for this species.

The survey methods are outlined below.

- Pitfall traps – five twenty litre buckets, with their tops flush with the surface of the soil, were set out at 7.5 m intervals with a 30 m drift fence in a “t-design”. Pitfall trapping targets small terrestrial mammals, as well as amphibians and reptiles. Traps were cleared early in the morning, soon after first light. This ensures that heat stress of any trapped animals is minimised and reduces the risk of diurnal predation of trapped animals. Shelter in the form of soil, leaves and twigs was also provided for captured animals in the bottom of each pitfall trap.
- Funnel traps – funnel traps, in pairs were installed along the 30 m drift fence as part of the pitfall trapping array – one pitfall site had ten funnel traps, the other six. Additionally, three dedicated funnel trap sites each had ten funnel traps placed in a single transect in pairs along a drift fence. Funnel traps capture reptiles that may not be caught in pitfall traps, such as snakes, dragons, large skinks and legless lizards. Checking of the traps proceeded as for pitfall trapping, but extra care was taken to ensure small reptiles were not hidden in the seams of the funnel and that small rodents have not chewed their way out, leaving a hole in the mesh. Shade material was provided over the funnel to avoid dehydration of trapped animals.

An example of a pitfall and funnel site is provided in Photograph 5.1.

Photograph 5.1 Pitfall and funnel trap site (EMM, March 2022)

Trap site locations are shown on Figure E.2 and Figure 5.2. Total trapping survey effort comprised 25 pitfall trap-nights and 112 funnel trap-nights.

f Habitat features

Distinctive habitat features such as drainage depressions or discrete patches of small wetland areas were incidentally recorded as the ecologists traversed the Project area.

g Koala searches

Searches for Koalas, or signs of their presence through scats and scratches was assessed across the Project area. Searches were completed at all quaternary sites and in areas of Eucalypt vegetation. Searches also included individual paddock trees in regrowth and non-remnant areas.

h Active searches

Active diurnal searches were conducted in areas where microhabitat such as leaf litter, log piles or rocks were abundant. Active searching targeted Ornamental Snake and Yakka Skink. During active searches, the surveyors would look for active animals under rocks and logs, look through leaf litter, under exfoliating bark and in crevices to find sheltering animals. Active searches in suitable habitat were conducted on an incidental basis while traversing the Project area, and two ecologists spent ten minutes searching whilst conducting each habitat assessment (refer Section 5.2.1), with a total effort of 19 person-hours.

Additionally, spotlighting searches of gilgai and other Brigalow habitats was undertaken in March 2022 totalling 50 person hours over five consecutive nights. Spotlighting searches of gilgai, Brigalow habitats and eucalypt woodlands in November 2022 totalled 60 person-hours over four consecutive nights.

i Incidental sightings

Incidental sightings of animal signs such as scat and tracks were recorded as the Project area was traversed. Ecologists recorded any secondary signs encountered at each site during the survey period, or while walking between sites in the Project footprint. Secondary signs can lead to the positive identification of mammals, reptiles and birds. Animals often reveal their presence through tracks left in soft substrate. Similarly, arboreal animals may leave distinctive scratches on tree trunks as they climb. Some *Petaurus* spp. leave feeding marks on tree trunks. Scats of many mammals can be identified, and in particular, the faecal pellets of Koalas or Greater Gliders often found at the base of trees are a sign of Koala or Glider presence. Hair, feathers, bones or nests can often be identified to species level.

j Pest fauna

As per pest flora, PMST and Wildlife Online searches were used to identify pest fauna listed as a 'Restricted Matter' under Queensland's *Biosecurity Act 2014,* known and potentially occurring within the Project area. Presence of these, and any others not identified in desktop searches were recorded in the field.

k Summary of fauna survey effort

Timing and methods for seasonal fauna surveys are guided by the applicable State and Commonwealth survey guidelines. Based on the initial list of candidate species reviewed prior to field surveys, a summary of the fauna survey effort implemented and consistency with applicable survey guidelines is provided in Table 5.1.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
Koala	**Survey methods for arboreal mammals** Broadcast surveys for 2 sessions of call playback of relevant species at midpoint of survey site. Spotlighting for 2 x 30 person-minute searches within the 100 x 100 m survey area. Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrats of the survey site. Otherwise incidental (Eyre et al. 2018).	**Survey methods for Koalas** Scat SAT for 2 person-minutes under 30 trees at each site. Diurnal strip transects where koala activity and density is high. **Spotlighting** Broadcasting surveys during breeding season (August to February). Camera trapping where fresh signs have been detected. Indirect sightings such as scratches and scat (DoE 2014).	Searches for Koalas, or signs of their presence through scats and scratches was assessed across the Project area in patches of eucalypt woodlands as well as non-remnant areas. Searches were completed at all 112 quaternary sites within the original Project area. Searches also included individual paddock trees in regrowth and non-remnant areas. Searches within suitable habitat in the revised alignment was incidental only. Five nights of nocturnal surveys were conducted in March 2022 using spotlights. Total nocturnal survey effort was 50 person hours over five nights although the majority of this effort was in non-suitable non-remnant habitat and Koala habitat is limited in the Project area. Four nights of nocturnal surveys were conducted in November 2022 using spotlights. Total nocturnal survey effort was 60 person hours over four nights although some of this effort was in non-suitable non-remnant habitat and Koala habitat is limited in the Project area.	Within the original alignment, survey methods are consistent with guidelines and adequate survey effort has been completed within the Project area to assess presence of Koala habitat and presence of individuals. Further survey effort will be required in the revised alignment, where suitable habitat occurs.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
Ornamental Snake	**Survey methods for reptiles** Pitfall trapping with 4 buckets at 7.5 m intervals on T-design; 45 m fence for 4 nights. Funnel trapping with 6 funnels 3 m in on distal ends of T-design; 45 m fence for 4 nights. Diurnal active searches under rocks and logs for 2 x 30 person-minute searches within 2 different 50 x 50 m quadrants of the survey site. Nocturnal active search for 2 x 30 person-minute searches within the 100 x 100 m survey site. Camera trapping with 1 camera per site for minimum of 4 nights. Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrats of the survey site. Otherwise incidental sightings are noted (Eyre et al. 2018).	**Survey methods for Brigalow Belt reptiles** Targeting water-inundated gilgai, wetlands, riparian habitats and the surrounding environment (e.g. tracks) and large logs between dusk and early morning hours. More effective on warm, humid evenings. Survey over a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species. Survey over a minimum of 3 nights. **Active searches** Actively look for reptiles whilst driving along roadways in your survey area especially following heavy rainfall events and during warm evenings for snakes. **Pitfalls** Six 20 litre (500 mm deep) buckets evenly distributed under a 30 m drift fence where optimal microhabitats occur. Place a funnel at each end of a pitfall line.	Spotlighting searches of gilgai and other Brigalow habitats totalling 50 person hours over five consecutive nights in March 2022. Four nights of nocturnal surveys were conducted in November 2022 using spotlights. Total nocturnal survey effort was 60 person hours over four nights although some of this effort was in non-suitable habitat. Up to three trap nights (funnels and pitfalls) at five trap sites, totalling 25 pitfall trap nights and 112 funnel trap nights. As noted in Section 5.4 these traps were closed early due to heavy rain. The revised alignment on Lot 11 and Lot 2 was surveyed for habitat suitability for ornamental snake, and gilgai areas on cracking clay soil was noted as suitable habitat. It is expected that ornamental snake will be present in this area, in similar density to that recorded in similar habitat on Lot 23, which was surveyed extensively in March 2022. No further targeted survey effort for ornamental snake is proposed.	The species has been shown to occur in cleared areas of gilgai and the Brigalow Belt reptile guideline includes cleared areas of gilgai as potential habitat for this species. Multiple records in cleared gilgai were made within the Project area during March 2022. Diurnal searches were not performed due to a lack of microhabitat in the form of timber/ground logs that would provide refuge when cracks aren't available. The Project area has been stick-raked following historical clearing. If the species is present, it is likely to be resting in cracking soils of gilgai or creek lines. The Commonwealth survey guidelines recommend surveys over a minimum of three nights targeting gilgai wetlands and riparian habitats of average complexity, especially following rainfall events. The seasonal surveys were conducted in these preferred habitats before and after rainfall events by spotlighting, over five nights.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
		At least 2 replicates per habitat type. Checked every morning and early evening (after the optimal foraging periods) over four days.		A total of 50 person hours was spent on nocturnal survey effort, and Ornamental Snake presence in the Project area has been confirmed. The species was identified in gilgai areas, some containing microhabitat. Therefore, adequate survey effort has been applied to determine Ornamental Snake populations and habitat distribution and condition.
Greater Glider	**Survey methods for arboreal mammals** Spotlighting for 2 x 30 person-minute searches within 100 x 100 m survey site.	No specific requirements for Greater Glider.	Five nights of nocturnal surveys were conducted in March 2022 using spotlights. Total nocturnal survey effort was 50 person hours over five nights although the majority of this effort was in non-suitable non-remnant habitat and Greater Glider habitat is not present in the original Project area. Hollow bearing trees were recorded where observed across the Project area, in the original alignment only although observations were also made on Lot 11 and Lot 2 on general abundance of suitable HBT for this species. Informal scat searches. Some areas of potential Greater Glider habitat, albeit marginal, occurs in the revised alignment on Lot 11. This habitat, characterised by remnant *Eucalyptus crebra* woodland with small to medium-sized hollows, was surveyed utilising targeted methods (e.g. nocturnal spotlighting) in Spring 2022. Four nights of nocturnal surveys were conducted in November 2022 using spotlights. Total nocturnal survey effort was 60 person hours over four nights although some of this effort was in non-suitable non-remnant habitat. Greater Glider habitat is not present in the Project area.	Within the original alignment, survey methods are consistent with guidelines and adequate survey effort has been completed. Spotlighting was focused around hollow bearing trees and riparian woodlands. Potential habitat for the species is present in the revised alignment, which will be subject to further survey effort.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
Squatter Pigeon	**Survey methods for diurnal birds** Diurnal bird surveys within the 100 x 100 m survey site by one observer for 5 minutes, on at least 6 occasions within a survey period. Longer (up to 10 minutes) may be required in complex habitats. Where practicable, two of the bird counts should be done in the early morning (<2 hours after sunrise), two in mid-morning (2 to 4 hours after sunrise), and the remaining two during less optimal times in the day (between 4 hours after sunrise and 2 hours before sunset) (Eyre et al. 2018). No specific requirements for Squatter Pigeon.	**Survey methods for birds** Area searches or transect surveys for 15 hours over 3 days. Applicable in areas of less than 50 ha. Flushing surveys for 10 hours over 3 days (DSEWPC 2010a). Applicable in areas of less than 50 ha.	Time driving around site is accepted to count to survey effort for this species, as the species often forages on bare dusty ground adjacent to natural habitats. Point counts were undertaken morning and evening at water sources in December 2021. Flushing surveys were undertaken while driving along unsealed roads and while traversing the Project area. Accumulated survey effort at all times when within the Project area while completing alternative surveys. The target species was continuously searched for during travel around the Project area. A total of 266 person hours was spent across the Project area over the course of the December 2021 and March 2022 surveys during daylight hours. A total of 70 person hours was spent in the revised alignment in the June 2022 surveys on Lot 2 and Lot 11.	The extent of survey effort is considered appropriate for the size of the Project area and consistent with survey guidelines. The species has been recorded in the Project area therefore considered as known to occur. Habitat has been mapped following DCCEEW criteria.
Yakka Skink	Diurnal search for 20 minutes per hectare in a single search. • Search 20% of suitable habitat when the project area is 50 ha or greater. • Search 40% of suitable habitat when the project area is less than 50 ha. – Distant observation for 20 minutes per day scanning suitable microhabitat for 3 days.	**Survey methods for Brigalow Belt reptiles** Searching microhabitats, such as carefully turning woody debris, rocks and artificial debris, raking the soil surface or leaf litter beneath trees and looking beneath peeling bark for reptiles or their sloughs. Optimal survey time is during the coolest parts of the day.	19 person hours of diurnal active searching (generally in cooler parts of day) and 137 trap nights (combination of funnels and pitfalls over five trap sites in total).	Limited open woodland habitat and fallen timber and rock microhabitat reduce the likelihood of the species being present in the Project area. Survey methods and effort are considered to meet guideline requirements for this species, as habitats of average complexity for the species are not considered to be present.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
	– Camera traps for 12 camera trap nights per colony over 4 nights. – Funnel traps for 60 trap nights per colony over 4 nights.	Survey over a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species. Survey over a minimum of 3 days. Transects (number and size of area sampled) should be strategically designed/positioned in large habitat patches (>10 ha) to adequately sample representative microhabitats in each habitat type. Target colony sites through diurnal surveys of suitable habitat. One large Elliott-style trap (15.5 cm x 15 cm x 46 cm) and one cage trap placed as close as possible to burrow entrances. Check every morning and early evening (after the optimal foraging periods) over four days. **Survey methods for Australia's threatened reptiles** Searching for burrow systems and communal defecation sites. The species can be confirmed by Elliott trapping around the burrows, by distant observation with binoculars or by shining a torch down the burrows at night.		

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
Australian Painted Snipe Latham's Snipe Sharp-tailed Sandpiper	**Terrestrial Vertebrate Fauna Survey Guidelines for Queensland** No specific survey guidelines. Generic diurnal bird survey: Six x 5–10 min area searches within 100 x 100 m survey site. Incidental detections.	**Australian Painted Snipe** Intensive vigilance is required to detect flushed birds. Area searches or transects through suitable wetlands; detection by sighting and flushing. Targeted stationary observations at dawn and dusk of suitable foraging locations within wetlands; detection by sighting. Also, a brief spotlight search shortly after dusk may detect birds. Stationary observations for 10 hours over 5 days for sites of less than 50 ha. Land-based area searches or line transects for 10 hours over 3 days for sites of less than 50 ha when wetland holds water but is not flooded.	Six diurnal bird surveys were undertaken over four days in December 2021. Surveys were stationary or meanders and were predominantly located close to watercourses and in areas of native vegetation. Surveys took place post dawn, at noon and mid/late afternoon. The target species was continuously searched for during travel around the Project area. A total of 266 person hours was spent across the Project area over the course of the three surveys during daylight hours.	This reduced effort when compared to the guideline recommendations is justified based on the limited optimal habitat in the Project area.

Table 5.1 Fauna survey guidelines and EMM survey effort

Target species	State guidelines	Commonwealth guidelines	EMM survey effort	Guidelines met
White-throated Needletail Fork-tailed Swift Oriental Cuckoo Rufous Fantail Black-faced Monarch Spectacled Monarch	No specific guidelines.	**From EPBC Referral Guidelines for Migratory species:** "While there are no standard survey techniques for swifts, they should be counted by an experienced person from elevated viewpoints (if present) during the Austral summer. Prevailing weather conditions should be noted." "The best methods of survey for the Oriental Cuckoo in non-breeding areas and the five breeding migrant flycatchers in breeding habitat is an area survey, preferably a 2 hectare survey in 20 minutes, over sufficient survey plots to estimate a density, and hence the population size across the proposed development area. Surveys should be undertaken in an appropriate season – spring or summer in southern Australia."	Six diurnal bird surveys were undertaken over four days in December 2021 and incidental observations were recorded over five days in March 2022 and four days in June 2022. Surveys were stationary or meanders and were predominantly located close to watercourses and in areas of native vegetation. Surveys took place post dawn, at noon and mid/late afternoon. The target species was continuously searched for during travel around the Project area. A total of 266 person hours was spent across the Project area over the course of the three surveys during daylight hours.	Guidelines were met for these species.

5.3 Survey timing and climatic conditions

5.3.1 December 2021

Conditions during the field survey ranged between 19–35 °C with 0.2 mm of rain recorded at Moranbah to 9:00 am on 9 December 2021. Localised rain was observed to be higher on this date, with heavy downpour occurring during an afternoon storm on 8 December 2021, although no data of the actual rain received was available. The nearest weather station at Moranbah received 182.4 mm of rainfall in the three months leading up to the survey (BOM, 2022), with 29.4 mm falling the week prior.

In December 2021, with the exception of Buffel Grass, most grasses were not in flower, making specific identification of grass species challenging. The potential detection of threatened grasses was reduced throughout the Project area due to lack of fertile material. Plant material was collected for some grass species and provided to the Queensland Herbarium for verification.

Overnight rain occurred during the survey period, on 8 December 2021. Frogs (Green tree frog (*Litoria caerulea*) and Ruddy tree frog (*Litoria rubella*)) were heard calling at the site the next day, despite the absence of standing water. This is an indication of how the site transforms after rain, and would provide suitable habitat for the Ornamental Snake, which feeds almost exclusively on frogs.

5.3.2 March 2022

Conditions during the field survey ranged between 21–41°C with 13.8 mm of rain recorded at Moranbah on 10 March 2022, although it is suspected the amount in the Project area was higher than this, as a local landholder reported approximately 40 mm at a nearby homestead. The nearest weather station at Moranbah received 193.8 mm of rainfall in the three months (December to February) leading up to the survey (BOM, 2022a), with no rain falling the week prior.

Overnight rain occurred during the survey period, on 10 March 2022. This resulted in inundation of the gilgai from a dry baseline, and flooding of the Project area in areas of low-lying clay soils. Frogs were heard calling that evening from the rain, as well as an emergence of Ornamental Snake in the gilgai areas.

5.3.3 June 2022

Conditions during the field survey ranged between 8.1–24.8°C with 0.2 mm of rain recorded at Moranbah on 30 June 2022. The nearest weather station at Moranbah received 150.6 mm of rainfall in the three months (April to June) leading up to the survey (BOM, 2022b), with no rain falling in the month of June, except on the 30th, as noted above. Above-average rainfall occurred in May (108.6 mm, mean 34.5 mm).

5.3.4 November 2022

Conditions during the field survey ranged between 18.1–38.8°C with 21.8 mm of rain recorded at Moranbah on 21 November 2022. The nearest weather station at Moranbah received 129.2 mm of rainfall in the three months (August to October) leading up to the survey (BOM, 2022b), with only 3 mm of rain falling in the month of November, except on the 21st, as noted above.

It is worth noting, there was no rain recorded at Moranbah weather station on 23rd or 24th although rain was noted on site, including heavy rain on 24th leading to high frog activity.

5.4 Limitations

Rainfall prior to the March 2022 surveys produced good conditions for identifying grasses and other herbaceous species, however there was a significant amount of Buffel Grass growth competing with the native flora present within the Project area.

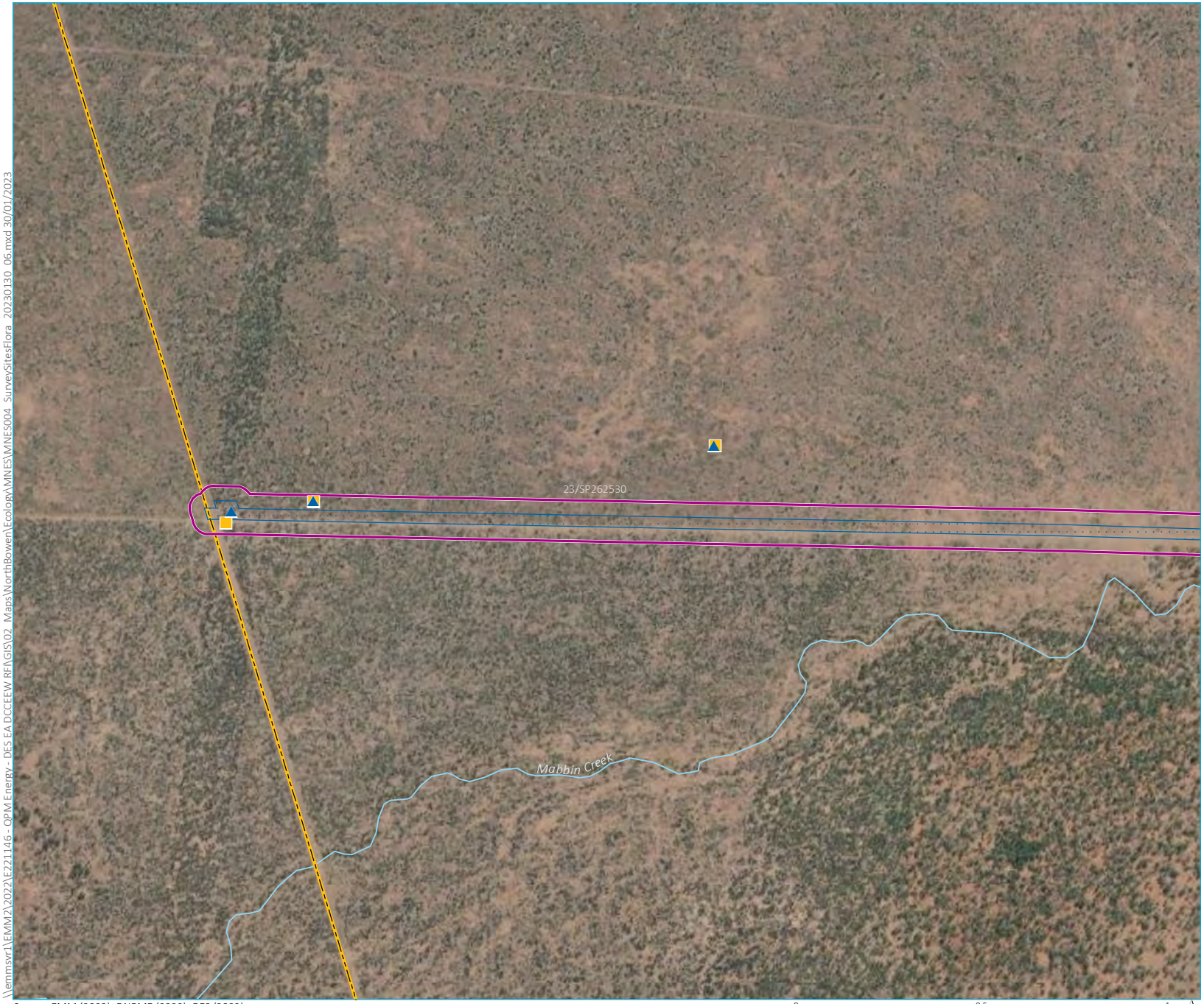
During the March 2022 surveys, a significant rainfall event occurred on the evening of 10 March, requiring the pitfall and funnel traps to be closed early to avoid inundation of the traps. Although the traps did not complete the desired four nights of survey, the implications of this are negligible due to the large number of Ornamental Snakes recorded during separate spotlighting effort (see Section 7.3.1). The rain event did not prevent access on foot to complete remaining flora and fauna survey effort.

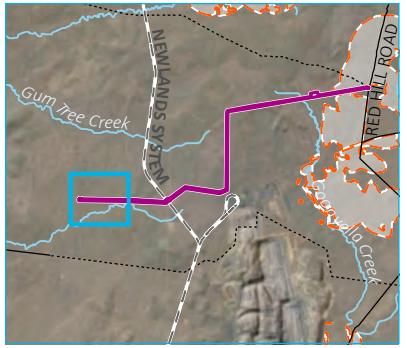
5.5 Significant impact assessment

Impact assessments have been undertaken in accordance with the Matters of National Environmental Significance – Significant impact guidelines 1.1 *Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013a). Species-specific guidelines have included:

- EPBC Act referral guidelines for the vulnerable Koala (DoE 2014) – noting the recent elevation of this species to Endangered status
- referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015a).

The methods provided within the guidelines are intended to determine the level of significant impacts on MNES due to the proposed action. This is achieved through 'significant impact criteria' which are imposed on identified values and vary according to the status of each value.





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- Cadastral boundary

Flora survey sites

- Quaternary assessment
- Habitat assessment

Survey sites - flora
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.1

EMM
creating opportunities

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m
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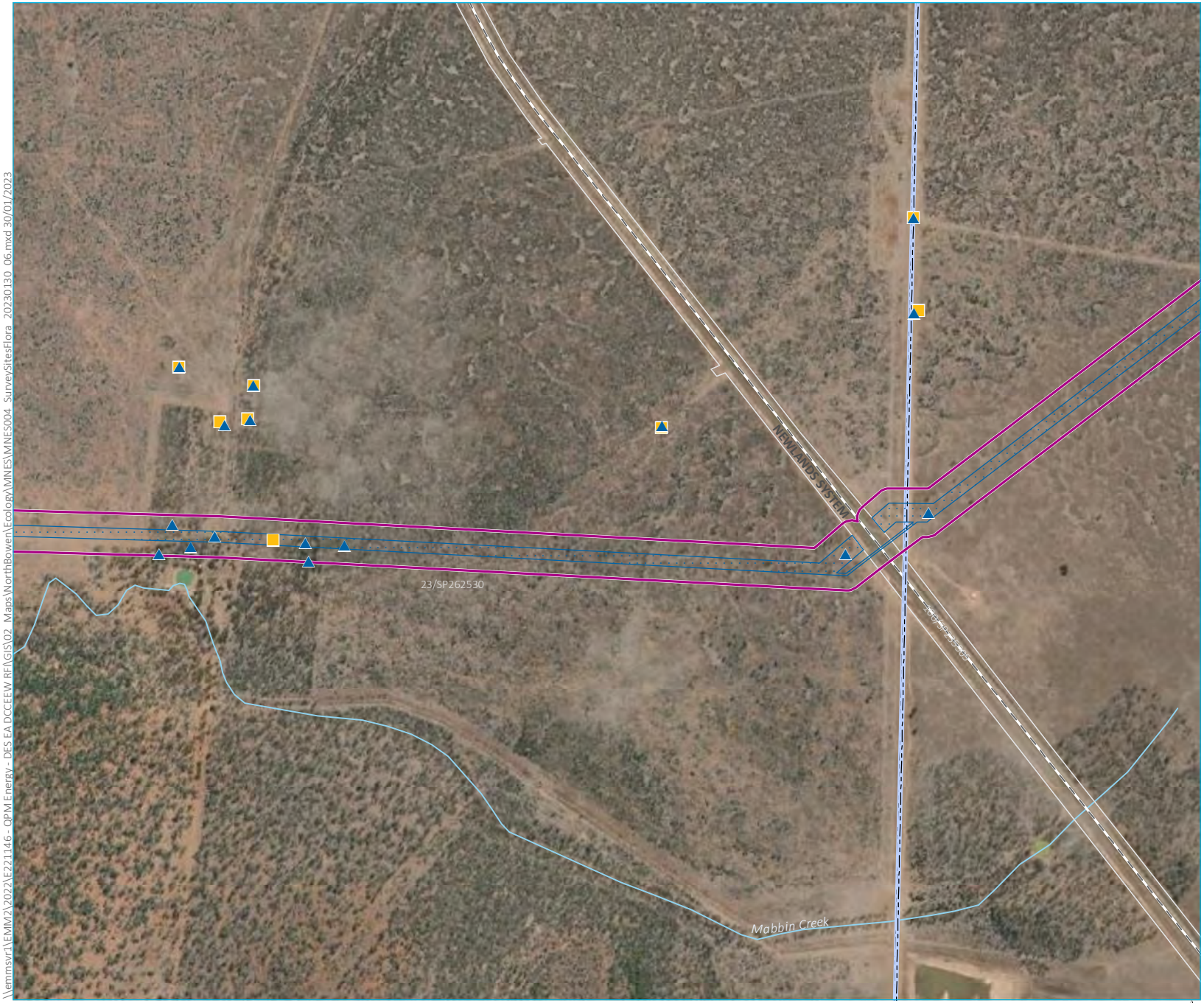

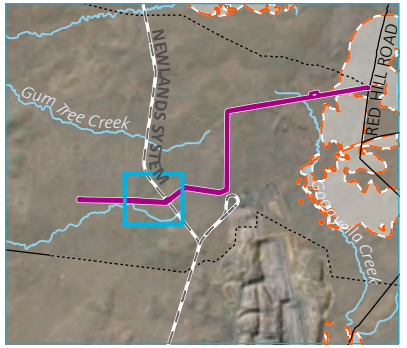

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- Habitat assessment

Survey sites - flora
Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.1

EMM
creating opportunities

Source: EMM (2023); DNRME (2022); DES (2022)

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GDA 1994 MGA Zone 55

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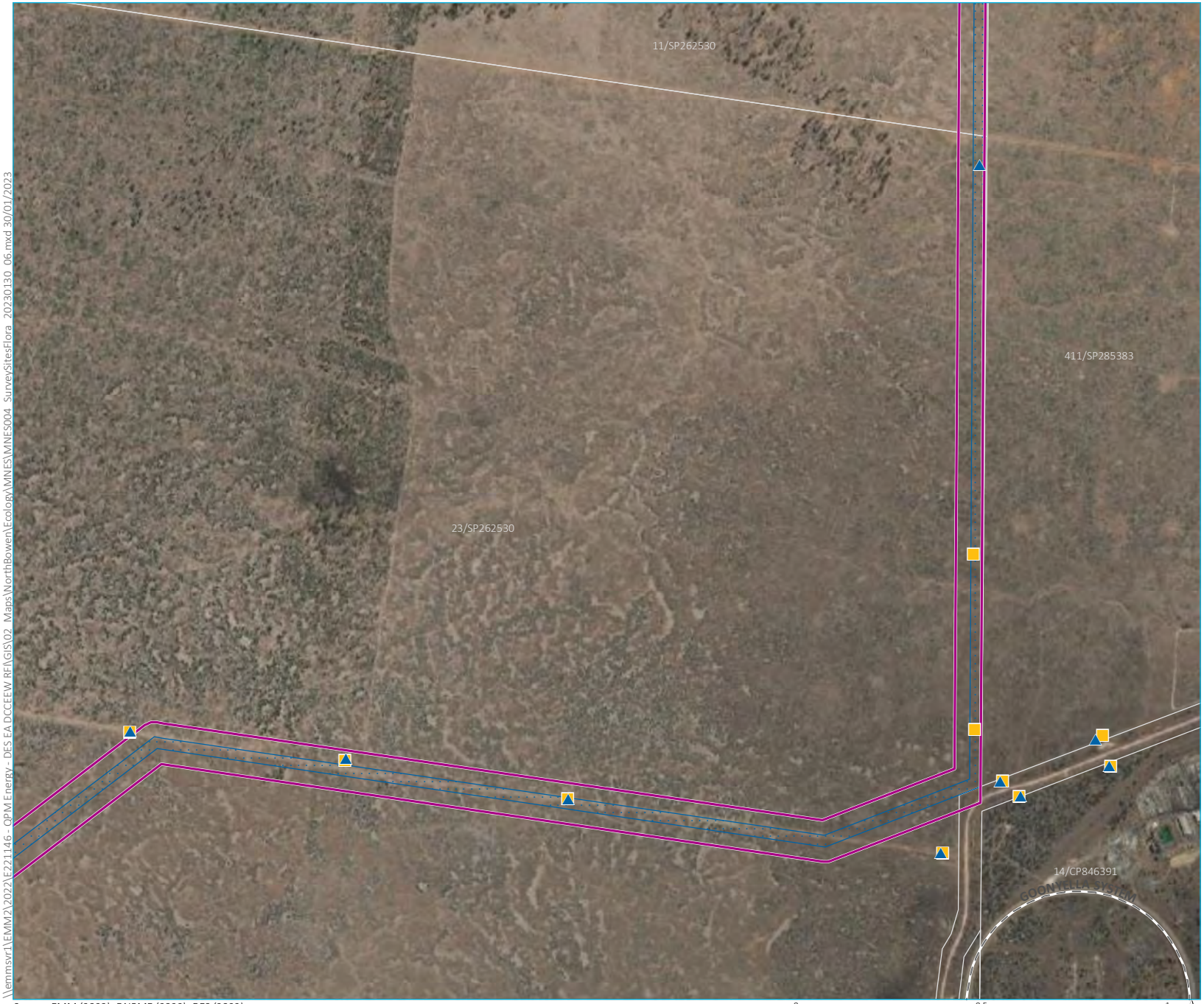

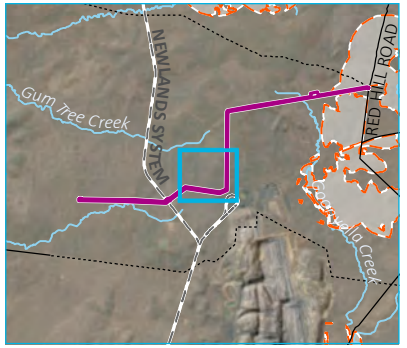

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Flora survey sites

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- Habitat assessment

Survey sites - flora
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
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EMM
creating opportunities

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0 0.5 1 m

GDA 1994 MGA Zone 55

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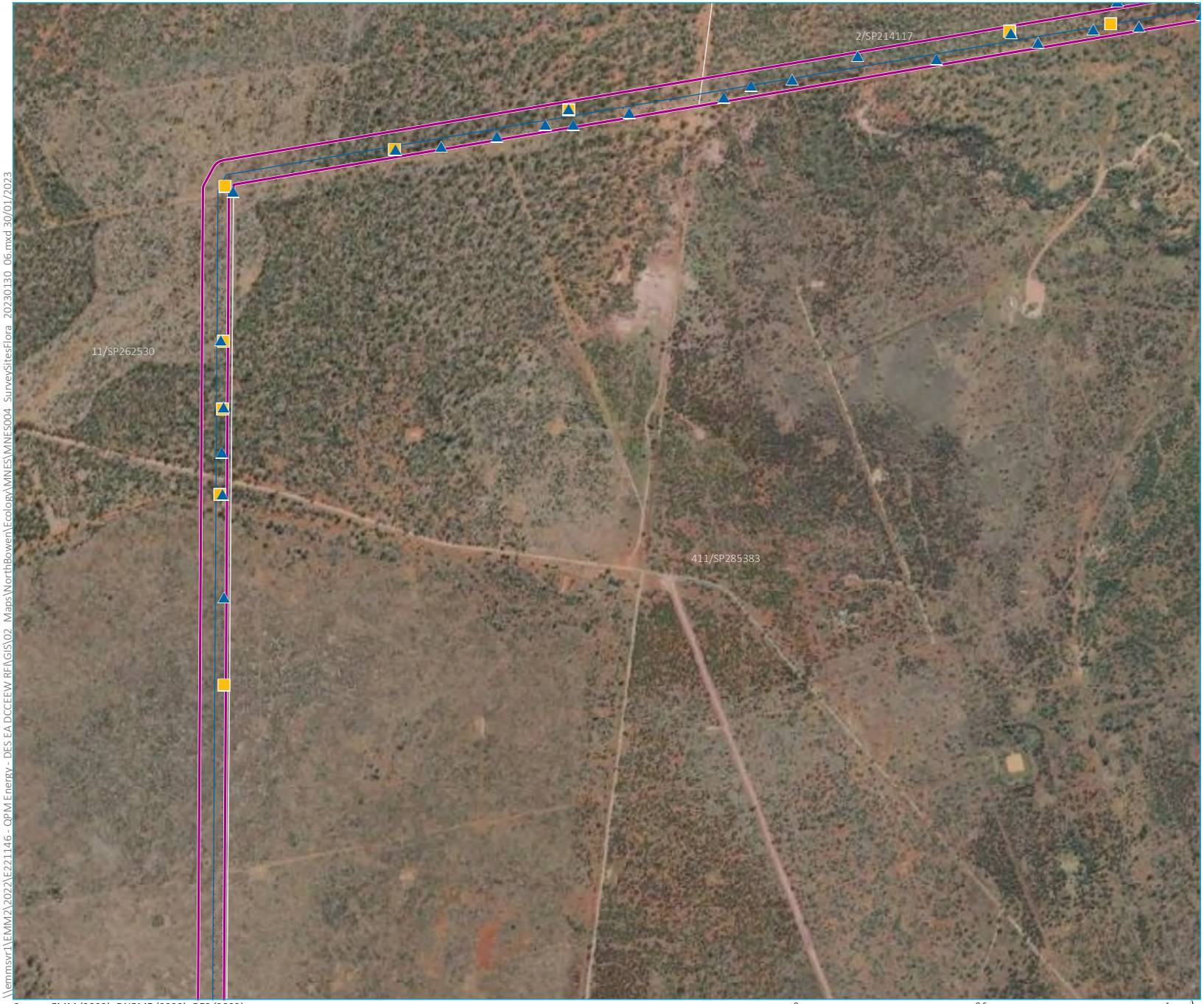

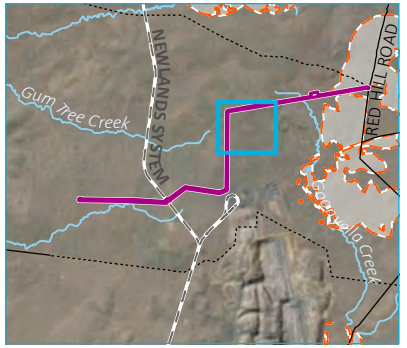

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Flora survey sites

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- Habitat assessment

Survey sites - flora
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.1

EMM
creating opportunities

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES004 SurveySitesFlora 20230130 06.mxd 30/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

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GDA 1994 MGA Zone 55

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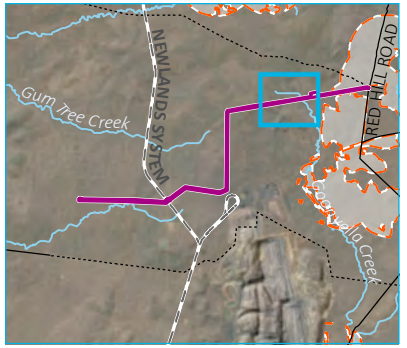

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Survey sites - flora
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.1

