

PEMBROKE

Olive Downs Coking Coal Project
Draft Environmental Impact Statement



PEMBROKE

Olive Downs Coking Coal Project Draft Environmental Impact Statement

MAIN REPORT

Executive Summary

Table of Contents

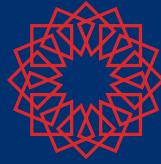
Section 1	Introduction
Section 2	Project Description
Section 3	Assessment of Matters of National Environmental Significance
Section 4	Assessment of Project Specific Matters
Section 5	Rehabilitation Strategy
Section 6	General Environmental Protection Commitments and Model Conditions
Section 7	References
Section 8	Abbreviations, Acronyms, Glossary and Definitions

ATTACHMENTS

Attachment 1	Olive Downs Coking Coal Project Terms of Reference
Attachment 2	Olive Downs Coking Coal Project Terms of Reference Reconciliation Table
Attachment 3	Regulatory Framework
Attachment 4	Peer Review Letters
Attachment 5	Public Consultation Report

APPENDICES

Appendix A	Terrestrial Flora Assessment
Appendix B	Terrestrial Fauna Assessment
Appendix C	Aquatic Ecology Assessment
Appendix D	Groundwater Assessment
Appendix E	Surface Water Assessment
Appendix F	Flood Assessment
Appendix G	Air Quality and Greenhouse Gas Assessment
Appendix H	Social Impact Assessment
Appendix I	Economic Assessment
Appendix J	Road Transport Assessment
Appendix K	Noise and Vibration Assessment
Appendix L	Geochemistry Assessment
Appendix M	Soil and Land Suitability Assessment
Appendix N	Non-Indigenous Cultural Heritage Assessment
Appendix O	Preliminary Risk Assessment



PEMBROKE

Olive Downs Coking Coal Project
Draft Environmental Impact Statement

Executive Summary

TABLE OF CONTENTS

ES1	INTRODUCTION	ES-1
ES1.1	PROJECT PROPONENT	ES-1
ES1.2	PROJECT SUMMARY	ES-1
ES1.3	PUBLIC CONSULTATION PROCESS	ES-6
ES1.4	PROJECT DESCRIPTION	ES-6
ES1.4.1	General Arrangement	ES-6
ES1.4.2	Construction	ES-7
ES1.4.3	Operations	ES-7
ES1.4.4	Rehabilitation and Conceptual Post-mining Land Use	ES-8
ES1.5	ENVIRONMENTAL ASSESSMENT	ES-12
ES1.5.1	Flora and Fauna	ES-12
ES1.5.2	Water Resources	ES-13
ES1.5.3	Water Quality	ES-14
ES1.5.4	Flooding and Regulated Structures	ES-15
ES1.5.5	Air Quality	ES-15
ES1.5.6	Social Values	ES-16
ES1.5.7	Economics	ES-16
ES1.5.8	Transport	ES-17
ES1.5.9	Noise and Vibration	ES-17
ES1.5.10	Land	ES-17
ES1.5.11	Cultural Heritage	ES-18
ES1.5.12	Waste Management	ES-18
ES1.5.13	Biosecurity	ES-18
ES1.5.14	Hazards and Community Safety	ES-18
ES1.6	GENERAL ENVIRONMENTAL MANAGEMENT COMMITMENTS AND MODEL CONDITIONS	ES-19

LIST OF TABLES

Table ES-1	General Rehabilitation Objectives for the Project
------------	--

LIST OF FIGURES

Figure ES-1	Regional Location
Figure ES-2	Project General Arrangement
Figure ES-3	General Arrangement – Olive Downs South Domain
Figure ES-4	General Arrangement – Willunga Domain
Figure ES-5	Conceptual Final Land Use – Olive Downs South Domain
Figure ES-6	Conceptual Final Land Use – Willunga Domain

ES1 INTRODUCTION

This Environmental Impact Statement (EIS) assesses the proposed Olive Downs Coking Coal Project (herein referred to as the Project). The Project is a proposed coking coal mine and associated infrastructure located within the Bowen Basin, located approximately 40 kilometres (km) south-east of Moranbah, Queensland (Figure ES-1).

On 17 February 2017, the Coordinator-General declared the Project a 'Coordinated Project' for which an EIS is required under Part 4 of the *Queensland State Development and Public Works Organisation Act, 1971*, and subsequently issued Terms of Reference for the Project on 28 June 2017. This EIS has been prepared to address the Terms of Reference. It is noted that the Project was gazetted as the "Olive Downs Project", but is now referred to as the "Olive Downs Coking Coal Project" (i.e. both names refer to the same Project).

The Project provides an opportunity to develop a greenfield open cut coal resource in an existing (brownfield) mining precinct for the export of coking and pulverised coal injection (PCI) products to the steel production industry. The Project would produce up to 20 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal over an anticipated operational life of approximately 79 years.

At full development, the Project would sustain an operational workforce of approximately 1,300 people, as well as a peak construction workforce of up to 700 people. The significant employment opportunities provided by the Project would assist in sustaining the prosperity of local communities and those in the wider region for the life of the Project. A Cost Benefit Analysis conducted for this EIS indicates that the Project would have net production benefits to Australia of approximately \$2 billion.

In addition to the direct employment opportunities, there would be a significant number of indirect employment opportunities, through suppliers, contractors, service providers and local business.

Coking coal produced in the Bowen Basin is in high demand for use in steel production in Asia because it's of high quality. The Project provides an opportunity to supply this, over the Project life, and provide long-term economic benefits through Queensland export income, State royalties and Commonwealth tax revenue.

ES1.1 PROJECT PROPONENT

The Project Proponent is Pembroke Olive Downs Pty Ltd (Pembroke) (ABN: 53 611 674 376).

The registered office and postal address for Pembroke is:

Level 19, 1 Macquarie Place
SYDNEY NSW 2000

Pembroke is a private Australian-based company focused on the acquisition and development of high quality, coking coal assets. Pembroke is backed by leading resources and energy-focused global private equity firm, Denham Capital.

