PEMBROKE

Olive Downs Project

Initial Advice Statement

Resource Strategies

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EXECUTIVE SUMMARY

Pembroke Resources proposes to develop the Olive Downs Project (the Project), a metallurgical coal mine and associated infrastructure within the Bowen Basin, located approximately 40 kilometres south-east of Moranbah, Queensland. The Project provides an opportunity to develop an open cut metallurgical coal resource within the Bowen Basin mining precinct that can deliver up to 14 million tonnes per annum of product coal for more than 30 years.

This document is an Initial Advice Statement (IAS) which supports an application to the Coordinator-General for declaration of the Project as a Coordinated Project under Part 4 of the Queensland *State Development and Public Works Organisation Act 1971* (SDPWO Act). This IAS provides an overview of the Project to stakeholders and the general public, and will inform the preparation of the Terms of Reference for an Environmental Impact Statement (EIS) for the Project.

The Project comprises the Olive Downs South and Willunga domains and associated linear infrastructure corridors, including an 18 km rail spur connecting to the Norwich Park Branch Railway, a water pipeline connecting to the Eungella pipeline network, an electricity transmission line (ETL) and access roads. The coal resource would be mined by conventional open cut mining methods, with product coal to be transported by rail to the Dalrymple Bay Coal Terminal.

It is expected that the workforce would reside within the regional towns of Moranbah, Nebo, Middlemount and Dysart and/or the existing accommodation camps in the region.

The Project's high quality metallurgical coal resource and the proximity to established regional transport corridors, townships and accommodation facilities provides an opportunity to efficiently develop a large scale mining operation. The site provides Pembroke Resources with the ability to plan a contemporary, best-practice mining development without the constraints typically associated with extensions of existing operations.

Pembroke Resources considers that the Project meets the requirements of section 27 of the SDPWO Act for declaration as a Coordinated Project as it:

- will involve complex Local, State and Commonwealth Government approval requirements;
- provides strategic significance to the Region and State, given the economic and social benefits expected to be created with a large scale development and associated significant workforce requirement and capital investment;
- will require comprehensive assessment of potential environmental impacts; and
- includes the development of rail, pipeline, ETL and road infrastructure to service the mine site.

Pembroke Resources will prepare an EIS for the Project which will assess the potential impacts on land, ecology, water resources and flooding, air and noise, cultural heritage, socio-economic, transport, hazards and safety and waste management. Appropriate management measures will be developed to mitigate potential impacts.

It is expected that the following key approvals would be required for the Project:

- Environmental Authority under the Queensland *Environmental Protection Act 1994*;
- approval under section 133 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*;
- Mining Lease/s under the Queensland *Mineral Resources Act 1989*;
- development approvals under the Queensland *Sustainable Planning Act 2009*; and
- water licence/s under the Queensland *Water Act 2000*.

1 INTRODUCTION

1.1 BACKGROUND

The Olive Downs Project (the Project), comprising the Olive Downs South and Willunga domains and associated linear infrastructure corridors (i.e. rail spur, water pipeline, electricity transmission line [ETL] and access roads), is located within the Bowen Basin, approximately 40 kilometres (km) south-east of Moranbah, Queensland (Figure 1). The Project provides an opportunity to develop an open cut metallurgical coal resource within the Bowen Basin mining precinct that can deliver up to 14 million tonnes per annum (Mtpa) of product coal for more than 30 years.

The Project's high quality metallurgical coal resource, to be mined efficiently through open cut methods, and its proximity to established regional transport corridors, townships and accommodation facilities, provides an opportunity to efficiently develop a large scale mining operation. The site provides Pembroke Resources the ability to plan a contemporary, best-practice mining development without the constraints typically associated with extensions of existing operations.

The coal resource lends itself to a large scale open cut mining complex, with infrastructure areas and corridors servicing and connecting the separate mining areas. Three linear, off-lease infrastructure corridors are expected to be required to connect the Project to the existing regional infrastructure network.

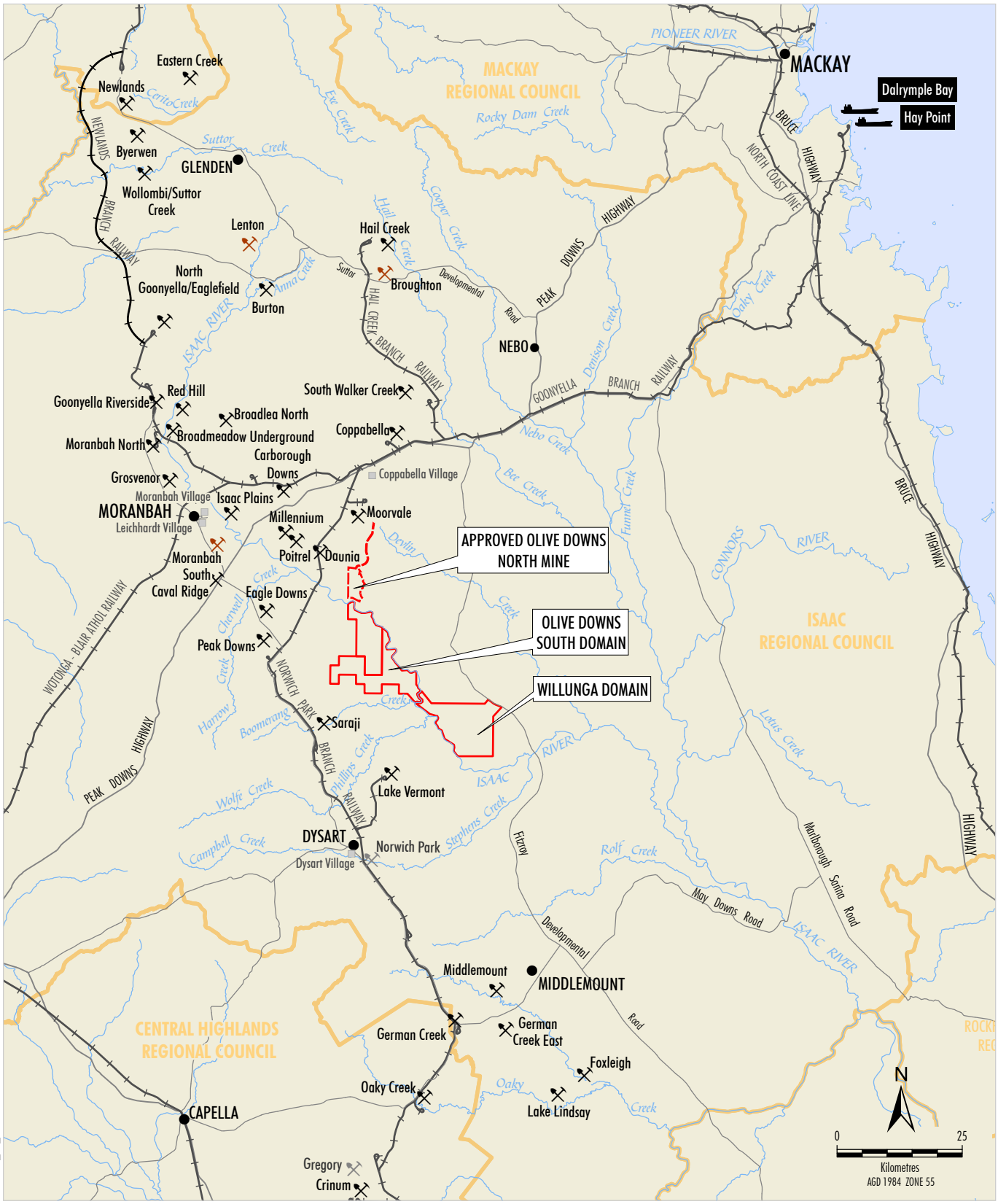
Given the above, and the strategic significance a large-scale greenfield project such as this provides to the region and State, Pembroke Resources considers the Project should be declared a 'Coordinated Project' requiring an Environmental Impact Statement (EIS) under section 26(1)(a) of the Queensland *State Development and Public Works Organisation Act, 1971* (SDPWO Act).

1.2 PURPOSE AND SCOPE OF THE IAS

This Initial Advice Statement (IAS) has been prepared by Pembroke Resources in accordance with section 27AB(a) of the SDPWO Act to support an application to the Coordinator-General to declare the Project a Coordinated Project for which an EIS is required.

This IAS provides an overview of the Project to stakeholders and the general public, and will inform the preparation of the Terms of Reference (ToR) for an EIS for the Project.

The Project excludes the currently approved Olive Downs North Mine. Although the Project would integrate with the Olive Downs North Mine (Section 3), this IAS does not contemplate any change to the currently approved Olive Downs North Mine.



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LEGEND

- Local Government Area
- Major Road
- Railway
- Port
- Approved/Operating Coal Mine
- Proposed Coal Mine
- Under Care and Maintenance
- Olive Downs North Mining Lease Boundary
- Olive Downs Project Mineral Development Licence Boundary

Source: Geoscience Australia - Topographical Data 250K (2006)

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OLIVE DOWNS PROJECT

Regional Location

Figure 1

2 THE PROPONENT

Pembroke Resources is a private Australian-based company focused on the acquisition and development of high quality, metallurgical coal assets. Formed in 2014, Pembroke Resources is led by an executive team with significant experience in the development, expansion, operation and financial management of coal mines and mining companies both in Australia and internationally.

Pembroke Resources is backed by leading resources and energy-focused global private equity firm Denham Capital. Denham Capital has committed financial backing to Pembroke Resources for asset acquisition and development, including funding to obtain Project approval and associated activities.

Pembroke Resources has entered binding agreements and secured a majority stake in the approved, but yet to be developed, Olive Downs North Mine. The acquisition is subject to the approval of the Coppabella Moorvale Joint Venture (CMJV) minority parties.

The Olive Downs North Mine is located to the immediate north of the Project and is approved to mine coal through open cut methods and transport the run-of-mine (ROM) coal by private haul road to the nearby Moorvale Mine for processing and rail load out. Development of the Project would integrate with the approved Olive Downs North Mine.

3 NATURE OF THE PROPOSAL

3.1 SCOPE OF THE PROJECT

The Project is an open cut coal mine comprising two mining domains, namely, Olive Downs South and Willunga, with attendant infrastructure including rail, water pipeline, ETL and access roads. Up to 20 Mtpa of ROM coal would be extracted over the anticipated Project operational life of more than 30 years. Approximately 90% of the product coal would be metallurgical coal (coking and pulverised coal injection [PCI]), with the remainder a thermal coal by-product.

In the initial stage of the Project ROM coal would be hauled to, and processed at, the Moorvale Mine coal handling preparation plant (CHPP). Toll washing at the Moorvale Mine CHPP would conclude after an on-site CHPP is installed.

The Olive Downs North Mine is an approved, but yet to be developed, coal mine (Figure 1) which is currently approved to extract up to 1 Mtpa of ROM coal from Mining Lease (ML) 70354, with haulage via ML 70355 to the existing operating Moorvale Mine (owned and managed by Peabody Energy Australia). ROM coal would be processed at the existing CHPP under toll-washing arrangements between Pembroke and CMJV.

The open cut mining operations for the Project, and the approved Olive Downs North Mine, would be operated as an integrated open cut mining operation by Pembroke.

The approximate extent of the Project Mining Lease Applications (MLAs) (Figure 2) is approximately 25,300 hectares.

Mine support infrastructure for the Project would include mine offices, crib facilities, bathhouse, warehouse, workshops and re-fuelling facilities, powerlines, communication facilities and other associated amenities. Power would be supplied to the Project via an ETL from the existing Broadlea Substation, located on the Peak Downs Highway (Figure 2).

The main water demands for the Project (i.e. CHPP water supply and dust suppression) would fluctuate with the rate of ROM coal feed to the CHPP, climatic (e.g. seasonal) conditions and as the extent of the mining operations changes over time. In addition, water would be required for washdown of mobile equipment and other minor non-potable uses when required, such as fire-fighting.

In addition to on-site water sources (e.g. groundwater extraction/open cut dewatering, processing water re-use and recycling, treated wastewater, flood harvesting, and incident rainfall and runoff collection) an external supplementary raw water supply is likely to be required for the Project. A water supply pipeline would be constructed from the existing Eungella pipeline network (Figure 2).

Existing local and regional infrastructure would be used to transport product coal to the port for export including the rail-load out facility at the Moorvale Mine, Norwich Park Branch Railway, Goonyella Branch Railway and the Dalrymple Bay Coal Terminal (DBCT) (subject to availability of rail and port allocation). A new rail loop, rail spur line and rail-load out facility would be constructed for the Project (Figure 2).

Vehicle access to the Project is expected to be via one of two preferred alignments (Figure 2):

1. Daunia Road (off the Peak Downs Highway), connecting to a private section of road to be constructed along the southern boundary of the Moorvale Mine, and along the Olive Downs North haul road and Mining Lease, before crossing the Isaac River and into the Olive Downs South domain infrastructure area.
2. Daunia Road (off the Peak Downs Highway), connecting to Annandale Road, running adjacent the Olive Down North MLs, before crossing the Isaac River and into the Olive Downs South domain infrastructure area.

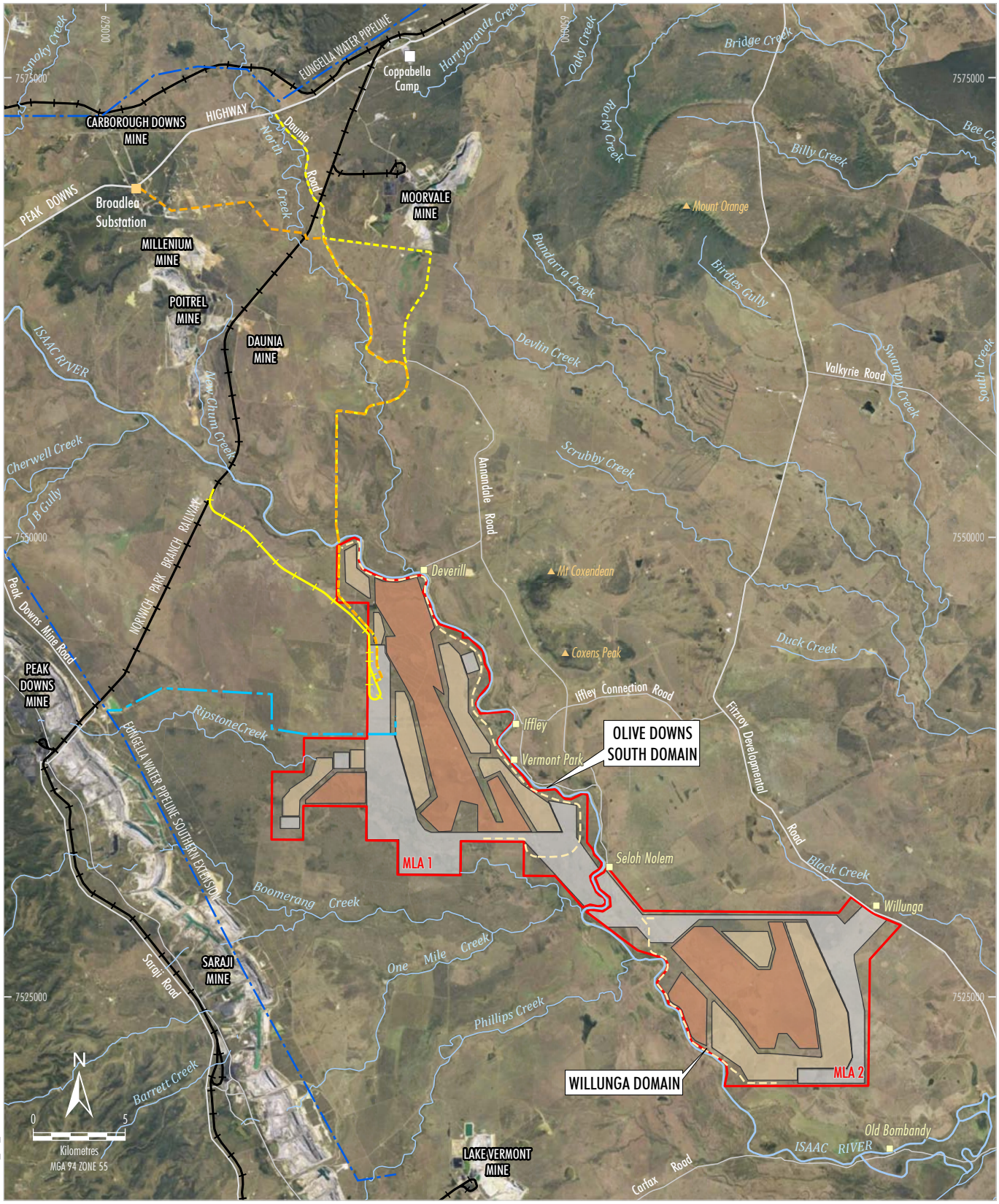
Access to the Willunga domain would be via the Fitzroy Developmental Road.

Up to approximately 33 trains per week (on average) would service the Project, with a peak daily maximum of eight trains per day.

A construction workforce of between 500 and 700 people is expected to be required for the Project. At full development, the Project would have an operational workforce of approximately 960 people. Existing accommodation facilities at both Coppabella and Moranbah are expected to have sufficient capacity for construction and operational workforces.

3.2 LAND USE

The Project is located within the Bowen Basin mining area where open cut coal mining is a key land use in the Bowen Basin, and a number of existing and approved coal mines, including Moorvale, Daunia, Poitrel, Millennium, Eagle Downs, Peak Downs, Saraji, Lake Vermont surround the Project (Figure 1).



LEGEND

- Mining Lease Application Boundary
- Eungella Pipeline Network
- Railway
- Relevant Homestead
- Open Cut Pit
- Waste Emplacement
- Infrastructure Area
- Levee

Conceptual Infrastructure Alignments*

- Preferred Rail Spur Alignment
- Preferred Electricity Transmission Line Alignment
- Preferred Access Road Alignment
- Preferred Water Pipeline Alignment

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Orthophotography: Google Image (2015)

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OLIVE DOWNS PROJECT

Conceptual Mine Plan and Alignment of Infrastructure Corridors

** Alignments are indicative only and subject to feasibility and environmental assessments*

Figure 2

Coal and petroleum (i.e. coal seam gas) mining exploration activities have been conducted within the Project areas and surrounds for decades.