EMM
creating opportunities

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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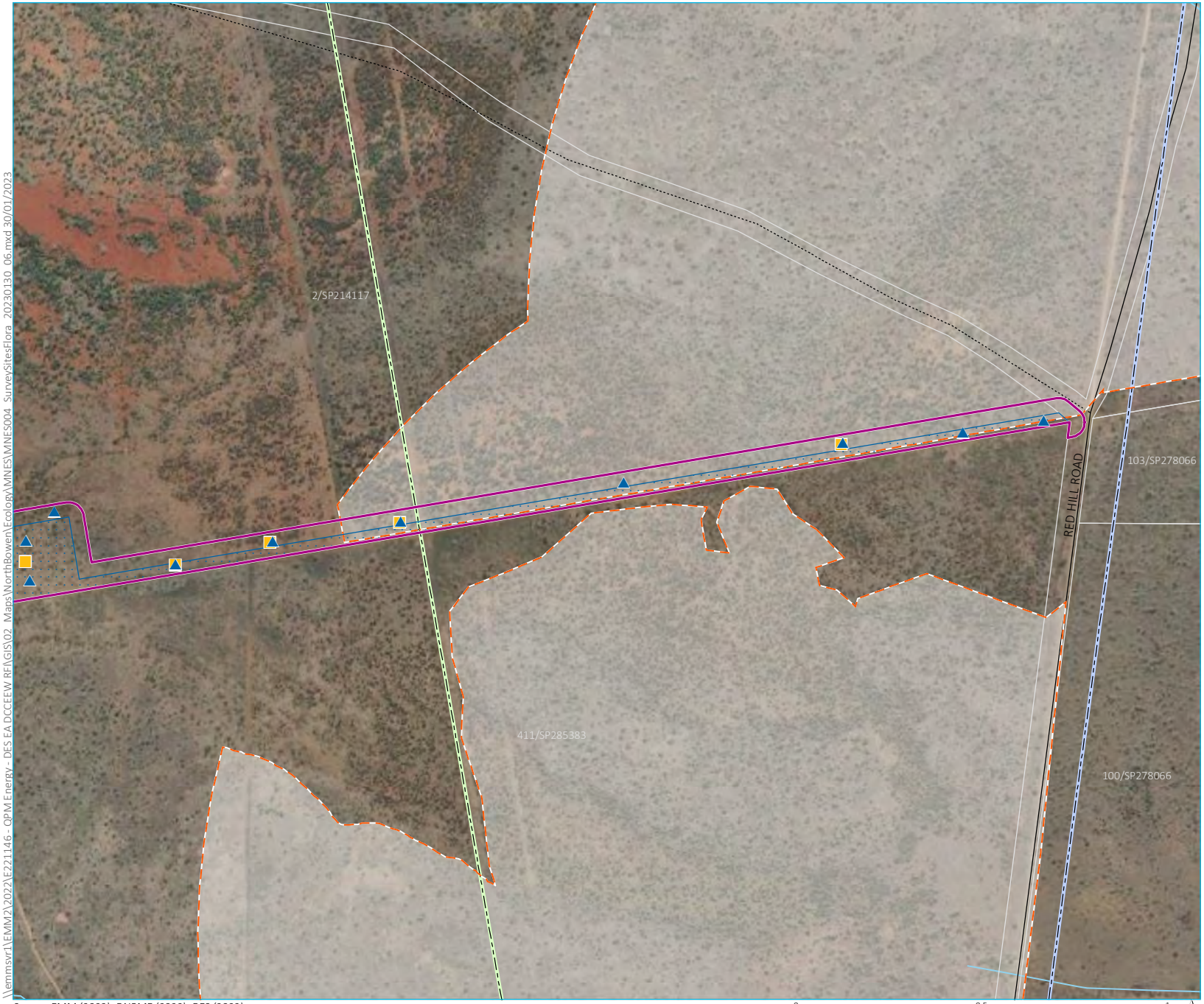

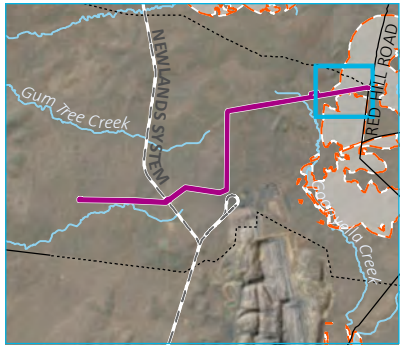

KEY

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\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES004 SurveySitesFlora 20230130 06.mxd 30/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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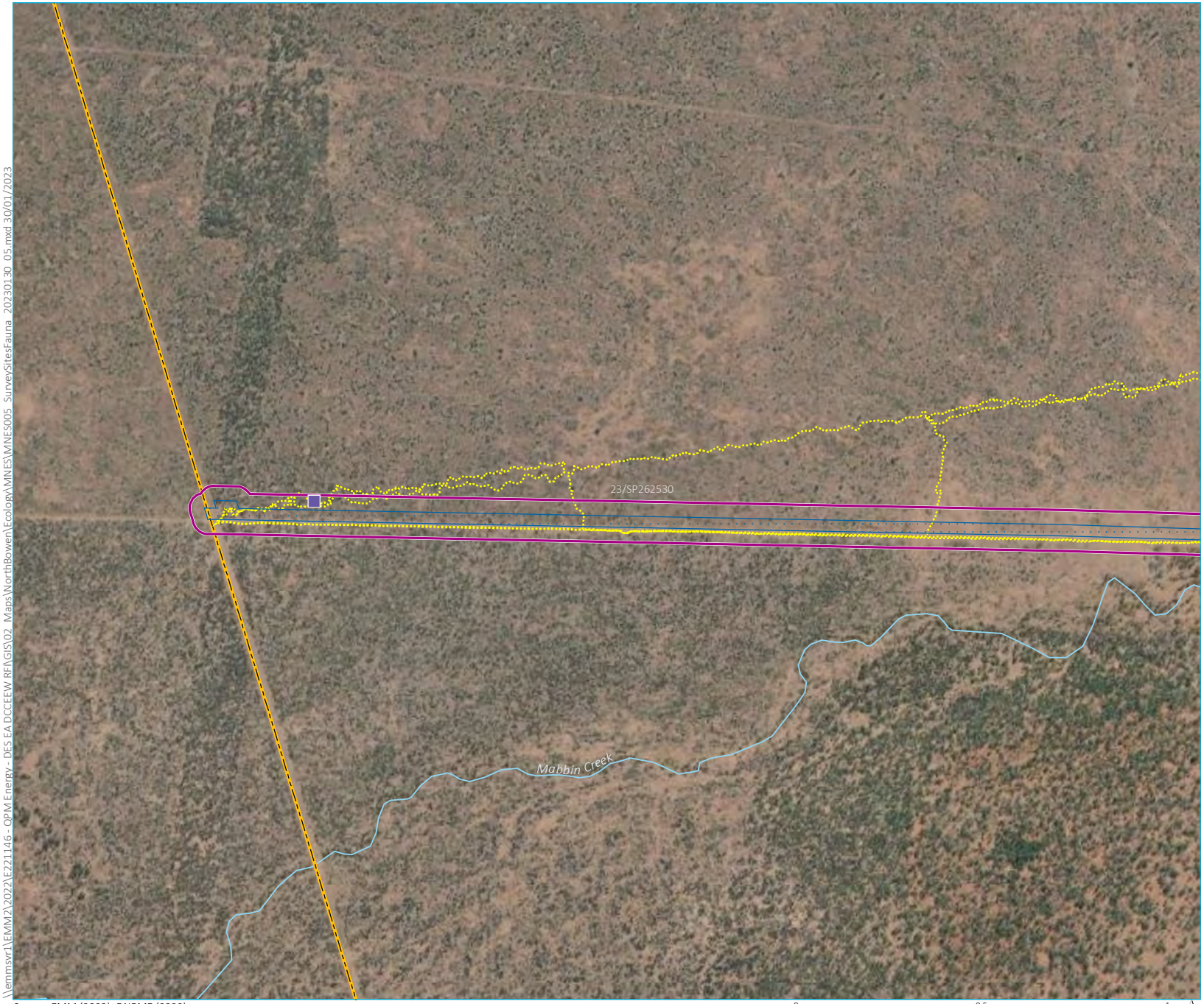
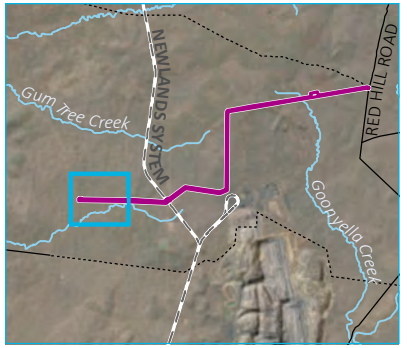
Survey sites - flora
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.1

EMM
creating opportunities





KEY

- Project area
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- Rail line
- Minor road
- Vehicular track
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- Cadastral boundary

Fauna survey sites

- Funnel trap
- Spotlighting transect

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Source: EMM (2023); DNRME (2022)

0 0.5 1 km

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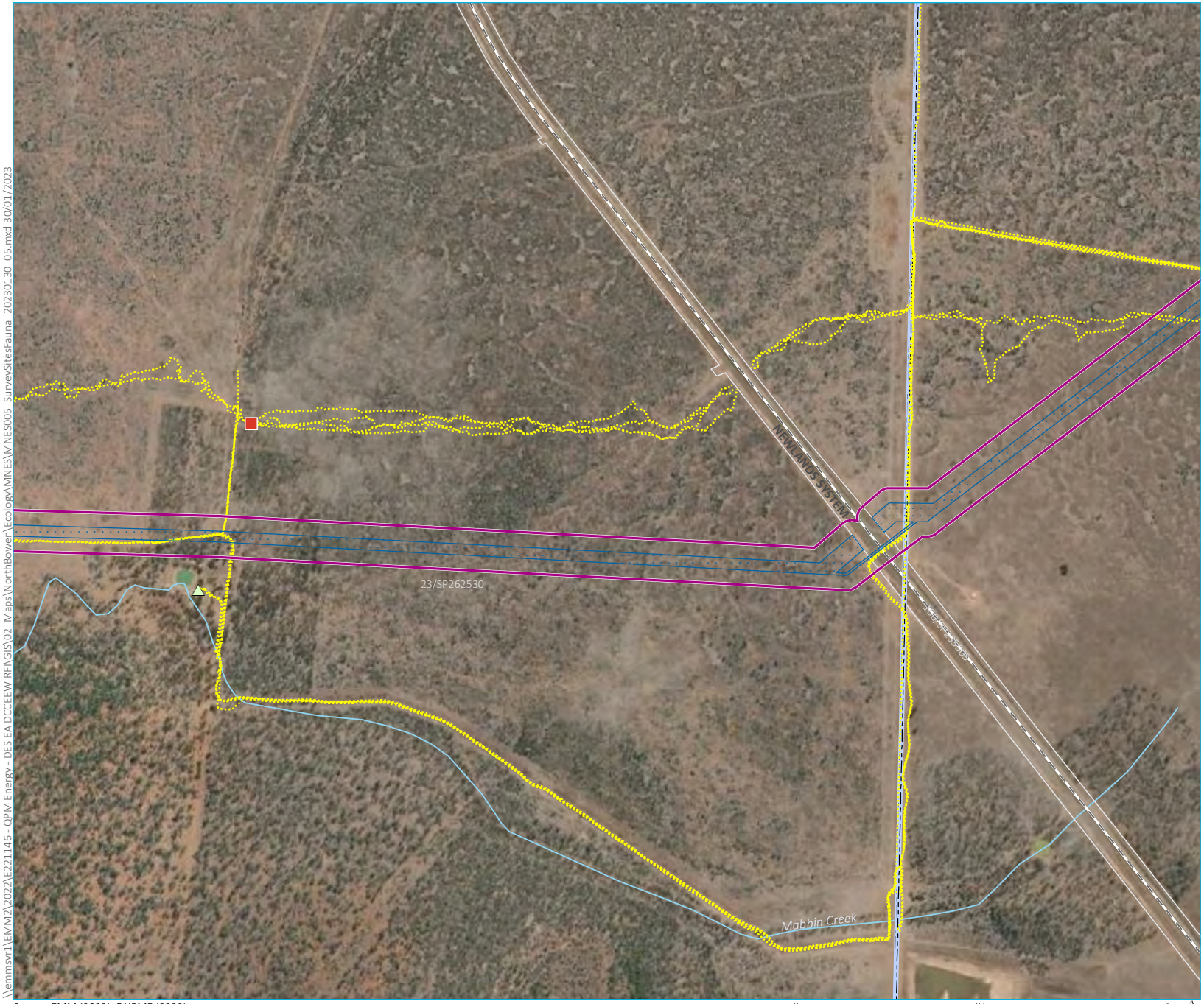
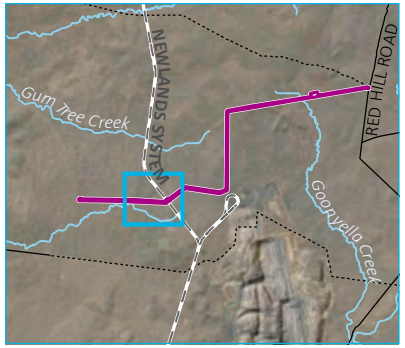
Survey sites - fauna
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM creating opportunities





KEY

- Project area
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- Watercourse/drainage line
- Cadastral boundary

Fauna survey sites

- Pitfall trap
- Anabat
- Spotlighting transect

Survey sites - fauna
Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM
creating opportunities

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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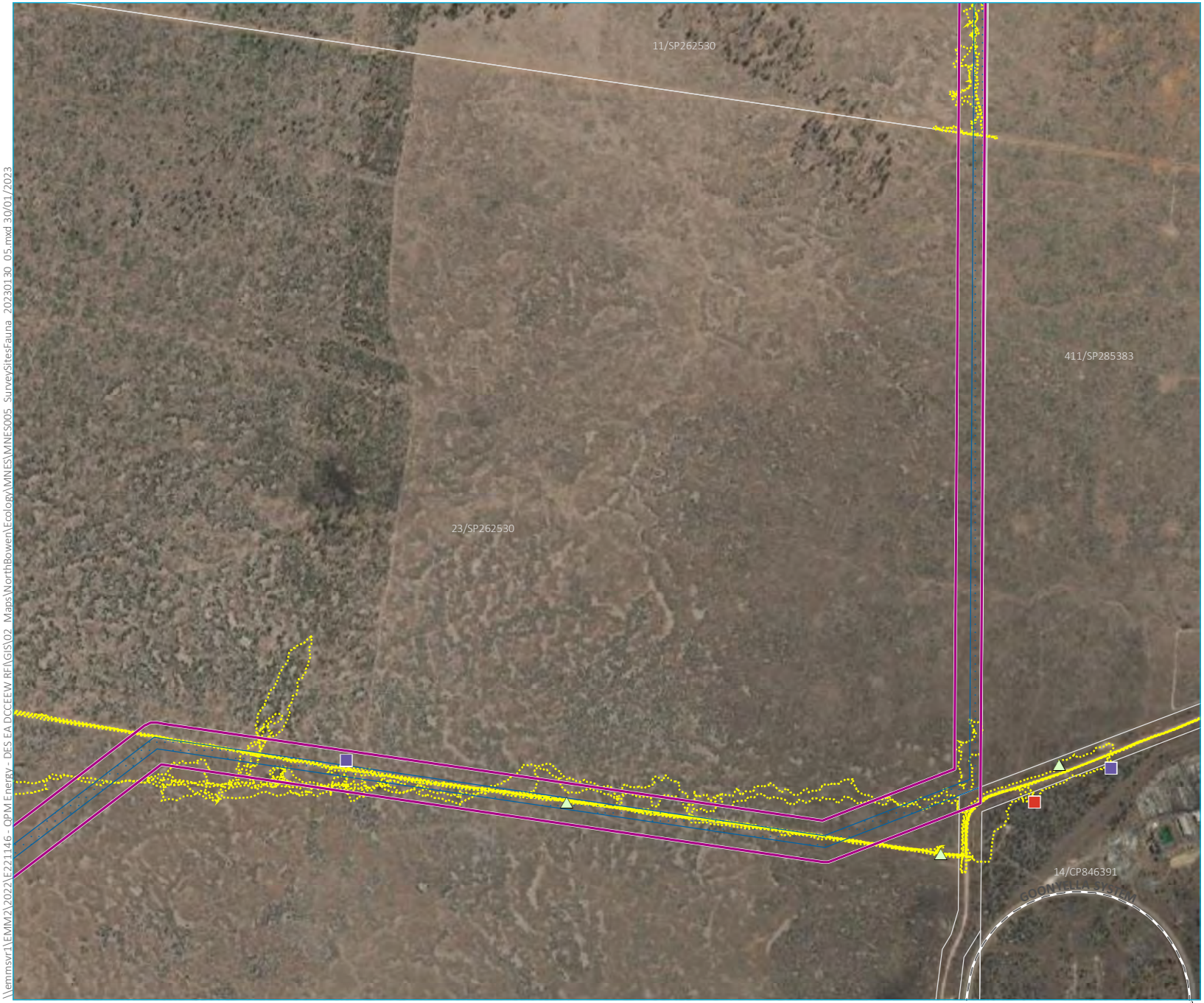

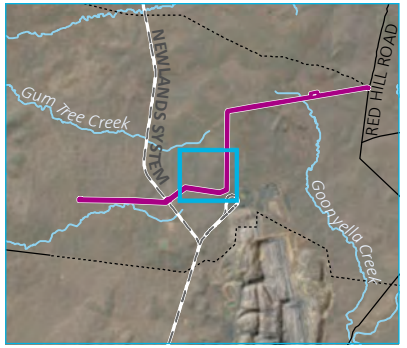

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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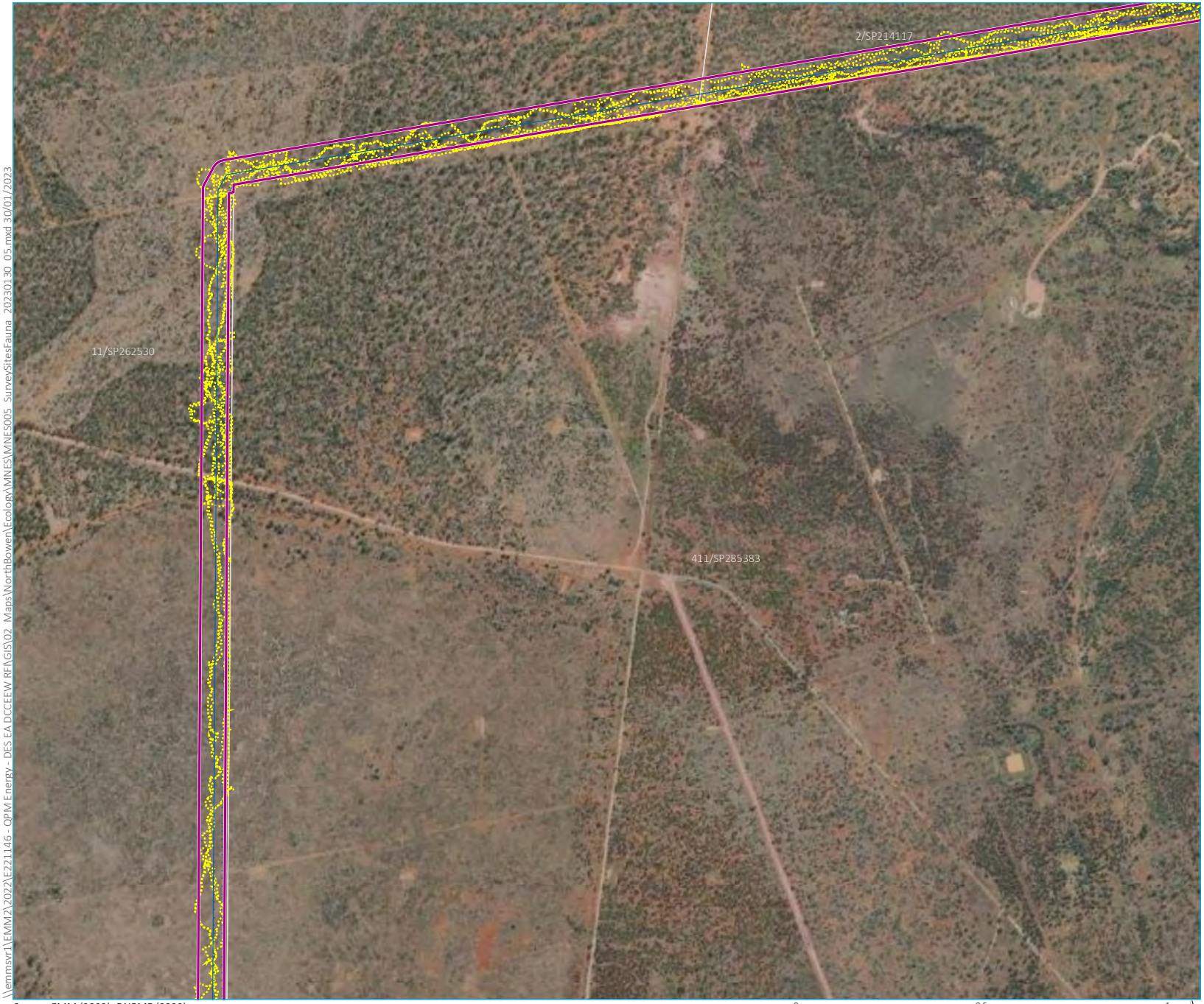
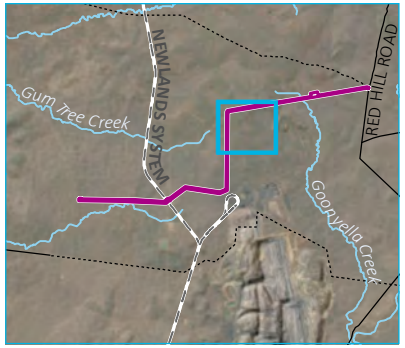
Survey sites - fauna
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM
creating opportunities





KEY

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Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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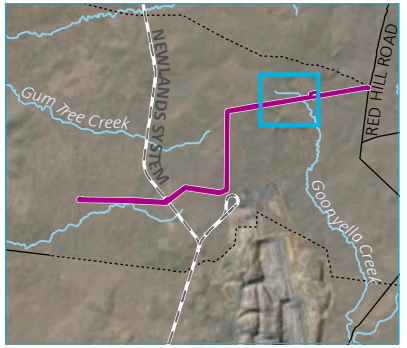
Survey sites - fauna
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM creating opportunities



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Source: EMM (2023); DNRME (2022)

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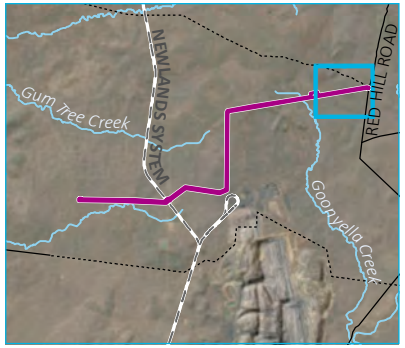
Survey sites - fauna
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM
creating opportunities



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Survey sites - fauna
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 5.2

EMM
creating opportunities

6 Desktop assessment results

The following sections present the results of the background research and desktop assessments which were completed prior to the commencement of field surveys.

6.1 Summary of PMST

A PMST search was undertaken on 6 December 2021, and recompleted on 5 May 2022 to inform this report, with a 20 km buffer added to the Project area. A summary of the results is provided in Table 6.1, with further detail in the sub-sections below.

Table 6.1 PMST results for the study area

MNES	PMST result
World Heritage Properties	None
National Heritage Properties	None
Wetlands of International Importance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed threatened ecological communities	4
Listed threatened species	24
Listed migratory species	9

6.2 World Heritage and National Heritage Properties

No World Heritage or National Heritage Properties are located within the Project area or Study area (Appendix A.1). The closest World Heritage property, the Great Barrier Reef, is located over 135 km east of the Project area.

6.3 Protected Area estates

No Protected Area estates are located within the Project area (Appendix A.1). The nearest Protected Area is Homevale National Park approximately 60 km to the north-east.

6.4 Wetlands of International Importance

No Wetlands of International Importance are located within the Project area (Appendix A.1). The closest Wetlands of International Importance are Bowling Green Bay, located approximately 250 km to the north of the Project area and Shoalwater and Corio Bays approximately 250 km to the southeast of the Project area.

Although not listed as a Wetland of International Importance, and therefore not an MNES, Lake Elphinstone (listed in the Directory of Important Wetlands in Australia) is located approximately 30 km north-east of the Project area.

6.5 Great Barrier Reef Marine Park and Commonwealth Marine Areas

The Great Barrier Reef Marine Park is located approximately 135 km east of the Project area (Appendix A.1).

6.6 Regional ecosystems and regulated vegetation

Results of the desktop assessment indicated that a total of eight REs are mapped within the Project area in the Queensland Government regulated vegetation mapping (including subdominant REs within heterogenous polygons). These are summarised in Table 6.2 including Vegetation Management Act class and Biodiversity Status.

The certified RE mapping for the Project area on Lot 23 includes:

- One polygon of 'Endangered' RE 11.4.9 – *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.
- One heterogeneous polygon of 'Endangered' – dominant RE 11.4.11/11.4.8/11.4.9.

The majority of vegetation within the new alignment and compressor facility on Lot 11 and Lot 2 is mapped as non-remnant, with an area of 'Least Concern' Regional Ecosystem (RE) 11.5.3/11.5.15 and 'Of Concern' RE 11.8.11, as well as 'Endangered' RE 11.8.13. The short description for these vegetation communities are as follows:

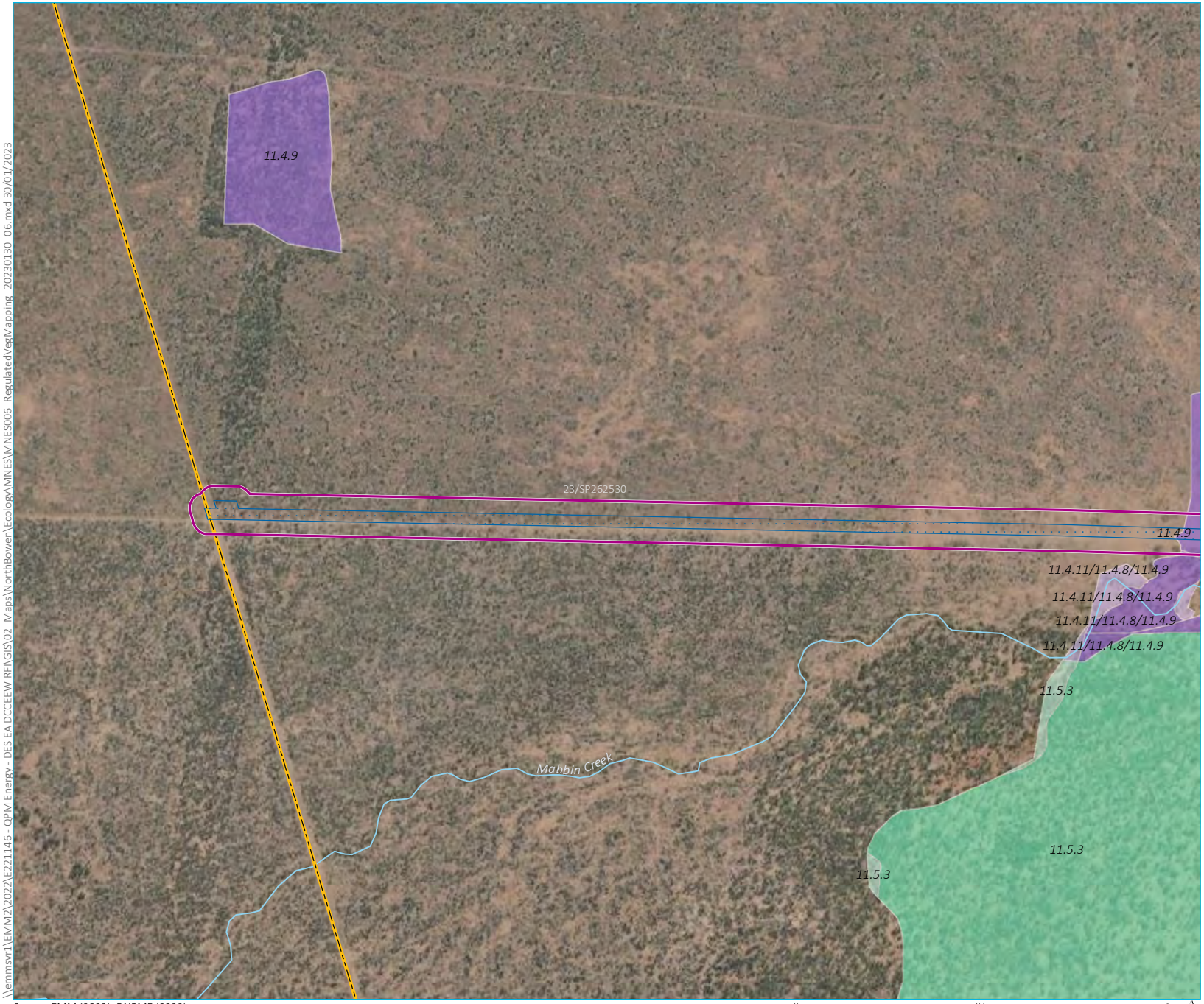
- Heterogenous polygons of 11.5.3 – *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces and 11.5.15 – semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces.
- Heterogenous polygons of 11.8.11 – *Dichanthium sericeum* grassland on Cainozoic igneous rocks and 11.8.5 *Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks.
- 11.8.13 – semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.

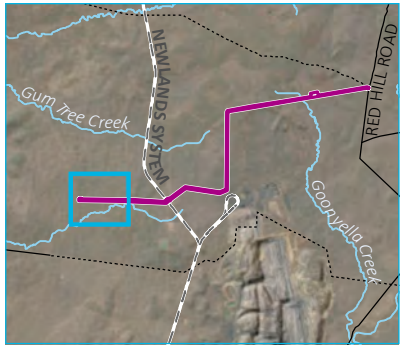
RE 11.5.3 may provide suitable habitat for Koala, Squatter Pigeon, Greater Glider and Yakka Skink, whilst Quassia (*Samadera bidwillii*) may occur in RE 11.5.15. A review of the aerial imagery indicates that gilgai are present within areas mapped as non-remnant vegetation, which is suitable habitat for Ornamental Snake. Non-remnant grassland areas within this new alignment may also provide suitable habitat for Squatter Pigeon and King Bluegrass. The proposed access road, at the eastern end of the alignment near Red Hill Rd is mapped within the Protected Plants High Risk Trigger Map.

Table 6.2 Regional ecosystems mapped in the Project area

RE code	Description	Vegetation Management Act class	Biodiversity status
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	Endangered	Endangered
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered
11.4.11	*Dichanthium sericeum* and *Astrebla spp.* grassland with patchy *Acacia harpophylla* or *Eucalyptus coolabah* on Cainozoic clay plains	Of Concern	Of Concern
11.5.3	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	Least Concern	No concern at present
11.5.15	Semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces	Least Concern	Endangered
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	Least Concern	No concern at present
11.8.11	*Dichanthium sericeum* grassland on Cainozoic igneous rocks	Of Concern	Of Concern
11.8.13	Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks	Endangered	Endangered

Regional Ecosystems within the Project area based on certified mapping is illustrated in Figure 6.1.





KEY

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Regional ecosystems (VM status)

- Remnant - endangered
- High value regrowth - endangered
- Remnant - least concern
- High value regrowth - least concern

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Source: EMM (2023); DNRME (2022)

0 0.5 1 km

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Regional ecosystem mapping in project area
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM
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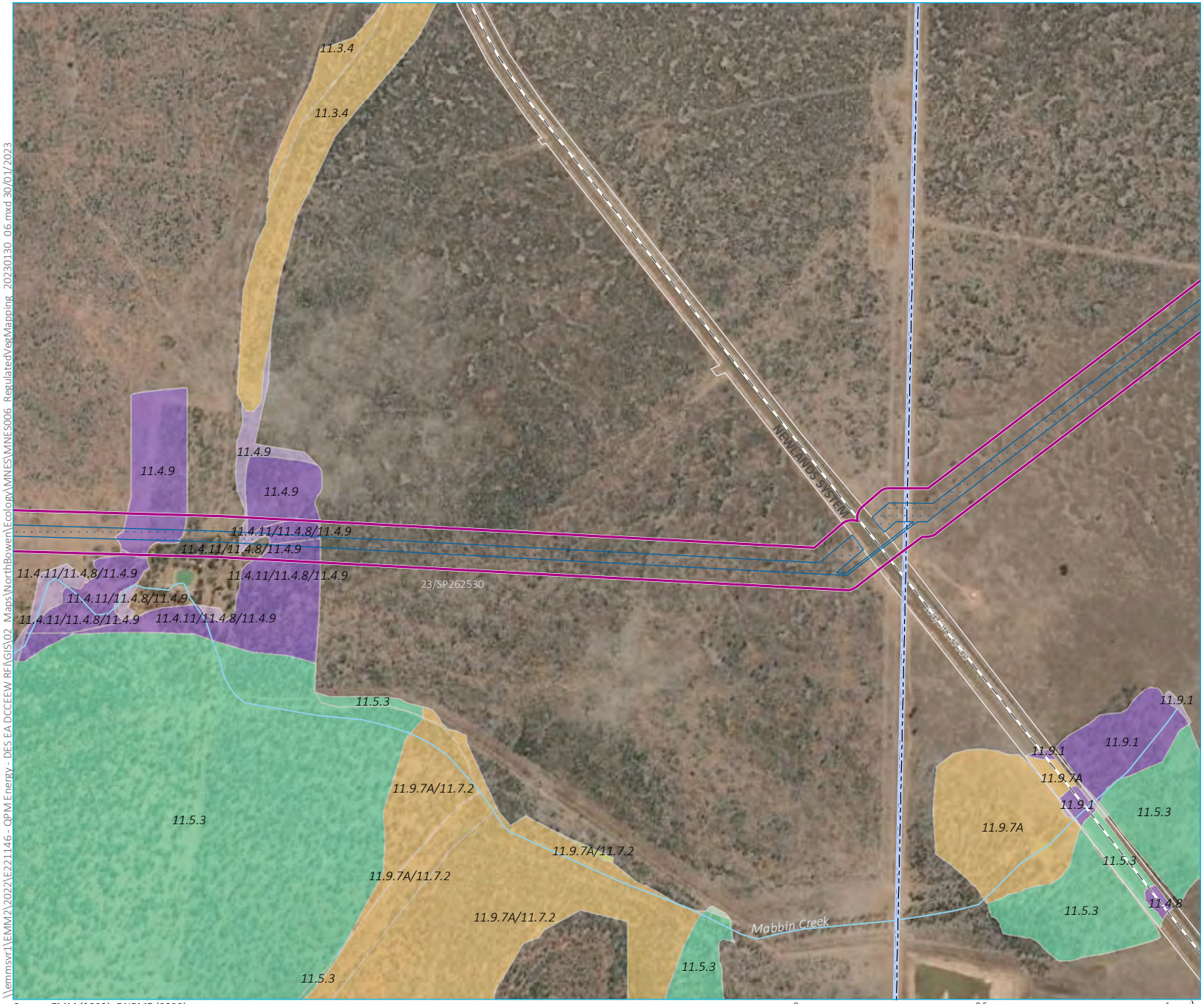

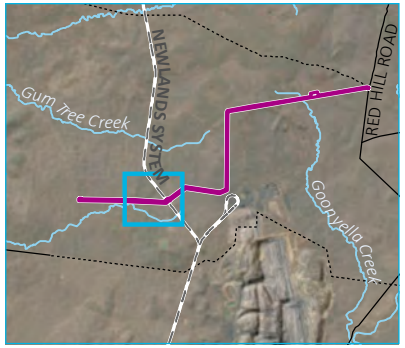

KEY

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Regional ecosystems (VM status)

- Remnant - endangered
- High value regrowth - endangered
- Remnant - of concern
- High value regrowth - of concern
- Remnant - least concern
- High value regrowth - least concern

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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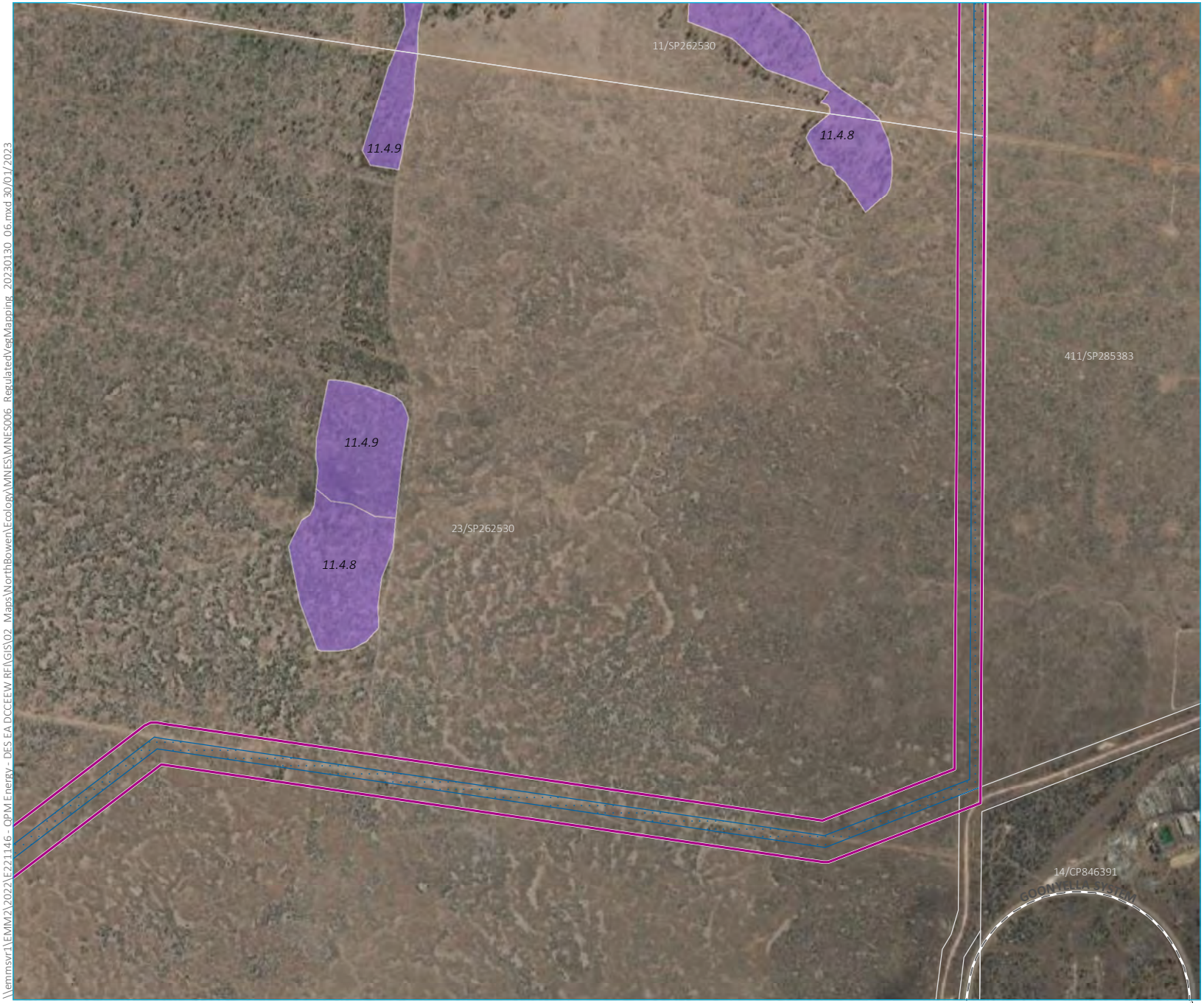
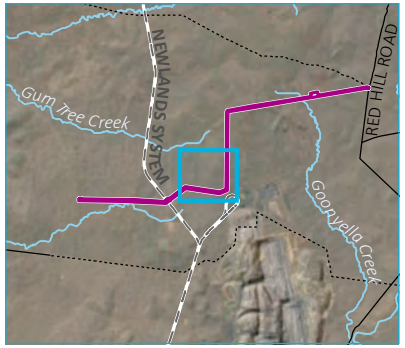
Regional ecosystem mapping in project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Regional ecosystems (VM status)