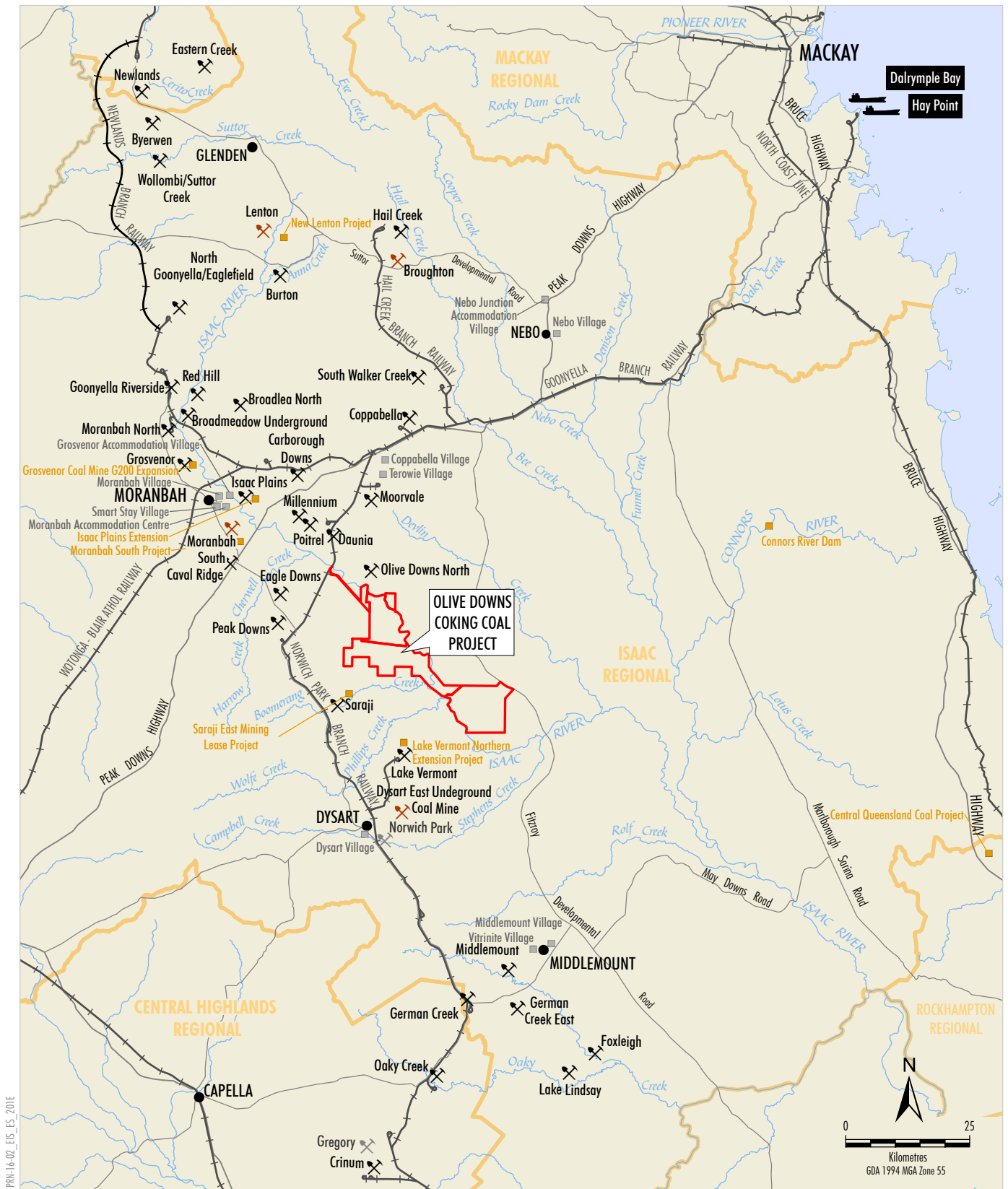
ES1.2 PROJECT SUMMARY

The total estimated coal resource proposed to be mined over the 79 year life is approximately 612 million tonnes.

Total capital expenditure is estimated at \$1.009 billion over the Project life.

The main activities associated with the development of the Project would include (Figures ES-2 to ES-4):

- ROM coal production for approximately 79 years (commencing approximately 2020 or upon grant of all required approvals) at a rate of up to 20 Mtpa, including mining operations associated with:
 - the Olive Downs South domain open cut pits and waste rock emplacements within Mining Lease Applications (MLA) 700032, MLA 700033, MLA 700035 and MLA 700036; and
 - the Willunga domain open cut pits and waste rock emplacements within MLA 700034.
- Installation and operation of on-site ROM coal handling and crushing facilities at Olive Downs South and Willunga domains, as well as the installation of a coal handling and preparation plant (CHPP) and product coal stockpiles at the Olive Downs South domain to produce approximately 14 Mtpa of product coal.
- Construction of a rail spur from the Norwich Park Branch Railway to a rail loop and rail-loadout facility at the Olive Downs South domain. Product coal will be transported by rail to the Dalrymple Bay Coal Terminal (DBCT) for export. Pembroke has secured port and rail capacity for its product coal. The Project would not trigger the need for upgrades.



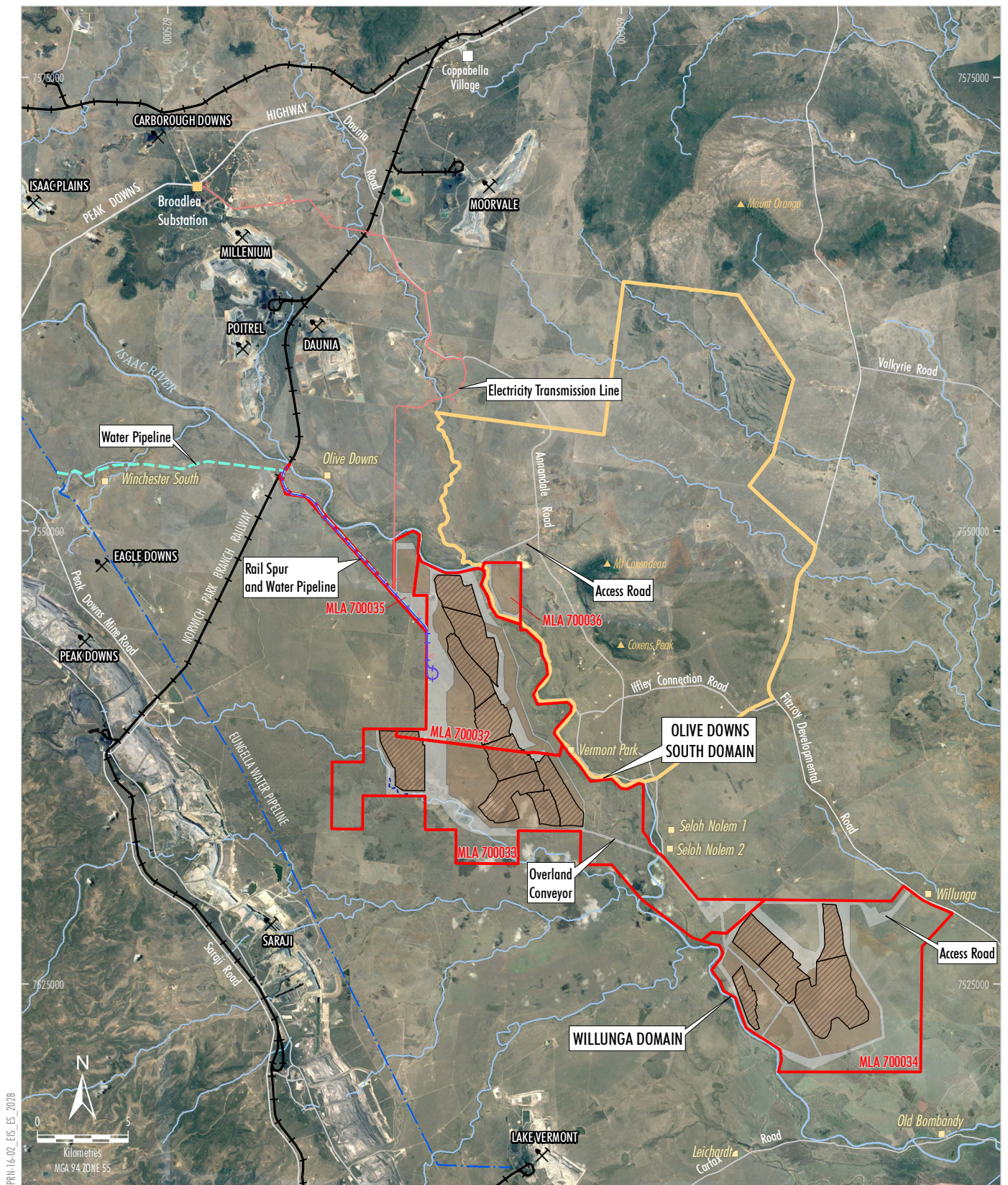
Source: Geoscience Australia - Topographical Data 250K (2006); Department of Natural Resources and Mines (2016)

