Central Queensland Coal Project

Chapter 3 – Description of the Project

Environmental Impact Statement

CDM Smith

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Central Queensland Coal Project

Chapter 3 – Description of the Project

24 October 2017

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3 Description of the Project

This describes the Central Queensland Coal Project (the Project) location, resource base and mining methods, including the timing of operations, disturbance areas, processing and products and operational infrastructure and workforce. Additional information regarding the process for identifying the various components of the Project is provided in Chapter 2 – Project Needs and Alternatives.

3.1 Project Overview

Central Queensland Coal is proposing to develop the Project located on Mineral Development Licence (MDL) 324, a greenfield site. The Project includes:

- Three open cut operations, associated mining activities and mining infrastructure;
- A train loadout facility (TLF) to load coal onto trains and provide a new connection to the North Coast Rail Line; and
- A transport corridor to transport coal from the mine to the TLF.

It is proposed that there will be two separate mining leases, which will cover the mining areas and TLF.

3.1.1 The Central Queensland Coal Project

The Project is located 130 km northwest of Rockhampton in the Styx Coal Basin in Central Queensland. The Project will be located within Mining Lease (ML) 80187 and ML 700022, which are adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029, both of which are held by the Proponent.

The Project will involve mining a maximum combined tonnage of up to 10 million tonnes per annum (Mtpa) of semi-soft coking coal (SSCC) and high grade thermal coal (HGTC). Development of the Project is expected to commence in 2018 and extend for approximately 20 years until the current reserve is depleted.

The Project consists of three open cut operations that will be mined using a truck and shovel methodology. The run-of-mine (ROM) coal will ramp up to approximately 2 Mtpa during Stage 1 (Year 1-4), where coal will be crushed, screened and washed to SSCC grade with an estimate 80% yield. Stage 2 of the Project (Year 4-20) will include further processing of up to an additional 4 Mtpa ROM coal within another coal handling and preparation plant (CHPP) to SSCC and up to 4 Mtpa of HGTC with an estimated 95% yield. At full production two CHPPs, one servicing Open Cut 1 and the other servicing Open Cut 2 and 4, will be in operation.

A new train loadout facility (TLF) will be developed to connect into the existing Queensland Rail North Coast Rail Line. This connection will allow the product coal to be transported to the established coal loading infrastructure at the Dalrymple Bay Coal Terminal (DBCT).

The Project is located within the Livingstone Shire Council (LSC) Local Government Area (LGA). The Project is generally located on the “Mamelon” property, described as real property Lot 11 on MC23, Lot 10 on MC493 and Lot 9 on MC496. The TLF is located on the “Strathmuir” property, described as real property Lot 9 on MC230. A small section of the haul road to the TLF is located on the “Brussels” property described as real property Lot 85 on SP164785.

3.2 Location

3.2.1 State Context

The Project is located in the Styx Coal Basin in Queensland, approximately 130 km northwest of Rockhampton. The Styx Coal Basin is an area of historical mining and grazing related communities in Central Queensland that extends over approximately 300 square kilometres (km^2) onshore and 500 km^2 offshore, under water depths of up to 100 metres (Geoscience Australia, 2017). The Styx Basin is a minor basin compared to the nearby Bowen Basin.

The location of the Project within the Styx Basin and its proximity to major Queensland towns is shown at Figure 3-1.

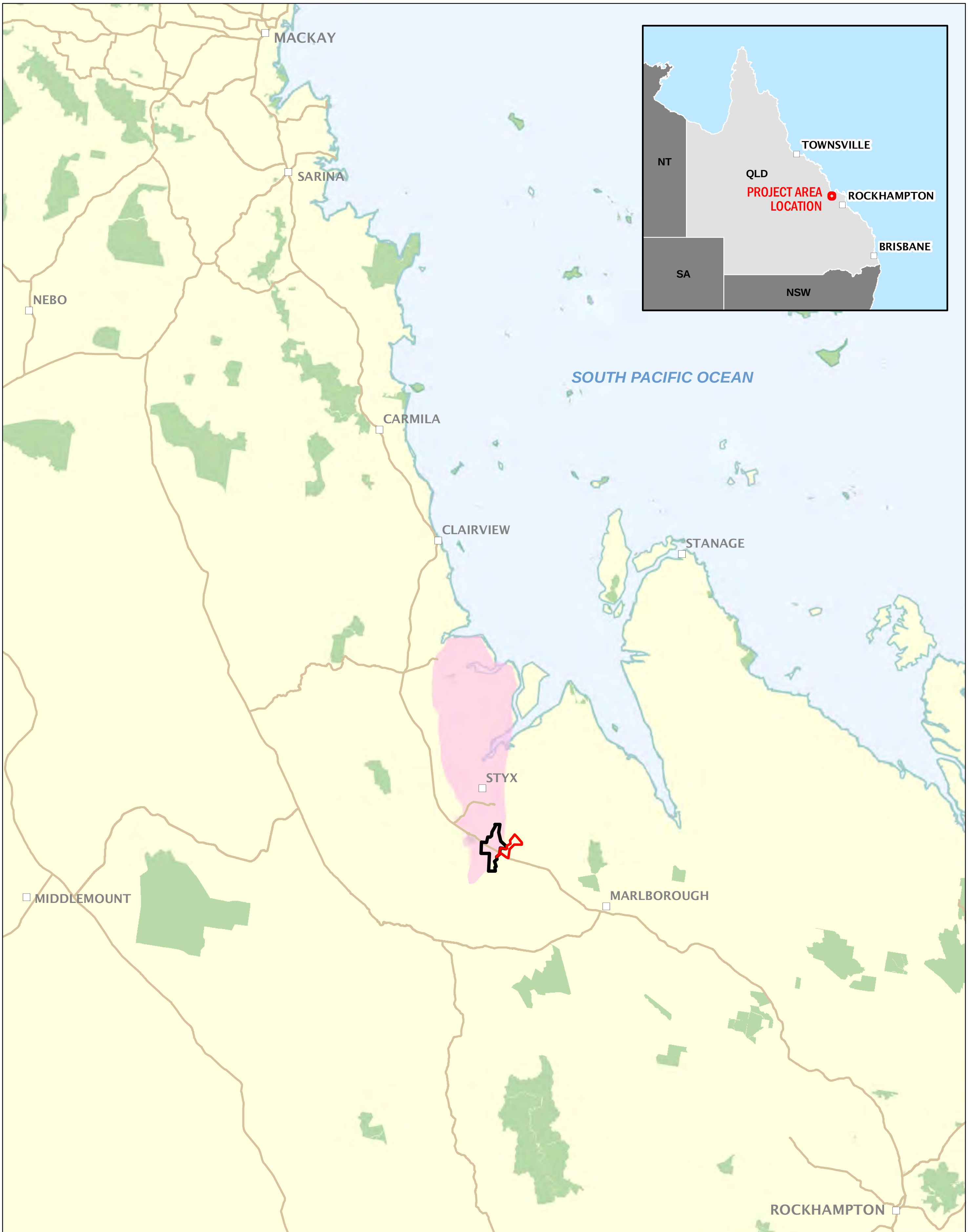

Figure 3-1

Project location state context

0 10 20 km

Scale @ A4 1:1,050,000
Date: 11/07/17
Drawn: Gayle B.

Legend

- ML 80187
- ML 700022
- Styx Coal Basin

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017
Geoscience Australia, 2017

CDM Smith

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3.2.2 Regional Context

The Project is located within the LSC LGA (Figure 3-2). The LSC LGA was established after de-amalgamation on 1 January 2014 and covers approximately 11,776 km^2 with a population of more than 37,000 residents. The major centres include the coastal towns of Yeppoon and Emu Park, with the smaller villages of Byfield, Farnborough, Cawarral, Keppel Sands, The Caves, Marlborough, Ogmore and Stanage Bay.

The nearest town to the Project is Ogmore, located approximately 10 km to the north of the Project. Marlborough, another nearby town, is located approximately 25 km to the southeast. The construction workforce will be sourced from locals to the area. Drive-in drive-out (DiDo) workers will be accommodated at existing accommodation in the Marlborough, Ogmore and St Lawrence region. Where these local and regional towns are not able to service the personnel, an accommodation camp will be developed outside the ML. The proposed accommodation camp is outside the scope of this EIS. Rockhampton is located approximately 130 km to the southeast of the Project and Mackay, approximately 160 km to the north. Both centres will likely be used as the main transit locations for the parts of the workforce that will not be local residents.

The Project will utilise the North Coast Rail Line to transport coal to the DBCT at the Port of Hay Point which is the preferred port facility to be utilised by the Project. The DBCT is located approximately 175 km north of the Project.

3.2.3 Local Context

The Project is largely located within the Marlborough Plains subregion, one of the 13 subregions of the Brigalow Belt North bioregion. The southern portion of the Mine Lease (ML) occurs in the adjacent Nebo-Connors Ranges subregion. The Project area is located close to the boundary of the Brigalow Belt South bioregion located to the south. Vegetation within the Marlborough Plains subregion is dominated by alluvial plains and colluvial slopes, usually supporting woodlands characterised by Poplar Gum (*Eucalyptus platyphylla*), Ghost Gum (*Corymbia dallachiana*), Forest Red Gum (*E. tereticornis*) and paperbarks (*Melaleuca* spp.) with low rises supporting Narrow-Leaved Ironbark (*E. crebra*).

Large sections of the Brigalow Belt North bioregion have been cleared of remnant native vegetation for grazing, agriculture and mining. Remaining vegetation is generally confined to rockier hilly areas, linear strips of roadside vegetation, riparian vegetation and relatively small isolated remnants. Thus, clearing over the past 150 years has resulted in a highly-fragmented landscape with remnant vegetation patches separated by large expanses of cleared land.

Areas to the north and east of the Project area have been substantially impacted by vegetation clearing associated with cattle grazing activity. Connectivity between remaining tracts of vegetation is tenuously maintained by thin strips of riparian vegetation along creek lines such as Tooloombah Creek and Deep Creek which border the Project. Nevertheless, woodland and open forest habitat remaining in the south and east of the site remains contiguous with an extensive tract of remnant vegetation, which includes Tooloombah Creek Conservation Park. To the west of the Project remain extensive tracts of remnant forest associated with the nearby Broadsound Range.

Vegetation within the Project area and immediate surrounds comprises:

- Heavily disturbed habitats that have previously undergone significant clearing for cattle production. Where this habitat occurs north of the Bruce Highway it is often dominated by patches of regrowth Brigalow;
- Substantial areas of less disturbed eucalypt woodland; and
- Smaller pockets of relatively closed canopy (open forest) vegetation generally with a dense weedy shrub layer. These are largely associated with the creek systems adjacent to the Project (ML) boundary.

The Project is wholly contained within the Styx River Basin, comprising of Styx River, Waverley and St Lawrence Creeks. The Styx Basin discharges to the Great Barrier Reef Marine Park (GBRMP), which is listed as a World Heritage Area. The Project is bordered by two watercourses as defined under the Water Act, namely Tooloombah Creek and Deep Creek. These creeks meet at a confluence downstream of the Project area to form the Styx River. The coastal zone, commencing downstream of the North Coast Rail Line, is located approximately 10 km downstream of the ML area. The GBRMP is located approximately 40 km downstream of the ML area.

The Fitzroy Basin Association Natural Resource Management (NRM) body manages waters within the Styx Basin. Fitzroy Basin Association NRM body encompasses eight sub-catchments; Lower-Fitzroy, Isaac-Connors, Comet, Upper Dawson, Lower Dawson, Styx-Herbert, Water Park and Boyne-Calliope. Due to the NRM comprising an area over 152,000 km^2, the region has been split into 192 Neighbourhood Catchments. The Project is located within the F3 Neighbourhood Catchment which is described as having a high sediment delivery ratio to the Great Barrier Reef with a low number of landholders within the basin (Fitzroy Basin Association, 2015). Sediment in the Fitzroy Region is the most significant risk to the Great Barrier Reef, an estimated 1.5 million tonnes of extra sediment deposited each year - 83% of the sediment coming from grazing land. It is estimated that the Styx Basin contributes 97,892 t per year. The load contributions from the Styx Basin are based on limited monitoring results. Cattle grazing is the dominant land use of the area (80%) and the basin contains 14% wetland areas. Many of the wetlands are Estuarine systems (8.8%) with approximately 187 lacustrine/palustrine wetlands (EHP 2017).

The existing land use and the natural features of the Project area are presented in Figure 3-3 and Figure 3-4, respectively.

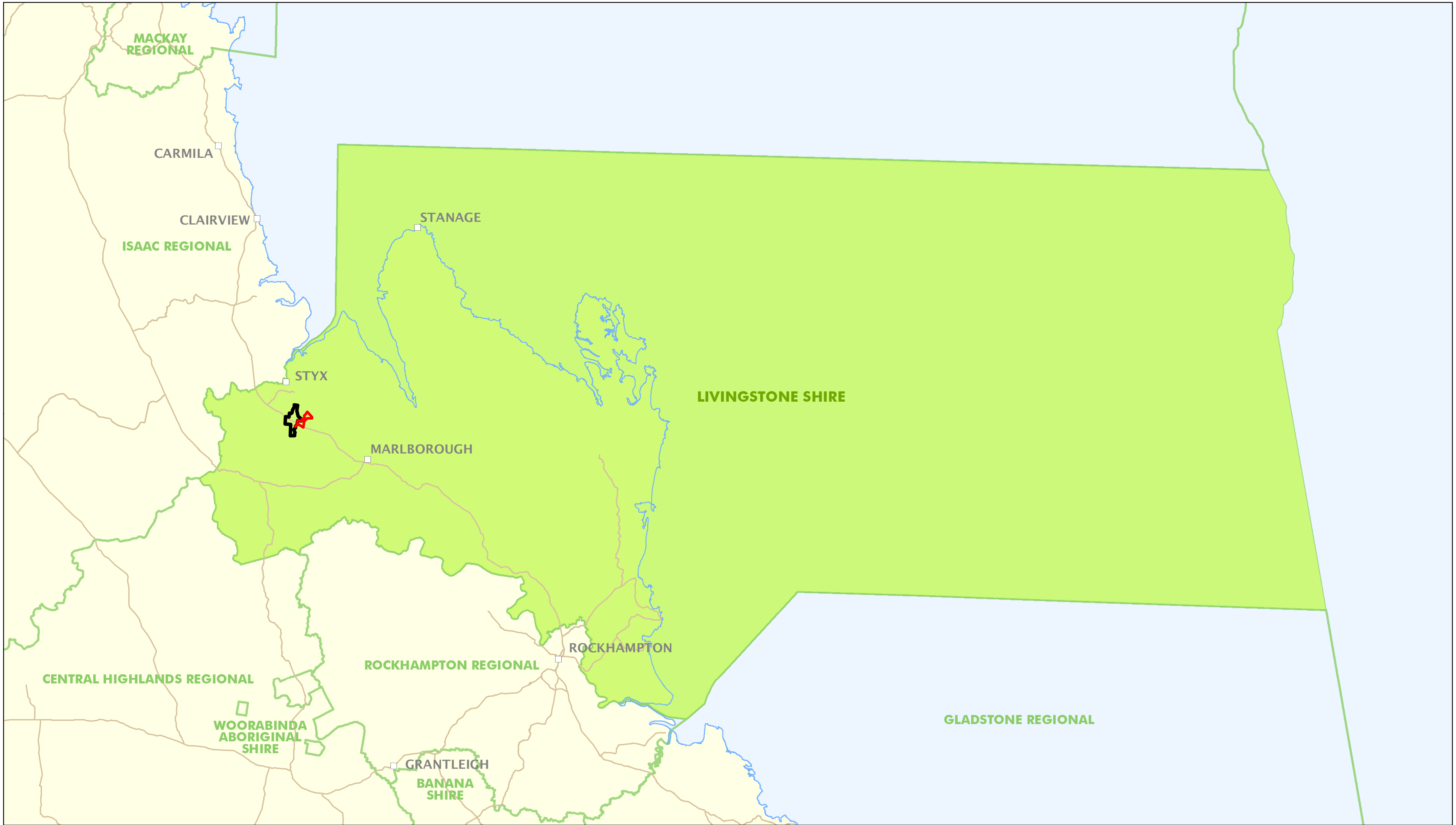

Figure 3-2
Project location LGA

Legend
- ML 80187
- ML 700022
- Main road

Local Government Area
- Livingstone Shire
- Surrounding LGA boundaries

Scale @ A4 1:1,650,000
Date: 17/07/17
Drawn: Gayle B.

