QEM

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A Montrose Environmental Company

Initial Advice Statement

QEM Limited
Julia Creek Vanadium and Energy Project
Julia Creek, Queensland
BAA240062.01
11 October 2024

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EXECUTIVE SUMMARY

ES 01 Initial Advice Statement Purpose

This Initial Advice Statement (IAS) for the Julia Creek Vanadium and Energy Project (the Project) located in Queensland's North West Minerals Province (NWMP) is prepared by QEM Limited (QEM) in accordance with Part 4, Subdivision 2, Section 27AB of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The purpose and scope of the IAS is to present a clear and concise narrative of the Project and to allow the Coordinator-General to consider Project details against the criteria in Section 27 of the SDPWO Act to determine whether to declare the Project a Coordinated Project.

RPM Global Advisory Services recently completed an updated Scoping Study (RPM Global 2024) for the Project on behalf of QEM. The Scoping Study approach was comprehensive, supported by substantial background studies and test work that demonstrated robust economic outcomes and no significant issues to prevent the Project from progressing to a pre-feasibility study. The Net Present Value (after-tax) of approximately $1,106 Million (M) (Australian Dollars (AUD), 8% discount rate), Internal Rate of Return of 16.3%, and a payback period of 5 years from the start of mining show strong economic outcomes. The Project's total projected revenue is approximately AUD 21.7 Bn, with 53% expected to come from V_2O_5 and 47% from transport fuel. QEM has committed capital funding to continue the Project's development and has a commitment to proceed to a pre-feasibility study.

Vanadium is identified as a critical mineral under regulation 98B and Schedule 4A of Queensland's *Mineral Resources Regulation 2013* and Australia's Critical Minerals List essential for manufacturing key technologies such as Vanadium Flow Batteries (VFB) that will help the world transition to net zero emissions. The location of the Project is within both the NWMP and the recently created Julia Creek and Richmond Critical Mineral Zone. The Project is strategically aligned with the critical mineral strategies of the Queensland and Australian Governments to support a strong pipeline of new critical minerals projects that can assist in the global economic and energy transition in response to climate change. The project will assist the Queensland Government in achieving the objectives of the New Industry Development Strategy, Battery Industry Strategy 2024-2029 and the Energy and Jobs Plan.

QEM considers that the information provided in the IAS allows the Coordinator-General to make a Coordinated Project declaration given the complexity of the Project, its value to Queensland and potential environmental impacts, for which the primary approval pathway would be an Environmental Impact Statement (EIS) under the SDPWO Act.

ES 02 Reasons for Seeking Coordinated Project Declaration

QEM considers that the Project is eligible for declaration as a Coordinated Project under the SDPWO Act for the following key reasons:

- Requires local, State and Commonwealth approvals
- Requires a comprehensive environmental impact assessment
- Has significant on-lease and off-lease infrastructure requirements
- Has potential to be of strategic significance to the region, State and Commonwealth including but not limited to social and economic benefits, employment opportunities and capital investment

ES 03 Identify the Proponent, Nature, Scope and Location

QEM (ASX:QEM) is an Australian Stock Exchange (ASX)-listed mining company focused on the exploration and development of the Project. The nature of the Project includes the development of an open-cut mining operation, with an estimated life of mine (LOM) of 30 years and on-site processing facilities to produce high-purity vanadium pentoxide (V_2O_5) at a rate of 10,571 tonnes per year and transport fuel products up to 313 million litres per year.

The mineral resource is globally significant and is estimated to contain 2,870 million tonnes (Mt) of V_20_5 at an average concentration of 0.31% with 461 Mt in the Indicated category and 2,406 Mt in the Inferred category. This makes the resource one of the single largest vanadium deposits in the world, with the added benefit of a contingent (SPE-PRMS 2018) in-situ oil resource of 6.3 million barrels (MMBBls) of Oil equivalent in the 1C

category, 94MMBBls in the 2C category, and 654MMBBls in the 3C category, contained within the same ore body.

The geological confidence of the production is high for a Scoping Study (RPM Global 2024) with over 80% of the process plant feed Indicated Resources, with the remaining classified as Inferred. Pre-production capital expenditure is estimated at approximately $791M AUD excluding contingency costs and indirect costs such as owner's and EPCM costs. Inclusive of contingency costs and indirect costs, pre-production capital expenditure is estimated at $1,096M AUD. The sustaining capital to maintain the Project over the operational period of 30 years is estimated at $598 M (AUD) or approximately $20 Million per year (M/year) (AUD). The Project is located approximately 16 kilometres (km) southeast of the Julia Creek township which is approximately 650 km west of Townsville and 250 km east of Mount Isa. Julia Creek is within the McKinlay Shire Council Local Government Area with Julia Creek serving as a hub for the surrounding agricultural and mining activities and essential amenities and services for residents and workers in the area.

ES 04 Key Potential Environmental Issues

Key environmental impacts have been identified in the IAS that are anticipated to be 'project-specific matters' in the ToR and will require detailed treatment through impact assessments in the EIS. The key environmental impacts identified include land disturbance, ecology, surface water quality, groundwater quality, air quality, greenhouse gas emissions, noise emissions, social, cultural heritage, waste and hazards. Preliminary best practice environmental management measures to protect environmental values have been identified and will be subject to further assessment in the EIS. Example management measures identified for the Project include a Construction Environmental Management Plan, Operational Environmental Management Plan, Greenhouse Gas Abatement Plan, Cultural Heritage Management Plan, Community and Stakeholder Engagement Plan, Social Impact Management Plan and Hazards and Risk Assessment.

ES 05 Key Approvals

Given the scale and complexity of the Project, there is a need to coordinate with and obtain various approvals from Commonwealth, State and Local Government departments in accordance with relevant legislation. A range of secondary approvals, permits and licences will also be necessary, which will be confirmed as part of the EIS process as the scope of the Project is refined.

The primary approval pathway identified for the Project is an EIS under the SDPWO Act. QEM is aware that the EIS evaluation process is not an approval in and of itself; however, interacts with downstream approval processes required following an evaluation report. This includes approvals under the *Planning Act 2016* (Planning Act) and the *Environmental Protection Act 1994* (EP Act).

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (*EPBC Act) requires assessment and approval for any activity or action that will have, or is likely to have, a significant impact on a matter of national environmental significance (MNES). Of the nine MNES listed under the EPBC Act, QEM has identified the Project has potential to impact on "listed threatened species and ecological communities". The potential for the Project to impact on MNES means a referral was made to the Commonwealth on the 3rd October 2024 for a determination as to whether the proposed relevant action constitutes a "controlled action" under the EPBC Act. If deemed a "controlled action", the Commonwealth will request a specific level of environment impact assessment depending on the nature of the proposed activity.

The Commonwealth could determine that an EIS is required to be prepared to undertake the assessment of the controlled action. An EIS under the SDPWO Act is an accredited form of assessment for MNES, with the bilateral agreement between the Commonwealth and the State of Queensland describing the role of the State and providing the Commonwealth with final approval of the Project.

QEM's intention is to prepare and lodge a referral to the Commonwealth following submission of this IAS to the Coordinator-General. This approach is envisioned to facilitate the most efficient consultation between the parties and will ensure any Commonwealth requirements can be incorporated seamlessly into the ToR in the event the Project is a controlled action for which EIS level of assessment is warranted.

Given the complexity of the Project, and its approval requirements, its value and strategic significance to Queensland and potential environmental impacts, the Project is seeking Coordinated Project status, for which the primary approval pathway would be an Environmental Impact Statement (EIS) under the SDPWO Act.

1 INTRODUCTION

1.1 Background

This Initial Advice Statement (IAS) for the Julia Creek Vanadium and Energy Project (the Project) located in Queensland's North West Minerals Province (NVMP) is prepared by QEM Limited (QEM) in accordance with Part 4, Subdivision 2, Section 27AB of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). QEM plans to develop an open-cut mining operation with on-site processing facilities to produce high-purity vanadium pentoxide (V_2O_5) and transport fuel (such as diesel and/or aviation fuel). Vanadium is identified as a critical mineral which are essential for the manufacturing of key technologies that will help the world transition to net zero emissions. The Project is located in the Julia Creek and Richmond Critical Mineral Zone (CMZ) and strategically aligned with the critical mineral strategies of the Queensland and Australian Governments to support a strong pipeline of new critical minerals projects that will assist in the global economic and energy transition in response to climate change.

The Queensland Government has committed to reducing greenhouse gas emissions by 30% below 2005 levels by 2030 and achieving net zero emissions by 2050. In addition, Queensland has set ambitious renewable energy targets, aiming for 70% of its energy to be sourced from renewables by 2032 and 80% by 2035. These targets reinforce the strategic importance of this Project, which contributes to the production of critical minerals, a key component for renewable energy technologies. QEM will develop a Greenhouse Gas Abatement Plan as part of the Environmental Impact Statement (EIS) process, further supporting the Project's alignment with these targets.

RPM Global Advisory Services recently completed a Scoping Study for the Project (RPM Global 2024) on behalf of QEM. The Scoping Study approach was comprehensive, supported by substantial background studies and test work to demonstrate robust economic outcomes and no significant issues to prevent the Project from progressing to a pre-feasibility study. The Net Present Value (NPV after-tax) of approximately $1,106 Million (M) (Australian dollars (AUD), 8% discount rate), Internal Rate of Return (IRR) of 16.3 per cent (%), and a payback period of 5 years from the start of mining show strong economic outcomes.

The mineral resource is globally significant and estimated to contain 2,870 million tonnes (Mt) of V_2O_5 at an average concentration of 0.31% with 461 Mt in the Indicated category and 2,406 Mt in the Inferred category. This makes the resource one of the single largest vanadium deposits in the world, with the added benefit of a contingent (SPE-PRMS 2018) in-situ oil resource of 6.3 MMBBls of Oil equivalent in the 1C category, 94MMBBls in the 2C category, and 654MMBBLs in the 3C category, contained within the same ore body.

The geological confidence of the production is high for a Scoping Study (RPM Global 2024) with over 80% of the process plant feed classed as an Indicated Resources, with the remaining classified as Inferred.

It is planned to mine the ore from shallow open cut pits and then separated above ground into vanadium-bearing and kerogen-rich feeds. The vanadium-bearing feed is processed to produce high-purity V_2O_5 (99.5% + pure) at an estimated rate of 10,571 tonnes (t) per year. The Projects' key value proposition is to produce high-purity V_2O_5 to address the demand in battery electrolyte for Vanadium Flow Batteries (VFBs). The potential exists for the production of other valuable products such as high purity alumina (HPA), zinc, copper and molybdenum. Metallurgy and economics of these opportunities will be further explored in the next Project phase. The high-purity V_2O_5 will be transported via road to Townsville for future processing into battery electrolyte. Processing of the kerogen-rich feed would undergo a hydrogenation process that will utilise green hydrogen in the form of a hydrogen-donor solvent, and a hydrotreating process using direct hydrogen. This would allow the production of 5,960 barrels per day (bbl/day) of transport fuel. QEM's expected transport fuel production of approximately 313 million litres per annum represent a modest 4% of the annual demand in Queensland.

Given the complexity of the Project, and its approval requirements, its value and strategic significance to Queensland and potential environmental impacts, the Project is seeking Coordinated Project status, for which the primary approval pathway would be an EIS under the SDPWO Act.

1.2 Location

The Project is located approximately 16 kilometres (km) southeast of the Julia Creek township. Julia Creek is approximately 650 km west of Townsville and 250 km east of Mount Isa. Julia Creek falls within the McKinlay Shire Council (MSC) Local Government Area (MGA). The town of Julia Creek serves as a hub for surrounding agricultural and mining activities and also provides essential amenities and services for residents and workers in the area.

The primary means of reaching the Project is via the Flinders Highway, a major east-west road connecting Cloncurry to Julia Creek and beyond. This well-maintained highway ensures a reliable transportation corridor for the Project's personnel and supplies.

The Julia Creek Airport, located approximately 19 km west of the Project, provides air connectivity for those travelling from farther distances. This airport is a vital link for efficiently transporting personnel and equipment resources to and from the Project. With its strategic location near Cloncurry and Julia Creek and convenient access via the Flinders Highway and Julia Creek Airport, the Project enjoys a favourable position within the region's mining and resource industry, recognised by establishment of the Julia Creek and Richmond CMZ to facilitate development of a critical minerals industry in the zone.

The location of the Project is shown in **Figure 1.** The Project area (on-lease) represents the total area of the existing Exploration Permit Mineral (EPM) areas with a future Mining Lease Application (MLA) area and Petroleum Facility Licence (PFL) area to be assessed during the EIS. The Project Area represents approximately 2,390 ha.

1.3 Reasons for Seeking Coordinated Project Declaration

QEM considers that the Project meets the requirements for declaration as a Coordinated Project under the SDPWO Act for the following reasons:

- Requires local, State and Commonwealth approvals
- Requires a comprehensive environmental impact assessment
- Has significant infrastructure requirements associated with water, workers camp, and product transportation
- Has potential to be of strategic significance to the region, State and Commonwealth including but not limited to social and economic benefits, employment opportunities and capital investment

Baseline environmental assessments commenced in 2022, with mine planning, engineering and infrastructure design studies captured in the Scoping Study (RPM Global 2024). QEM has committed capital funding to continue the Project's development and will proceed to a pre-feasibility study (PFS). Given the scale and characteristics of the Project, QEM considers that an EIS assessment process would be appropriate, thereby requiring preparation of a Terms of Reference (ToR) to define the general and specific matters that must be addressed in the EIS.

The key benefits and drivers for pursuing a Coordinated Project declaration under Section 26(1)(a) of the SDPWO Act include the following:

Key Benefits:

- Coordination of public and whole of government input to the Project's evaluation, including in the development of statutory ToR from the outset of the process to guide preparation of the EIS
- Having an independent and transparent social, economic, and environmental assessment of the Project undertaken by the Coordinator-General
- The ability for the Coordinator-General to evaluate the Project under the Commonwealth bilateral agreement in which State and Commonwealth matters can be addressed in the one process
- Consideration of cumulative impacts can be better considered in the evaluation process and in collaboration with other resource projects in the region and CMZ
- As the Project will likely constitute a 'large resource project', the Coordinator-General's ability to undertake a broad assessment of social impacts under the *Strong and Sustainable Resource Communities Act 2017* (SSRC Act) as part of the same EIS process will help ensure social and

community impacts are appropriately managed over the life of the Project. This aligns with QEM's own ESG principles to maximise benefits back to the regions in which they operate

- Regulation of a mining and petroleum facility will require QEM to obtain multiple complex approvals, permits, leases and authorities. Assessment by EIS is needed to support downstream approvals and provide greater confidence that those approvals will be granted
- Production and processing of oil shale to create petroleum products requires complex technology. Some of this technology is routinely utilised internationally but are novel in Australia and Queensland. Accordingly, the Coordinator-General's intervention and use of 'stated' or 'imposed' conditions may be needed to regulate some aspects of development. Enhanced collaboration with state agencies will occur throughout the EIS and as the Project develops, management of competing state interests will likely be required
- A high security and reliable water supply for the Project is yet to be confirmed and is largely dependent on the outcomes of the current review of the *Water Plan (Gulf) 2017* (Gulf Water Plan). Being a Coordinated Project allows QEM to negotiate for water held in the Strategic and State Reserves
- Project components may involve applications for operational works and material change of use that involve the clearing of native vegetation under schedule 10, part 3 of the *Planning Regulation 2017* (Planning Regulation) (for example construction of off-lease workers camp or water infrastructure). Coordinated Projects constitute a 'relevant purpose' under Section 22A of the *Vegetation Management Act 1999* (VM Act) meaning QEM could clear native vegetation which would otherwise be prohibited development
- The Project is within a CMZ, the intent of which is to support the establishment of a critical minerals industry through streamlined approvals processes and coordinated assessments to reflect their importance to the State's future energy transition aspirations
- QEM is yet to commence detailed engineering design for the Project. The Coordinator-General's evaluation process allows flexibility for QEM to progress detailed design in response to and in collaboration with key stakeholders

1.4 Purpose and Scope of IAS

This IAS has been prepared in line with the application requirements for a 'Coordinated Project' declaration (DSDILGP 2023a) and under Part 4, Subdivision 2, Section 27AB of the SDPWO Act to support an application to the Coordinator-General, with the intention of:

- Assisting the Coordinator-General in deciding whether the Project should be declared a Coordinated Project
- Assisting the Coordinator-General in determining whether an EIS is appropriate
- Informing and enabling stakeholders to determine the nature and relevance of the Project
- Assisting the Coordinator-General to prepare draft ToR for the EIS if this process is deemed appropriate for the Project

This IAS presents a clear and concise narrative of the Project to allow the Coordinator-General to consider Project details against the criteria in Section 27 of the SDPWO Act to determine whether to declare the Project a Coordinated Project. The IAS will be used to inform the ToR and whilst the information presented is preliminary it is intended the Project scope will be more defined during the environmental impact assessment process. Impacts and their mitigation will be informed by engineering work progressed during the EIS and feedback is received from key stakeholders.

600000E
650000E
7750000N
7700000N
Dalgonally Road
Alisona Road
Punchbowl Road
Nelia Budda Road
Wyaldra Access Road
Baroona Road
Sunny Plains Access Road
Old Nelia Road
Euraba Access Road
Nelia Maxwelton Road
Wills Developmental Road
Old Normanton Road
Mount Isa Line
Julia Creek
Flinders Highway
Nelia
Wensley Access Road
Yorkshire Nelia Road
Yorkshire Road
Pine Tree Road
Julia Creek - Kynuna Road
Kellosheil Access Road
Kharasson Access Road
Ardbrin Road
Mianmere Nelia Road
EPM 26429
EPM 25681
EPM 25662
EPM 27057
1MF10
2MF6
4MF13
6MF15
6SX5
1SX5
3MF38
1MF6
4MF43
2MF5
5MF14
5MF17
2SX4
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1EN15
3YP4
6EN56
7EN57
8EN131
128SP271042
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6YP15
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13EN137
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9EN114
ERT82
ART84
77RT136
BRT84
8EN125
6EN68
12EN89
3EN147
12EN158
5EN87
8EN61
9EN71
6B157123
3RT99
2RT99
AAP6647
11EN105
3EN17
4SP135881
9EN139
7EN2
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4EN25
2EN13
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1B157128
2B157128
2EN27
5EN18
3EN13
6EN49
4B157128
13B157116
3EN5
3RT15
2EN5
6RT25
5EN60
8SP256921
1TO5
4EN5
2RP747486
AAP5694
4TO16
8B157137
0 4 8 km
Scale: 1:300,000@ A3
Datum: GDA2020
Projection: MGA zone 54
N
Data Source:
© The State of Queensland (Department of Resources) 2023
© State of Queensland (Department of Transport and Main Roads) 2023
Google Imagery ©2022 CNES / Airbus, Maxar Technologies

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Legend

- Project area
- Project EPMs
- Cadastre (DCDB)
- State controlled roads
- Roads and tracks
- Railways

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Initial Advice Statment

Figure 1
Project location

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2 THE PROPONENT

2.1 Proponent Details

QEM intend to own and operate the Project with company contact details provided in **Table 1**.

Table 1. Proponent and consultant details

Details	Proponent- Managing Director
Entity	QEM Limited
ABN	13 167 966 770
Contact	Gavin Loyden
Address	Suite 6A, 50 Appel St. Surfers Paradise, QLD 4217
Phone	+61 7 5646 9553
Website	www.qldem.com.au
Email	gavin@qldem.com.au

2.2 Capability to Complete an EIS

QEM has the financial and technical capacity to successfully complete an EIS and deliver the required program of works, including the PFS. The company has a supportive shareholder base and has successfully raised capital to progress development in the past with the last two capital raising programs undertaken by the Company (2022 and 2023) oversubscribed. QEM has also actively taken steps to open up additional potential sources of revenue or saleable assets (such as the Julia Creek Renewables Project) to assist in funding the continued development of the Project.

Additionally, QEM has assembled a highly experienced project team with expertise in managing large-scale mining and energy projects, ensuring that all technical and operational aspects are effectively addressed. Financial and technical capability statements have been provided separately to the Coordinator-General, as they contain commercially sensitive information.

2.3 Principal EIS Consultant

The Project's State and Commonwealth environmental approvals application material, including the EIS, will be prepared and delivered by a capable and dedicated team, with extensive prior experience in mining approvals in Queensland and at the Commonwealth level.

The Project's anticipated principal consultants are detailed in **Table 2**.