PEMBROKE

OLIVE DOWNS COKING COAL PROJECT

Regional Location

Figure ES-1



PRH-16-02_EIS_ES_2028

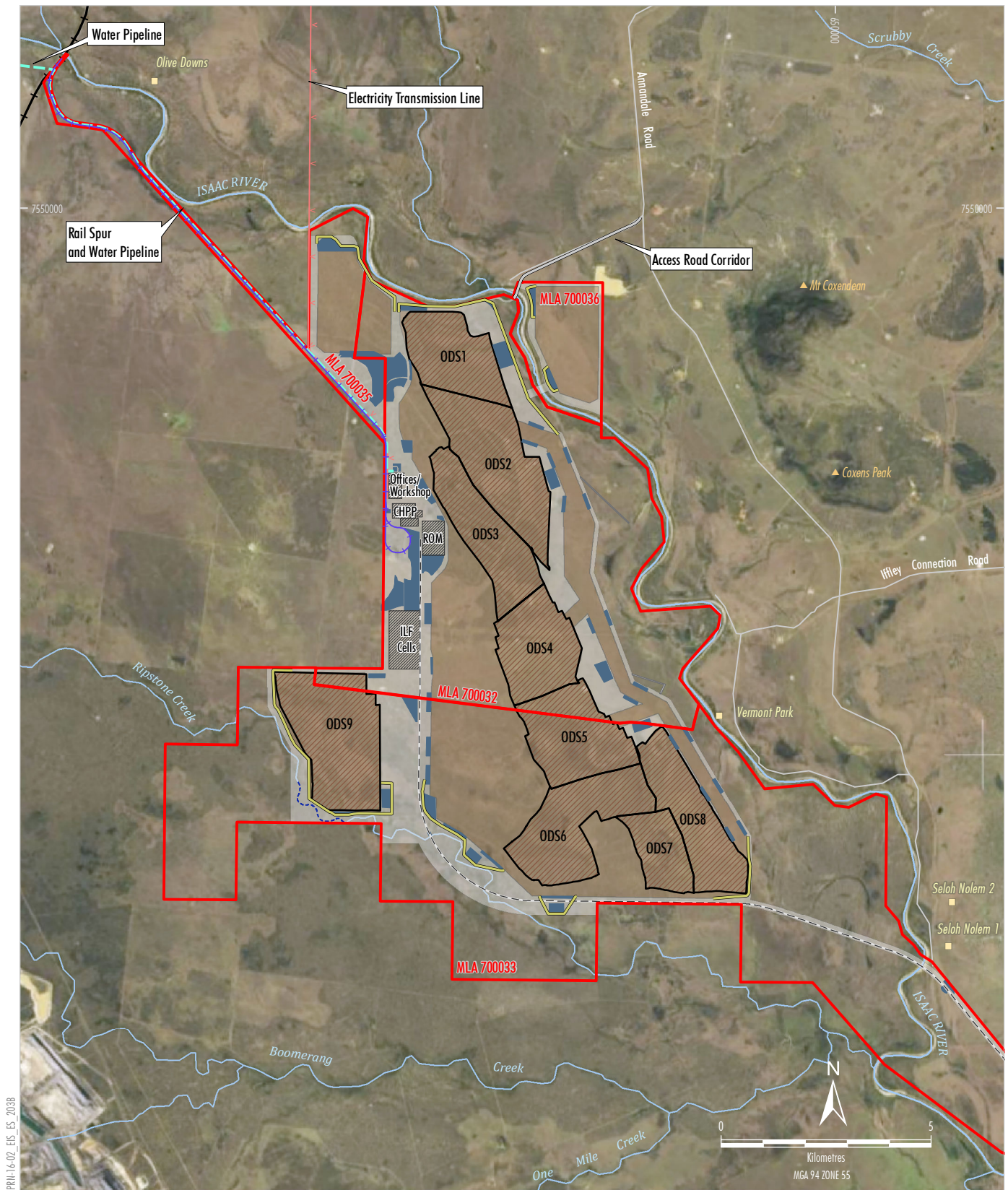
- LEGEND**
- Mining Lease Application Boundary
 - Approved/Operating Coal Mine
 - Evungella Pipeline Network
 - Railway
 - Dwelling
 - Proposed Electricity Transmission Line
 - Proposed Rail
 - Proposed Water Pipeline
 - Proposed Creek Diversion
 - Open Cut Pit Extent
 - Out-of-Pit and In-Pit Waste Rock Emplacement
 - Infrastructure Area
 - Pembroke-owned Potential Offset Properties

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



OLIVE DOWNS COKING COAL PROJECT
Project General Arrangement

Figure ES-2



PRM-16-02_EIS_ES_2038

- LEGEND**
- Mining Lease Application Boundary
 - Railway
 - Dwelling
 - Proposed Access Road
 - Proposed Electricity Transmission Line
 - Proposed Rail Spur and Loop
 - Proposed Water Pipeline
 - Proposed Creek Diversion
 - Open Cut Pit Extent (and Pit Numbering)
 - Out-of-Pit and In-Pit Waste Rock Emplacement
 - Infrastructure Area

- Key Infrastructure Component
- Water Storage
- Temporary Levee
- Overland Conveyor

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



OLIVE DOWNS COKING COAL PROJECT
General Arrangement -
Olive Downs South Domain

Figure ES-3



- LEGEND**
- Mining Lease Application Boundary
 - Dwelling
 - Open Cut Pit Extent (and Pit Numbering)
 - Out-of-Pit and In-Pit Waste Rock Emplacement
 - Infrastructure Area
 - Temporary Levee
 - Water Storage
 - Overland Conveyor
 - Key Infrastructure Component

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



OLIVE DOWNS COKING COAL PROJECT
General Arrangement -
Willunga Domain

Figure ES-4

- Construction of a new water supply pipeline from the Eungella network to the mine infrastructure area at the Olive Downs South domain. The pipeline would run parallel to the Project's rail spur within MLA 700035 and within an existing road reserve.
- Construction of an electricity transmission line (ETL) from the Broadlea Substation to the mine infrastructure area at the Olive Downs South domain.
- Construction of access roads from Annandale Road and the Fitzroy Development Road to access the Olive Downs South and Willunga domains, respectively.

The approximate extent of the Project open cut mining area, waste rock emplacements and infrastructure areas is 16,300 hectares (ha).

ES1.3 PUBLIC CONSULTATION PROCESS

Consultation with key Queensland State Government agencies, specifically in relation to the Project, has been conducted during preparation of the Initial Advice Statement, draft Terms of Reference, finalisation of the Terms of Reference and the draft EIS.

Engagement with relevant stakeholders has included:

- one-on-one Project briefings, workshops and community information sessions;
- discussion of key assessment considerations;
- discussion of community and social impacts, including proposed accommodation and employment strategies;
- formation of land access agreements to conduct baseline environmental surveys and install environmental monitoring equipment;
- description of the environmental assessment process; and
- presentation of the findings of the environmental assessments and Project development schedules.

Pembroke continues to consult with relevant Government agencies, landholders, overlapping tenure holders and the general community on a regular basis.

ES1.4 PROJECT DESCRIPTION

The Project comprises the Olive Downs South and Willunga domains and associated linear infrastructure corridors, including a rail spur connecting to the Norwich Park Branch Railway, a water pipeline connecting to the Eungella pipeline network, an ETL and access roads (Figure ES-2).

The maximum ROM coal production rate for the Project is expected to peak at approximately 20 Mtpa. Based on the indicative mine schedule for the life of the Project, the maximum ROM coal production rate would occur from approximately 2034.

The proposed Olive Downs South domain open cut pit areas are generally aligned from north to south and are located on the western side of the Isaac River (Figure ES-3). At peak development of Olive Downs South domain, production of ROM coal is expected to reach approximately 12 Mtpa.

The proposed Willunga domain open cut mine areas are located on the eastern side of the Isaac River (Figure ES-4). The Willunga domain is expected to produce approximately 8 Mtpa of ROM coal at peak operation.

ROM coal would be transferred from the Willunga domain to the Olive Downs South domain for processing via an overland conveyor.

ES1.4.1 General Arrangement

The Project design has been influenced by feedback from stakeholder engagement and findings from the environmental assessments conducted as part of this EIS. A number of refinements to the Project design have been made to improve environmental outcomes, including:

- maximising opportunities to backfill final voids by adjusting the mine schedule, including backfilling Pit ODS9;
- isolating final voids from the Isaac River;
- constraining the northern extent of open cut mining in the Olive Downs South domain to minimise impacts to the flooding characteristics and the riparian corridor of the Isaac River;
- minimising the degree of waste emplacement slopes to improve rehabilitation outcomes; and
- co-locating linear infrastructure corridors and using existing easements and road reserves to minimise impacts to existing land uses.