- Remnant - endangered

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Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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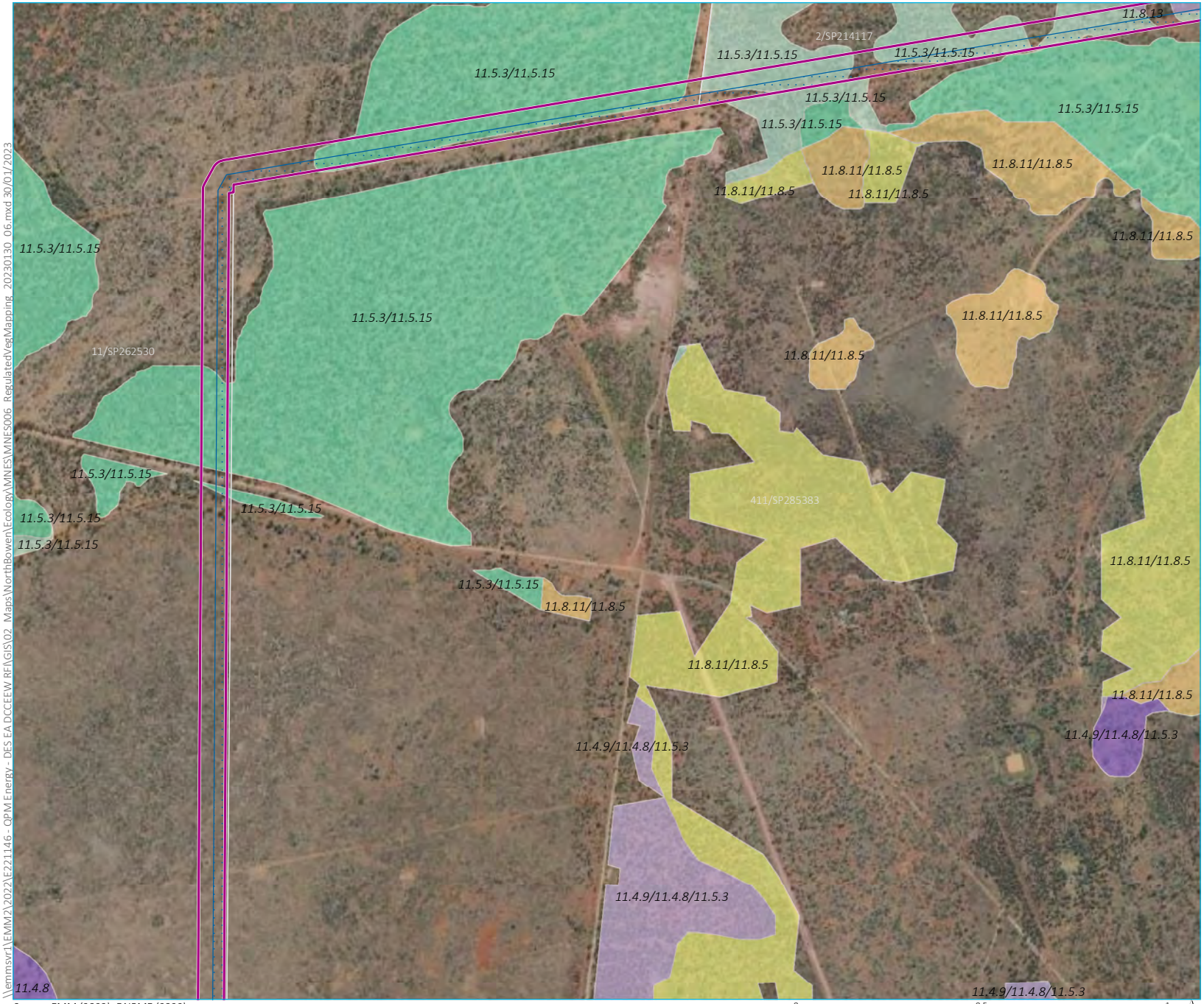
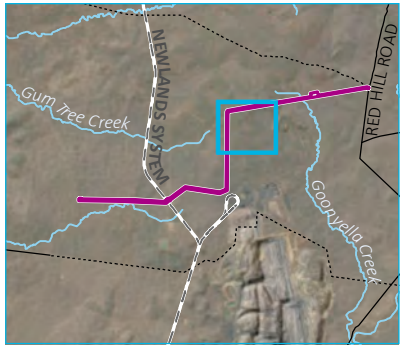
Regional ecosystem mapping
in project area
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Regional ecosystems (VM status)

- Remnant - endangered
- High value regrowth - endangered
- Remnant - of concern
- High value regrowth - of concern
- Remnant - least concern
- High value regrowth - least concern

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Source: EMM (2023); DNRME (2022)

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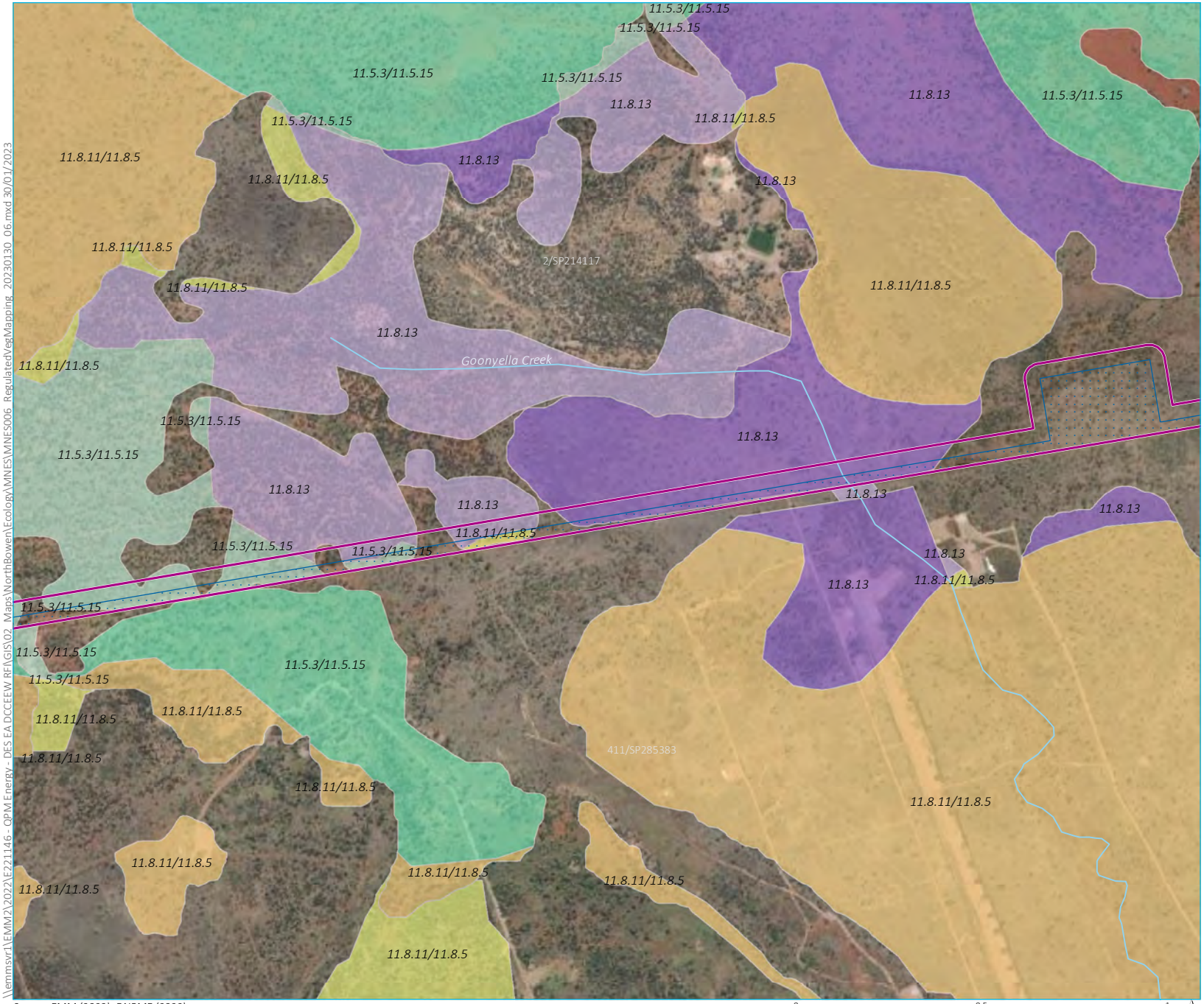
GDA 1994 MGA Zone 55

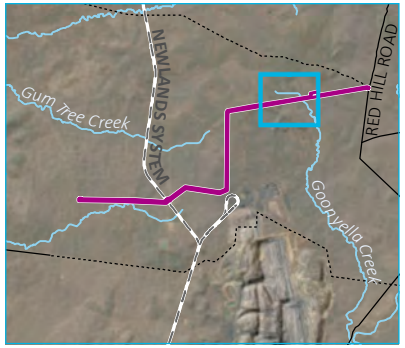
N

Regional ecosystem mapping
in project area
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Regional ecosystems (VM status)

- Remnant - endangered
- High value regrowth - endangered
- Remnant - of concern
- High value regrowth - of concern
- Remnant - least concern
- High value regrowth - least concern

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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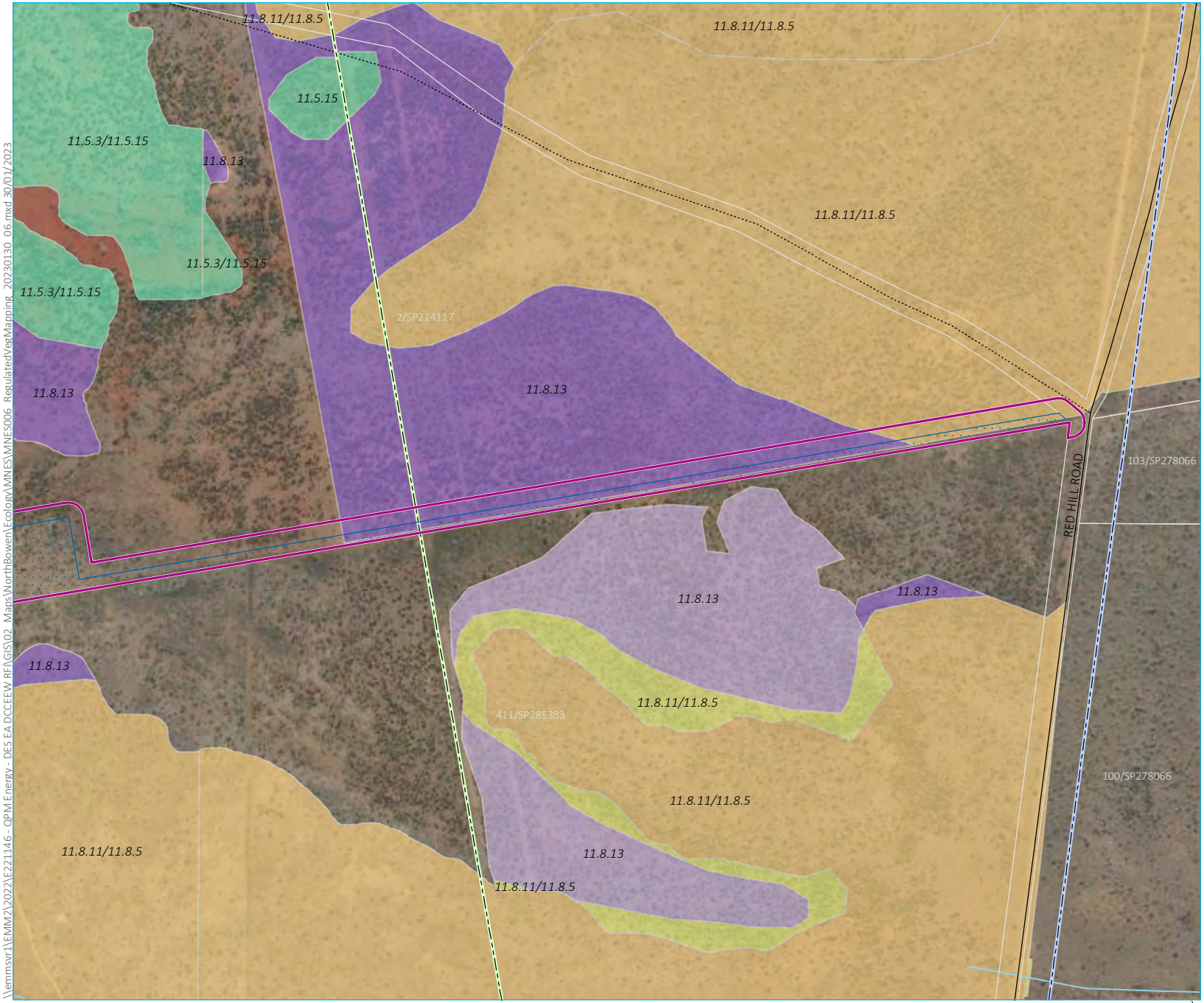
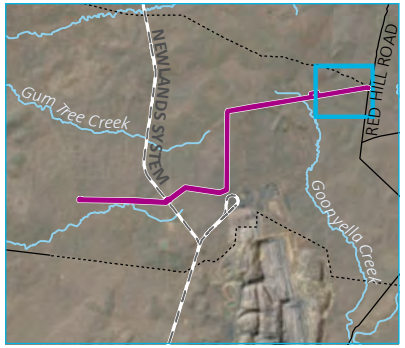
Regional ecosystem mapping in project area Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Regional ecosystems (VM status)

- Remnant - endangered
- High value regrowth - endangered
- Remnant - of concern
- High value regrowth - of concern
- Remnant - least concern

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Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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Regional ecosystem mapping in project area
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 6.1

EMM creating opportunities

6.7 Threatened Ecological Communities (TECs)

Four TECs were identified as potentially occurring with the study area based on results from the PMST desktop assessment (Appendix A) and review of the REs mapped in the Project area and adjacent properties. These TECs are:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow TEC)
- Natural Grasslands of the Queensland Central Highlands and Fitzroy River Basin (Grassland TEC)
- Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)
- semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT TEC).

Table 6.3 summarises the TECs with potential to occur in the Project area identified through PMST search and their analogous REs. The table shows in bold those analogous REs that are mapped in the certified mapping, within the Project area.

Table 6.3 TECs with potential to occur in Project area

TEC	EPBC Act status	Associated regional ecosystems
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	11.3.1, 11.4.3, 11.4.7, **11.4.8**, **11.4.9**, 11.4.10, 11.5.16, 11.9.2, 11.9.5, 11.9.6, 11.11.14, 11.12.21
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	11.3.21, 11.4.4, **11.4.11**, **11.8.11**, 11.9.9, 11.9.12, 11.11.17
Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions	Endangered	11.3.11, 11.4.1, **11.8.13**, 11.11.18, 11.2.3, 11.9.4
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	11.3.2, 11.3.17, 11.4.7, 11.4.12, 12.3.10

6.8 Threatened species

The following database searches were undertaken to identify listed flora species under EPBC Act and NC Act with potential to occur in the Project area:

- a search of the PMST (Appendix A) for listed flora species with potential to occur within 20 km of the Project area
- a search of Wildlife Online databases (Appendix A) for listed flora species that occur within 20 km of the Project area
- Essential Habitat mapping.

Results of the desktop assessment for threatened flora and fauna species under EPBC Act and NC Act are summarised in subsequent sections, based on the results of the PMST and a Queensland Wildlife Online search completed 5 May 2022. Desktop records of all threatened species in the study area are mapped in Figure 6.2. A refined likelihood of occurrence table to identify candidate threatened species for the Project area is located in Appendix C.

6.8.1 Threatened flora species

A total of six threatened flora species under the EPBC Act are considered to have potential to occur within the Project area based on desktop assessments (PMST search and database searches).

The seven EPBC Act threatened flora species identified with potential to occur are described in Table 6.4.

Table 6.4 Flora species with potential to occur

Scientific name	Common name	EPBC Act status[1]	NC Act status[2]	PMST search	Wildlife Online
Bertya opponens	-	V	LC	✓	✓
Denhamia megacarpa	-	E	E	✓	×
Dichanthium queenslandicum	King Bluegrass	E	V	✓	✓
Dichanthium setosum	Bluegrass	V	LC	✓	×
Eucalyptus raveretiana	Black Ironbox	V	LC	✓	×
Samadera bidwillii	Quassia	V	V	✓	×
Solanum graniticum	Granite Nightshade	E	LC	✓	×

1. EPBC Act status: CE- critically endangered, E – endangered, V – vulnerable, M – migratory, Ma – marine.
2. NC Act status: CE – critically endangered, E – endangered, V – vulnerable, NT – near threatened, LC – least concern.

Areas of Essential Habitat (mapped by DES) are mapped within the Project area, associated with records of King Bluegrass, are mapped on Lot 11 and Lot 2.

6.8.2 Threatened fauna species

A total of 21 threatened fauna species and eleven migratory species under the EPBC Act are considered to have potential to occur within the Project area based on desktop assessments (results of PMST and database searches).

The 21 EPBC Act threatened fauna species identified with potential to occur are described in Table 6.5.

Table 6.5 Threatened fauna species potentially occurring within Project area

Species	Common name	EPBC Act status[1]	NC Act status[2]	PMST search	Wildlife Online
Calidris ferruginea	Curlew Sandpiper	CE	CE	✓	×
Erythrotriorchis radiatus	Red Goshawk	V	V	✓	×
Falco hypoleucos	Grey Falcon	V	V	✓	×
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	✓	✓
Grantiella picta	Painted Honeyeater	V	V	✓	×
Hirundapus caudacutus	White-throated Needletail	V, Mi	V	×	×
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	E	✓	×
Poephila cincta cincta	Southern Black-throated Finch	E	E	✓	×
Rostratula australis	Australian Painted Snipe	E	E	✓	×
Tyto novahollandiae	Masked Owl (northern)	V	V	✓	×

Table 6.5 Threatened fauna species potentially occurring within Project area

Species	Common name	EPBC Act status[1]	NC Act status[2]	PMST search	Wildlife Online
Dasyurus hallucatus	Northern Quoll	E	LC	✓	×
Macroderma gigas	Ghost Bat	V	E	✓	×
Nyctophilus corbeni	Southeastern Long-eared Bat	V	V	✓	×
Petauroides volans	Greater Glider	E	E	✓	✓
Phascolarctos cinereus	Koala	E	E	✓	×
Denisonia maculata	Ornamental Snake	V	V	✓	✓
Egernia rugosa	Yakka Skink	V	V	✓	×
Elysea albagula	White-throated Snapping Turtle	CE	CE	✓	×
Furina dunmalli	Dunmall's Snake	V	V	✓	×
Lerista allanae	Retro Slider	E	E	✓	×
Rheodytes leukops	Fitzroy River Turtle	V	V	✓	×

1. *EPBC Act status: CE- critically endangered, E – endangered, V – vulnerable, M – migratory*
2. *NC Act status: CE – critically endangered, E – endangered, V – vulnerable, NT – near threatened, LC – least concern*

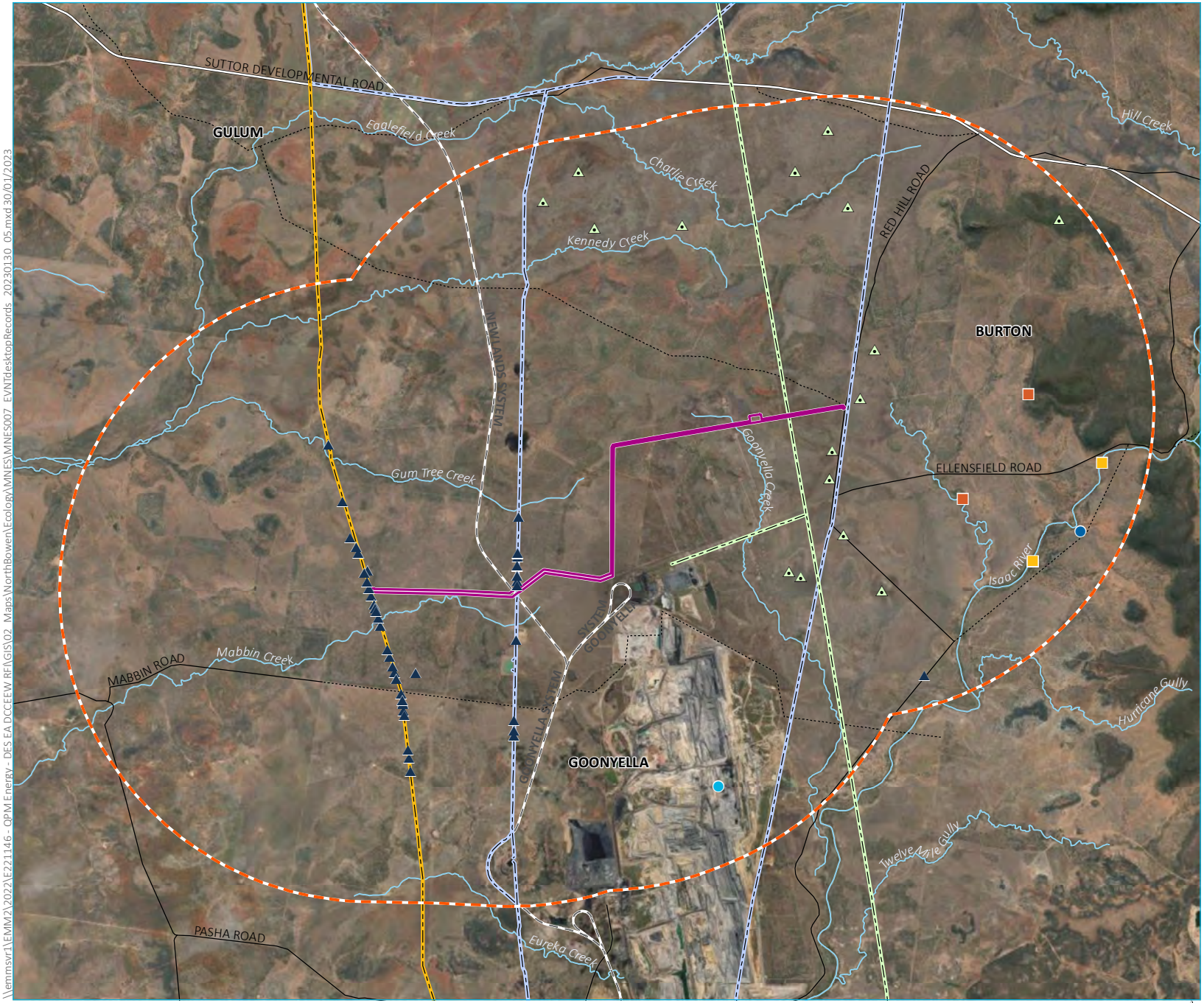
The eleven migratory species under the EBPC Act and SLC under the NC Act, identified with potential to occur are:

- White-throated Needletail (*Hirundapus* caudacutus) (Vulnerable and Migratory EPBC Act, Vulnerable NC Act)
- Fork-tailed Swift (*Apus pacificus*) (Migratory EPBC Act, SLC NC Act)
- Oriental Cuckoo (*Cuculus optatus*) (Migratory EPBC Act, SLC NC Act)
- Yellow Wagtail (*Motacilla flava*) (Migratory EPBC Act, SLC NC Act)
- Black-faced Monarch (*Monarcha melanopsis*) (Migratory EPBC Act, SLC NC Act)
- Common Sandpiper (*Actitis hypoleucos*) (Critically Endangered, Migratory EPBC Act, SLC NC Act)
- Sharp-tailed Sandpiper (*Calidris acuminata*) (Migratory EPBC Act, SLC NC Act)
- Curlew Sandpiper (*Calidris ferruginea*) (Migratory EPBC Act, SLC NC Act)
- Pectoral Sandpiper (*Calidris melanotis*) (Migratory EPBC Act, SLC NC Act)
- Latham's Snipe (*Gallinago hardwickii*) (Migratory EPBC Act, SLC NC Act)
- Osprey (*Pandion haliaetus*) (Migratory EPBC Act, SLC NC Act).

Several areas of essential habitat (mapped by DES) are mapped across the Project area, associated with record(s) of Ornamental Snake, as follows:

- Areas of Essential Habitat (mapped by DES), associated with records of Ornamental Snake are mapped on Lot 11 and Lot 2
- within mapped brigalow communities in the central portion of Lot 23.

Desktop assessments identified numerous records of Ornamental Snake (vulnerable under EPBC Act and NC Act) occurring along the alignments of both the Newland System rail line and water pipeline, including in locations where the proposed high-pressure and existing infrastructure interact. It is likely that Ornamental Snake is also present in the preferred alignment; it can be found in both remnant and non-remnant areas, and essential habitat for the species was mapped within the proposed alignment.



KEY

- Ecology study area
- Project area
- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse

Threatened species desktop records (wildnet)

- *Dichanthium queenslandicum*
- Ornamental Snake
- Black-faced Monarch
- Squatter Pigeon
- Greater Glider
- Short-beaked Echidna

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

0 2.5 5 km

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Threatened species desktop records within the study area

QPM Energy Project
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Figure 6.2

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6.9 Pest flora and fauna

Results of the desktop assessment (Wildlife Online) identified 15 pest flora species and 16 pest fauna species associated with the Project area. These are summarised below in Table 6.6.

Under the Biosecurity Act, a person who has control over a 'Restricted Matter' must not do the following:

- Category 3 – a person who has, or has a thing infested with, the 'Restricted Matter' in the person's possession or under the person's control must not distribute or dispose of the restricted matter unless the distribution or disposal is carried out via the methods set out in the Biosecurity Act.
- Category 4 – move the 'Restricted Matter', or cause or allow to be moved.
- Category 5 – keep in the person's possession or under the person' control.
- Category 6 – give food to the 'Restricted Matter.'

Table 6.6 Pest flora and fauna

Common name	Scientific name	Biosecurity Act category
Plants		
Gomphrena Weed	Gomphrena celosioides	
Red-head Cottonbush	*Asclepias curassavica*	
Blue Billygoat Weed	*Ageratum houstonianum*	
Bipinnate Beggar's Ticks	*Bidens bipinnata*	
	Emilia sonchifolia	
	Flaveria trinervia	
Parthenium*	*Parthenium hysterophorus*	3
	Symphyotrichum subulatum	
	Xanthium occidentale	
	Harrisia martinii	
Common Prickly Pear*	*Opuntia stricta*	3
Nutgrass	*Cyperus rotundus*	
Butterfly Pea	*Clitoria ternatea*	
Sunhemp	*Crotalaria juncea*	
	Macroptilium lathyroides var. semierectum	
	Prosopis pallida	
	Sida cordifolia	
	Sida rhombifolia	
	Sida spinosa	

Table 6.6 Pest flora and fauna

Common name	Scientific name	Biosecurity Act category
Scoparia	*Scoparia dulcis*	
	Bothriochloa pertusa	
	Cenchrus ciliaris	
Rhodes Grass	*Chloris gayana*	
Feathertop Rhodes Grass	*Chloris virgata*	
	Cynodon dactylon var. dactylon	
Sheda Grass	*Dichanthium annulatum*	
Angleton Grass	*Dichanthium aristatum*	
Summer Grass	*Digitaria ciliaris*	
Awnless Barnyard Grass	*Echinochloa colona*	
	Hyparrhenia rufa subsp. rufa	
	Megathyrsus maximus var. maximus	
	Megathyrsus maximus var. pubiglumis	
Red Natal Grass	*Melinis repens*	
	Moorochloa eruciformis	
Paspalum	*Paspalum dilatatum*	
Johnson Grass	*Sorghum halepense*	
Grader Grass	*Themeda quadrivalvis*	
Sabi Grass	*Urochloa mosambicensis*	
	Physalis pubescens	
Jamaica Snakeweed	*Stachytarpheta jamaicensis*	
Mammals		
Domestic Dog	*Canis lupis familiaris*	3, 4, 6
Cat	*Felis catus*	3, 4, 6
House Mouse	*Mus musculus*	
Rabbit	*Oryctolagus cuniculus*	3, 4, 5, 6
Pig	*Sus scrofa*	3, 4, 6
Amphibians		
Cane Toad	*Rhinella marina*	
Reptiles		
House Gecko	*Hemidactylus frenatus*	

1. * = Weed of National Significance (WoNS)

6.10 Watercourses and wetlands

Goonyella Creek a stream order 1 mapped watercourse intersects the Project area on Lot 2. The western portion of the alignment runs between Mabbin Creek to the south and Gum Tree Creek to the north, these being small ephemeral watercourses. These watercourses reside on a relatively flat alluvial plain which likely undergoes minor seasonal inundation.

No mapped National or State significant wetlands occur in the Project area.

6.11 Groundwater dependent ecosystems

According to reviews of the Bureau of Meteorology Groundwater Dependent Ecosystems Atlas (BOM 2020) and WetlandMaps 2.0 (DES 2019a), there is a low confidence potential terrestrial groundwater dependent ecosystem (GDEs) mapped within the Project area. This is associated with a patch of RE 11.3.4 in the west of the Project area on Lot 23. This area is mapped as a surface ecosystem dependent on the sub-surface presence of groundwater.

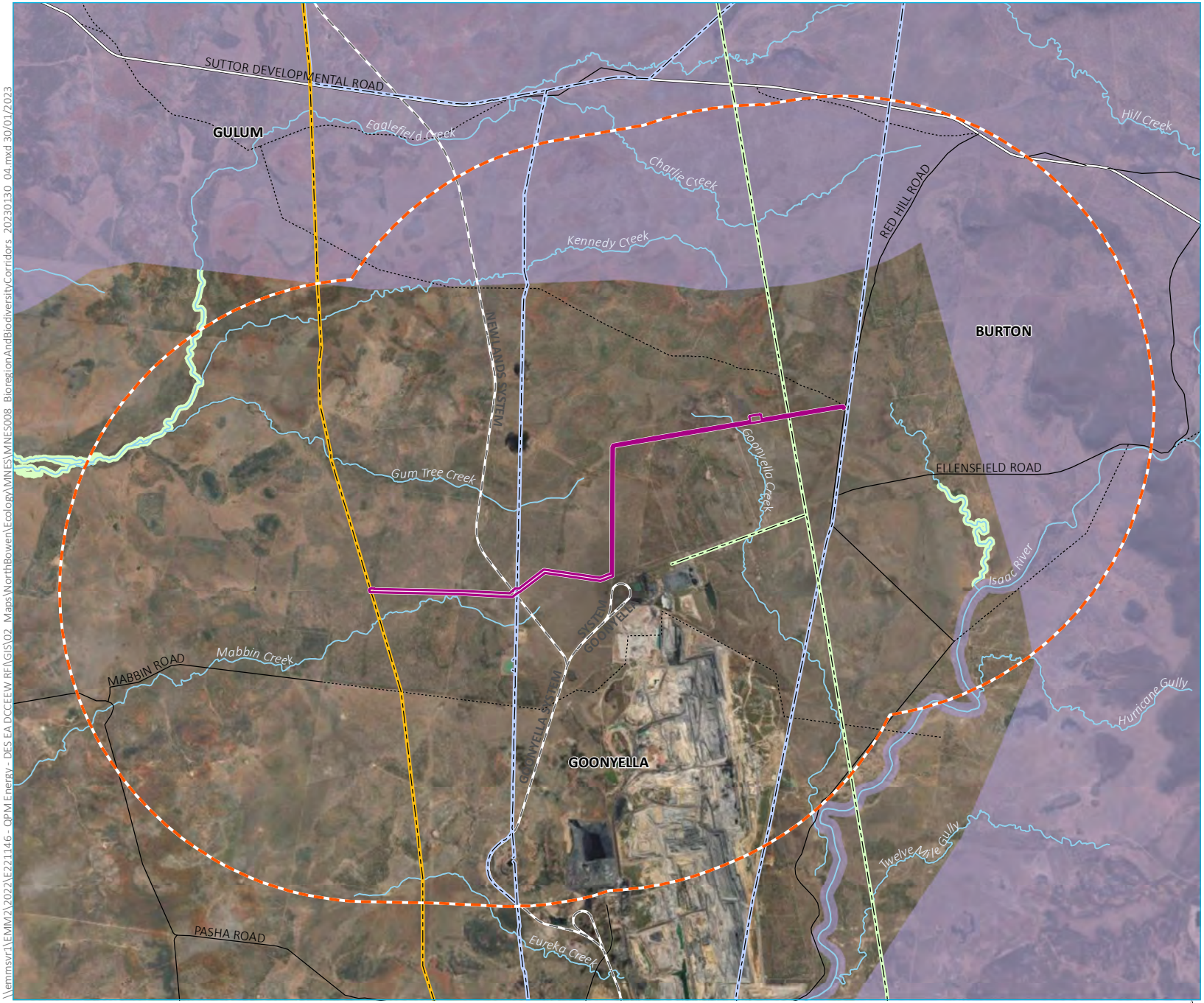
Additionally, small areas of high confidence potential terrestrial GDEs are mapped within the Project area on Lot 11 and Lot 2. These are associated with patches of RE 11.5.3/11.5.15 in the north of the Project area on Lot 11 and Lot 2. This area is mapped as a surface ecosystem dependent on the sub-surface presence of groundwater.

GDEs are an ecological value of significance which are considered under EPBC Act for large coal and coal seam gas projects. The Project will not have an impact on groundwater and is not expected to impact on GDEs. Management measures for water quality are discussed in Section 9.6.

6.12 Connectivity and biodiversity significance

A State significant biodiversity corridor is mapped approximately 4 km north of the Project area on Lot 11. This corridor is shown on Figure 6.3.

Proposed impacts to the extent and connectivity of remnant vegetation in the area were analysed using the DES 'landscape fragmentation and connectivity' tool based on the proposed vegetation clearing footprint at the time of State impact assessment.



KEY

- Ecology study area
- Project area
- Electrical transmission line
- North Queensland Gas Pipeline
- Water pipeline
- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse

Biodiversity corridors

- State
- Regional

Source: EMM (2023); DNRME (2022); DES (2022); GA (2011)

0 2.5 5 km

GDA 1994 MGA Zone 55

N

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Bioregion and biodiversity corridors

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MNES Preliminary Documentation
Figure 6.3

EMM creating opportunities

7 Field survey results

7.1 Site condition and summary

Generally, the site is heavily disturbed by current and historical land uses including livestock grazing and mining. A review of the aerial imagery (see Appendix D) indicates that the majority of areas exhibiting current impacts from vegetation clearing were initially disturbed prior to 1987. Vegetation across the proposed high-pressure pipeline route on Lot 23 is predominantly non-remnant. Pre-clear vegetation consisted primarily of brigalow woodland, which has been broadscale cleared, raked and seeded with the exotic pasture species, Buffel Grass. Minor areas of remnant and high-value regrowth remain within the central portions of the high-pressure pipeline route on Lot 23, although are in a degraded condition due to incursion of weed grass species in the ground layer. Despite disturbance, the high-pressure pipeline alignment on Lot 23 contains an abundance of gilgai habitat which transforms rapidly to freshwater wetlands after rain. These short-lived wetlands provide suitable habitat for a range of cryptic species that are difficult to detect when conditions are dry (e.g. burrowing frogs and ornamental snake).

The high-pressure pipeline route on Lot 411, now excluded from the project, is also heavily disturbed and predominantly non-remnant within the Project area, with areas of remnant vegetation adjacent to the existing road towards the eastern end of the Project area. Land south of the high-pressure pipeline route on Lot 411 has been largely developed for the North Goonyella/Riverside Mine, while areas to the north of the high-pressure pipeline route on Lot 411 contain less disturbed, remnant woodland.

The vegetation through the north-south alignment of the high-pressure pipeline route on Lot 23 is predominantly non-remnant, however contains extensive gilgai which is suitable habitat for ornamental snake. Many of these gilgai still held water in June 2022 but were in degraded condition through trampling by cattle. The northern end of the high-pressure pipeline alignment on Lot 11 is located within remnant woodland dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), which in some areas contains Semi-evergreen Vine Thicket (SEVT) species in the understorey. Buffel Grass is generally sparse within this woodland area. Historical vegetation clearing has occurred on Lot 2, which contains the east-west alignment of the high-pressure pipeline route, the proposed compressor facility and the proposed access road linking to Red Hill Road. The high-pressure pipeline alignment contains areas of non-remnant vegetation, as well as remnant areas of Narrow-leaved Ironbark woodland, *Acacia harpophylla* (Brigalow)/*Eucalyptus cambageana* (Blackbutt) woodland and grassy open *Eucalyptus orgadophila* (Mountain Coolibah) woodland. The proposed compressor facility is located within entirely non-remnant vegetation with Buffel Grass dominant in the ground layer. The eastern end of the alignment is heavily infested with *Parthenium hysterophorus* (Parthenium weed) on heavy dark brown cracking clay soil.

7.2 Flora

7.2.1 Vegetation communities

A total of 43 quaternary assessments were completed in the field across the Project area in December 2021, as illustrated in Figure E.1. Of these assessments, 17 were undertaken in mapped remnant vegetation, 9 in mapped high value regrowth (HVR) and the remaining 17 in non-remnant areas. The quaternary sites were completed in all polygons of mapped remnant and HVR vegetation, as well as routinely through the non-remnant areas, to confirm accuracy of the mapping in the field. These sites were all located in areas of the old alignment on Lot 411.

A total of 17 quaternary assessments were completed in the field across the Project area in March 2022, as illustrated in Figure 5.1 and Figure E.1. Of these assessments, three were undertaken in mapped remnant vegetation, one in mapped high value regrowth (HVR) and the remaining 13 in non-remnant areas. 14 of these sites were completed within the current alignment on Lot 23, and an additional three were completed on Lot 411, which is now removed from the Project area.

A total of 52 quaternary assessments were completed in the field across the Project area in June 2022, as illustrated in Figure 5.1. The high-pressure pipeline alignment on Lot 23 had been revised to relocate the rail crossing, with the new alignment passing through previously unsurveyed remnant vegetation. Seven quaternary sites were completed in this area, to confirm the extent and condition of the mapped vegetation. Two sites were also completed at the revised rail crossing location, which is correctly mapped as non-remnant. The remaining quaternary sites were completed in the north-south alignment on Lot 11 and east-west alignment on Lot 2.

The majority of the Project area on Lot 23 is characterised by Brigalow regrowth with Buffel Grass understorey, with the exception of one region of remnant Brigalow. On Lot 11, vegetation is correctly mapped as predominantly non-remnant, with one area of remnant RE 11.5.3. Significant RE mapping errors are present on Lot 2. The majority of vegetation is mapped as remnant or High Value Regrowth SEVT REs 11.5.15 or 11.8.13, which are not present. The actual vegetation present is predominantly Brigalow regrowth which has retained remnant status, but is heavily degraded with Buffel Grass in the understorey, and dense areas of Parthenium weed at the eastern end. Most of the RE codes are correct for mapped remnant polygons on Lot 411 (now excluded from the Project), however their extents were frequently inaccurate. Some areas of non-remnant vegetation were incorrectly mapped as remnant or high value regrowth (HVR). All extant vegetation extents were mapped correctly in the field using polyline streaming. A description of the field-validated REs within the proposed high-pressure pipeline and buffer areas, and compressor site Project area is provided in the following sections.

i Old pipeline alignment on Lot 411 (ground-truthed)

There is one heterogeneous polygon of mapped remnant 'Endangered' RE 11.4.9/11.4.8/11.5.3 which is intersected by the old high-pressure pipeline alignment (see 'polygon 2' in Figure E.1). The field survey confirmed that the vegetation within this patch contains areas consistent with all three REs, as well as non-remnant vegetation, as shown in Figure E.1. A representative photograph of the vegetation on the southern side of the road, within RE 11.4.8, is provided in Photograph 7.1.