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

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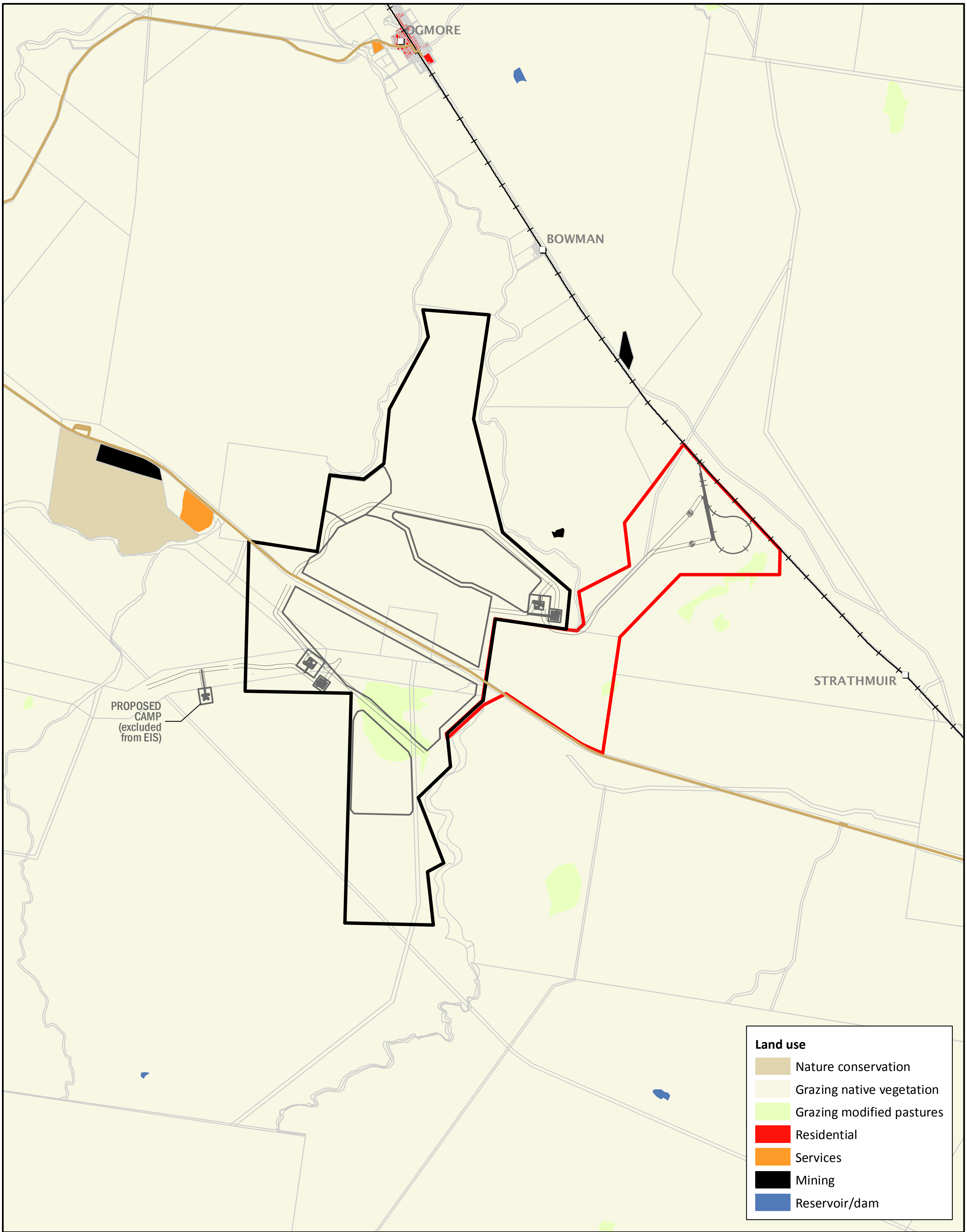


Figure 3-3
Existing land use in the Project area

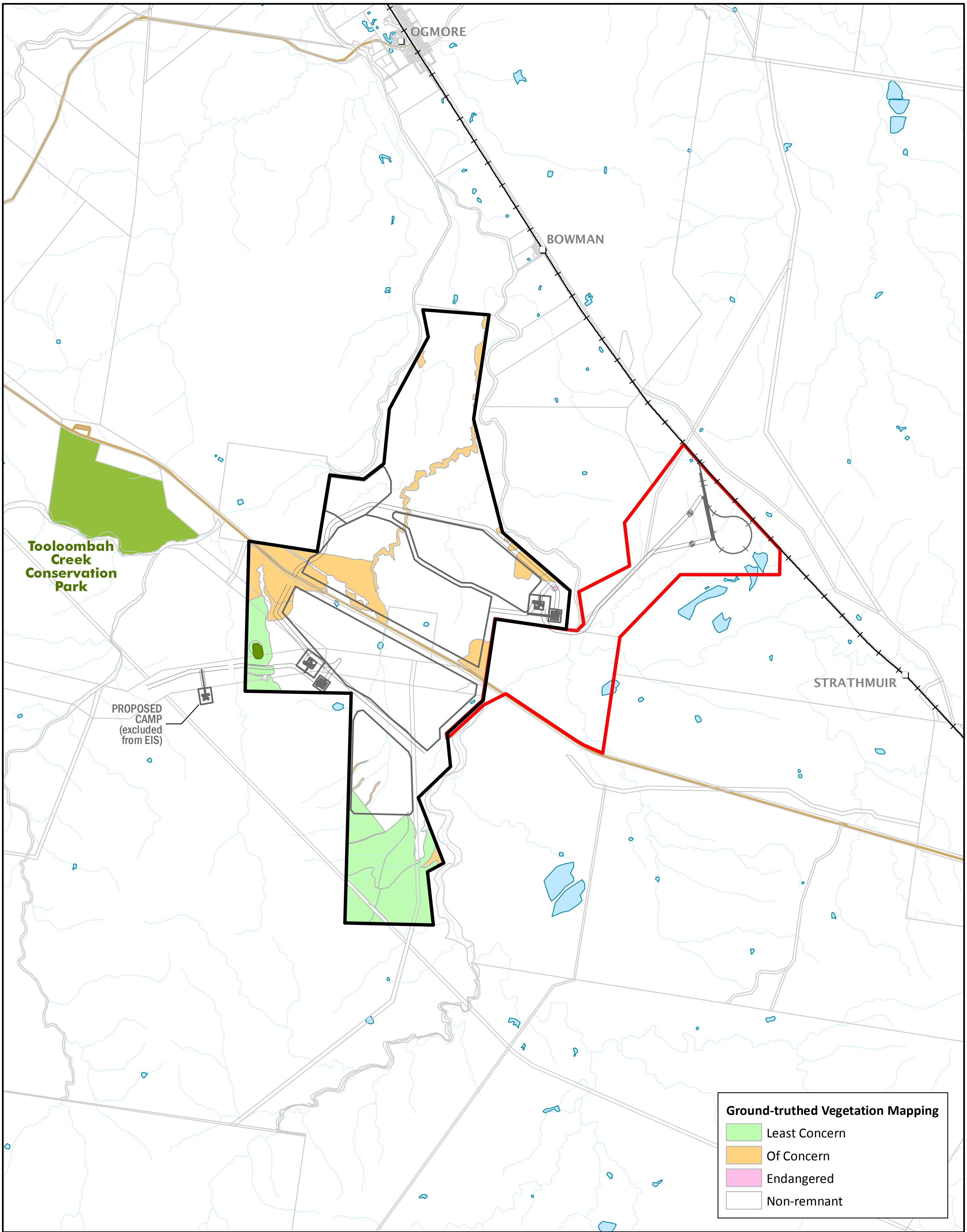
0 1 2 km

Scale @ A4 1:80,000
Date: 12/07/17
Drawn: Gayle B.

Legend
- ML 80187
- ML 700022
- Proposed mine infrastructure
- North Coast Rail Line
- Main road
- Cadastral boundary

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith



Legend
- ML 80187
- ML 700022
- Proposed mine infrastructure
- Protected Area
- Wetland Protection Area
- Reservoir
- North Coast Rail Line
- Main road
- Cadastral boundary
- Watercourse

0 1 2 km

Scale @ A4 1:80,000
Date: 08/08/17
Drawn: Gayle B.

Figure 3-4
Project area natural features

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

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3.2.3.1 Real Property Description

The mine area is located entirely within part of the Mamelon cattle property, situated on Lot 10 on MC493, Lot 1 on RL3001, Lot 11 on MC23 and Lot 9 on MC496, all of which are freehold tenures. The east-west oriented, Mt Bisson Road road reserve also traverses the mine area. Central Queensland Coal is working with the Department of Natural Resources and Mines, Department of Transport and Main Roads (DTMR) and Livingstone Shire Council to have the Mt Bisson Road realigned, resulting in the road connecting to the Bruce Highway closer to Tooloombah. The transport corridor is situated on Lot 10 on MC493 (Mamelon), Lot 85 on SP164785 (Brussels) and Lot 9 on MC230 (Strathmuir), all of which are freehold tenures. The TLF is to be located entirely Lot 9 on MC230 (Strathmuir).

Land tenure details for properties within or intersected by the Project area are included in Table 3-1 and the cadastral boundaries are shown in Figure 3-5.

Table 3-1 Real property descriptions

Property description	Property name	Tenure	Current use	Proposed use	Owner and occupier
Project Mine Area					
Lot 10 on MC493	Mamelon	Freehold	Grazing	Mining	QNI Metals PTY LTD
Lot 1 on RL3001					
Lot 11 on MC23					
Lot 9 on MC496					
AAP16117	Mt Bisson Road	Road Reserve	Grazing	Mining	Livingstone Shire Council
Haul Road Corridor					
Lot 9 on MC230	Strathmuir	Freehold	Grazing	Transport Corridor	Russell Charles Smith, Elizabeth Joan Smith and Edward George Smith
Lot 85 on SP164785	Brussels	Freehold	Grazing	Transport Corridor	Scott Robert McCartney
TLF					
Lot 9 on MC230	Strathmuir	Freehold	Grazing	TLF	Russell Charles Smith, Elizabeth Joan Smith and Edward George Smith

3.2.3.2 Native Title

The Barada Kabalbara Yetimarala People have a current Native Title claim over the area where the mine pits, TLF, ancillary infrastructure are proposed (Tribunal Number: QC2013/004) (see Figure 3-6). Native Title has been extinguished over the entire mine area as the mine pits and all associated infrastructure are located on freehold tenure.

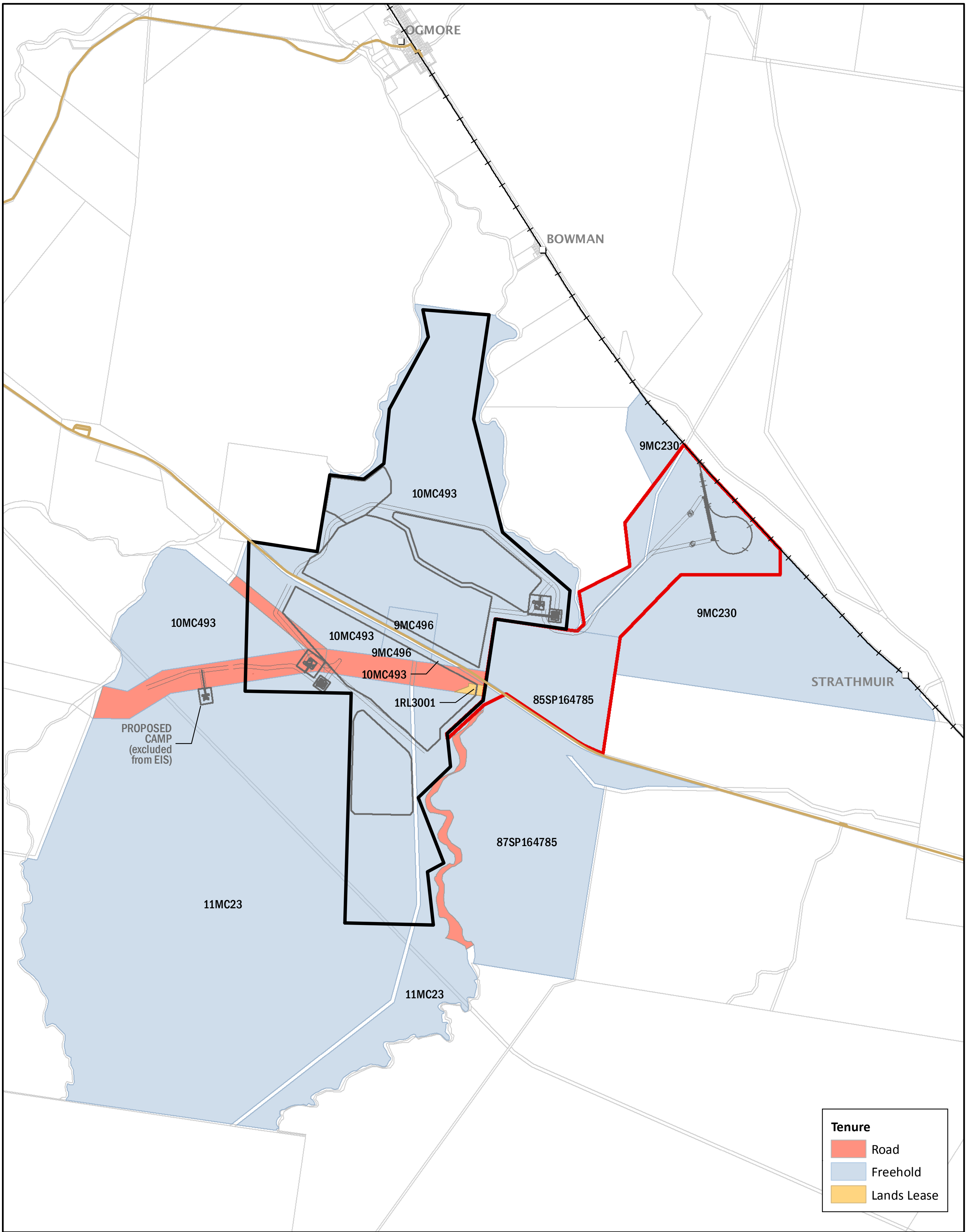

Figure 3-5

Underlying real property descriptions and cadastre

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Date: 12/07/17
Drawn: Gayle B.

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

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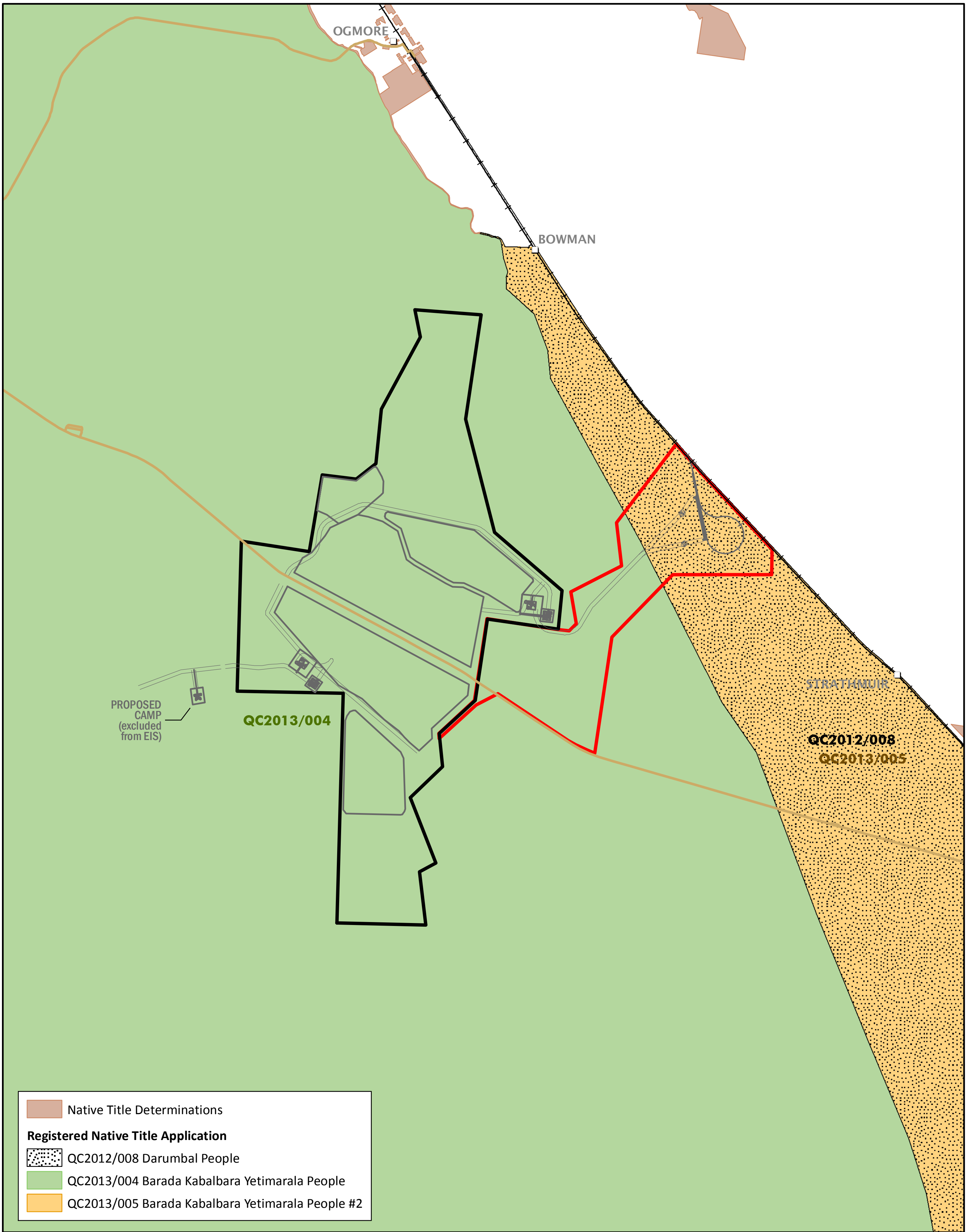

Figure 3-6
Native Title tenure

Scale @ A4 1:80,000
Date: 21/07/17
Drawn: Gayle B.