Table 2. Principal consultant

Details	Consultant
Entity	Epic Environmental Pty Ltd
ABN	54 169 579 275
Contact	Mark Longbottom
Address	Level 17, 95 North Quay Brisbane, QLD 4000
Phone	+61 0409 690 874
Website	www.epicenvironmental.com.au
Email	mlongbottom@epicenvironmental.com.au

2.4 Environmental Record of the Proponent

QEM acknowledges that mining and metals are essential, from building sustainable economic growth and supporting local community in Julia Creek and throughout North Queensland, to enabling innovations needed to address climate change urgency – but they must be produced responsibly.

QEM believes that integrating positive environmental, social and governance (ESG) qualities with rigorous, financial diligence is crucial to delivering long-term risk-adjusted performance. Proactively seeking

opportunities for positive change in ESG matters is fundamental to QEM's mission and fiduciary responsibility and QEM believe this approach will enhance shareholder value.

QEM is charting a course to help build resilience and enhance the social licence for the Project through a greater commitment to long-term, sustainable value creation that embraces the wider demands of people and the planet. The dual commodities of vanadium and oil will help address Australia's growing energy storage and fuel security issues in the transition to a renewable energy-driven society.

QEM or its Directors have never been convicted of an environmental offence under Queensland or other Australian Government legislation. QEM's mission is to operate in the safest and cleanest way possible while providing strong and sustained value to shareholders. The key ESG principles adopted by QEM are summarised in **Table 3** (QEM 2024a).

Table 3. QEM ESG principles

ESG Principles	Description
Environment	• Proposed use of renewable energy to produce Green Hydrogen and power mining operations • Target products such as high purity V_2O_5 to support global emission reduction targets
Social	• Supports local community – engagement, Indigenous relations, long-term jobs, training, youth programs, women's and community sporting programmes • Encourages employees to volunteer and fundraise (St Vinnies CEO Sleepout, St Vincent de Paul Society, Endeavour Foundation) • Bronze Partner of WISER (Women in Sustainable Energy and Resources)
Governance	• Management aligned with shareholders • Ethically sourced critical minerals – traceability and provenance • Support for women in leadership roles and Women in Mining and Resources Queensland (WIMARQ) Gold Coast Sponsor • Dedicated to corporate transparency • Use of Socialsuite ESG Go reporting software

3 NATURE OF PROPOSAL

3.1 Scope of the Project

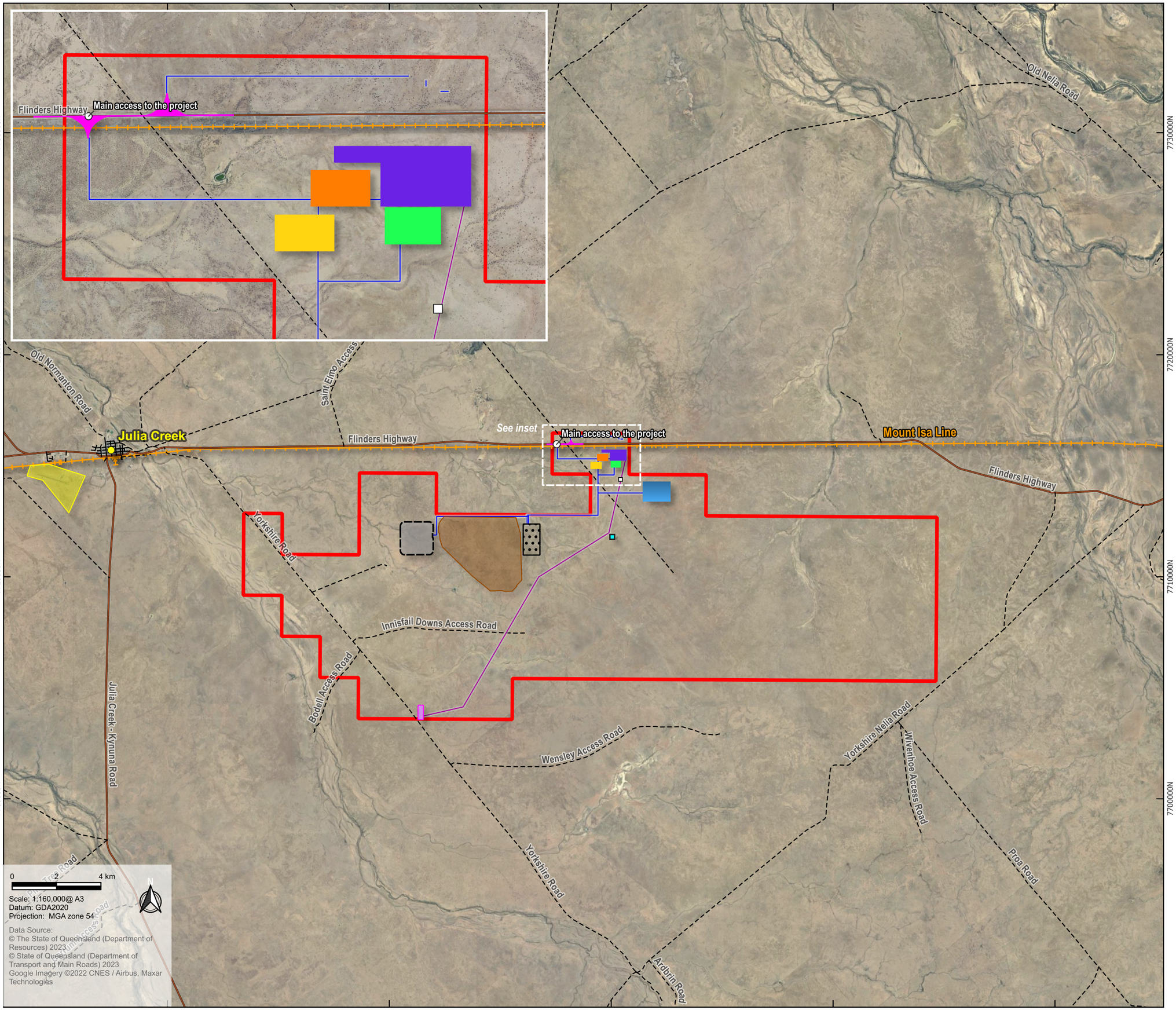
The Project proposes to produce two commodities: high-purity V_2O_5 and transport fuel (such as diesel and /or aviation fuel). The nature of the Project includes the development of an open-cut mining operation, with an estimated life of mine (LOM) of 30 years, with on-site processing facilities to produce V_2O_5 and transport fuel products. Mined ore has an average V_2O_5 feed grade of approximately 0.27%, upon which it would be separated above ground into vanadium-bearing and kerogen-rich feeds. The vanadium-bearing feed is processed to produce high-purity V_2O_5 at an estimated rate of 10,571 t per year (99.5%+ purity). The potential exists for the production of other valuable products such as HPA, zinc, copper and molybdenum. The high-purity V_2O_5 is then transported via road to Townsville for future processing into VFB electrolyte.

Processing of the kerogen-rich feed would undergo a hydrogenation process, that will utilise green hydrogen in the form of a hydrogen-donor solvent, and a hydrotreating process using direct hydrogen. This would allow the production of 5,960 barrels per day (bbl/day) of transport fuel. Approximately 7% of this transport fuel will be provided to the mining contractor for all the mining work. The remainder is sold at the mine gate to a distributor. Therefore, the average transport fuel sold is 5,500 bbl/day.

The Project tenements include EPM 25662, EPM 25681, EPM 26429 and EPM 27057 which comprise approximately 24,986.97 hectares (ha). These tenements are considered to be on-lease in this IAS and will be optimised into a Mining Lease Application (MLA) area and a Petroleum Facilities License (PFL). A standalone Mining Lease or Leases to accommodate infrastructure that directly supports mining operations such as water infrastructure and/or workers camp may also be included in the EIS or assessed under an alternative approval pathway.

Project components inside the Project area (defined as the on-lease component) relevant to Project construction, operation and decommissioning activities are described in **Section 3.2** and shown in **Figure 2**. Project components outside of the Project area (defined as the off-lease components) include a workers camp, rail infrastructure and water pipeline that are conceptual, however, will be holistically assessed as part of the EIS and are described in **Section 3.3**.

Infrastructure that will support the Project but will not form part of the scope of the EIS include the proposed renewables project owned by Enel Green Power Australia and is located immediately adjacent to the Project (QEM 2024b).



epic ENVIRONMENTAL

Legend

- Project area
- Infrastructure points

Regional infrastructure (existing or proposed)

- Existing airstrip
- State controlled roads
- Roads and tracks
- Railways

Proposed infrastructure (inside Project area)

- Highway upgrade
- Hydrolyser plant
- Laydown
- Magazine
- MIA and workshops
- Pit
- Processing facilities (feed, vanadium, oil)
- Run of mine
- Topsoil stockpiles
- Storage for waste rock and dry stacked tailings
- Water storage facility
- Substation
- Proposed access track
- Proposed access track and services

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Initial Advice Statment

Figure 2
Project components

3.2 Project Components Within the Project Area (On-Lease)

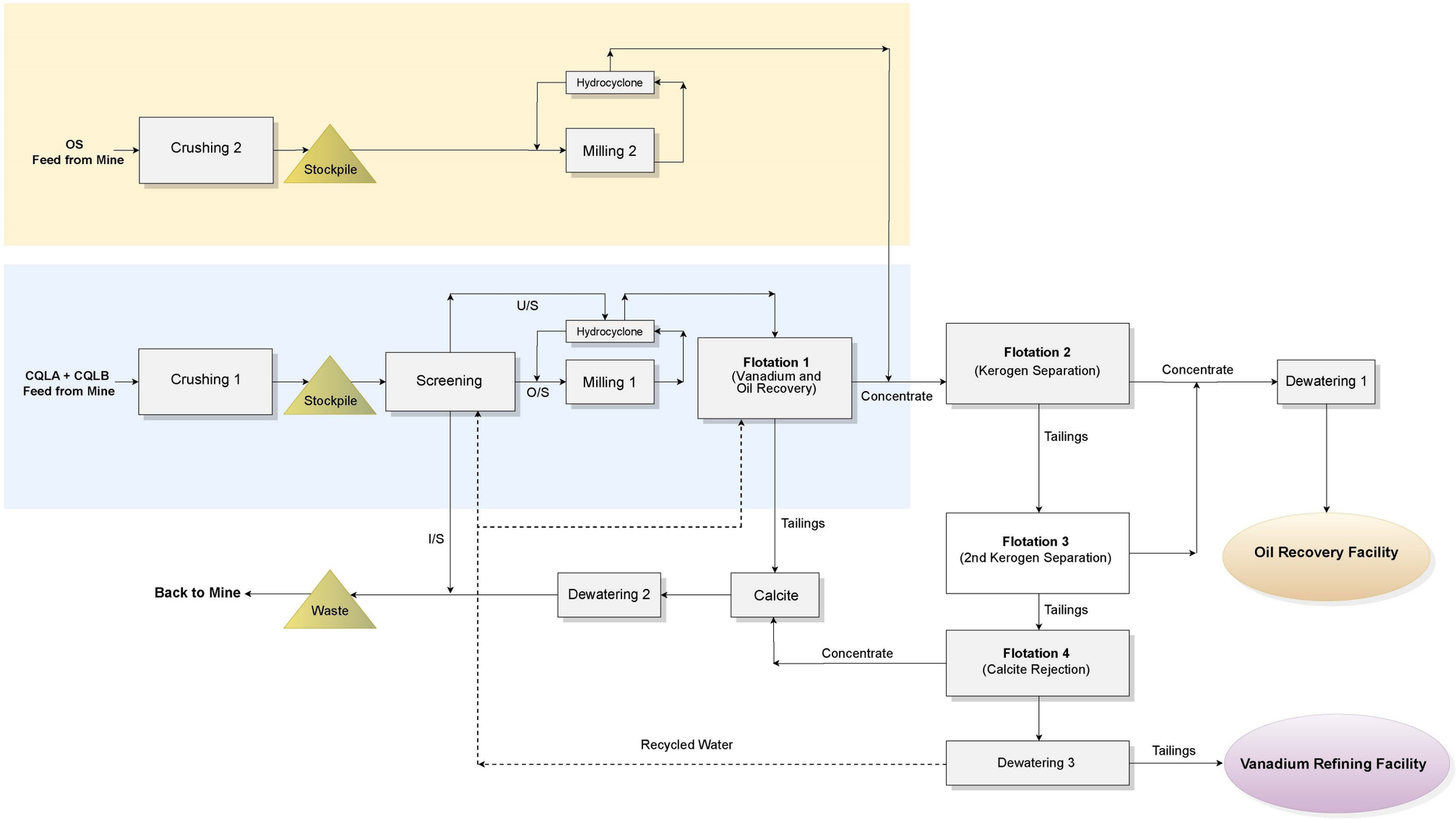
The key components and activities inside the Project area (on-lease) are summarised in **Table 4.**

Table 4. Key project components within Project area and description

Key Project Component	Description
Disturbance Footprint	Disturbance Footprint estimated to be 2,912 ha.
Mining	A single ore stream will be mined by conventional open-cut mining with pit optimisation results indicating that the open cut will be developed in a north-to-south direction, commencing in the northeast and with a strip ratio of 5:1. The pit shell is estimated at 3.2 km wide (west to east) and 3 km long (north to south) and will be divided into 100 metres (m) wide mining strips for mining and rehabilitation planning purposes. The pit floor is estimated to be a depth of approximately 50 m in the north and 65 m in the south. Ore will be drilled and blasted to fragment the material and mined using hydraulic excavators. Ore will be loaded into dump trucks and hauled to blending stockpiles, the run of mine (RoM) pad or directly fed to the RoM hopper.
Mining Rate	Ramp-up of ore production to 2.75 Mt in Year 1, 3.5 Mt in Year 2, and 5.3 Mt (wet) from Year 3-onwards.
Mine Life	The total project life is 32 years, comprising a 24-month construction phase followed by a 30-year mining period and site rehabilitation the following year.
Mineral Commodities	• Vanadium • Oil shale • Potential HPA, zinc, copper and molybdenum. The metallurgy and economics of these opportunities will be further explored in the next Project phase
Processing	A flowsheet has been developed to produce vanadium as high-purity V_2O_5 along with transport fuel as marketable products from the Lower Coquina (CQL) and Oil Shale (OS) ores. Processing has been divided into three stages including: • Feed Preparation • Vanadium Refining • Oil Recovery
Feed Preparation	Ore from the RoM will be concentrated into two separate streams: vanadium-bearing clay and kerogen-rich feed in the Feed Preparation Facility (FPF). The FPF would employ conventional mineral processing techniques widely used in the mining industry, such as crushing, milling, screening, and flotation, for dedicated downstream treatment. The processing flow sheet for the FPF is shown in **Figure 3**.
Vanadium Refining	The vanadium-bearing clays would report to the Vanadium Refining Facility (VRF), where vanadium would be extracted with sulphuric acid and purified through precipitation and re-leaching stages before calcination to produce high-purity V_2O_5 in powder form. This product will be packaged and stored before transport via road to Townville. Processing flow sheet for the VRF is shown in **Figure 4**.
Oil Recovery	The kerogen-rich stream would be converted into hydrocarbons and treated in the Oil Recovery Facility (ORF) to produce transport fuel, employing hydrogenation and conventional oil refinery processes. It is in the ORF's hydrogenation and hydrotreating steps that will use green hydrogen sourced from on-site hydrolyser plant. Processing flow sheet for the ORF is shown in **Figure 5**.
Hydrogen Production and Storage	A hydrolyser plant and hydrogen storage is proposed within the project area. Hydrogen will be produced within the Project area by a third party in an over-the-fence arrangement. The hydrogen will be immediately processed into hydrogen donor solvent which can be stored at ambient temperature and pressure. The hydrolyser plant is proven technology and is modular in scale. The net hydrogen production requirement for the project is 10,759 tonnes/annum. The process will be powered using renewable energy sourced from the adjacent wind an solar project.
Fuel Storage	Fuel storage and load-out area is to be positioned north of the Flinders Highway and has been sized to allow thirty days of product transport fuel storage.
Waste Rock	Waste in the weathered horizon will be mined using hydraulic excavators. Waste below the weathered horizon will first be drilled and blasted to fragment the material before being mined using hydraulic excavators. Waste will be loaded into dump trucks and initially hauled to an out-of-pit waste rock dump. As the pit progresses to the south and a large open cut void is

Key Project Component	Description
	established, waste will be backfilled into the open pit. Waste characterisation sampling and test work has commenced and will be provided in the EIS.
Processing Wastes	Waste streams from processing will be dewatered for disposal. A tailings disposal strategy of dry stack tailings is proposed. Trade-off studies will continue during the development of the EIS to evaluate the economic and environmental outcomes of alternative tailings strategies. As the pit progresses to the south and a large open cut void is established, tailings will be backfilled into the open pit. Waste characterisation sampling and test work has commenced and will be provided in the EIS.
Power Demand	Approximately 97 Gigawatt hours (GWh) annually. The energy balance includes: • FPF 50.5 GWh/year • VRF 18.5 GWh/year • ORF 20.0 GWh/year • MIA 8.0 GWh/year
Power Supply	Approximately 25 Megawatts (MW) of firm capacity sufficient to support the Project will be provided by the proposed adjacent renewables project through a 10-year offtake agreement on an arm's length basis (refer **Figure 12**). Future supply may also be provided by renewable energy sources connected to the proposed CopperString 2032 powerline infrastructure. Both of these power supply options will not form part of the EIS.
Water Demand	Approximately 2,120 Megalitres (ML) annually after water recycling. The indicative water demands for the Project include, process water, hydrolyser plant, potable water, fire water and dust suppression. A summary of the water demand is: • FPF 500 ML/year • VRF 500 ML/year • ORF 1,000 ML/year (including hydrolyser demand) • Dust suppression 88 ML/year • Personnel 33 ML/year
Water Supply	Water will be sourced on-lease from dewatering of open pits, water recovered from tailings, rainfall and run-off collection on-site. An off-lease water supply is further discussed in **Section 3.3,** with an indicative location shown in **Figure 12.** Trade-off studies will continue during the development of the EIS to evaluate the economic and environmental outcomes of different water supply strategies and determine the ultimate location of water supply infrastructure.
Mining Equipment	The mining fleet requirements are estimated to be: • 4 x Excavator 250 t • 19 x Truck 140 t • 1 x Excavator 80 t • 2 x Loader 11 cubic metres • 1 x Truck 90 t • 6 x Dozer 302 kilowatts (kW) • 2 x Dozer 425 kW • 6 x Grader 221 kW • 3 x Watercart 80 kilolitres • 2 x Drill 320 kilonewton • 2 x Service Truck 45 t
Supporting Infrastructure	Supporting infrastructure will include: • RoM area with RoM dump station, crushing and screening, equipment and conveyors • A new intersection on the Flinders Highway will be constructed, including turn-out lanes, acceleration and deceleration lanes, and waiting lanes • Haul roads, access roads and car parking • Construction lay down area • Construction material borrow pits • Topsoil stockpiles • Magazine • Surface water management structures • Water storage and distribution network (the size of the water storages and requirements for a Failure Impact Assessment will be determined during the PFS).

Key Project Component	Description
	• Sub-station and power distribution network • Onsite diesel generators • Administration buildings, gate house, parking, fencing, and access security • Operational buildings, including change house, ablution, workshops, laboratory, emergency services, and warehousing • Reagent storage and handling facilities • Process control room, communication, closed circuit television (CCTV), and security systems • Mine service area including offices, ablutions, heavy vehicle workshop and vehicle wash bays, diesel storage and refuelling facilities • Waste management facilities • Waste water treatment plant and waste storage facilities • Mobile radio tower or booster system • Workers camp on lease (if required) • Groundwater monitoring well network • Environmental monitoring station (weather and air quality)
Workforce	Total workforce number for construction and operation are estimated to include: • Construction workforce of up to 600 personnel • Operational workforce of up to 588 personnel, consisting of 309 mining, 106 processing, 133 infrastructure, and 40 admin personnel across a range of shift and roster patterns.
Rehabilitation and Closure	Rehabilitation of mining operations will occur progressively and will be subject to a Progressive Rehabilitation and Closure (PRC) Plan that will be developed during the EIS.