ES1.4.2 Construction

Construction of the Project is proposed to commence in 2019. This initial stage of construction would establish operations at the Olive Downs South domain. Key infrastructure that would be established during this initial stage would include (Figures ES-2 and ES-3):

- a mine access road from Annandale Road;
- the mine infrastructure area;
- a raw water supply pipeline from the existing Eungella pipeline network;
- a rail spur and rail loop from the Norwich Park Branch Railway to the rail-loadout facility;
- a 66 kV ETL and switching/substation from the existing regional power network for electricity supply;
- CHPP and associated coal handling infrastructure;
- water management infrastructure including sediment dams, up-catchment diversions, water storage dams and temporary flood protection levees;
- coal rejects management and storage facilities;
- a dry weather road crossing of the Isaac River to provide access to the eastern out-of-pit waste emplacement area; and
- rail-loadout facility including product coal stockpile areas.

Construction of the Willunga domain would commence in approximately 2027, and would include the construction of (Figures ES-2 and ES-4):

- a mine access road from the Fitzroy Developmental Road;
- the mine infrastructure area;
- an overland conveyor (and an adjacent access road) to transfer crushed ROM coal to the Olive Downs South domain CHPP;
- water management infrastructure, including sediment dams, up-catchment diversions, water storage dams and temporary flood protection levees;
- ROM coal handling and crushing facilities; and
- crossings of the Isaac River between the Olive Downs South and Willunga domains for direct vehicular access and ancillary infrastructure.

The Olive Downs South domain coal processing facilities would also be expanded during 2027, to handle the additional ROM coal generated from mining the Willunga domain.

ES1.4.3 Operations

ROM coal production is scheduled to commence in 2020. Open cut mining would be conducted using conventional truck and shovel mining methods.

This mining method has been specifically selected in preference to lower cost dragline mining, to maximise backfilling opportunities, thereby minimising the size of the final voids.

Mining would commence within Pits ODS1 and ODS2 in the northern part of the Olive Downs South domain (Figure ES-3). Waste rock would initially be emplaced in two out-of-pit waste rock emplacements (located to the west and east of Pit ODS1). Once sufficient space is available, waste rock would be progressively emplaced within the open cut pits, behind the advancing open cut operations.

In addition to the two out-of-pit waste rock emplacements described above, waste rock would also be used to construct a permanent highwall emplacement along the eastern margin of the Olive Downs South domain (Figure ES-3). The permanent highwall emplacement would be in the order of 300 m to 400 m wide, and approximately 25 m high, and would integrate with temporary flood levees to isolate the active open cut mining areas from the Isaac River floodplain.

Mining of Pit ODS9 is scheduled to commence in 2030. A permanent diversion of Ripstone Creek would be constructed prior to Pit ODS9 intersecting the existing alignment of the watercourse (Figure ES-3). Pit ODS9 would be completely backfilled once mining within it is complete.

The Project would produce up to approximately 6 Mtpa of ROM coal for the first 10 years of operations, after which production would increase to approximately 20 Mtpa when the majority of the Olive Downs South and Willunga domain open cut pits (Figure ES-4) are active.

ROM coal would be hauled by a fleet of rear dump trucks to crushing and screening plants at the Olive Downs South and Willunga domains. Crushed ROM coal from the Willunga domain would be transferred to the Olive Downs South domain via an overland conveyor (Figure ES-2).

ROM coal would be washed in the CHPP at the Olive Downs South domain. The product coal from the CHPP would be transferred to the product coal stockpiles before being reclaimed and loaded onto trains.

Coarse rejects from the CHPP would be emplaced within the in-pit waste rock emplacements, within the final open cut pit footprint, or within a separate emplacement area until such time as in-pit disposal areas become available.

Fine rejects would be thickened for transfer (via pipeline) to drying cells, prior to being reclaimed and placed in-pit.

Product coal would be transported by rail to the DBCT via the Project rail spur, the Norwich Park Branch Railway and the Goonyella Branch Railway (Figure ES-1). Product coal would be transported to overseas markets by sea.

The DBCT (and the Port of Hay Point itself) would not require expansion to handle coal from the Project, or the shipping movements associated with the transport of Project coal.

ES1.4.4 Rehabilitation and Conceptual Post-mining Land Use

The Project would be progressively rehabilitated over the life of the operation to achieve the rehabilitation goal of creating a post-mining landform that is:

- safe;
- non-polluting;
- stable; and
- able to sustain a post-mining land use.

General rehabilitation objectives for the Project are described in Table ES-1.

The conceptual post-mining land use for the Project is to reinstate land that would be suitable for the existing land uses, namely low intensity cattle grazing on flatter areas and low slopes, while establishing woodland vegetation to improve landform stability in areas near watercourses and drainage lines, and on the permanent highwall emplacements and adjacent areas.

Illustrations of the conceptual post-mining landform is presented on Figures ES-5 and ES-6. Key features of the conceptual final landform include:

- rehabilitated waste rock emplacement with slopes of approximately 7 degrees, able to sustain low intensity cattle grazing and woodland vegetation;
- ten backfilled open cut pits;
- three partially backfilled final voids associated with Pits ODS3, ODS7/8 and WIL5;
- water bodies within the final voids which would remain at least 90 metres (m) below ground level;
- permanent highwall emplacements surrounding the ODS3 and ODS7/8 final voids and isolating them from the Isaac River floodplain;
- woodland vegetation established in areas of the rehabilitated final landform which would benefit from enhanced stability effects;
- decommissioned and rehabilitated mine infrastructure areas; and
- a permanent diversion of Ripstone Creek.

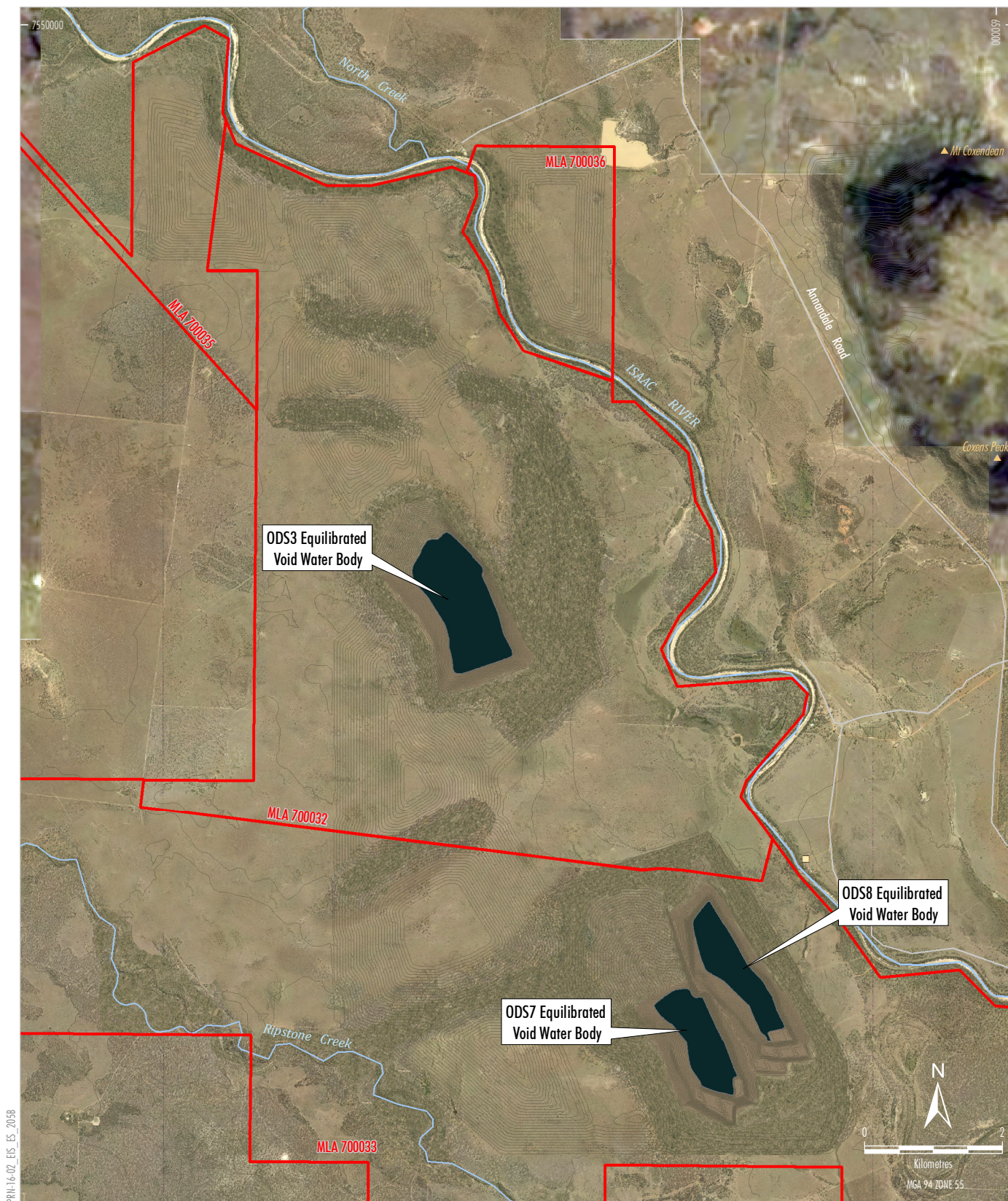
Waterbodies are predicted to form within the three final voids, equilibrating at a level below the regional groundwater table (Figures ES-5 and ES-6). This would allow the voids to act as groundwater sinks into perpetuity, preventing potentially saline water migrating into surrounding aquifers. The final void waterbodies are not predicted to spill to the surrounding environment, as they would remain at least 90 m below ground level.