DATA SOURCE
National Native Title Tribunal, 2017
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

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3.2.3.3 Existing Coal and Mineral Tenements

The mine area will be located within ML80187, held by Central Queensland Coal Pty Ltd. ML80187 abuts MDL 468 held by Fairway Coal Pty Ltd to the north and east.

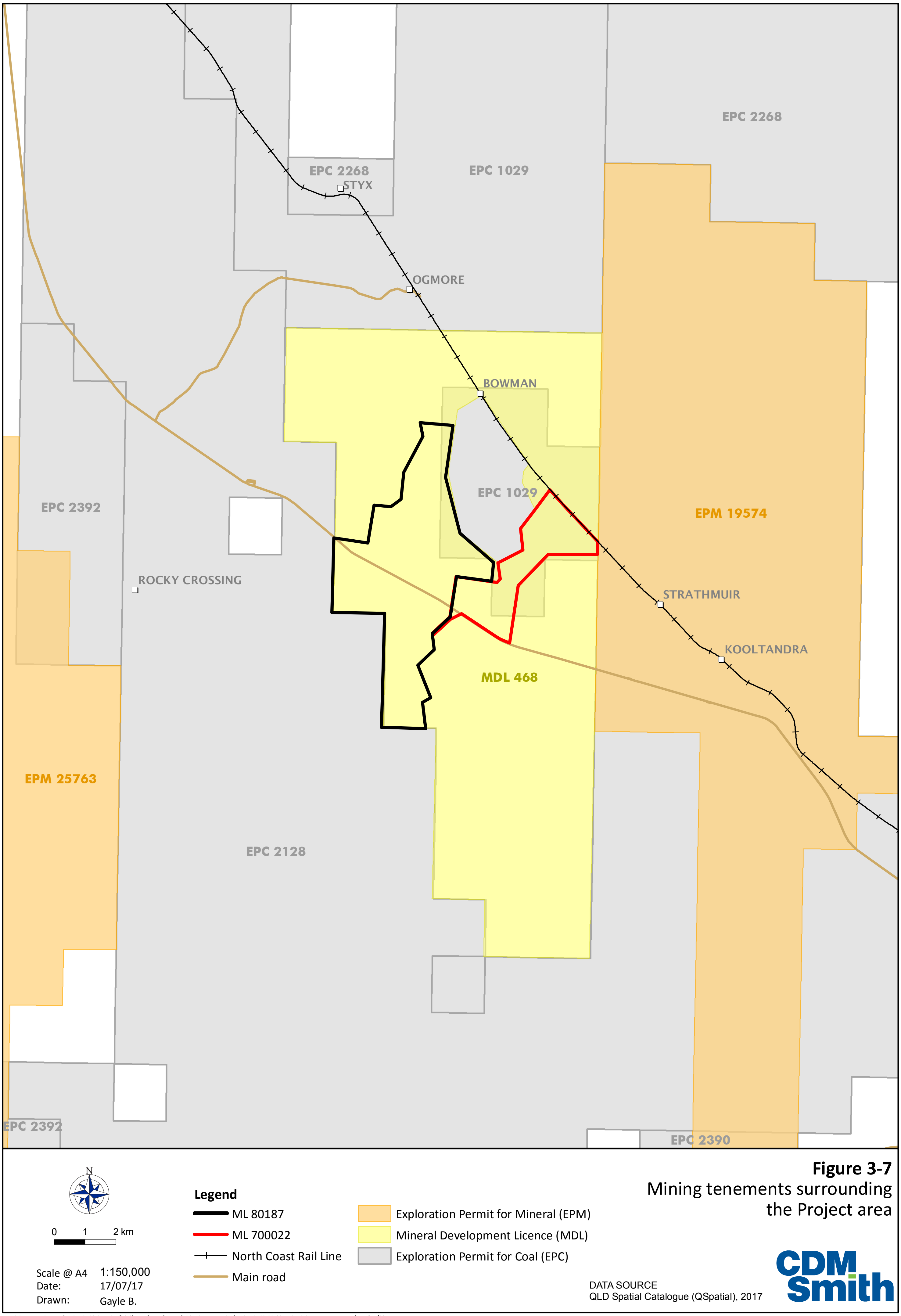
The transport corridor is in part located in ML80187. An additional ML (ML700022) is under application for the remainder of the haul road corridor and the TLF. The additional ML is held by Central Queensland Coal Pty Ltd and Fairway Coal Pty Ltd.

The Project will not overlap with any other mineral tenements including Exploration Permits for Minerals (EPM), Greenhouse Gas or Geothermal leases.

The surrounding area outside the Project footprint comprises EPC1029 held by Fairway Coal Pty Ltd, EPC2128 held by Scorpion Energy Pty Ltd, EPM Bandanna Oil Shale Pty Ltd and EPM19574 held by Marlborough Nickel. Details of the existing EPCs, MDLs and MLs are included at Table 3-2 and shown at Figure 3-7.

Table 3-2 Mining tenements in the immediate vicinity of the Project

Tenement	Tenure Holder	Granted	Expires
Mining Leases			
EPC 1029	Fairway Coal Pty Ltd	20/04/2006	19/04/2016*
EPC 2268	Waratah Coal Pty Ltd	27/06/2011	26/06/2019
EPC 2128	Scorpion Energy Pty Ltd	05/02/2013	04/02/2018
EPC 2392	Civil and Mining Resources Pty Ltd	22/04/2015	21/04/2020
EPM 19574	Marlborough Nickel Pty Ltd	13/12/2012	12/12/2017
EPM 16553	Bandanna Oil Shale Pty Ltd	14/01/2008	13/01/2019
EPM 25763	Orion Gold NL	15/05/2015	13/05/2020
EPM 25703	Orion Gold NL	30/10/2015	29/10/2020
EPM 25122	Orion Gold NL	12/02/2013	12/01/2018
EPM 19825	Orion Gold NL	12/02/2013	12/02/2018
MDL 468	Fairway Coal Pty Ltd	22/01/2014	21/01/2019
ML 80187	Central Queensland Coal Pty Ltd	15/06/2012	TBA
ML 700022	Central Queensland Coal Pty Ltd	23/05/2017	TBA
Petroleum Lease			
PSL 2019	Arrow Bowen Pipeline Pty Ltd	3/03/2016	3/02/2017



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Drawn: Gayle B.

Figure 3-7
Mining tenements surrounding the Project area

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\03 EIS Preparation\BES150160.03-007 R2 mining tenements.mxd 7/17/2017

3.2.3.4 Petroleum Tenements

No Authority to Prospect or petroleum production tenements (PLs) overlap with the Project's components.

3.2.3.5 Sterilisation of Resources

Infrastructure has been located on the mine in areas where it allows for the most economical recovery of the coal resource and will not result in the sterilisation of future reserves. Coal seam extraction will take place in the targeted coal seams. Central Queensland Coal will ensure maximum resource utilisation, which will ensure that low grade or uneconomic deposits are not sterilised for future extraction. Residual overburden and uneconomic in-situ deposits will be monitored and evaluated and managed in accordance with Chapter 11 – Rehabilitation and Decommissioning.

3.2.4 Disturbance Areas

The disturbance area for the mine is approximately 1,160 ha in total. A breakdown of the disturbance area for key infrastructure is shown at Table 3-3. Descriptions of the disturbance areas for the mine pit and related mining infrastructure, haul road and TLF are provided in Sections 3.2.4.1, 3.2.4.2 and 3.2.4.3. It should be noted that there are no easements within the Project footprint. There is a farm residence complex (refer to Chapter 18 – Cultural Heritage), including an unused tennis court, shed, uninhabited house (currently used as the site office), stockyards and two windmills.

Table 3-3 Disturbance areas for key Project components

Component	Approximate area (ha)
Project Mine Area Total Disturbance	**1,128**
Open Cut 1	311
Open Cut 2	340
Open Cut 4	60
Waste Dump 1	133
Waste Dump 2	164
CHPP 1 and 2	21
MIA 1 and 2 including haul roads	19
Water Infrastructure (dams)	68
Conveyors	12
Haul Road (MIA to TLF)	**9**
TLF Area	**23**
TOTAL	**1,160**

3.2.4.1 Mine Area

The extraction and processing of coal will take place on the mine area. The mining lease application area is 2,275 ha in size. The Project will physically occupy an area of 1,160 ha within the mining lease application areas.

The mine area comprises of three open cut operations, three waste rock dumps, dams, and initially a single mine industrial area (MIA), Coal Handling Preparation Plant (CHPP) and conveyor. A second CHPP and MIA will be introduced adjacent to Open Cut 1 as ROM volumes increase towards 10 Mtpa. Buffer zones will be provided within the mine layout to separate the Project's activities from retained ecological features including Deep and Tooloombah Creeks and associated riparian vegetation.

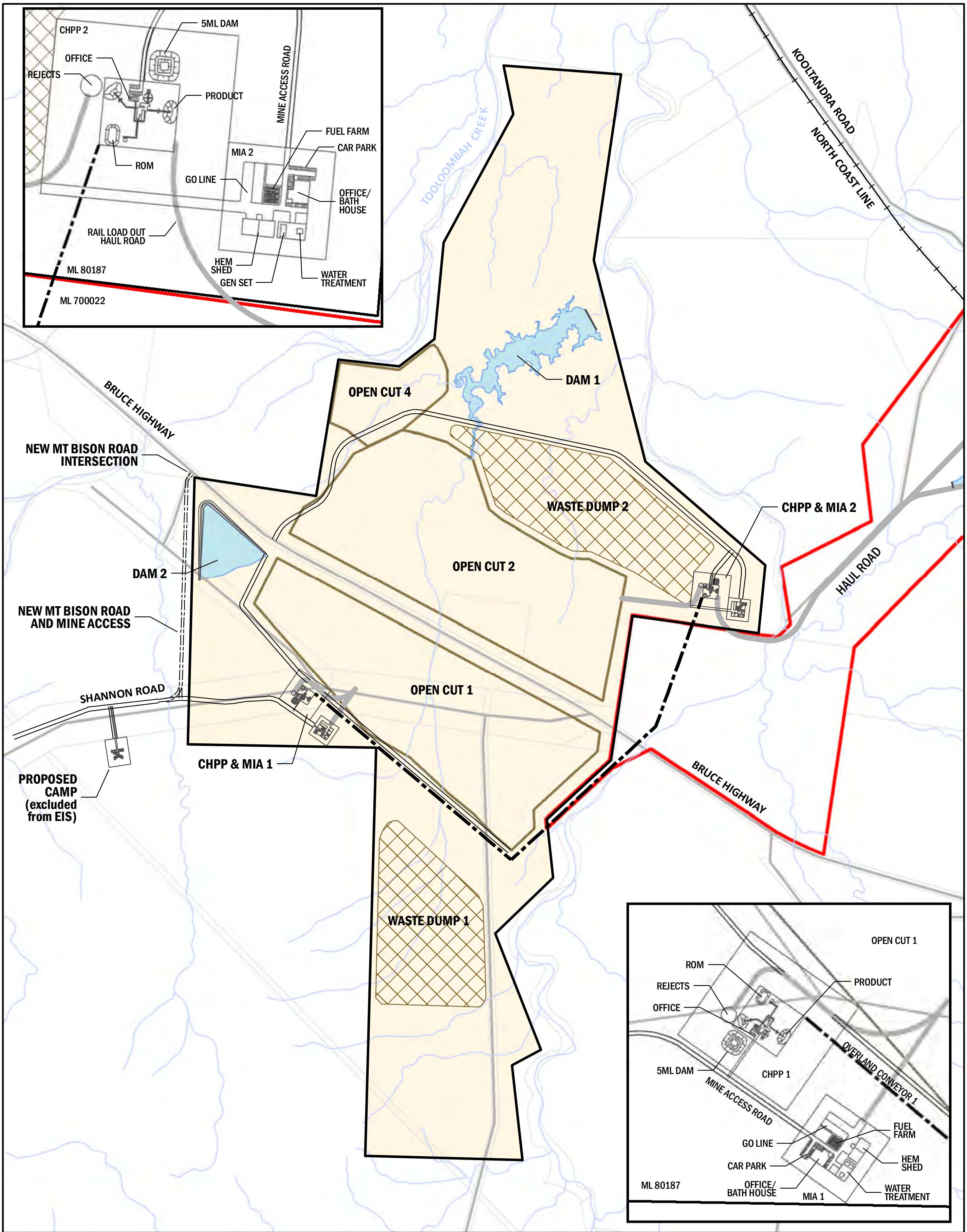
The general arrangement of the mine area is shown at Figure 3-8.

The final landform footprint including the rehabilitated waste rock dumps, backfilled pits and infrastructure required over mine life all of which will be decommissioned and rehabilitated are discussed in Chapter 11 – Rehabilitation and Decommissioning.

3.2.4.2 Haul Road Corridor

The transportation of coal from the product stockpiles to the TLF will be via the proposed transport corridor. The ML for the transport corridor will be approximately 750.2 ha. Central Queensland Coal will haul coal by truck along a transport corridor from the product stockpiles to the TLF. The proposed transport corridor originates from the area adjacent to the north-east corner of the Open Cut 2 and ends at the TLF approximately 4.5 km to the east (see Figure 3-9). The disturbance area of the haul road will be approximately 4.5 km x 20 m, resulting in an area of approximately 9 ha being disturbed.

The corridor crosses Deep Creek at the existing crossing point in the road reserve. The crossing will be upgraded and constructed to provide sufficient access to the TLF during normal weather conditions. The crossing upgrade will be designed to limit works within the watercourse and constructed to allow ongoing movement of vehicles and stock around properties if required by landholders.



N

Legend

- ML 80187
- ML 700022
- Open-cut Mine Pit
- Dam Catchment
- Waste Dump Area
- Overland Conveyor
- North Coast Rail Line
- Proposed mine infrastructure
- Haul roads
- Main road
- Cadastral boundary
- Watercourse

0 0.5 1 km

Scale @ A4 1:45,000
Date: 24/07/17
Drawn: Gayle B.

DATA SOURCE
QLD Open Source Data, 2017

Figure 3-8
Mine arrangement and haul road corridor

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3.2.4.3 Train Loadout Facility

Product coal will be stockpiled and loaded onto trains at the TLF. The ML area for the TLF is approximately 750.2 ha and the disturbance area for the TLF within the ML area will be approximately 23 ha.

The TLF will comprise a product coal stockpile, train loading hardstand area, environmental dam, rail loop and rail spur. The TLF will be constructed for the transfer of coal via the Queensland Rail (QR) North Coast Line (NCL) and then a short section of the Aurizon Goonyella rail corridor to the DBCT. The general layout of the TLF is shown in Figure 3-9 and the longitudinal section at Figure 3-10.

The TLF will be constructed entirely on freehold land known as part of Lot 9 on MC230. The northern boundary of the TLF abuts the QR North Coast Line shown as Lot 450 on SP108288. Works within the adjacent QR NCL corridor to connect the Project rail loop to the existing QR North Coast Line at the QR NCL / Project land boundary, will be carried out by QR as separate works to those authorised by this EIS.