Data Source:
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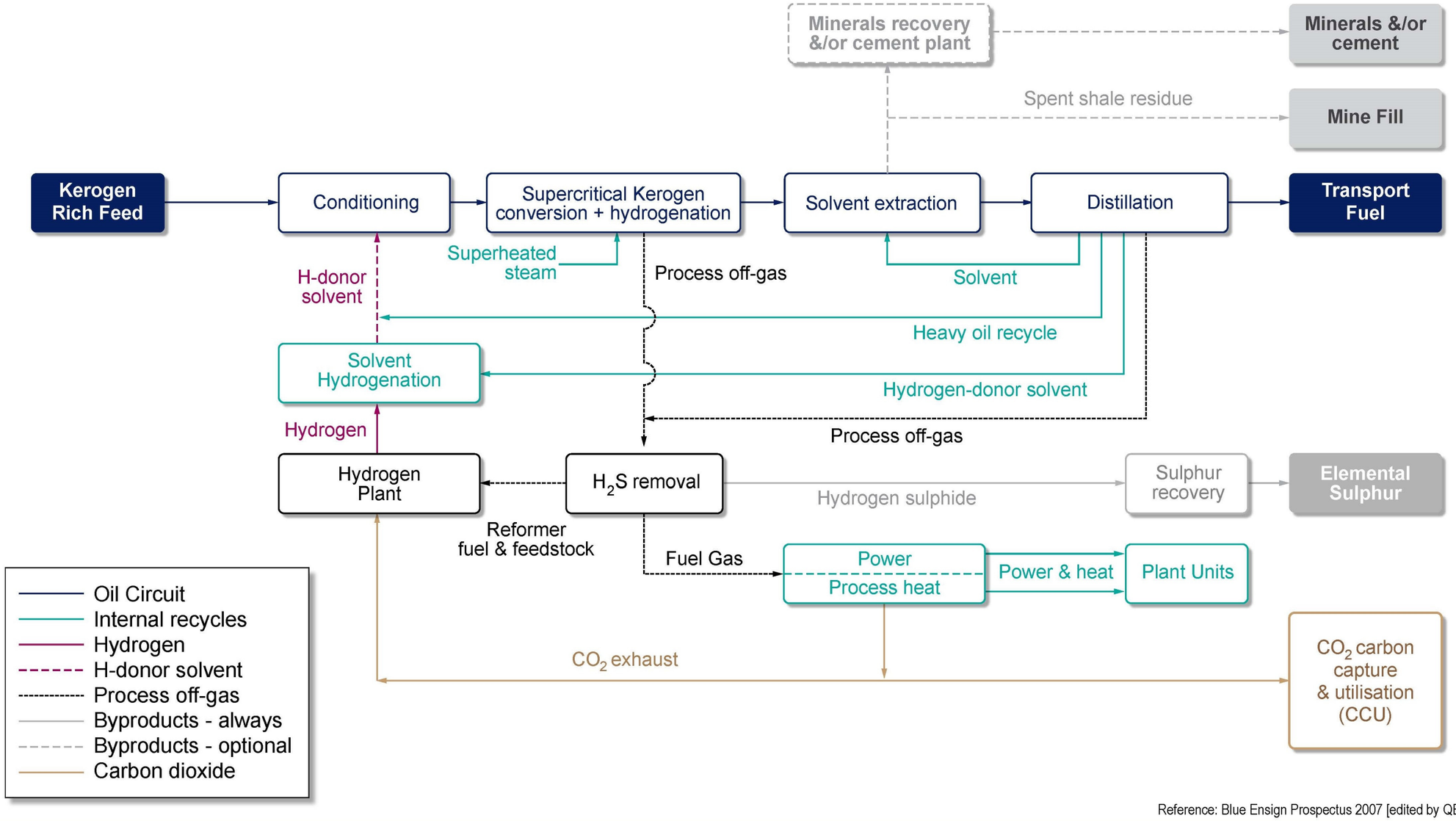
Figure 3
Process flowsheet 1 - feed preparation facility



Reference: Blue Ensign Prospectus 2007 [edited by QEM]

Data Source:
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Figure 4
Process flowsheet 2 - oil recovery facility

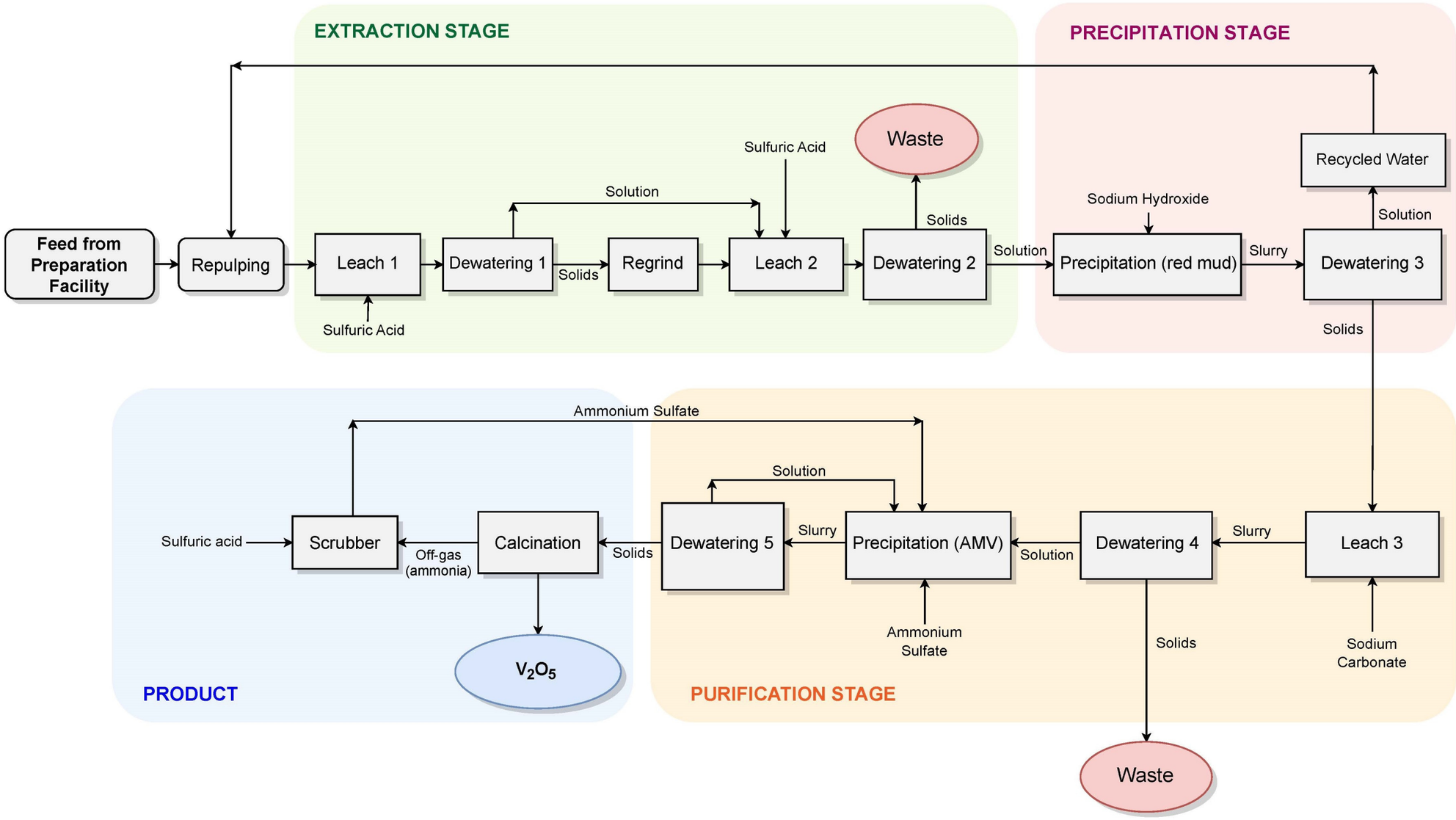

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Figure 5
Process flowsheet 3 - vanadium refining facility

3.3 Project Components Outside of Project Area (Off-Lease)

The key Project components and activities outside of the Project area (off lease) are summarised in **Table 5**.

Table 5. Key external project components and activities

Key Project Component	Description
Water Supply	The preferred water source is water harvesting from the Flinders River of up to 5,000 ML annually, supported by an offsite water storage dam equivalent to two years of water demand and a water distribution network. The allocation that will be sought is greater than the demand outlined in **Table 4** as it is based on a minimum of two years' water demand plus an allocation for evaporative losses. Trade-off studies will continue during the development of the EIS to evaluate the economic and environmental outcomes of water supply strategies and the ultimate location of water supply and storage infrastructure. An off-lease water storage facility and associated delivery infrastructure or consideration of alternative strategies would likely form part of the EIS.
Rail Infrastructure	A rail siding and staging facility may be required for the Project. Trade-off studies will continue during the development of the EIS to evaluate the economic and environmental outcomes of rail strategies and the ultimate location of rail infrastructure if required. An off-lease rail siding and staging facility would likely form part of the EIS.
Site Access and Transport	The Project lies to the south and north of the Flinders Highway and Mount Isa line of the Great Northern Railway running between Townsville and Mount Isa. Flinders Highway will be used for access to the mine, processing facilities and infrastructure access for the Project. Consultation with the Department of Transport and Main Roads (DTMR) and MSC will be undertaken to examine the proposed route, access needs and possible road upgrades / contributions. The transportation route will be evaluated and confirmed as part of the EIS, including consideration of access via Yorkshire Road.
Workers Camp	To accommodate workers during construction and operation, a worker camp is proposed in Julia Creek which has been identified as a preferred location in consultation with the MSC. Trade-off studies will continue during the development of the EIS to evaluate the economic and environmental outcomes of accommodation strategies and the ultimate location of the workers camp. The accommodation strategy will continue to be a key focus of engagement with MCS as identified in **Section 6**. The workers camp would likely form part of the EIS.

3.4 Aspects of the Project where Options or Flexibility are being Considered

During the PFS and EIS, trade-off studies will continue to evaluate the economic and environmental outcomes of Project options and strategies relating to accommodation, water, rail and tailings strategies that that will likely form part of the EIS and are currently only conceptualised. The Scoping Study has also identified key opportunities that will be assessed during the PFS including:

- Drilling campaigns to increase the confidence of mineral resources within and around the proposed pit location and drill areas on the eastern side of the lease to identify potential new satellite pits currently classified as Inferred Resources to upgrade to Indicated Resources
- Potential to increase production with significant quantities of economic ore identified throughout the EPMs
- QEM has identified the opportunity to produce sulfuric acid on-site. The current ORF flowsheet includes gas recovery, incorporating sulphur via scrubbing, which can be utilized for sulfuric acid production. This opportunity will be further explored in the next engineering phase. Any additional sulfuric acid requirements, beyond on-site production, will be sourced from commercial suppliers
- Alternative technologies to the hydrogenation process, such as pyrolysis, gasification, or combustion
- Production of aviation fuel (on-lease). This will not require additional processing to what is presented in **Figure 2**
- Economic recovery of mineral values from spent shale residue
- Potential recovery of mineral by-products like molybdenum, nickel, copper, zinc, silica, alumina, and soda ash
- Ability to manufacture cement from ORF solid residues

- Revenue can be generated by converting organic sulfur compounds to sulfur via hydrogen sulfide
- Vanadium electrolyte production
- Water supply options including locations for water storages and pipeline routes both on-lease and off-lease

It is intended to maintain flexibility with these options being included in the EIS subject to the evaluation of economic and environmental outcomes during the PFS. The PFS is scheduled to commence during the early stages of the EIS process and is anticipated to be completed by Q1, 2026 – coinciding with the completion of EIS technical studies. QEM anticipates the level of detail provided in the EIS process will be sufficient to allow the Coordinator-General to 'state conditions' under the SDPWO Act for primary approvals.

3.5 Components and Activities that Constitute the Project to be Declared Coordinated

The Project involves several complex components which are appropriate for a Coordinated Project declaration. This includes open cut mining, vanadium production, transport fuel production and storage, hydrogen production and hydrogen-donor solvent storage and associated off-lease supporting infrastructure. Further, the Project will require access to water from the Strategic Reserve under the Gulf Water Plan or alternative regional water sources. Therefore, a coordinated process for the assessment of the complex Local, State and Commonwealth statutory approvals' pathways would provide continuity for the assessment approach and conditioning required in approving the Project. Combined, the Project components are considered to represent State and regional significance.

3.6 Land Use

The Project area lies within Queensland's Mitchell Grass Downs, NWMP and Julia Creek and Richmond CMZ. The Project area boundaries are delineated by QEM's existing EPM tenements which extend between approximately 6 km to 37 km east of Julia Creek, adjoining the Flinders Highway. Julia Creek is a regional service town located within the Shire of McKinlay. Julia Creek has a population of 547, with approximately 5 percent of the population being Aboriginal and/or Torres Strait Islander people (Australian Bureau of Statistics (ABS 2024). The main local industry is beef cattle farming (ABS 2024). The town also services BHP's underground silver and lead mine at Cannington.

The Project area comprises natural grasslands on flat to slightly undulating downs country. Given an extended history of animal grazing, the Project area is in a largely disturbed state and has been historically used for cattle grazing on unimproved pastures. Several residential buildings exist within EPM 25662 and EPM 27057, and surrounding areas with the Julia Creek township approximately 6.5 km from the eastern boundary of the Project area.

The Project area is predominantly located on Lands Lease tenure, with a small section of EPM 26429 overlapping freehold land associated with the Mount Isa rail line and Flinders Highway (a state-controlled road). A stock route reserve sits within EPM 27057 and several vehicular tracks and fencing lines exist within the Project area. Exploration activities, including historical drilling, associated access track development have taken place throughout the Project area.

The region's main commercial land use is for beef cattle production and mining. The NWMP hosts several mining operations nearby including the Eloise Mine, Ernest Henry Mine, Cannington Mine, and Mount Isa Mines. The Saint Elmo Vanadium Project is currently in construction phase and located to the direct north of the Project (ABS 2024).

3.7 Land Ownership and Tenure

The land on which the Project is located is mostly State Land administered by the Department of Resources (DoR) under the *Land Act 1994*. The relevant land is outlined in **Table 6** and displayed in **Figure 2.**

QEM currently holds four tenements (EPM 27057, EPM 26429, EPM 25681, EPM 25662) which form the boundaries for the Project area (see **Figure 2**). The Project area is bound to the north by the Flinders Highway and Mount Isa rail line, as well as several Mining Leases. A MLA and PFL application will be lodged for the mining and petroleum activities, with ongoing discussions proposed with DoR and the Department of

Environment, Science and Innovation (DESI) to determine tenure arrangements for the mining and petroleum processing activities (see **Section 4**).

There are no registered native title claims or determinations over the Project area on the Register of Native Title Claims, relevant under the Commonwealth *Native Title Act 1993* (National Native Title Tribunal 2024). Ongoing consultation will occur with Traditional Owners as the Project progress through the EIS and PFS phase.

QEM will continue to engage with landowners during the continuation of exploration activities and during the advancement of the EIS. As the Project advances land access and compensation agreements will be negotiated with landowners to secure access to the land.

There may be additional landholders depending on the location of the offsite infrastructure to be determined during the PFS.

Table 6. Land ownership associated with the Project area (on-lease)

Lot on Plan	Tenure	Owner / Lessee
128 SP271042	Lands Lease- pastoral	Private Landholder
4 SP135881	Lands Lease	Curr Pty Ltd
1 EN3	Lands Lease	Private Landholder
451 SP104935	Lands Lease	Private Landholder
3 EN17	Lands Lease	Private Landholder
3 EN 16	Lands Lease	Private Landholder
6 EN16	Reserve	DES (now DESI) & DNRM (now DoR)
11 EN105	Freehold	Private Landholder
10 EN16	Lands Lease	Private Landholder
13 EN89	Freehold	Private Landholder
3 EN147	Lands Lease (perpetual- grazing or agricultural)	Private Landholder
9 EN147	Lands Lease	Private Landholder

3.8 Timeframes for the Project

A preliminary schedule has been developed for the delivery of Project and is provided in **Table 7**.

Table 7. Key project milestones

Key Milestone	Anticipated Completion Schedule*
Completion of Scoping Study	Completed
State Government - Coordinated Project declaration	Q4 2024
EPBC Act Controlled Action decision and published Final Terms of Reference	Q1 2025
Metallurgical and petrology test work for pre-feasibility study	Q2 2025
Infill Drilling and Resource Expansion	Q2 2025
Pre-feasibility study	Q1 2026
Technical studies for EIS completed and EIS draft prepared	Q1 2026
EIS Accepted and Notified for Public Comment	Q2 2026
Further Metallurgical and Petrology Optimisation	Q3 2026
CG issues EIS assessment report and EPBC Act approval granted	Q4 2026
EA granted and PRC Plan schedule approved	Q4 2026
Mining Leases and Petroleum Licences Granted	Q4 2026
Secondary Approvals and Management Plans Approved	Q1 2027
Definitive Feasibility Study	Q4 2027
Construction Tender Packages	Q4 2027
Financial Investment Decision	Q1 2028
Mining Contract Awarded	Q1 2028
Plant Procurement and Construction	Q2 2029
Commissioning	Q4 2029
Production starts	Q4 2029

*Anticipated completion schedule is subject to change

3.9 Project Staging

Project stages include pre-construction, construction, operation and decommissioning and rehabilitation. Construction, operation and decommissioning and rehabilitation stages will be progressive throughout the Project, with many construction activities (i.e. vegetation clearing, topsoil removal) undertaken concurrently with operation phase activities, and decommissioning and rehabilitation stage activities. Progressive rehabilitation will be undertaken in accordance with an approved PRC Plan. A conceptual project sequence is provided in **Table 8** and will be further detailed in the EIS.

Table 8. Conceptual project staging

Stage	Key activities
Pre-Construction	• Site preparation activities such as vegetation removal, earthworks, topsoil removal and stockpiling • Site establishment • Surveys
Construction	• Earthworks • Infrastructure construction • Open pit development - overburden • Construction of waste rock dump
Operation	• Open pit mining - ore and overburden • Ramp-up of ore production to 2.75 Mt in Year 1, 3.5 Mt in Year 2, and 5.3 Mt (wet) from Year 3 onwards • Processing activities • Maintenance activities • As a large open cut void is established, waste is directed to an in-pit dump
Decommissioning	• Infrastructure demolition and removal • Waste material removal • Contaminated land investigations and remediation
Rehabilitation	• Landform reshaping and cover materials construction in accordance with approved PRC Plan • Application of soils and revegetation to achieve post mining land use.

3.10 Project Need, Justification and Alternatives Considered

3.10.1 Objectives

The Project proposes to produce two commodities: high-purity V_2O_5 and transport fuel. The Project will accelerate the development of vanadium within a designated CMZ, critical for sustainable supply chains to support the energy transition challenge and will produce transport fuel to address the demand in the NWMP and improve Australia's fuel security.

3.10.2 Vanadium Strategic Significance

In 2022, the Australian Government designated vanadium as a critical mineral essential for the manufacturing of key technologies that will help the world and Australia transition to net zero emissions. The Commonwealth's *Australia's Critical Minerals Strategy 2023-2030* identifies that Australia is well placed to seize the opportunity of the clean energy transition and sets out a vision to grow the critical minerals sector. The key objectives of the strategy are:

- Create diverse, resilient and sustainable supply chains through strong and secure international partnerships
- Build sovereign capability in critical minerals processing
- Use our critical minerals to help Australia become a renewable energy superpower
- Extract more value from our resources onshore, which creates jobs and economic opportunities including for regional and First Nations communities

The *Queensland Critical Minerals Strategy* released in 2023 by the Queensland Government also identify that critical minerals including vanadium underpin the technologies required to achieve a global economic and

energy transition. A CMZ between Julia Creek and Richmond was established as a result of the strategy and represents the State's commitment to developing a critical minerals industry. To capitalise on the generational opportunity and demand for critical minerals this strategy identifies that, Queensland must take quick and purposeful action to seize the opportunity through the following four key objectives:

- Move faster, smarter
- Maximise investment
- Build value chains
- Foster research and ESG excellence

The Queensland and Australian Governments have recognised the importance of vanadium as a critical mineral and have made a commitment to support a strong pipeline of new critical minerals discoveries and projects. QEM's value proposition to produce high-purity V_20_5 to address the demand in battery electrolyte for VFBs is supported by State and Commonwealth policy, the presence of the CMZ and a clear desire to assist in the global economic and energy transition in response to a lower carbon future.

In addition to Australia, The United States, Canada, European Union, United Kingdom, India, Japan, South Korea and China have identified vanadium as a critical mineral. Although Russia, Brazil, and South Africa have significant vanadium resources and production, there is no clear evidence that they have officially designated vanadium as a critical mineral. However, these countries are major exporters and play crucial roles in the global supply chain for vanadium.

3.10.3 Transport Fuels Strategic Significance

Australia almost entirely relies on refined product and crude imports to meet domestic consumption. Over the last decade, five Australian refineries have closed leaving only two Australian refineries in operation. In financial year (FY) 2021, 91% of all liquid fuel consumed in Australia was imported (Carter, Quicke & Armistead 2022). This poses a significant fuel security risk due to the reliance on foreign countries, maritime transit and lack of sovereign supply. This was also identified in the Australian Government's National Defence Strategic Review in 2023, stating that fuel distribution in the north and northwest must be more effective and less vulnerable by introducing a more productive and predictable supply approach. The Project will also aim to resolve is the distance between the NWMP and the closest fuel import terminals located in Townsville (646 km), Cairns (852 km), and Mackay (973 km).