Final voids ODS3 and ODS7/ODS8 would be isolated from all flood waters up to, and including, a probable maximum flood event by the permanent highwall emplacements. These permanent highwall emplacements would integrate with the in-pit and out-of-pit waste rock emplacements, effectively surrounding the final voids and redefining the Isaac River floodplain extent. Final void WIL5 would be protected from flood water by a perimeter bund.

Fencing and signage would be installed around the final void highwalls to prevent access by humans and livestock.

Table ES-1
General Rehabilitation Objectives for the Project

Short-term	Medium to Long-term
<ul style="list-style-type: none"> • Minimise active disturbance areas by progressively rehabilitating, and restricting clearing to the minimum required for operations. • Salvage vegetation and habitat resources during clearing activities and re-use in rehabilitated areas to provide habitat resources for fauna (e.g. tree hollows and logs). • Install erosion and sediment control measures prior to the commencement of soil stripping and rehabilitation activities. • Strip soil from areas of disturbance, as required, to reduce the potential for erosion and sediment generation, and to minimise the extent of soil stockpiles and the period of storage. • In preference to stockpiling, replace stripped soil directly on completed sections of the final landform, wherever practicable. • Plant cover crops as appropriate on newly rehabilitated mine landform areas (and soil stockpiles) within two years of becoming available, to minimise the potential for soil erosion. • Stabilise new infrastructure disturbance areas (e.g. roads and dam embankments) as soon as possible by placement of soil and seeding. • Stabilise areas that interact with the Isaac River that have been affected by mine operations (e.g. road crossings). • Progressively place waste rock within the footprint of the open cut voids and reshape completed areas to their final landform shape so that they can be progressively rehabilitated. 	<ul style="list-style-type: none"> • Provide self-maintaining, geotechnically stable and safe landforms that complement existing surrounding landforms in terms of slope, geomorphological characteristics, vegetation and land use. • Remediate safety hazards at the mine infrastructure areas and any potentially contaminated sites to remove safety risks to people and animals. • Rehabilitate the mine infrastructure areas and mine landforms with either groundcover (i.e. grass species) and scattered trees that would return these areas to land suitable for grazing or native woodland/forest. • Establish woodland vegetation in areas of the rehabilitated final landform that would benefit from enhanced stability effects. • Construct the final top surface of the waste emplacements so that rainfall runoff drains in a natural, stable manner. • Create final voids that do not impact the receiving surface waters surrounding the Project. • Isolate the final voids from the Isaac River floodplain through the development of a permanent highwall waste rock emplacement and minimise the final void catchment areas with up-catchment diversions.

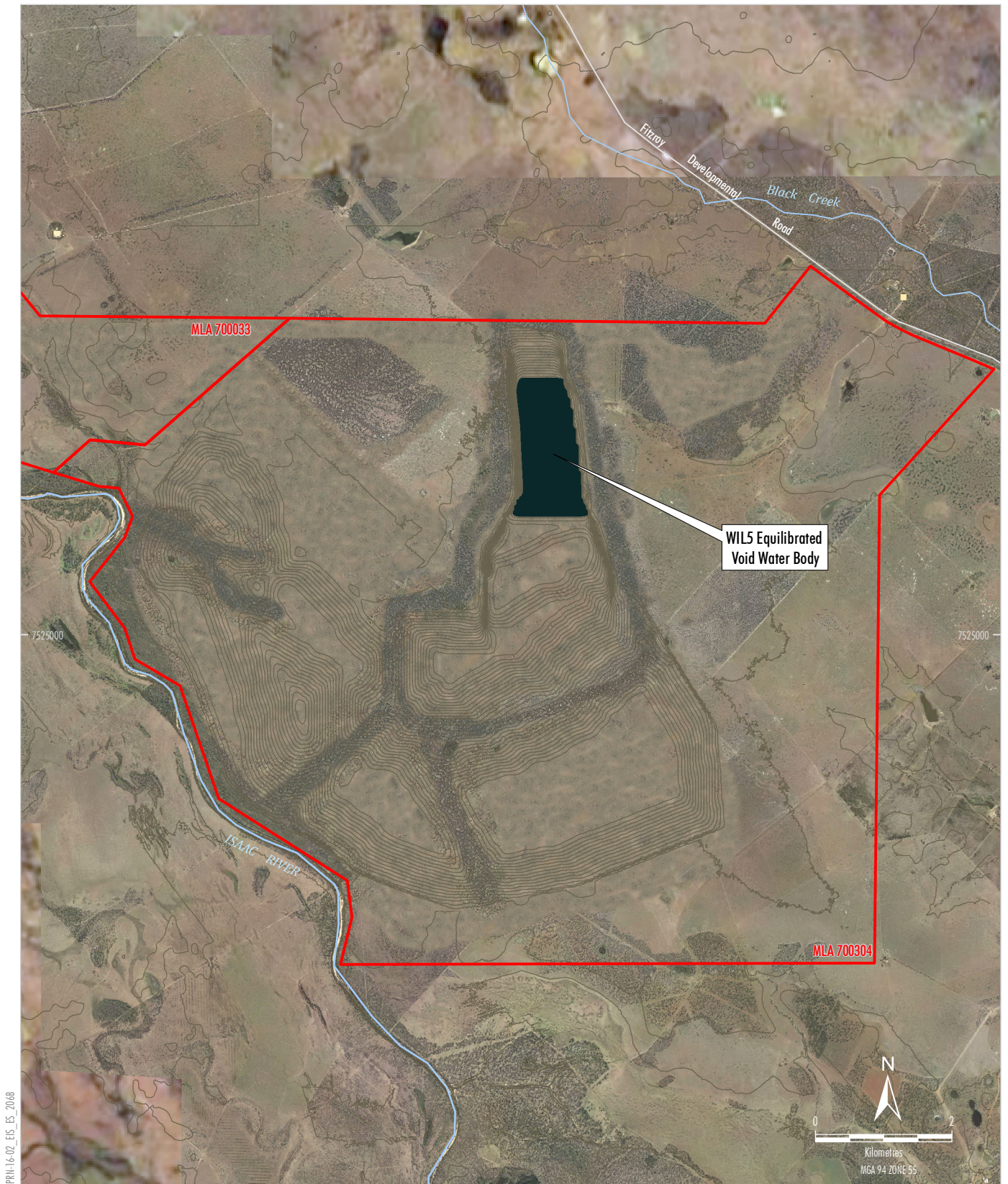


Source: Pembroke (2018),
Google Image (2016)



OLIVE DOWNS COKING COAL PROJECT
Conceptual Final Land Use
Olive Downs South Domain

Figure ES-5



Source: Pembroke (2018),
Google Image (2016)

LEGEND
 Mining Lease Application Boundary
 Dwelling



OLIVE DOWNS COKING COAL PROJECT
 Conceptual Final Land Use
 Willunga Domain

Figure ES-6

ES1.5 ENVIRONMENTAL ASSESSMENT

ES1.5.1 Flora and Fauna

Due to past and ongoing agricultural activities (e.g. clearing, grazing, thinning and cropping), the Project area is predominantly cleared land with patches of native vegetation.