Land within the Project area is used predominately for cattle grazing, with small areas showing some evidence of opportunistic cropping. The land has been largely cleared through past agricultural practices, however some tracts of remnant vegetation exist, particularly along the riparian corridor of the Isaac River. There is no Strategic Cropping Land (SCL) mapped within the Project MLAs or along the infrastructure corridors (Section 5.1.1.2).

The properties on which the Project is proposed are owned by mining companies (Iffley and Lake Vermont) and private landholders (Vermont Park, Seloh Nolem, Willunga and Old Bombandy) (Figure 3). Surrounding land in the vicinity of the Project is owned predominantly by other mining companies.

The Project is located within zones identified and mapped as Regional Landscape and Rural Production Area under the Mackay, Isaac and Whitsunday (MIW) Regional Plan (2012).

The Project areas are generally consistent with the *identified coal reserves* in the MIW Regional Plan (2012). The Project area is coincidental with existing petroleum tenements in the region.

3.3 PROJECT NEED, JUSTIFICATION AND ALTERNATIVES CONSIDERED

Pembroke Resources is focused on the acquisition of high quality, metallurgical coal assets to satisfy the long-term, global demand for metallurgical coal used in the steel production industry.

Prior to acquiring the Project, Pembroke Resources considered numerous existing and potential metallurgical coal assets around the world before focusing its acquisitions on Queensland's Bowen Basin, given its high quality coal resources and existing mining industry serviced by extensive infrastructure.

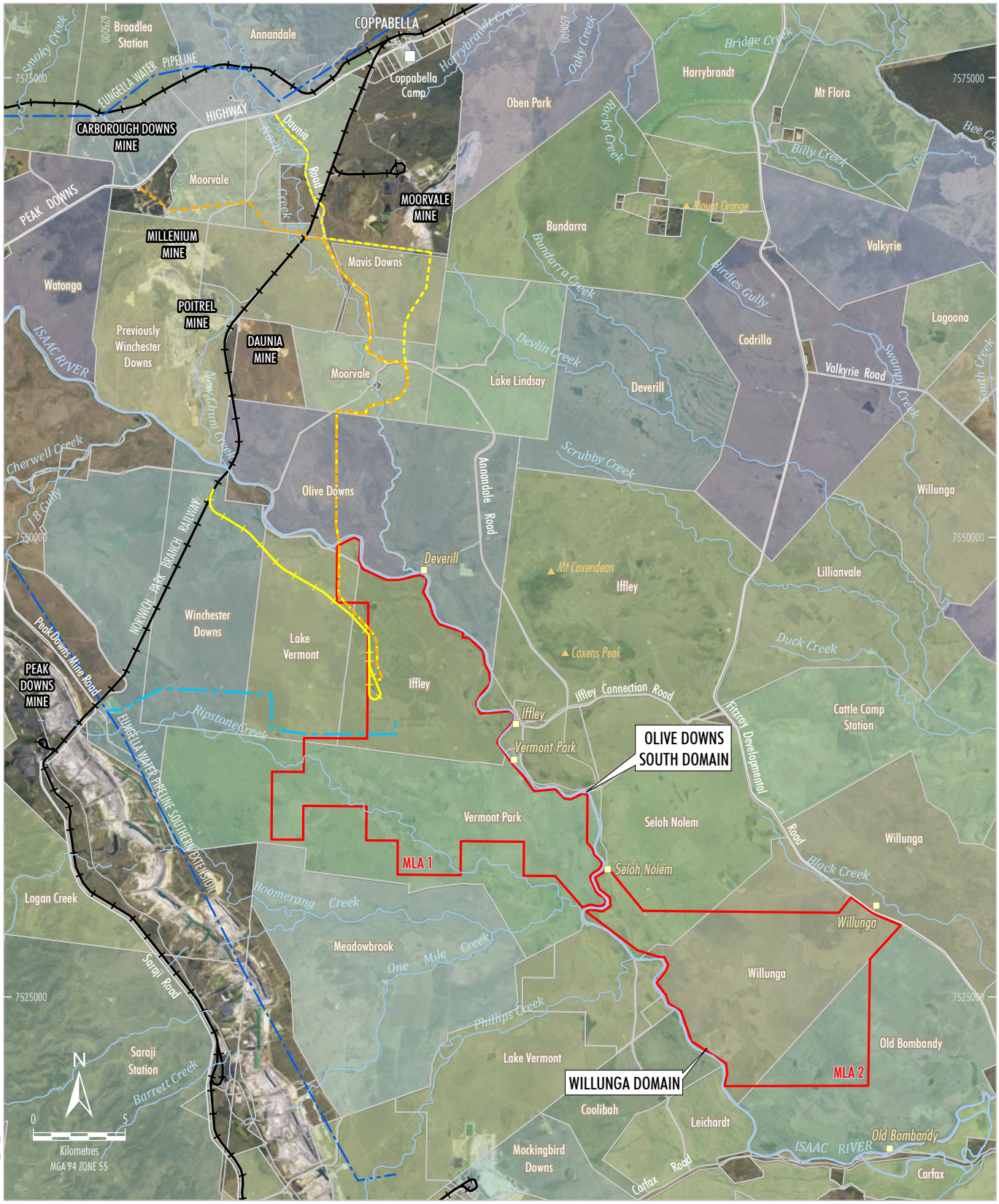
Despite the depressed coal market experienced in recent years, there will be an ongoing reliance on metallurgical coal for steel production. The development of new mining operations will provide significant direct employment opportunities for construction and operational workforces, and long term flow-on social and economic benefits to regional communities.

A number of alternative assets were investigated by Pembroke during its analysis of potential sites in the Bowen Basin, including existing operations with expansion opportunities. Following a review of the available options, it was considered that the opportunities presented by a greenfield site such as the Project outweighed the potential benefits of purchasing an existing operation. This included consideration of the constraints typically encountered at existing mines, including inefficient operations and mine plans, and the benefit of designing a greenfield mine from the ground up to optimise the development of the asset.

Accordingly, given its location within the existing Bowen Basin mining region, the greenfield nature of the asset, the significant size of the coal resource and proximity to existing infrastructure, Pembroke Resources considers that the Project would achieve its objective of developing a high quality, long-term, metallurgical coal asset.

The 'do nothing' alternative would not realise the value the coal resource would provide to State royalties and Commonwealth tax revenue. Should the Project not be developed, it would not contribute to Queensland's growing export industry and the significant economic growth it provides. Further, the employment opportunities and social and community benefits that would be generated through the construction and operation of the Project would not be created.

Pembroke Resources is conducting a Pre-feasibility Study of the Project to identify a preferred mine plan, infrastructure design and production and workforce profiles, in consideration of environmental and planning constraints, logistics, community and external relations, marketing, and commercial and financial matters. The Pre-feasibility Study will consider alternative mining methods and mine plans, however the geology of the Project resource is not easily amendable to underground mining methods, hence it would be extracted by open cut methods.



LEGEND

- Mining Lease Application Boundary
- Property Boundary
- Railway
- Eungella Pipeline Network
- Relevant Homestead

Conceptual Infrastructure Alignments*

- Preferred Rail Spur Alignment
- Preferred Electricity Transmission Line Alignment
- Preferred Access Road Alignment
- Preferred Water Pipeline Alignment

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Orthophotography: Google Image (2015)

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OLIVE DOWNS PROJECT

Rural Properties

** Alignments are indicative only and subject to feasibility and environmental assessments*

Figure 3

3.4 COMPONENTS, DEVELOPMENTS, ACTIVITIES AND INFRASTRUCTURE THAT CONSTITUTE THE PROJECT TO BE DECLARED COORDINATED

The general arrangement of the Project would use, and integrate with, the approved Olives Downs North Mine infrastructure. Construction of the Olive Downs North Mine infrastructure is scheduled to begin in 2017, with operations commencing in 2018 (subject to the approval of the CMJV minority parties).

The main activities associated with the development of the Project would include (Figure 2):

- up to 20 Mtpa of ROM coal production for a mine life in excess of 30 years (commencing approximately in 2020 or upon grant of all required approvals), including mining operations using conventional mining equipment (e.g. excavators, dozers, front end loaders and trucks) and strip mining methods, associated with:
  - development of the Olive Downs South domain open cut pits and waste rock emplacements within MLA 1 (within Mineral Development Licence [MDL] 3012 and MDL 3013); and
  - development of the Willunga domain open cut pits and waste rock emplacements within MLA 2 (MDL 3014);
- exploration activities;
- progressive development of soil stockpiles, laydown areas and borrow areas (e.g. for road base and ballast material);
- use of local quarries to source road base and ballast material (e.g. in the case where material is unavailable from sources within MLA 1 and MLA 2);
- drilling and blasting of competent overburden/ waste rock material;
- progressive placement of waste rock in emplacements adjacent to the open pit extents;
- progressive backfilling of the mine voids with waste rock behind the advancing open cut mining operations;
- construction of an access road from the Peak Downs Highway, via Annandale Road, to the Olive Downs South domain infrastructure area including a crossing of the Isaac River, and a second access road from the Fitzroy Developmental Road to the Willunga domain infrastructure area;
- progressive development of new haul roads and internal roads, including an Isaac River road crossing to provide access between the Olive Downs South and Willunga domains;
- installation and operation of on-site ROM coal handling and crushing facilities, and a CHPP at the Olive Downs South domain[1];
- installation and operation of on-site ROM coal handling and crushing facilities at the Willunga domain;
- transfer of crushed ROM coal from the Willunga domain to the CHPP at the Olive Downs South domain, via either haul road or conveyor with an Isaac River crossing;
- disposal of CHPP rejects on-site within appropriate out-of-pit and in-pit containment facilities, including mine voids behind the advancing open cut mining operations;
- progressive development of sediment dams and water storage dams, pumps, pipelines and other water management equipment and structures (including up-catchment diversions and levees);
- wastewater and sewage treatment by package sewage treatment plants;
- advance dewatering of open cut pit areas and construction and use of a groundwater supply borefield subject to the prevalence of suitable hydrogeological conditions;
- installation of a raw water supply pipeline from the existing Eungella pipeline network;
- discharge of excess water off-site in accordance with relevant principles and conditions of the Final Model Water Conditions for Coal Mines in the Fitzroy Basin (Department of Environment and Heritage Protection [DEHP], 2013);
- use of approved administration and maintenance facilities at the Olive Downs North Mine (subject to the approval of the CMJV minority parties) and establishment of new mine infrastructure areas at the Olive Downs South and Willunga domains including site offices, crib facilities, bathhouse, stores/warehouse, workshops and re-fuelling facilities (including diesel storage), power lines and back-up power generator, and communication facilities;

[1] Until the CHPP at Olive Downs South is commissioned and other relevant approvals are in place, the Project would make continued use of the existing CHPP at the Moorvale Mine under formal toll-washing arrangements between Pembroke and CMJV.

- electricity supply from the existing regional power network, via construction of a 66 kilovolt (kV) ETL and switching/substation;
- other associated minor infrastructure, plant, equipment and activities, including minor modifications and alterations to existing local and regional infrastructure as required to accommodate the increasing throughput;
- continued use of the existing rail-load out facility at the Moorvale Mine during the initial stage of the Project; and
- construction of a new rail loop and rail spur line from the Norwich Park Branch Railway and rail-load out facility including product coal stockpiles at the Olive Downs South domain for rail transport of coking and PCI coal products and thermal coal by-products for the export market via the DBCT (subject to availability of rail and port allocation).

Based on the planned maximum production rate, approximately 400 million tonnes (Mt) of product coal would be produced during the life of the Project. The mining layout and sequence for the Project would vary to take account of localised geological features, coal market volume and quality requirements, mining economics and Project detailed engineering design.

Final landform and rehabilitation concepts for the progressive rehabilitation program and end of the Project life (including final shaping of waste rock emplacements, topsoiling and revegetation) would be undertaken and documented as required by the *Environmental Protection Act, 1994* (EP Act).

3.5 EXTERNAL INFRASTRUCTURE REQUIREMENTS

Road Transport

Vehicle access for employees, contractors and deliveries to the Olive Downs South domain would be via the Peak Downs Highway, Daunia Road, Annandale Road, and private sections of access road to be constructed for the Project (Section 3.1).

Access for employees, contractors and deliveries to the Willunga domain would be provided by an access road from the Fitzroy Developmental Road. Vehicles would be able to travel between the Olive Downs South and Willunga domains via internal access roads, including an appropriately designed crossing of the Isaac River.

Until such time as the Olive Downs South domain on-site CHPP, rail spur and loop is constructed, ROM coal would be hauled via on-road trucks (e.g. B-doubles) from the Olive Downs South domain to the Olive Downs North Mine, and then on to the Moorvale Mine (Figure 2), subject to toll-washing arrangements between Pembroke and CMJV.

The final alignment of the access and haul roads will be subject to relevant studies conducted during feasibility studies and the EIS.

Rail Transport and Port Operations

The existing rail-load out facility at the Moorvale Mine including rail loop and rail spur line to the Norwich Park Branch Railway would continue to be used for the Project under formal toll-washing arrangements between Pembroke and CMJV, until such time as the Olive Downs South domain CHPP and rail spur and loop is commissioned.

A rail spur from the Norwich Park Branch Railway to the Olive Downs South domain infrastructure area and an on-site rail loop would be constructed for the Project. The preferred alignment for the rail spur between the Norwich Park Branch Railway and the Project is shown on Figure 2. The final alignment of the spur will be subject to relevant studies conducted during feasibility studies and the EIS.

A rail-load out facility including product coal stockpiles would be constructed adjacent the rail loop to allow for rail transport from the Olive Downs South domain direct to the DBCT (via the Norwich Park Branch Railway and Goonyella Branch Railway).

Pembroke is working with relevant stakeholders to establish a viable coal rail and port solution for the Project.

Subject to availability of rail and port allocation, the DBCT would be used for the Project.

Water Supply

A raw water supply pipeline would be constructed for the Project from the existing Eungella pipeline network, with the take off point to be located near the Peak Downs Mine. The preferred alignment for the pipeline between the Eungella pipeline network and the Project is shown on Figure 2. The final alignment of the pipeline will be subject to relevant studies conducted during feasibility studies and the EIS.

The existing Eungella pipeline is operated and maintained by SunWater.

Initial discussions with SunWater indicate there is sufficient water availability within the Eungella network to provide the estimated raw water requirement for the Project.

Operational water requirements would be sourced from on-site water storages containing runoff from disturbed mine areas or mine-affected water. If required, the operational water demand would be supplemented with external water supply under supply agreements via the pipeline connecting to the Eungella pipeline network, licensed flood harvesting during very high flow events within the Isaac River and potential use of a groundwater supply from groundwater bores at a location to be determined.

Electricity Supply

Electricity supply to the Bowen Basin area is provided via Powerlink's 275/132 kV substations at Strathmore, Nebo and Lilyvale. From these substations, the area is supplied from a number of 132 kV substations and Queensland Rail substations. Ergon Energy further distributes electricity from these substations to local customers (Powerlink, 2013).

Permanent Supply

Electricity supply for the Project would be provided from the existing regional power network via construction of a 66 kV ETL from the Broadlea Substation, and an on-site switching/substation located at the Olive Downs South mine infrastructure area. The preferred alignment for the ETL between the Broadlea Substation and the Project is shown on Figure 2. The final alignment of the ETL will be subject to relevant studies conducted during feasibility studies and the EIS.

Temporary Supply

Power may be supplied to some of the required infrastructure locations for the Project using packaged diesel generator units until permanent power supply becomes available.

Workforce Accommodation

Workforce accommodation options for the Project include existing accommodation facilities at both Coppabella and Moranbah, as well as other self-accommodation and rental accommodation in the region (Figure 1).

The construction workforce for the Project would be staged, with an initial peak during construction of the linear infrastructure and the Olive Downs South domain, and then another campaign when construction of the Willunga domain infrastructure area commences, approximately five years later.

Short-term construction/development activities during the life of the Project would require an additional construction workforce for short periods.

At full development, the Project would have an operational workforce of approximately 960 people.

Existing workforce accommodation options are expected to have sufficient capacity for construction and operational workforces. Pembroke Resources would also encourage its employees to reside within the regional towns, including Nebo, Moranbah, Middlemount and Dysart. The Project does not propose a 100% fly-in fly-out workforce.

Fuel Supply

Fuels (including diesel) would be transported to the Project by contractors.

The transport, storage and handling of fuels (including diesel) at the Project would be undertaken in accordance with relevant legislation and guidelines.

All equipment and vehicle operators would be trained in the safe operation of the equipment (including operating procedures for the refilling and maintenance of fuel storage tanks and mine vehicles) and the relevant emergency response procedures in the event of an incident.

Regular inspection programs would be undertaken to monitor the structural integrity of fuel tanks and bunds.

Telecommunications

High speed telecommunication data services are provided to Moranbah and coal mines in the Bowen Basin via an existing fibre optic network. Connection to the existing fibre optic network would be undertaken for the Project.

Communications systems would be integrated at the Olive Downs North Mine, Olive Downs South domain and Willunga domain to provide enhanced communications capacity across the network for the Project.

3.6 TIMEFRAMES FOR THE PROJECT

The design and procurement phase for the Project has commenced and would be finalised in 2019, subject to obtaining all relevant approvals.

An indicative chronology of key timeframes for Project related activities is provided below and shown on Figure 4:

- 2019–2020: Construction commences at the Olive Downs South domain (including early works described further below) and external ancillary infrastructure requirements (e.g. pipeline, ETL, rail loop and rail spur, etc.).
- 2020: First coal at the Olive Downs South domain.
- 2020–2028: ROM coal extraction at the Olive Downs South domain increases up to 6 Mtpa.
- 2023: Construction commences at the Willunga domain including external ancillary infrastructure requirements (e.g. access road, pipelines, powerlines, Isaac River crossing, etc.).
- 2025: First coal at the Willunga domain.
- 2025–2028: ROM coal extraction at the Willunga domain increases up to 6 Mtpa.
- 2028–2033: ROM coal extraction at the Olive Downs South domain increases up to 12 Mtpa.
- 2028–2033: ROM coal extraction at the Willunga domain increases up to 8 Mtpa.
- 2033 onwards: ROM coal extraction at the Olive Downs South and Willunga domains up to 20 Mtpa (combined).

Opportunities for early works may include:

- construction of the access road to the Olive Downs South domain and other internal roads;
- construction of water management infrastructure (including sediment dams, water storage dams, up-catchment runoff controls and diversions); and
- installation of advanced dewatering bores.