The loaded train will be 1 diesel-electric locomotive hauling 40 coal wagons with a load limit of 20 tonne per axle due to the QR NCL characteristics.

QR will be providing the piece of rail infrastructure that connects the Central Queensland rail loop to the QR (NCL) mainline rail infrastructure. In providing this connecting rail infrastructure, QR will make any necessary changes to the signalling system that currently exists on its NCL for the safe working of coal trains on and off the Project rail loop.

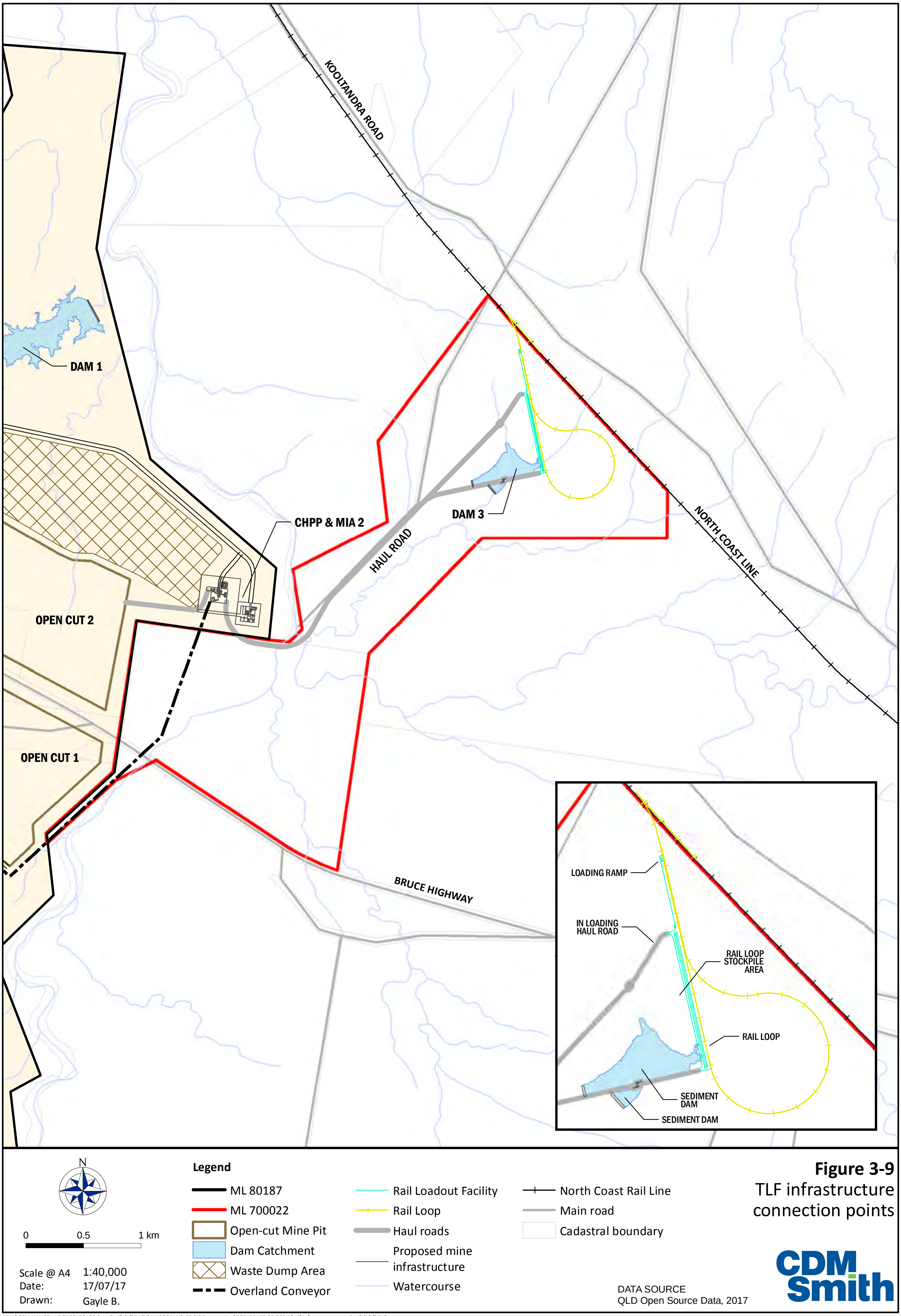

Figure 3-9
TLF infrastructure connection points

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\.03 EIS Preparation\BES150160.03-059 R2 tlf infrastructure.mxd 7/17/2017

PLAN

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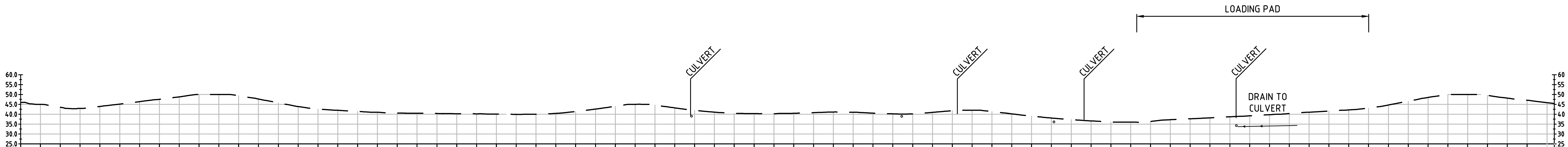

0.00	46.00
50.00	45.01
100.00	43.53
150.00	42.94
200.00	43.96
250.00	45.13
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350.00	47.53
400.00	48.77
450.00	50.01
500.00	50.02
550.00	49.39
600.00	47.72
650.00	45.75
700.00	43.87
750.00	42.65
800.00	42.00
850.00	41.41
900.00	41.00
950.00	40.60
1000.00	40.51
1050.00	40.38
1100.00	40.26
1150.00	40.20
1200.00	40.07
1250.00	39.94
1300.00	40.01
1350.00	40.44
1400.00	41.38
1450.00	42.62
1500.00	44.00
1550.00	45.02
1600.00	44.61
1650.00	43.22
1700.00	41.96
1750.00	41.04
1800.00	40.45
1850.00	40.33
1900.00	40.26
1950.00	40.47
2000.00	40.79
2050.00	41.13
2100.00	41.01
2150.00	40.56
2200.00	40.19
2250.00	40.20
2300.00	40.97
2350.00	41.76
2400.00	42.00
2450.00	41.32
2500.00	40.20
2550.00	39.03
2600.00	38.08
2650.00	37.30
2700.00	36.63
2750.00	36.00
2800.00	36.00
2850.00	36.34
2900.00	37.25
2950.00	37.72
3000.00	38.21
3050.00	38.70
3100.00	39.22
3150.00	39.79
3200.00	40.37
3250.00	41.01
3300.00	41.57
3350.00	42.16
3400.00	43.05
3450.00	44.69
3500.00	46.61
3550.00	48.48
3600.00	49.98
3650.00	50.01
3700.00	49.52
3750.00	48.17
3800.00	47.07
3850.00	45.84
3868.43	45.39

LONGITUDINAL SECTION

1:5000 HOZ.
1:5 VERT.

CAD FILE: P:\Project\BES150160.03-Styx Coal Project 5 mtpa EIS Preparation\CADD GIS\CADD\Production Drawings\Draft\BES150160-03-001.dwg

NO.	BY	DATE	DESCRIPTION	CHKD
A	APS	18.07.17	FOR INFORMATION	TK

REVISIONS

DESIGNED	APS	CHECKED	TK
DRAWN	APS	CHECKED	TK
APPROVED	TK	DATE	18.07.17
RPEQ NO. AND SIGNATURE			

SCALE
0 50 100 150 200 250m
SCALE 1:2,500 AT A1 SHEET SIZE
0 100 200 300 400 500m
SCALE 1:5,000 AT A1 SHEET SIZE
A1 ORIGINAL SIZE

HORIZONTAL:
Map Grid of Australia Zone 55, using GDA94 datum
VERTICAL:
(m) AHD

DESIGNER
CDM Smith
cdmsmith.com

CLIENT

PROJECT NO. BES150160.03
CLIENT DRG NO.

TITLE
Figure 3-10
Train Loadout Facility plan and longitudinal section

STATUS FOR INFORMATION
CDM SMITH DRG NO. BES150160-03-001
REV. A

3.3 Geology and Resources

3.3.1 Regional Geology

The Styx Coal reserves lie in the Styx Basin, a small, Early Cretaceous, intracratonic sag basin that covers an area of approximately 300 km^2 onshore and 500 km^2 offshore (see Figure 3-11). The known coal bearing strata of the basin are referred to as the Styx Coal Measures and consist of quartzose, calcareous, lithic and pebbly sandstones, pebbly conglomerate, siltstone, carbonaceous shale and coal. The environment of deposition was freshwater, deltaic to paludal with occasional marine incursions (Taubert, 2004).

The Styx Coal Measures are preserved as basin infill in a half graben geometry which has an overall plunge to the north. Earlier attempts to understand coal-seam geometry are thought to have been incorrect, in assuming that the deposit was basically flat lying rather than incorporating the north and east dipping components.

The Styx Basin is relatively undeveloped, except for two small scale, government owned mines that were in operation from 1919 to 1963. The Ogmore and Bowman collieries, located close to the north and northeast of ML80187 respectively, produced small qualities of low quality coal for use in steam trains and other boiler requirements (see Chapter 18 - Cultural Heritage).

3.3.2 Local Stratigraphy

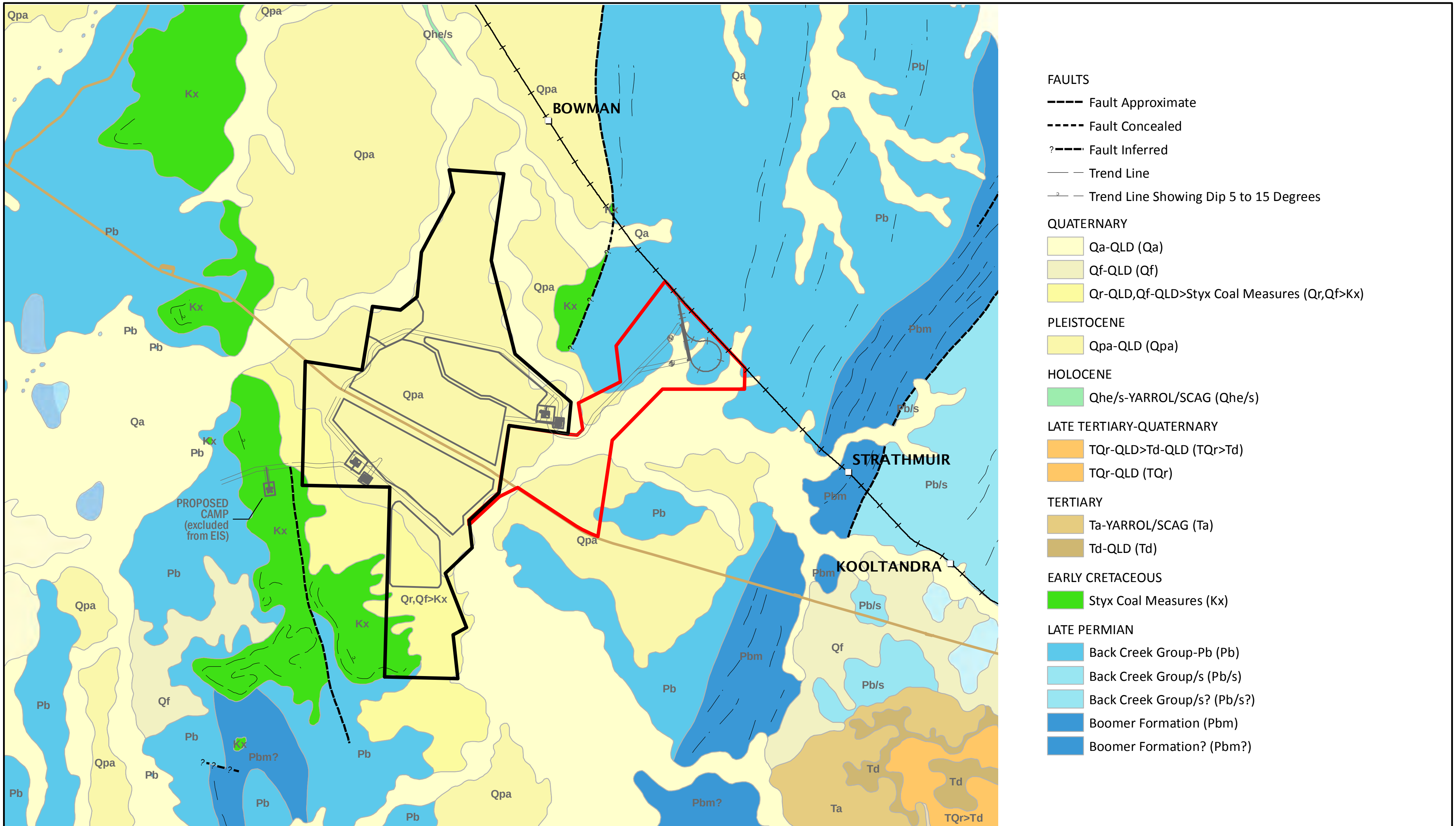
The stratigraphy of the Project area is shown at Figure 3-12. The coal seams are relatively shallow, and the average cumulative thickness of the full sequence of coal (Grey to V_L2 seams) is approximately 6 m, contained within a sequence of approximately 120 m of coal bearing strata.

The coal seams dip generally to the east in the area west of the Bruce Highway, with the Violet seam, the lowest coal seam in the sequence sub-cropping in the western part of ML80187. The deposit structure is currently interpreted to be a syncline structure, the axis of which runs northwest / southeast through the mine area. This structural interpretation follows the deposit structure originally described by Morten (1955).

Currently no faults have been interpreted, and the apparent undulation seen in the floor contours of the coal seams is interpreted to be the result of variations in interburden thickness, known to be common in the Basin.

Table 3-4 Stratigraphic units of the Project mine

Period	Group	Sub-group/formation	Dominant lithology
Quaternary	Surficial	Quaternary Alluvial	Alluvium, coastal swamp deposits
Cainozoic	Surficial	Undifferentiated sediment	Sand, soil, alluvium, lateritic gravel
Lower Cretaceous	-	Styx Coal Measures	Quartz sandstone, conglomerate, siltstone, carbonaceous shale, coal
Upper Permian	Back Creek Group	Boomer Formation	Volcanolithic sandstone, claystone, siltstone, pebble conglomerate
Permian	Back Creek Group	Back Creek Group	Undifferentiated: fossiliferous volcanolithic sandstone, siltstone, limestone



N

0 1 2 km

Legend

ML 80187
ML 700022
Proposed mine infrastructure
North Coast Rail Line
Main road

Scale @ A4 1:100,000
Date: 12/07/17
Drawn: Gayle B.

Figure 3-11
Regional geological map

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2016

CDM Smith

BRUGGEMANNGD B:\BES150160 Styx Coal\GIS\DATA\MXD\FINAL\.03 EIS Preparation\BES150160.03-009 R2 geology.mxd 7/12/2017

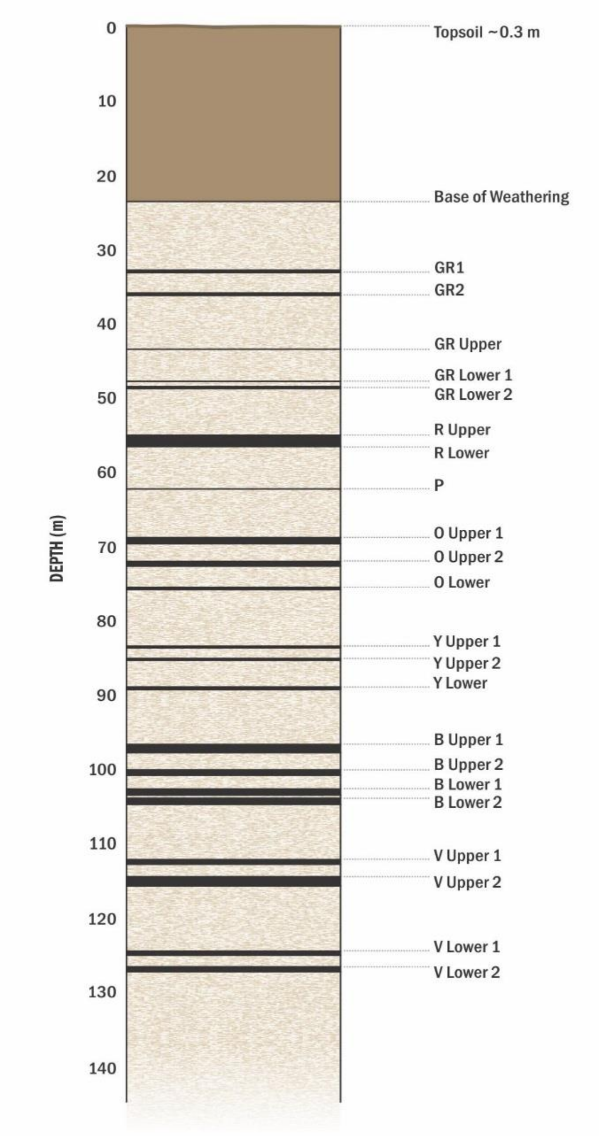


Figure 3-12 Schematic stratigraphic section

3.3.3 Coal Seams

The economic Cretaceous coal measures targeted for mining are the Styx Coal Measures, contained within the Styx Basin. The Styx basin is located on the central Queensland coast, north of Marlborough. It is a Lower Cretaceous sedimentary basin which unconformably overlies Permian sedimentary rocks of the Back Creek Group that have been compressed into a broad regional syncline, the Strathmuir Syncline. The basin extends beneath the sea bed into the Broad Sound near the Port of St Lawrence. Its portion on land is approximately 20 km wide (east-west) and 70 km long (north-south).