A total of 18 individual native Regional Ecosystems (REs) have been ground-truthed within the Project disturbance footprint. These REs fall within five broad vegetation groups, including:

- eucalypt dry woodlands on inland depositional plains;
- eucalypt open forests to woodlands on floodplains;
- eucalypt woodlands to open forests;
- other acacia dominated open forests, woodlands and shrublands; and
- wetlands (swamps and lakes).

Approximately 5,662 ha of REs occur within the 16,300 ha Project disturbance footprint. The remainder of the Project disturbance footprint (approximately 10,638 ha) is non-remnant vegetation and cleared land. The REs to be cleared as part of the Project include:

- approximately 4,805 ha of eucalypt dry woodlands on inland depositional plains;
- approximately 659 ha of eucalypt open forests to woodlands on floodplains;
- approximately 78 ha of acacia dominated open forests, woodlands and shrublands; and
- approximately 120 ha of wetland REs (swamps and lakes).

Of the 18 REs identified within the Project disturbance footprint, four have a conservation status of 'Endangered' under the Queensland *Vegetation Management Act, 1999* and four have a conservation status of 'Of Concern'. The remaining 10 REs have a conservation status of 'Least Concern'.

Approximately 140 ha of 'Endangered' REs and 866 ha of 'Of Concern' REs would be cleared over the life of the Project. All of the REs to be cleared occur extensively in the surrounding landscapes and subregions.

One threatened ecological community listed under the EPBC Act has been recorded in the Project area and surrounds, namely, the *Brigalow (Acacia harpophylla Dominant and Co-dominant) Threatened Ecological Community* (Brigalow Woodland TEC). The patches of Brigalow Woodland TEC within the Project disturbance footprint are small (totalling approximately 13 ha), degraded by edge effects and weeds and are highly fragmented.

Two sub-populations of *Bertya pedicellata*, listed as 'Near Threatened' under the Queensland *Nature Conservation Act, 1992* (NC Act), were recorded in the north-west section of the ETL corridor. No other conservation significant flora species listed under the NC Act or Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been recorded in the Project area or surrounds, despite targeted surveys.

The Isaac River riparian zone would remain largely intact during the Project life (except for Project infrastructure river crossings).

Historical agricultural practices have degraded the fauna habitat across the Project site to varying extents. External connectivity of the habitats is relatively low, except for habitat along watercourses and drainage features, where the majority of records of conservation significant fauna species occur. Conservation significant fauna species recorded in the Project area include:

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – listed as 'Vulnerable' under the EPBC Act and NC Act;
- Koala (*Phascolarctos cinereus*) – listed as 'Vulnerable' under the EPBC Act and NC Act;
- Greater Glider (*Petauroides volans*) – listed as 'Vulnerable' under the EPBC Act and NC Act;
- Ornamental Snake (*Denisonia maculata*) – listed as 'Vulnerable' under the EPBC Act and NC Act;
- Australian Painted Snipe (*Rostratula australis*) – listed as 'Endangered' under the EPBC Act and 'Vulnerable' under the NC Act; and
- Short-beaked Echidna (*Tachyglossus aculeatus*) (recorded via scats) – listed as 'Special Least Concern' under the NC Act.

Five Matters of National Environmental Significance (MNES) (threatened species and an ecological community) listed under the EPBC Act have been recorded in the Project locality:

- Squatter Pigeon (southern);
- Koala;

- Greater Glider;
- Ornamental Snake;
- Australia Painted Snipe; and
- Brigalow Woodland TEC.

Each of the above MNES are also listed as Matters of State Environmental Significance (MSES).

All the watercourses and drainage lines within the Project area are ephemeral and experience flow only after sustained or intense rainfall and runoff in the catchment. Aquatic ecology surveys found that the lack of both diversity and abundance of aquatic plants at some sites is likely indicative of harsh physical conditions, cattle grazing and trampling, or a combination of these factors. No aquatic flora or fauna species listed under the NC Act, EPBC Act or *Fisheries Act, 1994* were identified in the Project area.

A number of wetlands are located within the Project area, however none are identified as of National or International Importance. Most of these wetlands have been impacted by cattle.

Although desktop mapping indicates that the wetlands may be potential Groundwater Dependent Ecosystems (GDEs), the vegetation and habitat mapping, aquatic survey results and groundwater data collected on-site indicate that the wetlands are, in fact, not GDEs. The only potential GDEs in the vicinity of the Project are associated with the riparian vegetation along the Isaac River, North Creek, Phillips Creek and Cherwell Creek, and the downstream extent of Ripstone Creek.

Measures proposed to avoid and mitigate impacts from the Project on flora and fauna include:

- refinement of the mine design to minimise land clearance;
- vegetation clearance procedures;
- preparation of a Species Management Program;
- progressive rehabilitation of the Project disturbance areas;
- feral animal control strategies;
- bushfire prevention and management; and
- preparation of a Receiving Environmental Management Program.

Significant residual impacts to MNES and MSES are proposed to be addressed through the Project biodiversity offset strategy. Biodiversity offsets would be delivered in stages, commensurate with the staged development of the Project.

A land-based offset would be provided for the initial stage of the Project. Pembroke intends to deliver this land-based offset using its significant landholdings to the immediate northeast of the Project (Figure ES-2). These landholdings cover approximately 34,250 ha, with approximately half of the land covered with remnant vegetation.

ES1.5.2 Water Resources

The Project is located within the headwaters of the Isaac sub-catchment of the greater Fitzroy Basin. The Isaac River is the main watercourse which bisects the Project area and flows in a general north-west to south-east direction past the Project. Tributaries of the Isaac River in the vicinity of the Project include (from upstream to downstream):

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

A review of existing surface water licences along the Isaac River indicates that five surface water users are located upstream of the Project, five are located downstream of the Project, with an additional two users whose location is unknown. The licences are used for mining, diverting flow, irrigation, stock, impounding water, construction and domestic supply.

The groundwater regime relevant to the Project comprises the following hydrogeological units:

- Cainozoic sediments:
 - Quaternary alluvium – an unconfined aquifer localised along the Isaac River;
 - Regolith – an unconfined and largely unsaturated unit bordering the alluvium;
- Triassic Rewan Group – an aquitard;
- Permian coal measures with:
 - hydrogeologically 'tight' interburden units; and
 - coal sequences that exhibit secondary porosity through cracks and fissures.

Groundwater investigations and monitoring conducted for the Project has found that, of the above hydrogeological units, the key aquifer that provides a beneficial use to landholders for agricultural and domestic use is within the unconfined aquifer localised along the Isaac River.

Alluvium is present across the Project area. Immediately outside the Project area, along the narrow corridor of the Isaac River, it can be up to 30 m thick. Groundwater monitoring indicates that only a narrow corridor of alluvium along the Isaac River remains saturated, with the surficial alluvium away from the Isaac River remaining largely dry.

Where groundwater is present within the alluvium, it is generally between 10 m and 20 m below ground level.

A groundwater bore census conducted as part of Project groundwater investigations confirmed that groundwater use in the Project area is limited, largely due to the limited extent of saturated alluvium. Only 11 groundwater bores were located within 5 km of the Project mining areas, and of these, 10 draw water from the alluvium. Only five of these bores are equipped with pumps and are used for stock and domestic purposes.

A significant proportion of mine site water requirements would be sourced from water collected on the site, including rainfall runoff and groundwater inflows to the open cut pits. Additional water demands would be met through allocation from SunWater's Eungella Pipeline, via the Project water pipeline. Extraction from the Isaac River is not proposed to supply water during operations.

Groundwater would be intercepted from the alluvium and underlying aquifers associated with the Permian coal measures through the development of the open cut pits.