A combination of quaternary and BioCondition assessments, and review of historical aerial imagery was completed within this patch to accurately determine whether the extant vegetation meets the requisite criteria to be defined as remnant. The patch of vegetation south of the road is consistent in composition with RE 11.4.8, described as *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains. Partly within the high-pressure pipeline extent, at the western end of the patch, mature *E. cambageana* of 18 m average height is present, with a shrub layer of currant bush (*Carissa ovata*) and peach bush (*Ehretia membranifolia*). Through the central and eastern portions of the patch, *A. harpophylla* is also present, as a shrub layer of approximately 3–6 m in height. The canopy within the polygon is sparse as many of the large trees have been removed, with cover around 15%. Buffel Grass is present within the ground layer and weed cover comprises around 30% cover in that stratum. Soils within the patch are characterised by red-brown cracking clay.

Historical aerial imagery demonstrates that the area has been subjected to previous disturbance, although the precise boundary of the clearing extent is uncertain but includes the southern portion of the patch, through which the old high-pressure pipeline alignment and buffer areas traverse. The main Goonyella North Rd was in place by 2000, along with a channelised diversion of Goonyella Creek, and associated levee wall to the north of the road. An unsealed access road that bisects the patch was constructed sometime between 2004 and 2007. Historical aerial photographs of the Project area are provided in Appendix D. There is a fence and cleared maintenance access tracks on both sides of the unsealed road.

North of the road within the buffer area of the proposed high-pressure pipeline, mature brigalow is present within remnant RE 11.4.9, and grades into RE 11.5.3 to the west.

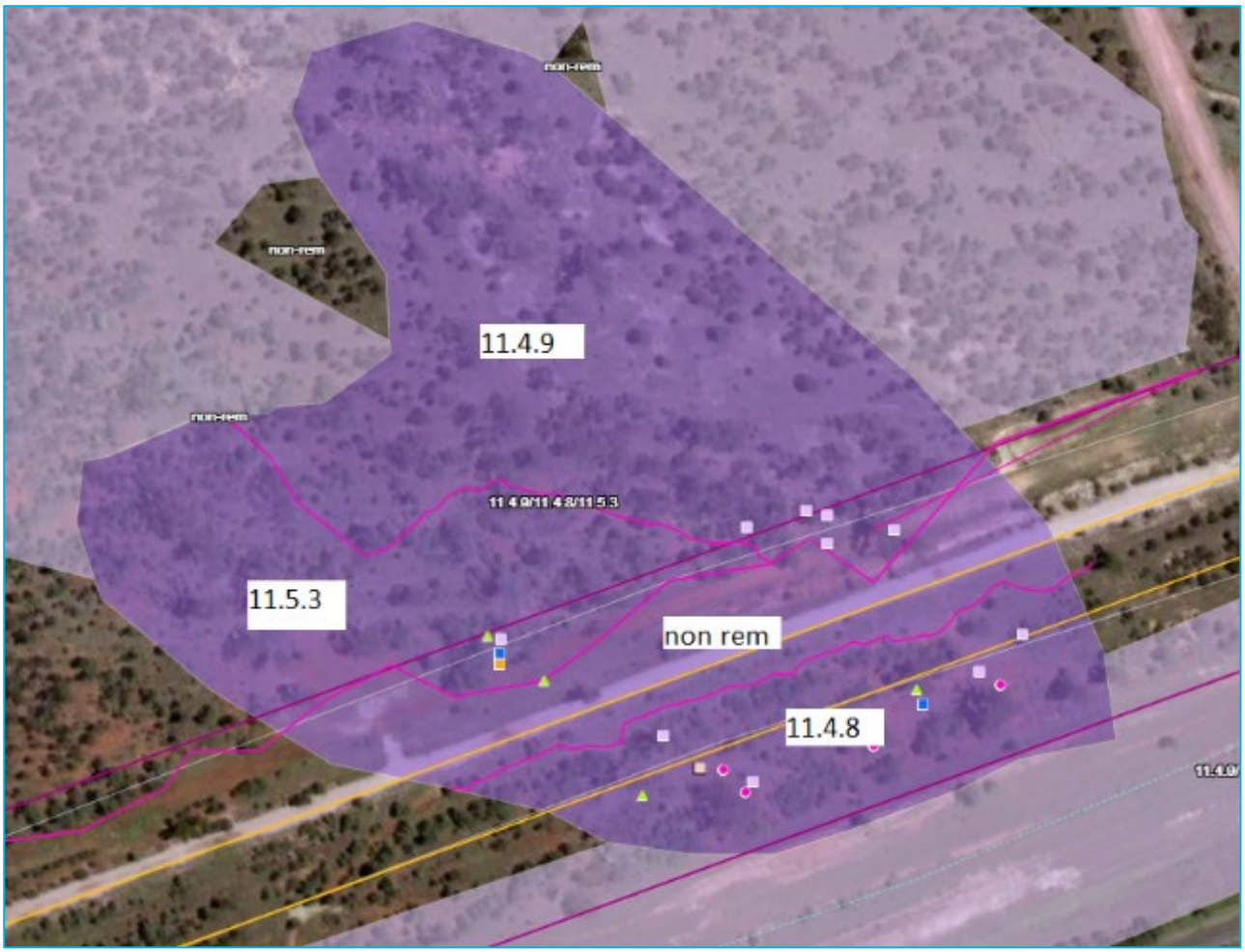


Figure 7.1 **Lot 411 (old alignment) – Ground-truthed distribution of REs within heterogeneous 'polygon 2'**

Photograph 7.1 **Lot 411 (old alignment) – *Eucalyptus cambageana* woodland with brigalow understorey on Lot 411**

The old high-pressure pipeline alignment traverses two other polygons of mapped regulated vegetation. These are located at the southern tip of a patch of HVR 'Endangered-dominant (E-dom)', RE 11.4.9/11.4.8/11.5.3 towards the eastern end of the alignment (see 'polygon 5' in Figure E.1) and a patch of HVR 'Of Concern-dominant (OC-dom)' RE 11.8.11/11.8.5 mapped over Goonyella Creek, at the eastern end of the Project area. Both of these polygons are incorrectly mapped, within the Project area. The boundary of the E-dom patch was correctly mapped in the field and occurs within the northern part of the high-pressure pipeline buffer. This patch is shown in Photograph 7.2 and Photograph 7.3.

Photograph 7.2 **Lot 411 (old alignment) – looking north in to mapped HVR E-dom RE 11.4.9/11.4.8/11.5.3**

Photograph 7.3 **Lot 411 (old alignment) – looking east along southern boundary of mapped HVR E-dom RE 11.4.9/11.4.8/11.5.3**

The OC-dom patch traverses a box culvert within Goonyella Creek and is characterised by mostly exotic vegetation, including Sabi Grass (*Urochloa mosambicensis*), Parthenium (*Parthenium hysterophorus*) and Buffel Grass, with scattered native knotweed (*Persicaria attenuata*) and Black Wattle (*Acacia leiocalyx*) (see Photograph 7.4).

Photograph 7.4 Lot 411 (old alignment) – mapped HVR OC-dom RE 11.8.11/11.8.5 at Goonyella Creek

One area within the old high-pressure pipeline alignment contained grassland comprised of a variety of grasses, including *Aristida, Eragrostis, Chloris, Bothriochloa* and/or *Dichanthium* species. A number of these were sampled and lodged with the Queensland Herbarium, and were confirmed to be *Dichanthium sericeum subsp. humilis* (Queensland Bluegrass), *Aristida latifolia* (Feathertop Wiregrass), *Dichanthium aristatum* (Angleton Grass) and *Eriochloa procera* (Slender Cupgrass). Two of these (Queensland Bluegrass and Feathertop Wiregrass) are indicator species for the Grassland TEC.

Further detailed post-wet season surveys were undertaken in March 2022, to determine whether this patch meets the condition thresholds for the Grassland TEC. Two patches of natural grassland remained, with dominant species including *D. sericeum, A. latifolia, Panicum decompositum* (Native Millet), *Aristida calycina* (Dark Wiregrass) and *Cynodon Dactylon* (Couch Grass), three of which are indicator species for the TEC. In between these patches, Buffel Grass dominated, along with other weeds such as *Chloris gayana* (Rhodes Grass) and *Macroptilium lathyroides* (Phasey Bean). The extent of the native grassland patches were measured in the field via GPS polygon streaming. Patch 1 (western most) measured 1,031 m^2 (~0.1 ha) and patch 2 was 894.4 m^2 (~0.08 ha). Both patches are too small to meet the minimum patch size to qualify as either remnant REs 11.8.11/11.8.5 or the Grassland TEC (1 ha).

Photograph 7.5 Lot 411 (old alignment) – grassland area too small in extent to qualify as Grassland TEC

The remaining areas were primarily represented by degraded, non-remnant areas varying from low open Brigalow regrowth woodland with a weedy ground layer dominated by Buffel Grass, to areas of exotic Buffel Grass grassland.

a Buffer areas

There is one heterogeneous polygon of mapped remnant 'Endangered' RE 11.4.9/11.4.8 which is intersected by the northern buffer area (see 'polygon 1' in Figure E.1). The field survey confirmed that the vegetation within this patch contains areas consistent in composition with RE 11.4.9 and 11.4.8. Brigalow-dominated RE 11.4.9 is present towards the southern boundary (refer Photograph 7.6), and Blackbutt-dominated RE 11.4.8 occurs further towards the centre of the patch (refer Photograph 7.7). However, the boundary of the polygon is incorrectly mapped, being approximately 20 m north of the mapping. The boundary was correctly mapped in the field, using polyline mapping, as shown in Figure E.1. The mapping error is also evident in Photograph 7.6, which was taken from within the mapped remnant polygon, but clearly shows the cleared area, presumably for the fence construction and maintenance.

Photograph 7.6 Lot 411 (old alignment) – Brigalow-dominated woodland (RE 11.4.9) at the southern edge of polygon 1

Photograph 7.7 Lot 411 (old alignment) – Blackbutt-dominated woodland (RE 11.4.8) within the central part of polygon 1

A patch of HVR of E-dom RE 11.4.9/11.4.8/11.5.3 (refer 'polygon 3' on Figure E.1) is mapped to the east of polygon 2. The boundary of this patch was also incorrect and mapped accurately via polyline streaming. The southern boundary of the patch is defined by a comprehensively cleared track and fence line, as shown in Photograph 7.8. The vegetation to the south of this track is severely fragmented regrowth brigalow, interrupted by the unsealed access road and the channelised redirection of Goonyella Creek.

Photograph 7.8 **Lot 411 (old alignment) – cleared track which defines the southern boundary of polygon 3**

The channelised redirection of Goonyella Creek is buffered by 50 m and mapped as HVR of Endangered RE 11.4.9/11.4.8 at the western end, and E-dom 11.4.9/11.4.8/11.5.3 at the eastern end (see 'polygon 4' in Figure E.1). Part of this mapped HVR, varying in width from 20 to 40 m, intersects the southern buffer area. The channel itself is almost entirely choked with Buffel Grass, and the mapped HVR within the buffer area contains Brigalow with an average height of 3–6 m and approximately 25% cover, and almost entirely Buffel Grass in the ground layer, as shown in Photograph 7.9. Aerial imagery indicates that this vegetation has not been cleared since before 2004 (i.e. more than 15 years ago), so the HVR mapping is correct where Brigalow regrowth is present.

Photograph 7.9 Lot 411 (old alignment) - Brigalow regrowth within polygon 4

In the northern buffer area, there is a patch of mapped 'Least Concern' RE 11.5.3, described as *Eucalyptus populnea* +/- *E.melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces (refer 'polygon 6' in Figure E.1). The boundary of this vegetation community was difficult to discern, as the ecosystem is a sparsely vegetated, naturally open woodland. Field verification confirmed that, close to the southern boundary of the mapped polygon, the dominant canopy species is Mountain Coolibah (*Eucalyptus orgadophila*), with an average height of 15 m and canopy cover of 5% (refer Photograph 7.10). A sparse shrub layer containing *Acacia salicina* (Sally Wattle) and *Santalum lanceolatum* (Sandalwood) overlies a dense ground cover of Buffel Grass. The soil is dark brown cracking clay. This vegetation more closely aligns with RE 11.4.13, described as *E.orgadophila* open woodland on Cainozoic clay plains, which has a VM Act status of 'Least Concern'. The boundary of the remnant vegetation was accurately mapped in the field, utilising polyline streaming, and followed the extent of mature *E. orgadophila* trees, as shown in Figure E.1 and Figure 7.2.

Photograph 7.10 *Eucalyptus orgadophila* open woodland located within northern buffer area

To the east of polygon 6, a heterogeneous patch of 'Of Concern' RE 11.8.11/11.8.5 is mapped within the northern buffer area (see Figure E.1). This site is heavily disturbed, with no tree canopy and 5% cover of Sally Wattle, Sandalwood and Yellow wood (*Terminalia oblongata*). The ground cover is dominated by Buffel Grass, Native sensitive weed (*Neptunia gracilis*), and bluegrass (*Bothriochloa* spp.), as shown in Photograph 7.11.

This site was re-surveyed during the post-wet season survey and confirmed to contain majority non-native grasses and forbs. Given the abundance of non-native cover, it is considered unlikely to represent either the mapped grassland REs or the Natural Grassland TEC.

A further patch of heterogeneous 'Of Concern' RE 11.8.11/11.8.5 is mapped within the northern buffer area, to the east of this patch (see Figure E.1). This site is heavily disturbed (see Photograph 7.12), with <1% low shrub cover and approximately 70% ground cover that had been heavily grazed by cattle to less than 10 cm (evidenced by pugging and abundant grass in adjacent fenced area). The ground cover is dominated by *Bothriochloa* spp. Native Sensitive Weed, Parthenium and Buffel Grass.

This site was re-surveyed during the post-wet season survey and confirmed to contain mostly weeds. Given the prominence of non-native cover, it is considered unlikely to represent either the mapped grassland REs or the Natural Grassland TEC.

Photograph 7.11 Lot 411 (old alignment) – non-remnant area within northern buffer, incorrectly mapped as grassland RE 11.8.11/11.8.5

Photograph 7.12 Lot 411 (old alignment) – heavily grazed grassland within northern buffer area, mapped as RE 11.8.11/11.8.5

b Compressor facility (old alignment)

The entirety of the proposed compressor facility area is mapped as non-remnant vegetation, which was confirmed to be correct during the field investigation. There site is characterised by brigalow regrowth around 3–6 m in height and ranges from 5% cover in the heavily disturbed southwestern section (Photograph 7.13), to approximately 35% cover in the less disturbed northern portion (Photograph 7.14). There is a dam in the south eastern corner that was dry at the time of the December 2021 survey (Photograph 7.15).

This area was re-assessed post-wet season, to determine whether it holds any values for wetland-dependent species. The southwest corner has scattered tracks and small mounds of earth throughout. There is some infrastructure in this area (well heads etc).

Whilst the northern portion contains Brigalow regrowth, it provides very limited Ornamental Snake habitat with no gilgai seen, minor soil cracks, and is densely infested with Buffel Grass in the understorey.

Photograph 7.13 Lot 411 (old alignment) – proposed compressor facility site, southwest section

Photograph 7.14 Lot 411 (old alignment) – Brigalow regrowth within the northern portion of the proposed compressor facility site

Photograph 7.15 Lot 411 (old alignment) – dam (dry) in the southeast portion of the proposed compressor facility site

There are several patches of mapped regulated vegetation within the buffer area of the proposed compressor facility Project area, however, this mapping is incorrect, as all of the above polygons were confirmed in the field to contain non-remnant vegetation, contiguous with the vegetation within the proposed compressor facility Project area. This vegetation within the compressor survey buffer area is characterised by Brigalow regrowth 3–6 m in height, with other associated shrub species including *Geijera parviflora, Lysiphyllum carroni, Terminalia oblongata and Acacia salicina.* The shrub layer is sparse, ranging in cover from 5% to 20% across the buffer areas. Dense Buffel Grass, Parthenium and Native Sensitive Weed dominate the ground stratum, with cover ranging from 75% to 100%.

ii Current pipeline alignment on Lot 23 (ground truthed)

The high-pressure pipeline alignment of Lot 23 passes through entirely non-remnant vegetation, with the exception of a small area in the eastern half containing mapped HVR of Endangered RE 11.4.9 *Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains.* Review of the aerial imagery indicates that the majority of the alignment was disturbed through vegetation clearing between 1987 and 2000, and clearing has continued since (see Appendix D). Mapped vegetation on Lot 23 was ground-truthed in March 2022 and June 2022. Quaternary site assessments were completed at 10 locations within non-remnant vegetation across the proposed high-pressure pipeline route, to confirm the accuracy of the certified mapping. Survey locations are shown in Figure 5.1. Extant vegetation comprised disturbed grassland dominated by Buffel Grass, *Eragrostis* species (Wiregrass) and *Sida cordifolia* (Flannel Weed), as shown in Photograph 7.16. Gilgai occurred frequently, within which the dominant grass species was frequently *Leptochloa ligulata (syn Dinebra ligulata)* (Spangletop) (Photograph 7.17). Soils were uniformly brown heavy cracking clay.

Photograph 7.16 Disturbed grassland dominated by Buffel Grass within the pipeline alignment, Lot 23

Photograph 7.17 Inundated gilgai containing *Leptochloa ligulata* on Lot 23

Areas of brigalow regrowth occurred within mapped non-remnant vegetation, at sporadic locations along the alignment. These had been retained for shade, as reported by the landholder, and were characterised by low clumps of Brigalow 1–4 m in height, sometimes within gilgai, as shown in Photograph 7.18.

Photograph 7.18 Brigalow regrowth within gilgai habitat (also a fauna survey site)

The mapped polygon of HVR Endangered RE 11.4.9 that intersects the high-pressure pipeline alignment was surveyed in March 2022. This area is characterised by Brigalow regrowth 5–6 m in height with 30–40% cover as shown in Photograph 7.19. The technical description for RE 11.4.9, based on 10 reference sites indicates an average height of the canopy at 8.9 m and 21.5% cover. This does not qualify as remnant vegetation (70% height and 50% cover of the pre-clear vegetation), however is correctly mapped as High Value Regrowth. To the north of this patch, within the high-pressure pipeline buffer is mapped OC RE 11.3.4, described as *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains. This mapping is incorrect; the HVR Brigalow continues to the north beyond the high-pressure pipeline buffer for at least 100 m. A map of the ground-truthed Regional Ecosystems within the Project Area is provided in Figure 7.2, however the ground-truthed RE layer is clipped to the current Project area, so this vegetation is not shown.

Photograph 7.19 Brigalow 5–6 m in height within mapped HVR RE 11.4.9

Photograph 7.20 Brigalow vegetation within pipeline buffer on Lot 23, incorrectly mapped as OC RE 11.3.5 (Eucalypt woodland)

Subsequent to the completion of ground-truthing in March 2022, the high-pressure pipeline alignment on Lot 23 was relocated, due to constraints with the rail crossing location. The original and revised alignments are shown in Figure 3.1. The new alignment passes through one polygon of mapped remnant RE 11.4.9, one heterogeneous polygon of remnant RE 11.4.11/11.4.8/11.4.9 and one small section of mapped HVR RE 11.4.9, as shown in the Regional Ecosystem mapping in Figure 6.1. Non-remnant mapping surrounds a dam in this same area. The extent of the mapping is incorrect. Within the Project area, the vegetation is predominantly remnant 'Endangered' RE 11.4.9, described as *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains. Here, Brigalow is 7–12 m in height with canopy cover of approximately 35%, as shown in Photograph 7.21. Some areas of mixed RE 11.4.9/11.4.8 occur in the easternmost mapped remnant polygon (see Photograph 7.22). These Brigalow-dominated communities would not qualify as the Brigalow TEC, however, as the understorey is heavily degraded by Buffel Grass (refer Section 7.2.3).

Photograph 7.21 Remnant Brigalow woodland on Lot 23, revised pipeline alignment

Photograph 7.22 Remnant Blackbutt woodland on Lot 23, revised pipeline alignment

iii Current pipeline alignment on Lot 11 and Lot 2 and new compressor facility location (groundtruthed)

The majority of vegetation within the new alignment on Lot 11 is mapped as non-remnant, with an area of 'Least Concern' Regional Ecosystem (RE) 11.5.3/11.5.15. The short description for these vegetation communities are as follows:

- 11.5.3 – *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces.
- 11.5.15 – semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces.

The non-remnant vegetation mapping in the north-south alignment is correct. This area has been previously cleared with recent follow-up clearing of the shrub layer evident. The ground layer contains dense Buffel Grass varying in dominance of between 30% and 50%. The native bluegrass, *Dichanthium sericeum* dominates in some areas, particularly to the north of the fence which forms the Lot 11/Lot 23 property boundary. Low shrubs of approximately 1 m in height are scattered throughout the grassland, and comprised of species typical of Brigalow woodland, including *Terminalia oblongata* (Yellow Wood), *Ehretia membranifolia* (Peach Leaf), *Alectryon diversifolius* (Scrub Boonaree) and *Carissa ovata* (Currant Bush). Soils are dark brown heavy cracking clay soils, and gilgai are common. Some gilgai still contained water during the June 2022 field visit, however were heavily degraded through trampling by cattle (see Photograph 7.23).

Photograph 7.23 Gilgai on Lot 11 (north-south alignment) degraded by cattle

The section mapped as remnant 'Of concern' RE 11.5.3/11.5.15 is characterised by *E. crebra/Corymbia clarksoniana* (Clarkson's Bloodwood) woodland approximately 14 m in height and 20–30% canopy cover, on red sand with minor clay content. An understorey of SEVT species is prominent in some areas, consisting of species such as *Bursaria incana (*Prickly Pine*), Brachychiton rupestris (*Narrow-leaved Bottle Tree*), Brachychiton* australis (Broad-leaved Bottle Tree) and *Denhamia oleaster* (Stiff Denhamia). However, the secondary tree and shrub layers frequently included species more commonly associated with RE 11.5.3 such as *Erythroxylum australe* (Cocaine Bush), *Ventilago viminalis* (Vine Tree), *Eremophila mitchellii* (False Sandalwood) and *Cassia brewsteri* (Bean Tree). RE 11.5.3 is the correct mapping for this area, and a representative photograph is provided in Photograph 7.24.

Photograph 7.24 *Eucalyptus crebra* woodland with SEVT understorey species on Lot 11

Areas mapped as HVR RE 11.5.3/11.5.15 are similar to the Narrow-leaved Ironbark woodland with SEVT understorey recorded on Lot 11, however is regrowth vegetation that has been previously cleared. Average height of the canopy is 11–12 m with 20–30% cover, on red sandy soil. This is consistent with remnant vegetation of RE 11.5.3, which is described as *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces. *Eucalyptus populnea* is not present, however *E. crebra* is noted in the RE description as being locally dominant in some areas.

Further east, regrowth Brigalow woodland (7–8 m tall) interspersed with Blackbutt-dominated woodland is present on red-brown sandy clay soils, as shown in Photograph 7.25. This is consistent with Endangered REs 11.4.9/11.4.8, however is mapped as High Value Regrowth of Endangered RE 11.8.13, which is described as semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks. Exotic grasses are very sparse in the ground layer, comprising ~5% of cover. As such, this patch would qualify as the Brigalow TEC (refer Section 7.2.3).

Photograph 7.25 Remnant Brigalow/Blackbutt woodland on Lot 2

A section of HVR 11.4.9/11.4.8 (Brigalow 5–6 m tall with emergent, interspersed taller Blackbutt to 16 m) is present east of this patch, as shown in Photograph 7.26. This patch is incorrectly mapped as a heterogeneous polygon of 'Of Concern' RE 11.8.11/11.8.5, which are grassland-dominant REs, and are not present. To the east of the Brigalow community is open grassy woodland dominated by *Eucalyptus orgadophila* (Mountain Coolibah), with scattered *Corymbia clarksoniana* on dark brown cracking clay soil, consistent with 'Least Concern' RE 11.8.5. The canopy is very sparse (~10% cover) which is typical of the community, with an almost absent shrub layer (~1% cover) containing *Alectryon diversifolius* and *Santalum lanceolatum* (Sandalwood). Buffel Grass and Parthenium dominate the ground layer, particularly at the edges of the community along the road. A representative photograph of this patch is shown in Photograph 7.27.

Photograph 7.26 HVR Brigalow with interspersed taller Blackbutt on Lot 2

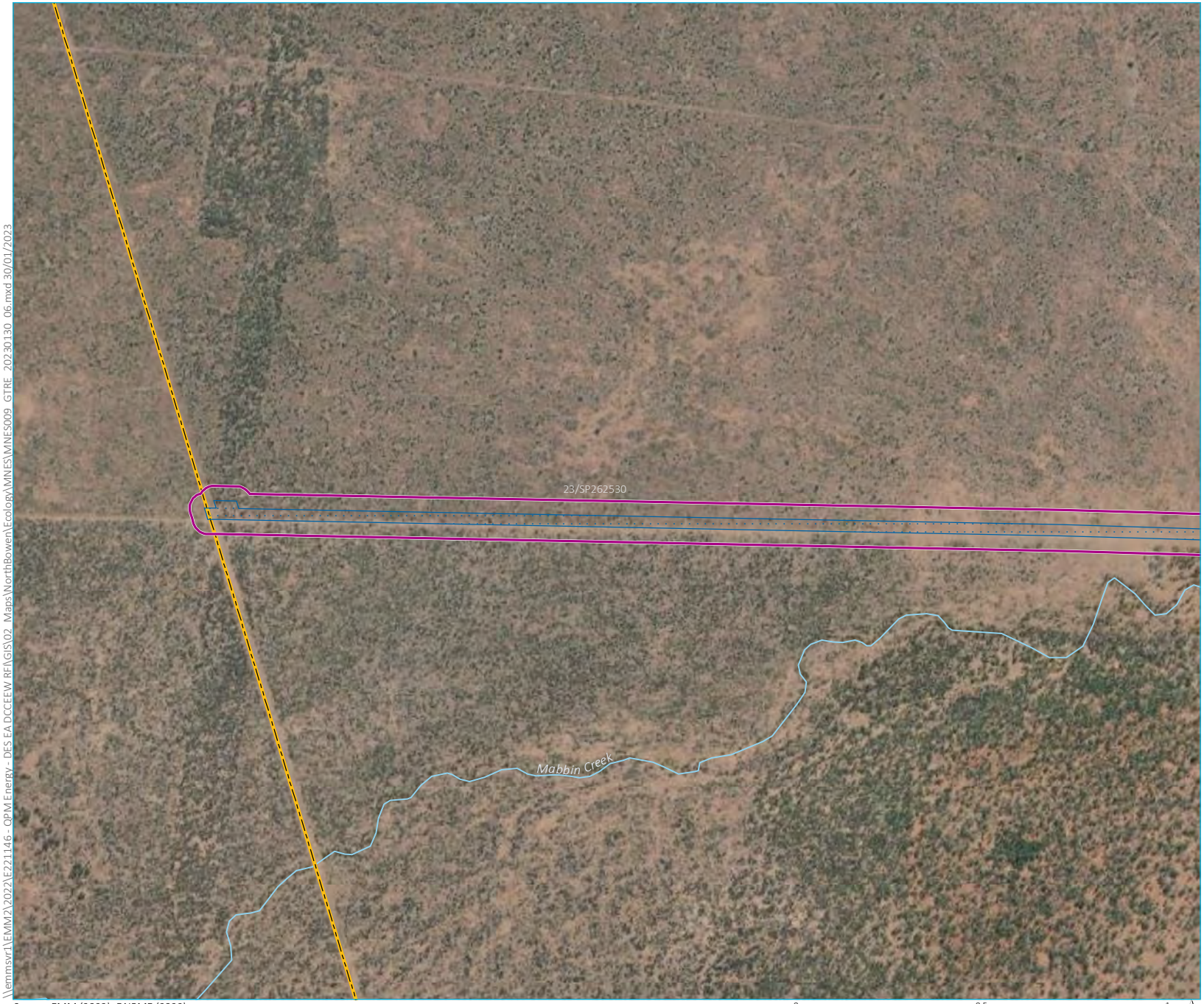
Photograph 7.27 *Eucalyptus orgadophila* grassy open woodland incorrectly mapped as SEVT on Lot 2

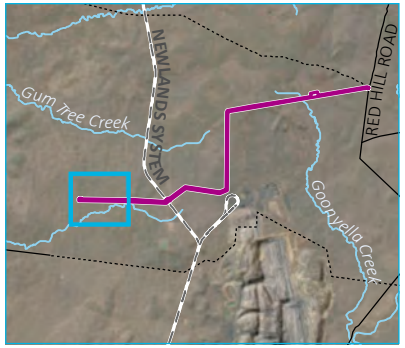
The proposed compressor facility location on Lot 2 is located within entirely non-remnant vegetation. Brigalow regrowth approximately 4 m in height and 5% cover is interspersed with lower shrubs 1–3 m high and 10% cover, such as *Santalum lanceolatum, Alectryon diversifolius* and *Atalaya hemiglauca.* The ground layer is heavily grazed and Buffel Grass dominates, with non-native species comprising approximately 95% of the ground cover. A representative image of the compressor location is provided in Photograph 7.28.

Photograph 7.28 Proposed compressor facility location

East of the compressor facility is a small patch of HVR Brigalow 11.4.9 approximately 4–6 m high and 15% canopy cover, with scattered low shrubs comprising 10% cover. The ground layer contains 70% Buffel Grass and is heavily grazed. From this patch through to the eastern extent of the Project area, the vegetation is consistent with Brigalow RE 11.4.9, which has been previously disturbed but regained remnant status, according to the extant height and cover characteristics. The vegetation is comprised of *Acacia harpophylla* 8–12 m in height and 25% cover, with a secondary tree layer and/or tall shrub layer of species such as *Atalaya hemiglauca* and *Lysiphyllum carroni* (Queensland Ebony). A lower shrub layer, frequently dominated by *Carissa ovata* and *Alectryon diversifolius* provided approximately 15% cover. The understorey of these Brigalow patches was heavily invaded by Buffel Grass and Parthenium, with 60–90% exotic cover in most areas. As such, they would not qualify as the Brigalow TEC. A representative photograph of the Brigalow vegetation community at the eastern end of the Project area on Lot 2 is provided in Appendix D.

Photograph 7.29 **Remnant Brigalow community at eastern end of Lot 2**





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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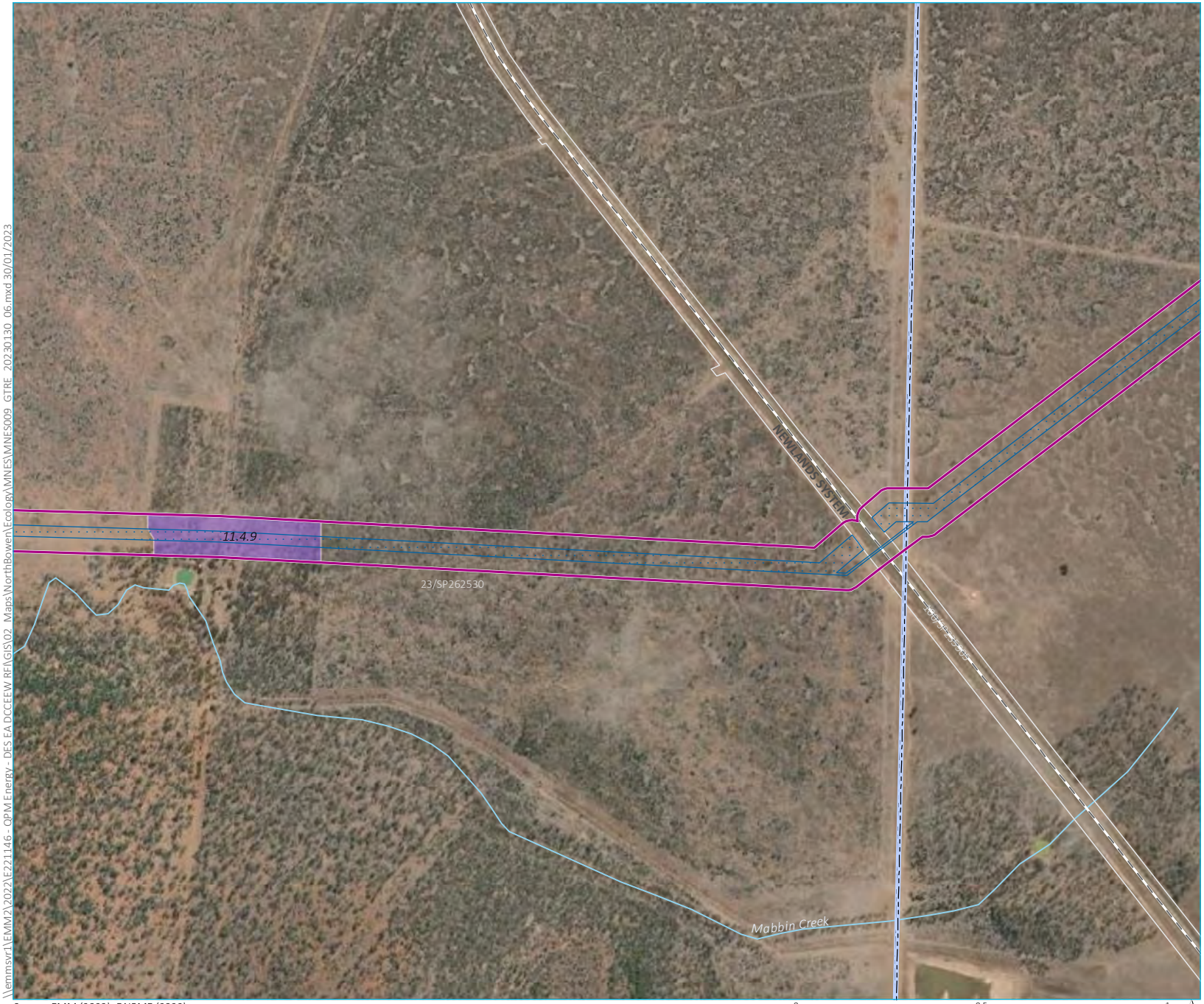
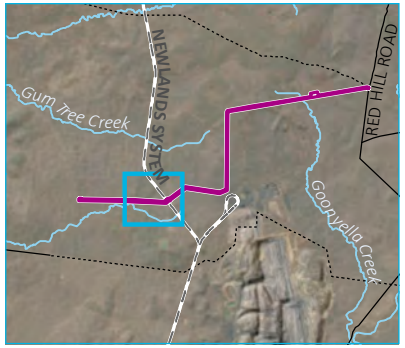
Ground-truthed regional ecosystems
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered

Ground-truthed regional ecosystems
Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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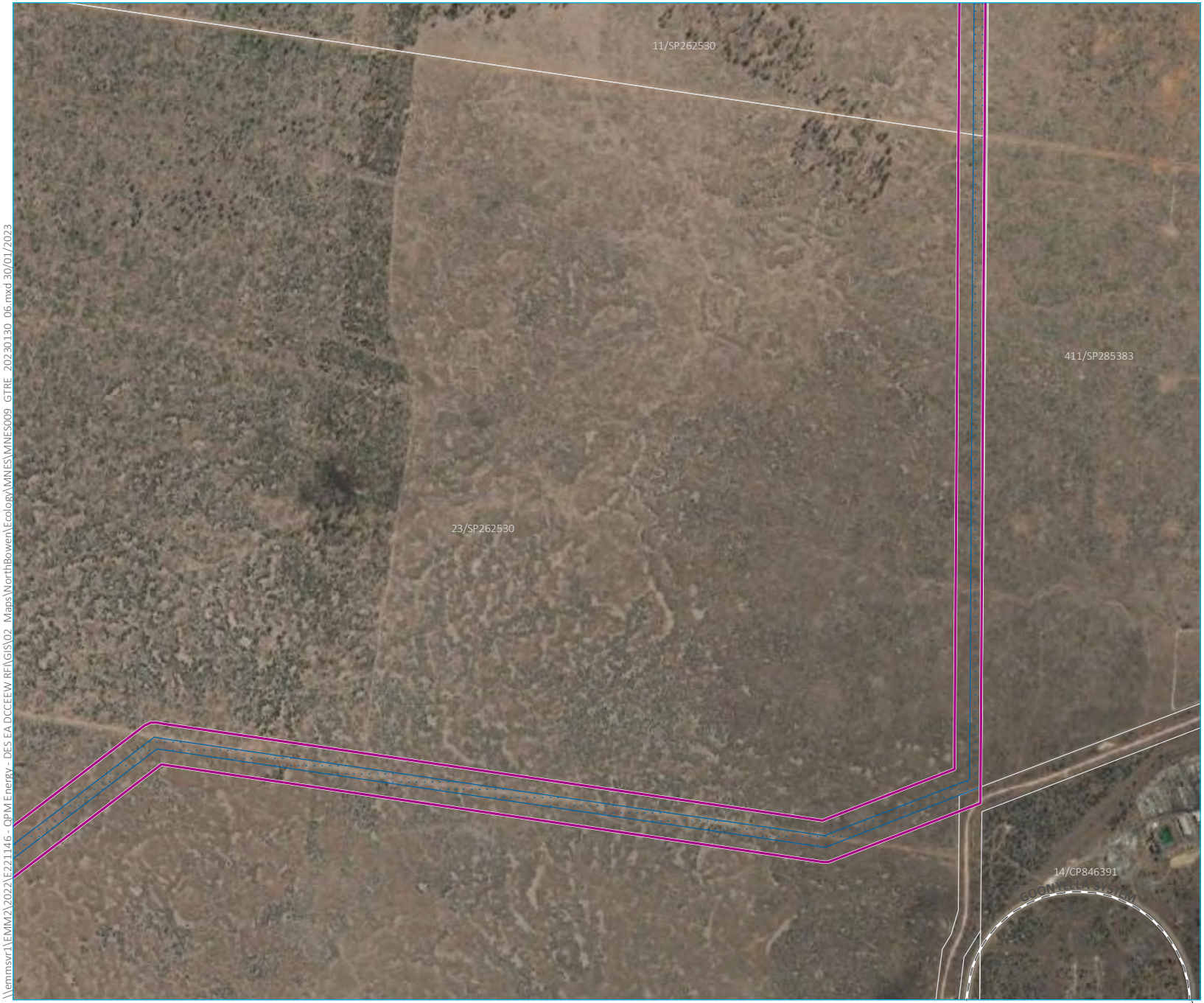

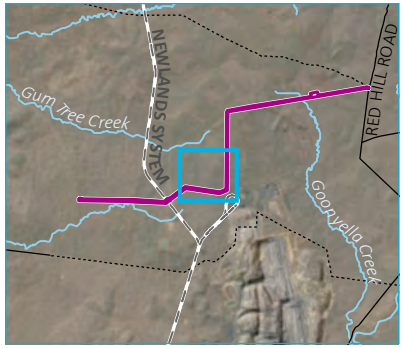

KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Ground-truthed regional ecosystems
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

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Source: EMM (2023); DNRME (2022)