3.7 CONSTRUCTION AND OPERATIONAL PROCESSES

Construction activities would be undertaken in two campaigns (i.e. the Olive Downs South domain and then the Willunga domain) which would include, but not necessarily be limited to, the following key requirements:

- Olive Downs South domain:
  - early works (as described in Section 3.6) and development of access road, river crossing, flood levees, soil stockpiles, laydown areas and borrow areas (e.g. for road base and ballast material);
  - construction of on-site rail loop and rail spur line to the Norwich Park Branch Railway;
  - development of mine infrastructure area including construction of on-site fuel storage;
  - installation of ROM coal handling and crushing facilities and CHPP;
  - construction of ETL to existing regional power network and switching/substation on-site;
  - connection to the existing telecommunications network;
  - installation of raw water supply pipeline (e.g. from existing Eungella water pipeline);
  - development of sediment dams and water storage dams, pumps, pipelines and other water management equipment and structures (including up-catchment diversions and flood levees);
  - installation of a water treatment plant and a package sewage treatment plant; and
  - construction of rail load-out facility and product coal stockpile areas.
- Willunga domain:
  - construction of an access road from the Fitzroy Developmental Road;
  - development of sediment dams and water storage dams, pumps, pipelines and other water management equipment and structures (including up-catchment diversions and flood levees);
  - development of the mine infrastructure area including construction of on-site fuel storage and sewage treatment plant;

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Resource Strategies

Source: Pembroke Resources Pty Ltd (2016)

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OLIVE DOWNS PROJECT

Timeframes for the Project

Figure 4

- installation of ROM coal handling and crushing facilities;
- installation of a water treatment plant and a package sewage treatment plant; and
- construction of an Isaac River road crossing and conveyor gantry to provide access and coal clearance between the Olive Downs South and Willunga domains infrastructure areas.

Pembroke is working with relevant stakeholders to establish a viable coal rail and port solution for the Project. Subject to availability of rail and port allocation, the DBCT would be used for the Project.

Discharge of excess water would be undertaken off-site in accordance with relevant principles and conditions of the *Final Model Water Conditions for Coal Mines in the Fitzroy Basin* (DEHP, 2013).

Rehabilitation would be undertaken progressively during the Project. Final rehabilitation works and mine closure activities would be undertaken upon completion of ROM coal extraction.

3.8 WORKFORCE REQUIREMENTS DURING CONSTRUCTION AND OPERATION

The anticipated construction workforce for the Project is expected to be in the range of 500 to 700 people. At full development across the Olive Downs South and Willunga domains, the Project operational workforce would be in the order of 960 people.

The operational hours at the Project would be 24 hours a day, seven days a week.

It is anticipated that mining operations would be on a 12.5 hour shift cycle roster, working seven days on, seven days off. Senior management and staff would work on a five days on (Monday to Friday), two days off roster.

As described in Section 3.5, existing accommodation facilities at both Coppabella and Moranbah would be used for the Project. Options for bus transport and/or car pooling to the Project would be available during construction and operations.

Pembroke Resources does not propose to use a 100% fly-in fly-out workforce, although acknowledges that some proportion of the construction and operational workforces would travel between their homes and the site via the Moranbah and Mackay airports.

3.9 ECONOMIC INDICATORS

The capital cost over the life of the Project is estimated to be in the order of $1 billion.

Upon commencement of operations, the Project would include economic benefits through ongoing annual direct and indirect output or business turnover, annual household income and direct employment.

Indirect employment and business generation would also be realised in a number of different sectors including property services, mechanical repairs, machinery, materials handling and equipment manufacturing, research, technical and computer services, wholesale trade and retail trade. A number of these service providers are established in the Bowen Basin. The Project would provide ongoing support and employment opportunities for these businesses.

The Project will contribute to State royalty payments and Commonwealth tax revenues.

3.10 FINANCING REQUIREMENTS AND IMPLICATIONS

As described in Section 3.9, the capital cost over the life of the Project is estimated to be in the order of $1 billion. The capital cost associated with the initial construction stage to establish the on-site ROM coal handling and crushing facilities, CHPP and rail infrastructure to service the Olive Downs South domain is estimated to be approximately $530 million.

Project capital has been secured for the exploration, feasibility studies, environmental approval and design and tendering phases of the Project.

Third party financing for the initial construction costs will be required. The Project may be partially funded through equity investment, which may be gained from several sources already identified with whom discussions are underway. Funding from the market place for equity may be sought or through the introduction of a joint venture partner. Pembroke Resources has strong interest for Project funding from several international banks. It is also common for a project of this nature that funding is obtained from a major Engineering Procurement Contractor.

Pembroke Resources is confident that a global market exists for the Project's metallurgical coal production and will continue to assess and progress funding arrangements as the Project develops.

4 LOCATION OF KEY PROJECT ELEMENTS

4.1 LOCATION

Regional Context

The Project is located approximately 170 km south-west of Mackay, in the Bowen Basin region of Central Queensland, within the Isaac Regional Local Government Area (LGA) (Figure 1). The Project is located approximately 40 km south-east of Moranbah and approximately 40 km north of Dysart in a mining precinct comprising several existing nearby coal mining operations, including (Figure 1):

- Moorvale (18 km north of the Project);
- Daunia (10 km north-west of the Project);
- Millennium (15 km north-west of the Project);
- Poitrel (10 km north-west of the Project);
- Peak Downs (12 km west of the Project);
- Saraji (5 km south-west of the Project); and
- Lake Vermont (12 km south of the Project).

The Project is located:

- within the Brigalow Belt North Bioregion as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Department of the Environment and Energy [DEE], 2016a);
- in the Isaac Connors Sub-catchment Area of the Fitzroy Basin under the Water Resource (Fitzroy Basin) Plan 2011 (Queensland);
- in the Isaac Connors Groundwater Management Area (GMA) declared under the Water Resource (Fitzroy Basin) Plan 2011 (Queensland). Parts of the Project are located within and proximal to the Isaac Connors Alluvium Groundwater Sub-area declared under the Water Resource (Fitzroy Basin) Plan 2011 (Queensland);
- approximately 250 km north of the Mimosa Zone defined in the Great Artesian Basin Strategic Management Plan (Great Artesian Basin Consultative Committee, 2000); and
- within the Barada Barna Country (QC2008/011) Native Title Determination Application Area registered with the National Native Title Tribunal (NNTT) (2016).

The Project is not situated within a declared sub-artesian groundwater area under the *Water Regulation, 2002* (Queensland).
Other coordinated projects and major projects in the region include (Figure 1):

- Connors River Dam and Pipeline Project (75 km north-northeast of the Project);
- Goonyella Riverside and Broadmeadow Mines (50 km north-west of the Project);
- Goonyella Riverside to South Walker Creek Dragline Move (25 km north of the Project);
- Isaac Plains Extension (24 km north-west of the Project);
- Saraji East Mining Lease Project (5 km south-east of the Project); and
- Lake Vermont Northern Extension Project (3 km south of the Project).

Local Context

The Project is located directly south of the approved Olive Downs North Mine.

The Olive Downs South domain is located to the south and west of the Isaac River. The Willunga domain is located to the north and east of the Isaac River, further downstream of the Olive Downs South domain.

The general landscape of the Project area constitutes gently undulating, to flat plains, with elevations of approximately 200 metres (m) Australian Height Datum (AHD). The overall elevation of the Project area ranges from 150 m in the low-lying southeast of the Project to 250 m in the higher areas to the north of the Project area (Queensland Government, 2016a). The Project is bordered by a cluster of small mountains to the north-east, approximately 400 m high, as well as a range of low-lying mountains ranging from 300-400 m high, 10 km to the south-west of the Project.

Land ownership in the vicinity of the Project is described in Section 4.2.

4.2 TENURE

Tenements

The Project is located within the nearby tenements held by Pembroke Resources as follows (Figure 5):

- MDL 3012, 3013 and 3014; and
- Parts of Exploration Permit for Coal (EPC) 649, 688, 721 and 850 (under Beneficial Interest).

Pembroke will lodge MLAs (i.e. MLA 1 and MLA 2 indicatively shown on Figure 2) for the Project areas with the Queensland Mining Registrar prior to submission of the EIS.

The granting of the MLs for the Project would be conditional upon Pembroke entering into a co-development agreement with holders of petroleum tenements (e.g. Authority to Prospect [ATP] 1103 and ATP 1031 held by Arrow Energy Pty Ltd) under section 318CB of the *Mineral Resources Act, 1989* (Queensland) (MR Act).

Land Ownership

The key lots directly impacted by the Project MLAs include:

- Iffley (11KL135);
- Vermont Park (9CNS98);
- Willunga (8KL95);
- Seloh Nolem (7KL96);
- Old Bombandy (9KL97);
- Lake Vermont (4CNS15); and
- Winchester Downs (5CNS90).

The key lots directly impacted by the Project infrastructure corridors include:

- Rail corridor:
  - Iffley (11KL135);
  - Lake Vermont (4CNS15); and
  - Winchester Downs (5CNS90).
- ETL:
  - Iffley (11KL135);
  - Lake Vermont (4CNS15);
  - Olive Downs (3GV90);
  - Moorvale (3SP221655; 1SP187962; 2SP214498; 4RP894192); and
  - Annandale Road reserve.
- Water pipeline:
  - Iffley (11KL135);
  - Lake Vermont (4CNS15); and
  - Winchester Downs (5CNS90; 8SP277384).
- Access road:
  - Iffley (11KL135);
  - Lake Vermont (4CNS15);
  - Olive Downs (3GV90);
  - Moorvale (4RP894192);
  - Mavis Downs (5/RP866478);
  - Annandale Road reserve; and
  - Daunia Road reserve.

Local Government Planning Scheme

Isaac Regional Council is the relevant local government authority for the Project.
Isaac Regional Council was formed in 2008 from the Belyando, Nebo and Broadsound Shire Councils. The Project is located within the former Broadsound Shire Council area.

Isaac Regional Council currently operates under different planning schemes across the LGA, *viz*:

- Planning Scheme for Broadsound Shire (2005);
- Planning Scheme for the Shire of Nebo (2008);
- Planning Scheme for Belyando Shire (2009); and
- Moranbah Priority Development Area (PDA) Development Scheme (2011).

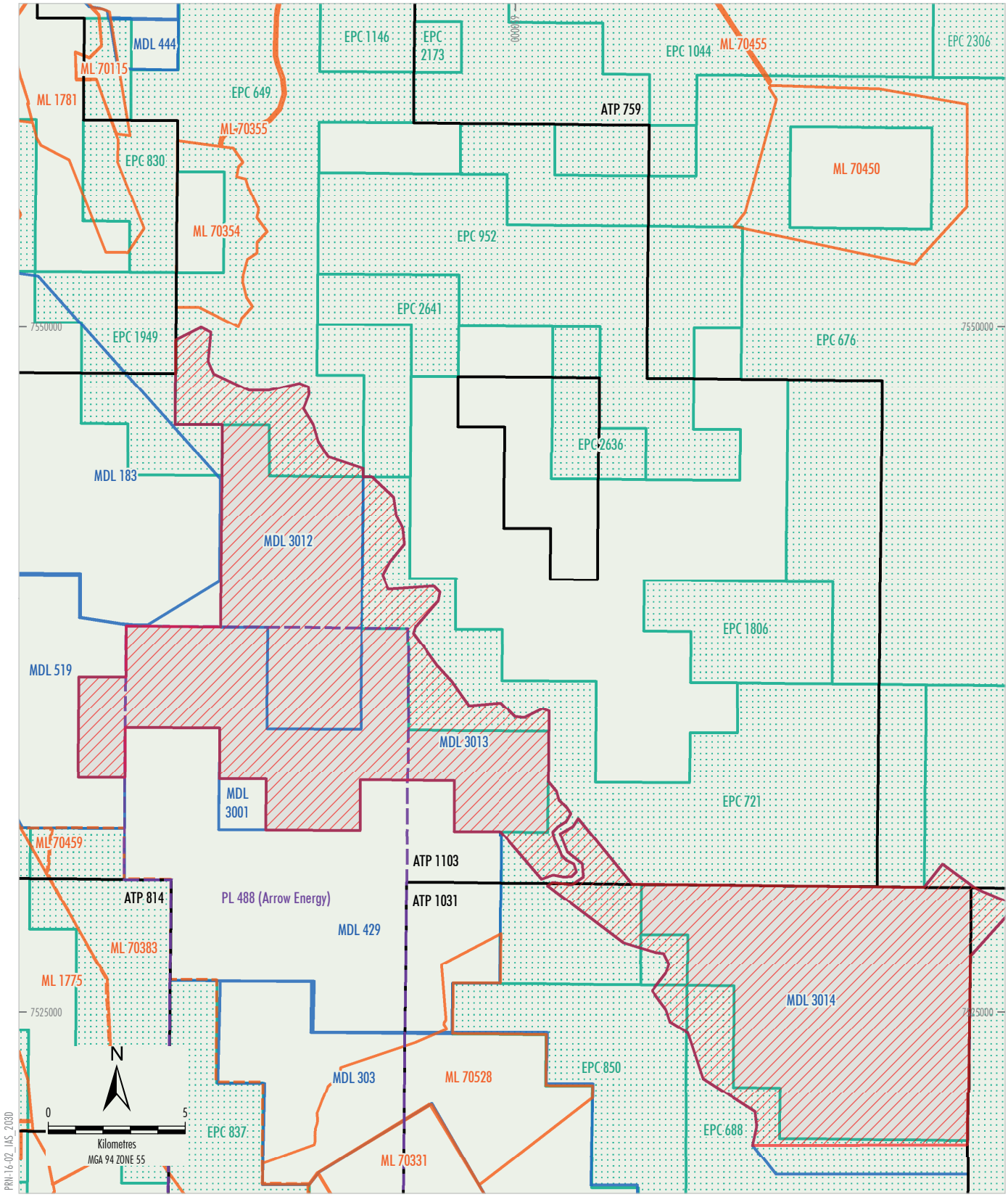
Isaac Regional Council is currently developing a new Isaac Regional Planning Scheme which is expected to be completed in 2018.

Until the new Isaac Regional Planning Scheme is developed, the Planning Scheme for Broadsound Shire (2005) would continue to be applicable to the Project.

Regional Plan

The MIW Regional Plan (2012) establishes a vision and direction for the region to 2031 and is applicable to the Project area.

The MIW Regional Plan recognises that coal mining is the major industry in the region and the largest employer.



LEGEND

- Olive Downs Project Mining Lease Application Area
- EPC Granted
- PL Application
- MDL Permit Granted
- ML Permit Application
- ML Permit Granted
- ATP Granted

Source: Department of Natural Resources and Mines (2016)

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OLIVE DOWNS PROJECT

Mining Tenements

Figure 5

5 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 NATURAL ENVIRONMENT

5.1.1 Land

5.1.1.1 Geology and Soils

Regional geology mapping of the Project area (Figure 6) shows the Fair Hill and Rangal formations in the north of the Project, and the Rewan and Blackwater formations in the south and east of the Project area. Broad scale geology testing undertaken by the Department of Environment and Resource Management (DERM) in 2011, indicates the Project region is dominated by Tertiary sediments, with the Project area predominantly containing Cainozoic alluvium, as well as mixed Mesozoic sediments (Raymond and McNeil, 2011).

Soil data sourced from the Department of Natural Resources and Mines (DNRM) shows Vertosols and Sodosols are the dominant soil types within the Project area (Figure 7) (Queensland Government, 2016a). Specific soil test sites conducted surrounding the Project area by the Queensland Government show Black Vertosols to the north of the Project area, Brown Vertosols and Dermosols near the Olive Downs South domain, and Red Kandosols and Black Vertosols in the Willunga domain (Figure 7). No acid sulphate soils have been identified within the Project boundary (Queensland Government, 2016a).

5.1.1.2 Agricultural Land

There is no SCL mapped within the Project MLAs or along the infrastructure corridors (Figure 8). The closest SCL to the Project is located to the south of the Willunga domain, adjacent to the Isaac River.

Agricultural land classifications indicate the majority of the Project area lies on C1 (sown pastures, and native pasture on high fertility soils) and C2 (Native Pastures) class agricultural lands (Queensland Government, 2016a). This indicates that the land is suitable for pasture, however is not suitable for wide scale cropping (Department of Agriculture and Fisheries [DAF], 2016).

With the exception of small areas near the proposed new rail loop and rail spur line and rail load-out facility, there is no other mapped *good quality agricultural land* (GQAL) as identified in the MIW Regional Plan (2012) within the Project area.

5.1.1.3 Surrounding Mines

As described in Section 4.1, the Bowen Basin contains a number of currently operating coal mining activities, including mines to the immediate north and west of the Project area (Figure 1).

5.1.1.4 Nature Conservation Areas

The Project area does not include any nature conservation areas, and there are no nature conservation areas in the immediate surrounds of the Project (Queensland Government, 2016a). The nearest National Park to the Project area is the Dipperu National Park, located approximately 30 km to the north-east of the Project. The Junee National Park lies 45 km to the south-east of the Project.

The nearest State Forest is the Bundoora State Forest, which lies 50 km to the south-west of the Project.

There are no Ramsar protected wetland sites, nationally important wetland sites, or World Heritage areas within the Project area or vicinity (DEHP, 2016a).

5.1.1.5 Surface Water

The Project lies in the north of the Fitzroy River catchment, within the Isaac River sub-catchment (Queensland Government, 2016a). The stretch of the Isaac River in the vicinity of the Project is a 6th order stream, under the Strahler classification system (Queensland Government, 2016a).