Groundwater drawdown due to the development of the Project is predicted to potentially impact five privately-owned groundwater bores. Two of these bores are constructed in the alluvium and three in the Permian coal measures which are not currently used. Groundwater levels at the alluvial bores are predicted to recover following mining. Impacts at the Permian bores are expected to be able to be mitigated by lowering the bore pumps, if they were to be used in the future.

Potential impacts at privately-owned bores would be managed through agreements between Pembroke and the landholders. If groundwater resources are found to be impacted by the Project, measures would be put in place to ensure the bore owner has access to a similar quantity and quality of water for the groundwater bore's authorised purpose.

This may include deepening a bore to increase its pumping capacity, constructing a new water supply bore, providing water from an alternative source or financial compensation.

The extensive surface water and groundwater monitoring programs established for the Project to date would continue during Project operations to monitor potential impacts on water resources. A Water Management Plan and a Receiving Environment Monitoring Program would be developed for the Project to describe the monitoring programs and how the monitoring data would be analysed to identify potential impacts to water resources.

ES1.5.3 Water Quality

Available baseline datasets from Queensland Government and Pembroke's monitoring show that the water quality in the Isaac River during and after significant flow events has exceeded the Isaac River water quality objectives (WQO) for electrical conductivity for short periods of time. For the most part, the water quality in the Isaac River is within the WQOs.

While water within the Isaac River is largely fresh, groundwater within the alluvium along the Isaac River has recorded ranges from fresh to moderately saline. Water within the alluvium is generally suitable for stock water supply and irrigation, however, the alluvial groundwater generally exceeds guideline levels for drinking water and freshwater aquatic systems.

Groundwater within the underlying regolith and coal measures is generally saline, however groundwater in the sandstone units adjacent to the coal measures is generally suitable for stock water supply.

Land disturbance associated with mining activities has the potential to adversely affect the quality of surface runoff by increasing sediment loads from waste rock and reject emplacement areas and releasing mine affected water with high salt loads.

To minimise the potential impacts to the water quality of the receiving environment, the Project water management system has been designed to maintain separation between runoff from areas undisturbed by mining and water generated within active mining areas. In particular, water storage dams that manage mine affected water would be designed and operated to achieve zero uncontrolled release to the receiving environment.

Water collected in sediment dams would be captured and retained for reuse on-site and/or controlled release. Water balance modelling indicates that the proposed controlled release strategy for the Project would achieve the regional WQOs for the Isaac River.

Although saline water bodies are predicted to form within the final voids decades to centuries after the completion of mining, the water bodies would remain below the pre-mining groundwater level, meaning the final voids would act as groundwater 'sinks'. Saline water within the voids would be contained within the voids themselves and would not migrate into the surrounding aquifers.

ES1.5.4 Flooding and Regulated Structures

Open cut mining areas, infrastructure areas and final voids would be isolated from floods through the construction of temporary flood levees and permanent highwall emplacements.

The temporary levees and permanent highwall emplacements would provide flood protection for active open cut pits from a 0.1% annual exceedance probability (AEP) flood event (i.e. a 1 in 1,000 year event). Following mine closure, the permanent highwall emplacements would isolate final voids from all flood events, up to and including a probable maximum flood.

Predicted increases to flood levels and velocities adjacent to and just upstream of the Project are not considered to result in any significant change to the existing flood risk for surrounding privately-owned properties or infrastructure.

A geomorphology assessment prepared for the Project, using the flood modelling results, predicts that although the changes to flood characteristics associated with the development of the Project may result in isolated areas subject to somewhat higher risk of scour compared to the existing situation, the overall risk of rapid and significant geomorphic change in the Isaac River due to the Project would be low.

Dense vegetation cover would be established in the isolated areas which are predicted to experience a higher risk of scour to maintain and enhance stability during and following flood events.

A preliminary assessment of the consequence category of the proposed regulated structures (dams and levees) for the Project has been undertaken by a 'suitably qualified and experienced person' in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* and assigned a preliminary category of 'low' consequence.

ES1.5.5 Air Quality

A range of management measures are proposed to be implemented to minimise dust generation at the Project, including:

- watering of haul roads;
- use of chemical surfactants on haul roads;
- progressive rehabilitation of waste rock emplacements to minimise wind generation of dust;
- water sprays on coal stockpiles, conveyor transfer points and the train load out;
- enclosure of ROM crushing plant; and
- dust suppression systems for drilling operations.

In addition to water sprays during train load-out (i.e. coal moisture regulation), Pembroke would design the train load-out facility consistent with the dust management strategies identified for new facilities in QR Network's *Coal Dust Management Plan*, including:

- automated loading of train wagons to prevent overloading;
- sill beam brushes to remove coal on the outside faces of the train wagons;
- veneering system to prevent coal dust generation during transit to port; and
- use of spill pit to recover spilt coal under the train load out.

Coal would also be tested for dustiness and dust management would be adjusted accordingly based on the results of testing.

Pembroke would also operate a proactive and reactive dust management system which would integrate real-time meteorological and air quality monitoring with meteorological forecasting to enable mining operations to be modified as required in order to achieve compliance with relevant air quality objectives at nearby privately-owned receptors.

Modifying mining operations could include the application of additional dust controls, an increase in the intensity of applied dust controls, reducing the intensity of particular operations or halting particular operations.

With the implementation of the above management measures and monitoring system, air quality levels at nearby sensitive receptors are predicted to remain below the relevant criteria during all stages of the Project.

ES1.5.6 Social Values

Regional communities in the vicinity of the Project, including Moranbah, Dysart, Middlemount and Nebo have strong identities as towns developed to support the mining industry in the region. These communities have experienced the historical cyclical impacts of the coal industry, with corresponding fluctuations in economic prosperity and population numbers.

In recent years, the Isaac Regional Local Government Area has experienced a decrease in population and a significant impact on the housing market associated with the downturn in the mining industry. Reversal of the residential population decline is a key priority for the communities.

Pembroke intends to prioritise the employment of locals from within the Isaac Regional Local Government Area for the operational workforce and would encourage the workforce to live locally.

Consultation undertaken as part of this EIS indicates that the local communities are generally very positive about the Project, with a range of employment and population-based benefits identified. The Project would support social resilience and sustainability in the local communities by:

- offering long-term, locally-based employment, which would increase local community wellbeing;
- enabling population growth and population stability, which would increase community viability (e.g. service availability and volunteer resources);
- supporting workforce involvement and integration with local communities, which would increase social capital;
- increasing demand for local and regional businesses' offerings, with potential for increased indirect employment and business growth; and

- enabling increased labour force participation and development of the region's skills base.

A Social Impact Management Plan has been prepared for the Project to manage potential impacts to rental housing cost inflation, increased demand for social infrastructure and community services and labour draw from local and regional businesses.

ES1.5.7 Economics

Pembroke would work in partnership with the Isaac Regional Council and the local community so that the benefits of the projected economic growth in the region are maximised and impacts avoided or mitigated, as far as possible.

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

- a Project operational workforce of up to approximately 1,300 on-site personnel, when ROM production reaches 20 Mtpa (i.e. from 2034) (an average of 1,000 over the life of the Project);
- a construction workforce of up to 700 people during the construction of the Olive Downs South domain mine infrastructure area in the initial years of the Project (an average of 500 over the entire construction period); and
- a construction workforce in the order of 200 people during the construction of the Willunga domain mine infrastructure area and expansion of the Olive Downs South domain mine infrastructure area around Year 10 of the Project.

The Project is also projected to result in indirect employment impacts associated with related upstream or downstream industries and any 'crowding out' of activity in other sectors of the economy.

Considering these direct and indirect employment impacts, the additional net employment in the Isaac Regional Council Local Government Area and Queensland is projected to peak at 748, and 1,383 fulltime equivalent jobs, respectively.

The projected impact on the Isaac Regional Council Local Government Area gross product peaks at approximately \$1,455 million in 2037. This peak is due to the higher levels of activity within the Isaac Regional Council Local Government Area associated with peak Project production and the flow-on benefits of purchasing inputs to operate the Project.

The projected impact on the Queensland gross product peaks at approximately \$1,865 million in 2040.