The majority of the Styx Coal Measures are concealed beneath Tertiary sediment. Queensland Geological Survey mapping shows the eastern margin of the Styx Basin extends to the eastern edge of the terrestrial Cainozoic sediments that conceal it. The Styx Coal Measures outcrop in the western margin of the Styx Basin as low forested hills. These outcrops form a series of detached hills, orientated north-south, that continue for about 60 kilometres northward to the coastline near the Port of St Lawrence. The outcrops generally form small hills and hillocks, but at their greatest height, are 100 metres above the low-lying sediment flats to the east. The hills are probably the coal-barren basal section of the Styx Coal Measures sequence, which consists of thick beds of quartz-dominant sandstones.

The strata of the Styx Basin dip gently to the east, at around 3 degrees. Tertiary-aged, lateritised sedimentary rocks outcrop to the east of the southern part of the basin. Styx Basin sediments lap onto Permian strata in the west, but appear to be faulted against them in the east. The southern part of the basin is bounded to the east by a post-depositional high-angle reverse fault. Adjacent to this fault, the Cretaceous sediments are folded and faulted.

The Styx Basin sediments were laid down on a coastal plain which developed on the Palaeozoic Strathmuir Syncline during the Early Cretaceous. The Styx Basin probably developed by subsidence of the Strathmuir Synclinorium, an older feature containing Permian Bowen Basin strata. A schematic geological cross section (east-west) across the Styx Basin is shown in Figure 3-13 and the supporting description key is at Table 3-5.

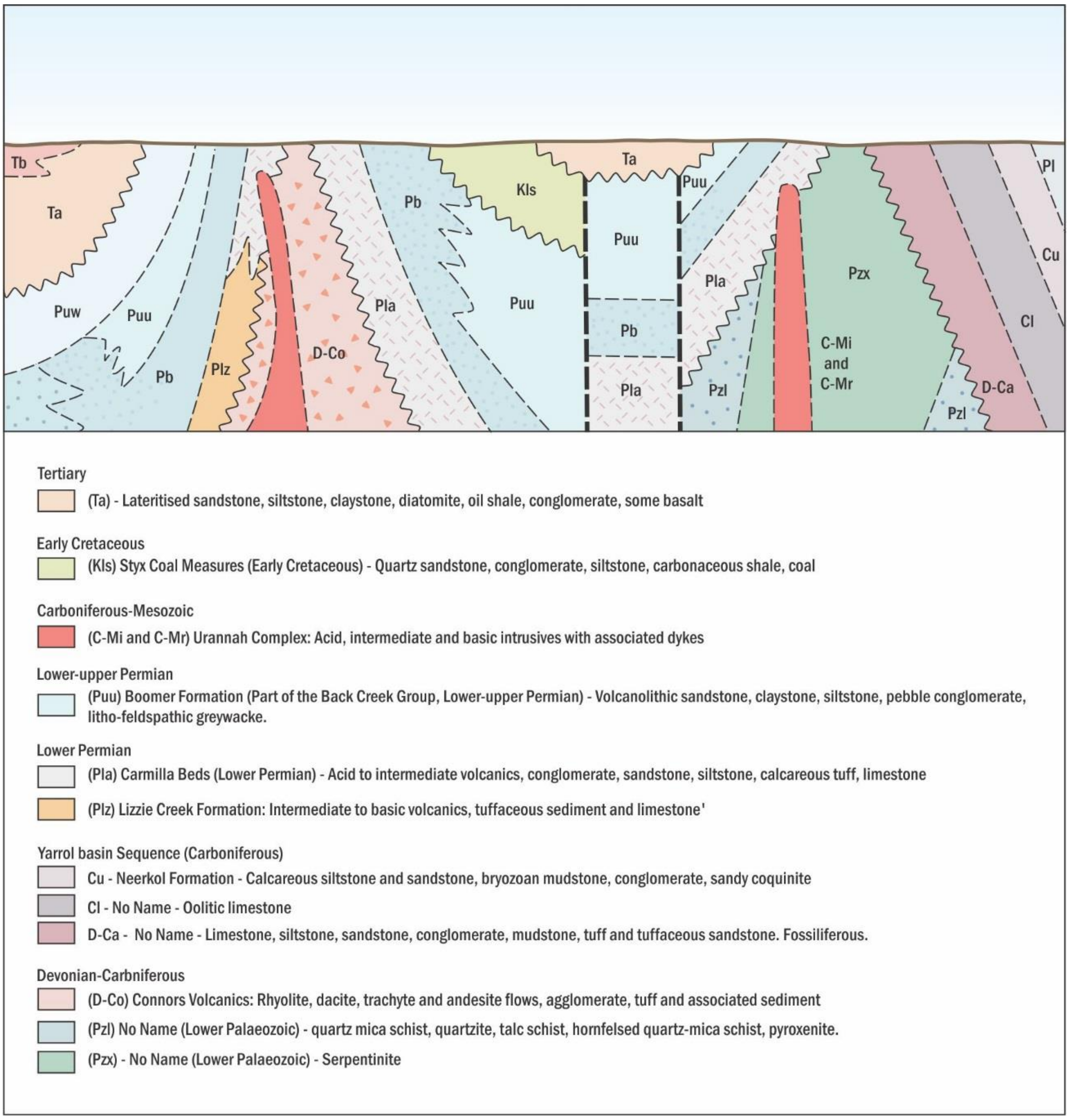


Figure 3-13 Schematic west to east geological cross section from Australia 1:250 000 Geological Series

Table 3-5 Geological cross section key

Code	Name	Description
Ta	No Name (Tertiary)	Lateritised sandstone, siltstone, claystone, diatomite, oil shale, conglomerate, some basalt.
Kls	Styx Coal Measures (Early Cretaceous)	Quartz sandstone, conglomerate, siltstone, carbonaceous shale, coal.
Pb	Undifferentiated back Creek Group (Lower-upper Permian)	Undifferentiated: fossiliferous volcanolithic sandstone, siltstone, limestone, coquinite, minor crystal, lithic and vitric tuffs; sheared siltstone, phyllite.
Puu	Boomer Formation (Part of the Back Creek Group, Lower-upper Permian)	Volcanolithic sandstone, claystone, siltstone, pebble conglomerate, litho-feldspathic greywacke.
Pla	Carmilla Beds (Lower Permian)	Acid to intermediate volcanics, conglomerate, sandstone, siltstone, calcareous tuff, limestone.
Pzx	No Name (Lower Palaeozoic)	Serpentinite.
Pzl	No Name (Lower Palaeozoic)	Quartz mica schist, quartzite, talc schist, hornfelsed quartz-mica schist, pyroxenite.
D-Ca, Cl and Cu	Yarrol basin Sequence (Carboniferous)	
Cu	Neerkol Formation	Calcareous siltstone and sandstone, bryozoan mudstone, conglomerate, sandy coquinite.
Cl	No Name	Oolitic limestone.
D-Ca	No Name	Limestone, siltstone, sandstone, conglomerate, mudstone, tuff and tuffaceous sandstone. Fossiliferous.
D-Co	Devonian-Carbniferous 'Connors Volcanics'	Rhyolite, dacite, trachyte and andesite flows, agglomerate, tuff and associated sediment.
Plz	Lower Permian Lizzie Creek Formation	Intermediate to basic volcanics, tuffaceous sediment and limestone.
C-Mi and C-Mr	the Carboniferous-Mesozoic Urannah Complex	Acid, intermediate and basic intrusives with associated dykes.

Cretaceous Coal Seam Characteristics – Styx Coal Measures

The coal seams that comprise the Styx Coal Measures are generally thin, commonly less than two metres in thickness. Seam splitting is common and seam thicknesses vary considerably. All seams are potentially economically exploitable, despite their relatively small thicknesses. Coal quality throughout the deposit is generally consistent, and all seams demonstrate coking properties.

The seams were divided into seam groups and named using a colour scheme. From the base of the Measures to the top, they are tagged as: Violet, Blue, Yellow, Orange, Pink, Red, Green and Grey.

The coal plies may coalesce to form substantially thick seams in parts of the deposit (e.g. Violet and Blue) but in other seams (Orange, Green, Grey) coalescence is not evident in the ML 80187 area. It is common for the coal plies to lense out over moderate distances. The Orange, Green and Grey Seams are characteristically coal ply groups that may coalesce elsewhere in the Styx Basin, but do not coalesce within the proposed mining area. The Red, Yellow and Pink Seams split into two plies in isolated areas. The Red Seam is the most consistent in thickness and quality throughout the ML 80187 area, and occurs in the middle of the coal-bearing part of the stratigraphic sequence. The Red Seam commonly exceeds two metres in thickness.

All plies and coalesced seams demonstrate coal quality and seam thickness characteristics that are attractive mining targets. Coal quality analysis and reconciliation with geophysical data show that the majority of run-of-mine coal will require wash-plant treatment to remove partings. Sulphur content is low, even in the raw sample analysis. Pyrite has not been noted in any geological logging or results of quality analysis. Float-sink, drop-shatter, sizing and associated analyses indicate wash-plant yields are likely to be around 80% of run-of-mine coal. Basic seam thickness information is provided in Table 3-6.

Table 3-6 Cretaceous coal measures coal seam characteristics

Seam	Ply	Seam thickness (m)		
		Min	Max	Average
Grey	GR1	0.11	1.09	0.42
	GR2	0.10	0.77	0.37
Green	GR Upper	0.10	0.85	0.34
	GR Lower1	0.10	0.79	0.37
	GR Lower2	0.10	0.29	0.19
Red	R Upper	0.10	2.24	0.81
	R Lower	0.10	1.32	0.71
Pink	P	0.10	0.25	0.16
Orange	O Upper1	0.10	0.60	0.33
	O Upper2	0.10	0.39	0.26
	O Lower	0.10	0.71	0.36
Yellow	Y Upper1	0.10	2.74	0.64
	Y Upper2	0.10	1.03	0.30
	Y Lower	0.10	0.78	0.37
Blue	B Upper1	0.10	1.76	0.56
	B Upper2	0.10	1.71	0.71
	B Lower1	0.10	2.23	0.53
	B Lower2	0.11	0.88	0.37
Violet	VI Upper1	0.10	1.35	0.36
	VI Upper2	0.10	0.30	0.18
	VI Lower1	0.10	1.19	0.43
	VI Lower2	0.10	0.74	0.36

3.3.4 Coal Seam Structure

The Styx deposit is contained within the Styx Sedimentary Basin, an early Cretaceous basin that formed because of subsidence of the already existing Strathmuir Syncline. Regionally, the strata dip to the east and east-northeast at approximately three degrees, with local variations. In the Styx deposit area, a regular dip of three degrees to the east also exists. The Styx Basin is thought to extend north from dry land, continuing undersea in the Broad Sound area, in conjunction with the undersea extension of the Strathmuir Syncline.

The most relevant and local regional geological structure is the axis of the Strathmuir Syncline, which appears to have caused formation of the Styx Basin. Regional faults associated with the Strathmuir Syncline have confined the extents of sediment accumulation in the eastern part of the basin. Numerous folds and faults are mapped to the south of the Styx Basin, in the Permian formations, parallel with the axis of the Strathmuir Syncline, but their effect does not extend into the Styx Basin, as these structures formed prior to its formation.

Geological modelling has not identified evidence of displacement of seams in the deposit area by folding or faulting. Faulting that is known to occur within the Styx Coal Measures on the eastern side of the basin, noted from surveys of the early 20th century mining shafts, does not appear to have affected the western or central parts of the basin. Variations in seam structure contours produced from modelling of the Styx deposit are considered to be the result of variations in interburden thickness, known to be common in the Basin. Although slickensiding and other geotechnical defects have been noted in some Styx deposit core logs, displacement by folding or faulting has not been detected or interpreted during seam correlation exercises, geological modelling, geotechnical analysis, downhole sonic scanner analysis or drill core analysis. Some fracturing of rock is expected to be encountered during mining, but no structural displacement of seams.

3.3.5 Coal Quality

3.3.5.1 Raw Coal Quality

All coal quality data has been modelled on an air dried basis (adb). There is a total of 67 cored holes used to build the quality model.

The results show the raw ash for all plies sampled ranges from 7 % to 39.6 % and averages at 20.1 %, adb. Inherent moisture for all plies ranged from 1.6 % to 5.0 % with an average of 3.2 %, adb. Calorific values for all plies ranged from 17 Mj/kg to 31 Mj/kg and averages at 26.7 Mj/kg, adb, and the vitrinite reflectance averages at 0.85 (%mmr or Romax) over all coal plies.

The Red and Yellow Seams have the most consistently low ash values and high calorific value with the average raw ash percentage for the Red Seam of 14.5 %, adb, and an average CV of 28.5 Mj/kg, adb. The Yellow Seam has an average raw ash value of 15.5 %, adb and an average CV value of 28.0 Mj/kg, adb. The Blue and Violet Seams have the most variable qualities across the different plies across the deposit. The Blue Seam has an average raw ash percentage of 22.5 %, adb and an average CV value of 25.2 Mj/ kg, adb. The Violet Seam has an average raw ash of 22.6 %, adb and an average CV value of 25.6 Mj/kg, adb.

The raw coal quality results (adb), of each group of seams are displayed in Table 3-7.

Table 3-7 Summary of Coal Resources – Raw Quality Data (adb)

Category / seam	Coal Mass (Mt)	Ave Thickness (m)	Raw Coal Quality (adb)								Comments
			RD	PRD	IM%	Ash%	Vol%	FC%	CV MJ/Kg	TS%	
Indicated	34.3	0.86%	1.43	1.40	3.5	16.8	30.7	52.1	27.8	0.53	Weighted Av Indicated
Grey	3.4	0.54	1.46	1.43	3.7	20.4	30.1	49.7	27.0	0.45	
Green	4.5	0.45	1.43	1.40	3.9	16.7	31.3	52.1	27.8	0.50	
Red	9.2	1.25	1.42	1.39	3.8	16.8	31.3	53.1	28.2	0.59	
Orange	2.5	0.58	1.44	1.40	2.9	20.0	28.1	49.1	25.8	0.54	
Yellow	3.4	0.98	1.50	1.46	3.3	23.1	30.9	48.5	26.1	0.61	
Blue	11.3	0.83	1.40	1.38	3.4	13.3	30.7	53.6	28.6	0.50	
Violet	-	-	-	-	-	-	-	-	-	-	
V_L2	-	-	-	-	-	-	-	-	-	-	
Inferred	169.1	0.59	1.47	1.44	3.1	20.75	29.04	51.15	26.47	0.53	Weighted Av Inferred
Grey	3.0	0.46	1.44	1.42	3.9	17.6	30.4	50.3	27.9	0.46	
Green	7.7	0.35	1.46	1.43	3.3	19.8	30.8	52.2	27.5	0.50	
Red	25.3	0.73	1.41	1.38	3.4	15.7	31.0	52.9	27.9	0.57	
Orange	9.0	0.42	1.50	1.46	3..6	26.7	26.1	43.7	26.4	0.48	
Yellow	29.5	0.54	1.44	1.41	3.0	16.4	29.6	52.4	27.0	0.58	
Blue	59.0	0.60	1.50	1.46	3.0	23.0	28.3	50.0	25.1	0.48	
Violet	34.2	0.63	1.50	1.46	3.1	22.5	28.6	52.5	26.9	0.56	
V_L2	1.4	0.36	1.65	1.60	2.9	39.6	29.3	52.4	27.6	0.68	
Grand Total	203.4	0.63	1.46%	1.43	3.2	20.1	29.3	51.3	26.7	0.53	Weighted Av Total

3.3.5.2 Product Coal Quality

Initial float sink analysis (F1.50 fraction) of the coal plies included in the Resource Estimate, gives an average theoretical yield of approximately 83.1 %, average washed ash of approximately 6.1 % and calorific value of approximately 31.6 Mj/kg. CSN values average approximately 5.3, ranging from 3.4 to 6.1. These initial results are very encouraging to potentially produce a high quality thermal coal or a soft coking coal from the Project area.