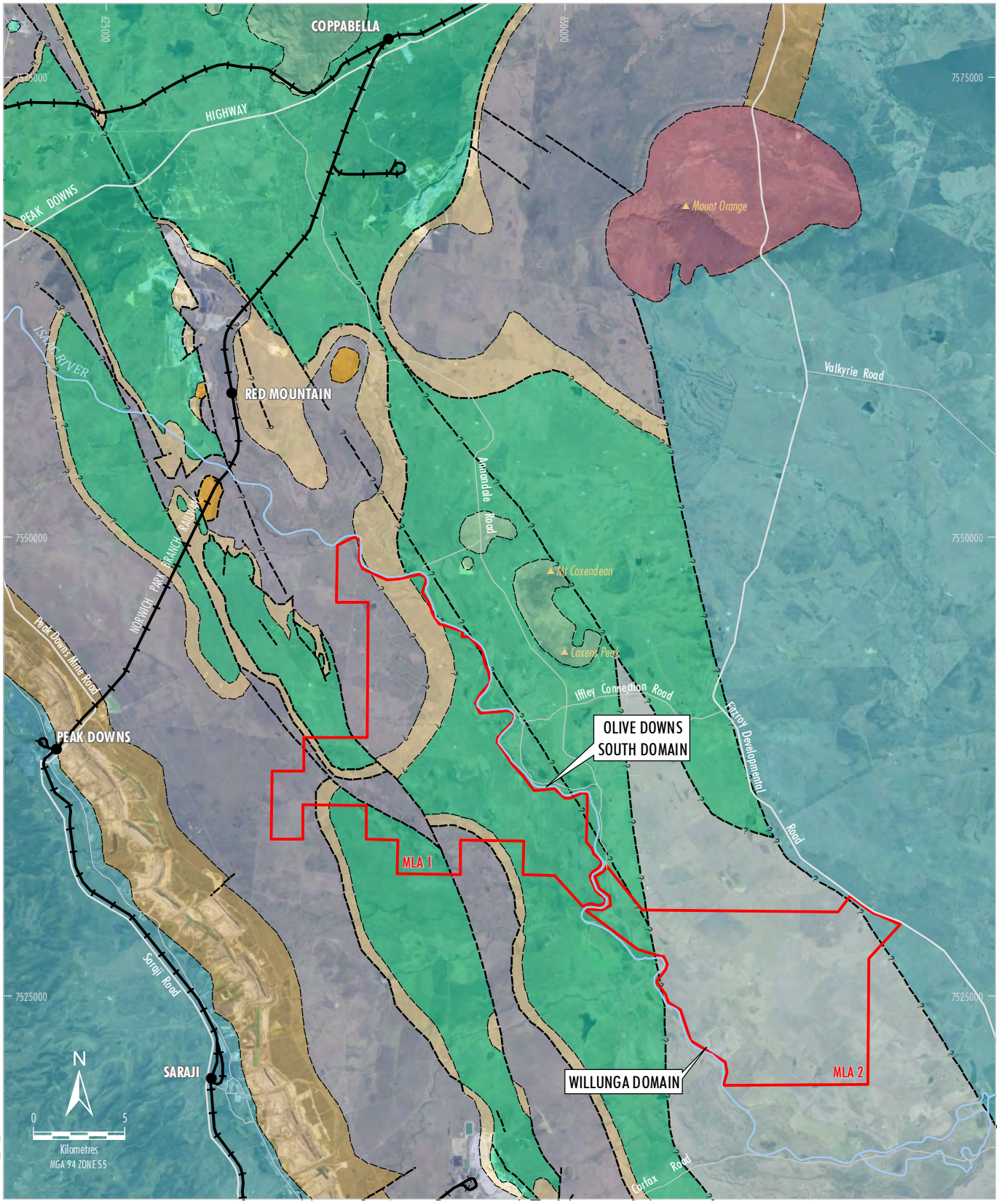
5.1.2 Water

Tributaries of the Isaac River in the vicinity of the Project include (from upstream to downstream) (Figure 2):

- North Creek;
- Ripstone Creek;
- Boomerang Creek;
- Phillips Creek;
- Stephens Creek; and
- Devlin Creek.

No diversions of the Isaac River, or the tributaries listed above, are required for the Project.

A number of other unnamed 1st and 2nd order streams drain to the Isaac River from the Project area (Queensland Government, 2016a).



LEGEND

Mining Lease Application Boundary

Railway

Geological Boundaries

Geological Boundary Approximate

Geological Boundary Inferred

Faults and Shear Zones

Fault Approximate

Fault Inferred

Rock Unit Name

- Back Creek Group
- Blackwater Group
- Bundarra Granodiorite
- Clematis Group
- Fair Hill Formation, Fort Cooper Coal Measures
- German Creek Formation
- Ki-CQ
- Moranbah Coal Measures
- Rangal Coal Measures, Bandanna Formation, Baralaba Coal Measures
- Rewan Formation

Source: Department of Natural Resources and Mines (2016)

Geology: Based on or contains data provided by the State of Queensland (Department of Employment, Economic Development and Innovation) 2015

Orthophotography: Google Image (2015)

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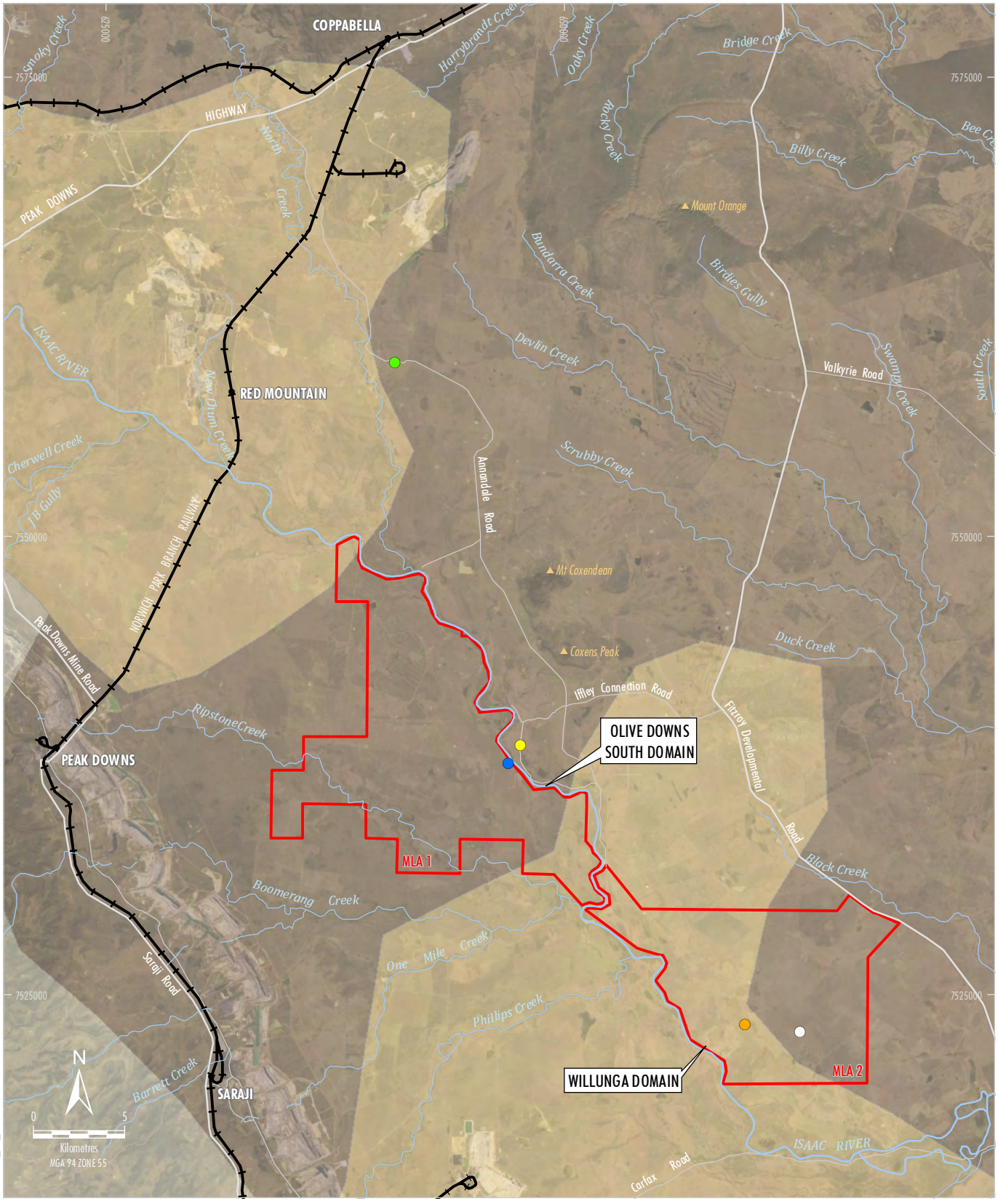
Regional Geology

Figure 6



LEGEND

Mining Lease Application Boundary

Railway

Australian Soil Classification

- Dermosol Brown Hypocalcic Sodic
- Kandosol Red Dystrophic Haplic
- Vertosol Black Epipedal Epicalcareous-Epihypersodic
- Vertosol Black Self-Mulching Epicalcareous-Endohypersodic
- Vertosol Brown Epipedal Class Undetermined

Dominant Soil Types

- Rudosols
- Sodosols
- Vertosols

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Queensland Environment & Resource Management(2016)
Orthophotography: Google Image (2015)

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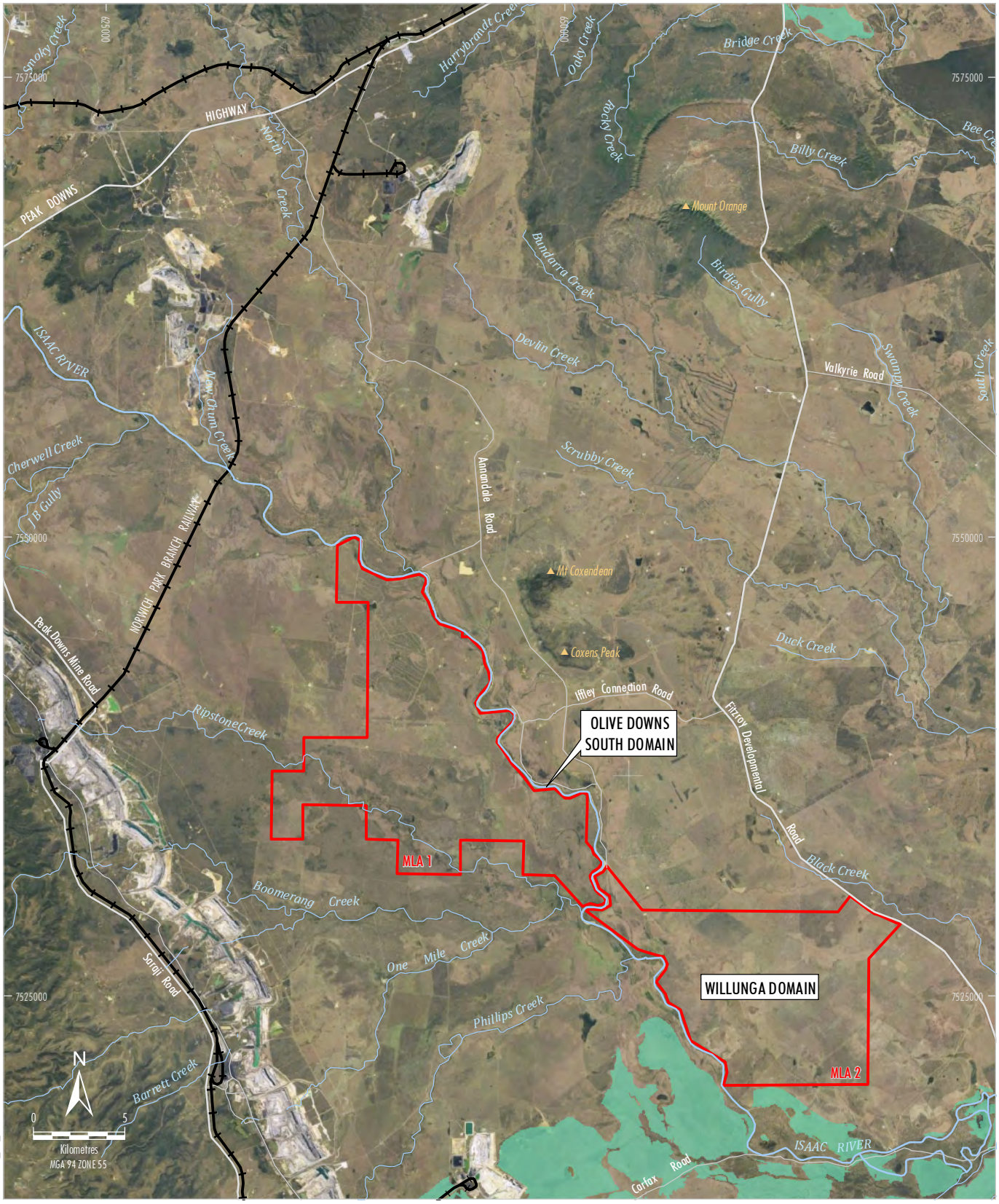
Australian Soils Classification

Figure 7



LEGEND

- Mining Lease Application Boundary
- Strategic Cropping Land
- Railway

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Queensland Environment & Resource Management(2016)
Orthophotography: Google Image (2015)

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OLIVE DOWNS PROJECT

Strategic Cropping Land in the Vicinity of the Project

Figure 8

The Queensland Government currently operates a surface water monitoring station (Station No. 130410A) on the Isaac River near the Deverill Homestead, at the northern end of the Olive Downs South domain (Figure 2). Flow duration data from this station indicate that the Isaac River is dry for most months of the year (between April and November), however during the summer months, high flows for short periods are typically observed.

5.1.2.1 Flooding

The Queensland Floodplain Assessment Overlay (QFAO) represents a floodplain area within drainage sub-basins in Queensland (DNRM, 2016a). It has been developed for use by local governments as a potential flood hazard area and it represents an estimate of areas potentially at threat of inundation by flooding (DNRM, 2016a). The data have been developed through a process of drainage sub-basin analysis utilising data sources including 10 m contours, historical flood records, vegetation and soils mapping and satellite imagery (Figure 9). During years with particularly heavy summer rainfalls, such as 2010 and 2016, the Isaac River level has risen to over 10 m in depth near the Project boundary (Queensland Government, 2016b). The mapping shows a portion of the Project area falls within the Isaac River flood plain (Figure 9).

Management and mitigation measures to minimise the risk of flood inundation will be developed for the Project during preparation of the EIS and are described further in Section 7.7.

5.1.2.2 Groundwater

The Project is located in the Isaac Connors GMA defined under the *Water Resource (Fitzroy Basin) Plan, 2011* made under the Queensland *Water Act, 2000*. Consistent with previous studies in the region (i.e. Bowen Gas Project EIS), hydrogeological conceptualisation suggests that the Project coal resource is within a confined and semi/confined porous rock groundwater system.

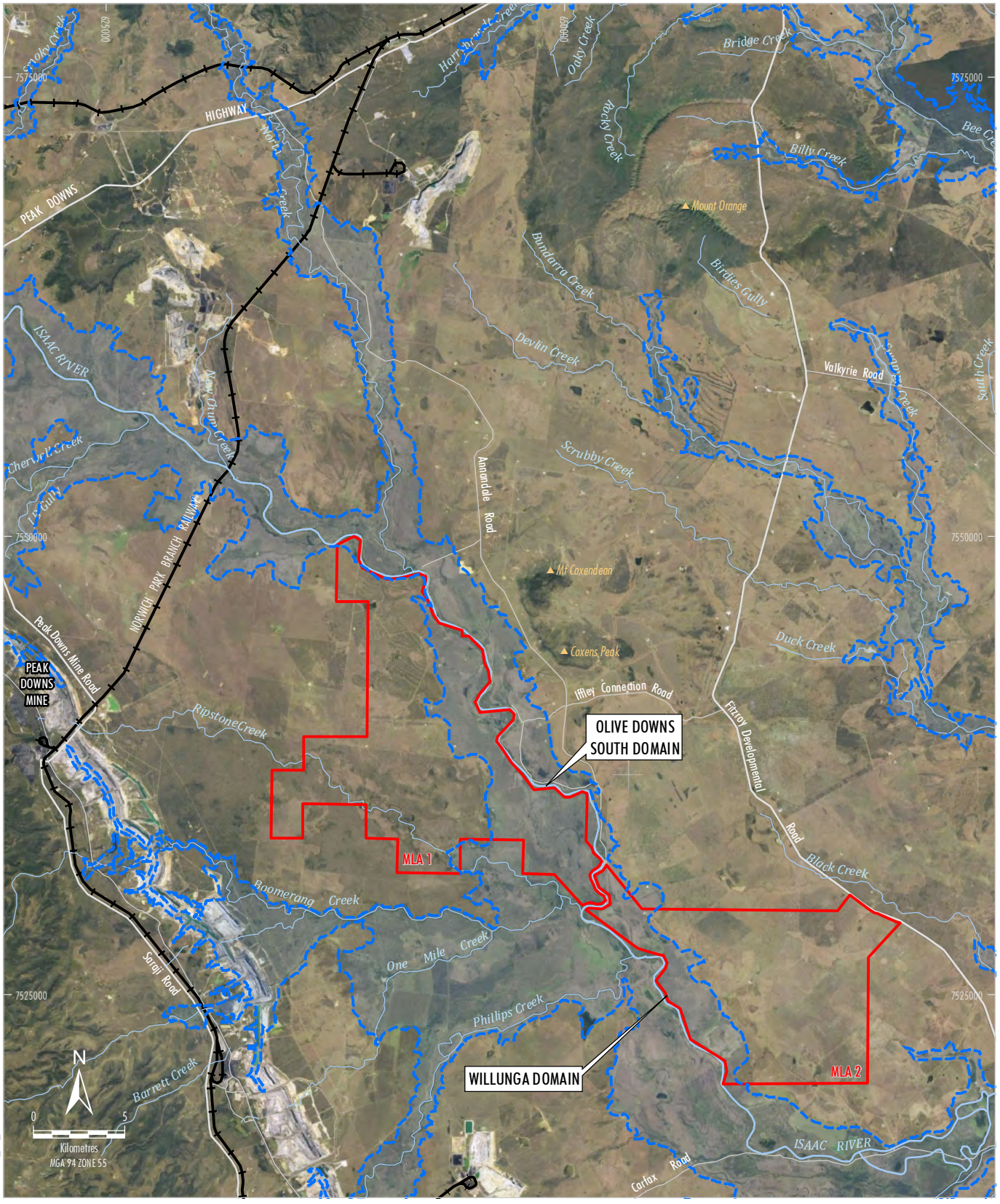
Quatenary alluvial and unconsolidated Tertiary sediments associated with the Isaac River and its tributaries are located within and adjacent to the Project and are defined by the Isaac Connors Alluvium Groundwater Sub-area under the *Water Resource (Fitzroy Basin) Plan, 2011* made under the Queensland *Water Act, 2000*. Hydrogeological conceptualisation suggests these sediments (with thicknesses ranging from 10–50 m along the Isaac River) contain unconfined groundwater.

There are a number of existing groundwater bores located along the Isaac River adjacent to the Project boundary. Bore number 141677 is located directly north of the Project. Bore data indicate that this bore overlies an aquifer which is part of the New Chum Formation, which provides a potable yield of 0.38 litres per second (Queensland Government, 2016a). Two bores exist adjacent to the Iffley property directly east of the Project, and 10 bores exist along the Isaac River, where it runs along the south-western boundary of the Willunga domain.