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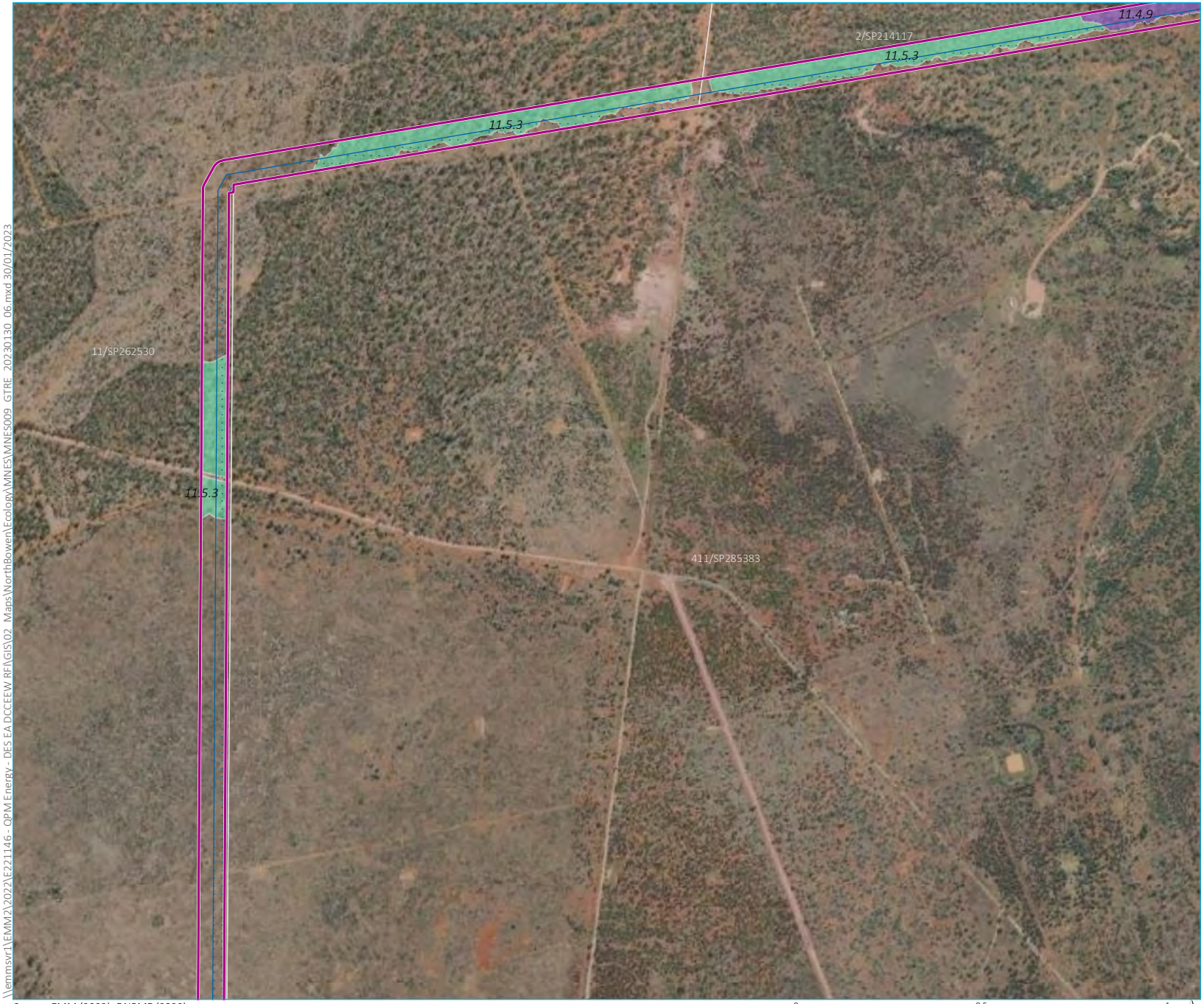
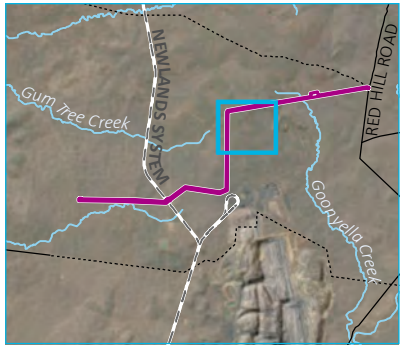
GDA 1994 MGA Zone 55

N

creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- Remnant - least concern

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Source: EMM (2023); DNRME (2022)

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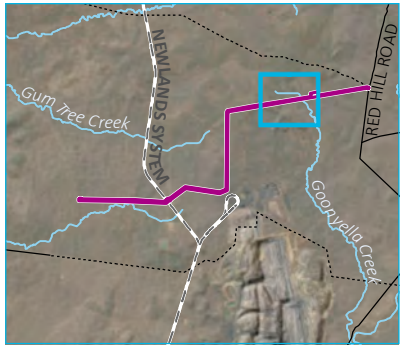
GDA 1994 MGA Zone 55

N

Ground-truthed regional ecosystems
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- High value regrowth - endangered
- Remnant - least concern

Ground-truthed regional ecosystems
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

EMM creating opportunities

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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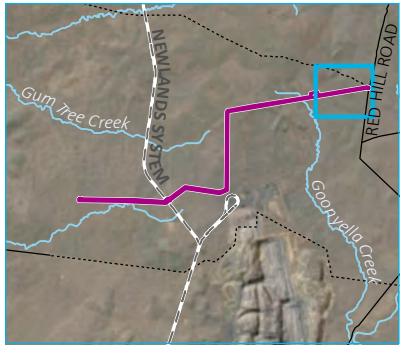

KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Ground-truthed regional ecosystems

- Remnant - endangered
- High value regrowth - endangered

Source: EMM (2023); DNRME (2022)

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Ground-truthed regional ecosystems
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.2

EMM
creating opportunities

7.2.2 Threatened flora species

Threatened flora species were searched for across the Project area. No threatened species were recorded during these surveys. *Eucalyptus raveretiana* (Black Ironbox), which is a tree, occurs in riparian (river) habitats, which is not present in the Project area, and this species was confirmed to be absent. Likewise, *Samadera bidwillii* (Quassia), a shrub, grows in dry rainforest and vine thicket. This habitat is also absent, and Quassia was not present in the Project area.

Three species of threatened grass, *Dichanthium queenslandicum* (King Bluegrass), *Dichanthium setosum* (bluegrass) and *Digitaria porrecta* (Finger Panic Grass) were identified in database searches or the PMST as potentially occurring within the Project area. The December 2021 surveys of Lot 411 confirmed that the majority of the grassed extents within Lot 411 are dominated by introduced grasses and forbs. Several grasses were sampled and lodged with the Queensland Herbarium from a patch of grassland immediately west of Goonyella Creek. These samples were confirmed as not belonging to these threatened species.

Targeted searches for these grasses were completed during the post-wet season March 2022 survey on Lot 411 and Lot 23. On Lot 411, meanders were completed through the natural grassland patches described in Section 7.2.1, as well as the mapped grassland RE (11.8.11/11.8.5) in close proximity. No threatened species were located, and the majority of grassland patches were in degraded condition, with Buffel Grass in abundance. Significant rain had fallen prior to the March 2022 survey, and grasses were in flower at the time of survey, including species of *Dichanthium* and *Digitaria* genera.

During the June/July 2022 survey, on Lot 23, Lot 11 and Lot 2, meanders for the target threatened grasses were completed whilst undertaking quaternary assessments, as well as in transit through the high-pressure pipeline alignment between sites. On Lot 11 and Lot 2, the high-pressure pipeline alignment was searched thoroughly on foot by two ecologists for the threatened grasses wherever suitable habitat was present (i.e. heavy clay soils and/or stony red-brown loam). Due to preceding rains, the majority of grasses were flowering at the time, including *Dichanthium* and *Digitaria* species, so there was a high level of confidence in the detectability of these species. A total of 43 quaternary sites were completed within suitable habitat on Dabin Station and Denham Park, and no threatened grasses were recorded. Flora survey effort is shown in Figure 5.1. Grazing, clearing and weed invasion are known threats to all three species (DAWE, 2022i; DAWE, 2022t; DoE, 2008a; DoE, 2013c), and all are significant ecological drivers within the Project area. As such, it is considered unlikely that any occur within the Project area.

7.2.3 Threatened ecological communities

Field surveys confirmed that the Poplar Box and SEVT TECs are not present on Lot 23 or Lot 411.

REs that are analogous with the Brigalow, SEVT and Grassland TECs are mapped within the Project area on Lot 23 (Brigalow TEC only), Lot 11 and Lot 2, and are discussed in more detail in the following sections.

i Brigalow TEC

The Approved Conservation Advice for the Brigalow (*Acacia harpophylla*) dominant and co-dominant ecological community (DAWE 2013b) identifies key diagnostic characteristics of the Brigalow TEC. These include:

- *Acacia harpophylla* is present as dominant or co-dominant in the tree layer
- occurs in one of 16 listed REs
- the vegetation is brigalow regrowth with species composition and structural elements broadly typical of one of the identified Qld REs (assumed to be the case if not comprehensively cleared in the last 15 years).

Condition thresholds also apply for the Brigalow TEC. These are:

- the patch is 0.5 ha or more in size
- exotic perennial plants comprise less than 50% of the total vegetation cover of the patch, as assessed over a representative minimum sample area of 0.5 ha.

Seven mapped polygons of remnant or regrowth REs that are included in the Brigalow TEC description (RE 11.4.8 and 11.4.9), are mapped within the Project area. Five of these occur on Lot 411, as described in Section 7.2.1, which are now excluded from the Project area. One patch of HVR RE 11.4.9 occurs on the original high-pressure pipeline on Lot 23, which has also now been superseded. One patch of remnant RE 11.4.8/11.4.9 occurs on Lot 23, within the current high-pressure pipeline alignment. On Lot 2, several patches of Brigalow community are present that are not mapped correctly in the RE mapping.

An assessment of all extant patches against the Brigalow TEC criteria is provided in Table 7.1.

Regrowth vegetation qualifies as the Brigalow TEC, provided it meets the condition thresholds listed above. One of the five patches on Lot 411 qualify as the Brigalow TEC, as the cover of Buffel Grass is less than 50%; within the extent of the Project (buffer only, not the high-pressure pipeline), the other four patches are too degraded through Buffel Grass invasion to meet the TEC definition. However, this area has now been superseded by the revised high-pressure pipeline alignment and will not be impacted.

The Brigalow patch on Lot 23 in the superseded alignment meets the definition of the Brigalow TEC, as Brigalow is dominant in the canopy, the vegetation is consistent with regrowth of an analogous RE (11.4.9), the patch is approximately 2.36 ha in size, and exotic perennial cover is around 35%. Further, the historical aerial imagery indicates that the patch has not been cleared since at least 2000 (possibly earlier), so also meets the disturbance criterion (not comprehensively cleared for at least 15 years). A representative photograph of the Brigalow patch on Lot 23 is provided in Photograph 7.21. However, the Brigalow patch on Lot 23 through which the revised alignment passes is heavily invaded by Buffel Grass and other exotic species, with an average cover assessed over the entire patch (approximately 5 ha) of between 60–100%. Therefore, this patch does not need the condition threshold to qualify as the Brigalow TEC.

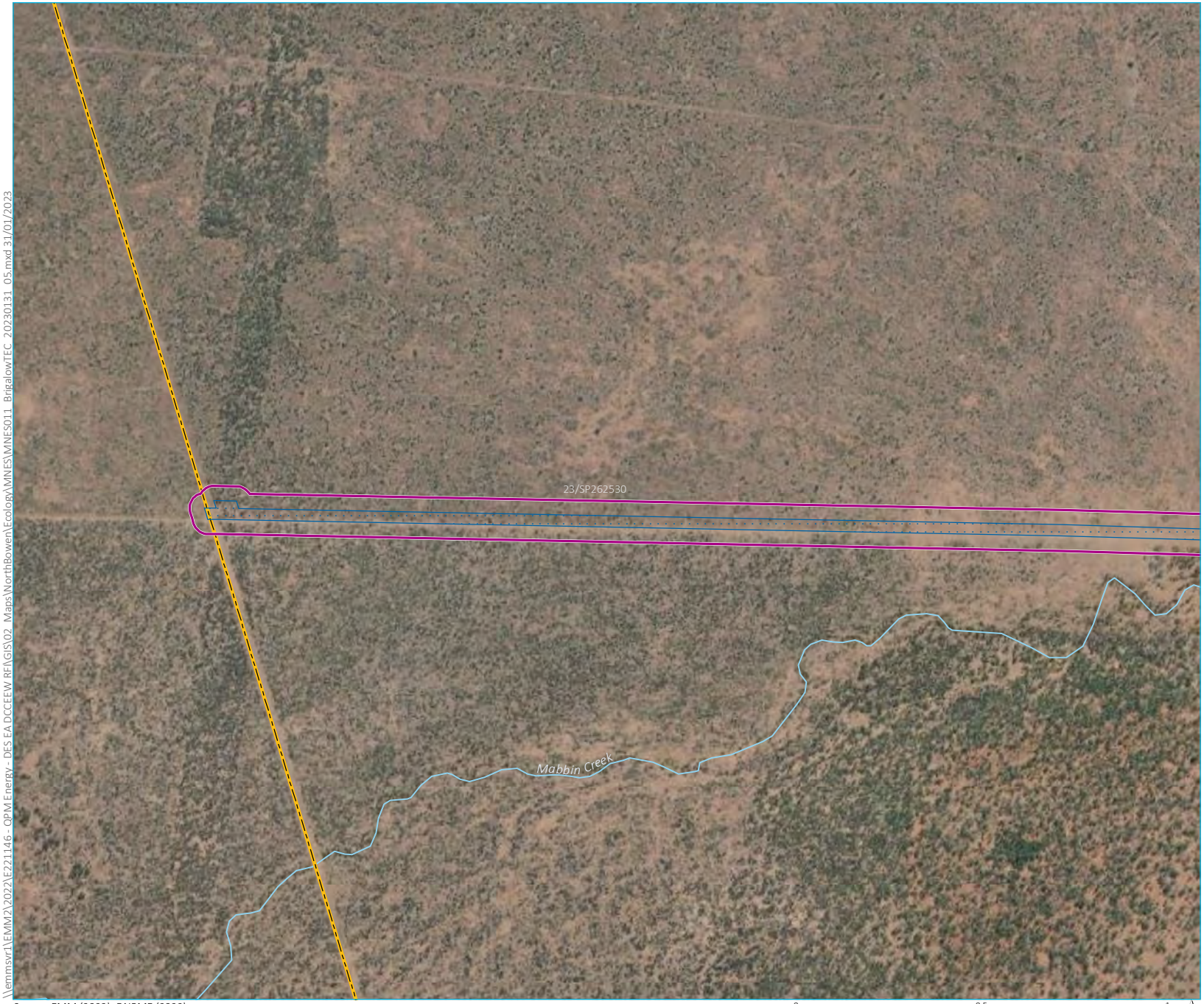
On Lot 2, ground-truthing of vegetation identified errors in the certified Regional Ecosystem mapping. Whilst no Brigalow REs are mapped, remnant and high value regrowth of RE 11.4.9/11.4.8, which is analogous to the Brigalow TEC is present, as shown in Figure 7.2. Areas within the Project area that qualify as the Brigalow TEC are shown in Figure 7.3 and described in Table 7.1.

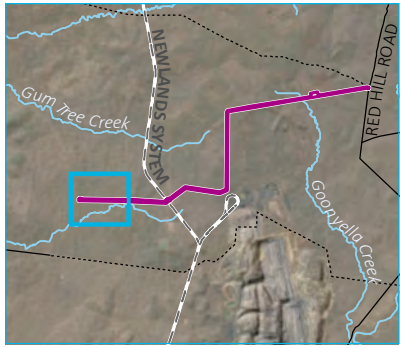
Table 7.1 Assessment of Brigalow TEC within Project area

Polygon number	Lot number	Mapped RE	Ground-truthed RE	Size of patch (area within disturbance footprint in brackets)	% cover of exotic perennial plants	Meets TEC?
1	411	Remnant 11.4.9/11.4.8	Mapped patch not within pipeline extent. Small sections of RE 11.4.9 and 11.4.8 in northern buffer area. Boundary of patch incorrectly mapped.	7.68 ha (old alignment)	50–80% (within Project area	No. Dominance of Buffel Grass in understorey excludes the TEC.
2	411	Remnant 11.4.9/11.4.8/11.5.3	All three REs are present within the patch.	11.4.9–3.17 ha 11.4.8–1.15 ha 11.5.3–1.53 ha (old alignment)	30%	Yes
3	411	Regrowth 11.4.9/11.4.8/11.5.3	Mostly outside of Project area. Small sections of HVR of RE 11.4.9 are present within the northern buffer (southern boundary of the larger patch).	4.44 ha (old alignment)	90% (within Project area).	No. Dominance of Buffel Grass in understorey excludes the TEC.
4	411	Regrowth 11.4.9/11.4.8/11.5.3	Within the pipeline extent, HVR of RE 11.4.9 is present.	2.55 ha (old alignment)	85%	No. Dominance of Buffel Grass in understorey excludes the TEC.
5	411	Regrowth 11.4.9/11.4.8/11.5.3	Part of northern buffer area contains HVR of RE 11.4.9.	9.65 ha (old alignment)	90% (within Project area.	No. Dominance of Buffel Grass in understorey excludes the TEC.
6	23 (superseded alignment)	Regrowth 11.4.9	HVR 11.4.9 is present, and more extensive than mapped.	~2.36 ha (0)	35%	Yes
7	23 (current alignment)	Remnant 11.4.9, non-remnant and remnant 11.4.11/11.4.8/ 11.4.9	Remnant 11.4.9 is present, with *E.cambageana* (mixed 11.4.9/11.4.8) at eastern end.	1.37 ha	60–100%	No. Dominance of Buffel Grass and other weeds in the understorey excludes the TEC.

Table 7.1 Assessment of Brigalow TEC within Project area

Polygon number	Lot number	Mapped RE	Ground-truthed RE	Size of patch (area within disturbance footprint in brackets)	% cover of exotic perennial plants	Meets TEC?
8	2	Regrowth 11.8.13/11.5.15/ non-remnant	Remnant 11.4.9.	18 ha (0.51 ha)	5%	Yes
9	2	Regrowth 11.8.11/11.8.5	HVR 11.4.9.	42 ha (0.29 ha)	5%	Yes
10	2	Regrowth 11.8.11/11.8.5	HVR 11.4.9.	16 ha (0.07 ha)	70%	No. Dominance of Buffel Grass in the understorey excludes the TEC.
11	2	Remnant 11.8.13 and 11.8.11/11.8.5	Remnant 11.4.9.	22 ha (1.16 ha)	60–80%	No. Dominance of Buffel Grass and other weeds in the understorey excludes the TEC.





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

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Brigalow Threatened Ecological Community within the project area
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM
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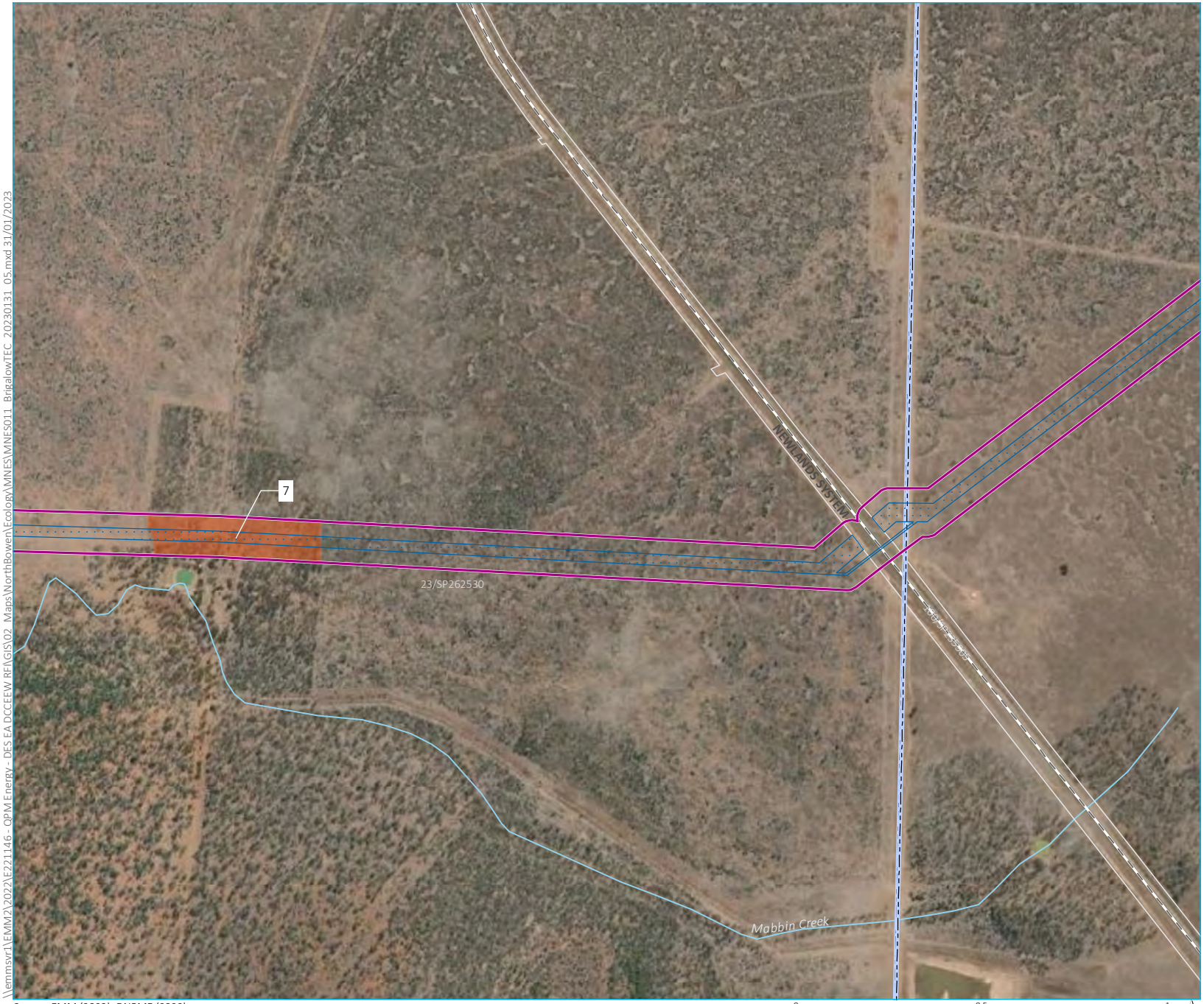

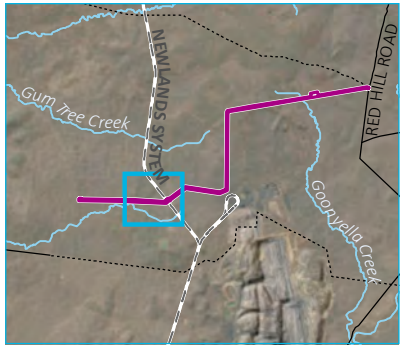

KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

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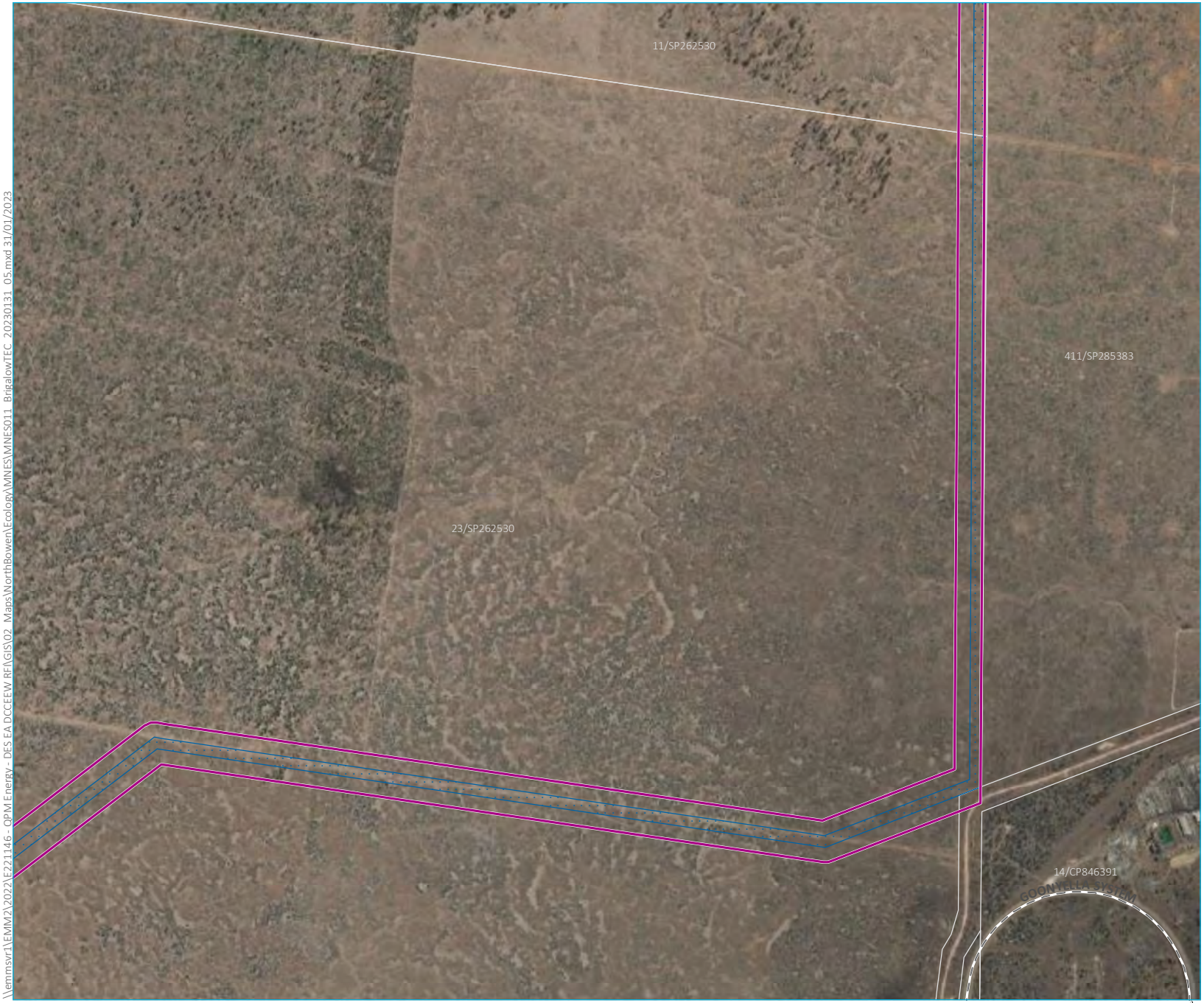
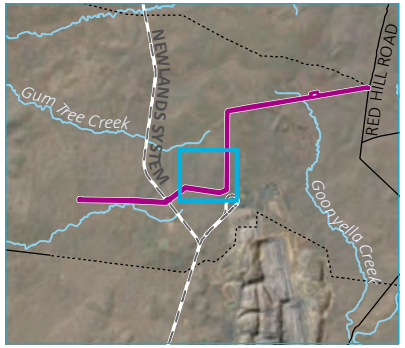
Brigalow Threatened Ecological Community within the project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

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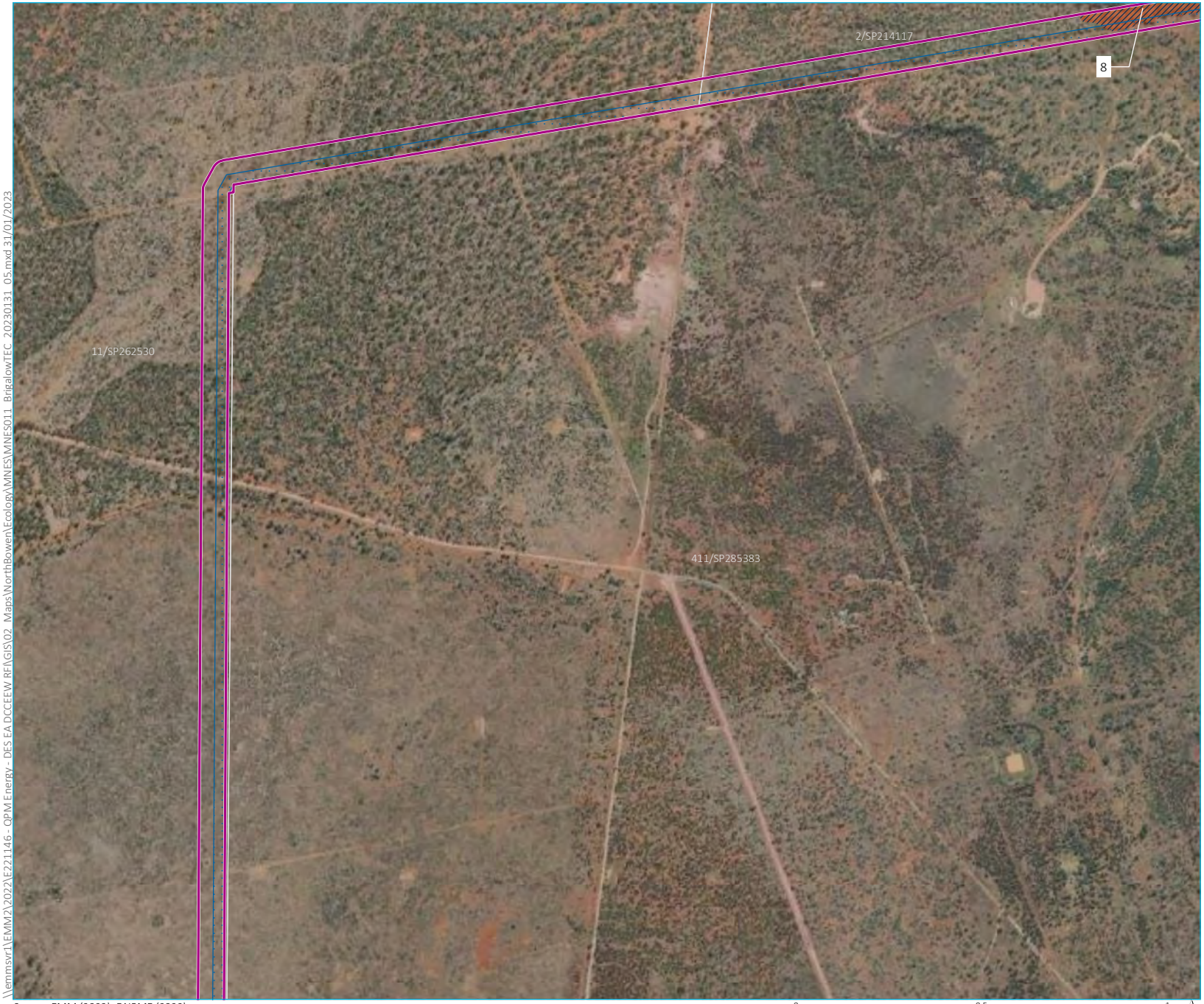
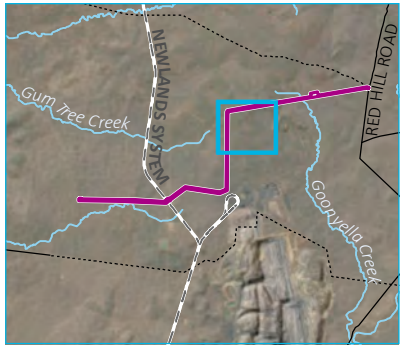
Brigalow Threatened Ecological Community within the project area Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Brigalow TEC
- Brigalow vegetation

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Source: EMM (2023); DNRME (2022)

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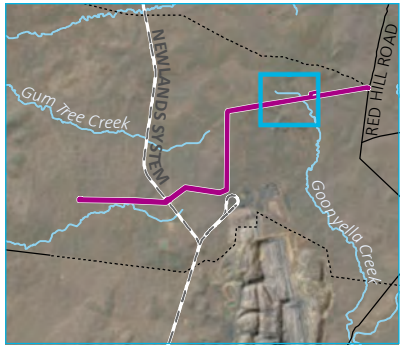
Brigalow Threatened Ecological Community within the project area
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM
creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow TEC
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

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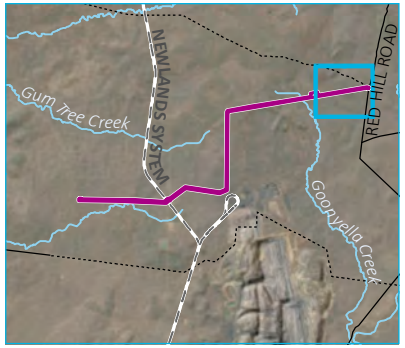
Brigalow Threatened Ecological Community within the project area
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Brigalow vegetation

Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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Brigalow Threatened Ecological Community within the project area Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.3

EMM creating opportunities

ii Grassland TEC

The Commonwealth Listing Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin. (DSEWPaC, 2008) identifies key diagnostic characteristics of the Grassland TEC. These include:

- it occurs within one of six subregions in the Brigalow Belt North Bioregion, or one of two subregions in the Brigalow Belt South Bioregion
- tree canopy is absent or less than 10% projective crown cover, and not derived from cleared woodland
- the ground layer is dominated by perennial native grasses and contains at least three of the indicator native species.

Areas within the Project area containing grassland were assessed against the Grassland TEC conditions in a preliminary manner during the December 2021 survey, and in detail during the post-wet season survey in March 2022. A site walkover of the revised alignment on Lot 23, Lot 11 and Lot 2 was completed in June 2022.

As described in Section 7.2.1, two patches of natural grassland on Lot 411 met the composition criteria for the Grassland TEC, however they were too small (less than 1 ha) to qualify as the TEC. These patches occurred amongst a hostile matrix of invasive, non-native grasses and forbs, and is likely they these patches will be lost to the more competitive weed species over time. There were no areas representing the Grassland TEC on Lot 23, as this property has been extensively modified as grazing pasture.

In the north-south alignment on Lot 11, significant areas of *Dichanthium sericeum* grassland are present, however this vegetation is derived from a cleared woodland, and does not qualify as the natural grassland TEC.

On Lot 2, two patches of REs that are analogous to the natural grassland TEC are mapped within the Project area – a patch of 11.8.11/11.8.5 to the west of the compressor facility and another of the same heterogeneous RE mix (11.8.11/11.8.5) at the eastern extent, within the proposed access road. Both are incorrect, and the natural grassland TEC does not occur within the Project area. The mapped patch to the west of the compressor facility is cleared (non-remnant) within the existing fence line track. Adjacent to the track, vegetation is comprised of *E. cambageana* approximately 16 m high, with *A. harpophylla* regrowth as a secondary tree layer around 6–8 m in height. Soil is red clayey sand with surface stones, as shown in Photograph 7.30.

Photograph 7.30 Brigalow/Blackbutt woodland incorrectly mapped as Grassland TEC on Lot 2

Within the mapped patch of RE 11.8.11/11.8.5 in the proposed access road alignment, vegetation is comprised of dense grassland (100% cover away from the cleared fence line track) with scattered regrowing shrubs of about 15% canopy cover. Within the disturbance footprint is Brigalow woodland 8–12 m high with 30–40% cover, as shown in Photograph 7.30. Areas of grassland close to the road are dominated by Buffel Grass and Parthenium Weed, however one patch did contain predominantly native grasses (*Dichanthium, Bothriochloa* and *Heteropogon* species). This area was too small (approximately 0.1 ha) to qualify as the Grassland TEC.

Photograph 7.31 Brigalow woodland incorrectly mapped as Grassland TEC within proposed road access on Lot 2

iii SEVT TEC

As described in Section 7.2.1, several patches of REs that are analogous to the SEVT TEC as mapped within the Project area, on Lot 11 and Lot 2. These include:

- 11.5.15 – semi-evergreen vine thicket on Cainozoic sand plains and/or remnant surfaces.
- 11.8.13 – semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.

The polygon on Lot 11 mapped as remnant 'Of concern' RE 11.5.3/11.5.15 is characterised by *E. crebra/Corymbia clarksoniana* (Clarkson's Bloodwood) woodland approximately 14 m in height and 20–30% canopy cover, on red sand with minor clay content. An understorey of SEVT species is prominent in some areas, however, they are not present as dominant species in the canopy, which defines the RE. The secondary tree and shrub layers frequently included species more commonly associated with RE 11.5.3, so this RE is the correct mapping for this polygon. In accordance with the *Commonwealth Listing Advice on Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions* (TSSC, 2001), the SEVT TEC is analogous with particular Queensland REs, which are not present. Therefore, the SEVT TEC is absent.

Several polygons on Lot 2 are mapped as remnant or HVR 'Endangered' RE 11.8.13. However, these are mapped incorrectly, and correct REs include:

- 'Endangered' RE 11.4.9 – *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.
- 'Endangered' RE 11.4.8 – *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.
- 'Least Concern' RE 11.8.5 – *Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks.
- Areas of non-remnant vegetation.

Certified RE mapping and ground-truthed Regional Ecosystem (GTRE) mapping is shown in Figure 6.1 and Figure 7.2 respectively.

7.2.4 Pest flora species

Due to the highly disturbed nature of the Project area a number of weed species were recorded. Open (non-remnant) areas were dominated by groundcover weeds, primarily Parthenium (*Parthenium hysterophorus*) and Buffel Grass (*Cenchrus ciliaris*). Parthenium is a category 3 restricted invasive plant under the *Biosecurity Act 2014*, and was recorded on all subject Lots within the Project area. It is particularly dense in the black soil sections of Lot 23 (Denham Park Station) and Lot 2 (Dabin Station). It must not be given away, sold, or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. This is called a general biosecurity obligation (GBO). Parthenium is also a Weed of National Significance (WoNS) at Commonwealth level.

Care should be taken to ensure vehicle and machinery hygiene protocols are adopted, to prevent the spread of Parthenium and rats tail grasses off-property and into areas that are clean of the species.

7.3 Fauna

Incidental sightings of all vertebrate fauna species during surveys were recorded totalling 124 species. This included 18 reptile species, nine amphibian species, 72 bird species, 16 bat species and nine terrestrial mammals. A consolidated vertebrate fauna species list is provided in Appendix F.

7.3.1 Recorded EVNT or migratory species

Two threatened fauna species were recorded over the three survey periods – Squatter Pigeon and Ornamental Snake, with White-throated Needletail recorded close by (within 3 km) along the old alignment.

These observations are summarised below. Locations of MNES threatened species are displayed in Figure 7.4.

i Ornamental Snake

This species is well-known from the Moranbah area, and occupies Brigalow woodland, particularly in areas with gilgai (melon hole) habitat. Suitable habitat for the species is present in all areas mapped as RE 11.4.8 or 11.4.9 within the Project area. On Lot 411, gilgai was only present in the Project area at the western end of the property, in a patch of 20 year old Brigalow regrowth, which is not currently mapped as regulated vegetation. Minor gilgai are also present within other patches of Brigalow on this Lot.

Gilgai habitat is more developed and abundant on Lot 23, which was not accessible during the December 2021 survey but was targeted in March 2022 surveys.