3.3.6 Estimated Coal Resource

The assessment of coal resource at the Styx resource area was conducted by a qualified and experienced geologist. The assessment of the coal resource identified a total of 203.4 million tonnes (Mt) of coal resource (see Table 3-8). This is based on a nominal 100 m depth cut-off for open cut extraction.

Table 3-8 Estimated coal resource to depth of 100 m – Central Queensland mine area

Method	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	Subtotal (Mt)
Open Cut 1	0	15.0	65.0	80.0
Open Cut 2	0	19.3	93.0	112.3

Method	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	Subtotal (Mt)
Open Cut 4	0		11.1	11.1
Total	**0**	**34.3**	**169.1**	**203.4**

3.3.7 Exploration History

Central Queensland Coal and Fairway have undertaken an extensive exploration drilling program in EPC1029 from late 2010, focusing on the Mamelon Property area in 2011 and 2014, and extending the exploration area to the north of the Mamelon Property in 2012. A total of 137 holes have been drilled including 68 chip holes and 69 fully cored HQ sized holes. All holes were geophysically logged and surveyed in line with industry standards.

In addition to the exploration drilling, six large diameter cores have been completed on two sites for coal washability and handleability tests. Drill hole spacing varies across the deposit, but generally ranges between 100 m and 1,000 m. All coal core has been sampled and analysed for proximate analysis, specific energy, total sulphur and relative density. Several holes have had further ash analysis and analysis for ash fusion temperatures. Float sink coal quality analysis has also been undertaken on all coal samples at three densities, F1.40, F1.50 and F1.60 on recent drilling (post 2010) and at F1.50 on drilling pre-2010. Crucible Swelling Number (CSN) analysis was also performed on each density cut point to further investigate the coking properties of the coal found in the Project area.

Historical data from the Geological Survey of Queensland, 1955 (27 drill holes), Earth Resources Australia, 1981 (7 drill holes) and New Hope Collieries, 1994 (9 drill holes) are available for the Project area. Data from these drill programs were included in initial modelling to aid the understanding of the deposit and plan exploration drilling.

Central Queensland Coal have created a geological and raw coal quality model for the Project area using the MapInfo 'Discover' and Ventyx 'Minescape' software packages. Exploration drill hole data, raw coal quality and washed coal quality data were correlated and audited by Central Queensland Coal and Xenith. The model was finalised in February 2015.

A total of 137 drill holes have been used to develop the structural model (Central Queensland Coal and Fairway drill holes). The holes are a mixture of cored holes and chip holes, all with geophysical logs. A total of 69 drill holes have coal quality data available and were used as Australasian Joint Ore Reserves Committee Points of Observation where seams were cored and had suitable raw coal quality and geophysical data. The location of the drill holes used in the geological model are shown at Figure 3-14.

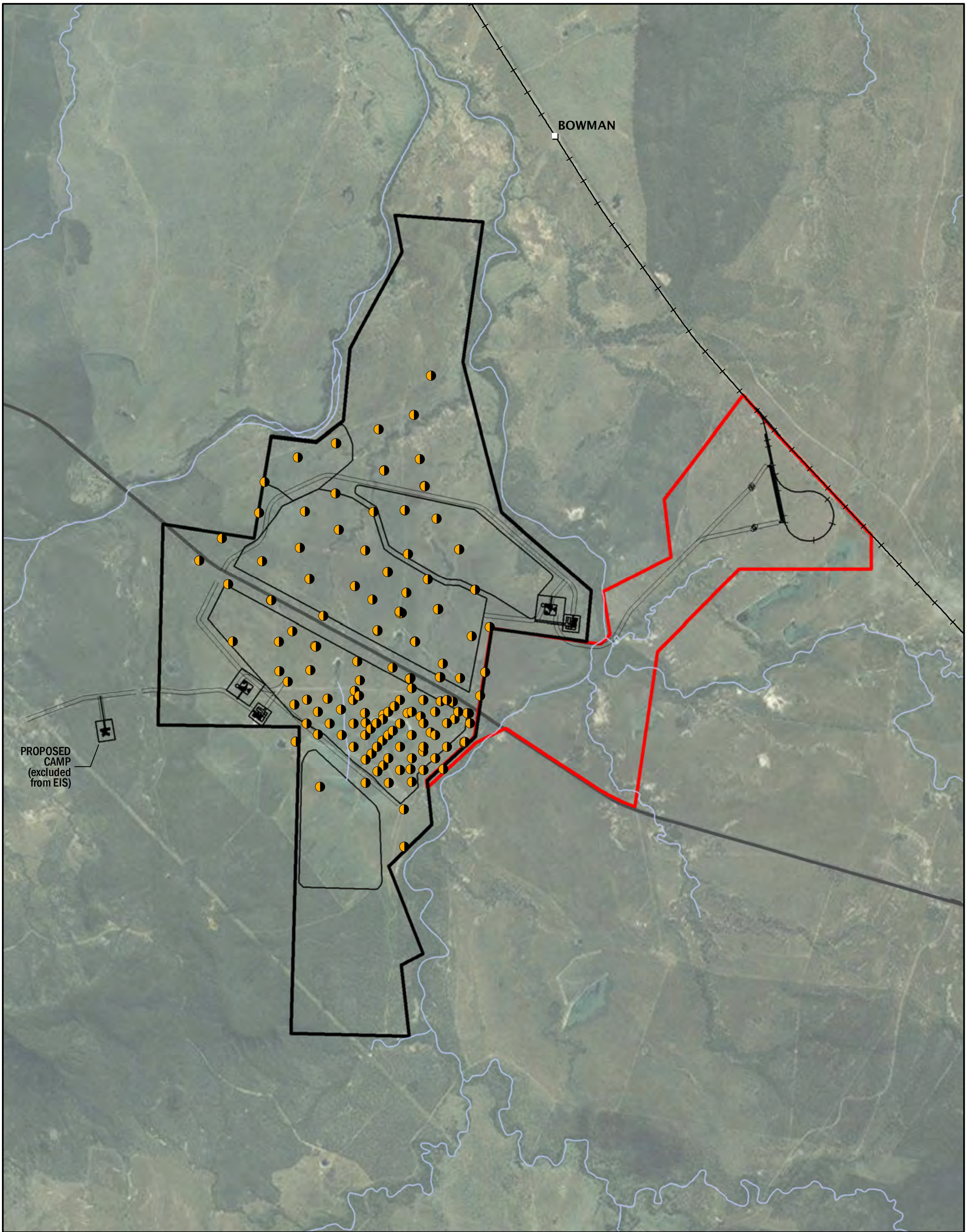


Figure 3-14

Location of exploration drillholes

Scale @ A4 1:60,000
Date: 24/07/17
Drawn: Gayle B.

DATA SOURCE
QLD Spatial Catalogue (QSpatial), 2017
Esri Basemaps, 2017

CDM Smith

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3.4 Construction

3.4.1 Overview

This section describes the various activities and their expected timing for the construction phases of the Project. Construction activities are anticipated to occur 24 hours per day, seven days a week. For ease of reading the construction activities associated with the open cut mining and MIA have been separated into separate specific sub-sections within each section.

3.4.2 Construction Program

The construction of the Open Cut 2, the initial CHPP, the haul road and TLF and associated mine infrastructure located on the east of the Bruce Highway is planned to commence simultaneously in Year one. Open Cut 1 will commence development at approximately Year 10 coinciding with the construction of the second CHPP and MIA. Open Cut 4 will be developed in Year 12.

The commencement date for construction is dependent upon the timing of the Project approvals process. An indicative timeframe has been prepared for the EIS, and as such, Year one should be understood to be the period following receipt of the ML and Environmental Authority (EA) for the Project (2018). The indicative timing for the Project development is shown at Figure 3-15.

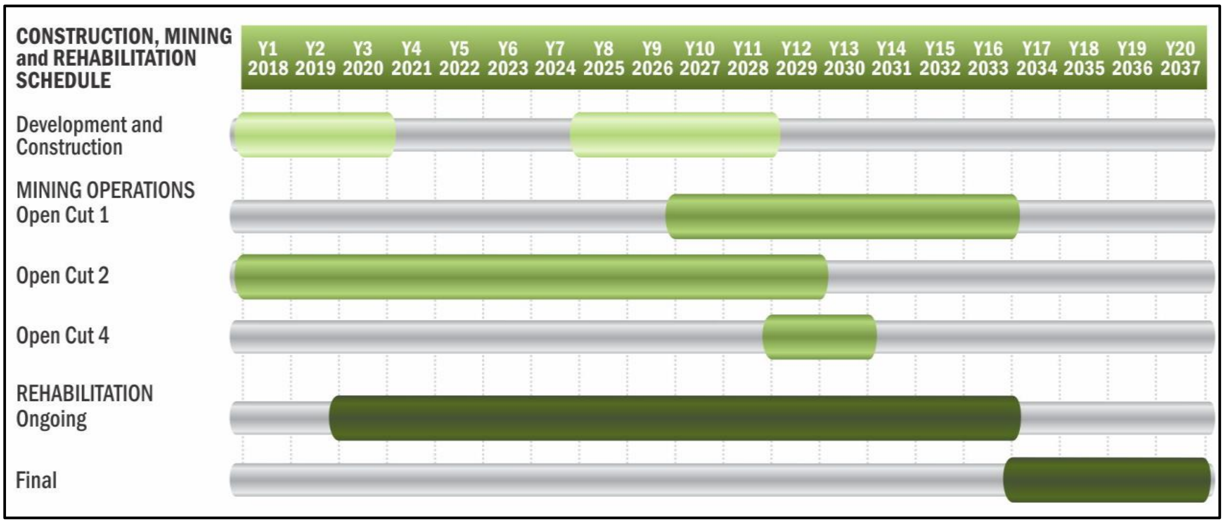

Figure 3-15 Indicative Project development schedule

3.4.3 Site Preparation

The initial site clearance works will be focused on the site access road, internal access roads, dams and laydown areas for construction, the MIA, CHPP and TLF. Site clearance will include clearance of vegetation, soil removal and storage, bulk earthworks and temporary drainage works. These works will be conducted in accordance with the Project's vegetation and soil management measures.

Site clearance activities will be staged during the construction phase on an as needed basis to coincide with construction requirements and to minimise the extent and duration of cleared areas at any one time. Suitable soil resources for use in rehabilitation will be stripped from areas where construction and mining operations will occur. Topsoils and subsoils will be stripped, handled and stored in a manner in line with industry best practice to prevent the deterioration of soil quality (refer to Chapter 11 – Rehabilitation and Decommissioning). This includes the separation of topsoil and subsoil. Topsoil contains a higher nutrient content and therefore must be kept separate from the subsoil to be utilised in the rehabilitation phase to promote vegetative growth. Topsoils can be stored as a berm around active worksites and utilised as an erosion and sediment control (ESC) provided adequate controls (including sediment fence and appropriate cover) are in place to manage the erosion risk of the topsoil stockpile or bund itself. An inventory of available soils will be maintained to ensure adequate materials are available for planned rehabilitation activities.

Stripped topsoil may also be used to improve the quality of in situ topsoil outside the proposed area of disturbance if within the same soil class. Soil ameliorates such as gypsum and / or fertilisers shall be applied to the topsoil prior to stripping, if required.

Site preparation activities will include the following:

- Construction of the mine access points on the Bruce Highway and the Mount Bison Road;
- Site security;
- Site clearance;
- Civil works;
- Environmental protection measures;
- Washdown facilities;
- Erosion and sediment controls;
- Concrete batch plant (concrete will be batched onsite, with suitable batching materials delivered to site by contracted supplier);
- Mobilisation to site;
- Utilisation of existing accommodation at Ogmore, Marlborough, Clairview and St Lawrence. An accommodation camp may be developed near the ML if required for overflow capacity (out of EIS scope);
- Crib hut;
- Fencing;
- Amenities;
- Access road / haul road establishment;
- Establishment of yards;
- Installation of temporary water supply with potable water trucked to the site until a water treatment plant (WTP) is installed;
- Sewerage management infrastructure with effluent trucked from site by a licensed contractor to a licensed waste disposal facility;
- Demountable offices;
- Car park; and
- Establishment of laydown and storage areas.

3.4.4 Construction and Description of Key Infrastructure

Infrastructure to be constructed for the Project includes:

- Three open cut pits;
- Two CHPPs and product coal stockpiles;
- Two ROM coal stockpile areas and ROM dump stations (comprising dump hopper, product conveyor, crushers and surge bin);
- ROM coal haul roads and waste rock haul roads;
- Product stockpile and conveyor from Open Cut 1 to the product coal stockpile East;
- Waste management facilities;
- Water supply pipeline and management facilities, including raw water supply, storage and a WTP to treat water to potable quality;
- Mine affected water dams, sediment affected water dams and clean water dams;
- Light and heavy vehicle internal roads;
- Main gate and security building;
- Power distribution lines and substation; and
- Product coal haul road from the CHPP 2 to the TLF, TLF product coal stockpile area, rail loop and rail spur.

3.4.4.1 Civil Works

Civil works including construction of structure foundations, permanent laydown areas and hardstands will commence following grant of the Mining Lease and EA. It is expected that civil works required during the construction phase will be completed within Year 1; however, there may be requirements for further civil works during the operations and decommissioning phases. Typical civil works that will be undertaken as part of the Project include, but are not limited to:

- Civil earthworks, including foundation construction;
- Installation of permanent and temporary drainage;
- Trenching and laying of reticulated services and any other underground pipelines and services;
- Installation of powerlines and substations;
- Road formation construction, surfacing and finishing required for unsealed roads;
- Conveyor footings;
- Earthworks for the establishment of drainage diversions;
- Dams, including raw water dams, sediment affected water dams, mine affected water dams and clean water; and
- TLF, rail loop and rail spur formation construction, track laying and finishing for TLF.

Installation of permanent drainage will be undertaken to accommodate drainage requirements for both the construction and operational phase where possible. Where permanent drainage for the operational phase cannot be installed, temporary drainage for the construction period will be designed to the relevant standards.

A conveyor is proposed to transport product coal from Open Cut 1, under the Bruce Highway at the existing bridge crossing, to the product coal stockpiles on the north eastern side of the Bruce Highway. This conveyor will be constructed in a way that does not pose a safety hazard or affect the flood conveyance of the bridge. The conveyor located under the Deep Creek road bridge is shown in Figure 3-16.