Hydrogeological conceptualisation also suggests that the intervening Triassic units (i.e. Rewan Formation) consist of very tight shales and fine sandstones and are expected to act as an aquitard, and therefore isolate the Quatenary alluvial and unconsolidated Tertiary sediments from the underlying coal resource, where present. This is consistent with previous studies in the region (i.e. Bowen Gas Project EIS) which identifies the Rewan Formation as a regional confining unit.

In 2011, the DERM released a study which characterised the regional chemistry of the groundwater within the Fitzroy Basin (Raymond and McNeil, 2011). This study broadly classified the groundwater chemistry of the Fitzroy basin using DNRM registered bores. The basin was then differentiated into a number of different groundwater zones based upon differing groundwater characteristics. Although some areas of the Project area could not be classified due to a lack of data, broad mapping shows that the northern and south-eastern parts of the Project fit into the 'Isaac-Dawson' groundwater zone, characterised by Sodic water types (Raymond and McNeil, 2011).

Groundwater in this region was found to contain moderate to high salinities, dominated by Sodium and Chloride ions. Deep groundwater in the vicinity of the Project area exhibited high levels of electrical conductivity relative to other areas within the Fitzroy basin (Raymond and McNeil, 2011). This is consistent with anecdotal evidence which suggests that the groundwater extracted from historical bores in the Project area yield water that is unsuitable for stock and domestic purposes.



LEGEND

Mining Lease Application Boundary

Queensland Floodplain Assessment Overlay

Railway

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Orthophotography: Google Image (2015)
Queensland Floodplain Assessment Overlay (2016)

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Floodplain Assessment Overlay

Figure 9

Groundwater Dependent Ecosystems

Regional mapping of Groundwater Dependent Ecosystems (GDEs) based on the National Atlas of GDEs (Bureau of Meteorology, 2016) identifies:

- large areas of land within the Project area as having either no or a low potential for groundwater interaction;
- the Isaac River main channel as a GDE with a high potential for groundwater interaction, reliant on surface expression of groundwater;
- some areas immediately adjacent the Isaac River main channel as having a moderate potential for groundwater interaction, including vegetation reliant on subsurface groundwater;
- isolated areas immediately adjacent Boomerang Creek as having a high potential for groundwater interaction, including vegetation reliant on subsurface groundwater;
- other isolated areas as having a moderate potential for groundwater interaction, including vegetation reliant on subsurface groundwater;
- wetlands on the Isaac River floodplain with moderate potential for groundwater interaction, mapped as GDEs reliant on surface expression of groundwater; and
- vegetated swamps in depressions beyond the Isaac River floodplain with moderate potential for groundwater interaction, mapped as GDEs reliant on surface expression of groundwater.

The wetlands of the Isaac River floodplain include a paleochannel lake, ox-bow lakes and floodchannel wetlands (DPM pers.comm.). The paleochannel lake was targeted during the preliminary aquatic surveys in December 2016 (DPM pers.comm.). This included fish survey implementing backpack electrofishing techniques, as well as overnight deployment of baited box traps, fyke nets and cathedral traps. These techniques failed to detect any fish within this waterbody, suggesting that it may be subject to complete drying and wetting cycles that limit the persistence of a diversity of aquatic biota.

It is likely that the clay-rich substrates of this waterbody hold surface run-off for extended periods, but it is less likely that surface expressions of groundwater would make substantial contributions to wetted habitat at this location.

Further aquatic ecology surveys will be conducted to ground-truth the extent of other potential GDEs within the Project area and surrounds.

Stygofauna

A *Desktop Assessment: Likelihood of Stygofauna Occurrence in the Bowen Basin* (4T Consultants Pty Ltd, 2012) was prepared for the Bowen Gas Project EIS and identified areas of possible, likely and high likelihood of suitable stygofauna habitat in the vicinity of the Project.

With the exception of areas associated with the Isaac River and tributaries located generally beyond the mine tenements, almost all areas were identified as having limited stygofauna habitat (4T Consultants Pty Ltd, 2012).

5.1.3 Air

5.1.3.1 Emissions in the Region

Air quality in the region is expected to be influenced by dust emissions from local agricultural activities, as well as emissions from surrounding coal mines. The DEHP manages a dust monitoring station at Moranbah which collects hourly PM_{10}[2] dust particulate readings. Data from this station showed an hourly average of 24.74 micrograms per cubic metre (µg/m^3) during 2015 (Queensland, Government 2016c).

Isaac Plains Coal Mines (IPCM) manages the DL4B dust logger, located approximately 1 km to the north-east of Moranbah, which monitors 30 day average values for Total Suspended Particles (TSP), and 24 hour average value PM_{10} and $PM_{2.5}$[3]. Data from this station for the week of the 3 to 10 September demonstrates that the 24 hour average PM_{10} and $PM_{2.5}$ concentrations varied from 0 to 10 µg/m^3, and the 30 day average TSP concentration varied from 7 to 8 µg/m^3 during this period (IPC, 2016).

Anglo American monitored TSP, dust deposition, PM_{10} and $PM_{2.5}$ levels around Moranbah and reported these levels in the Moranbah South Project EIS in 2013. Average annual TSP and dust deposition levels were recorded as 27.5 µg/m^3 and 71 milligrams per metre squared per day (mg/m^2/day) respectively. 24 hour averages of PM_{10} and $PM_{2.5}$ were recorded as 26.8 and 4.3 µg/m^3 respectively (Hansen Bailey, 2013).

[2] PM_{10} refers to particulate matter 10 micrometres or less in diameter.

[3] $PM_{2.5}$ refers to particulate matter 2.5 micrometres or less in diameter.

5.1.3.2 Wind

Wind data is available from the BHP Billiton Mitsubishi Alliance's (BMA) air quality monitoring station at Moranbah. Wind data collected from 2012 to 2013 at this station shows light to moderate winds predominantly from the east to south-east, with wind speeds ranging from 0–8 metres per second (m/s) (Advanced Environmental Dynamics, 2012a, 2012b, 2013a and 2013b). These results are consistent with the 2015 data collected at the DEHP's Moranbah dust monitoring station, which recorded light winds averaging 2 m/s, originating predominantly from the south-east (Queensland, Government 2016c).

5.1.4 Regional Ecosystems

The Project area contains large patches of cleared grazing land as well as areas of remnant and regrowth woodland vegetation. DEHP regional ecosystem (RE) mapping indicates 26 REs occur within the Action area and surrounds (DEHP, 2016d). Dominant REs in the Project area are:

- RE 11.5.3/11.4.9 (*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces/*Acacia harpophylla* shrubby woodland with Terminalia oblongata on Cainozoic clay plains).
- RE 11.3.2/11.3.7/11.3.1 (*Eucalyptus populnea* woodland on alluvial plains/*Corymbia* spp. woodland on alluvial plains/*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains).
- RE 11.3.2/11.3.25/11.3.1 (*Eucalyptus populnea* woodland on alluvial plains/*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines/ *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains).
- RE 11.3.2/11.3.1 (*Eucalyptus populnea* woodland on alluvial plains/*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains).

Preliminary results from recent flora surveys indicate that the woodland areas on-site are made up of predominantly Poplar Box woodlands with areas of riparian vegetation present along the banks of the Isaac River (DPM Envirosciences, pers. comm.). A ground-truthed RE map will be prepared by DPM Envirosciences and provided in the EIS.

Verified RE mapping produced by DEHP (2016d) also includes wetland communities mapped in close proximity to the Isaac River. The extent of these wetlands is being ground-truthed as part of the ongoing ecology surveys being undertaken for the Project.

Figure 10 shows the endangered remnant vegetation and high value regrowth mapped by DEHP over the Project area and surrounds (DEHP, 2016d). As with the verified RE mapping produced by DEHP (2016d) the extent of endangered regional ecosystems within the Project area will be ground-truthed by the flora surveys being conducted for the Project.

As described in Section 5.1.1.4, there are no nature conservation areas in the vicinity of the Project area.

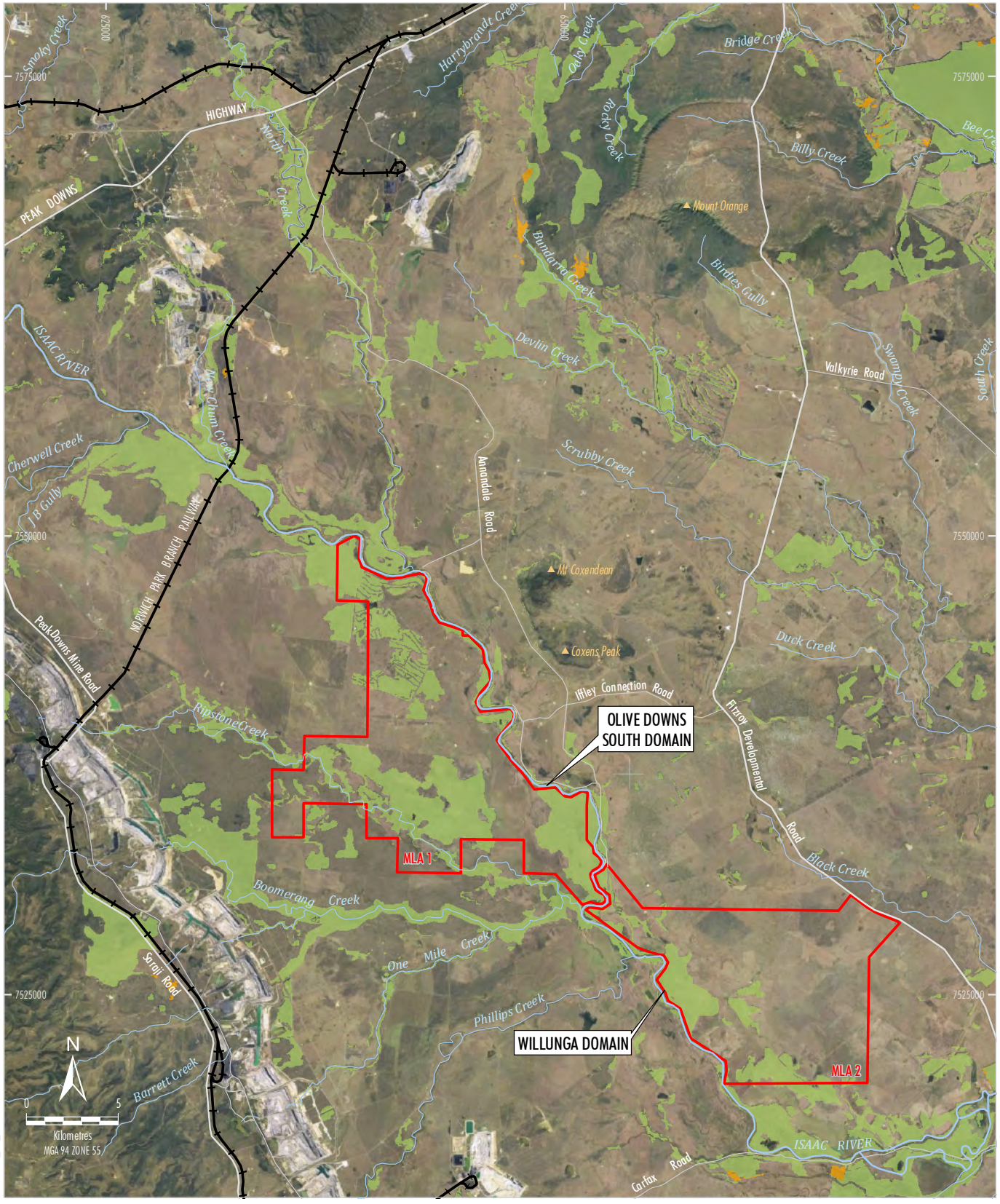
An *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) Protected Matters Search (DEE, 2016c) was undertaken to identify any threatened ecological communities present in the Project area and surrounds.

The desktop search identified three endangered ecological communities listed under the EPBC Act which have the potential to occur in the Project area and surrounds (Table 1).

Table 1
Threatened Ecological Communities

Threatened Ecological Community	Conservation Status under the EPBC Act[1]
Brigalow (*Acacia harpophylla* dominant and co-dominant)	E
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	E
Semi-evergreen Vine Thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E

[1] Threatened species status under the EPBC Act and/ or *Vegetation Management Act, 1999* (VM Act) current as at December 2016.
E = Endangered.



PRN-1 6-02_MS_2090

LEGEND

Mining Lease Application Boundary

Railway

Threatened Regional Ecosystem Mapping

Endangered High Value Regrowth

Endangered Remnant Vegetation

Source: Geoscience Australia - Topographical Data 250K (2006)
Department of Natural Resources and Mines (2016)
Queensland Environment & Resource Management(2016)
Orthophotography: Google Image (2015)

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Threatened Regional Ecosystem Mapping

Figure 10

5.1.5 Flora and Fauna

The following database searches were undertaken to identify any matters of National and/or State environmental significance with the potential to occur in the Project area and surrounds:

- Wildlife Online Database Search (DEHP, 2016b);
- EPBC Protected Matters Search (DEE, 2016c) (Appendix A); and
- Atlas of Living Australia (ALA) Database Search (ALA, 2016).

Fauna

Vertebrate fauna species located within the Project area and surrounds are represented by amphibians, reptiles (including skinks, snakes and geckos), birds (both migratory and non-migratory) and mammals (including microbat species) (DPM Enviros ciences, pers. comm.).

The desktop searches above identified 32 fauna species listed as conservation significant or migratory under either the EPBC Act or *Nature Conservation Act, 1992* (NC Act), with the potential to occur within the Project area and surrounds. This includes seven reptiles, 18 birds (11 of which are migratory), four non-flying mammals and three bats (Table 2).

Preliminary results from the recent fauna surveys have recorded four conservation significant species, within the Project area namely Ornamental Snake, Squatter Pigeon, Koala, and Greater Glider (DPM Enviros ciences, pers comm.).

Flora

REs within the Project area that have been identified by the DEHP (2016d) regional mapping are described in Section 5.1.4.

The desktop searches listed above identified six conservation significant species under either the EPBC Act or NC Act with the potential to occur in the Project or surrounds (Table 3). Preliminary results from the recent flora surveys have not detected any conservation significant flora species.

Table 2
Potentially Occurring Conservation Significant Fauna Species

Scientific Name	Common Name	Conservation Status[1]		Protected Matters Search (DEE, 2016c)	ALA (2016)	Wildlife Online (DEHP, 2016b)
		EPBC Act	NC Act			
Reptiles						
Elseya albagula	Southern Snapping Turtle	CE	E	●	-	-
Rheodytes leukops	Fitzroy River Turtle	V	V	●	-	-
Egernia rugosa	Yakka Skink	V	V	●	-	-
Lerista allanae	Allan's Lerista	E	E	●	-	-
Acanthophis antarcticus	Common Death Adder	-	V	-	-	●
Denisonia maculate	Ornamental Snake	V	V	●	●	●
Furina dunmalli	Dunmall's Snake	V	V	●	-	-
Birds						
Plegadis falcinellus	Glossy Ibis	M	-	-	●	-
Pandion haliaetus	Osprey	M	-	●	-	-
Erythrotriorchis radiatus	Red Goshawk	V	E	●	-	-
Rostratula australis	Australian Painted Snipe	E	V	●	-	-
Gallinago hardwickii	Latham's Snipe	M	-	●	-	-
Tringa nebularia	Common Greenshank	M	-	●	-	-
Calidris Ferruginea	Curlew Sandpiper	CE	-	●	-	-
Calidris ferruginea	Curlew Sandpiper	M	-	●	-	-
Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	●	-	●
Cuculus optatus	Oriental Cuckoo	M	-	●	-	-

Table 2 (Continued)
Potentially Occurring Conservation Significant Fauna Species

Scientific Name	Common Name	Conservation Status[1]		Protected Matters Search (DEE, 2016c)	ALA (2016)	Wildlife Online (DEHP, 2016b)
		EPBC Act	NC Act			
Birds (Continued)						
Hirundapus caudacutus	White-throated Needletail	M	-	-	●	-
Apus pacificus	Fork-tailed Swift	M	-	●	-	-
Grantiella picta	Painted Honeyeater	V	V	●	-	-
Monarcha melanopsis	Black-faced Monarch	M	-	●	-	-
Myiagra cyanoleuca	Satin Flycatcher	M	-	●	-	-
Motacilla flava	Yellow Wagtail	M	-	●	-	-
Neochmia ruficauda ruficauda	Star Finch (eastern)	E	E	●	-	-
Poephila cincta cincta	Black-throated Finch (southern)	E	E	●	-	-
Mammals						
Dasyurus hallucatus	Northern Quoll	E	-	●	-	-
Tachyglossus aculeatus	Short-beaked Echidna	-	SLC	-	●	-
Phascolarctos cinereus	Koala	V	V	●	●	●
Petauroides volans	Greater Glider	V	-	●	●	●
Pteropus poliocephalus	Grey-headed Flying-fox	V	-	●	-	-
Macroderma gigas	Ghost Bat	V	V	●	-	-
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	●	-	-

[1] Threatened species status under the EPBC Act and/ or the NC Act current as at December 2016.
SLC = Special Least Concern, E = Endangered, V = Vulnerable, CE = Critically Endangered and M = Migratory.

Table 3
Conservation Significant Flora Species

Scientific Name	Common Name	Conservation Status[1]		Protected Matters Search (DEE, 2016c)	ALA (2016)	Wildlife Online (DEHP, 2016b)
		EPBC Act	NC Act			
Cycas ophiolitica	-	E	E	●	-	-
Dichanthium queenslandicum	King Blue-grass	V	V	●	-	-
Dichanthium setosum	Bluegrass	V	-	●	-	-
Eucalyptus raveretiana	Black Ironbox	V	-	●	-	-
Samadera bidwillii	Quassia	V	V	●	-	-
Solanum elachophyllum	-	-	E	-	●	●

[1] Threatened species status under the EPBC Act and/ or the NC Act current as at December 2016.
E = Endangered and V = Vulnerable.