No Ornamental Snake were captured in funnel or pitfall traps during the March 2022 surveys. Initially, conditions were dry and none were recorded during spotlighting between 7–9 March. After heavy rain on 10 March, a total of nine individuals were recorded on Lot 23 and on the following night, a total of 30 individuals were recorded in the same area. All individuals were in the gilgai on the eastern part of the property, although it is likely individuals would have been recorded in the western part of the alignment too if this area had been accessed (was not possible due to flooding). In November 2022, five Ornamental Snake were recorded on the southern part of Lot 11 in gilgai habitat, although the species is expected on the whole north-south alignment on this lot.

Additionally, the species has potential to occur in parts of Lot 11 and Lot 2 where Brigalow communities on clay soils are present adjacent to extensive areas of gilgai on the east-west alignment. These areas are mapped as potential dispersal habitat. These areas were spot lit in November 2022 although no Ornamental Snakes were recorded in these areas.

Habitat mapping criteria is provided in Section 7.6.

A photograph of an Ornamental Snake from 11 March 2022 is provided as Photograph 7.32.

Photograph 7.32 Ornamental Snake

ii Squatter Pigeon

Squatter Pigeons were observed on four different occasions while traversing the Project area in March 2022, and once in June 2022. This comprised groups of one, two, five and eight individuals all in the same vicinity around the dam on Lot 23 during March 2022. A group of four birds were seen in the same area in June 2022. The disturbance footprint will impact the location where Squatter Pigeon have been consistently observed.

Squatter Pigeons are typically found in remnant or regrowth habitats dominated by *Eucalyptus, Corymbia, Acacia* or *Callitris* species within 3 km of available surface water (DAWE 2022b). Breeding habitat is within 1 km of a water source (DAWE 2022b). Permanent or temporary water is available across the Project area in the form of the abovementioned farm dam, as well as other small dams in the vicinity of the Project area. Additionally, mildly-disturbed or cleared habitats along vehicle tracks or on the peripheries of the Project area represent ideal habitat for this species.

Utilised habitat in these areas have low ground layer cover, typically below 33%. Areas within the Project area containing dense grassy understorey dominated by Buffel Grass, with limited availability of permanent water are not considered suitable habitat for Squatter Pigeon. However, where the ground cover is sparser, and particularly in proximity to permanent surface water (e.g. farm dams) are considered suitable habitat.

Habitat mapping criteria is provided in Section 7.6.

iii White-throated Needletail

White-throated Needletail was recorded close to the Project area (within 3 km) along the old alignment. White-throated Needletails migrate north and have largely left Australia by April to breed in the Northern Hemisphere. As this species is strictly an aerial feeder it would use the entire area as foraging habitat.

Habitat mapping criteria is provided in Section 7.6.

7.3.2 Other potential EVNT or migratory species

The following additional species are considered likely to occur in the Project area or have been assessed conservatively due to being high-priority species.

i Koala

Although assessed as having a low potential to occur in the Project area this species has been conservatively assessed. DCCEEW has identified this species as being on a high priority list due to the extensive bushfires which occurred in 2019–20 in southern and eastern Australia and although they are not considered likely to occur in the Project area, are scarce in the Moranbah region and have not been recorded to date, assessments have been carried out based on their potential presence.

No individuals were recorded and no scratches or scats associated with the species were recorded. If present in the region, the species is likely to be restricted to riparian areas of major watercourses. The Project area is largely cleared and dominated by dense weedy ground-cover.

However, conservatively and following DCCEEW current expectations, any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees (following EPBC Act referral guidelines for the vulnerable Koala (DoE 2014)) is considered potential Koala habitat. This includes mixed Eucalypt regrowth or modified vegetation communities, or shrubland containing emergent Koala food trees. Koala food trees typically consist of the following genera in order of general preference:

- Eucalyptus
- Corymbia
- Angophora
- Lophostemon
- Melaleuca.

The Project area is dominated by weedy regrowth, although a number of patches of vegetation were ground-truthed where emergent food trees did occur, typically Blackbutt (*Eucalyptus cambageana) or* Narrow-leaved Ironbark (*Eucalyptus crebra).*

On Lot 2, a patch of *Eucalyptus orgadophila* open grassy woodland may provide suitable habitat for Koala. However, this habitat is marginal, as it characterised by a dense grassy understorey dominated by exotic species (Buffel Grass and Parthenium Weed). On Lot 11 and Lot 2, areas of RE 11.5.3 may also provide suitable habitat for koala, although no signs (scats, scratches) were observed, and no live animals were recorded. These areas were spot lit in November 2022 and no Koalas were recorded.

Although food trees are present and therefore potential habitat occurs, the disturbance footprint does not contain contiguous eucalypt woodland, or retain connectivity to such areas. As such, the habitat mapped has been assessed as marginal for the species as it is highly fragmented and limited in extent, and the likelihood of the species occurring on a regular basis is low.

An assessment of potential Koala habitat in the Project area following the '*referral guidelines for the vulnerable Koala'* (DoE 2014) under the EPBC Act is summarised in Table 7.2. These guidelines are now out of date since the species has been uplisted to Endangered, but regardless the critical habitat assessment provides a valuable evaluation of habitat based on a number of criteria.

Habitat mapping criteria is provided in Section 7.6.

Table 7.2 Koala critical habitat assessment

Attribute	Score (coastal)	Status within Project area
Koala occurrence	+2 (high) – evidence of one or more Koalas in the last 2 years.	No sightings of scat, scratches or the Koala itself were recorded in the Project area. Database searches (ALA and Biomaps) found no Koala records within 20 km of the Project area. The closest record is from Moranbah in 1996 and approximately 35 km to the southwest, with another record 40 km to the east from Hail Creek in 2014. **Therefore, the Project area scores +0 for this attribute.**
	+1 (medium) – evidence of one or more Koalas within 2 km of the edge of the impact area within the last 5 years.	
	0 (low) – none of the above.	
Vegetation composition	+2 (high) – has forest or woodland with 2 or more known koala food tree species; or 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	The Project area is dominated by weedy regrowth, although a number of patches of vegetation were ground-truthed where emergent food trees did occur, typically Blackbutt (*Eucalyptus cambageana*) or Mountain Coolibah (*Eucalyptus orgadophila*). However, high quality habitat (ie riparian woodland) is not present within the Project area. **The Project area scores +2 for this attribute due to presence of Eucalyptus species.**
	+1 (medium) – Has forest or woodland with only 1 species of known koala food tree present.	
	0 (low) – none of the above.	
Habitat connectivity	+2 (high) – area is part of a contiguous landscape ≥ 500 ha.	The Project area is mostly cleared, and suitable vegetation is sparse. **The Project area scores 0 for this attribute**.
	+1 (medium) – area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.	
	0 (low) – none of the above.	

Table 7.2 Koala critical habitat assessment

Attribute	Score (coastal)	Status within Project area
Key existing threats	+2 (high) – little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present.	There were no signs of Koalas during surveys and no desktop Koala records within 20 km of the Project area. If Koalas are present within the Project area, there is a low risk of vehicle strike as no major highways are adjacent. Additionally, Wild Dog are a threat around the region. **The Project area therefore scores +1 for this attribute.**
	+1 (medium) – evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence; or Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low) – evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present; or Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high) – habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guidelines.	The Project area is dominated by weedy regrowth, although a number of patches of vegetation were ground-truthed where emergent food trees did occur, typically Blackbutt (*Eucalyptus cambageana*). However, high quality habitat (i.e. riparian woodland) is not present within the Project area. The Project area is unlikely to be important in achieving interim recovery objectives. **The Project area therefore scores +0 for this attribute.**
	+1 (medium) – uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guidelines.	
	0 (low) – habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1 of the guidelines.	
Total score	**A total score of three (3) has been recorded using the criteria above. A habitat score of 5 or greater is the trigger at which a site may be considered as 'critical habitat' and a score of 8 triggers the requirement of a referral. No Koalas or secondary signs, such as scat or scratches, were identified during surveys across the Project area and no Koalas were identified within 35 km during desktop assessments. Koala habitat is very limited in the Project area.**	

ii Australian Painted Snipe

This species occurs in shallow freshwater wetlands, of both an ephemeral and permanent nature across all states of Australia, but most commonly in eastern Australia. It is widespread and thought to be dispersive or migratory with dispersive movements attributed to local conditions (moving to flooded areas or permanent wetlands from drying areas or away from areas affected by drought). They are thought to breed in response to climatic conditions rather than during a particular season, with breeding recorded in all months (DAWE 2022c).

Australian Painted Snipe may utilise gilgai habitats in the Project area during seasonably suitable conditions when gilgai are inundated and potentially as suitable habitats further inland dry out.

iii Latham's Snipe

Extensive suitable habitat is present within the Project area in the form of gilgai habitats. This species is listed as Migratory under the EPBC Act. It is a shorebird species that breeds primarily in Japan during the Austral winter and spends the Austral summer in eastern Australia. It is most commonly associated with wetlands, creeks or moist grasslands. It is a secretive, well-camouflaged species and is usually only revealed to an observer when disturbed into flight (DoE 2019).

This species is likely to regularly occur in any wetland habitat across the Project area during summer months, when wetland areas contain water.

iv Migratory species

An assessment of the potential habitat for listed migratory species within the Project area is provided below.

- **Fork-tailed Swift** – this species is almost exclusively aerial and occurs mainly over inland plains. Habitats include riparian woodland, heathland and low scrub areas. They also occur in coastal areas over cliffs and beaches. The species breeds in northern Asia and spends the non-breeding season (typically October–March, inclusive) in Australia, moving further south as the summer progresses. No habitat mapping has been undertaken for Fork-tailed Swift as this species could occur in any airspace over the Project area. It is a migratory species that occurs in Australia only during the summer months but is highly aerial.

- **Oriental Cuckoo** – this species occurs in a wide range of woodlands, particularly in the ecotones of denser riparian communities. The species does not breed in Australia. The species generally occurs in more denser woodlands closer to the coast and it is unlikely to occur in the Project area.

- **Yellow Wagtail** – this is a rare vagrant species, occupying open country near swamps, salt marshes, sewage ponds and mangroves. No suitable habitat for this species is present within the Project area.

- **Osprey** – a large coastal raptor, that also utilises large inland rivers. There are no significant wetlands within the Project area and this species is considered unlikely to occur.

- **Latham's Snipe** – is a non-breeding migrant, occupying shallow wetland habitat with dense cover. No records of this species exist within the study area although areas of potentially suitable habitat in the form gilgai occur within the Project area. Such habitats may be utilised on a sporadic basis if the species is present in the region.

A number of migratory wader species were identified via desktop searches as potentially occurring in the Project area. These include Curlew Sandpiper, Common Sandpiper, Sharp-tailed Sandpiper and Pectoral Sandpiper. These species utilise shorelines of coastal areas, and inland water bodies. Suitable wetland habitat for these birds is unlikely to be present in the Project area.

7.3.3 Low potential or unlikely EVNT or migratory species

The remaining threatened fauna species identified as potentially occurring within the Project area, that are considered unlikely to occur based on ground-truthing of available habitat include the following species – further discussion around all candidate species in Section 6.8 is provided in the Likelihood of Occurrence assessment provided as Appendix C.

- **Curlew Sandpiper** – a migratory shorebird that utilises shorelines of coastal areas, and inland water bodies. Suitable wetland habitat for this species is not present in the Project area.

- **Red Goshawk** – utilises coastal and sub-coastal tall open forests and woodlands, tropical savannas traversed by wooded or forested rivers, and the edges of rainforest. This habitat is not present within the Project area.

- **Grey Falcon** – occupies the arid and semi-arid zones, further inland from the Project area, extremely rare.

- **Star Finch (eastern)** – utilises seasonally damp habitat near permanent waterholes. Known only from a small population of less than 50 birds, however the eastern subspecies may be extinct. The dominance of Buffel Grass and other exotic species and lack of permanent water renders the Project area unsuitable for this species.

- **Southern Black-throated Finch** – utilises savannah grasslands and riverine wetlands dominated by eucalypts, paperbarks or acacias and is known from localities close to Townsville. This habitat is not present in the Project area.

- **Australian Painted Snipe** – utilises shallow freshwater wetlands with good coverage of grasses, rushes or reeds, lignum, open timber or samphire. Permanent water in the Project area is limited to Goonyella Creek, which is heavily degraded, and lacks the cover preferred by this species.

- **Masked Owl (northern)** – utilises woodland habitats with well-developed tree hollows for roosting and hunting, as well as open grasslands and grassy woodlands. The southern limit of the species is not precisely known, but likely to be further north than the Project area.

- **Northern Quoll** – utilises rocky habitat for denning, and riparian areas for movement and foraging. No rocky habitat is present within the Project area, and riparian habitat is extensively modified and degraded. This species has suffered significant decline in recent decades, with the nearest known population within the Clark-Connors Range, west of Mackay.

- **Greater Glider** – this species utilises eucalypt forest and woodland with mature trees containing abundant hollows, which it uses for shelter. There is a small section of the alignment on Lot 11 that contains RE 11.5.3 - Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana woodland on Cainozoic sand plains and/or remnant surfaces. This woodland is mapped correctly and contains E. crebra and C. clarksoniana trees around 14 m high. Some hollows are present, but they are relatively scarce (approximately five per hectare) and small in size, as the woodland appears to have been subject to selective clearing in the past. Due to the open nature of the canopy, small numbers of hollows and lack of connectivity to more optimal Greater Glider habitat, this area is conservatively considered marginal habitat for Greater Glider.

  Two areas of RE 11.5.3 on Lot 2 have now regrown to achieve remnant status. However, hollows have not yet developed in the canopy trees, so no denning habitat for the glider is present. Marginal areas were spot lit in November 2022 and none were recorded, and the species is considered unlikely to occur given the constraints outlined above.

- **Ghost Bat** – roosts in large sandstone and limestone caves. This habitat is not present in the Project area, and the nearest known population is at Cape Hillsborough, north of Mackay.

- **Southeastern Long-eared Bat** – inhabits inland woodland habitats on the western slopes and plains of southern Queensland, and is likely to occur further south of the Project area.

- **Yakka Skink** – this large skink utilises Brigalow habitats and in particular, hollow ground logs for denning. Ground timber throughout the Project area is predominantly recently felled trees with a paucity of hollows. The presence of this species is often detected via its conspicuous latrine sites. None were observed within the Project area, and this species is considered unlikely to occur.
- **White-throated snapping Turtle** – this species utilises riverine habitats within the Fitzroy, Mary and Burnett River catchment. This habitat is not present within the Project area.
- **Dunmall's Snake** – utilises open forest and woodlands (particularly Brigalow) on floodplains. This habitat is not present in the Project area.
- **Allan's Lerista** – known only from a small area near Clermont/Capella, south of the Project area, in open grasslands and grassy woodland, on black and red soil.
- **Fitzroy River Turtle** – only found in the Fitzroy River and its tributaries, in flowing rivers with deep pools. This habitat is not present in the Project area.

7.3.4 Non-EVNT fauna observations

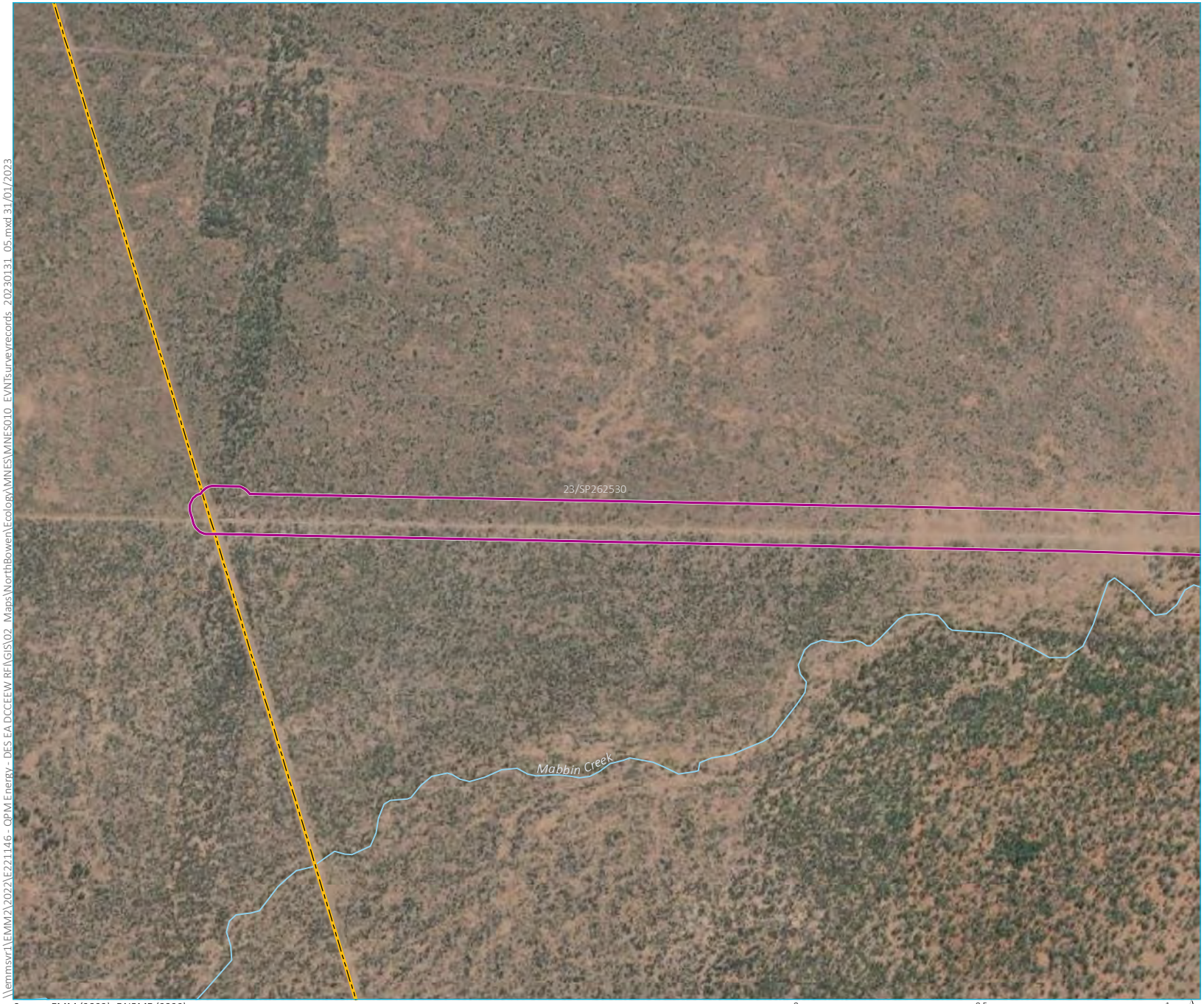
Incidental sightings of non-EVNT fauna were recorded throughout the Project area during surveys. These species are listed in Appendix F. Of note were multiple occurrences of *Notaden bennettii* after heavy rains on 10 March 2022, at the north-eastern extent of their range (Photograph 7.33).

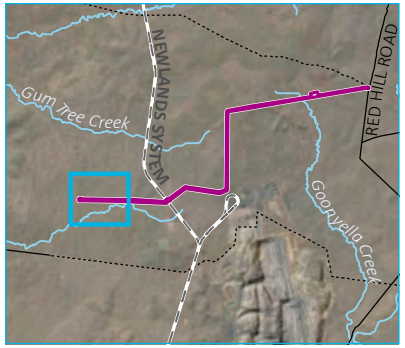
Numerous microbat species were observed incidentally during nocturnal surveys. Analysis of Anabat data was prepared by Balance Environmental and results have been incorporated into this technical report. The Anabat results are provided in Appendix G.

Photograph 7.33 ***Notaden bennettii***

7.3.5 Pest fauna species

Four terrestrial vertebrate pest species were recorded within the Project area – the Cane Toad (*Rhinella marina*). Rabbit (*Oryctolagus cuniculus*), Common Myna (*Acridotheres tristis*) and Brown Hare (*Lepus europaeus*). Wild Dog (*Canis lupus familiaris*) and Feral Cat (*Felis catus*) are both likely to occur along with a number of introduced bird species. Three of these species (Feral Cat, Rabbit and Wild Dog) are listed as 'restricted matters' under the *Biosecurity Act 2014*.





KEY

- Project area
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

N

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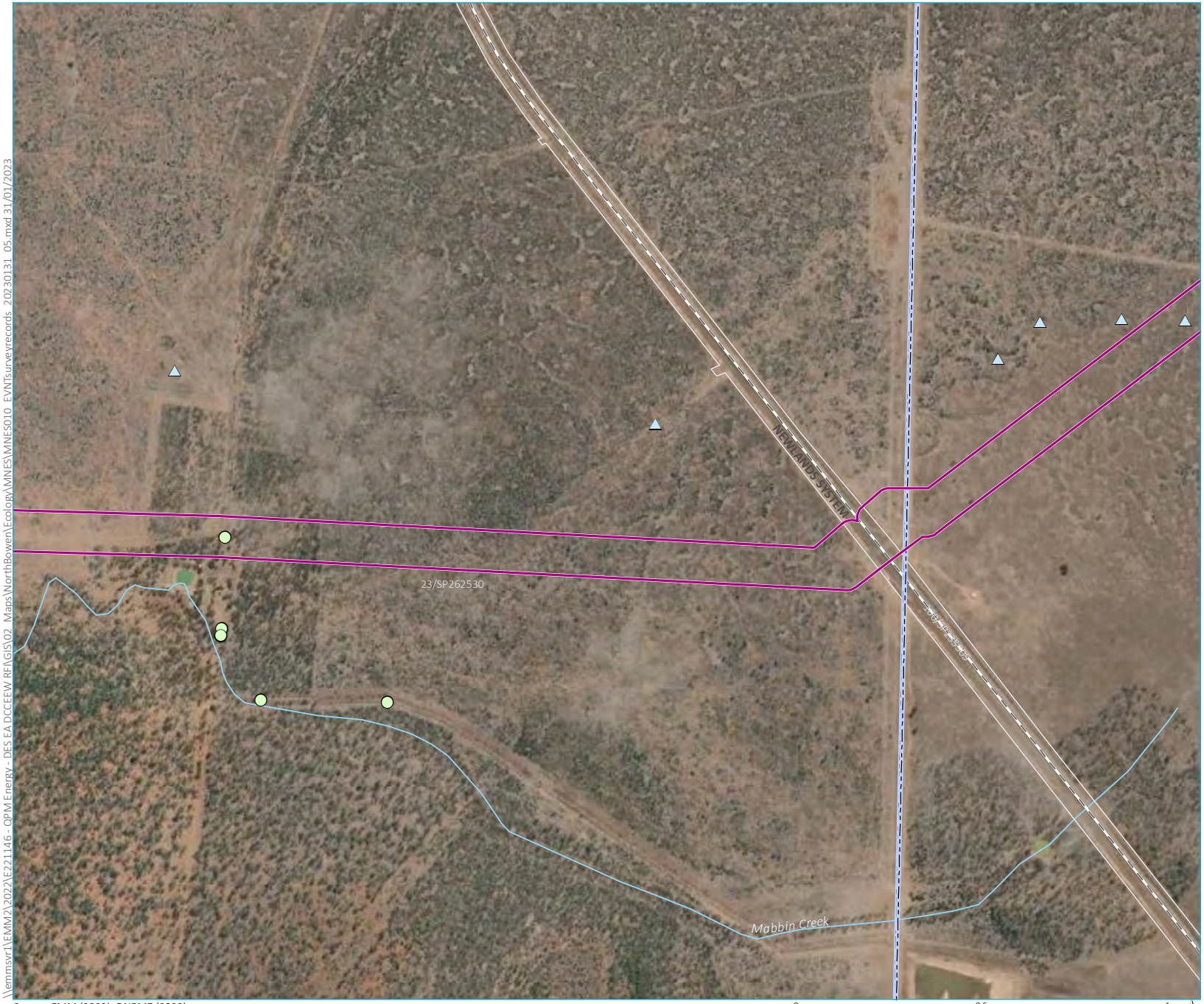
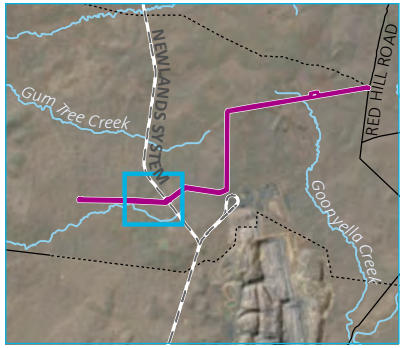
EMM threatened species records within the project area
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM
creating opportunities





KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake
- Squatter Pigeon

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Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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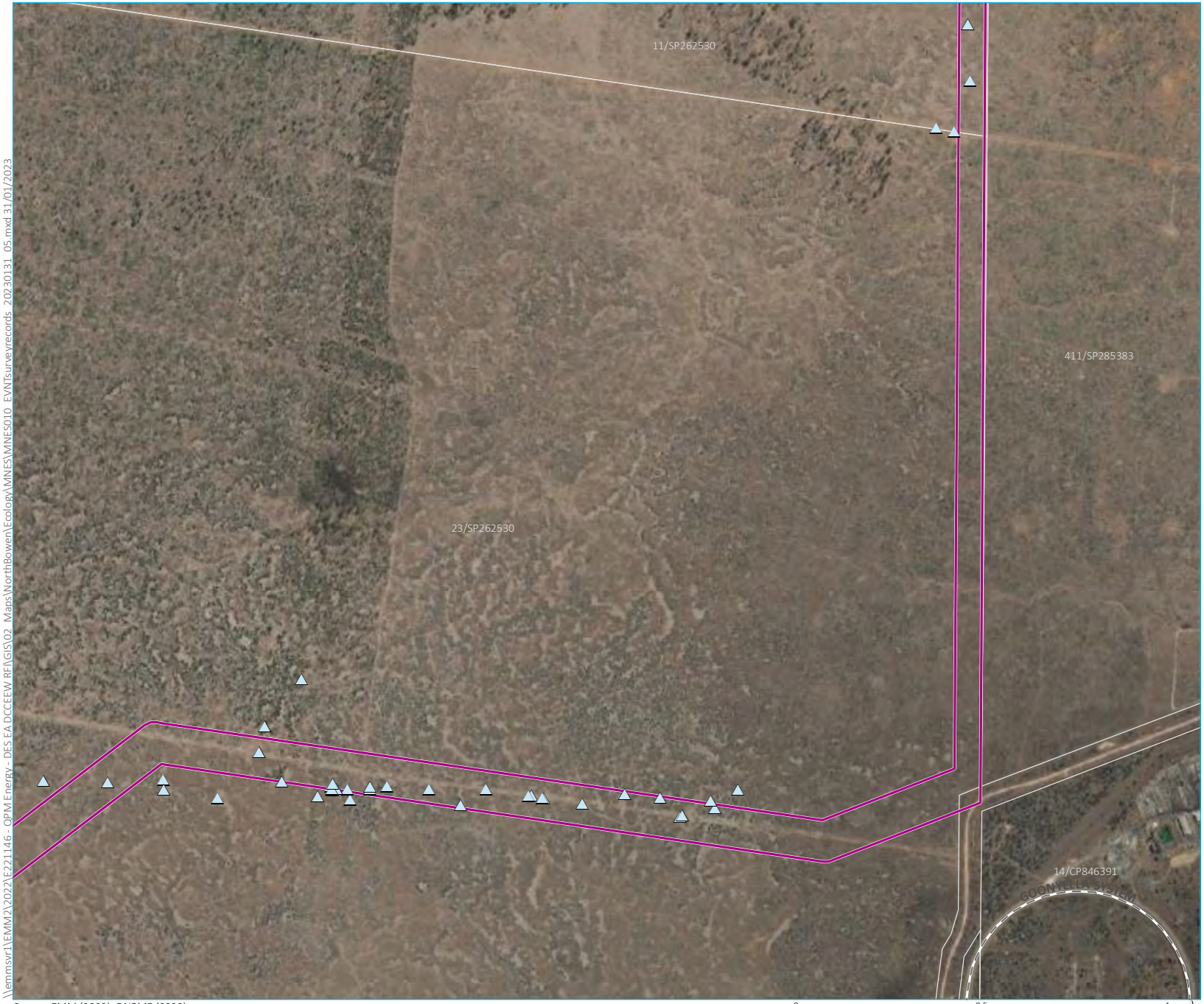
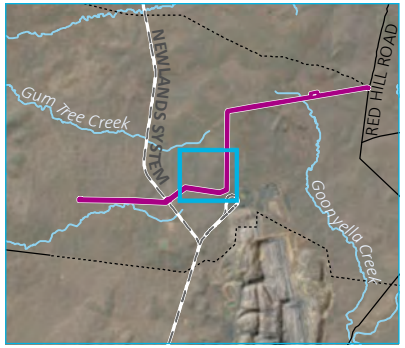
EMM threatened species records within the project area
Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM creating opportunities





KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake

Source: EMM (2023); DNRME (2022)

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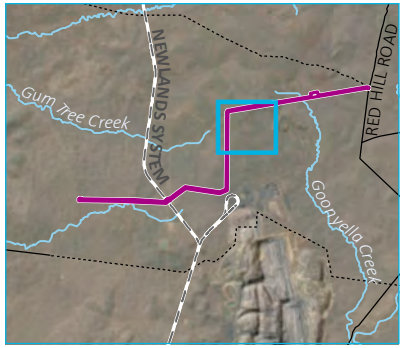
EMM threatened species records within the project area
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM
creating opportunities



KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Threatened species records (EMM, 2022)

- Ornamental Snake

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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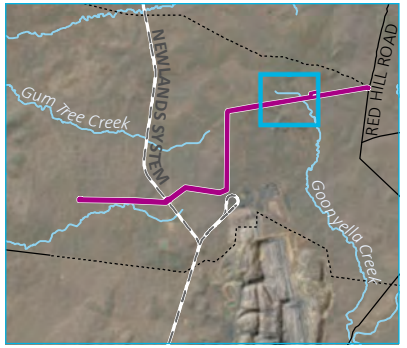
EMM threatened species records within the project area
Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM
creating opportunities



KEY

- Project area
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

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GDA 1994 MGA Zone 55

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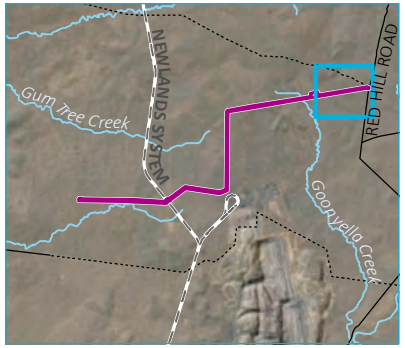
EMM threatened species records within the project area
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM creating opportunities



KEY

- Project area
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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EMM threatened species records within the project area
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.4

EMM creating opportunities

7.4 General habitat assessments

A general habitat assessment was collected at each quaternary flora site, with a total of 78 undertaken across the Project area over both survey periods (Figure 5.1 and Figure E.1).

Specific habitat attributes were assessed at each site to confirm suitable habitat features for particular EVNT species and provide justification for the potential occurrence of a species due to the presence or absence of suitable microhabitats. In general, hollow bearing trees were sparse within the Project area.

Most habitat observed across the Project area is considered of relatively low quality due to previous broad-scale vegetation clearing, weed encroachment and grazing activity.

7.5 Candidate species and communities

A refined likelihood of occurrence was prepared for the potential MNES associated with the Project based on EMM's desktop assessment and findings (see full likelihood of occurrence table in Appendix C). This assessment was informed by the results of the background research, database searches and field work conducted by EMM between December 2021, March 2022, June 2022 and November 2022.

Definitions used for the refined likelihood of occurrence are described below:

1. **Known** – records of the species exist in the Project area or within 1 km of the Project area and suitable habitat is present in the Project area.

2. **Likely** – species records exist within the study area and suitable habitat is present within the Project area.

3. **Potential** – species records exist within the study area, suitable habitat for the species exists within study area, but there is insufficient information to categorise the species as likely, or unlikely to occur, in the Project area.

4. **Unlikely** – no records in study area and a low to very low probability that a species will occur in the Project area due to the lack of suitable habitat or is outside the species known geographical range.

The refined likelihood of occurrence assessments are provided in Appendix C and those species identified as 'known', 'likely' or have 'potential' to occur in the Project area are summarised in following sections.

7.5.1 List of candidate TECs

A refined likelihood of occurrence assessment was completed for the four TECs identified from the results of the desktop analysis and field surveys in December 2021, March 2022 and June 2022 (Table 7.4). As a result, this refined assessment determined that one is known to occur.

Table 7.3 TECs with potential to occur in Project area

TEC	EPBC Act status	Likelihood of occurrence	Rationale
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	Known	Recorded on Lot 23 and Lot 2 – see Section 7.2.3

Further rationale behind remaining TECs identified in the desktop analysis being classified as unlikely to occur is provided in Appendix C.

7.5.2 List of candidate flora species

A refined likelihood of occurrence assessment was completed for the seven threatened flora species based on results of the desktop analysis and field surveys in December 2021, March 2022, June 2022 and November 2022. This assessment determined that none of the threatened flora species are likely to occur within the Project area.

Further detail behind known and likely species is provided in Section 7.6. Further rationale behind remaining species identified in the desktop analysis being classified as unlikely to occur is provided in Appendix C.

7.5.3 List of candidate fauna species

A refined likelihood of occurrence assessment was completed for the 21 threatened fauna species identified from the results of the desktop analysis and field surveys in December 2021, March 2022, June 2022 and November 2022 (Table 7.4). As a result, this refined assessment determined that two threatened species are known to occur, one was likely to occur, and a further two species were assessed as having potential to occur. Candidate fauna species are listed in Table 7.4.

Further detail behind known and likely species is provided in Section 7.6 and in significant residual impact assessments for these species in Chapter 10. Further rationale behind remaining species identified in the desktop analysis being classified as unlikely to occur is provided in Appendix C.

Table 7.4 Candidate threatened fauna species

Species name	Common name	EPBC Act[1]	NC Act[2]	Likelihood of occurrence	Rationale
Birds					
Denisonia maculata	Ornamental Snake	V	V	Known	Multiple records of this species exist within the study area (66 records), and essential habitat is mapped for the species. Field surveys identified this species as being present in the Project area and as such the species is considered known to occur.
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	Known	Multiple records of this species exist within the study area (12 records). Field surveys identified this species as being present in the Project area and as such the species is considered known to occur.
Hirundapus caudacutus	White-throated Needletail	V Mi	V	Likely	Field surveys identified this species as being present close to the Project area and as such the species is considered likely to occur.
Rostratula australis	Australian Painted Snipe	E	E	Potential	No records of this species exist within the study area although areas of potentially suitable habitat in the form gilgai occur within the Project area. Such habitats may be utilised on a sporadic basis if the species is present in the region. The Australian Painted Snipe is a predominately crepuscular and nocturnal shorebird species. It is most common in south eastern Australia but can exhibit dispersive characteristics and has been known to turn up far from its usual range when conditions are suitable post rain events. The species was not recorded during field surveys. Also, due to its nomadic nature this species is considered to have the low potential to occur during suitably wet conditions, although any occurrence is likely to be sporadic.

Table 7.4 Candidate threatened fauna species

Species name	Common name	EPBC Act[1]	NC Act[2]	Likelihood of occurrence	Rationale
Mammals					
Phascolarctos cinereus	Koala	E	E	Potential (low)	No records of Koala exist within the study area. The species is not considered likely to occur in the Project area, and is scarce in the Moranbah region and has not been recorded to date. No individuals were recorded and no scratches or scats associated with the species were recorded. If present in the region, the species is likely to be restricted to riparian areas of major watercourses. The Project area is largely cleared and dominated by dense weedy ground-cover. Koala is considered to have a low potential to occur in the Project area.

1. EPBC Act status: E – endangered, V – vulnerable, Mi – migratory
2. NC Act status: E – endangered, V – vulnerable

7.5.4 List of candidate migratory species

A refined likelihood of occurrence assessment was completed for the eleven listed migratory species based on results of the desktop analysis and field surveys in December 2021, March 2022, June 2022 and November 2022 (Table 7.5). The assessment determined that three migratory species are likely to occur.

Further detail behind likely species is provided in Section 7.6 and in significant residual impact assessments for these species in Chapter 10.

Further rationale behind remaining species identified in the desktop analysis being classified as unlikely to occur is provided in Appendix C.

Table 7.5 Candidate migratory species

Species name	Common name	EPBC Act[1]	NC Act[2]	Likelihood of occurrence	Rationale
Migratory aerial birds					
Apus pacificus	Fork-tailed Swift	Ma	SLC (Mi)	Likely	Multiple records of this species are represented within the study area and habitat is present within the Project area. During surveys this species was identified adjacent to the Project area over Burton Dam; approximately 18 km to the east therefore, it is considered as likely to occur.
Hirundapus caudacutus	White-throated Needletail	V Mi	V	Likely	Multiple records of this species occur within the study area. Field surveys identified this species as being present close to the Project area and as such the species is considered likely to occur.
Migratory wetland birds					
Gallinago hardwickii	Latham's Snipe	Mi	SLC (Mi)	Likely	No records of this species exist within the study area although areas of potentially suitable habitat in the form gilgai occur within the Project area. Such habitats may be utilised on a sporadic basis if the species is present in the region.

1. EPBC Act status: M – migratory, Ma – marine
2. NC Act status: SLC – special least concern, Mi – migratory

7.6 Threatened and migratory species habitat mapping

Habitat constraints mapping has been prepared for those MNES that have been identified (post consideration of desktop assessments and field ecology surveys results) as being 'known' or 'likely' to occur in the Project area.

This also includes mapping of habitats for Koala which was assigned a likelihood of 'low potential'. DCCEEW has identified Koala as being on a high priority list due to the extensive bushfires which occurred in 2019–2020 summer in southern and eastern Australia. The latest high priority list was released by DCCEEW on 20 March 2020 and identified species requiring urgent management intervention. The fires covered an unusually large area and, in many places, burnt with unusually high intensity. The priority animals were identified based on the extent to which their range has potentially been burnt, how imperilled they were before the fires (for example, whether they were already listed as vulnerable, endangered or critically endangered), and the physical, behavioural and ecological traits which influence their vulnerability to fire (DAWE 2020). Although Koala are considered a low potential likelihood to occur, a conservative assessment of the potential for significant residual impact is provided.

Habitat mapping is based on EMM's site assessments, spatial datasets, and best available information about a species' habitat requirements. Vegetation community mapping combined with required habitat features and other environmental attributes (such as distance to permanent water or land zones) has been applied to model potential habitats. Relevant habitat suitability information was also used where available such as SPRAT profiles, Recovery Plans and Conservation Advice Statements.

The habitat modelling is conservative. Whilst certain habitat types and likely distributions across the Project area can be extrapolated from survey findings (e.g. potential occurrence of Squatter Pigeon close to water sources and/or areas dominated by alluvial sandy soils) other potential species distributions that were not detected are more difficult to accurately predict based purely on the field survey results. Specific habitat attributes according to species preferences as well as habitat mapping methods and field survey results are summarised in subsequent sections.

7.6.1 Brigalow TEC

The Project area on Lot 23, 411, 11 and 2 has been surveyed for the Brigalow TEC. Two patches are present on Lot 2, as described in Section 7.2.3.

Within the Project area, patches of Brigalow that qualify as the TEC, as well as those that do not, are shown on Figure 7.3.