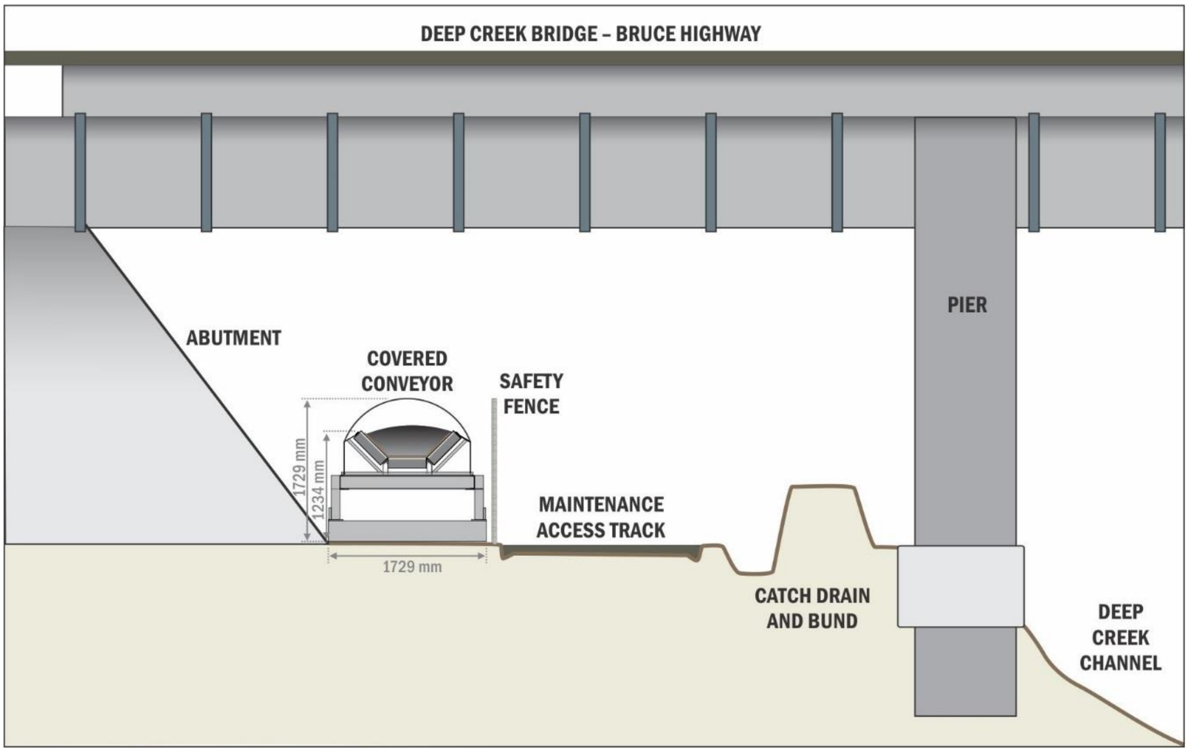

Figure 3-16 Conveyor crossing under Deep Creek road bridge

Roads associated with the Project's MLs include ROM coal and waste rock haul roads, site access roads and light and heavy vehicle internal roads. Construction of ROM coal and waste rock haul, light and heavy vehicle internal roads will be phased over the life of the construction and operations of the mine. The new intersection required for access to the Project on the north eastern and south western sides of the Bruce Highway, will be designed to conform with the Austroads Guide to Road Design (Austroads 2012) (particularly Part 4 Intersections and Crossings – General) as well as DTMR, Road Planning and Design Manual (DTMR 2013). Indicative haul road design criteria Indicative haul road cross sections are shown at Figure 3-17 (at cut and fill) and Figure 3-18 (at grade). The basic design criteria adopted for the indicative design process is presented in Table 3-9. Haul road design and construction will include suitable culverts and over flow structures to allow the free flow of water during the wet season.

Table 3-9 Indicative haul road design criteria

Design Element	Criteria
Typical Cross Section	
Design vehicle	Multi-train haul truck
Number of traffic lanes	2 lanes (one lane each travel direction) except across culverts where one way traffic is designated to minimise area of disturbance
Traffic lane width	4 m
Traffic lane crossfall	3%
Shoulder width	2 m
Shoulder crossfall	4%
Cut batter slope	2H:1V
Fill batter slope	4H:1V
Horizontal Alignment	
Design vehicle	Truck
Design speed	90 km/h
Minimum curve radius	250 m
Vertical Alignment	
Design vehicle	Truck
Design speed	90 km/h
Maximum longitudinal gradient	8%
Minimum K value for crest curves	40
Minimum K value for sag curves	35

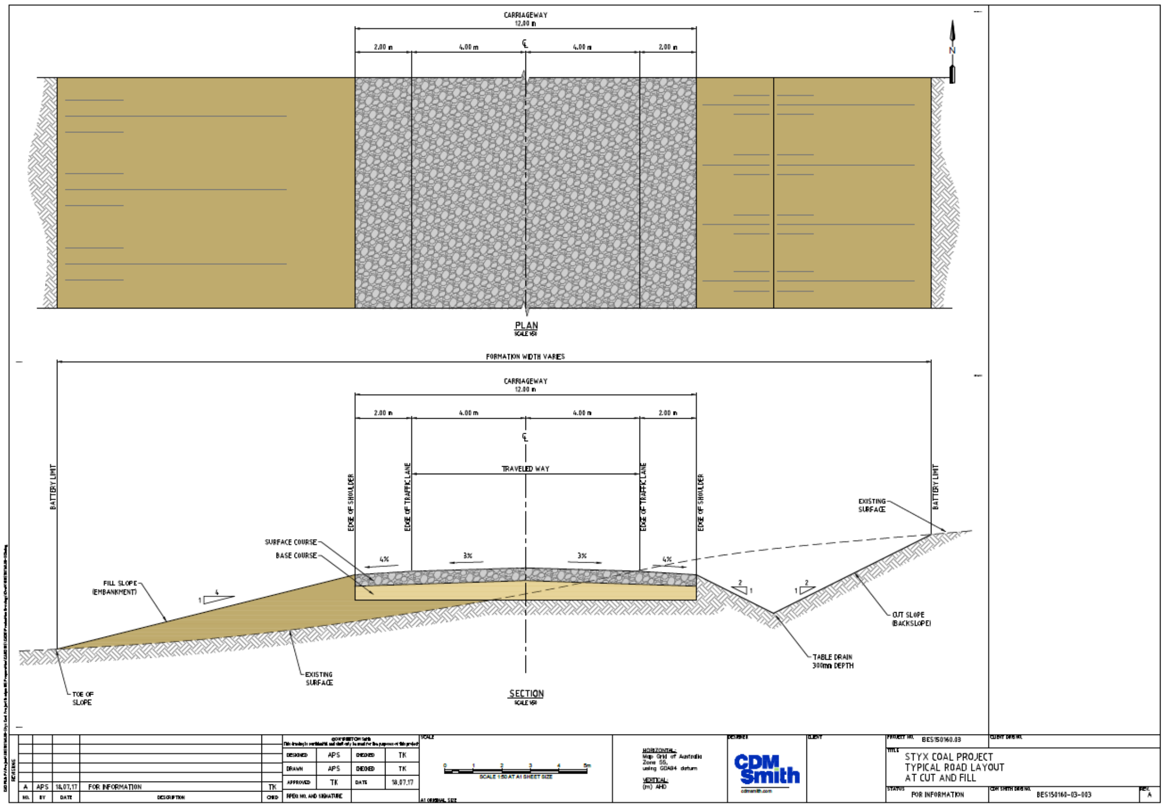

Figure 3-17 Typical road layout at cut and fill

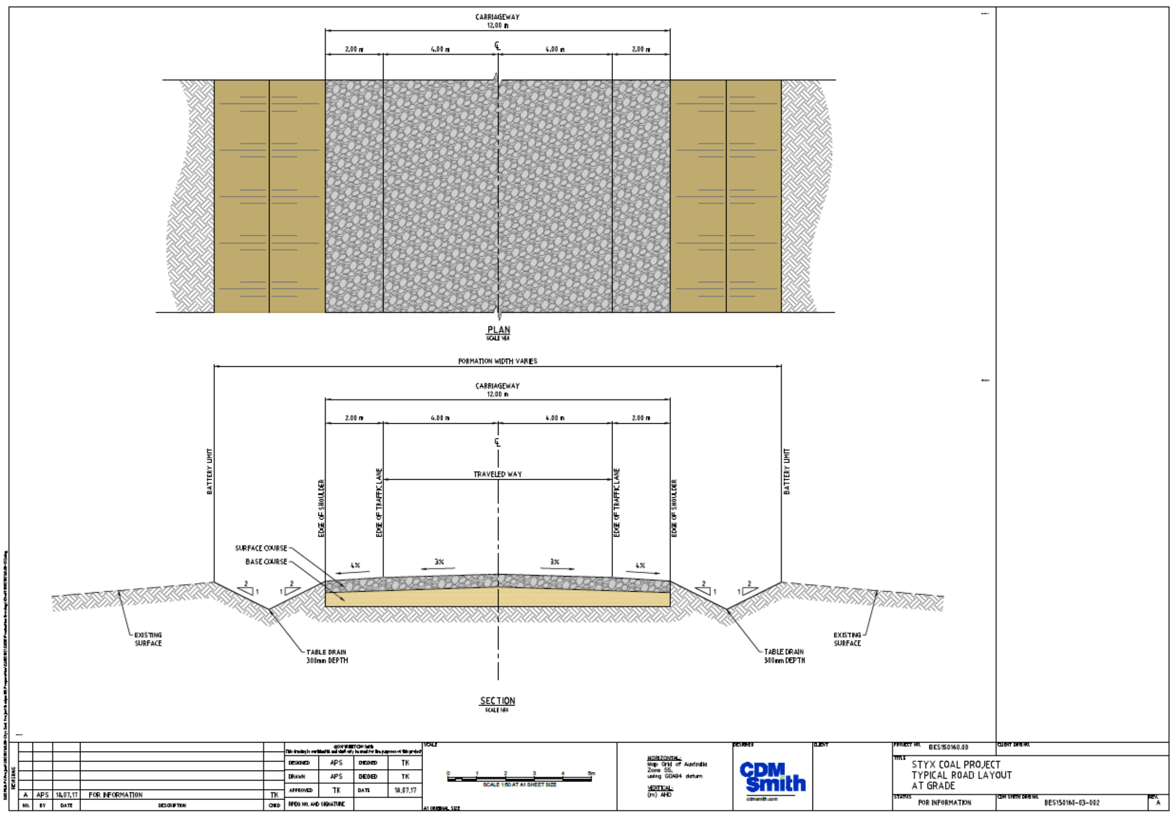

Figure 3-18 Typical road layout at grade

A new power distribution network will be installed to provide electricity across the site. To date, no electricity infrastructure has been identified in the proposed mining lease areas and as such, no relocation, replacement or removal of existing electricity infrastructure is required. Works within proximity of electricity infrastructure will be carried out in accordance with the Electrical Safety Act 2002, Electrical Safety Regulations 2013, and the Code of Practice for Working Near Exposed Live Parts.

Quarry materials will be sourced from a combination of existing quarries and onsite competent materials for use as road base, select fill, rail ballast, rock protection, sealing aggregates and other construction materials. Further investigations are required to determine the quality and suitability of the deposits for construction purposes. It is not anticipated that any new offsite borrow pits, stream bed excavations, or expanded quarry and screening operations will be required to service the construction or operation of the project.

The Project is located on freehold land with no forest products or quarry materials reserves to the State. As such, it is not anticipated that any State-owned quarry material administered under the *Forestry Act 1959* will possibly be sterilised or restricted from utilisation (including offsets and loss of access for existing operations authorised under the *Forestry Act 1959*). Should it be the case that State-owned quarry material will possibly be sterilised or restricted from utilisation, Central Queensland Coal will negotiate suitable arrangements with the Department of Agriculture and Fisheries and other affected parties before any work commences.

3.4.4.2 Building and Structures

Construction of buildings and structures will occur after the civil works. Installation of plant and related building components will follow superstructure erection, including the installation of pipe works, cables and instrumentation. Where possible, main plant components will be pre-fabricated and delivered complete to site to minimise the requirement for on-site assembly work.

The construction management office area will be located near the MIA supporting Open Cut 2 and Open Cut 4. The facilities will be of a temporary nature and will be replaced by the permanent administration facilities towards the end of construction. The temporary facilities will include:

- Demountable buildings including offices, workshops, meeting rooms, crib rooms / kitchen, toilets, first aid, communications and storage;
- Car park;
- A light vehicle wash down slab;
- Power supply from diesel generators;
- Temporary construction water storage;
- A temporary potable water storage, until permanent facilities are installed; and
- Temporary wastewater storage, until permanent facilities are installed.

3.4.4.3 Coal Handling and Preparation Plant

Construction of the two CHPP, ROM coal and product conveyors and stockpiles is anticipated to last approximately 12 months. Given the height and size of the CHPP modules, product stockpiles, surge bin and crushing facilities, the use of cranes, lifts and multistorey scaffolding is anticipated. All work will be in accordance with recognised building standards and regulations.

3.4.4.4 Construction Water Requirements

Both potable and construction water will be required for the construction phase of the Project. For construction water, existing farm dams and a newly constructed Raw Water Dam will be sourced. Water permits will also be sought to take water from Tooloombah Creek during construction. These permits may include direct truck fill from Tooloombah Creek or involve harvesting from Tooloombah Creek to the Raw Water Dam for subsequent truck fill. Potable water will either be transported to site by water tankers during construction, or involve treatment of groundwater bore or raw water supplies to drinking water standard via a batch water treatment plant (WTP). All potable water will be procured, transported, treated monitored and stored in compliance with the Australian Drinking Water Guideline 2011 (NHMRC and NRMMC 2011).

3.4.5 Construction Materials, Plant and Equipment

Quarry materials for the construction of the access road and haul road base material will be sourced from existing offsite quarries. Once access to site is established, materials will be sourced from a combination of on-lease deposits where possible and licensed offsite quarries. It is not anticipated that forestry materials will be required by the Project.

The exact location and quality / suitability of the competent material deposits existing within the Project's mining lease areas is yet to be determined, although it is expected that appropriate materials for foundations can be sourced on-lease. This will also include the overburden extracted as part of the mining operations.

Hazardous materials will be used and stored onsite during the construction of the mine. Hazardous materials that will be used during construction include diesel fuels, lubrication oils, paints and thinners, explosives and protective coatings. Further details regarding the usage and storage are discussed in Chapter 21 – Hazard and Risk.

All materials, plant and equipment will be delivered to the Project via road. An assessment of the traffic and transportation is discussed at Chapter 6 – Traffic and Transport and the technical assessment at Appendix A4a –Road Impact Assessment. Large and oversize loads are anticipated, particularly during the CHPP, dump station, stacker / reclaimer and heavy mining equipment construction and installation phase. Loads will mostly be hauled from either the Port of Brisbane, Port of Mackay or the Port of Gladstone. The transportation of oversize and some large loads will take place according to permits issued by DTMR and LSC to minimise disruption to other road users.

Construction traffic will involve rigid and articulated vehicles, and light goods vehicles. Traffic flows and vehicles types are expected to vary over the construction period, reflecting the types of materials and equipment required at a specific time.

The Project will use standard construction equipment, general trade equipment and specialised equipment as required. The indicative number and type of construction equipment required is shown in Table 3-10. Construction equipment will, where practicable, be serviced and maintained at the site workshop.

Table 3-10 Indicative construction equipment

Equipment	Quantity
Generator (1MW)	1
CAT 631G Scraper	2
785D Haul Truck	4
789D Haul Truck	4
793D Haul Truck	5
RH170 Excavator	1
Liebherr 996 Excavator	1
EX1200 Excavator	1
960 Front End Loader	1
980 Front End Loader	1
992 Front End Loader	1
Volvo Semi-Tippers	8
UDR800 Drill	1
D9 Dozer	1
D11 Dozer	1
D10 Dozer	1
HD605 Water Cart	1
16 Grader	1
Service Truck	1
Pump Truck	1
Fuel Truck	1
Franner Crane	1

3.4.6 Construction Waste Management

The management of the waste streams associated with the construction of the Project, in addition to the operation and decommissioning, are discussed in Chapter 7 – Waste Management. Inert waste will typically be disposed of in-pit, whilst recyclable materials and other wastes will be separated and taken from site by appropriately licenced contractors to licenced recycling and disposal facilities. Waste generation from emissions that will contribute to existing local air quality are discussed in Chapter 12 – Air Quality.

3.4.7 Construction Site Management and Security

3.4.7.1 Site Management

The Site Senior Executive (SSE) will be responsible for site management during the construction phase. The SSE will be supported in this role by a senior site representative from the principal construction contractor. The SSE will oversee the principal contractor during the construction of the Project including monitoring the principal contractors' performance to ensure that the mitigation measures established for the construction phase are implemented and that construction impacts and nuisance are minimised. A site Safety and Health Manager and a site Environmental Manager will also be appointed by Central Queensland Coal and will be present on the site during the construction phase.

3.4.7.2 Emergency Response

An Emergency Response Plan (ERP) will be implemented at the site as part of the overall Safety and Health Management System (SHMS) prior to the commencement of construction activities. The system will be modified as the site transitions into operations. The ERP will include specific procedures aimed at identifying and minimising risks in an emergency response situation, address rescue and escape procedures, provide for regular testing and review of emergency response procedures and prescribe the requirement for routine auditing to ensure the consistency and effectiveness of the system.

Designated first aid and emergency rescue facilities and equipment will be established at the site prior to the commencement of construction and then will remain onsite throughout the life of the Project. Appropriately trained personnel will be onsite always to implement emergency response procedures when required.

Site inductions will include specific discussions in relation to emergency response procedures for the site. This will include Standard Operating Procedures associated with rescue and escape procedures in addition to onsite first aid resources and processes.

3.4.7.3 Access and Security

The site access will be restricted to authorised personnel only. Access to the site will be via a swipe card system monitored by CCTV with remote communications, augmented with an internal access security system. Secondary external access points will always be locked and will only be used by authorised mine site personnel.