Introduced Species

The EPBC Protected Matters Search identified 21 introduced species (including nine fauna and six flora species) with the potential to occurr within the Project area and surrounds, including (DEE, 2016c):

- Mallard (*Anas platyrhynchos*);
- Nutmeg Mannikin (*Lonchura punctulata*);
- House Sparrow (*Passer domesticus*);
- Spotted Turtle-dove (*Streptopelia chinensis*);
- Cane Toad (*Rhinella marina*);
- Domestic Dog (*Canis lupus familiaris*);
- Goat (*Capra hircus*);
- Cat (*Felis catus*);
- Feral deer (*Cervus sp.*);
- House Mouse (*Mus musculus*);
- Rabbit (*Oryctolagus cuniculus*);
- Pig (*Sus scrofa*);
- Red Fox (*Vulpes vulpes*);
- Prickly Acacia (*Acacia nilotica subsp. Indica*);
- Rubber Vine (*Cryptostegia grandiflora*);
- Cotton-leaved Physic-Nut (*Jatropha gossypifolia*);
- Lantana (*Lantana camara*);
- Prickly Pears (*Opuntia* spp.);
- Prickly Acacia (*Vachellia nilotica*);
- Parkinsonia (*Parkinsonia aculeate*); and
- Parthenium Weed (*Parthenium hysterophorus*).

5.2 SOCIAL AND ECONOMIC ENVIRONMENT

5.2.1 Isaac Region

The Isaac Region's economic development is based upon coal mining and agricultural production (Isaac Regional Council, 2014c). The Isaac Region is home to 25 currently operating coal mines, with many more in the advanced development phase. As of 2014, the region was responsible for 47% of Queensland's overall coal production (Isaac Regional Council, 2014c). Agriculture is also a key contributor to the local economy, although less so than coal mining.

Given the multitude of currently existing services which cater to mine workers in Dysart and Moranbah, it is expected that these townships would provide a majority of the services needed by the Project workforce during its operation.

The Project is anticipated to provide a significant number of workers who would reside and work in the region. Given that the Project has a proposed mine life in excess of 30 years, the Project is anticipated to incur long-lasting economic growth to the region, especially within Dysart and Moranbah.

Dysart and Moranbah are the two closest regional centres to the Project, and provide the majority of the social and economic services for the region (Isaac Regional Council, 2014a and 2014b).

5.2.2 Moranbah

Moranbah, located approximately 40 km to the north-west of the Project, was established in 1969 for the purpose of housing mine workers (Isaac Regional Council, 2014a). Moranbah is home to a number of education facilities, including two day-care facilities, two primary schools and a high school. Additionally, Moranbah offers a number of health services, including a hospital, as well as a number of dental and general medical centres. The town also offers a range of recreational and accommodation services, including a number of hotels, a supermarket, shopping centre, multiple sporting fields and clubs, and a range of small stores and businesses (Isaac Regional Council, 2014a). Moranbah also contains an airport, located approximately 5 km to the south-east of the township.

5.2.3 Dysart

Dysart, located approximately 25 km to the south-west of the Project, provides a similar range of services to mine workers in the region, albeit on a smaller scale than Moranbah. The town was established in 1973, to service surrounding coal mines within the region (Isaac Regional Council, 2014b). Recreational facilities include an Olympic swimming pool, a nine hole golf course, as well as a number of sporting fields. The town houses a hospital, dental surgery, and medical centre. Additionally, Dysart has a variety of accommodation options, including multiple hotels, and several accommodation villages. Dysart is also home to a kindergarten, a primary and secondary school, and an airport approximately 2 km to the south-east.

5.2.4 Accommodation and Housing

The Project is anticipated to attract a number of workers to the region, a significant proportion of whom are anticipated to require housing within the Project surrounds. Of the estimated 35,485 people currently residing in the Isaac region, 11,085 are resource sector workers living within temporary accommodation (Isaac Regional Council, 2014c). As such, many of the towns in the region including Moranbah and Dysart, contain existing infrastructure suitable for housing a large number of workers in temporary accommodation.

5.2.4.1 Accommodation Villages

As well as numerous hotels for temporary accommodation, Moranbah and Dysart contain a number of accommodation villages. These include two Morris-owned accommodation villages, the Leichardt accommodation village, the Ausco Dysart accommodation village, the Civeo accommodation villages in Moranbah, Coppabella and Dysart, and the Dysart Staff Accommodation Village commissioned by the BHP BMA (Figure 1).

The Civeo accommodation villages in Moranbah, Copabella and Dysart currently have a capacity of over 5,900 rooms (Civeo, 2016a; 2016b; 2016c), while the Dysart Staff Accommodation contains 308 single modular rooms available for accommodation (Hutchinson Builders, 2011). Additionally, the Buffel Park Accommodation Village, approximately 20 km to the south of Moranbah, services a large portion of the workers from the Caval Ridge Mine, with a capacity of 1,945 rooms.

5.2.5 Cultural Heritage (Indigenous and Non-Indigenous)

5.2.5.1 Indigenous Heritage

A Cultural Heritage Management Agreement (CHMA) was signed on 5 July 2016, by Pembroke Resources and registered Aboriginal Parties on behalf of the Barada Barna People for MDLs 3012, 3013 and 3014 and parts of EPC 721

A search of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) database did not identify any Aboriginal cultural heritage sites within MDL 3012, MDL 3013 or MDL 3014 (DATSIP, 2016).

5.2.5.2 Non-Indigenous Heritage

A search of the Queensland Heritage Register, which identifies culturally significant sites for the people of Queensland, was undertaken on 7 September 2016. This search revealed no culturally significant sites within the Project boundary or in the general vicinity of the Project (Queensland Government, 2016d). The closest significant site was located in Nebo, 50 km to the north-east of the Project boundary.

Additionally, a search of the National Heritage List, which identifies nationally significant cultural sites, also showed no sites within the Project boundary or its surrounds (DEE, 2016b).

5.3 BUILT ENVIRONMENT

As described in Section 5.2.2 and 5.2.3, Moranbah and Dysart are the nearest regional townships to the Project and contain the majority of the existing, health, education and accommodation infrastructure within the region.

As described in Section 5.1.1.3, the Project is surrounded by a number of operational coal mines (Figure 1).

The Arrow Bowen pipeline is an approved, but yet to be developed gas pipeline, sited adjacent to the Project boundary. The proposed buried pipeline is planned to transport coal seam gas from the Bowen Basin to north Gladstone. Although the exact route of the pipeline is currently being revised (Arrow Energy, 2016), the EIS for the Project indicates that the main pipeline route is proposed to run alongside the eastern boundary of the Project (Arrow Energy, 2012).

A smaller pipeline, named the Saraji Lateral Pipeline, is proposed to branch off the main Bowen pipeline at approximately the point where the Iffley Connection Road meets the Fitzroy Developmental Road to the east of the Project boundary. The proposed route of this lateral pipeline is through the Vermont Park property, towards the Saraji Coal Mine (Arrow Energy, 2012). Given that the final pipeline route is yet to be finalised, consultation will be undertaken with Arrow Energy to facilitate any Project interaction with the pipeline.

The existing road network surrounding the Project area is described in detail in Sections 3.5 and 5.4.

5.4 TRAFFIC AND TRANSPORT

5.4.1 Road Transport

The major road transport routes in the vicinity of the Project are the Peak Downs Highway, located approximately 15 km to the north-west of the Project, and the Fitzroy Developmental Road, 10 km east of the Project (Figure 2).

The Fitzroy Developmental Road runs directly along the Project eastern boundary at the Willunga property, to the south-east of the Project extent. Additionally, the Peak Downs Mine Road, which becomes Saraji Road when it intersects the Saraji mine, runs generally north-south approximately 10 km to the west of the Project.

The Iffley Connection Road, Vermont Park Road and Annandale Road run along the boundary of the Project, connecting the Project area with the Fitzroy Developmental Road and the Peak Downs Highway (Figure 2). Carfax Road runs east-west to the south of the Project boundary, connecting the Fitzroy Developmental Road with Dysart.

5.4.2 Rail Transport

Rail transportation in the region is serviced by the Norwich Park Branch Railway which runs roughly north-south approximately 10 km to the west of the Project. This branch forms part of the Goonyella Railway line which transports coal from the Bowen Basin to the Hay Point and DBCT south-east of Mackay (Aurizon, 2016).

Within the Project region the Moorvale, Millenium, Peak Downs, Saraji and Lake Vermont mines, have rail spurs and loops, branching off the Norwich Park line. Additionally, the Norwich Branch services the Dysart, Harrow, Winchester and Red Mountain railway stations within the vicinity of the Project. As part of the Project, a rail spur and loop is proposed to be constructed from the western boundary of the Project to connect to the Norwich Park Branch Railway.

5.5 LAND USE AND TENURES

Figure 3 shows the rural properties in the vicinity of the Project. The Project boundary currently contains portions of six different properties, namely, the Iffley, Lake Vermont, Vermont Park, Seloh Nolem, Willunga and Old Bombandy properties. These are all freehold properties (Queensland Government. 2016a).

As shown in Figure 5, the Project area is made up of MDL 3012, 3013 and 3014 held by the Proponent.

Arrow Energy hold a number of ATPs for petroleum in the region, including ATP 1103, ATP 1031 and ATP 759 which overlap and are in the vicinity of the Project (Figure 5).

A Petroleum Lease Application (PLA) for Petroleum Lease 488 has been lodged by Arrow Energy directly to the south of the Project, and overlaps parts of the Project area (Figure 5). This PLA was lodged in 2012 but has yet to be granted (Queensland Government, 2016a).

Pembroke Resources has commenced discussions with Arrow Energy regarding overlapping tenure, and the formation of a Joint Interaction Management Plan to deal with safety matters relating to the overlapping ATPs and MDLs in accordance with the Queensland *Coal Mining Safety and Health Act 1999*.

Pembroke Resources also intends to prepare a Joint Development Plan with Arrow Energy to manage activities in overlapping PLAs owned by Arrow Energy and future Project MLAs, in accordance with the Queensland *Mineral and Energy Resources (Common Provisions) Act, 2014.*

5.5.1 Key Local and Regional Land Uses

As described in Section 5.1.1, the existing land use for properties in the Project area is predominantly grazing, with small areas showing some evidence of historical cropping.

The Project is located within the Isaac Regional LGA and, as described in Section 5.1.1.4, there are no nature conservation areas, including National or State Parks, in the Project area or immediate surrounds.

As described in Section 5.1.1.3, the Project is surrounded by a number of currently operating coal mines.

5.5.2 Key Local and Regional Land Tenures

The majority of the land within the Project region is made up of freehold land, especially to the south and east of the Project boundary. A significant block of leasehold land exists to the west of the Project, corresponding with the Saraji and Peak Downs mines. Additionally, a large area of leasehold land to the north-west of the Project corresponds with the Poitrel and Millennium mines.

5.5.3 Native Title

The Native Title Claimants over the Project area, as well as the general Project region are the Barada Barna People (Queensland Government, 2016a). The Barada Barna People lodged a Native Title Application over the Project area (Federal Court Reference QUD380/2008) in 2008, and the claim has since been accepted for registration.

As stated in Section 5.2.5.1, the Proponent currently holds a CHMA with the Barada Barna People over the Project area.

5.6 PLANNING INSTRUMENTS, GOVERNMENT POLICIES

The Isaac Regional Council is developing a Planning Scheme for its entire LGA, which is expected to be completed in 2018. Until the new Planning Scheme is in place, development will be regulated under the existing Broadsound, Belyando and Nebo Shire Planning Schemes, through the Queensland *Sustainable Planning Act, 2009* (SP Act).

The following State and Regional plans, strategies and policies are relevant to the Project:

- *State Planning Policy* (Department of Infrastructure, Local Government and Planning, 2016).
- *Mackay, Isaac and Whitsunday Regional Plan*.
- *Queensland Environmental Offsets Policy*.
- *Environmental Protection (Air) Policy, 2008* (EPP [Air]).
- *Environmental Protection (Noise) Policy, 2008* (EPP [Noise]).
- *Environmental Protection (Water) Policy, 2008* (EPP [Water]).
- *Queensland Waste Avoidance and Resource Productivity Strategy (2014-2024)* (DEHP, 2014).

The following Commonwealth policies and guidelines are relevant to the Project:

- *EPBC Act Environmental Offsets Policy*.
- *Information Guidelines for Independent Expert Scientific Committee Advice on Coal Seam Gas and Large Coal Mining Development Proposals (2015)*.

6 POTENTIAL PROJECT IMPACTS

Throughout mine development, operation, and decommissioning, there are a number of potential Project impacts which may affect the surrounding Project region, as outlined in the sections below.

6.1 NATURAL ENVIRONMENT

Land

The Project mining activities have the potential to directly and indirectly impact on the land resources and uses within the Project area, including:

- temporary change of use of land as a result of open cut mining activities and development of surface infrastructure (before the land is rehabilitated);
- permanent landform change through the formation of final voids;
- alteration of natural landscapes; and
- impacts to the agricultural capacity of the land.

The natural landscape in the Project area would be altered through the formation of both in-pit and out-of-pit waste rock emplacements, final voids and flood levees. The temporary change to land during mining operations would be managed through the rehabilitation of the majority of the site to a land use generally consistent with the existing land use. Rehabilitation would be conducted progressively to achieve the final land use objectives.

Topsoil would be stripped, stockpiled and managed to minimise erosion potential and maintain the viability of the soil.

The EIS will describe how the Project would be rehabilitated such that following completion of mining activities, the site would be safe, stable and non-polluting and able to support the proposed post-mining land use.

Consideration will be given to the DEHP *Guideline Application Requirements for Activities with Impacts to Land* (DEHP, 2016a) as part of the assessment to identify potential impacts to land.

Water

The Project has the potential to impact environmental values identified for water resources through direct disturbance associated with open cut mining, diversion of drainage features and through release of water to the surrounding environment.

Potential impacts could include:

- changes to surface drainage and flooding regimes;
- changes to the hydrology and geomorphology of drainage features through construction of diversions;
- localised effects on surface and groundwater quality;
- local depressurisation of the groundwater aquifers; and
- impacts to other water users in the region.

Development of open cut operations associated with the Project would alter the topography and drainage characteristics within the Project area.

Surface Water

A water management system would be designed for the Project and would aim to protect the identified environmental values by separating runoff from disturbed, rehabilitated and undisturbed catchments. The Project water management strategy would involve:

- separation of undisturbed area runoff from disturbed area runoff;
- collection and reuse of surface runoff from disturbed areas;
- capture of pit inflows and reuse as process water;
- storage of water on-site;
- licensed water extraction to supplement water supply; and
- flood harvesting.

Operational water requirements would be sourced from on-site water storages containing runoff from disturbed mine areas or mine-affected water. If required, the operational water demand would be supplemented with external water supply under supply agreements via the pipeline connecting to the Eungella pipeline network and potential use of a groundwater supply from groundwater bores at a location to be determined.

A surface water assessment (including a site water balance model) will be prepared for the Project as part of the EIS and will consider the DEHP *Guideline Application Requirements for Activities with Impacts to water* (DEHP, 2016b).

Groundwater

Using the regional groundwater modelling undertaken for the Bowen Gas Project EIS (Ausenco Energy, 2012) as an indicative study, it is expected the magnitude of the predicted groundwater take (e.g. leakage) in the Isaac Connors Alluvium Groundwater Sub-area, as result of extraction of groundwater in the Isaac Connors GMA by the Project, would be such that it would not cause a significant drawdown effect in the Quaternary alluvial and Tertiary sediments surrounding the Project.

Further, Sinclair Knight Merz (SKM) (2009) states that in the Isaac-Connors catchment the watertable elevation varies spatially and temporally however it is typically 5 to 20 m below ground surface. JBT Consulting (2010) state that the ephemeral nature of the Isaac River indicates that groundwater baseflow is not significant, and this is supported by SKM (2009) who also indicate that creeks and rivers are typically losing streams/systems (i.e. loss of surface water to underlying strata).

The Project open cut pits would act as groundwater sinks during operations and post-closure. This would cause a localised change in groundwater flow direction, generally a reversal of direction due to the depth and direction of excavation. There would also be a change in hydraulic properties over the mine footprint where mine waste rock is used to infill the open cut pits.

A groundwater assessment will be prepared for the EIS and will be cognisant of the *Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals* (IESC, 2015) and will consider the DEHP *Guideline Application Requirements for Activities with Impacts to Water* (DEHP, 2016b).

Ecosystems, Flora and Fauna

Open cut mining activities and infrastructure development associated with the Project has the potential to directly disturb terrestrial and aquatic vegetation and fauna habitat. Mining activities also have the potential to introduce weeds and feral animals to the Project area.

An environmental assessment of the potential impacts to terrestrial and aquatic biodiversity will be conducted to demonstrate how the Project can be managed to protect the identified biodiversity values.

A terrestrial flora and fauna assessment and an aquatic ecology assessment will be conducted to assess the potential impacts to biodiversity associated with the Project, including consideration of:

- Matters of State Environmental Significance (MSES);
- RE mapping;
- flora and fauna species within the Project area, particularly conservation significant species listed under the NC Act and EPBC Act;
- Environmentally Sensitive Areas (ESAs);
- wetlands;
- GDEs; and
- Matters of National Environmental Significance (MNES).

The assessments will describe the proposed avoidance and mitigation measures to protect or enhance the ecological values of the Project area and surrounds.

Consideration of biodiversity offset requirements will be included in the ecological assessments in accordance with the relevant Queensland and Commonwealth legislation and policies.

Consideration will be given to the *Queensland Environmental Offsets Policy* and the Commonwealth *EPBC Act Environmental Offsets Policy* during the development of the ecological assessments to identify management and mitigation measures.

6.2 AMENITY, INCLUDING NOISE, AIR QUALITY, VIBRATION, LIGHTING, URBAN DESIGN AND VISUAL AESTHETICS

Noise and Vibration

A range of legislation, policy, guidelines and standards are relevant to identifying values and managing impacts for noise and vibration at the Project including the EP Act, EPP (Noise) and Ecoaccess Guidelines.

Acoustic Quality Objectives for sensitive receptors are detailed in the EPP (Noise). The objectives aim at protecting the qualities of the acoustic environment that are conducive to human health and wellbeing for individuals to sleep, study or learn, be involved in recreation, including relaxation and conversation and protecting the amenity of the community.

Noise sources from the Project would include mining (e.g. equipment and blasting) and processing activities (e.g. crushing and conveyors). The level of noise at a given receptor would vary depending on the distance from the noise source, the meteorological conditions, intervening topography, and the type of noise source.

Noise sensitive receptors will be identified in the vicinity of the Project area during the preparation of the EIS. A preliminary review suggests that there are six local landholders (or sensitive receptors) within 5 km of the Project.