The Project's potential production of 313 ML of transport fuel would be an important contribution to Queensland's development. The expected transport fuel production of approximately 313 ML per annum (at full capacity) represent a modest 4% of the annual demand in Queensland. QEM's value proposition is to domestically produce transport fuel (such as diesel) in North West Queensland to address the demand and contribute towards Australia's fuel security is strongly aligned with Australian Government strategic priorities.

3.10.4 Economic Benefits to the Region and the State

Development of the Project will provide ongoing employment opportunities, as well as long-term social and economic benefits to northwest Queensland local and regional communities. Pre-production capital expenditure is estimated at approximately $791M (AUD) excluding contingency costs and indirect costs such as owner's and EPCM costs. Inclusive of contingency costs and indirect costs, pre-production capital expenditure is estimated at $1,096M (AUD). The sustaining capital to maintain the Project over the operational period of 30 years is estimated at $598 M (AUD) or approximately $20 Million per year (M/year) (AUD). The total LOM capital expenditure is estimated to be $1,694 M (AUD).

The Project would result in economic benefits to the region including:

- Employment and training throughout construction and operation
- Ongoing indirect and direct outputs, business generation from local or regional goods and services procurement leading to maintained or increased business turnover and household income
- Create and maintain ongoing trade and employment opportunities

The Project is estimated to generate up to 600 construction jobs and 588 operational jobs spread over multiple rosters and shifts. These figures are early estimates and require validation as the Project progresses through

the PFS and EIS. Unskilled jobs will be created by the Project in roles such as security personnel, heavy machinery operators, maintenance providers, IT technicians and bus drivers. A worker population estimated at 35 % of the workforce will reside locally boosting long-term demand for local businesses and services and creating new employment opportunities for local workers.

A Cost-Benefit Analysis (CBA) to assess the net impact of the Project will be undertaken as part of the EIS. This CBA would identify the impacts resulting from the Project compared to the 'without Project' scenario to present a net stream of benefits and costs. Potential environmental economic impacts (i.e., impact on ecosystem value, cost of greenhouse gas emissions) will also be considered as part of the CBA.

The Project would also contribute to Commonwealth tax revenues and State royalties. The financial model that supports the Scoping Study assumes royalty payments of 2.50% and 2.69% on sales of vanadium pentoxide and transport fuel respectively; it also assumes a company tax rate of 30%. No tax-free period has been considered in the financial model, hence royalty and tax payments are modelled from year 1 of production. Cumulatively over the life of the project, the estimated royalty payments are approximately $562.7 M (AUD) and Company tax payments are approximately $2.3Bn (AUD). The financial model will be further refined in the following project development phases.

3.10.5 Vanadium Market Forecast

According to United States Geological Survey (International Bank for Reconstruction and Development 2023), in 2023, 70 % of the global vanadium supply comes from China and Russia, and the balance from South Africa, Brazil, United States, India, and Vietnam. Approximately 90 % of global vanadium consumption is in the making of steel for products in the industrial and automobile sectors. In 2023, only 4 % of demand came from VFB electrolyte (International Bank for Reconstruction and Development 2023). However, as power grids around the world continue to replace fossil fuel power plants with large-scale renewable energy assets, long-duration energy storage (such as VFBs) is critical to ensuring reliable grid operation.

QEM's objective of producing high purity V_20_5 to address the demand in battery electrolyte for VFB's, responds to the market opportunity presented by the forecast demand growth in VFB. In their 2022 report, Guidehouse Insights forecasted the global annual deployments of VFBs to reach approximately 32.8 GWh in 2031, with Asia Pacific leading in deployments. This presents significant growth with a compound annual growth rate of 41 % across the forecast period (Guidehouse Insights 2022). As power grids around the world continue to replace fossil fuel power plants with large-scale solar photovoltaic (PV) arrays and wind farms, long-duration energy storage (LDES) is critical to ensuring reliable grid operation.

Vanadium electrolyte is one of the critical components of VFBs for LDES complementing renewable electricity generation. The purity of the electrolyte has an impact on the electrochemical performance and cost of the battery. Using high-purity vanadium is key to increasing battery performance, capacity, and efficiency. High-purity means free from byproducts and chemical residue that can often be left behind and negatively impacts the electrochemical stability, charging and discharging, and ultimately battery life.

QEM favours a long-term average price of United States dollar (USD)11.56 per pound (/lb) in line with its objective of producing high-purity V_2O_5 (99.5 % pure) to address the demand in battery electrolyte for VFB, assuming ongoing market growth and limited increased capacity globally. Increased vanadium use in energy storage is likely to impact long term pricing with a premium being received for high purity V_2O_5 needed for use in batteries. This pricing is based on 2030 forecasts from the World Bank, Vanitec and Project Blue (International Bank for Reconstruction and Development 2023, Guidehouse Insights 2022).

3.10.6 Transport Fuel Market Forecast

Over the last decade, the demand for diesel in Queensland has grown 180 %. In 2023, 32.8 billion litres of diesel were consumed in Australia with Queensland consuming 25% (8.3 billion litres), making it highest consumption state in the country (Commonwealth of Australia 2024b). The Scoping Study assumes a transport fuel price of 120.24 cents per litre (AUD, excl. goods and services tax (GST) and excise). This price is based on the 2022 to 2024 daily average wholesale at the gate price from Brisbane (diesel product) (Australian Institute of Petroleum 2017).

3.10.7 Alternatives Considered

Alternative Project options have been considered during the Scoping Study including alternative mining methods and layouts, alternative infrastructure and processing options. The refinement of options will continue throughout the progression of the PFS and EIS with key considerations in the Scoping Study included:

- Disturbance Footprint is primarily defined by the location of the deposit, and therefore, there is limited scope to avoid impacts that would occur in the direct path of the Project. There are, however, opportunities to avoid and minimise impacts to native vegetation through design and placement of ancillary infrastructure and access roads associated that will continue to be explored during the EIS
- The locations of surface infrastructure, for example, have been determined through an iterative approach with consideration to environmental, social and cultural values, including:
  - locations of State and Commonwealth threatened species, communities and habitat
  - locations of areas and sites of cultural significance, including aboriginal heritage sites and waterways
  - locations of existing pastoral infrastructure, including access tracks and stock watering points surrounding topography and hydrology, avoiding areas prone to flooding
- The consideration of the workers camp location has been undertaken in consultation with key stakeholders, with consideration given to onsite or offsite accommodation. QEM is committed to continuing to engage with McKiney Shire Council throughout the development of the accommodation strategy for the Project during the PFS
- The existing infrastructure limits transport route options, with the Flinders Highway providing the best option. Rail will be considered as part of the PFS
- Water supply options investigated during the Scoping Study include groundwater, third-party supplemented water, water trading, overland flow capture, water harvesting, and regional common user infrastructure. These will be subject to further assessment during the development of the PFS with a summary of preliminary consideration provided below.
  - Groundwater – groundwater resources weren't considered sufficient to provide sustainable yield
  - Lake Julius Water Supply – Significant linear infrastructure requirements and high capital costs
  - Water Harvesting Julia Creek – Initial modelling shows this is not a feasible option but may supplement other supplies
  - Water harvesting Flinders River – Feasible as a sole water supply option with large water storage and pumping requirements
  - Water Trading – On the basis of flow condition risks and water trade availability, this was not carried as the preferred option but will be subject to further consideration
- Health safety risks have been considered for infrastructure placement, including standoff and exclusion requirements for the magazine, petroleum and hydrogen storage). Risks will be further considered and identified during PFS and EIS risk assessment process
- Mine haulage has been optimised to reduce associated greenhouse gas (GHG) emissions. Opportunities to advance this, and other GHG reduction opportunities, further will be considered in the PFS and EIS
- Infrastructure locations have considered flooding risks and creeks mapped as fish passage. Avoidance was selected in the first instance and minimisation of impacts considered when avoidance could not be achieved

The Project is located in a relatively unique geological and spatial setting, with accessible ore structures positioned at a depth from the surface that makes the Project economically feasible. Further, the presence of major transportation options and future power infrastructure adjacent to the Project offer a range of strategic opportunities.

Should the Project not proceed, there would be a missed opportunity for significant economic growth provided by Queensland's growing critical minerals sector, State royalties and Commonwealth tax revenue would be foregone, and the employment opportunities and social and community benefits for the region would not be realised. The Project not proceeding would also impact the acceleration of vanadium

development within a designated CMZ critical for sustainable supply chains to support the energy transition challenge and a missed opportunity to improve Australia's fuel security.

3.11 Workforce Requirements During Construction and Operations

A construction workforce of 600 and an operational workforce of 588 is estimated. Wherever possible, QEM will aim to use a local workforce, and engage with indigenous stakeholders to match skills, workforce capacity and experience to the Project needs. A worker population estimated at 35 % of the workforce will reside locally within the region, boosting long-term demand for local businesses and services and creating new employment opportunities for local workers. QEM will ensure its local workforce and contractors are provided the opportunity to upskill and gain experience to be competitive in the labour market for the Project. Personnel will be encouraged to be residentially based in Julia Creek where appropriate and partnership opportunity discussions have commenced with Technical and Further Education (TAFE) QLD in Mount Isa and Townsville.

3.12 Financial Requirements and Implications

RPM Global Advisory Services recently completed a Scoping Study (RPM Global 2024) for the Project on behalf of QEM. The Scoping Study approach has been comprehensive, supported by substantial background studies and test work and has demonstrated robust economic outcomes. Key economic outcomes for the project include:

- Pre-production capital expenditure is estimated at approximately AUD 791M and AUD 305M (7% owner's cost, 15% EPCM costs and 20% contingency) for a total of AUD 1,096M (see **Table 9**)
- The sustaining capital to maintain the Project over the operational period of 30 years is estimated at $598 M (AUD) or approximately $20 Million per year (M/year) (AUD) (see **Table 9**)
- Capital expenditure estimates are inclusive of progressive rehabilitation and environmental management requirements
- NPV (after-tax) of approximately $1,106 M (AUD, 8% discount rate), IRR of 16.3%, and a payback period of 5 years from the start of mining show strong economic outcomes
- Projected revenue over the life of mine from V_2O_5 sales is approximately $11.5 Billion (Bn) (AUD), and approximately $10.1Bn (AUD) from the sale of transport fuel with a total revenue of $21.7Bn (AUD)

Table 9. Capital expenditure (AUD M)

Capital	Initial	Sustaining	Total
ORF	$242	$25	$267
FPF	$249	$46	$295
VRF	$114	$28	$142
Processing Infrastructure	$27	$39	$66
Infrastructure	$318	$460	$778
Contingency 20%	$146	$-	$146
Total Capital Cost	**$1,096**	**$598**	**$1,694**

The EIS development costs including potential environmental offsets is estimated at $10,000,000. QEM believes that future funding for development of the Project will be available when required, due to the following value drivers:

- Global demand is expected to increase significantly for vanadium
- QEM has held preliminary, confidential discussions with respect to Project and corporate funding/ownership with potential strategic partners and financiers, including international mining companies, trade partners, and other parties capable of providing financing required to develop the Project
- The technical and financial parameters are robust and economically attractive following positive results from the Scoping Study (RPM Global 2024)

QEM will continue to assess any potential benefits associated with the Project in relation to government initiatives and programs, including production tax incentives, royalty deferrals, rent exemptions or deferrals,

and funding opportunities. However, it is important to note that the project economics outlined in the Scoping Study (RPM Global 2024) are not reliant on these factors.

Key risks identified during the Scoping Study include:

- Delay in approvals or Project changes required due to identified social or social constraints
- Stakeholder acceptance of producing transport fuel
- Geological uncertainties that may affect resources and future reserve statement
- Metallurgical recoveries and grades
- Hydrogenation process technical and operating risks
- Reliable access to water and power
- Increase in operating/capital costs and/or reduction in commodity pricing

4 APPROVALS REQUIRED FOR THE PROJECT

Given the scale and complexity of the Project, there is a need to coordinate with and obtain various approvals from Commonwealth, State and Local Government agencies in accordance with relevant legislation. A range of secondary approvals, permits and licences will also be necessary, which will be confirmed as part of the EIS process as the scope of the Project is refined. All statutory requirements for the Project are outlined in **Table 10**. A summary of primary approvals and tenure requirements for the Project are described in the subsequent sections.

4.1 State SDPWO Act

The primary approval pathway identified for the Project is an EIS under the SDPWO Act. QEM is aware that the EIS evaluation process is not an approval in and of itself, however interacts with downstream approval processes that are still required to be obtained following release of an evaluation report. This includes most notably approvals under the *Planning Act 2016* (Planning Act) and the *Environmental Protection Act 1994* (EP Act).

It is anticipated QEM will provide specific planning and assessment reports relevant to the primary State approvals as part of the EIS process, as if those approvals are being sought directly under the Planning Act or EP Act. By providing this information, QEM is seeking to enliven the Coordinator-General's ability to 'state conditions' for key approvals under the SDPWO Act. As the Project may involve new and emerging technologies that are not routinely employed in Queensland, this approach may help facilitate delivery of the Project by providing consistency of assessment approach across approvals.

As stated conditions must be incorporated in decision notices and authorities issued by downstream assessment managers and administering authorities, a greater level of Project certainty and direction is able to be facilitated.

The Project may also constitute a controlled action under the Commonwealth EPBC Act. In this instance, QEM would prefer the Project be assessed under the bilateral agreement which would allow the Coordinator-General to assess the proposed action on behalf of the Australian Government as part of the EIS process.

A key driver of the Project's success to date is the positive relationships QEM has built with the local community. To maximise Project benefits back to the community, QEM will prepare a Social Impact Assessment (SIA) as part of the EIS. An SIA under the SSRC Act is required in instances that a Project is located within 125 km of a declared nearby regional community and/or the mine employs a workforce of 100 or more employees.

4.2 Commonwealth EPBC Act

The EPBC Act requires assessment and Commonwealth approval for any activity or action that will have, or is likely to have, a significant impact on a MNES. The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is responsible for the management of the EPBC Act.

Of the nine MNES listed under the EPBC Act, QEM has identified the Project has potential to impact on "listed threatened species and ecological communities". The potential for the Project to impact on MNES means that a referral to the Commonwealth was made on the 3rd October 2024 for a determination as to whether the proposed relevant action constitutes a "controlled action" under the EPBC Act. If deemed a controlled action, the Commonwealth will request a specific level of environment impact assessment depending on the nature of the proposed activity.

The Commonwealth could determine that an EIS is required for assessment of the controlled action. The Coordinator-General's EIS process is an accredited assessment process for MNES and can be utilised to inform the Commonwealth Minister on whether to approve the controlled action. Under the bilateral agreement between the Commonwealth and the State of Queensland dated 2014, DCCEEW has input at the required times in the Coordinator-General's EIS process and is responsible at the end of the process for issuing a separate conditioned approval for the action and for managing ongoing compliance.

Pursuant to Section 6 of the Coordinator-General's application guideline (DSDILGP 2023a), QEM's intention is to prepare and lodge the referral to the Commonwealth shortly following lodgement of this IAS to the Coordinator-General. This approach is envisioned to facilitate the most efficient consultation between the parties and will ensure any Commonwealth requirements can be incorporated seamlessly into the ToR in the event the Project is a controlled action for which EIS level of assessment is warranted.

4.3 Mining Activities and Leases

QEM, as an 'eligible person' intends to hold a MLA, granted under Section 234 of the *Mineral Resources Act 1989* (MR Act), to undertake exploration and mining of minerals including vanadium and oil shale (as defined by Section 6 of the MR Act). A MLA is yet to be lodged with DoR and will be undertaken during the EIS process.

A Site Specific Environmental Authority (SSEA) for the MLA area issued through stated conditions from the Coordinator-General under the SDPWO Act is proposed. All information for an SSEA will be provided through the EIS, including all engineering and financial feasibility studies, detailed designs, and environmental technical studies.

An SSEA application under the EP Act will be required for undertaking Environmentally Relevant Activity (ERA) 19 - mining metal ore (per Schedule 3, *Environmental Protection Regulation 2019* (EP Regulation)). The following ERAs may also likely be required for the Project under Schedule 2 of the EP Regulation including for the production of hydrogen within the MLA:

- ERA 7 chemical manufacturing
- ERA 8 chemical storage
- ERA31 mineral processing
- ERA33 crushing, milling, grinding or screening
- ERA63 sewage treatment

Applicable ERAs will be confirmed during the PFS and EIS, including required ERAs for hydrogen production.

4.4 Petroleum Activities and Leases

QEM, as an 'eligible person' intends to also hold a PFL for producing transport fuel products from the extracted oil shale, granted in accordance with Section 446 of the *Petroleum and Gas (Production and Safety) Act 2004* (P & G Act). A PFL application is yet to be lodged to DoR and will be undertaken during the EIS process.

The PFL may overlap with the MLA tenure due to the location of the processing infrastructure, however this will be further considered through the EIS process. A SSEA issued through stated conditions from the Coordinator-General under the SDPWO Act for petroleum processing is also proposed.

An SSEA application under the EP Act will be required for undertaking ERA 8 - a petroleum activity, other than an activity mentioned in any of items 1 to 7 (Schedule 3, EP Regulation). The following ERAs will also likely be required for the Project under Schedule 2 of the EP Regulation:

- ERA 11 oil refining or processing
- ERA 62 resource recovery and transfer facility operation

Applicable ERAs will be confirmed during the PFS and EIS.

4.5 Off-Lease Infrastructure

4.5.1 Workers Camp

A Development Application (DA) for a material change of use (MCU) is likely to be needed to establish the off-lease conceptual workers camp in the Julia Creek township, including associated operational works under the Planning Act and *McKinlay Shire Council Planning Scheme 2019* (MSC 2019). Schedule 10 of the *Planning Regulation 2017* identifies the matters that the assessment manager and/or referral agency assessment must have regard to. The State Development Assessment Provisions (SDAP) nominate applicable State Codes based on the referral triggers. The EIS for the workers camp may include assessment against:

- State Code 16: native vegetation clearing, for clearing of Category B regulated vegetation
- State Code 22: environmentally relevant activities

The proposed camp location may intersect with rural and/or rural residential zoning under the MSC 2019, therefore, the EIS may also include an assessment against:

- Rural residential zone code
- Rural zone code
- Operational work code

As noted in **Section 4.1**, a SIA under the SSRC Act will be prepared as part of the EIS to ensure social and community impacts of the workers camp as an accommodation strategy for the Project will be appropriately considered. Alternative locations for the workers camp, including as on-lease infrastructure within the MLA area, will be further investigated through the EIS process.

4.5.2 Water Infrastructure

Pending the outcomes of further investigations into water supply options as part of the EIS process, and outcomes of the current review of the Gulf Water Plan, additional approvals and tenure may be required to establish an easement for a water pipeline and storage. This may include a DA, with assessment against relevant state and local codes to be undertaken through the EIS process. Alternatively, a Specific Purpose Mining Lease (SPML) application may be considered through the EIS process. An application for a water licence or allocation under the Water Plan and tenure requirements will also be investigated.

4.6 Approvals Table

Commonwealth, State and local approvals and associated triggers are described in **Table 10.** Approval triggers and requirements are subject to change and are proposed to be confirmed as part of the EIS process in conjunction with detailed engineering. In **Table 10**, the 'Entire Project' includes both on-lease and off-lease infrastructure and associated disturbance areas which will be subject to approval under Commonwealth and State legislation.