A Cost Benefit Analysis conducted for this EIS indicates that the Project would have net production benefits to Australia of approximately \$2 billion.

ES1.5.8 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 Fitzroy Developmental Road, located to the east of the Project (Figure ES-1).

Fitzroy Developmental Road runs directly along the Project eastern boundary at the Willunga domain and would provide access to the Willunga infrastructure facilities in the south-east of the Project extent (Figure ES-2).

Annandale Road, connecting with Daunia Road, is a local road that would be used to access the Olive Downs South domain.

Traffic counts on the road network in the vicinity of the Project indicates that the existing network is operating at an acceptable level with the current road traffic volumes.

To accommodate road traffic movements associated with the construction and operation of the Project, in particular the Olive Downs South domain, Pembroke proposes to form a road infrastructure agreement with the Isaac Regional Council to upgrade parts of Annandale Road and Daunia Road.

A new intersection on the Fitzroy Developmental Road, where it would join the Willunga domain access road would also be constructed as part of the Project, in accordance with the Department of Transport and Main Roads' (DTMR) *'Road Planning and Design Manual (Edition 2) – Volume 3: Supplement to Austroads Guide to Road Design Part 4A'* (2014).

With the exception of the upgrades to Annandale Road and Daunia Road, and the new intersection on the Fitzroy Developmental Road and Daunia Road, the existing road system is predicted to satisfactorily accommodate the expected future traffic generated by the Project without need for additional specific measures.

Pembroke would prepare a Road Use Management Plan in consultation with DTMR and the Isaac Regional Council.

The Road Use Management Plan would include measures to manage the safety of road users, workforce transport management strategies, driver fatigue management and monitoring.

The Project rail spur would not cross any existing roads and would therefore not have any direct impacts on the existing road network.

It is expected that, on average, between four and six trains would be loaded per day when the Project is operating at its peak production rate. Discussions with Aurizon indicate that there would be sufficient capacity in the regional rail network to accommodate the rail movements associated with the Project.

ES1.5.9 Noise and Vibration

As the Project expands to its peak production rate, noise emissions are predicted to increase, primarily due to the associated increase in mining fleet and the mining operations expanding towards the nearby privately-owned dwellings. Fixed plant, specifically the overland conveyor, is also predicted to contribute to noise levels at privately-owned dwellings in its vicinity.

Noise modelling across a number of stages of the Project predicts that mining fleet operating in the closest proximity to the nearby privately-owned dwelling and part of the overland conveyor would require some level of noise attenuation to reduce noise emissions and enable compliance with the relevant noise criteria at the nearby privately-owned dwellings.

In addition to noise attenuation of some mobile fleet and part of the overland conveyor, Pembroke would operate a proactive and reactive noise management system which would integrate real-time meteorological and noise monitoring with meteorological forecasting to enable mining operations to be modified as required in order to achieve compliance with relevant noise criteria at nearby privately-owned receptors.

Modifying mining operations could include reducing the intensity of particular operations in areas closest to the sensitive receptors or halting particular operations.

With the implementation of the above management measures and monitoring system, noise levels at nearby sensitive receptors are predicted to remain below the relevant criteria during all stages of the Project.

ES1.5.10 Land

No Strategic Cropping Areas are located within the Project footprint. Anecdotal evidence, supported by groundwater and soil resource assessments conducted for this EIS, indicates that the lack of highly productive groundwater resources and good quality agricultural land limits the capability of the land within the Project site to support cropping.

The Project would be progressively rehabilitated to ultimately create a final landform that is able to sustain low-intensity cattle grazing and woodland vegetation, as per the current land use of the Project site.

Development of the Project would alter the topography and landforms within the Project site. Some topographic changes would be temporary (i.e. temporary bunds/levees and drains) while others would be permanent (i.e. rehabilitated landforms). Direct views of the elevated Project landforms are not expected to be significant from nearby dwellings, given the large separation distances and presence of intervening vegetation.

Although part of the Project rail spur and water pipeline cross two lots designated as Stock Routes, the Project is not expected to significantly impact the use of the Stock Routes.

ES1.5.11 Cultural Heritage

Historical and archival research and review of heritage registers and a field survey was undertaken as part of the EIS.

No items of significance were identified on the following heritage lists within the Project site:

- World Heritage List;
- National Heritage List;
- Commonwealth Heritage List;
- Queensland Heritage Register;
- Local Heritage Register;
- Register of National Estate (former); or
- Register of the National Trust Queensland.

The heritage sites identified within the Project area do not have sufficient heritage value to consider inclusion on a local heritage register and none of the identified sites are considered to be of heritage significance.

In addition, Pembroke has formed an Indigenous Land Use Agreement and a Cultural Heritage Management Plan with the Barada Barna Aboriginal Corporation, which provides consent to the conduct of the Project, subject to other approvals, and outlines the engagement to be undertaken prior to development of the Project.

ES1.5.12 Waste Management

The primary source of waste to be generated at the Project is excavated waste rock and fine and coarse rejects, other waste streams include regulated and non-regulated wastes.

A Waste Management Program would be developed and implemented at the Project to minimise the potential environmental impacts associated with waste generation.

ES1.5.13 Biosecurity

Introduced flora species occur within the Project area and are likely due to the high level of past clearance and the current land use (e.g. grazing). 15 of the introduced species recorded within the Project area are identified as Restricted Matter species listed under the Queensland *Biosecurity Act, 2014*, comprising 11 flora species and four fauna species.

Consistent with the general biosecurity obligations outlined by the *Isaac Regional Council Local Government Biosecurity Plan*, Pembroke would manage the Project so that it does not result in the spread of pests, diseases or contaminants. The following measures would be implemented at the Project in order to control and limit the spread of pests and weeds:

- vegetation clearance procedures;
- progressive rehabilitation;
- feral animal control strategies;
- weed management; and
- development of a Weed and Pest Management plan.

ES1.5.14 Hazards and Community Safety

A number of hazardous substances would be used during the construction and operation of the Project, including hydrocarbons, explosives and other chemicals. Further to this, natural events (e.g. bushfires and floods) may result in hazardous situations within the Project area and the surrounding locality.

A number of hazard mitigation and management measures would be described in the management plans for the Project. Management plans identified as part of the preliminary risk assessment include:

- Air Quality Management Plan;
- Blast Management Plan;
- Cultural Heritage Management Plan;
- Social Impact Management Plan;
- Water Management Plan; and
- Rehabilitation and Mine Closure Plan.

ES1.6 GENERAL ENVIRONMENTAL MANAGEMENT COMMITMENTS AND MODEL CONDITIONS

As part of this EIS, Pembroke has developed proposed EA conditions which are generally consistent with the *Model Mining Conditions* (Version 6) or the guideline *Structures which are dams and levees constructed as part of environmentally relevant activities* (ESR/2016/1933).

Key environmental management measures to be implemented for the Project include:

- provision of biodiversity offsets for significant residual impacts to MNES and MSES;
- operation of a Project water management system to protect the integrity of local and regional water resources;
- construction of temporary flood levees and permanent highwall emplacements to isolate operational mining areas and the final voids from floods;
- operation of proactive and reactive air quality and noise management systems using a combination of real-time monitoring, meteorological forecasting and best practice management measures; and
- rehabilitation of the Project site to achieve a final landform that is safe, non-polluting, stable and able to sustain low intensity grazing and woodland vegetation.

Further to the above, Pembroke has committed to the preparation and implementation of the following plans, programs and strategies to minimise impacts to environmental values:

- Species Management Program;
- Weed and Pest Management Plan;
- Fauna Species Management Plan;

- Receiving Environment Monitoring Program;
- Water Management Plan;
- Erosion and Sediment Control Plan;
- Groundwater Monitoring and Management Program;
- Surface Water Monitoring Program;
- Mineral Waste Management Plan;
- Air Quality Management Plan;
- Noise Management Plan;
- Blast Management Plan;
- Social Impact Management Plan;
- Road Use Management Plan;
- Rehabilitation and Mine Closure Plan;
- Rehabilitation Monitoring Program;
- Topsoil Management Plan;
- Emergency Response Procedure; and
- Waste Management Program.