Within the study area, the following REs which are analogous with the Brigalow TEC (consistent with the SPRAT profile) are mapped as potential Brigalow TEC based on the desktop regulated vegetation mapping:

- RE 6.4.2-*Casuarina cristata* +/- *Acacia harpophylla* open forest on clay plains
- RE 11.3.1-*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains
- RE 11.4.3-*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains
- RE 11.4.7-Open forest of *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* on Cainozoic clay plains
- RE 11.4.8-*Eucalyptus cambageana* open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains
- RE 11.4.9-*Acacia harpophylla* shrubby open forest with *Terminalia oblongata* on Cainozoic clay plains
- RE 11.4.10-*Eucalyptus populnea* or *E. pilligaensis*, *Acacia harpophylla*, *Casuarina cristata* open forest on margins of Cainozoic clay plains

- RE 11.5.16-*Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains/remnant surfaces
- RE 11.9.1-*Acacia harpophylla-Eucalyptus cambageana* open forest on Cainozoic fine-grained sedimentary rocks
- RE 11.9.5-*Acacia harpophylla* and/or *Casuarina cristata* open forest on Cainozoic fine-grained sedimentary rocks
- RE 11.9.6-*Acacia melvillei* ± *A. harpophylla* open forest on Cainozoic fine-grained sedimentary rocks
- RE 11.11.14-*Acacia harpophylla* open forest on deformed and metamorphosed sediments and interbedded volcanics
- RE 11.12.21-*Acacia harpophylla* open forest on igneous rocks; colluvial lower slopes
- RE 12.8.23-*Acacia harpophylla* open forest on Cainozoic igneous rocks
- RE 12.9-10.6-*Acacia harpophylla* open forest on sedimentary rocks
- RE 12.12.26-*Acacia harpophylla* open forest on Mesozoic to Proterozoic igneous rocks.

These areas are shown on Figure 7.9, and have not been subject to groundtruthing to determine status and extent. There are approximately 4,610 ha of REs analogous with Brigalow TEC in the study area based on regulated vegetation mapping.

7.6.2 Dichanthium queenslandicum

The Project area on Lot 23 and Lot 11 (Denham Park), Lot 411 (Peabody) and Lot 2 (Dabin Station) have been surveyed for this species, and it was not present in the alignment at time of survey.

On Lot 11 and Lot 2, meanders for target threatened grasses were completed whilst undertaking quaternary assessments, as well as in transit through the high-pressure pipeline alignment between sites, and none were found. Due to the preceding rains, including red-breaking, unseasonal rain in May 2022, grasses were flowering during March and June 2022 so detectability of these species would have been optimal. The native bluegrass, *Dichanthium sericeum* dominates in some areas, particularly to the north of the fence which forms the Lot 11/Lot 23 property boundary and in small patches at the eastern end of Dabin Station near Red Hill Road. Several records of *D. queenslandicum* have been collected from within 5 km of the Project area near Dabin Station, however the Project area in proximity to these records was searched thoroughly by two ecologists when the grasslands were in flower, and *D. queenslandicum* was not present.

Due to a lack of suitable native grasslands, extensive areas of Buffel Grass and other exotic species, heavy cattle grazing, and previous clearing activity, the species is considered unlikely to occur in the Project area. No habitat mapping has been prepared for this species.

The eastern end of the alignment is mapped as high risk for protected plants. This is due to records of *Dichanthium queenslandicum*. Although none were recorded in the June 2022 survey, and most grasses were flowering, a formal protected plant survey will be undertaken in areas of high-risk trigger mapping within 12 months of clearing (a requirement under Queensland legislative framework). Should the species be found, efforts will be made to avoid during clearing. If the species cannot be avoided, a suitable mitigation will be determined in consultation with DCCEEW/DoR.

7.6.3 Dichanthium setosum

The Project area on Lot 23 and Lot 11 (Denham Park), Lot 411 (Peabody) and Lot 2 (Dabin Station) have been surveyed for this species, and it was not present in the alignment at time of survey.

On Lot 11 and Lot 2, meanders for target threatened grasses were completed whilst undertaking quaternary assessments, as well as in transit through the high-pressure pipeline alignment between sites, and none were found. Due to the preceding rains, including red-breaking, unseasonal rain in May 2022, grasses were flowering during March and June 2022 so detectability of these species would have been optimal. The native bluegrass, *Dichanthium sericeum* dominates in some areas, particularly to the north of the fence which forms the Lot 11/Lot 23 property boundary and in small patches at the eastern end of Dabin Station near Red Hill Road. These areas were searched thoroughly by two ecologists when the grasslands were in flower, and *D. setosum* was not present. Further, there are no records of *D. setosum* occurring in proximity to the Project area, with the nearest record is approximately 50 km to the northeast, from Homevale National Park (ALA, 2022).

Due to a lack of suitable native grasslands, extensive areas of Buffel Grass and other exotic species, heavy cattle grazing, and previous clearing activity, the species is considered unlikely to occur in the Project area. No habitat mapping has been prepared for this species.

The eastern end of the alignment is mapped as high risk for protected plants. This is due to records of *Dichanthium queenslandicum*. Although none were recorded in the June 2022 survey, and most grasses were flowering, a formal protected plant survey will be undertaken in areas of high-risk trigger mapping within 12 months of clearing (a requirement under Queensland legislative framework). Should the species be found, efforts will be made to avoid during clearing. If the species cannot be avoided, a suitable mitigation will be determined in consultation with DCCEEW/DoR.

7.6.4 Ornamental Snake

Preferred habitat comprises habitat of a size capable of supporting one or more breeding units, and/or important resources (such as major food sources), or the area is proximal to populations, or may act as a potentially important corridor. General habitat comprises habitat potentially used by transient individuals and may include areas of sub-optimal habitat (DoE 2019b). Preferred habitat constitutes seasonally inundated gilgai depressions on cracking clay soils where microhabitat features (deep soil cracks or woody debris) are present (Kerswell et al, 2020).

The species has been shown to occur in cleared areas of gilgai. The Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DSEWPC 2011) include cleared areas of gilgai for this species.

All areas of gilgai within the Project area have been mapped as preferred habitat for this species, based on the number of records during the March 2022 survey. This primarily occurs on Lot 23 in the western part of the alignment, and the north-south alignment on Lot 23 and Lot 11.

On Lot 411, habitat is generally lacking. Gilgai was only present in the Project area at the western end of the property, in a patch of 20 year-old Brigalow regrowth, which is not currently mapped as regulated vegetation. Additionally, the area around the dam at the old proposed compression facility location at the east end of the alignment is conservatively mapped as potential habitat.

Preferred habitat in the Project area is predominantly within non-remnant vegetation, in gilgai habitats. These non-remnant areas are dominated by grassland, predominantly introduced Buffel Grass on heavy cracking clay soils. Other grass species include *Eragrostis* species (Wiregrass) and *Sida cordifolia* (Flannel Weed). Within the gilgai, dominant grass species was frequently *Leptochloa ligulata (syn Dinebra ligulata)* (Spangletop). Soils were uniformly brown heavy cracking clay.

Areas of brigalow regrowth occurred within mapped non-remnant vegetation, at sporadic locations along the alignment, and were characterised by low clumps of Brigalow 1–4 m in height, sometimes within gilgai. Ground timber was generally sparse, and comprised small Brigalow branches.

Areas of connectivity/dispersal habitat have also been mapped between areas of preferred habitat (known or possible) on the basis that movement between these areas is likely, and these areas will act as connective habitat. This connectivity/dispersal habitat includes Brigalow communities away from areas of gilgai. This is consistent with the *Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles* (DSEWPC 2011) which includes connective habitat as being important for the species. Areas of connectivity/dispersal habitat relate to the area of RE 11.5.3/11.5.15 located between the two large gilgai expanses in the Project area on Lot 11, as well as the black soil areas on the east-west alignment of Lot 2. Gilgai and soil cracks in this section are absent, or at best very shallow and minor, and unlikely to be preferred habitat of Ornamental Snake, but may be utilised for dispersal into areas of better gilgai habitat. This includes all areas of clay dominated soils, claypans and open woodlands of coolabah, poplar box, and brigalow.

Comparison with the Agnew (2010, pers. comms.) criteria for habitat characteristics where this species has been found to be abundant, is provided below:

- **They are located within the lowest part of the catchment** – areas of gilgai habitat that are mapped as being preferred habitat are in lower lying areas.
- **They have diversity of gilgai size and depth (if deep, then broad with gently sloping gradients at the sides)** – areas that have been mapped as preferred habitat include a diverse range of gilgai sizes and profiles.
- **There are soils of high clay content and deep-cracking characteristics** – areas mapped as preferred habitat have clay based soils, with cracking characteristics, which offers refugia for this species.
- **Ground timber is usually relatively common (especially piles adjacent to or close by to gilgai)** – ground timber is not abundant in any of the gilgai areas of the Project area however it is present sporadically throughout.
- **Where burrowing frogs (*Cyclorana* species) are abundant** – Green-striped Frog (*Cyclorana alboguttata*) and other frog species were recorded frequently in the gilgai habitats during the March 2022 surveys. Locations frogs were recorded are shown on Figure 7.5.
- **Habitat patches are typically greater than 10 hectares in area and are within, or connected, to larger areas of remnant vegetation** – the areas of gilgai mapped as preferred habitat are large expanses of gilgai, close to areas of remnant Brigalow vegetation in some instances. The gilgai is widely distributed throughout the study area.

A total of 36.05 ha of preferred habitat and 19.62 ha of connectivity/dispersal habitat between areas of preferred habitat is mapped in the Project area. Although gilgai habitat is not present in these connectivity habitat areas, the species could move across these areas between gilgai patches. This is consistent with the Draft Referral Guidelines for nationally listed Brigalow Belt reptiles as stated above. Mapping is based on aerial imagery and in-field observations.

Habitat mapping for this species is shown on Figure 7.5.

Within the study area, all areas of the following REs are mapped as potential habitat for the species based on the referral guidelines (DSEWPC 2011):

- RE 11.4.3 – *Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains.
- RE 11.4.6 – *Acacia cambagei* woodland on Cainozoic clay plains.

- RE 11.4.8 – *Eucalyptus cambageana* open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains.
- RE 11.4.9 – *Acacia harpophylla* shrubby open forest with *Terminalia oblongata* on Cainozoic clay plains.
- RE 11.5.16 – *Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains/remnant surfaces.

Additionally, areas of land zone 4 in the preclear RE mapping (relating to clay plains) are included as potential habitat.

These areas are shown on Figure 7.10, and have not been subject to groundtruthing to determine status and extent. There are approximately 25,169 ha of potential Ornamental Snake habitat in the study area.

7.6.5 Squatter Pigeon

Squatter Pigeon can utilise a broad range of habitats including remnant, regrowth, non-remnant, and modified vegetation communities with nearby access to permanent surface water (typically within 1–3 km). Generally, they are recorded in open *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* dominated communities, and occur in their highest densities in those habitats with abundant and diverse native grasses (primary foraging resource).

The species also shows soil and landscape associations with foraging and breeding primarily recorded from flat alluvial plains, gently sloping and undulating plains, as well as low hilly terrain with well-drained, sandy, or loamy soils. Breeding in these areas only generally occurs within 1 km of a permanent water source (artificial or natural) (Squatter Pigeon Workshop 2011).

Soil landscapes are good indicators of where natural, foraging and breeding habitats for the Squatter Pigeon (southern) occur (Squatter Pigeon Workshop 2011). Well-draining, gravelly, sandy or loamy soils support the open-forest to woodland communities with patchy, tussock-grassy understories that support the subspecies' foraging and breeding requirements. Given that the subspecies nests in shallow depressions on the ground, it requires well-draining soils. The species foraging and breeding habitats are known to be associated with landzones 3, 5 and 7 of which only landzones 3 and 5 occurs in the Project area.

As such, the following criteria provided by DCCEEW is used to map Squatter Pigeon habitat in the Project area (DCCEEW criteria provided in italics with further commentary in non-italic text):

- **Breeding habitat** – *any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5, 7) and within 1 km of a suitable, permanent or seasonal waterbody.*

  Waterbodies have been mapped to include stream order 1 and above as well as dams identified on site and through aerial imagery.

- **Foraging habitat** – *any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including but not limited to areas mapped as Queensland land zones 3, 5, 7) and within 3 km of a suitable, permanent or seasonal waterbody.*

  Waterbodies have been mapped to include stream order 1 and above as well as dams identified on site and through aerial imagery. Areas considered unsuitable for the species (dense weedy groundcover) have been excluded from mapping entirely. Therefore, some foraging areas have been added additionally to the potential breeding habitat to capture the cleared tracks that the species has been observed foraging on or is likely to forage on, but does not form breeding habitat (open tracks with little ground cover).

- **Dispersal habitat** – *any forest or woodland occurring between patches of foraging or breeding habitat that facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies, and areas of cleared land less than 100 m wide linking areas of suitable breeding and/or foraging habitat.*

  As well as mapped remnant and regrowth vegetation communities (using ground-truthed mapping in the Project area) some non-remnant areas have been mapped as dispersal habitat for this species, as scrub is present and the species could move through these areas between patches of breeding or foraging habitat.

Once the above habitat was initially mapped, it was further refined based on observations made in the field as much of the Project area is considered too weedy and densely vegetated for the species to occur (e.g. areas of dense Buffel Grass) or areas on heavy clay soils (landzone 4). Particularly within areas of Project infrastructure in the centre of the Project area, the habitat is typically unsuitable for the species. Much of the Project area is dominated by areas of dense Buffel Grass groundcover, which differs from the patchy tussock grassy understories of open woodland favoured by the species. Feeding opportunities are restricted in such dense weedy understoreys, and the potential for predation is increased. Therefore, dense Buffel Grass areas have been excluded from mapping.

Other habitat factors described above restrict the suitability for the species. Squatter Pigeon are unlikely to move far from woodland trees which provide shelter (Squatter Pigeon Workshop 2011). Where scattered trees occur, and the distance of cleared land between patches of habitat does not exceed 100 m, individuals may be found foraging or dispersing across modified environments (Squatter Pigeon Workshop 2011).

A total of 9.55 ha of breeding habitat, 19.98 ha of foraging habitat and 2.15 ha of dispersal habitat is mapped within the Project area.

Habitat mapping for this species is shown on Figure 7.6.

Within the study area, habitat mapping follows the criteria described above for the Project area, based on regulated vegetation mapping and utilising preclear RE mapping to incorporate cleared areas that could comprise habitat for the species.

These areas are shown on Figure 7.11, and have not been subject to groundtruthing to determine status and extent. There are approximately 20,680 ha of potential Squatter Pigeon (breeding) habitat and 3,927 ha of potential Squatter Pigeon (foraging) habitat in the study area.

7.6.6 Koala

Although assessed as having a low potential to occur in the Project area this species has been conservatively assessed in the significant residual impact assessments. DCCEEW has identified this species as being on a high priority list due to the extensive bushfires which occurred in 2019–2020 in southern and eastern Australia and although they are not considered likely to occur on site, and have not been recorded to date, assessments have been carried out based on their potential presence.

No individuals were recorded, and no scratches or scats associated with the species were recorded. If present, the species is likely to be restricted to areas where sparse *Eucalyptus cambageana* are present, or the patch of RE 11.5.3/11.5.15 on Lot 11 or a patch of *Eucalyptus orgadophila* open grassy woodland on Lot 2. However, this habitat is marginal. The remainder of the Project area is largely cleared and dominated by regrowth Acacia.

Conservatively, any forest or woodland containing species that are known Koala food trees, or shrubland with emergent food trees (following EPBC Act referral guidelines for the vulnerable Koala (DoE 2014)) is considered potential Koala habitat. This includes mixed Eucalypt regrowth or modified vegetation communities, or shrubland containing emergent Koala food trees. Koala food trees typically consist of the following genera in order of general preference:

- Eucalyptus

- Corymbia
- Angophora
- Lophostemon
- Melaleuca.

The DCCEEW guideline provides a 'koala habitat assessment tool' to assist in the determining the sensitivity, value and quality of lands potentially impacted under development proposals. Formal assessments of Koala habitat in the Project area following the EPBC Act referral guidelines (DoE 2014) are provided in Table 7.2.

Low quality and low potential Koala habitat in the Project area includes areas of vegetation (including remnant, regrowth and areas of non-remnant) that contain eucalypt species. For the purposes of this assessment, all potential Koala habitat is combined and assessed.

A total of 5.0 ha of low potential habitat is mapped within the Project area.

Habitat mapping for this species is shown on Figure 7.7.

Within the study area, any remnant/regrowth woodland dominated by Eucalyptus species in study area has been mapped as potential habitat. This corresponds to any Eucalypt or Corymbia dominated broad vegetation group (BVG). All other areas are potential dispersal habitat.

These areas are shown on Figure 7.12, and have not been subject to groundtruthing to determine status and extent. There are approximately 21,761 ha of potential Koala habitat and 46,408 ha of dispersal habitat in the study area.

7.6.7 Greater Glider

This species utilises eucalypt forest and woodland with mature trees containing abundant hollows, which it uses for shelter. There are some isolated mature trees (*E. cambageana*) with hollows within the high-pressure pipeline and buffer areas of the Project area however these do not form part of a contiguous woodland and habitat is not suitable for this species.

There is a small section of the alignment on Lot 11 that contains RE 11.5.3 – *Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces. This woodland is mapped correctly and contains *E. crebra* and *C. clarksoniana* trees around 14 m high. Some hollows are present, but they are relatively scarce (approximately five per hectare) and small in size, as the woodland appears to have been subject to selective clearing in the past. Due to the open nature of the canopy, small numbers of hollows and lack of connectivity to more optimal Greater Glider habitat, this area is conservatively considered marginal habitat for Greater Glider, and should be confirmed through nocturnal spotlighting surveys at a later date.

Areas of RE 11.5.3 on Lot 2 are unsuitable for Greater Glider, as they have been cleared in the past and have now regrown to achieve remnant status. However, hollows have not yet developed in the canopy trees, so no denning habitat for the glider is present.

Habitat (as informed by the *Draft Consultation on Species Listing Eligibility and Conservation Actions Petauroides volans* (Greater Glider (southern)) (DAWE 2021) is present if suitable large hollow bearing trees containing hollows greater than 8 cm (Gibbons & Lindenmayer 2002) are present.

The Project area is considered unsuitable as denning habitat for Greater Glider due to the dominant vegetation communities of small statured woodlands with a lack of hollows, sparse canopy cover, low canopy height and small diameter at breast height (DBH). This small stature is likely due to previous large-scale clearing activities which have essentially reduced the age of the dominant vegetation species across the Project area below that necessary to produce the large hollows (typically >100 years required for this species).

This species utilises eucalypt forest and woodland with mature trees containing abundant hollows, which it uses for shelter. There are some isolated mature trees (*E. cambageana*) with hollows within the high-pressure pipeline and buffer areas of the Project area however these do not form part of a contiguous woodland and habitat is not suitable for this species.

These areas were subject to repeated nights spotlighting in November 2022 and no Greater Glider were observed.

The species is considered unlikely to occur in the Project area. No habitat mapping has been prepared for this species.

7.6.8 White-throated Needletail

No habitat map has been prepared for this species as it is an aerial insectivore that spends most of its time aloft, and could occur anywhere over the Project area, therefore the whole Project area is considered potential foraging habitat.

The species does not breed in Australia, and as a wide-ranging nomadic species, foraging habitat also provides a surrogate for dispersal habitat.

Mature woodland in the Project area may provide potential roosting habitat for White-throated Needletail. It is thought that the number of references to Needletails roosting in trees possibly over-emphasizes such occurrences (DAWE 2021d).

The Project area contains 7.04 ha of potential roosting habitat and 65.05 ha of potential foraging habitat for White-throated Needletail.

7.6.9 Fork-tailed Swift

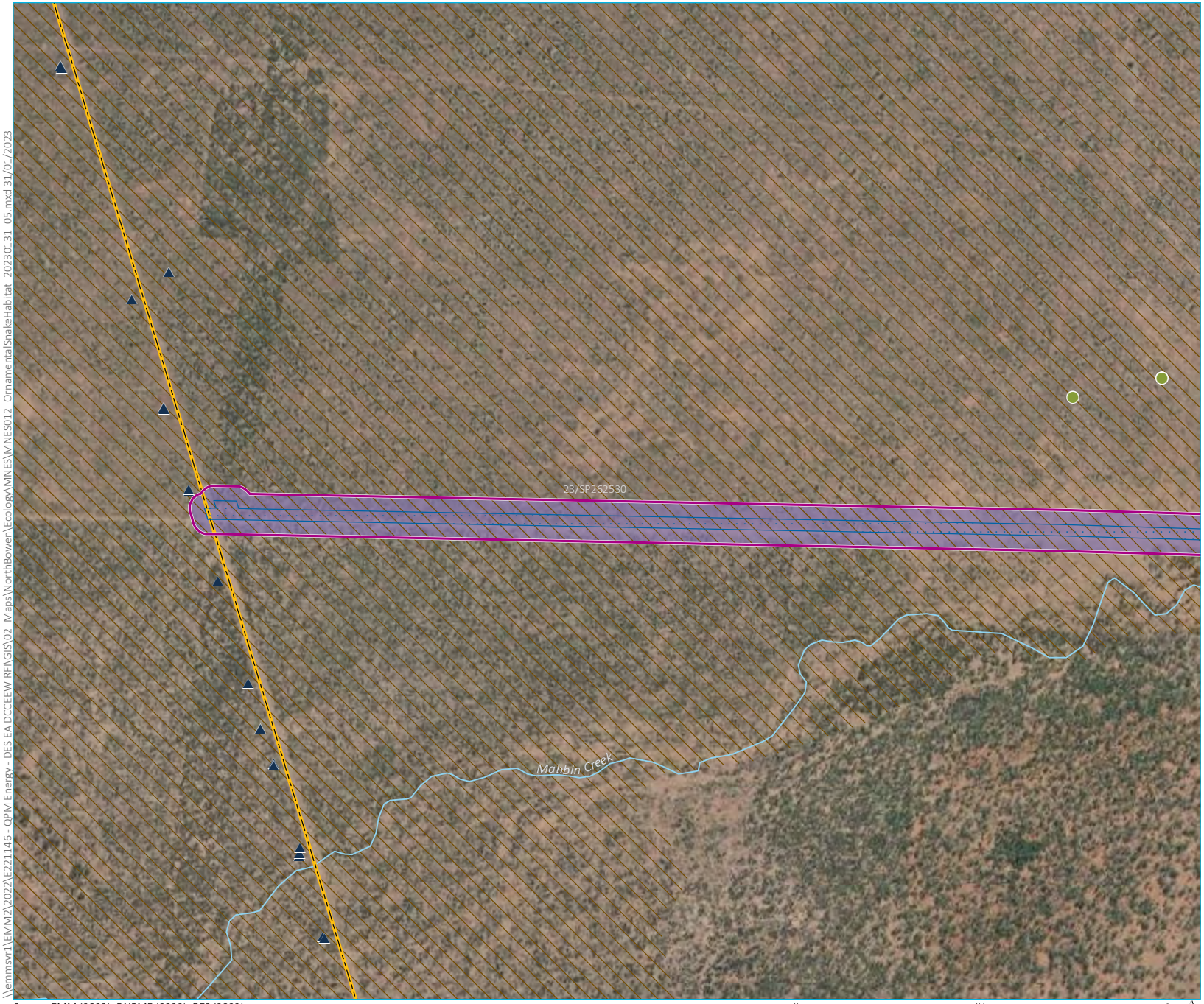
No habitat map has been prepared for this species as it is an aerial insectivore that spend most of their time aloft, and could occur anywhere over the Project area, therefore the whole Project area (65.05 ha) is considered potential foraging habitat. The species does not breed in Australia, and as a wide-ranging nomadic species, foraging habitat also provides a surrogate for dispersal habitat.

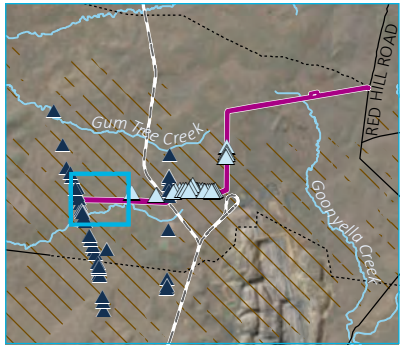
7.6.10 Latham's Snipe

This species occurs in shallow freshwater wetlands, of both an ephemeral and permanent nature across eastern Australia. Habitat includes a variety of wetland types, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub.

Habitat is present within the Project area within areas of gilgai. A total of 36.05 ha of potential habitat is mapped within the Project area.

Habitat mapping for this species is shown on Figure 7.8.





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Preferred

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES012 OrnamentalSnakeHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

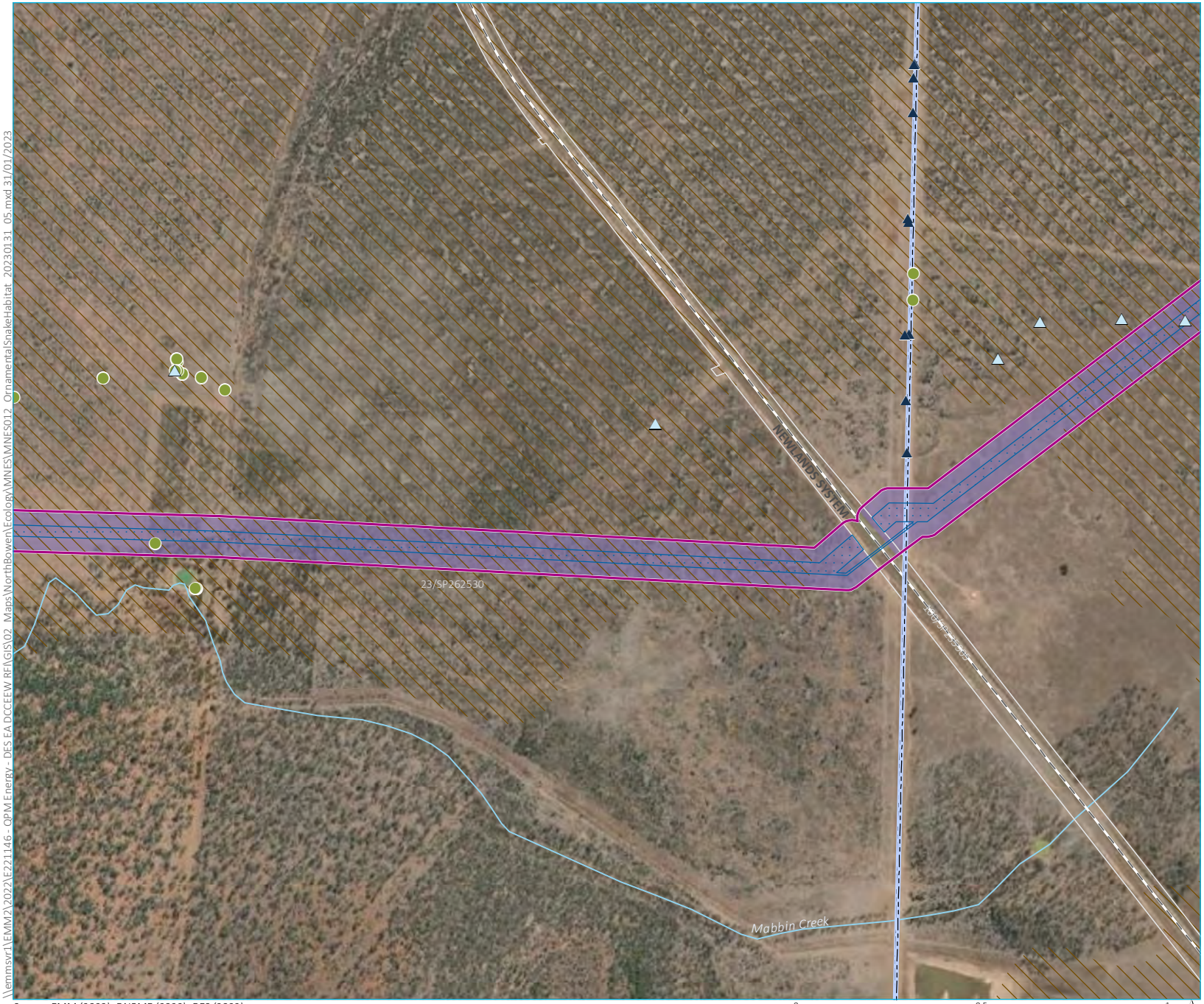
GDA 1994 MGA Zone 55

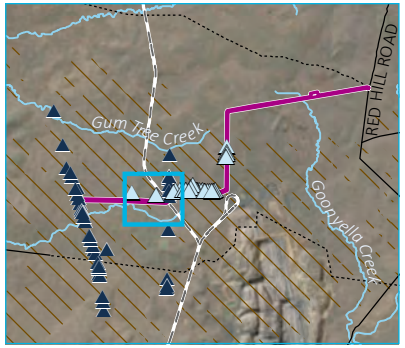
N

Ornamental Snake habitat within the project area Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities





KEY

- Project area
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- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Preferred

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

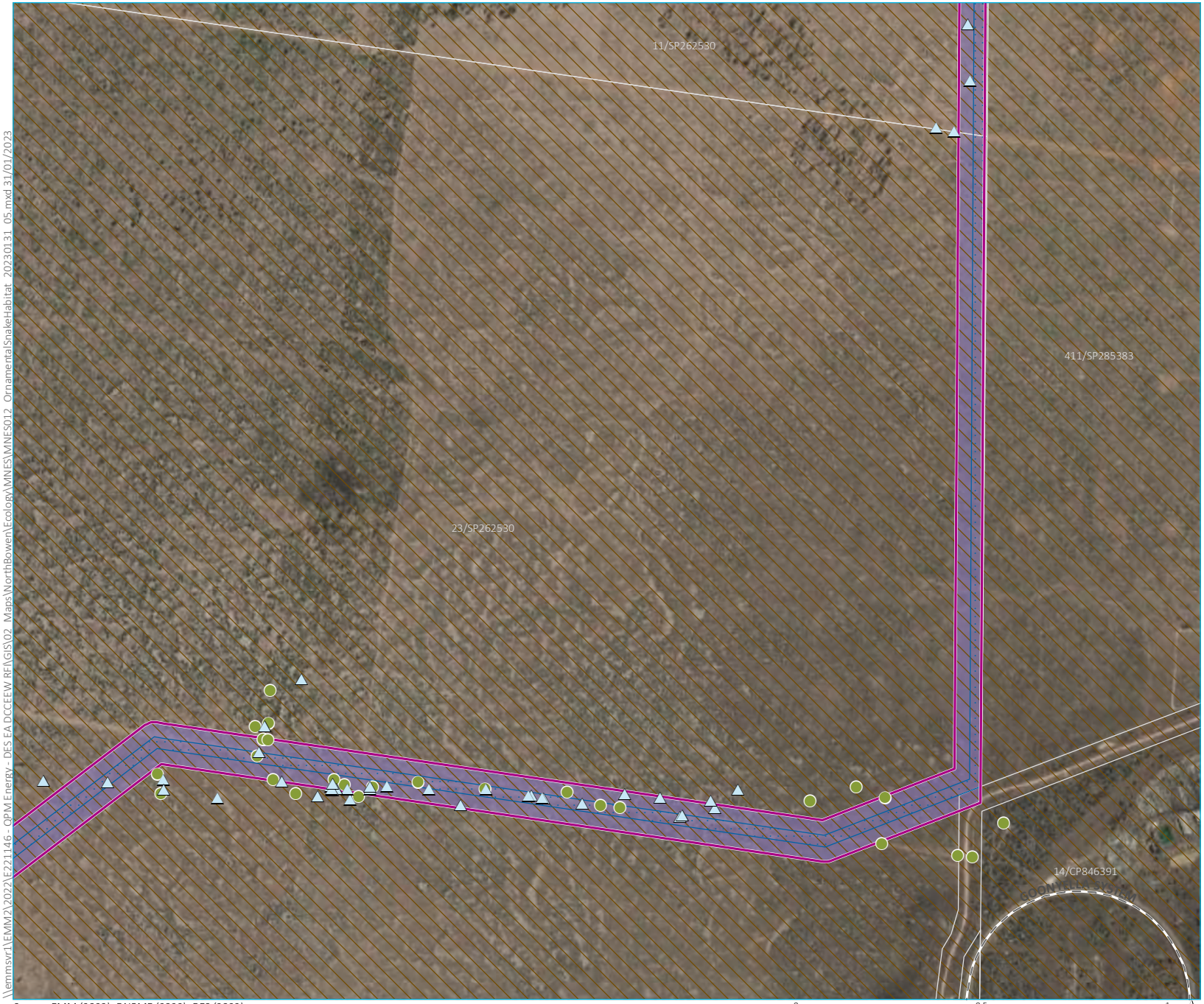
N

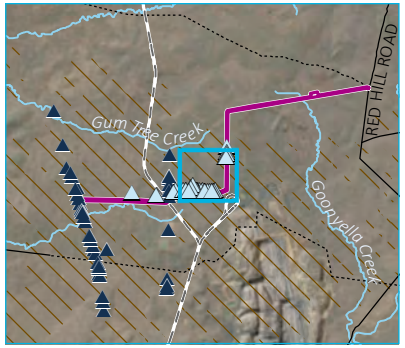
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES012 OrnamentalSnakeHabitat 20230131 05.mxd 31/01/2023

Ornamental Snake habitat within the project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Preferred

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES012 OrnamentalSnakeHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

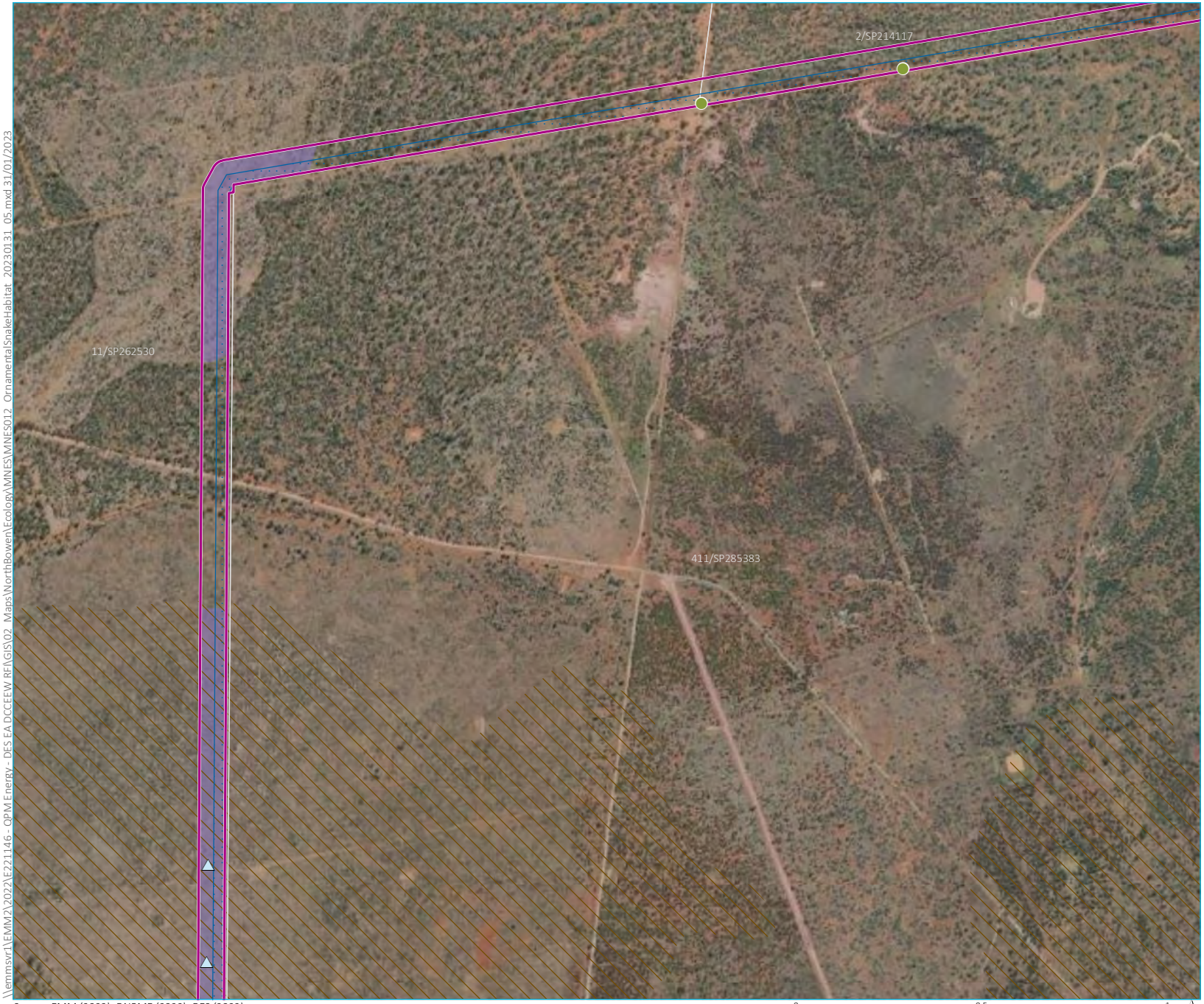
GDA 1994 MGA Zone 55

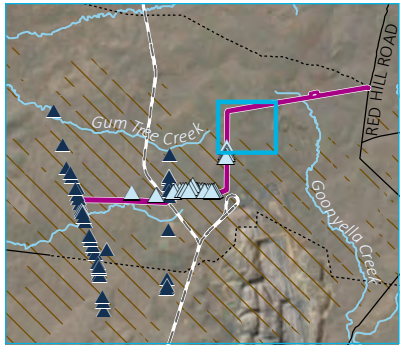
N

Ornamental Snake habitat within the project area Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Preferred
- Connectivity

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES012 OrnamentalSnakeHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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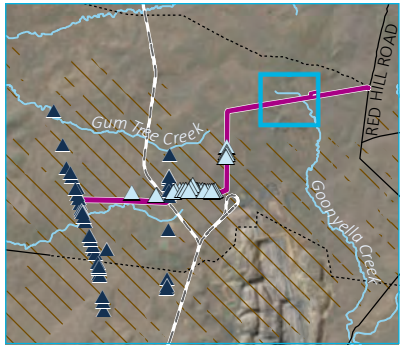
Ornamental Snake habitat within the project area Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Connectivity

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02_Maps\NorthBowen\Ecology\MNES\MNES012_OrnamentalSnakeHabitat_20230131_05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

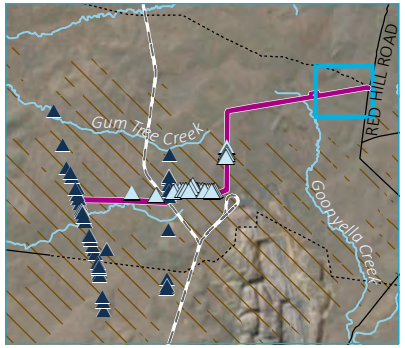
GDA 1994 MGA Zone 55

N

Ornamental Snake habitat within the project area
Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Preclear land zone 4
- Frog sighting (EMM)