Table 10. Commonwealth, State and local approvals that may be required for the project

Legislation	Approval	Trigger	Reference to Project	Administrating Authority	Within Scope of EIS
Commonwealth					
Native Title Act 1993	Native Title Agreement	A Project that has areas that may be subject to Native Title. Currently no native tile claims or native title determinations within the area of the Project.	Entire Project including State Owned Land.	DoR	Yes
EPBC Act	EPBC Referral and approval	A Project that will have or is likely to have a significant impact on a MNES. Where the Minister makes a decision that the Project is a Controlled Action and is subject to assessment and approval under the EPBC Act the bilateral agreement between the State and the Commonwealth can be via an accredited process	On-lease infrastructure, separate EPBC considerations may apply for off-lease infrastructure once confirmed.	DCCEEW	Yes
EPBC Act Environmental Offsets Policy (2012)	Environmental Offsets	Where impacts on MNES cannot be mitigated or avoided.	On-lease infrastructure	DCCEEW	Yes
National Greenhouse Energy Reporting Act 2007	Apply to register on National Greenhouse and Energy Register	Mandatory reporting framework for greenhouse gas emissions and production and consumption of energy when threshold values are exceeded by a corporation or single facility.	Entire Project	Clean Energy Regulator	Yes
State					
SDPWO Act	IAS, Coordinated Project and EIS Prescribed Project, if suitable	Where the Proponent is seeking a Coordinated Project determination and seeking the Coordinator-General to facilitate the planning and delivery of the infrastructure. Where the Project is declared a Coordinated Project by the Coordinator-General and the EIS assessment process is determined. This process is an accredited form of assessment for the purposes of the EPBC Act.	Entire Project	Office of Coordinator-General (OCG), Department of State Development and Infrastructure (DSDI)	Yes
SSRC Act	SIA	SIA is mandatory for EISs for large resource projects.	Entire Project	Office of Coordinator-General, DSDI	Yes
EP Act P & G Act	SSEA	The Project is required to have an EA to conduct all Environmentally Relevant Activities (ERAs) (for a petroleum activity) onsite as per the EP Reg.	Petroleum Activities	DESI	Yes

Legislation	Approval	Trigger	Reference to Project	Administrating Authority	Within Scope of EIS
EP Act	SSEA	The Project is required to have an EA to conduct all ERAs (for a resource activity) onsite as per the EP Reg.	Mining Activities	DESI	Yes
	PRC Plan and Estimated Rehabilitation Cost (ERC) for mining	The Project is required to have a PRC Plan and ERC for mining activities.	To accompany the SSEA for the mining activities, the Project must have a PRC Plan and ERC to ensure appropriate and timely rehabilitation methods are implemented.	DESI	Yes
	Plan of Operations and ERC for petroleum activities	The holder of an EA for a petroleum lease must prepare a plan of operations for carrying out petroleum activities, and an ERC to accompany the rehabilitation plan for the Project.	Petroleum Activities	DESI	Yes
	Notification of land	A Proponent must notify DESI of any activities listed in Schedule 3 of the EP Act that have the potential to cause land contamination so it can be recorded on the Environmental Management Register (EMR)	Required one week prior to activity occurring.	DESI	Yes
	Registration as a suitable operator	Applicant must be registered as a suitable operator under Section 318I of the EP Act prior to issue of the Environmental Authority.	Register as a suitable operator under Section 318I of the EP Act.	DESI	Yes
MR Act	MLA	The Project is required to have a ML in order to operate large scale mining and all associated activities.	MLA is yet to be lodged.	DoR	No. MLAs will be submitted separately.
	Specific purpose MLA	If required, the water pipeline may be contained within a specific purpose MLA	If applicable, Specific purpose MLA will be lodged for off-lease water infrastructure.	DoR	Yes
P & G Act	PFL application	The Project is required to have a PFL in order to operate petroleum activities.	PFL application is yet to be lodged.	DoR	No. PFL application will be submitted separately
P & G Act	Safety Management System (SMS)	Operators must develop and maintain an SMS to manage safety risks associated with petroleum activities.	Petroleum Activity	DoR	Yes

Legislation	Approval	Trigger	Reference to Project	Administrating Authority	Within Scope of EIS
Water Act 2000	Riverine Protection Permit	Placing fill or excavation in a mapped watercourse.	Activities that may impact mapped local watercourses.	Department of Regional Development, Manufacturing, and Water (DRDMW)	Yes
	Water licencing	Water licence to take unallocated water from other region(s) in the basin. Coordinated Project declaration allows the Project to negotiate directly with the DRDMW, outside of a public tender process.	Entire Project	DRDMW	Yes
Water Act 2000	Operational work for taking or interfering with water in a watercourse	Taking or interfering with a watercourse.	Activities that may impact mapped local watercourses.	DRDMW	Yes
Fisheries Act 1994	Operational work that is constructing or raising waterway barrier works	Project potentially impacting fish passage within a mapped waterway.	Activities that may impact mapped local watercourses.	DSDI Department of Agriculture and Fisheries (DAF)	Yes
Planning Act	Development Application for Reconfiguration of a Lot, Material Change of Use and/or Operational Work	Any off-lease infrastructure i.e. water pipeline, workers camp, as required. Will trigger referral to DTMR.	Off-lease infrastructure.	Assessment Manager	Yes
	Owner's consent	Development application for a Material Change of Use on State land	On-lease infrastructure within the State reserve.	DoR	Yes
Building Act 2014	Building Work	Construction of the off-lease Worker's Camp	Workers Camp	Private Certifier	No
Aboriginal Cultural Heritage Act 2003 (ACH Act)	Cultural Heritage Management Plan (CHMP)	Where an EIS is required, a CHMP must be in place and approved under Division 2 of Part 7 of the ACH Act as a pre-requisite to the grant of any lease, licence, permit, approval, or other authority required under any Act for the Project.	Mining and Petroleum Activities	Department of Treaty, Aboriginal and Torres Strait Islander Partnerships, Communities, and the Arts (DTATSIPCA)	Yes

Legislation	Approval	Trigger	Reference to Project	Administrating Authority	Within Scope of EIS
Mining and Quarrying Safety and Health Act 1999 (MQSH Act)	Mine must comply with obligations under the MQSH Act to protect the safety and health of persons at the mine	Mines must ensure that the risk of injury or illness to any person resulting from operations is at an 'acceptable' level. This means that the level of risk must be not only within acceptable limits but also as low as reasonably achievable.	On-lease infrastructure	DoR	No
Work Health and Safety Act 2011 *Work Health and Safety Regulation 2011*	Major Hazard Facility Licence	If required, need a licence for operating a Major Hazard Facility where threshold quantities of fuels/chemicals listed in Schedule 15 of the *Work Health and Safety Regulation 2011* are stored, handled or processed.	Project infrastructure	Workplace Health and Safety Queensland	Yes
Nature Conservation Act 1992 *Nature Conservation (Animals) Regulation 2020* *Nature Conservation (Plants) Regulation 2020*	Permit for the movement of protected animals	If protected species are identified during the environmental assessment or pre-clearing survey.	Entire Project	DESI	Yes
	Protected plant clearing permit – or Exempt clearing notification	If protected plants are found in areas to be cleared or if no protected plants found in areas to be cleared.	Entire Project	DESI	Yes
	Species Management Plan	If interfering with protected native fauna habitat and breeding places.	Entire Project	DESI	Yes
Vegetation Management Act 1999	Operational work to clear native vegetation	Where the works require the clearing of regulated vegetation.	Off-lease infrastructure	DoR	Yes
Environmental Offsets Act 2014	Offset Strategy	If there is a significant residual impact on a prescribed State environmental matter.	Entire Project	DESI	Yes
Transport Infrastructure Act 1994	Dependent upon Project specifics	Carry out road access works within a State-controlled road.	Activities within the road corridor	DTMR	Yes
	Rail feasibility investigator authority	To authorise entering land to investigate feasibility of a rail corridor (applied for under s110 of the Act).	Activities within the rai corridor..	DTMR	Yes

Legislation	Approval	Trigger	Reference to Project	Administrating Authority	Within Scope of EIS
Land Act 1994	Tenure arrangements, including leases for mining and petroleum activities, temporary road closures, and stock routes.	Project activities on state land.	On-lease infrastructure within the State reserve.	DoR	Yes
Stock Route Management Act 2002		Interference with stock route reserve (Lot 6 EN16)	On-lease infrastructure within the State reserve.	DoR	Yes
Biosecurity Act 2014	General biosecurity obligation	Statutory duty of care 'General Biosecurity Obligation (GBO)' under the *Biosecurity Act 2014* (Section 23) to manage biosecurity risks and threats under QEM's control. For example, introduced plant species which may be declared Restricted Matters such as Prickly Acacia *Vachellia nilotica*, which is also a Weed of National Significance (WoNs).	Entire Project	DAF	Yes
Local					
McKinlay Shire Council Planning Scheme 2019	Development Application Approval	Where offsite components (i.e. workers camp and water pipeline) are likely to be code assessable against the Operational Works Code in the Planning Scheme/s.	Off-lease infrastructure	MSC	Yes

5 ENVIRONMENTAL CONSIDERATIONS

This Section provides a high-level overview of the existing environment, potential impacts and management and mitigation measures for the Project in accordance with Appendix 1 of the *Application guideline-Coordinated project declaration under the SDPWO Act* (DSDILGP 2023a). For the purposes of informing desktop searches which underpin **Section 4**, the Project area is defined as all project components within the Project's EPMs (see **Figure 2)**.

5.1 Land Use and Built Environment

5.1.1 Existing Environment

5.1.1.1 Land Use and Tenure

The Project Area has been historically used for cattle grazing on unimproved pastures of the Mitchell Grass Downs and is in a largely disturbed state, situated across several rural properties. Several fencing lines and vehicular tracks also occur across these properties. Desktop mapping indicates that the Project Area is largely comprised of remnant least concern regional ecosystems (REs), dominated by *Astrebla* tussock grassland. However, these REs are subject to significant grazing pressures (QGlobe 2024).

The Project tenure is currently comprised of EPMs, freehold, lands lease, and reserve land, described in **Table 6**. Surrounding views are of the existing environment which comprises mostly degraded, cattle grazing country, and the Flinders Highway. From Flinders Highway, the Project Area is viewed as flat and mainly treeless plains subject to cattle grazing.

5.1.1.2 Topography, Geology and Soils

The Project Area lies on flat lying black soil plains characteristic of the Mitchell Grass Downs Bioregion, with relief generally less than 1 m high (see **Figure 6**). The Project area contains sediments from the Eromanga Basin, a marine basin that formed between the Late Triassic to Early Late Cretaceous period. The geology within the Project area is benign, and is comprised of relatively flat to gently undulating plains with an elevation range of 130-150 m Australian Height Datum (AHD). Subtle topographic highs are largely consistent with outcropping Toolebuc Formation instead of the primarily weathered and subdued Allaru Mudstone which is generally 200 m to 300 m thick and formed within a calm shallow to basinal marine setting (see **Figure 6**). The economic sequences are contained within the Toolebuc Formation, with vanadium in the whole formation and oil mainly within the oil shale (Arrolla Siltstone). The Toolebuc is anomalous in various elements, including vanadium, copper, zinc, nickel and molybdenum, derived from seawater by paleo-organisms (RPM Global 2024). Several creeks and drainage lines occur within the Project area and generally flow to the northwest.

The region is dominated by Epicalcareous to Epihypersodic self-mulching brown vertosols under the Australian Soil Classification system (see **Figure 7)** (McKenzie et al 2000). The area is mapped as MM5 which is described as gently undulating clay plains with a slight gilgai microrelief, containing substantial gypsum. Topography in some locations is strongly undulated, and dissected by deep wide valleys where the soil unit is exposed by stream erosion. Brown clays (Ug5.32) of moderate depth (76 – 91 cm) are dominant with similar grey clays (Ug5.26, Ug5.22) also commonly occur. In areas, particularly located adjacent to eroded lateritic mesa-like hills or lateritic scarps, red-brown clays (Ug5.37, Ug5.38) are locally dominant, with smaller areas of red loamy duplex soils (Dr3.22). In other small local areas, a veneer of silcrete (billy) gravel is prominent, with associated lower-level plains, or small stream flood-plains with deeper clay soils (Ug5.28, Ug5.29, Ug5.24, and Ug5.34) (McKenzie et al 2000, QGlobe 2024). Acid sulphate soils are not expected to occur in the Project area due to its distance from the coast, topography (above 5 mAHD), and geomorphic and soil characteristics.

The agricultural features of the Project area include:

- A stock route reserve within EPM 27057
- No mapped cropping zones
- No mapped Priority Agricultural Areas
- Project area is not located within or adjacent to Strategic Cropping Land (SCL)

- No mapped Strategic Environmental Areas (SEAs)
- The Project Area is mapped as Agricultural Land Classification C (ZEG2), sown and native pasture land on high fertility soils

No known past activities indicate a contribution to land contamination within the Project Area. There are also no mapped World Heritage areas, Ramsar protected wetland sites, nationally important wetland sites, State Forests or Nature Refuges within or adjacent to the Project Area.

5.1.2 Potential Impacts

The Project is consistent with an objective of the *North West Queensland Regional Plan 2010* (specifically Section 2.3), which notes that mining and extractive resources are to be managed to maximise economic opportunities, while minimising negative environmental and social impacts for present and future generations (Growth Management Queensland 2010). Similarly, the *Queensland Plan* seeks to ensure that in 30 years' time Queensland will be home to vibrant and prosperous communities. The Plan identifies nine foundation areas which create the framework, namely education, community, regions, economy, health and wellbeing, environment, people, infrastructure and governance. This Project can positively contribute to the region, produce significant economic outcomes and also support the renewables sector.

Landowner's consent will be obtained for the Project, with proposed ML and PFL tenure further described in **Section 4.** The Project area is zoned as rural under the MSC 2019 and will be consistent with the outcomes of the rural zone code (Section 5.2.4.1 (c) and (g) of the Planning Scheme) to the extent that impacts on the viability of existing agricultural, residential and tourist uses will be minimised as much as possible, and adequate separation and buffering is provided when investigating the location of the workers camp.

The existing land resources and uses may be directly or indirectly impacted by Project activities via:

- Temporary land use change to mining, petroleum activities and infrastructure
- Final void formations causing permanent landform changes
- Landscape alterations or degradation resulting from pre-rehabilitation vegetation clearing and excavation
- Disposal of wastes
- Agricultural capacity reduction as a result of landform or vegetation changes
- Construction and operational phases may contribute to land compaction, contamination, erosion, and degradation of soils
- Changes to tenure for proposed mining activities on State Land
- Change to the visual aspect of the area, close to the township of Julia Creek and the Flinders Highway

Waste products will be generated through construction activities, operation of mining and extraction, and decommissioning. Waste may impact the receiving environment through the contamination of soil, water resources and habitats, and may harm or injure neighbouring communities and fauna and flora species. Waste streams from construction, operation and decommissioning will be managed in accordance with a strategy in line with the Waste Management Hierarchy. The strategy will identify controls to reduce wastes and ensure that onsite wastes do not enter the environment, or to minimise impacts should unexpected waste emissions occur.

Sources of mine waste to be generated may include:

- Tailings
- Reagent wastes
- Waste rock

Non-mining wastes may include:

- Regulated Wastes (waste hydrocarbons, tyres, batteries) from maintenance activities
- Recyclable general wastes (plastics, aluminium cans, glass, paper)
- General wastes (food scraps, wood, paper, and plastic not suitable for recycling)
- Recyclable scrap metal

- Sewage effluent from portable facilities

Land is anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The EIS will include an assessment of potential impacts to land that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Impacts to Land* (DESI 2024d). Similarly, waste will be assessed in accordance with the *Application requirements for activities with waste impacts* (DESI 2024g).

Key studies that will be undertaken to support an EIS relating to land will include:

- PRC Plan
- Soil and Land Suitability Assessment
- Visual Amenity Impact Assessment
- Waste Characterisation Assessment

5.1.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts to land from the Project and will likely include including:

- Progressive rehabilitation in accordance with the Project's PRC Plan and PRC Plan Schedule, and Estimated Rehabilitation Costing
- Final Void Management Plan
- Construction Environmental Management Plan
- Operational Environmental Management Plan
- Geochemical assessment and landform designs
- Soil management procedures
- Revegetation Management Plan
- Erosion and Sedimentation Control Plan
- Land disturbance procedures
- Spill Management Plan

epic ENVIRONMENTAL

Legend

- Project area
- Elevation contours (10m interval)
- State controlled roads
- Railways

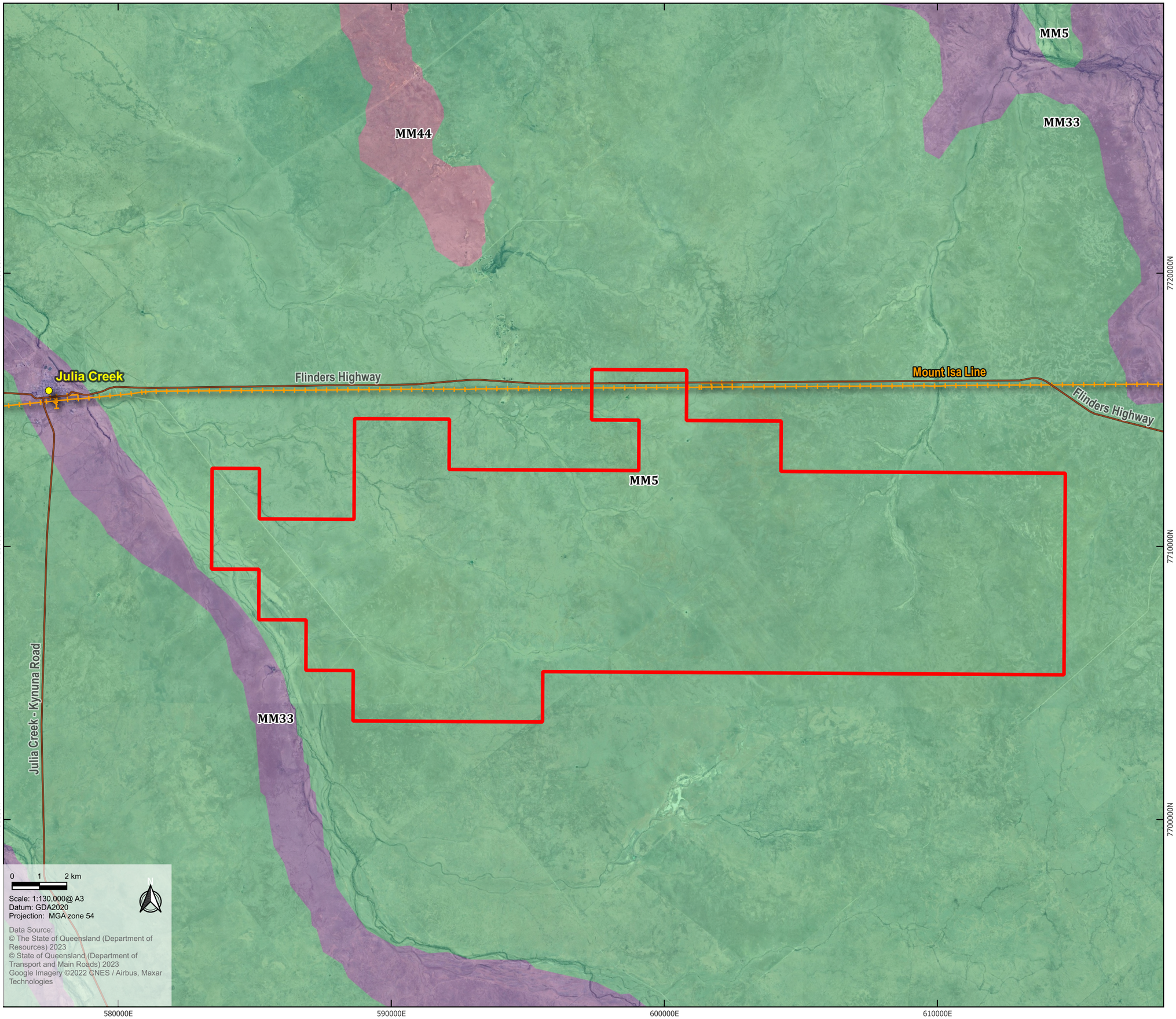
Detailed Surface geology (August 2022)

- Qa: Qa-QLD - Stratified Unit (including Volcanic And Metamorphic) - Alluvium
- Ta: Ta-QLD - Stratified Unit (including Volcanic And Metamorphic) - Poorly Consolidated Sediments
- Qpa: Qpa-QLD - Stratified Unit (including Volcanic And Metamorphic) - Alluvium
- Ka: Allaru Mudstone - Stratified Unit (including Volcanic And Metamorphic) - Mudrock
- Ko: Toolebuc Formation - Stratified Unit (including Volcanic And Metamorphic) - Mixed Siliciclastic/carbonate Rocks
- Qhab: Qhab-QLD - Stratified Unit (including Volcanic And Metamorphic) - Alluvium

Scale: 1:130,000@ A3
Datum: GDA2020
Projection: MGA zone 54

QEM Limited
Julia Creek Vanadium and Energy Project
Initial Advice Statment

Figure 6
Site topography and geology



epic ENVIRONMENTAL

Legend

- Project area
- State controlled roads
- Railways

Atlas of Australian soils Queensland

- MM33
- MM44
- MM5

QEM Limited
Julia Creek Vanadium and Energy Project
Initial Advice Statment

Figure 7
Soil mapping units

5.2 Ecology

5.2.1 Existing Environment

A fauna survey was undertaken by Epic Environmental in March 2022 which recorded 55 terrestrial fauna species, comprised of six mammal, 40 bird, seven reptile and two frog species in the Project area and immediate surrounds. The survey identified occurrence of the Fork-tailed Swift (*Apus pacificus*) in the Project area, listed as Migratory under the EPBC Act. Two flora surveys undertaken by Epic Environmental in March 2022 and October to November 2022 identified a total of 121 flora species within the Project area. No Environmentally Sensitive Areas occur within the Project area.