Sensitive receptors may also be affected by blast vibration. The nature (e.g. size of blasts, delay settings) and frequency of blasting will be assessed to determine appropriate mitigation measures.

Noise and vibration impacts will be addressed in the EIS, including cumulative impacts of surrounding mining operations, and the assessment will consider the DEHP *Guideline Application Requirements for Activities with Noise Impacts* (DEHP, 2016c).

Air Quality and Greenhouse Gas

Air quality is managed under the EP Act, the *Environmental Protection Regulation, 2008* (EP Regulation) and the EPP [Air].

Open cut mining activities and the handling of spoil, ROM and product coal have the potential to generate particulate matter (i.e. dust) emissions in the form of:

- TSP;
- particulate matter with an equivalent aerodynamic diameter of 10 micrometres (µm) or less (PM_{10}) (a subset of TSP); and
- particulate matter with an equivalent aerodynamic diameter of 2.5 µm or less ($PM_{2.5}$) (a subset of TSP and PM_{10}).

Mining activities generate particles in all the above size categories, with the majority generally larger than 2.5 µm. Fine particulates (less than 2.5 µm) are typically generated through combustion processes.

Open cut mining activities associated with the Project would also result in emissions of greenhouse gases through:

- fugitive coal seam gas emissions from open cut pits;
- combustion of diesel fuels in mining plant and equipment; and
- explosives use at the Project.

EM960 *Application requirements for activities with impacts to air* (DEHP, 2014) states that a dust deposition limit of 120 milligrams (i.e. 0.12 grams per square metre per day [g/m^2/day]) averaged over one month is frequently used in Queensland. Such an air quality objective is a benchmark set to protect the general health and amenity of the community in relation to air quality.

Emissions of other air pollutants would also arise from mining operations associated with diesel powered equipment used on-site, and on-site blasting. Emissions from diesel-powered equipment generally include carbon monoxide (CO), nitrogen dioxide (NO_2) and other pollutants, such as sulphur dioxide (SO_2) and emissions of blasting include nitrogen oxides.

The emission of these and other pollutants generated from diesel combustion and blasting activities at mine sites are considered to be too small, too infrequent or too widely distributed to generate any significant off-site pollutant concentrations.

As described above, a preliminary review suggests that there are six local landholders (or sensitive receptors) within 5 km of the Project.

Background air quality levels will be considered and potential impacts of the Project will be addressed in the EIS, including cumulative impacts of surrounding mining operations.

Indirect greenhouse gas emissions are also associated with the Project through electricity consumption and emissions associated with the transport of product coal.

Pembroke Resources would monitor and manage greenhouse gas emissions through its participation in the Commonwealth Government's *National Greenhouse and Energy Report System* (NGERS). Under NGERS requirements, relevant sources of greenhouse gas emissions and energy consumption must be measured and reported on an annual basis, allowing major trends in emissions/energy consumption to be identified.

An air quality and greenhouse gas assessment will be prepared for the Project as part of the EIS, and will consider the DEHP *Guideline Application Requirements for Activities with Impacts to Air* (DEHP, 2015).

Visual and Lighting

The major components of the Project which are considered to potentially impact the visual landscape include:

- clearance and disturbance of vegetation within the Project area;
- changes to topographical features including placement of waste rock in out-of-pit emplacements;
- excavation of open cut pits;
- construction of levees;
- elevated infrastructure items (including conveyors); and
- lighting associated with night-time mining operations (including operation of the CHPP).

It should be noted that the public road network in the vicinity of the Project landforms already have views of surrounding mines and will eventually have views of the approved Olive Downs North Mine (e.g. Peak Downs Highway and Annandale Road).

The main issues to consider in the assessment of visual impacts are the number of sensitive viewing locations and the level to which the proposed works are visible (i.e. if the works are not seen, there is no impact).

The most visually sensitive locations in the vicinity of the Project are the nearby privately owned rural residences and local roads (e.g. Annandale Road and Fitzroy Developmental Road). The potential views of the Project from these locations would vary depending on the intervening topography and vegetation occurring between the sensitive location and the Project. The distance from the Project would also contribute to the potential views from each sensitive location.

A visual assessment will be prepared for the Project as part of the EIS, and will consider the relevant state and federal guidelines.

6.3 SOCIAL ENVIRONMENT—POTENTIAL BENEFICIAL AND ADVERSE IMPACTS

Potential impacts of the Project on the social values of the local and regional communities would be identified through direct engagement with potentially affected stakeholders and analysis of potential impacts against the attributes of the existing social environment.

Consultation undertaken specifically for the Project would include both targeted consultation, as well as a broader consultation program for the EIS.

Project-specific consultation would be conducted with the local community, affected landowners and other relevant stakeholders, including other advisory agencies/groups, and a summary of the stakeholder engagement and community consultation program provided in a Public Consultation Report.

The source of the workforces would be dependent upon the availability of required contractors and where such contractors are based, however the opportunity would be provided to contractors from the local and regional area.

The Project is likely to have a range of both positive and negative social impacts within the community, including the following examples:

- the provision of employment and training opportunities (including opportunities for the Indigenous community);
- the injection of wealth into local and regional economy;
- population growth, demographic change, and population decline upon decommissioning;
- land use changes as a result of the Project;
- potential amenity impacts including, air quality, noise and vibration;
- increased demand for permanent and temporary housing in the local and regional community;
- fear of major disaster or hazard (flooding); and
- potential impacts on social cohesion.

A social impact assessment will be prepared for the Project as part of the EIS, and will consider the Coordinator-General's *Social Impact Assessment Guidelines* (2013).

6.4 ECONOMIC EFFECTS

As described in Section 3.9, the Project would result in significant economic benefits through ongoing annual direct and indirect output or business turnover, annual household income and direct employment.

Indirect employment and business generation would also be realised in a number of different sectors including property services, mechanical repairs, machinery, materials handling and equipment manufacturing, research, technical and computer services, wholesale trade and retail trade.

A number of these service providers are established in the Bowen Basin. The Project would provide ongoing support and employment opportunities for these businesses.

The Project would also include the payment of State royalties and Commonwealth tax revenue.

The EIS will include an economic analysis of potential impacts the Project would have on labour demand, local business, wages, input costs and household goods and services.

6.5 BUILT ENVIRONMENT

Road Transport

Potential traffic impacts of the Project on traffic generation, roadway capacity, safety and road condition would be assessed in a Road Transport Assessment, prepared in accordance with the Department of Transport and Main Roads (DTMR) (2006) *Guidelines for Assessment of Road Impacts of Development*.

The Project life would be in excess of 30 years. In order to consider the potential impacts of the Project in the context of potential background traffic growth and traffic growth associated with other proposed projects, an annual baseline growth rate and the expected traffic generation from key projects would be considered.

Project traffic generation has the potential to increase delays at existing and new intersections along key roads used by workforces and visitors/deliveries.

Project traffic generation has the potential to increase impacts on road pavement of key roads used by workforces and visitors/deliveries.

As product coal would be railed to port, no product coal road transport is proposed for the Project.

Rail Transport and Port Operations

Pembroke proposes to construct a new rail loop and rail spur line from the Norwich Park Branch Railway and rail-load out facility including product coal stockpiles at the Olive Downs South domain for the Project. Until built and commissioned, the existing rail-load out facility at the Moorvale Mine would continued to be used.

Based on a “Goonyella-based” train configuration with 126 wagons and a total payload of 10,800 tonnes (t), an average of four product coal train would be loaded per day for the Project.

Based on a “Blackwater-based” train configuration with 98 wagons and a total payload of 8,200 t, an average of 33 product coal trains would be loaded per week for the Project. However, to allow for cargo assembly for loading of ships to meet the required performance standards at the port, a peak of up to eight product coal trains per day may be required at times.

Subject to availability of rail and port allocation, the DBCT would be used for the Project.

6.6 MNES UNDER THE EPBC ACT

MNES which are relevant to the Project include:

- Listed threatened species and ecological communities (Sections 5.1, 6.1 and 7.1).
- Migratory species (Section 5.1.5, 6.1 and 7.1).
- A water resource, in relation to coal seam gas development and large coal mining development (Sections 5.1.2, 6.1 and 7.1).

The following MNES do not occur within the Project area:

- World Heritage Property.
- National Heritage Place.
- Wetland of International Importance.
- Great Barrier Reef Marine Park.
- Commonwealth Marine Area.

The Project is not a nuclear action.

Pembroke Resources will lodge an EPBC Act Referral for the Project with DEE to determine whether it requires assessment and approval under the EPBC Act. The referral will detail the potential impacts associated with the Project on all MNES. The controlling provisions for the Project (should it be called in as a controlled action) would be determined by DEE.

7 ENVIRONMENTAL MANAGEMENT AND MITIGATION MEASURES

7.1 NATURAL ENVIRONMENT

Pembroke Resources would implement a range of environmental management and mitigation measures to minimise the potential impacts of the Project. Management and mitigation measures would include:

- progressive rehabilitation of Project disturbance areas;
- dust suppression (watering) of haul roads, ROM and product coal stockpiles and transfer points;
- blast management measures;
- management of water resources in accordance with the Environmental Authority issued for the Project under the EP Act;
- preparation of water management plans and monitoring programs under the Environmental Authority issued for the Project under the EP Act;
- licensed extraction of water resources in accordance with relevant Queensland water related legislation;
- boundaries of areas to be cleared, and those not to be cleared, would be defined during construction and operation;
- feral animal control strategies would be implemented as necessary and in accordance with relevant standards; and
- provision of biodiversity offsets for matters of National and State environmental significance (where required) in accordance with the Queensland Environmental Offsets Policy and the Commonwealth EPBC Act Environmental Offsets Policy.

Further environmental management and mitigation measures would be developed and described in detail in the EIS.

7.2 BUILT ENVIRONMENT

Road Transport

Pembroke Resources proposes to construct an access road from the Peak Downs Highway, via Annandale Road, to the Olive Downs South domain infrastructure area, and a second access road from the Fitzroy Developmental Road to the Willunga domain infrastructure area.

Pembroke Resources would implement the following road transport management measures:

- dangerous goods transported by road would continue be transported along existing dangerous goods routes in accordance with the appropriate Queensland legislation;
- all oversized vehicles would have the relevant permits, licences and escorts, as required by DTMR and the proposed route would be negotiated with the relevant local councils; and
- all oversize vehicle loads would be appropriately secured and covered.

During the detailed design of the Project and preparation of the EIS, Pembroke Resources will assess the condition of the public roads proposed to be used to access the Project, and will discuss the requirements for any upgrades with the Isaac Regional Council and DTMR.

Rail Transport and Port Operations

No specific rail transport or port operations mitigation measures are proposed to be implemented by Pembroke Resources for the Project.

Pembroke is working with relevant stakeholders to establish a viable coal rail and port solution for the Project.

7.3 CULTURAL HERITAGE MANAGEMENT (INDIGENOUS)

A CHMA was signed on 5 July 2016, by the Proponent and registered Aboriginal Parties on behalf of the Barada Barna People for MDLs 3012, 3013 and 3014 and parts of EPC 721.

The CHMA provides for the engagement of the Barada Barna People prior to the commencement of any ground disturbance works, which allows for an assessment of the cultural heritage values within the proposed area of disturbance, and for the development of appropriate management strategies.

The CHMA applies to MDLs 3012, 3013 and 3014 and parts of EPC 721 and includes the following provisions:

- establishment of a Liaison Committee comprised of representatives from Pembroke Resources and the Barada Barna People for the purposes of coordination, implementation, management and future conduct of matters arising in relation to the Cultural Heritage Management Plan (CHMP);
- reporting of discovery of any Aboriginal Cultural Heritage within the CHMA area;
- process for obtaining approval for Project works and cultural heritage management, including the implementation of agreed management arrangements relevant to previously identified significant areas and objects (through initial cultural heritage assessments in accordance with an initial cultural heritage assessment agreement);
- procedures in relation to the discovery of any human remains; and
- access to the Project and surrounding areas covered by the CHMA.

The Project would be constructed and operated in accordance with the above provisions.

7.4 NON-INDIGENOUS CULTURAL HERITAGE MANAGEMENT

As described in Section 5.2.5.2, no culturally significant sites within the Project boundary or in the general vicinity of the Project have been identified and, therefore, no specific management measures to mitigate the impact of the Project are proposed by Pembroke Resources.

7.5 GREENHOUSE GAS MANAGEMENT PLAN

An assessment of potential greenhouse gas emissions associated with the Project would be conducted for the EIS.

Pembroke Resources would implement measures to minimise the generation of greenhouse gas emissions including monitoring the fuel efficiency of mobile equipment, minimising double-handling of materials and consideration of the use of alternative renewable energy sources.

Pembroke Resources would conduct annual reporting of greenhouse gas emissions, energy production, energy consumption and any other information required under the *National Greenhouse and Energy Report Act, 2007*.

7.6 WASTE MANAGEMENT

The management of waste (non-mineral) at the Project would be governed by Queensland legislation, including:

- EP Act;
- EP Regulation;
- *Environmental Protection (Waste Management) Regulation, 2000* (Queensland); and
- *Waste Reduction and Recycling Act, 2011* (Queensland) (WRR Act).

Waste streams generated by the Project would comprise, but not be necessarily limited to, the following:

- waste rock;
- CHPP rejects;
- recyclable and non-recyclable general wastes;
- sewage and wastewater; and
- other wastes from mining and workshop activities (e.g. used tyres, scrap metal, waste hydrocarbons and oil filters).

The application of the waste management hierarchy is an underlying principle of all waste management in Queensland. The waste management hierarchy, as stipulated in the WRR Act, identifies the most preferred to the least preferred waste management option:

- avoid;
- reduce;
- reuse;
- recycle;
- recover;
- treat; and
- dispose.

Pembroke Resources would manage the waste produced at the Project in accordance with the waste and resource management hierarchy. If waste must be disposed of, Pembroke Resources would do so in a way that prevents or minimises adverse effects on environmental values.

All general domestic waste (e.g. general solid [putrescible] waste and general solid [non-putrescible] waste) would be stored on-site in bins for regular transport off-site by a licensed waste transport contractor to a licensed landfill.

Waste tyres would be segregated and stored in a designated area with no grass or other flammable material. Tyres would be transported off-site to a supplier for retreading where practicable or disposed on-site in a designated tyre disposal area.

Scrap metal would be placed in scrap metal skips for collection by a licensed contractor. Larger items would be left in an accessible location where specific collection arrangements can be made.

Waste oils would be collected and stored in designated waste oil containers within a designated bunded area for transport by a licensed regulated waste contractor to a regulated waste receiver.

Engine oil/fuel filters would be collected and stored in sealed oil filter disposal pods. Filters would be treated (solvent wash) by a licensed regulated waste contractor to recover oil.

7.7 HAZARD AND RISK, AND HEALTH AND SAFETY

Mine Planning

Mine planning is a process that takes into account the range of key variables that may influence a potential mining operation and its viability. Aspects considered in the mine planning process include safety, risks to the operation, resource recovery, potential environmental impacts (e.g. noise, air quality, water), community issues, geotechnical considerations, mining methods and rates, equipment requirements, infrastructure capacity, development timeframes and economics (i.e. capital and operating costs).

Risk assessment and analysis would be incorporated at various stages in the Project design, environmental assessment and decision-making.

Hazard and Safety Assessment

A Hazards and Safety Assessment would be prepared by Pembroke Resources for the EIS to identify Project related risks and develop appropriate mitigation measures and strategies. The Hazards and Safety Assessment would be in the form of a preliminary risk assessment in accordance with Australian Standard/New Zealand Standard (AS/NZS) International Standards Organisation (ISO) 31000:2009 *Risk Management – Principles and Guidelines* (ISO 31000:2009) and IEC/ISO 31010:2009 *Risk Management – Risk Assessment Techniques*.

The Hazards and Safety Assessment would consider both on-site and off-site risks to people, property and the environment (in the presence of controls).

A number of potentially hazardous materials and chemical substances would be used during construction, operations and decommissioning of the Project. In addition to the potentially hazardous materials, natural events may result in hazardous situations within the Project area and the surrounding locality. Such natural events include bushfires and floods.

The following processes and measures would be implemented at the Project to reduce the risk of impacts on health, safety and the environment associated with the Project:

- the transport, storage and handling of all dangerous goods, explosives and hazardous substances would be undertaken in accordance with relevant legislation and guidelines;
- all chemicals would be managed in accordance with the relevant material safety data sheet (MSDS);
- all equipment and vehicle operators would be trained in the safe operation of the equipment and the relevant emergency response procedures in the event of an incident;
- Pembroke Resources and all contractors would be required to manage and remove from site all waste oil generated during their operations;
- waste hydrocarbons and oil filters would be collected, stored and removed from site by licensed contractors;
- chemical storage areas would be designed and bunded in accordance with Australian Standard (AS) 1940:2004;

- regular inspection programs would be undertaken to monitor the structural integrity of fuel tanks and bunds;
- spill control kits would be located at all chemical storage areas and in all service vehicles and key staff would be trained in spill prevention and clean up; and
- explosives magazines would be fenced, signed and maintained in accordance with AS 2187:2006.

Pembroke Resources would also develop an Emergency Response Plan that would be implemented at the Project. The Emergency Response Plan would outline the procedures (including evacuation procedures) that would work alongside or in conjunction with emergency services (including the Isaac Local Disaster Management Group) such that the health and well-being of Pembroke Resources personnel, contractors and the public is maintained.

Potential off-site hazards include, but are not limited to, the following:

- altering flooding characteristics;
- detrimentally impacting the water quality of the surrounding aquatic environment; and
- altering bushfire regimes.

Flood/Water Quality Risk Management

The Project is located on areas adjacent the Isaac River and its tributaries mapped as Level 1 flood hazard (Department of Infrastructure, Local Government and Planning, 2016). All practicable measures would be taken to prevent flooding of the Project infrastructure areas. Road elevations and flood levees (or sufficiently robust spoil dumps) would be designed and constructed to provide for appropriate flood immunity during significant flood events.

All water storage structures and facilities would be designed, constructed and managed in accordance with *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures – Version 5.0* (DEHP, 2016c).

Bushfire Risk Management

The Project is located on areas of 'medium potential bushfire intensity" bushfire hazard (Department of Infrastructure, Local Government and Planning, 2016).

All reasonable and practicable fire prevention measures would be implemented by Pembroke Resources during construction and operation, including the construction and maintenance of fire breaks (if required), the provision of fire-fighting equipment around the site and the training of staff in the proper use of the fire-fighting equipment.