Ornamental Snake records

- EMM
- Wildnet

Ornamental Snake habitat

- Connectivity

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES012 OrnamentalSnakeHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022); DES (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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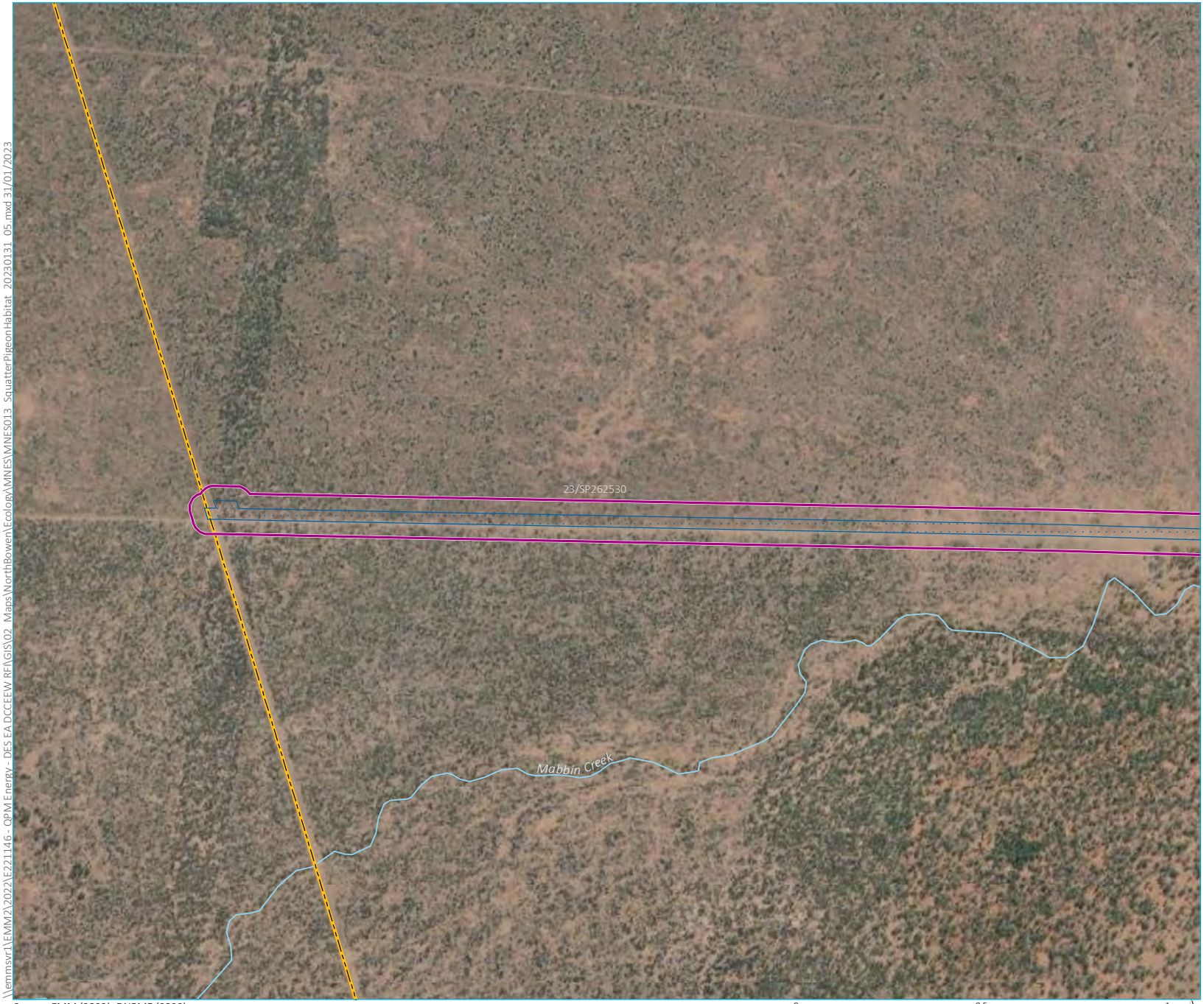
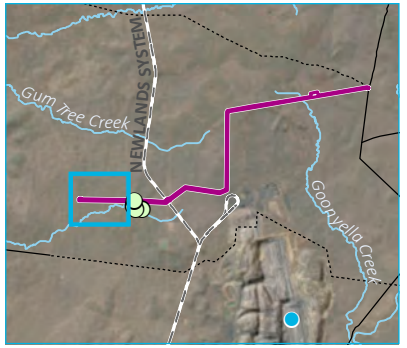
Ornamental Snake habitat within the project area
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.5

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

Source: EMM (2023); DNRME (2022)

0 0.5 1 km

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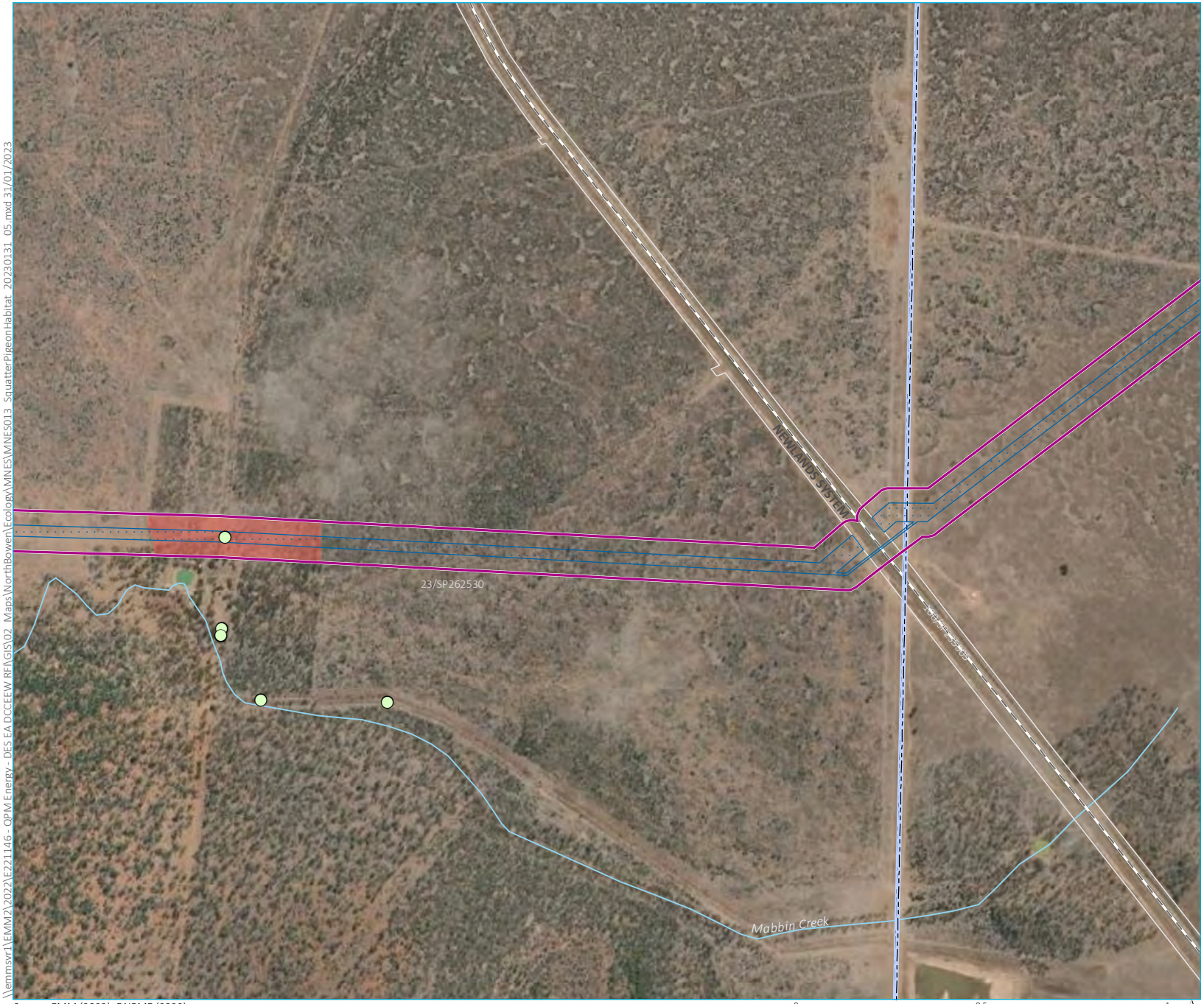
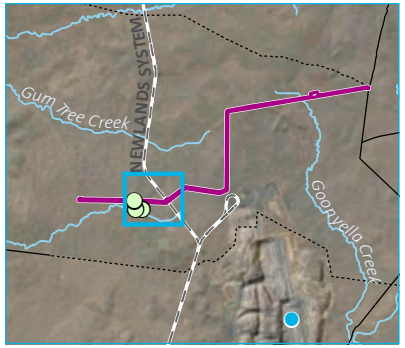
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Squatter Pigeon habitat within the project area Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

Squatter Pigeon habitat

- Breeding

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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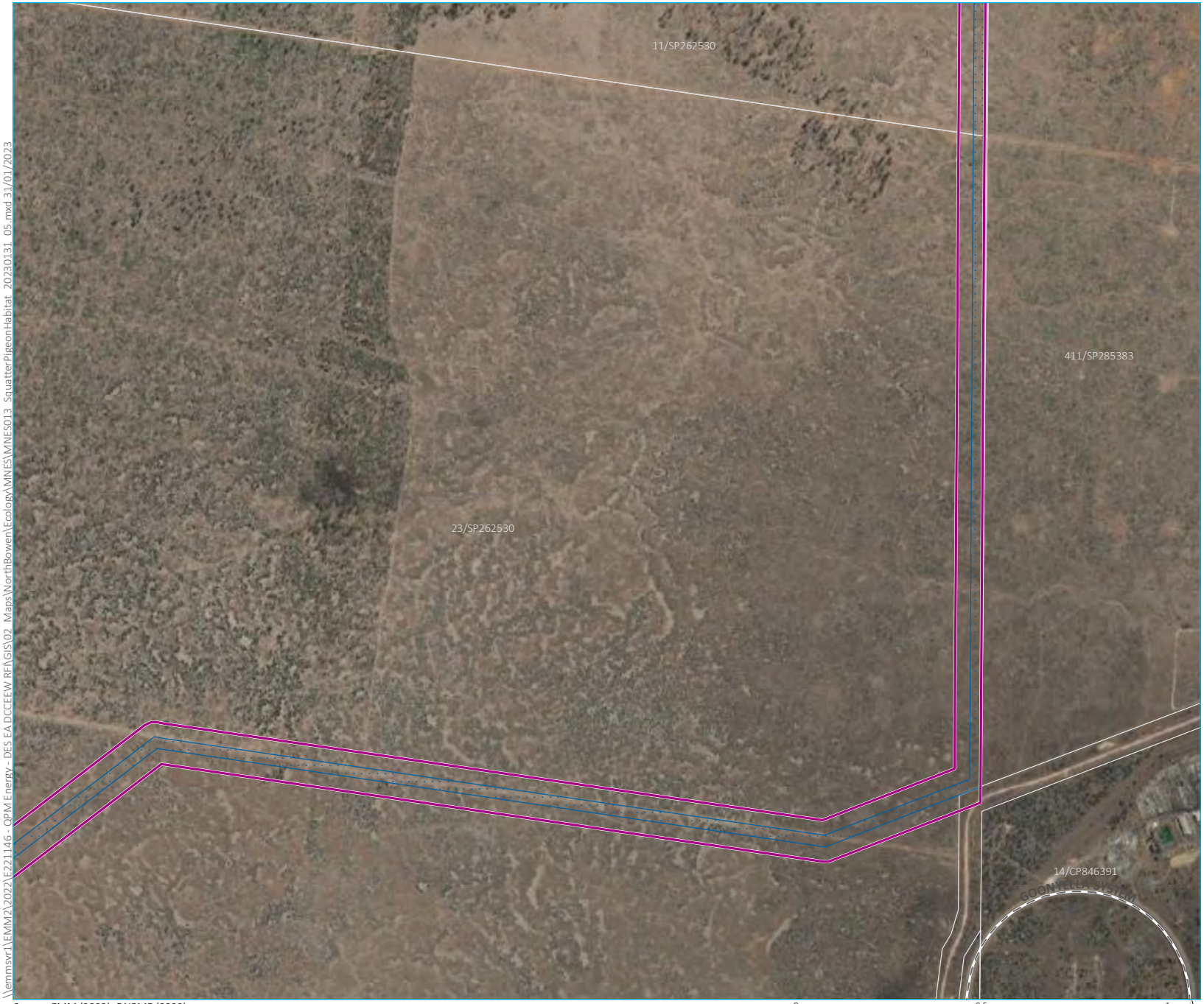
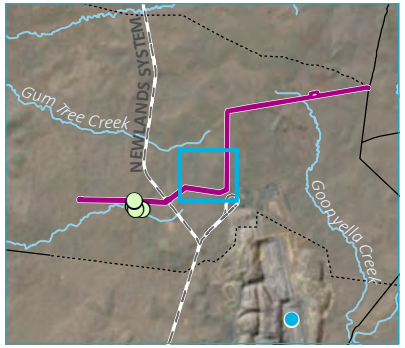
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Squatter Pigeon habitat within the project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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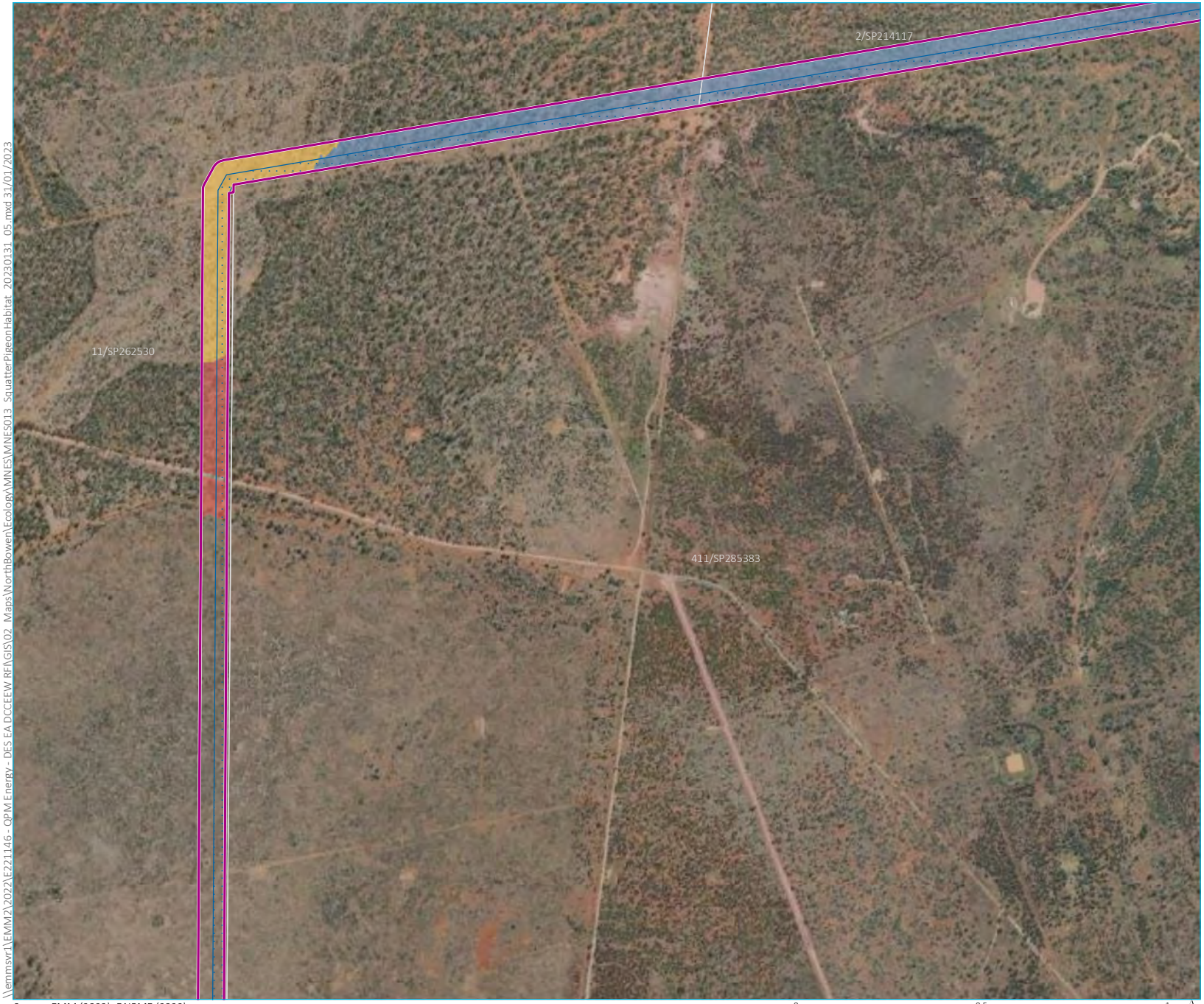
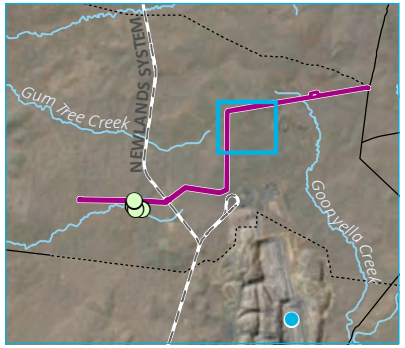
Squatter Pigeon habitat
within the project area
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

Squatter Pigeon habitat

- Breeding
- Foraging
- Dispersal

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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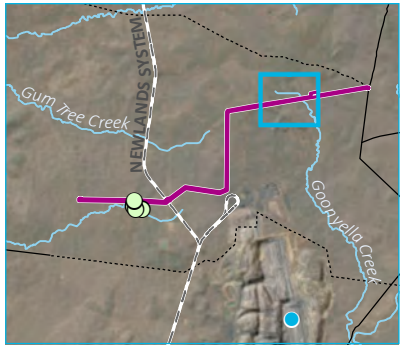
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Squatter Pigeon habitat within the project area Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

Squatter Pigeon habitat

- Breeding
- Foraging

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

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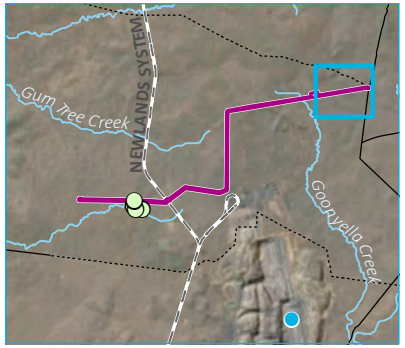
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Squatter Pigeon habitat within the project area Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Squatter Pigeon records

- EMM
- Wildnet

Squatter Pigeon habitat

- Breeding
- Foraging

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES013 SquatterPigeonHabitat 20230131 05.mxd 31/01/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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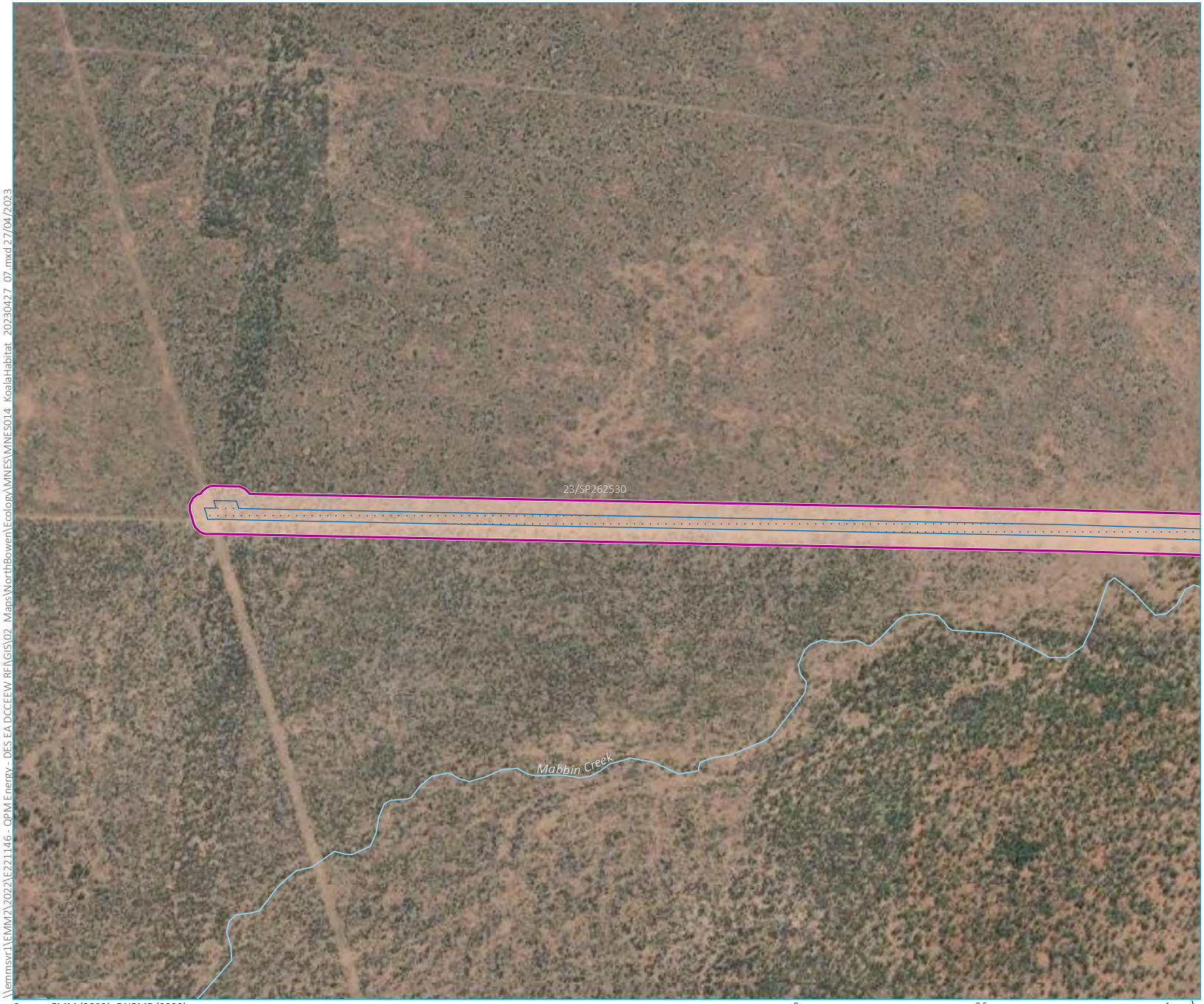
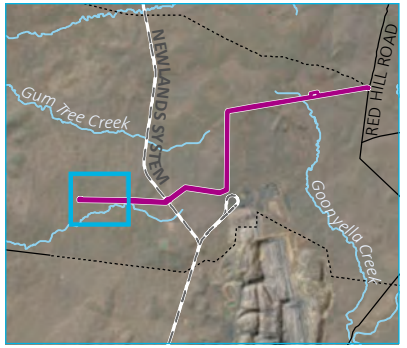
Squatter Pigeon habitat
within the project area
Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.6

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Koala habitat

- Low potential cleared or Acacia regrowth dispersal habitat

Source: EMM (2023); DNRME (2022)

0 0.5 1 km

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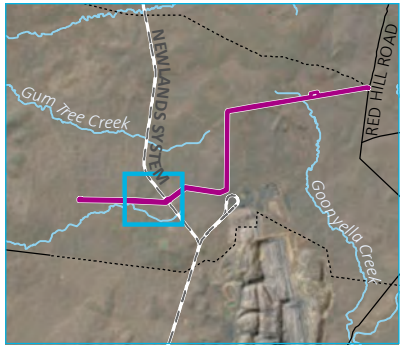
Koala habitat
within the project area
Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM
creating opportunities

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES014 KoalaHabitat 20230427 07.mxd 27/04/2023



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Koala habitat

- Low potential cleared or Acacia regrowth dispersal habitat

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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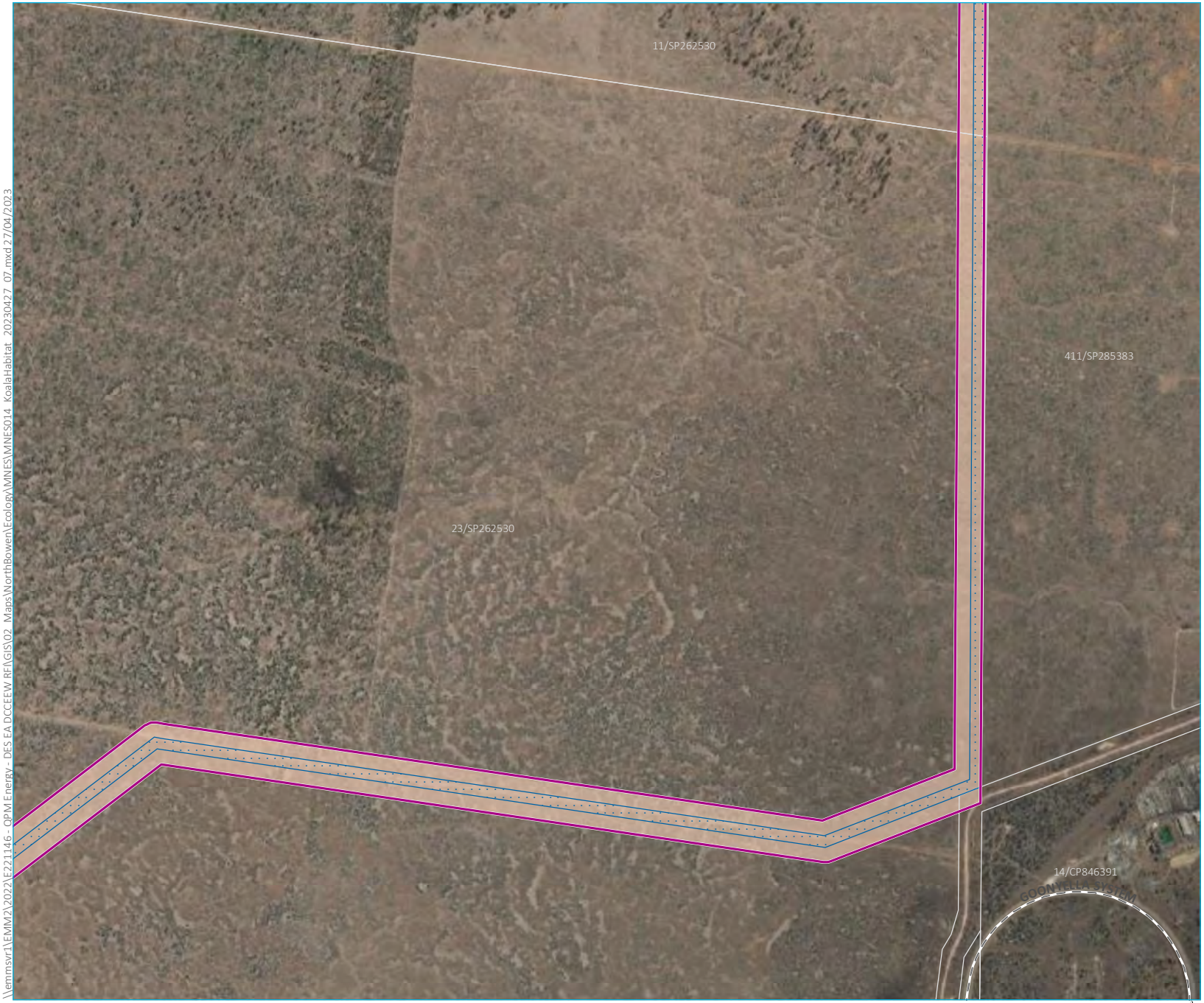
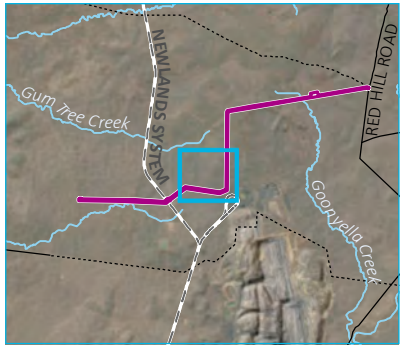
\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02_Maps\NorthBowen\Ecology\MNES\MNES014_KoalaHabitat_20230427_07.mxd 27/04/2023

Koala habitat within the project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Koala habitat

- Low potential cleared or Acacia regrowth dispersal habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES014 KoalaHabitat 20230427 07.mxd 27/04/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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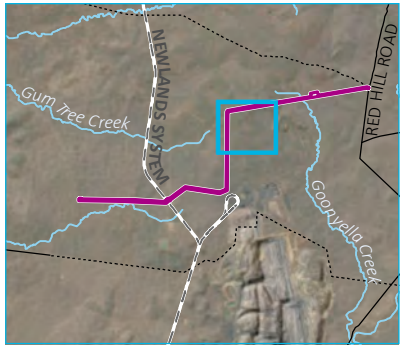
Koala habitat within the project area Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary

Koala habitat

- Potential
- Low potential cleared or Acacia regrowth dispersal habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES014 KoalaHabitat 20230427 07.mxd 27/04/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

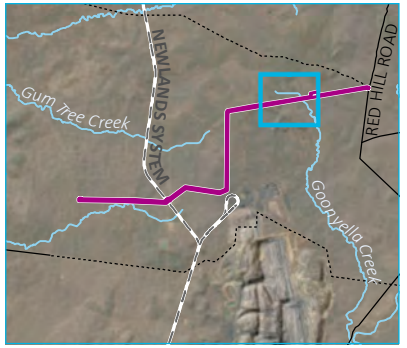
GDA 1994 MGA Zone 55

N

Koala habitat within the project area Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Koala habitat

- Potential
- Low potential cleared or Acacia regrowth dispersal habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02_Maps\NorthBowen\Ecology\MNES\MNES014_KoalaHabitat_20230427_07.mxd 27/04/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

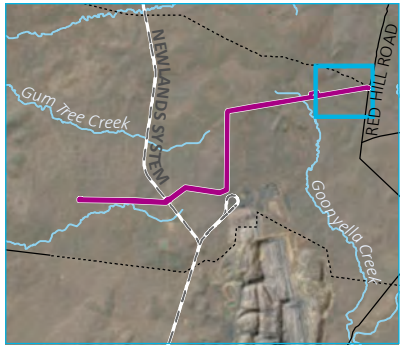
GDA 1994 MGA Zone 55

N

Koala habitat within the project area Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

Koala habitat

- Low potential cleared or Acacia regrowth dispersal habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES014 KoalaHabitat 20230427 07.mxd 27/04/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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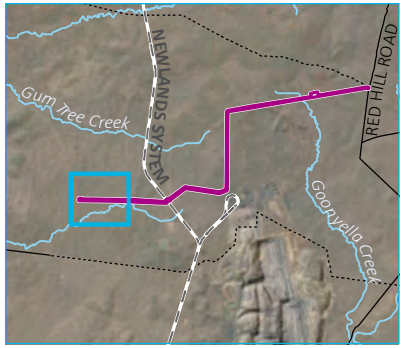
Koala habitat within the project area Map 6 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.7

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- North Queensland Gas Pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Potential Latham's Snipe habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES016 LathamsSnipeHabitat 20230309 06.mxd 9/03/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

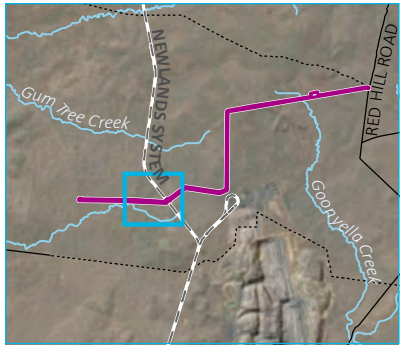
GDA 1994 MGA Zone 55

N

Latham's Snipe habitat within the project area Map 1 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.8

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary
- Potential Latham's Snipe habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES016 LathamsSnipeHabitat 20230309 06.mxd 9/03/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

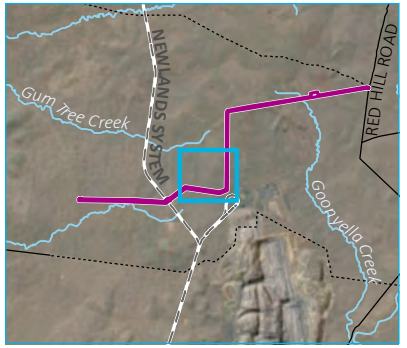
GDA 1994 MGA Zone 55

N

Latham's Snipe habitat within the project area Map 2 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.8

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Potential Latham's Snipe habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES016 LathamsSnipeHabitat 20230309 06.mxd 9/03/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

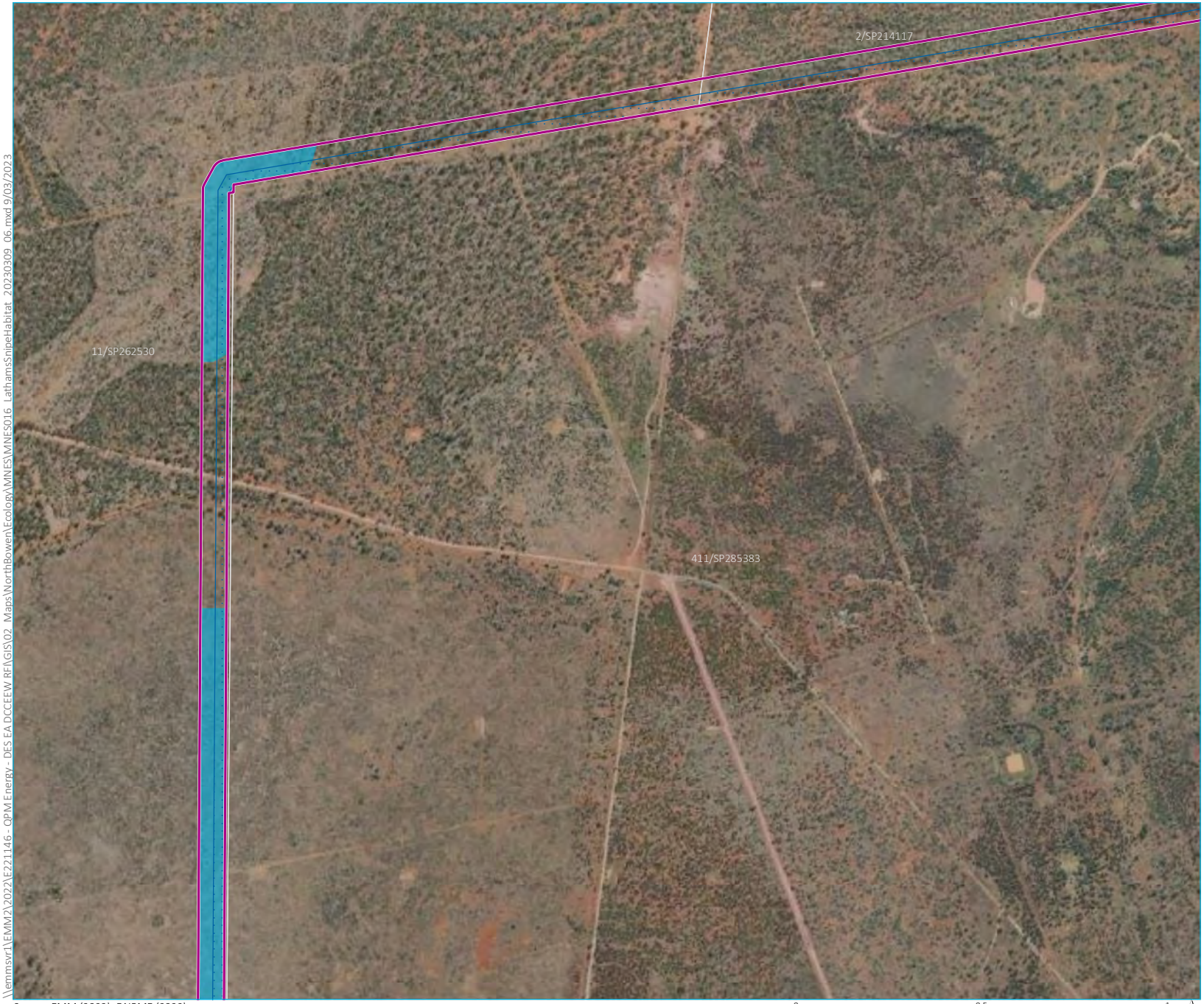
GDA 1994 MGA Zone 55

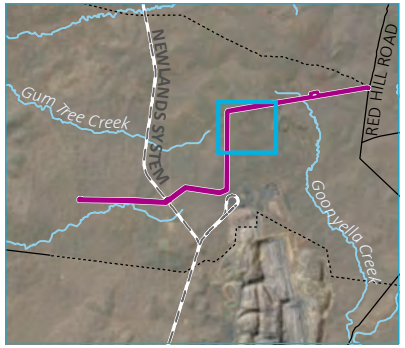
N

Latham's Snipe habitat
within the project area
Map 3 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.8

EMM
creating opportunities





KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Cadastral boundary
- Potential Latham's Snipe habitat

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02 Maps\NorthBowen\Ecology\MNES\MNES016 LathamsSnipeHabitat 20230309 06.mxd 9/03/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

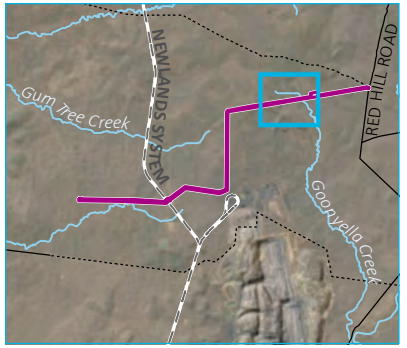
GDA 1994 MGA Zone 55

N

Latham's Snipe habitat within the project area Map 4 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.8

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

\\emmsvr1\EMM2\2022\E221146 - QPM Energy - DES EA DCCEEW RFI\GIS\02_Maps\NorthBowen\Ecology\MNES\MNES016_LathamsSnipeHabitat_20230309_06.mxd 9/03/2023

Source: EMM (2023); DNRME (2022)

0 0.5 1 m

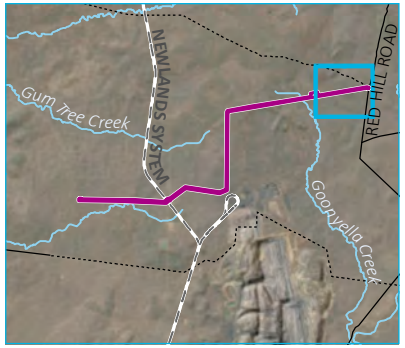
GDA 1994 MGA Zone 55

N

Latham's Snipe habitat within the project area Map 5 of 6

QPM Energy Project
MNES Preliminary Documentation
Figure 7.8

EMM creating opportunities



KEY

- Project area
- Proposed disturbance footprint
- Electrical transmission line
- Water pipeline
- Rail line
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary

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Source: EMM (2023); DNRME (2022)

0 0.5 1 m

GDA 1994 MGA Zone 55

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Latham's Snipe habitat
within the project area
Map 6 of 6

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EMM
creating opportunities