5.2.1.1 Matters of National Environmental Significance

A desktop search for Threatened Ecological Communities (TECs) showed that a single TEC – the community of native species dependent on natural discharge of ground water from the Great Artesian Basin – is likely to occur within the Project area. Ecological assessments will be undertaken as part of the EIS to verify the extent of the TEC across the Project area, as well as investigating potential impacts and proposed mitigation and management options.

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a MNES are controlled actions and require approval from the Commonwealth Government. The DCCEEW EPBC Act Protected Matters report (PMR) was generated based on the Project area with a 10 km buffer. The PMR identified 15 threatened fauna species and 10 migratory species were identified as potentially occurring within the search area (**Table 11**). No MNES threatened flora species were identified as potentially occurring within the search area (DCCEEW 2024a, DESI 2024g).

Table 11. MNES threatened species desktop search results

Species	Common name	EPBC status	Source database
Birds			
Calidris ferruginea	Curlew Sandpiper	CE, Mi	PMR, WildNet
Erythrotriorchis radiatus	Red Goshawk	E	PMR
Rostratula australis	Australian Painted Snipe	E	PMR
Erythrura gouldiae	Gouldian Finch	E	PMR
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	PMR
Gallinago hardwickii	Latham's Snipe	V, Mi	PMR
Tyto novaehollandiae kimberli	Masked Owl (north)	V	PMR
Grantiella picta	Painted Honeyeater	V	PMR
Falco hypoleucos	Grey Falcon	V	PMR
Calidris acuminata	Sharp-tailed Sandpiper	V, Mi	PMR, WildNet
Mammals			
Sminthopsis douglasi	Julia Creek Dunnart	V	PMR, WildNet
Macroderma gigas	Ghost Bat	V	PMR
Macrotis lagotis	Greater Bilby	V	PMR
Reptiles			
Acanthophis hawkei	Plains Death Adder	V	PMR
Varanus mertensi	Merten's Water Monitor	E	PMR
Migratory (where not listed above)			
Glareola maldivarum	Oriental Pratincole	Mi	PMR
Motacilla cinerea	Grey Wagtail	Mi	PMR
Motacilla flava	Yellow Wagtail	Mi	PMR
Actitis hypoleucos	Common Sandpiper	Mi	PMR
Apus pacificus	Fork-tailed Swift	Mi	PMR
Charadrius veredus	Oriental Plover	Mi	PMR
Calidris melanotos	Pectoral Sandpiper	Mi	PMR

CE = critically endangered, E = endangered, V = vulnerable, Mi = Migratory

5.2.1.2 Matters of State Environmental Significance

A search of the WildNet database using a central coordinate point (-20.7151, 141.9514) and a 60 km buffer was used to identify MSES within the Project area. The WildNet results identified three fauna species listed as threatened and nine fauna species listed as special least concern (SLC) under the *Nature Conservation Act 1992* (NC Act) (DESI 2024g). One additional threatened flora species was also identified. These species are outlined in **Table 12**.

Table 12. MSES threatened species desktop results

Species	Common name	NC Act status	Source database
Fauna			
Apus pacificus	Fork-tailed Swift	SL	WildNet
Charadrius veredus	Oriental Plover	SL	WildNet
Hydroprogne caspia	Caspian Tern	SL	WildNet
Epthianura crocea crocea	Yellow Chat	V	WildNet
Actitis hypoleucos	Common Sandpiper	SL	WildNet
Calidris acuminata	Sharp-tailed Sandpiper	SL	WildNet
Calidris alba	Sanderling	SL	WildNet
Calidris ferruginea	Curlew Sandpiper	CE	WildNet
Tringa nebularia	Common Greenshank	SL	WildNet
Tringa stagnatilis	Marsh Sandpiper	SL	WildNet
Plegadis falcinellus	Glossy Ibis	SL	WildNet
Tringa nebularia	Common Greenshank	SL	WildNet
Sminthopsis douglasi	Julia Creek Dunnart	E	WildNet
Flora			
Dolichocarpa spathulata	*Dolichocarpa spathulata*	V	WildNet

SL= special least concern, CE = critically endangered, E= endangered, V = vulnerable

There are two distinct areas of endangered or vulnerable MSES protected wildlife habitat within the Project area, specifically within EPM 25662 (QGlobe 2024) (see **Figure 8**).

The Project area is mapped entirely as least concern Category B (remnant) vegetation. No Category C or Category X regulated vegetation is mapped within the Project area, however, the Project area overlaps areas mapped as MSES regulated vegetation (intersecting a watercourse) (QGlobe 2024).

The Project area is dominated by Mitchell grass (*Astrebla* spp.) tussock grasslands on rolling plains (downs). The plains are interlaced by multiple drainage lines which support open grasslands, herblands or eucalypt woodlands and isolated remnant plateaus (Sattler and Williams 1999). There is no essential habitat occurring within or surrounding the Project area (QGlobe 2024). Biodiversity Planning Assessment (BPA) mapping identifies a state terrestrial biodiversity corridor that intersected the Project area. No riparian corridors are mapped across the Project area (State of Queensland 2024). No protected areas including nature refuges, special wildlife reserves, and estates occur within the project area (QGlobe 2024).

Desktop assessment indicates the presence of seven mapped REs. This mapping shows large areas of the northern area as RE 4.3.15, while the southern area is largely comprised of 4.9.1c/4.9.12x8 and 4.3.15/4.3.4f. None of the REs recorded onsite are listed as Endangered under the VM Act. Furthermore, none have an Endangered biodiversity status (**Table 13**).

Table 13. Regional ecosystems recorded within the Project area (on-lease)

Regional Ecosystem	Brief Description	VM Act* Status	Biodiversity Status	Total Area (ha)to
4.3.15	*Astrebla squarrosa* +/- *Dichanthium* spp. +/- *Eulalia aurea* grassland on alluvium	LC	NC	40.01
4.3.15/ 4.3.19/ 4.3.4x2d	*Astrebla squarrosa* +/- *Dichanthium* spp. +/- *Eulalia aurea* grassland on alluvium *Dichanthium* spp., *Eulalia aurea, Astrebla* spp. Grassland on alluvium *Eucalyptus coolabah* open woodland on fringing drainage lines in clay and limestone landscapes	LC	NC	253.17

Regional Ecosystem	Brief Description	VM Act* Status	Biodiversity Status	Total Area (ha)to
4.3.15/ 4.3.4f	*Astrebla squarrosa +/- Dichanthium* spp. *+/- Eulalia aurea* grassland on alluvium *Eucalyptus coolabah +/- E. microtheca* low open woodland. Occurs on drainage lines on *Astrebla* spp. Undulating plains and braided channels on alluvial plains, particularly north-east Riverine wetland or fringing riverine wetland	LC	NC	1,609.62
4.3.4f	*Eucalyptus coolabah +/- E. microtheca* low open woodland. Occurs on drainage lines on *Astrebla* spp. Undulating plains and braided channels on alluvial plains, particularly north-east Riverine wetland or fringing riverine wetland	LC	NC	37.29
4.9.12x8	Mixed low open woodland, including combinations of the species *Atalaya hemiglauca, Ventilago viminalis, Corymbia terminalis* and *Denhamia oleaster*. A sparse shrub layer may occur. The ground layer is tussock grasses, including *Aristida* spp., *Enneapogon* spp. and *Astrebla lappacea*. Occurs on rises of exposed Cretaceous mudstone (Toolebuc Formation) with rocks to the surface	LC	NC	1.73
4.9.1c	*Astrebla lappacea +/- Aristida latifolia +/- Panicum decompositum* grassland on Cretaceous sediments	LC	NC	19,749.68
4.9.1c/ 4.9.12x8	*Astrebla lappacea +/- Aristida latifolia +/- Panicum decompositum* grassland on Cretaceous sediments Mixed low open woodland, including combinations of the species *Atalaya hemiglauca, Ventilago viminalis, Corymbia terminalis* and *Denhamia oleaster*. A sparse shrub layer may occur. The ground layer is tussock grasses, including *Aristida* spp., *Enneapogon* spp. And *Astrebla lappacea*. Occurs on rises of exposed Cretaceous mudstone (Toolebuc Formation) with rocks to the surface	LC	NC	3,283.08

*VM Act = *Vegetation Management Act 1999*; LC = Least Concern, NC = No Concern

5.2.1.3 Weeds and Pests

Three Category 3 restricted matter species of weeds were identified in the desktop assessment as potentially occurring within the Project area (QGlobe 2024). Two of these species are listed as Weeds of National Significance (WoNS) (Centre for Invasive Species Solutions 2021). All potentially occurring weeds are listed below:

- Prickly Acacia (*Vachellia nilotica*) (WoNS)
- Parkinsonia (*Parkinsonia aculeata*) (WoNS)
- Chinese Apple (*Ziziphus mauritiana*)

Twelve species of feral animal were identified in the MSES report and PMST report (DESI 2024g, DCCEEW 2024a), including the Dog/Dingo (*Canis familiaris*) and Pig (*Sus scrofa*) amongst others. Of these species, six are pest species listed under Schedule 2 of the *Biosecurity Act 2014* as 'Restricted Matters'.

epic ENVIRONMENTAL

Legend

- Project area
- State controlled roads
- Railways
- Regulated vegetation (100m from wetland)
- Regulated vegetation (essential habitat)
- Wildlife habitat (endangered or vulnerable)
- Wildlife habitat (special least concern animal)
- Regulated vegetation (intersecting a watercourse)

580000E 590000E 600000E 610000E

7720000N 7710000N 7700000N

Julia Creek

Flinders Highway

Mount Isa Line

Julia Creek - Kynuna Road

0 1 2 km

Scale: 1:130,000@ A3
Datum: GDA2020
Projection: MGA zone 54

N

Filepath: -BAA\BAA240062.01 QEM Julia Creek Project EIS\Workspaces\BAA240062.01 EIS\1. IAS\Rev 1\Figure 8 Matters of state environmental significance.qgz

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Figure 8
Matters of state environmental significance

5.2.2 Potential Impacts

As a result of Project activities, the following direct or indirect impacts to flora, fauna, and ecosystems near the Project may occur:

- Clearing for infrastructure resulting in vegetation and habitat fragmentation and loss
- Turbidity and reduced aquatic ecology values as a result of unplanned sediment or mine water releases to waterways
- Unplanned contaminant releases to soil, potentially causing degraded vegetation and habitat nearby
- Smothered flora from excessive dust generation and deposition causing degradation of vegetation and habitats
- Introduction and/or spread of weed and feral animal species resulting in habitat degradation, increased competition and decline in local native populations
- Biodiversity values that may be impacted include, groundwater dependent ecosystems (GDEs), wetlands, REs, MSES and MNES

During the LOM, it is intended that grazing will continue on those parts of the Project area which are not required by mining operations. Clearing of regrowth and sparse remnant native vegetation will be necessary for the mine, and associated infrastructure. Much of the proposed Project area has been extensively grazed by cattle for many years and is infested by prickly acacia. Clearing of vegetation would occur in stages as mining progresses, followed by rehabilitation.

The most significant and direct impact of the Project on ecological values is the clearing of vegetation. Under the EPBC Act land clearance is listed as a key threatening process as it reduces the size of local populations of flora and fauna dependent on removed habitat. These impacts are immediate and significant in the short-term with persistent long-term impacts possible if habitat created during mine rehabilitation does not closely resemble pre-mining ecosystems. If sufficient habitat refuges are not maintained locally prior to the maturation of rehabilitated land, local extinction of certain species may occur. Connectivity across the broader Project area has been considered in terms of habitat connections and broader corridors with regional linkages beyond the boundaries of the Project area.

Vegetation will be removed to support the construction of Project infrastructure. The REs to be cleared, are not listed as 'Of Concern'. However, one TEC is mapped as potentially occurring within the desktop search area. Field assessment of potential TECs will be undertaken as part of the EIS process to determine the extent of impacts to TECs.

Fauna are also at risk of vegetation clearing for the Project through direct mortality or injury. Increased noise and traffic also present a risk to fauna during Project activities. Fauna of low mobility are at risk of injury or death/injury from heavy machinery during clearing or vehicle movement.

Project activities may also convey several indirect impacts to the nearby environment including habitat degradation and fragmentation, edge effects, noise and traffic impacts and changes to local fire regimes. Fragmented habitats are able to support fewer species when compared to connected blocks of habitat of the same size. This is because fragmentation restricts dispersal of fauna and plant seeds between available habitat. Habitat fragmentation impacts depend on the size of the remaining habitat fragments, degree of dispersal inhibition by habitat gaps, and ecological attributes of the species.

The most likely change to fire regimes due to Project activities is due to the reduced frequency of fire as a result of fuel load reduction from clearing. This is likely to benefit vegetation that is fire-sensitive in the Project area. In general, the Project is not expected to cause substantial changes to local fire regimes. Any change is expected to be short-term, as rehabilitated sites are expected to develop a grass layer with the potential to support fire within the first years of development. Active fire exclusion will be practiced to allow for the establishment of trees and shrubs.

Vehicular traffic and earthworks associated with mining can generate substantial amounts of dust during dry periods. However, progressive earthworks will ensure that any one block of vegetation will only be exposed to

significant levels of dust for a short period. Noise impacts may also disrupt fauna habitation, breeding or use of an area.

Flora and fauna are anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The EIS will include Terrestrial and Aquatic Ecology Assessments that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Impacts to Land* (DESI 2024d). Key studies that will be undertaken to support an EIS relating to flora and fauna will include:

- Ecological assessment report
- Aquatic ecology assessment report
- Offset strategy
- Stygofauna assessment

5.2.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts to ecology from the Project and will likely include including:

- Biodiversity offsets for MNES and MSES in consideration of the Queensland *Environmental Offsets Act 2014*, EPBC Act Environmental Offsets Policy 2012 and Queensland Environmental Offsets Policy
- Procedures for surface disturbance and vegetation clearing
- Revegetation Management Plan
- Weed and Pest Management Plan
- Threatened Species Management Plan
- Offset Management Plan

5.3 Surface Water

5.3.1 Existing Environment

The Project is located within the Flinders River Catchment area of the Water Plan and is further separated into the Flinders River and Cloncurry River drainage subbasins (see **Figure 9**). The Project is located within the Great Artesian Basin (GAB) area and within the northern part of the Eromanga Basin which overlies the north-western Galilee Basin and connects the Euroka Arch to the Carpentaria Basin. There are minimal notable topographic features and subtle topographic highs across the region. Under the Interim Biogeographic Regionalisation for Australia (IBRA), the area is classified as Central Downs subregion within the Mitchell Grass Downs biogeographic region. Several creeks and drainage lines occur within the Project area, including the following watercourses which are also waterways for waterway barrier works (WWBW):

Julia Creek

- Traverses through the southwestern corner of the Project area
- Several tributaries of Julia Creek also traverse the Project area
- High risk (red) / moderate risk (orange) waterway

Horse Creek

- Traverses through the central part of the Project area
- Several tributaries of Horse Creek also traverse the Project area
- Low risk (green) / moderate risk (orange) waterway

Spellary Creek

- Traverses through the western section of the Project area
- Several tributaries of Spellary Creek also traverse the Project area
- Low risk (green) waterway

Inferred surface water flow is generally toward the north/northwest direction. A 12 month baseline surface water quality monitoring program was completed in 2023. This consisted of 11 sampling locations around the

tenement and shire. QEM is continuing periodic sampling each quarter. The western extent of the Project area intersects with rapid hazard assessment floodplain extent mapping (see **Figure 10**)(QGlobe 2024). Flooding has been further considered in **Section 5.9.2.**

Catchment run off is generally from southeast to northwest towards the Cloncurry River and to a lesser extent the Flinders River (see **Figure 10)**. No High Ecological Significance (HES) wetlands on the map of Referable Wetlands occur within the Project area. Furthermore, no areas of High Ecological Value (HEV) wetlands or HEV waterways as shown on the map of Queensland Wetland Environmental Values within the Project area (QGlobe 2024). Multiple wetlands (mapped waterways) of low ecological significance located in the northern portion of the Project area. Freshwater bodies are limited across the Project area despite inundation filling some water storage areas on a seasonal basis. No High Ecological Significance (HES) wetlands on the map of Referable Wetlands occur within the Project area. Furthermore, no areas of High Ecological Value (HEV) wetlands or HEV waterways as shown on the map of Queensland Wetland Environmental Values within the Project area (QGlobe 2024).

5.3.2 Potential Impacts

The Project may involve taking or interfering with groundwater and overland flow water from the Flinders River, requiring a water licence or allocation under the Water Plan. The Water Plan identifies that there is general unallocated water available (for any purpose) and strategic unallocated water (including projects considered to be of regional significance or Coordinated Projects under the SDPWO Act) within the Flinders River catchment area. The Project may seek to negotiate with DRDMW outside of a tender process to secure an entitlement to this water. A detailed evaluation of a preferred water supply strategy will be undertaken as part of the EIS.

Project activities may result in direct and indirect impacts on water quality and resources via:

- Changes in the Project area's existing geomorphology and hydrology
- Changes in the existing surface water and flood flow paths
- Reduced watercourse flow as a result of surface water flow into pits
- Increase in potential for sedimentation and erosion as a result of land disturbance
- Controlled and uncontrolled releases from processing facilities, mining and tailings storage facility
- Potential acid rock drainage from the waste rock dumps and tailings storage facility

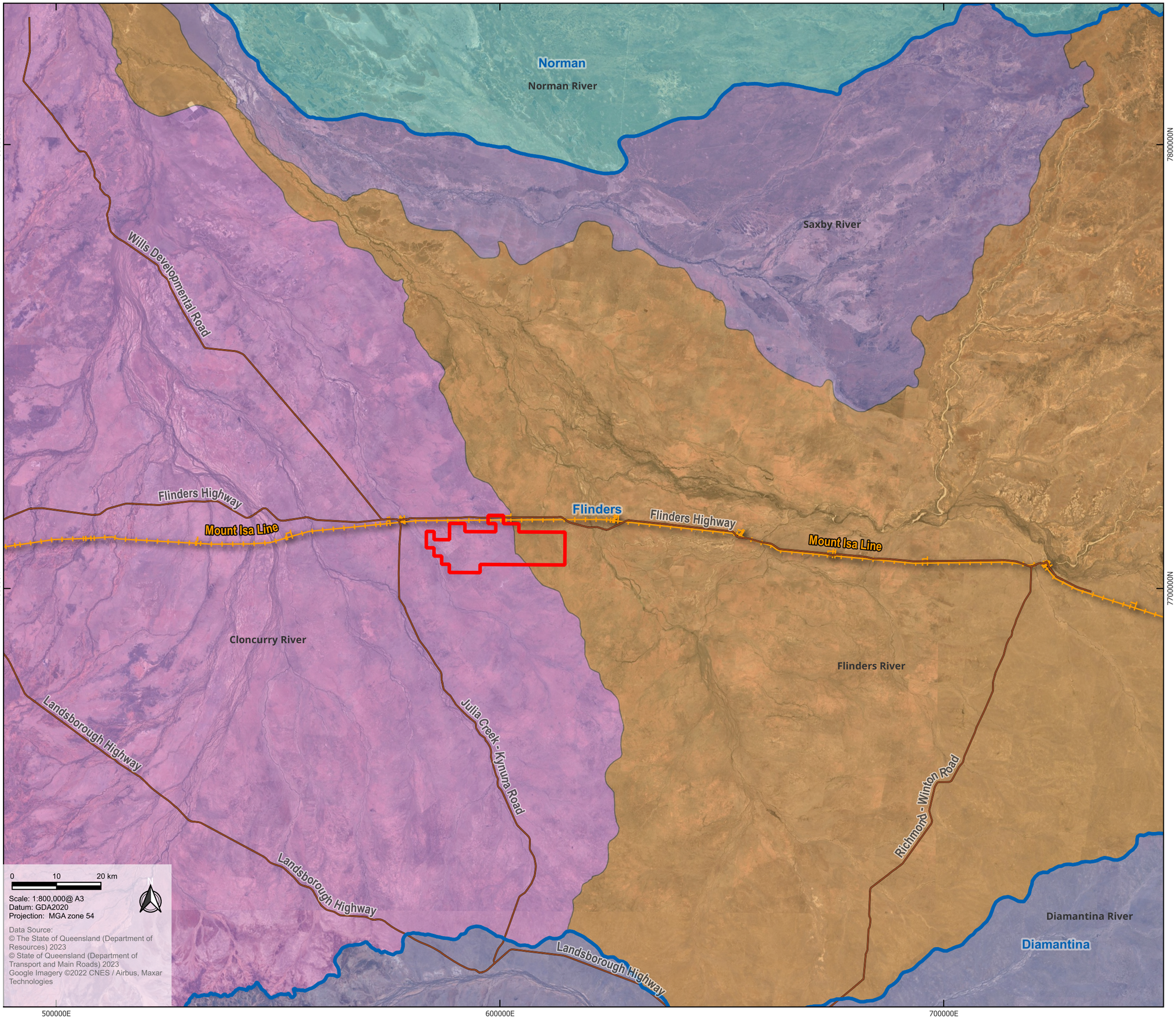
Surface water is anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The EIS will include an assessment of potential impacts to surface water including flooding, and geomorphology that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Impacts to Water* (DESI 2024c). Key studies that will be undertaken to support an EIS relating to surface water will include:

- Surface Water Impact Assessment
- Aquatic Ecology Survey

5.3.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts to surface water from the Project and will likely include including:

- Surface Water Management Plan
- Surface Water Management Infrastructure
- Surface Water Monitoring Plan
- Fish passage and diversion infrastructure
- Receiving Environment Monitoring Plan
- Erosion and Sediment Control Plan
- Spill Management Plan



epic ENVIRONMENTAL

Legend

- Project area
- State controlled roads
- Railways
- Drainage basins

Drainage sub-basins

- Cloncurry River
- Diamantina River
- Flinders River
- Norman River
- Saxby River

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Figure 9
Water catchment context

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epic ENVIRONMENTAL

Legend

- Project area
- Floodplain assessment overlay
- State controlled roads
- Railways

Watercourses

- Major
- Minor

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Figure 10
Queensland floodplain assessment overlay

580000E 590000E 600000E 610000E

7720000N 7710000N 7700000N

Julia Creek
Julia Creek
Flinders Highway
Mount Isa Line
Flinders Highway
Horse Creek
Horse Creek
Spellany Creek
Alick Creek
Julia Creek
Julia Creek
Julia Creek
Julia Creek - Kynuna Road

0 1 2 km

Scale: 1:130,000@ A3
Datum: GDA2020
Projection: MGA zone 54

Data Source:
© The State of Queensland (Department of Resources) 2023
© State of Queensland (Department of Transport and Main Roads) 2023
Google Imagery ©2022 CNES / Airbus, Maxar Technologies

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5.4 Groundwater

5.4.1 Existing Environment

The Project is located within the Great Artesian Basin (GAB) area which occupies 1.7 million square metres and consists of a multi-layered confined aquifer system. The Project lies within the northern part of the Eromanga Basin which overlies the north-western Galilee Basin and connects the Euroka Arch to the Carpentaria Basin.