7.8 ENVIRONMENTAL MANAGEMENT

Environmental Management System

Pembroke Resources would establish an integrated Environmental Management System across all operations/activities for the Project to track that all environmental management commitments and strategies are implemented, monitored and reviewed to continually improve environmental performance at the operations.

Pembroke Resources would employ a team of appropriately qualified environmental personnel to monitor compliance with current legislation (e.g. EP Act) and environmental planning frameworks.

Construction and operational management plans would be developed in consultation with relevant stakeholders and utilised for day-to-day management of the Project operations/activities.

8 APPROVALS REQUIRED FOR THE PROJECT

Commonwealth, State and Local Government approvals anticipated to be required for the Project are summarised in Table 4.

Table 4
Key Primary Regulatory Approvals Anticipated to be Required for the Project

Legislation	Approval	Approval Trigger	Relevance to Project	Administering Authority	Within Scope of EIS[1]
Commonwealth Government Approvals					
EPBC Act	EPBC Act approval	An Action that is or is likely to have a significant impact on MNES is required to have an EPBC Act approval.	The Project will be referred to the DEE to determine whether it is expected to have significant impact on MNES. If the Project is determined to be a Controlled Action, it is expected that it will be assessed through a Bilateral Agreement between the Commonwealth and the State of Queensland under section 45 of the EPBC Act relating to Environmental Assessment.	DEE	Yes
Native Title Act	Compliance with 'right to negotiate' or negotiation and registration of indigenous land use agreement (ILUA)	Any areas subject to a determination that native title exists or a registered native title claim (can only be Crown land).	The State will not grant a Mining Lease without compliance with the Native Title Act.	DNRM	No. Compliance is entirely under the Native Title Act.
State Government Approvals					
SDPWO Act	Coordinated Project declaration, evaluation of the Project EIS and Prescribed Project declaration	A Coordinated Project is one which has: • complex approval requirements, involving Local, State and Federal Governments; • significant environmental effects; • strategic significance to the locality, region or State, including any infrastructure, economic and social benefits, capital investment or employment opportunities it may provide; or • significant infrastructure requirements. A Prescribed Project is, among other things, one that is of major economic or social significance to the State and provides a prescribed process for timely decision-making.	This IAS forms part of the application for declaration of the Project as a Coordinated Project. The Coordinator-General will consider the application and determine whether the Project meets the requirements for declaration as a Coordinated Project. If declared a Coordinated Project, it is likely that it will be declared on the basis that an EIS is required for the Project which will be prepared in accordance with Part 4 of the SDPWO Act. In addition to declaration as a Coordinated Project, the Coordinator-General may also declare the Project a Prescribed Project.	The Office of the Coordinator-General	Yes

Table 4 (Continued)
Key Primary Regulatory Approvals Anticipated to be Required for the Project

Legislation	Approval	Approval Trigger	Relevance to Project	Administering Authority	Within Scope of EIS[1]
State Government Approvals (Continued)					
ACHA	CHMP	Where an EIS is required (including where an EIS is voluntarily undertaken), a CHMP must be in place as a pre-requisite to the grant of any lease, licence, permit, approval or other authority required under any Act.	A CHMA has been negotiated for the preliminary stages of the Project (i.e. exploration and development) to monitor compliance with the cultural heritage duty of care under the ACHA. A CHMP will replace the CHMA. A proponent must give notice of its intention to develop a CHMP to prescribed parties, including the Aboriginal parties for the area. Where the proponent cannot reach agreement with the Aboriginal parties on the terms of a CHMP, the matter can be referred to the Land Court. An ILUA or right to negotiate agreement that makes provision for Aboriginal cultural heritage is an alternative to a CHMP in these circumstances.	Department of Aboriginal and Torres Strait Islander Partnerships	No. CHMPs are developed and approved under the ACHA.
EP Act	Environmental Authority	An Environmental Authority is required to conduct Environmentally Relevant Activities (ERAs) which also includes resource activities. ERAs are listed in the EP Regulation.	ERAs, including mining black coal, would be conducted as part of the Project.	DEHP	Yes
MR Act	Mining Lease	Large scale mining (i.e. machine mining) and associated activities must be conducted within a Mining Lease.	Mining and associated activities to be conducted as part of the Project, within MDLs 3012, 3013 and 3014 will require a Mining Lease. Indicative MLA boundaries are shown on Figure 2.	DNRM	No. Mining Lease Applications will be made separately through the MR Act.
RPI Act	Regional Interests Development Approval (RIDA)	A RIDA is required when a resource activity is proposed to be located in an area of regional interest.	Investigations to date show that the only area of regional interest in proximity to the Project is Strategic Cropping Areas. If Project components are to be located within an area of regional interest an application for a RIDA would be made.	DILGP	Yes, if required.

Table 4 (Continued)
Key Primary Regulatory Approvals Anticipated to be Required for the Project

Legislation	Approval	Approval Trigger	Relevance to Project	Administering Authority	Within Scope of EIS[1]
State Government Approvals (Continued)					
Water Act	Water Allocation	A water licence may be required to take or interfere with overland flow water. Taking or interfering with groundwater would be permitted under a mining lease for the Project. A Riverine Protection Permit may be required for excavation or placing of fill within a watercourse, where the works are conducted outside a Mining Lease.	The Project may involve taking or interfering with overland flow water, requiring licencing. The Project is located within the Fitzroy River Catchment and is therefore subject to the Water Resource (Fitzroy Basin) Plan 2011 and Fitzroy Basin Resource Operations Plan 2011. The Water Resource (Fitzroy Basin) Plan 2011 regulates interfering with and taking of overland flow water from within the Fitzroy Basin, and states that the volume necessary to satisfy the requirements of an EA may be taken without a water licence. Excavation and placement of fill may be conducted during development of the off-lease infrastructure. If the works do not meet the exemption requirements, a Riverine Protection Permit may be required.	DNRM	Yes
Local Government Approvals					
SP Act	Development Application	Development approvals pursuant to the *Sustainable Planning Regulation 2009* (SP Regulation) and the Belyando Shire planning scheme may be required for operational works (such as excavation and filling, clearing of native vegetation and works that allow taking or interfering with water), material change of use, building works and reconfiguring a lot.	Project components located outside a mining lease (e.g. rail spur, pipeline, ETL and access road) require assessment through the Integrated Development Application System, pursuant to the SP Act and having regard to the requirements of the SP Regulation and the relevant local government planning scheme.	Isaac Regional Council	Yes

[1] If declared a Coordinated Project, an EIS will be prepared under Part 4 of the SDPWO Act. Project components will be evaluated through the EIS such that the Coordinator-General can consider the Project as a whole and recommend approval conditions accordingly.

9 COSTS AND BENEFITS SUMMARY

The establishment and operation of the Project would stimulate demand in the local, regional and Queensland economies, in excess of 30 years, leading to increased business turnover in a range of sectors and increased employment opportunities.

A cost-benefit analysis would be conducted for the Project EIS and would describe significant benefits and costs arising from all stages of the Project.

Potential benefits and costs in addition to relevant positive and negative externalities would be valued where reasonable, or otherwise described using quantitative and qualitative information.

9.1 LOCAL, STATE AND NATIONAL ECONOMIES

In recent years, since the end of the mining boom, elevated operational costs and depressed coal market prices have seen a number of mining operations reduce their workforces or cease production entirely to minimise losses. The resultant job losses and decreased expenditure have negatively impacted regional communities.

Despite the depressed market experienced in recent years, an ongoing reliance on metallurgical coal, used in steel production, will require continued development of mining operations targeting the high-quality coal resources within the Bowen Basin in Queensland. The recent surge in the prices of metallurgical coal demonstrates not only the highly inelastic nature of demand but also the lack of good substitutes for this commodity. The development of new mining operations will provide significant direct employment opportunities for construction and operational workforces, and long term flow-on social and economic benefits to regional communities.

The source of the workforce would be dependent upon the availability of required workers. It is expected that the workforce would comprise a mix of local and regional workers, the proportional mix depending on availability. Based on the current state of the industry, it would be expected that there would be a readily available pool of local and regional workers.

Economic impacts would be considered in the EIS at the local, regional and national levels. Economic impacts of the Project would be considered in accordance with the Coordinator General's *draft Economic Impact Assessment Guideline for Coordinated Projects.*

Key indicators including gross regional product, gross state product, employment outcomes and value added to the economy would be used to quantify the direct and indirect impacts on Local, Regional and State economies in the EIS.

9.2 NATURAL AND SOCIAL ENVIRONMENTS

The potential impacts on the natural and social environments (as described in Sections 6.1 and 6.3) would be considered as part of the cost-benefit analysis for the Project.

Employment and other opportunities expected to be generated by the Project include:

- a Project operational workforce in the order of 960 on-site personnel, at full development; and
- an additional construction workforce in the order of 500 to 700 people.

10 COMMUNITY AND STAKEHOLDER CONSULTATION

Pembroke Resources has commenced engagement with relevant stakeholders to:

- provide Project briefings;
- discuss key assessment considerations;
- discuss community and social impacts, including proposed accommodation and employment strategies;
- form land access agreements to commence baseline environmental surveys and install environmental monitoring equipment;
- describe the environmental assessment process; and
- present the environmental assessment and Project development schedules.

Stakeholders consulted to date include:

- local landholders;
- Isaac Regional Council;
- Native Title parties;
- Office of the Coordinator-General;
- DEHP;
- DNRM;
- DEE;
- overlapping tenure holders;
- infrastructure service providers (including Aurizon, Ergon, Sunwater); and
- DBCT Management, including participation in its Capacity Forum.

Pembroke Resources has developed a stakeholder engagement strategy for the Project. The stakeholder engagement strategy has been implemented prior to and during the development and lodgement of this IAS, and will be implemented during:

- development and finalisation of the ToR;
- during preparation and lodgement of the EIS; and
- post EIS lodgement, exhibition and supplementary EIS development, lodgement and exhibition prior to determination.

Implementation of the stakeholder engagement strategy would include engagement and opportunity for consultation with all affected and interested persons, and any other relevant stakeholders identified during its implementation.

A range of consultation mechanisms have been proposed for implementation during the assessment and approvals process for the Project including, but not necessarily limited to, the following:

- community information sessions;
- recording of opportunistic stakeholder interactions including one-on-one meetings;
- local government (council) briefings;
- State Government department briefings;
- Commonwealth Government department briefings;
- letters, advertising and notifications;
- site tours;
- newsletters and factsheets;
- media releases;
- regular updates and maintenance of the Pembroke website; and
- publication of application and assessment materials on the Office of the Coordinator-General's Coordinated Project website.

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12 ACRONYMS

ALA	Atlas of Living Australia
AHD	Australian Height Datum
AS/NZS	Australian Standard/New Zealand Standard
ATP	authority to prospect
BMA	Billiton Mitsubishi Alliance
CE	Critically Endangered
CHMA	Cultural Heritage Management Agreement
CHMP	Cultural Heritage Management Plan
CHPP	coal handling preparation plant
CMJV	Coppabella Moorvale Joint Venture
CO	carbon monoxide
DAF	Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DBCT	Dalrymple Bay Coal Terminal
DEE	Department of the Environment and Energy
DEHP	Department of Environment and Heritage Protection
DERM	Department of Environment and Resource Management
DNRM	Department of Natural Resources and Mines
DTMR	Department of Transport and Main Roads
E	Endangered
e.g.	example
EIS	Environmental Impact Statement
ESAs	Environmentally Sensitive Areas
et al.	and others
ETL	electricity transmission line
EP Act	*Environmental Protection Act, 1994*
EPC	Exploration Permit for Coal
EPBC Act	*Environment Protection and Biodiversity Conservation Act, 1999*
EPP (Air)	*Environmental Protection (Air) Policy, 2008*
EPP (Noise)	*Environmental Protection (Noise) Policy, 2008*
EPP (Water)	*Environmental Protection (Water) Policy, 2008*
EP Regulation	*Environmental Protection Regulation, 2008*
ERAs	Environmental Relevant Activities

GDEs	Groundwater Dependent Ecosystems
GMA	Groundwater Management Area
$g/m^2/day$	grams per square metre per day
GQAL	*good quality agricultural land*
IAS	Initial Advice Statement
IBRA	Interim Biogeographic Regionalisation for Australia
i.e.	that is
IESC	Independent Expert Scientific Committee
ILUA	Indigenous Land Use Agreement
IPC	Isaac Plains Coal
IPCM	Isaac Plains Coal Mines
ISO	International Standards Organisation
ISO 31000:2009	International Standards Organisation 31000:2009 *Risk Management – Principles and Guidelines*
km	kilometre
kV	kilovolt
LGA	Local Government Area
m	metres
M	Migratory
MDL	Mineral Development Licence
MIW	Mackay, Isaac and Whitsunday
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
m/s	metres per second
$mg/m^2/day$	milligrams per squared metre per day
ML	Mining Lease
MLAs	Mining Lease Applications
MR Act	*Mineral Resources Act, 1989*
MSDS	material safety data sheet
Mt	million tonnes
Mtpa	million tonnes per annum
NC Act	*Nature Conservation Act, 1992*
NGERS	*National Greenhouse and Energy Report System*
NNTT	National Native Title Tribunal

No.	number
NO_2	nitrogen dioxide
PCI	pulverised coal injection
PDA	Priority Development Area
pers comm.	Personal Communication
PLA	Petroleum Lease Application
$PM_{2.5}$	particulate matter 2.5 micrometres or less in diameter
PM_{10}	particulate matter 10 micrometres or less in diameter
QFAO	Queensland Floodplain Assessment Overlay
RE	Regional Ecosystem
RIDA	Regional Interests Development Approval
ROM	run-of-mine
RPI Act	*Regional Planning Interests Act, 2014*
SCL	Strategic Cropping Land
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SKM	Sinclair Knight Merz
SLC	Special Least Concern
SO_2	sulphur dioxide
SP Act	*Sustainable Planning Act, 2009*
t	tonnes
the Project	The Olive Downs Project
ToR	Terms of Reference
TSP	Total Suspended Particles
US	United States
V	Vulnerable
VM Act	*Vegetation Management Act, 1999*
Water Act	*Water Act, 2000*
WRR Act	*Waste Reduction and Recycling Act, 2011*
°	degrees
$\mu g/m^3$	microgram per cubic metre
µm	micrometre

APPENDIX A
EPBC ACT PROTECTED MATTERS SEARCH RESULTS

Australian Government
Department of the Environment and Energy

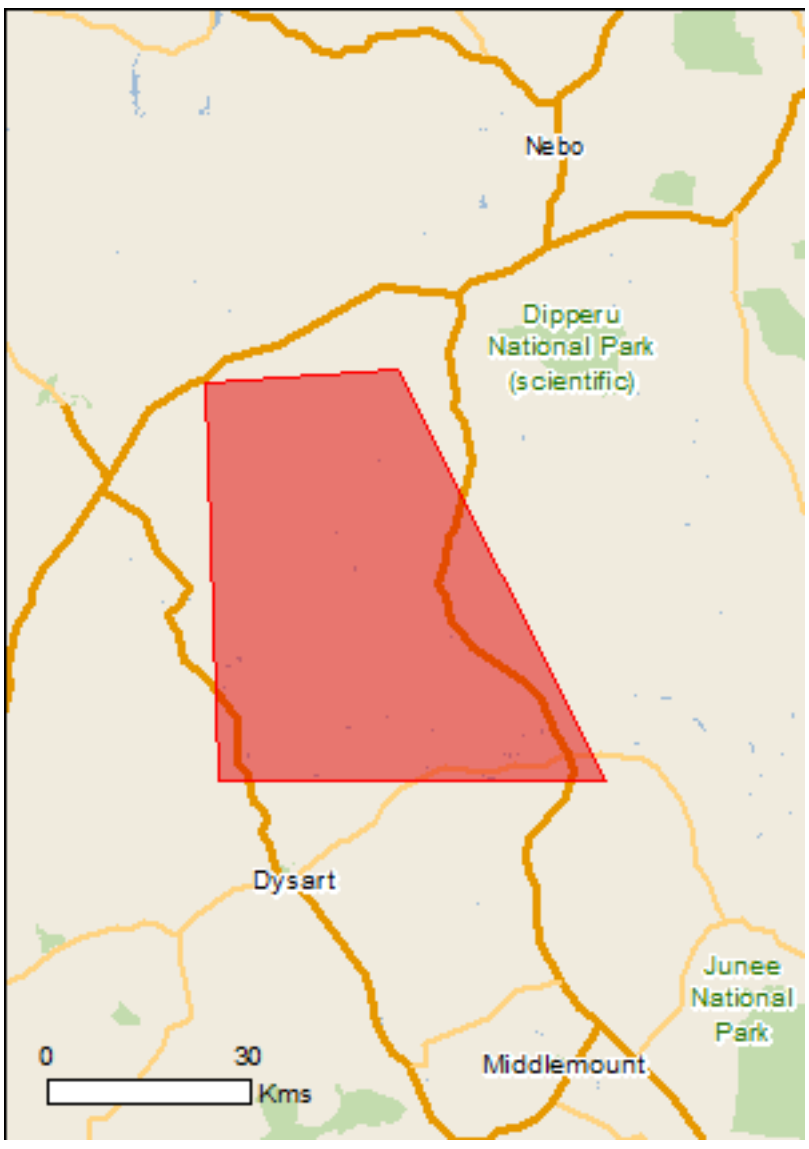
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

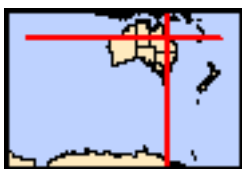
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 06/12/16 14:47:59



Coordinates

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	24
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	21
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-	Vulnerable	Species or species

Name	Status	Type of Presence
eared Bat [83395]		habitat may occur within area
Petauroides volans		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus		
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Other		
Cycas ophiolitica		
[55797]	Endangered	Species or species habitat likely to occur within area
Plants		
Dichanthium queenslandicum		
King Blue-grass [5481]	Endangered	Species or species habitat may occur within area
Dichanthium setosum		
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus raveretiana		
Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area
Samadera bidwillii		
Quassia [29708]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Denisonia maculata		
Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area
Egernia rugosa		
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Elseya albagula		
Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat likely to occur within area
Furina dunmalli		
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Lerista allanae		
Allan's Lerista, Retro Slider [1378]	Endangered	Species or species habitat may occur within area
Rheodytes leukops		
Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Cuculus saturatus Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

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Acknowledgements

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-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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