A total of five (5) registered groundwater bores exist within the Project area (see **Figure 11**):

- Registration Number (RN)2453
- RN13556
- RN184984
- RN163617
- RN15813

A total of 11 groundwater monitoring bores were established across the Project area in August 2022 and July 2023 (see **Figure 11**) and a groundwater monitoring program commenced with data collected to inform groundwater technical studies as part of the EIS. Aspects that will be assessed in future groundwater studies include:

- Regional Faults and Structures
- Local Conditions
- Registered Groundwater Bores
- Groundwater monitoring network
- Local hydrogeological conditions
- Groundwater-surface water interactions
- Groundwater dependent ecosystems
- Stygofauna
- Groundwater levels and flows
- Groundwater inflows
- Conceptual hydrogeological model

The Bureau of Meteorology (BoM) GDE Atlas identifies a potential aquatic GDE (low confidence) in the western portion of the Project area (Commonwealth of Australia 2024a). The GDE connects to a larger system to the west and north of the Project area that are associated with the Flinders River (see **Figure 11**).

5.4.2 Potential Impacts

As a result of the Project, the following impacts to groundwater, users and GDEs may occur within and surrounding the Project area:

- Reduced water availability at private water bores due to a decline in groundwater pressure and/or levels
- Reduced groundwater head with potential effects on GDEs
- Reduced baseflow to watercourses, potentially resulting in reduced surface water availability to potential users downstream and GDEs
- Groundwater system contamination due to the improper storage and handling of chemicals and fuels
- Groundwater quality impacts through seepage from the tailings storage facility, waste rock landforms, processing activities, final voids and water storage facilities
- Impacts to quality and/or levels of shallow groundwater systems from over-use of water for dust suppression and construction activities

The presence of GDEs will be verified through the groundwater, surface water and ecology assessments undertaken as part of the EIS and in accordance with the Independent Expert Scientific Committee (IESC) methodology for assessing Groundwater Dependant Ecosystems (Commonwealth of Australia 2019).

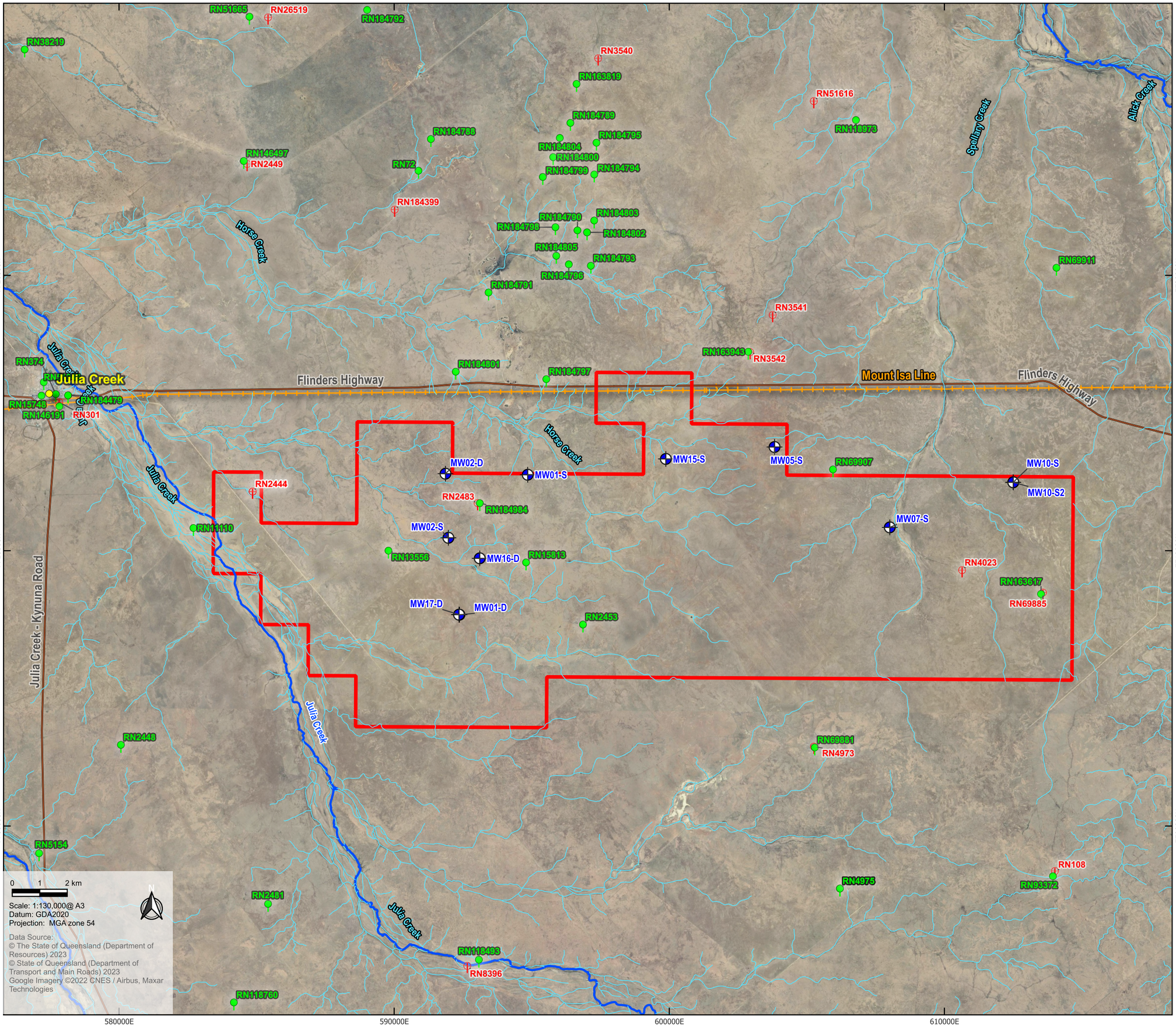
Groundwater is anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The EIS will include an assessment of potential impacts to groundwater that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Impacts to Water* (DESI 2024c). Key studies that will be undertaken to support an EIS relating to groundwater will include:

- Groundwater impact assessment
- Groundwater monitoring well installation report
- Underground Water Impact Report

5.4.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts to groundwater from the Project and will likely include including:

- Groundwater Management Plan
- Groundwater Monitoring Program
- Receiving Environment Monitoring Plan



epic ENVIRONMENTAL

Legend

- Project area
- State controlled roads
- Railways

Watercourses

- Major
- Minor
- Groundwater monitoring well

Registered water bores (status)

- Existing
- Abandoned and destroyed

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Figure 11
Registered groundwater bores and monitoring wells

5.5 Air, Noise, and Greenhouse Gas

5.5.1 Existing Environment

The Julia Creek regional climate is classified as hot and semi-arid with an average of 475.6 millimetres (mm) of rain per annum (BoM 2024a). The closest weather station to the Project area (operating from 2001 to present) is located approximately 25 km north-west at Julia Creek airport station (029058). All climate data was obtained from this weather station. Approximately 60 percent of rainfall occurs during the summer months when the area is subject to monsoonal influences from the Gulf of Carpentaria (BoM 2024a). The wettest month is typically January (123.2 mm) during which nearly 25 percent of rainfall occurs (BoM 2024). Average annual evaporation, gathered from Julia Creek Post Office weather station (029025), is 7.9 mm. Livestock rely predominantly on artesian bore water. Mean maximum temperatures vary from 27.3 degrees Celsius (°C) in June to 39.0°C in December. Mean minimum temperatures range from 9.0°C in July to 24.2°C in January (BoM 2024a).

The local area has limited air quality data currently available. The current Julia Creek regional air quality is generally characteristic of an undeveloped rural environment. Sources of airborne particulates are expected to include local road use, potential uncovered loads on the Mount Isa railway line, bushfires, and general rural and residential activities. Data from the Mount Isa weather station indicates the annual mean wind direction runs mainly in the southeast direction (BoM 2024a). A network of dust deposition bottles will be established to collect baseline air quality data to inform future air quality assessment.

Existing background noise levels for the Project area would be consistent with nearby rural areas. Existing noise levels are expected to vary from 50–60 A-weighted decibels (dB(A)) during the day to 30-40 dB(A) at night, dependent on machinery operations, traffic, drilling and general activity in the area. However, limited noise data is currently available for the local area with noise monitoring to be undertaken to inform a future noise assessment.

The closest sensitive receptors include homesteads of the Lot and Plans described in **Table 6,** as well as the Julia Creek township, and Flinders Highway.

5.5.2 Potential Impacts

Open cut mining activities have the potential to generate significant quantities of dust and other particulate matter (PM) including PM10 and PM2.5 (airborne matter with an equivalent diameter of <10 micrometres, and <2.5 micrometres, respectively). Coarse dust particles are generally created through physical agitation of matter, while fine particles are usually generated through combustion processes.

Potential impacts to air quality impacts from Project activities include:

- Odour generation from exhaust fumes from machinery, generators, onsite equipment, and reagents from the processing plant
- Dust generation from:
  - Excavation activities to develop pits, tailings storage facility, etc.
  - Land disturbance during construction activities
  - Activities associated with open cut mining, RoM pad (extraction, processing, and transportation)
  - Product handling and transportation
  - Vehicle movement on unsealed tracks
- Emissions from waste streams to air from processing activities including oil and vanadium.
- The township of Julia Creek and several homesteads are identified as sensitive receptors relating to air quality

Noise and vibration impacts from the Project may include:

- Construction activities such as earthmoving and the use of mobile equipment to build infrastructure associated with the mine
- Mine operations including blasting, mining fleet, conveyors, crushing, load out processes, and

- Hauling of product and road transport movements
- Vibration impacts as a result of blasting and blast overpressure occurrences

The nearest sensitive receptors to the Project are several homesteads within the Project area, including Innisfail Downs, Garomna, Nelia West Outstation, and an unnamed house. There are also several homesteads nearby the Project footprint, such as the Bodell and Wensley homesteads (both approximately 2.5 km from Project boundary). The Julia Creek township is approximately 6 km from the nearest Project boundary.

GHG emissions are likely to be produced by Project activities. The most significant contributors to GHG emissions are likely to be due to diesel fuel combustion in mining plant and equipment, blasting activities, electricity consumption and transportation. Based on the thresholds provided in Appendix C of the GHG guideline, the Project is considered to be within the Medium to High emitter category as expected GHG emissions (for Scope 1 and Scope 2) will be over 25,000 t carbon dioxide equivalent (CO_2-e) per year. Therefore, a GHG abatement plan will be required.

Air quality, GHG and noise are anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS). The EIS will include an air quality assessment, that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Impacts to Air* (DESI 2024a), and a noise assessment that will consider the requirements outlined in the DESI Guideline *Application Requirements for Activities with Noise Impacts* (DESI 2024b). The EIS will include a GHG assessment, in consideration of the DESI Guideline for *Greenhouse Gas Emissions* (DESI 2024i). Key studies that will be undertaken to support an EIS relating to air quality, noise and vibration will include:

- Air quality assessment
- Noise and vibration assessment
- Greenhouse gas assessment
- Climate Change Risk Assessment

5.5.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts associated with noise, vibration, air and GHG from the Project and will likely include including:

- Air Quality Management Plan
- Noise and Vibration Management Plan
- Air Quality Monitoring Plan
- GHG Abatement Plan
- Complaints Register and Procedures
- Climate change vulnerability consideration within the Pre-Feasibility Study, and subsequent design works

5.6 Traffic and Transport

5.6.1 Existing Environment

The Project area lies to the south of Flinders Highway and the Mount Isa line of the Great Northern Railway which runs between Mount Isa to Townsville with the closest port being the Port of Townsville (see **Figure 1**).

The project is accessible on all sides via the Flinders Highway, Yorkshire Road and/or Yorkshire Neilia Road. A series of property and access tracks are also located within the Project area.

5.6.2 Potential Impacts

The Project has the potential to impact traffic generation, roadway capacity, safety, and condition. The Flinders Highway is proposed as the single access road to the mine, processing facilities and infrastructure. Traffic through this state-controlled road will be controlled and monitored for the life of the Project. The Project may require alterations to public road and rail infrastructure during the construction and operational phases of the Project.

Where required, FIFO workers will likely arrive via Mount Isa Airport, Julia Creek Airport, or Cloncurry Airport before transiting via bus or automobile to site. QEM through consultation is aware that upgrades to the Julia Creek Airport and Cloncurry Airport are being considered to support the broader growth in the region. Consultation with McKinley Shire Council and Cloncurry Shire Councill will continue to ensure adequacy of existing or proposed upgrades to airport infrastructure.

Traffic and transport are anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The EIS will include traffic and transport assessments that will consider the requirements outlined in DTMR (2018) *Guide to Traffic Impact Assessment*. Key studies that will be undertaken to support an EIS relating to traffic and transport will include:

- Traffic Impact Assessment
- Intersection Detailed Design

If an export facility is required in the future the capacity of the port's capacity would be investigated.

5.6.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts associated with transport from the Project and will likely include including:

- Transport Management Plan
- Road Use Management Plan

5.7 Social

5.7.1 Existing Environment

The majority of existing accommodation, health, services, and education infrastructure within the vicinity of the Project area is located in Julia Creek, Cloncurry, and Richmond near the Project area. There is limited accommodation available in Julia Creek, and the large distances to the neighbouring towns of Richmond (approximately 125 km) and Cloncurry (approximately 150 km) from the Project area are unsuitable for a workers camp.

5.7.2 Potential Impacts

As a large resource Project, a 100% FIFO workforce during the operational phase is prohibited under the SSRC Act. Julia Creek has a population of 547, with approximately 5% of the population being Aboriginal and/or Torres Strait Islander people (Australian Bureau of Statistics (ABS 2024). With other Projects being developed in the region, it is understood that Julia Creek will have some capacity to provide a local workforce to the Project, with support from FIFO employees.

A construction workforce of 600 and an operational workforce of 588 is estimated. QEM are committed to a recruitment hierarchy consistent with the SSRC Act. Wherever possible, QEM will prioritise using a local workforce from Julia Creek and within the 125 km radius of the main access to the Project (coordinates are -20.65302608, 141.93637870, as shown in **Figure 12**). The secondary priority will be for workers who live in regional communities and FIFO employees; QEM will also further engage with Indigenous stakeholders to match skills, workforce capacity and experience to the Project needs and establish indigenous employment targets. Opportunities to provide training programs locally will be investigated in the PFS and EIS. A worker population estimated at 35% of the workforce will reside locally boosting long-term demand for local businesses and services and creating new employment opportunities for local workers.

The Project proposes an offsite workers camp sized for 60 % FIFO workforce with approximately 214 temporary beds. The location of the conceptual camp is shown in **Figure 12**. An additional 400 temporary beds will be required for 24 months during the Project's construction phase. Engagement with McKinlay Shire Council will continue during the PFS and EIS to minimise the need for new workforce accommodation infrastructure in Julia Creek. Preferentially, options to utilise legacy accommodation infrastructure from the CopperString 2032 Project, Multicom Resources Saint Elmo Vanadium Project, and other proposed Projects in

the region will be investigated during the PFS and EIS. This will be considered as a low impact solution for temporary workforce accommodation during site preparation and primary construction phases of the Project.

Potential positive and negative social impacts include:

- Amenity impacts (including air quality, noise and vibration and visual amenity)
- Impacts to community cohesion
- Changes in land use of the Project
- Impacts to cultural heritage sites
- Revenue for local / regional businesses
- Enhanced business activity within the region
- Employment and training opportunities
- Improved population stability and economic well-being in the region
- Revenue through taxes and royalties, enabling Government spending
- Economies of scale and autonomous operation may have an impact to the benefits for the region and be considered as part of the EIS

The Project has capacity throughout the construction and operating phases to provide significant economic benefits via:

- Employment and business turnover
- Ongoing indirect and direct outputs, household incomes
- Trade and employment opportunities
- Tax revenues and royalties

As several service providers and businesses are based in Julia Creek, the Project would seek to create ongoing trade opportunities with these businesses. The Project may also result in potential adverse economic impacts including impacts on business activity in the region through competition for resources.

A Social Impact Assessment (SIA) will be prepared as part of the EIS to assess the potential benefits and impacts the Project may have on the social values of the local and regional communities. The SIA will involve consultation with identified interested and affected stakeholders including the local community (including businesses), landowners, Indigenous groups, Council, State and Local government representatives and other specialist interest groups.

The SIA would be prepared in accordance with the *Social Impact Assessment Guideline* (DSDILGP 2018) to address legislative requirements of the SSRC Act, including the following key matters:

- Workforce management
- Community and stakeholder engagement
- Housing and accommodation
- Health and community well-being
- Local business and industry procurement
- The impact of workforce numbers into the area
- Post closure impacts to the local community and businesses that supported the mine

Social is anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The Coordinator-General's *Social Impact Assessment Guideline* (DSDMIP 2018, now DSDILGP) would be considered in assessing potential social impacts. Key studies that will be undertaken to support an EIS relating to social and economic impacts will include:

- Social Impact Assessment
- Economic Assessment

5.7.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts associated with social from the Project and will likely include including:

- Community and Stakeholder Engagement Strategy

- Community and Stakeholder Engagement Plan
- Social Impact Management Plan

Inset 1 proposed offsite construction camp

Inset 2 Project area and renewable facility

See inset 1

See inset 2

Julia Creek

Cloncurry

Oorindi

Gilliat

Nelia

Nonda

Bundock

Maxwelton

Richmond

Mckinlay

Kynuna

Selwyn

Mount Isa Line

Flinders Highway

Landsborough Highway

Julia Creek - Kynuna Road

Julia Creek Talgora Road

Old Normanton Road

Punchbowl Road

Dalgonally Road

Wills Developmental Road

Alisona Road

Nelia Bunda Road

Old Nelia Road

Nelia Maxwelton Road

Frontage Road

Richmond Woolgar Road

Lucindale Road

Yorkshire Nelia Road

Proa Road

Minamere Nelia Road

Ardbrin Road

Pine Tree Road

McKinlay Gilliat Road

Eulolo Mckinlay Road

Caradon Road

Middleton Kynuna Road

Quambetook Access Road

Wensley Access Road

Yorkshire Road

Scale: 1:950,000@ A3
Datum: GDA2020
Projection: MGA zone 54

0 10 20 km

Data Source:
© The State of Queensland (Department of Resources) 2023
© State of Queensland (Department of Transport and Main Roads) 2023
Google Imagery ©2022 CNES / Airbus, Maxar Technologies

Legend

- Project area

Project Infrastructure

- Mine access point
- 125 km buffer of mine access point
- Indicative disturbance footprint
- Conceptual water pipeline
- Conceptual camp

Regional infrastructure (existing or proposed)

- State controlled roads
- Roads and tracks
- Railways
- Enel Green Power Australia renewable energy project

QEM Limited
Julia Creek Vanadium and Energy Project
Initial Advice Statment

Figure 12
Project and regional infrastructure

Filepath: ...BAA\BAA240062.01 QEM Julia Creek Project EIS\Workspaces\BAA240062.01 EIS\1. IAS\Rev 1\Figure 12 Project and regional infrastructure.qgz

5.8 Cultural Heritage

5.8.1 Existing Environment

There is no "native title party" as defined in Section 34 of the ACH Act for the Project area. There is an approved CHMP (CLH018008), prepared under the Queensland *Aboriginal Cultural Heritage Act 2003* and the *Torres Strait Cultural Heritage Act 2003,* which is sponsored by Multicom Resources Pty Ltd for the Saint Elmo Vanadium Project directly north of the Project. Furthermore, CuString Pty Ltd has sponsored an approved CHMP (CLH020014) which intersects with the majority of the Project area and has been endorsed by Wanamara People Core Country claim. This CHMP is associated with the CopperString 2032 Project at Julia Creek.

Ongoing consultation will occur with Traditional Owners and any registered parties as the Project progress through the EIS and PFS phase.

A desktop search has found 24 cultural heritage artefact scatters occur within a 10 km buffer of the Project area, however these are not within the proposed infrastructure footprint. There is also a mapped Aboriginal Intangible Place approximately 50 km north-west of the Project area (DTATSIPCA 2024).

Non-Indigenous cultural heritage values include places of social value to the local community and places of architectural, historic, or scientific significance. A search of the National Heritage List, Queensland Heritage Register, and MSC interactive mapping indicates that there are no listed non-Indigenous heritage sites within the Project area (DCCEEW 2024b, DESI 2024h, MSC 2019). However, WWII RAFF High Frequency Direction Finding Station is located approximately 3 km west of the Julia Creek township (DCCEEW 2024).

5.8.2 Potential Impacts

It is considered unlikely that significant Indigenous or non-Indigenous cultural heritage will be impacted by the Project. However, database search results indicate that there may be artefact scatters occurring on Lot 10 Plan EN16 (DTATSIPCA 2024). There may also be items of unrecorded cultural heritage within the Project area. In accordance with the Queensland Aboriginal Cultural Heritage duty of care guidelines, a Cultural Heritage assessment will be undertaken as part of the EIS to ensure impacts are avoided and minimised. A CHMP is mandatory when an EIS is required for a project.

Existing and potential artefacts will be treated with appropriate site management initiatives that may otherwise be threatened by construction impacts. Similarly, a management procedure will be developed in the event that a fossil is encountered during mining activities.

Cultural heritage is anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the EIS. The Coordinator-General's *Social Impact Assessment Guideline* (DSDMIP 2018, now DSDILGP) would be considered in assessing potential social impacts. Key studies that will be undertaken to support an EIS relating to social and economic impacts will include:

- Indigenous Cultural Heritage Assessment
- Non-Indigenous Cultural Heritage Assessment

5.8.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts associated with heritage from the Project and will likely include

- Cultural Heritage Management Plan
- Accidental Finds Procedures
- Indigenous Engagement Plan
- Consultation with Traditional Owners and registered cultural heritage parties

5.9 Hazards, Health and Safety

5.9.1 Existing Environment

A review of the Queensland 2023 State Disaster Risk Report (QFES 2023) hazard prioritisations has been undertaken to provide a high-level overview of the potential natural hazards that exist in the Project Area. Existing climate hazard priorities for the Project area appear to include severe thunderstorms, tropical cyclones (downgraded to Tropical Lows before reaching Project area), flooding, heatwave, bushfires, and earthquakes, and will be further described in the EIS (BoM 2024b).

5.9.2 Potential Impacts

The design, operation and control measures that will be implemented for the Project will focus on the prevention and reduction of incidents to be as low as reasonably practicable. Natural events that could pose serious safety risks and cause significant damage will be assessed during the EIS. Identification of hazard and risks through a risk assessment will be undertaken in accordance with Australian Standard/New Zealand Standard International Standards Organisation (ISO) 31000:2009 Risk Management – Risk Assessment Techniques.

The western extent of the Project area intersects with rapid hazard assessment floodplain extent mapping (see **Figure 11**) (QGlobe 2024). The mine design will aim to locate infrastructure away from watercourses where possible. Details of any required diversions, and potential impacts and mitigation measures will be included in the EIS.

Placement of mine domains has considered modelled 0.1% and 1% annual exceedance probability (AEP) flooding areas and creeks mapped as fish passage. Avoidance was selected in the first instance and minimisation of impacts considered when avoidance could not be achieved. The current out of pit dump placement will need to consider the watercourse determination of the impacted minor non-perennial creek.

The identification of all hazardous substances and any explosives to be used, transported, stored, processed or produced and the rate of usage will be undertaken in the EIS. Where the storage of hazardous chemicals exceeds the threshold limits in schedule 15 of the Workplace Health and Safety Regulation 2011, the Project would require a licence for operating as a Major Hazard Facility.

Health safety risks have been considered for infrastructure placement including standoff and exclusion requirements for the magazine, transport fuel and hydrogen solvent storage. Risks will be further considered and identified during PFS and EIS risk assessment process (RPM Global 2024).

Hazards, health and safety are anticipated to be identified as a project-specific matter in the ToR to be given detailed treatment in the. Identification of hazard and risks will be undertaken through a risk assessment undertaken in accordance with Australian Standard/New Zealand Standard International Standards Organisation (ISO) 31000:2009 Risk Management – Risk Assessment Techniques. Key studies that will be undertaken to support an EIS relating to Hazards, Health and Safety will include a hazards analysis and risk assessment.

5.9.3 Management Measures

A range of management and mitigation measures would be determined during the EIS to minimise potential impacts associated with heritage from the Project and will likely include including:

- Identification of hazard and risks through a risk assessment will be undertaken in accordance with Australian Standard/New Zealand Standard International Standards Organisation (ISO) 31000:2009 Risk Management – Risk Assessment Techniques
- The *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (DESI 2024f) would be used to guide design, construction and management of water storage and management structures and facilities
- Compliance with the requirements of the *Mining and Quarrying Safety and Health Act 1999*
- Health and Safety Management Plan
- Safety Management System

6 COMMUNITY AND STAKEHOLDER ENGAGEMENT

QEM have been undertaking exploration activities in the Project area since 2015. Engagement with key stakeholders has been ongoing and will continue to occur throughout the EIS process. No major concerns have been raised during public consultations to date. Additionally, QEM have actively engaged with the Julia Creek community to date and have published a set of newsletters and frequently asked questions flyers for the community and landholders which have been published on their website. The landholders are also provided with a weekly project update that is distributed by email. In 2023, QEM opened an office in Julia Creek and have since been conducting monthly trips to Julia Creek to meet with landowners, council and project stakeholders. QEM also sponsor a range of community initiatives including the Julia Creek Saints junior rugby team and local events such as races, camp drafts and rodeos.

Key stakeholders identified for the Project include:

- Direct and adjoining landholders
- Local and regional communities, particularly Julia Creek
- Commonwealth, State, and Local Government agencies, including the office of the Coordinator-General, DCCEEW, Department of Agriculture and Fisheries (DAF), DoR, DESI, DRDMW, DSDI, DTATSIPCA, DTMR, MSC
- Special interest groups, including youth, women's and community sporting programmes
- Indigenous stakeholders
- Business operators and representatives
- Other stakeholders, including Clean Energy Regulator, Private Certifiers, Workplace Health and Safety Queensland, AMEC, MITEZ, WISER, Critical Minerals Office

To support the environmental approvals process, a Community and Stakeholder Engagement Strategy will be developed, consistent with the requirements of the *Social Impact Assessment Guidelines* (DSDILGP 2018) and the SSRC Act. This engagement strategy will be implemented following the release of this IAS and will continue through the release of the draft ToR, EIS technical studies and SIA, and during calls for public comment on the EIS. The community and stakeholder engagement objectives for the Project are to:

- Raise stakeholder awareness of the Project, including timelines and potential impacts
- Address stakeholder concerns and interests
- Initiate engagement as early as possible in the EIS process to ensure stakeholders have sufficient time to consider the Project's potential impacts and provide input into mitigation strategies
- Ensure disadvantaged and hard to reach stakeholders and groups are identified and included in community engagement activities
- Identify opportunities to work together with stakeholders to develop strategies that maximise Project benefits and minimise adverse impacts
- Initiate engagement with local businesses and vendors to identify local procurement opportunities

A range of engagement and communications tools will continue to be utilised throughout the environmental approvals process, including but not limited to:

- Face-to-face meetings
- Community roadshows and public information sessions
- Council and government department briefings (with DESI, DoR, DCCEEW, MSC, and other relevant departments)
- Regular Project newsletter and factsheets for the Julia Creek community outlining project milestones and technical studies
- Weekly Project email to landholders outlining key actions and updates
- Media releases and ASX announcements
- Business briefings
- Regular updates to the QEM website
- Investor conferences and webinars

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Key State and Commonwealth Agencies will continue to be engaged as the Project is progressed**.** Stakeholder engagement activities undertaken to date including engagement outcomes are provided in **Table 14.**

Table 14. Consultation history

Stakeholders	Timing	Format	Information Provided	Identified Interests or Concerns	Action Items
Landowners					
Landholders	Since project inception	• Weekly email newsletter (commenced February 2022) • Phone calls • Face-to-face meetings • 2024 Double Materiality Assessment • QEM website	Project and community related updates and information on ongoing project activities.	Exploration rehabilitation; maintaining the natural environment	Maintain this ongoing engagement with all landholders.
Traditional Owner Groups and First Nations Stakeholders					
Representative of the Wanamara People	January 2024 – Present	• Email • Phone calls	Project and community related updates.	None identified at this stage	Maintain this ongoing engagement.
Councils					
McKinlay Shire Council	Since project inception	• Weekly email newsletter (commenced February 2022) • Phone calls • Presentations to council (approximately 3-4 times yearly) • 2024 Double Materiality Assessment • Face-to-face meetings • Consultation at mining and energy	Project and community-related updates and discussions on the broader industry in the region.	Interested in working with QEM to develop the Workforce accommodation strategy and identify workers camp location. Not overwhelming the town with development	Maintain this ongoing engagement and collaboration with Copperstring, Qld Gov and other proposed mining projects in the area to ascertain where common user infrastructure may be used.

Stakeholders	Timing	Format	Information Provided	Identified Interests or Concerns	Action Items
		industry events within the region			
Cloncurry Shire Council	Since April 2022 when initial meeting in-person at Council headquarters	• Weekly email newsletter (commenced February 2022) • Phone calls • 2024 Double Materiality Assessment • Face-to-face meetings • Consultation at mining and energy industry events within the region	Project and community related updates and discussions on the broader industry in the region.	Interest in whether the Cloncurry Airport would be valuable to the QEM Project.	Maintain this ongoing engagement.
State and Commonwealth Government representatives, agencies and services					
State Representatives • Scott Stewart MP (Minister for Resources) • Chris Lees (Chief of Staff, Minister for Resources) • Mick de Brenni MP (Minister for Energy and Clean Economy Jobs) • Susan McDonald (Shadow Minister for Resources & Northern Australia) • Robbie Katter (KAP State leader and member for Traeger) • Antonio Lovisi (Senior Trade and Investment Office, Mining, Resources and Energy) • Tim Linley (Principal Policy Advisor, Premier's Office) • Mike Kaiser (Director-General, Department of the Premier and Cabinet)	Since project inception	• Email • Phone calls • Presentations to State Government teams (approximately half a dozen times per year) • 2024 Double Materiality Assessment • Face-to-face in Julia Creek • Consultation at mining and energy industry events within the region and SE Qld	Project and community related updates, information required for the advancement of the project, discussions on the broader industry in the region.	Interest in QEM's vanadium mining timeline for Qld's energy storage needs.	Maintain this ongoing engagement.

Stakeholders	Timing	Format	Information Provided	Identified Interests or Concerns	Action Items
• Shaun Ferris (Deputy Director-General, Department of Resources) • Elliott Franks (Director, Communications, Department of Resources) • Karen Oakley (Office of the Coordinator General) • Tammy Parry (Regional Director, NWQ State Development) • Megan Crowther (Senior Economic Development Officer, LWQ State Development)					
Commonwealth Representatives • Bob Katter (Federal Member for Kennedy) • Sash Pavic (Adviser - Resources, Office of the Hon Madeleine King MP) • Laurence Coleman (Office of the Hon Madeleine King MP) • Warren Tegg (Senior Adviser, Office of the Hon Ed Husic MP)	Since project inception	• Email • Phone calls • Presentations • Three visits (in the past two years) • 2024 Double Materiality Assessment • Face-to-face • Consultation at mining and energy industry events	Project and community related updates, information required for the advancement of the project, discussions on the broader industry in the region.	Interest in long-term local employment and water source.	Maintain this ongoing engagement.
Agencies • OCG • DoR • DESI • DSDI • DTATSIPCA • DTMR • DRDMW • DAF • DHLGPPW • DCCEEW (Cth)	Since project inception	• Email • Phone calls • Presentations • Face-to-face	Project updates and information required for the advancement of the project	Interest in long-term local employment, technology, energy and water sources, and progress on environmental baselining.	Maintain this ongoing engagement.
Broader Community					

Stakeholders	Timing	Format	Information Provided	Identified Interests or Concerns	Action Items
Local contractors and businesses	Various and ongoing	• Email • Phone calls • Face-to-face • QEM website • Project Newsletters and Fact Sheets	Information provided for the provision of work packages within Julia Creek and the NWMP.	None identified at this stage.	Maintain this ongoing engagement.
Julia Creek Community	Various and ongoing	• QEM Website • Social Media • Project Newsletters and Fact Sheets • Face-to-face at local community events • 2024 Double Materiality Assessment	Project and community related updates and consultation around support for local community events and initiatives, for which QEM is a major sponsor. This includes: • Julia Creek Saints junior girls and boys and senior rugby league teams • Town vs Country Women's Netball • Julia Creek Dirt N Dust Festival (April) • Saxby Roundup weekend (June/July) • Sedan Dip (August) • Big Weekend in (October) • Beach Races in (November)	Key insights from the 2024 Double Materiality Assessment show initial key areas of interest for stakeholders include: • Climate change and ecological impacts • Employee health and safety • Diverse and inclusive workforces • Meaningful and positive community relations	QEM will maintain engagement and continue to develop positive community relations, while addressing key areas of interest throughout project design.
Industry Associations					
MITEZ AMEC Townsville Enterprises Limited (TEL) Vanitec	Various and ongoing	• Face-to-face • Email • Phone calls • QEM website • Social media • Project Newsletters and Fact Sheets	Project and community updates, and contributions to industry-led government consultation pieces over several years.	None identified at this stage.	Maintain this ongoing engagement and look for collaborative approaches to potential regional issues.

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8 ACRONYMS

Abbreviation	Definition
ABS	Australian Bureau of Statistics
ACH Act	*Aboriginal Cultural Heritage Act 2003*
AEP	*Annual exceedance probability*
ALA	Atlas of Living Australia
ASX	Australian Stock Exchange
AUD	Australian Dollars
bbl/day	barrels per day
Bn	Billion
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CBA	Cost Benefit Analysis
CCRA	Climate Change Risk Assessment
CCTV	Closed circuit television
CE	Critically Endangered
CHMP	Cultural Heritage Management Plan
CO_2-e	Ca
DA	Development Application
DAF	Department of Agriculture and Fisheries
DAWE	Former Department of Agriculture, Water, and the Environment (now DCCEEW)
dB(A)	A-weighted decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DESI	Queensland Department of Environment, Science and Innovation (formerly DES)
DNRM	Department of Natural Resource Management
DoR	Queensland Department of Resources
DRDMW	Queensland Department of Regional Development, Manufacturing and Water
DSDI	Queensland Department of State Development and Infrastructure
DSDILGP	Former Queensland Department of State Development, Infrastructure, Local Government and Planning (now DSDI)
DTATSIPCA	Queensland Department of Treaty, Aboriginal and Torres Strait Islander Partnerships, Communities and the Arts
DTMR	Queensland Department of Transport and Main Roads
E	Endangered
EA	Environmental Authority
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EMS	Environmental Management System
EP Act	Queensland *Environmental Protection Act 1994*
EPCM	Engineering, Procurement, Construction and Management
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPM	Exploration permit for minerals
EP Regulation	Queensland *Environmental Protection Regulation 2019*
EPP (Air)	Queensland *Environmental Protection (Air) Policy 2019*
EPP (Noise)	Queensland *Environmental Protection (Noise) Policy 2019*
EPP (Water)	Queensland *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*
ERAs	Environmentally Relevant Activities
ERC	Estimated Rehabilitation Costing
ERDC	Eastern Resource Development Corridor
ESG	Environmental Social Governance
FIFO	Fly-in fly-out
FPF	Feed preparation facility
FY	Financial year
GAB	Great Artesian Basin
GBO	General Biosecurity Obligation
GDE	Groundwater Dependant Ecosystem

Abbreviation	Definition
GHG	Greenhouse gas
Gulf Water Plan	*Water Plan (Gulf) 2017*
GWh	Gigawatt hours
GST	Goods and services tax
Ha	hectares
HES	High Ecological Significance
HEV	High Ecological Value
HPA	High purity alumina
IAS	Initial Advice Statement
IBRA	Interim Biogeographic Regionalisation for Australia
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
IRR	Internal Rate of Return
ISO	International Standards Organisation
JORC	Joint Ore Reserves Committee
kL	kilo Litres
km	kilometres
kW	kilowatt
LC	Least concern
LDES	Long-duration energy storage
LGA	Local Government Area
LOM	Life of mine
m	metres
M	Million
mAHD	metres Australian Height Datum
MARPOL	International Convention for the Prevention of Pollution from Ships
MCU	Material change of use
Measured	Measured Group Pty Ltd
Mi	Migratory
MIA	Mining infrastructure area
MITEZ	Mount Isa to Townsville Economic Development Zone
ML	Mining lease
ML	Megalitres
MLA	Mining lease application
mm	millimetres
MMbbls	million barrels
MNES	Matters of National Environmental Significance
MQSH Act	Queensland *Mining and Quarrying Safety and Health Act 1999*
MR Act	Queensland *Mineral Resources Act 1989*
MSA	Mining service area
MSES	Matters of State Environmental Significance
Mt	Million tonnes
MW	Megawatts
M/year	Million per year
NC	No concern
NC Act	Queensland *Nature Conservation Act 1992*
NPV	Net Present Value (After Tax)
NWMP	North West Minerals Province
OCG	Office of the Coordinator General
ORF	Oil refining facility
PFL	Petroleum Facility Licence
PFS	Pre-feasibility studies
Planning Act	Queensland *Planning Act 2016*
Planning Regulation	Queensland *Planning Regulation 2017*
PM	Particulate matter
PMR	Protected Matters report

Abbreviation	Definition
PMST	Protected Maters Search Tool
PRC Plan	Progressive Rehabilitation and Closure Plan
PV	Photovoltaic
P & G Act	Queensland *Petroleum and Gas (Production and Safety) Act 2004*
QEM	QEM Limited
REs	Regional Ecosystems
RN	Registration Number
RoM	Run of mine
SCL	Strategic Cropping Land
SDAP	State Development Assessment Provisions
SDPWO Act	Queensland *State Development and Public Works Organisation Act 1971*
SEA	Strategic Environmental Area
SIA	Social Impact Assessment
SLC	Special least concern
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
SPML	Specific purpose mining lease
SSEA	Site-specific Environmental Authority
SSRC Act	Coordinator-General's *Strong and Sustainable Resource Communities Act 2017*
TAFE	Technical and Further Education
TEC	Threatened Ecological Community
t	tonnes
ToR	Terms of reference
tpa	tonnes per annum
TSF	Tailings storage facility
USA	United States of America
USD	United States Dollar
V	Vulnerable
VFBs	Vanadium Flow Batteries
VM Act	Queensland *Vegetation Management Act 1999*
VRF	Vanadium refining facility
V_2O_5	Vanadium pentoxide
WildNet	WildNet wildlife database
WIMARQ	Women in Mining and Resources Queensland
WISER	Women in Sustainable Energy and Resources
WoNS	Weeds of National Significance
WWBW	Waterway barrier works
°C	Degrees Celsius
%	Percent
/lb	Per pound

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