Access to the site by visitors will be permissible under a strictly controlled system with defined Standard Operating Procedures. The system will incorporate procedures to ensure visitors are fully authorised to access the site, have satisfactorily completed a visitor's induction, are escorted on-site by suitably qualified personnel and are registered into the site SHMS. The site security system will be routinely reviewed to ensure procedures remain current and continue to achieve security objectives.

3.5 Operations

3.5.1 Mine Sequencing

3.5.1.1 Overview

The mining schedule is based on the development of three open cut operations producing a total of up to 10 Mtpa of ROM. Open Cut 2 will be developed initially and is anticipated to operate until year 12 (2028). Open Cut 1 is anticipated to commence operations in year 10 (2026) and operate until Year 16 (2032). Open Cut 4 will commence operations in year 11 (2027) and cease operations in 2028. The proposed open cut mine layouts and sequencing of open pit are shown in Figure 3-19. Mining operations will be seven days a week and 24 hours per day.

Mining will commence at the south-eastern ends of Open Cut 1 and 2 and progress generally in a northwest direction. Mining will commence at the western end of Open Cut 4 and continue generally in an easterly direction. Being terraced mines both open cut operations will advance across strike. The mining schedule for all three pits was established to commence operations in the lower strip ratio areas for that pit, focused on all seams suitable for mining. It is anticipated that operations in the open cuts will continue for approximately 20 years which comprises 16 years of mining and four years to finalise the rehabilitation program which commences in year 2 and continues through to the end of mine life.

Whilst the initial mining approach is based around truck and shovel operations, Central Queensland Coal will continue to review alternative mining methods to optimise product coal outputs. Other mining methods to improve resource recovery may be considered as the Project progresses.

Subject to statutory approvals, soil removal from both pits is scheduled to commence in Q1 2018. First shipment of product coal is scheduled in the second half of 2018. Construction of mine facilities will commence immediately after grant of the Mining Leases. Mining is to commence on the Mining Leases as soon as construction of the mine facilities has been completed. The years of mining for each of the open cut operations are shown at Table 3-11.

Table 3-11 Mining schedule

Mine operation	Years of operation
Open Cut 2 (east)	Year 1 – Year 12
Open Cut 1 (west)	Year 10 – Year 16
Open Cut 4 (east)	Year 11 – Year 12

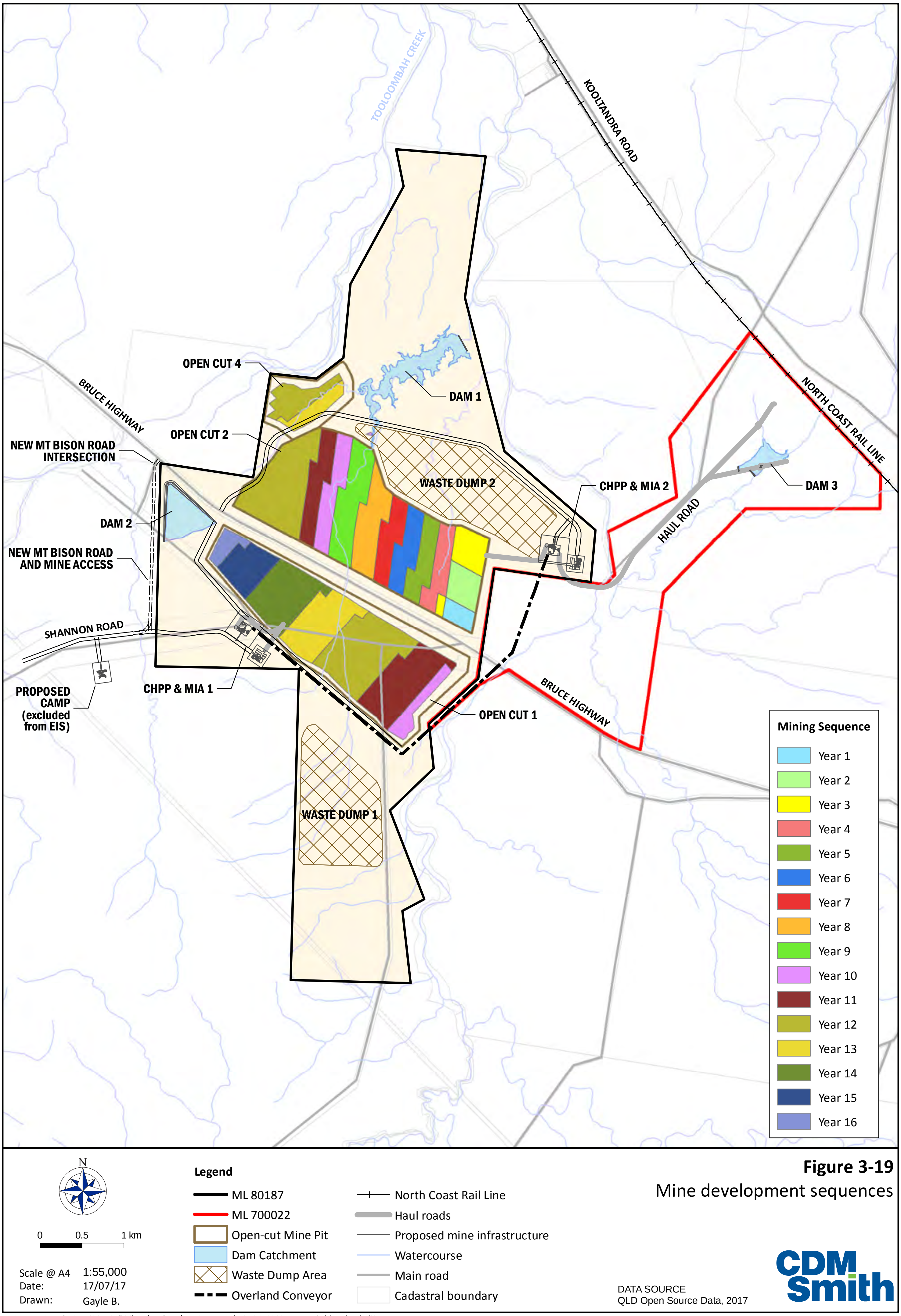

Figure 3-19
Mine development sequences

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3.5.2 Mining Method

Open cut mining methods will target the multiple seams during mining of the three pits. Mine development will commence with the removal of vegetation and topsoil by scrapers in accordance with relevant management plans to avoid and minimise impacts. Cleared material will be placed on dedicated topsoil stockpiles or placed directly onto reshaped final landforms if available. The initial box cut will be developed utilising a ramp formed in the low wall of each of the three pits. It is proposed that most of the waste rock will be dumped to the ex-pit waste dumps (see Figure 3-8) for the initial strips and then in-pit for the remaining strips.

The coal bearing strata are known as the Styx Coal Measures and consists of quartzose, calcareous lithic and pebbly conglomerate, sandstone, siltstone, mudstone, carbonaceous shale, with a proportion of weathered material near the surface. The upper portion of weathered overburden, where possible, will be free dug and removed. Where the overburden materials become competent and the free digging operations cease, a drill and blast operation will be utilised to fracture strata. Some of the weathered sandstones and fresh sandstones will be used for concurrent civil works and construction of haul roads.

Coal mining will be undertaken using a fleet consisting of excavators, front end loaders and trucks to mine the coal seams, with the coal hauled to the CHPP for benefaction. Interburden waste between the main coal seams is then blasted and this waste is mined by the excavators and hauled by trucks to waste rock dumps in the previous strips. The next coal seam is mined in the block, with the coal mining and parting operation planned to be performed in a series of sections along the pit.

Initial out-of-pit dumping is required as the box cuts are developed. The ex-pit dumping for Open Cut 1 commences in 2027 and lasts until 2028 and will be to a maximum height of 40 m (RL 80 m). The ex-pit dumping for Open Cut 2 will commence in 2018 and continue until 2021 and will be to a maximum height of 45 m (RL 75 m). Open Cut 4 waste will be dumped in-pit at Open Cut 2. Rehabilitation of the out-of-pit dumps will continue through the life of the mine (refer to Chapter 11 – Rehabilitation and Decommissioning).

3.5.2.1 Blasting

Blasting will be required to break and fragment the overburden and interburden horizons in each of the three open cuts. This allows the fragmented rocks to be excavated and transported to the waste rock dump and for the coal seam to be mined productively. Blasting may not be required to break the coal seam as generally the coal seams are less than 3 m thick.

Blasting will be carried out in accordance to blasting management standard operating procedures. Blasting will generally occur on Monday to Sunday between 7 am and 6 pm. Blasting outside these hours will be covered by a specific Blast Management Plan developed for each individual occurrence and will incorporate a notification procedure informing all related and impacted parties. Blasting activities will be carried out in accordance with the Project's EA so that ground vibration and airblast overpressure (the wave explosive energy released into the atmosphere) are within approved blasting limits (see Chapter 23 – Draft EA Conditions). Blasting activities will account for the direction the wind is blowing to reduce the risk of potential airblast overpressure impacts at noise sensitive receptors.

It is envisaged that an explosives contractor will provide the explosives for the site. The preferred option for storage and supply of bulk explosives is for the blasting contractor to store the chemicals in a remote location offsite, and then transport the shots to site in specially designed trucks for loading into the blast holes. The blasting contractor, through a specifically designed initiation system, connects each primed blast hole together with detonating cord. The speed at which each blast progresses is determined by the site Blast Engineer to minimise noise and vibration.

Over the life of the mine, the volume of bulk explosives used per annum will average approximately 18,400 tonnes per year.

3.5.2.2 Mining Equipment

The proposed mining method involves large truck and excavator mining with truck haulage direct to the crusher dump hopper or the ROM pad adjacent to each of the CHPPs. Based on this scenario the following equipment listed at Table 3-12 will be required to support open cut mining throughout the duration of the Project.

Table 3-12 Mining equipment schedule

Equipment	Quantity			
Specification	Operation Year 4	Operation Year 8	Operation Year 12	Operation Year 14
CAT 631G Scraper	1	1	1	1
789D Haul Truck	4	4	8	4
793D Haul Truck	8	12	36	4
RH170 Excavator	1	1	2	1
Liebherr 996 Excavator	2	3	9	1
SKS 270mm Drill	1	2	4	1
MD5150C Track Drill	1	2	3	1
D9 Dozer	1	4	4	1
D10 Dozer	2	3	5	2
D11 Dozer	2	3	4	2
HD605 Water Cart	2	3	4	2
16M Grader	2	2	2	2
24H Grader	1	2	2	1
B-Double Coal Haulage Units	2	3	8	2
992 Front End Loader	3	4	6	3
Service Truck	1	2	2	1
Pump Truck	1	2	2	1
Fuel Truck	1	1	3	1
Franner Crane	1	1	2	1
Service vehicles	10	14	19	10
Generator (520kVA)	3	6	6	3
Generator (300kVA)	3	5	5	3

3.5.3 Coal Handling System

The coal handling system consists of a ROM coal system, a product coal system and a rejects waste system. This incorporates simultaneous coal feed from the three open cut mines supplying the CHPPs. Materials handling capacity has been set at a maximum of 2.5 Mtpa of ROM coal for each CHPP. A schematic showing the coal handling system is shown in Figure 3-20.

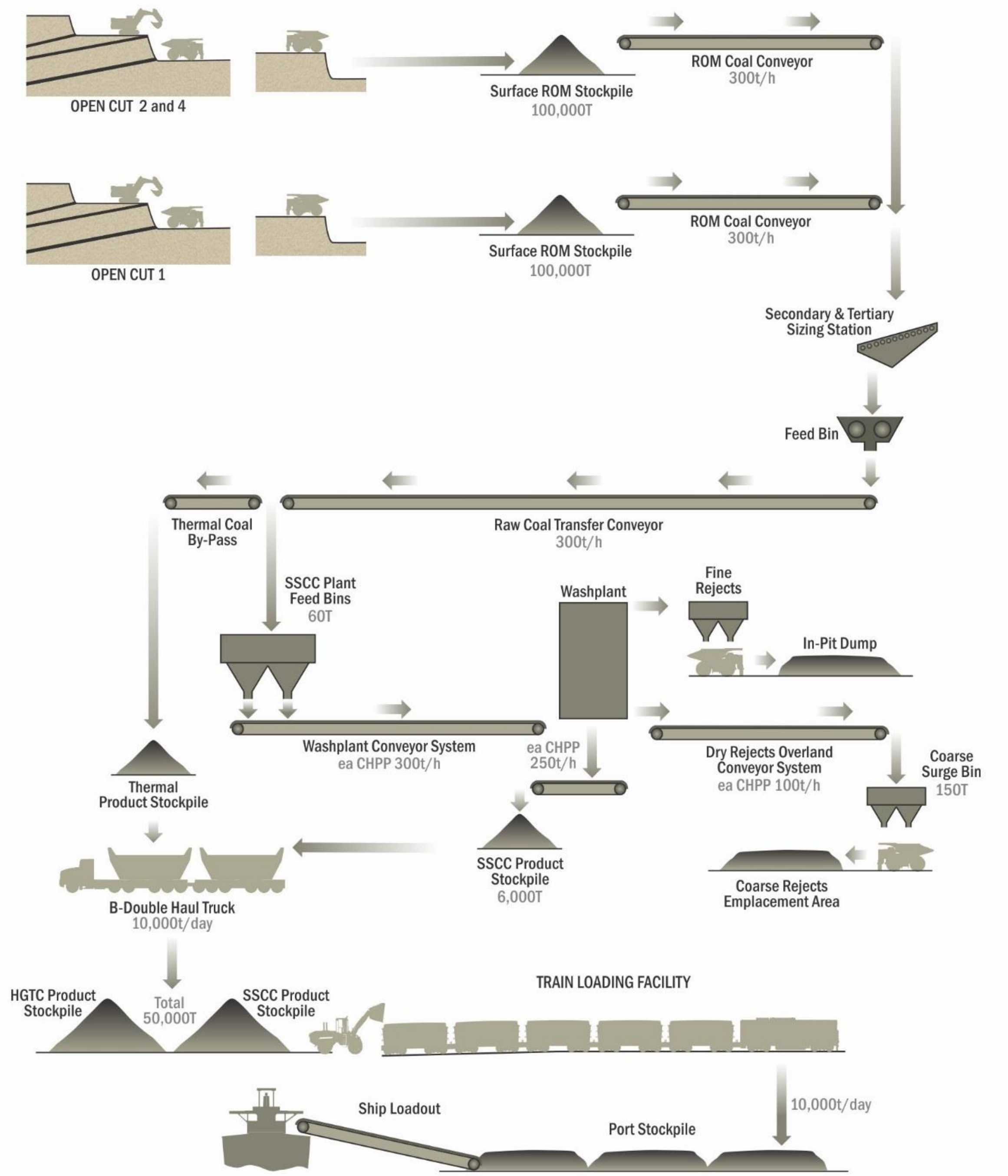

Figure 3-20 Coal handling system

3.5.3.1 Raw Coal Plant Layout

Raw coal from the open cut operations will be transferred by truck to one of two 100,000 t capacity ROM pads. There will be one ROM pad, ROM bin and primary crusher arrangement servicing each of the open cut operations. Secondary and tertiary crushing stations will be located immediately after the primary crushing station. This stockpile will be no more than 30 m high.

Coal will be dumped directly into a ROM bin when the CHPPs are running at capacity or deposited into the ROM stockpiles to allow surge capacity. Reclaim feed to the ROM bin from the stockpile will be by front end loader. An elevated ROM pad will be constructed using a reinforced concrete design around the crusher pocket.

Primary crushing takes place immediately under the ROM feed bin. The primary sizer is a low speed sizer, a combination of high torque and low roll speeds with a unique tooth profile.

3.5.3.2 Raw Coal Conveyor Configuration

ROM coal conveyors sized at 300 t/hour will deliver sized ROM coal to the overland conveyor streams. A single ROM coal conveyor will service each CHPP. Overland conveyors will then transfer the ROM coal from the crushers to the plant feed bin which will then feed into the CHPP.

3.5.3.3 Coal Handling Preparation Plant

Two CHPPs will be required to process ROM coal delivered from each of the pits and increase the recovery of the coal resource. Each CHPP will remove (wash) the unwanted sediment and rock from the coal to improve the quality of coal exported to market. The first CHPP will be established to support operations at Open Cut 2 and Open Cut 4. The second CHPP will be established to support operations at Open Cut 1.

A single conveyor sized at 300 t/hour will feed each of the CHPPs from the ROM stockpiles. At this point the feed will become a slurry through addition of water to transport and optimise feed conditions to de-sliming screens. The de-sliming screen will remove sub-sized particles from, and dewater, the dense medium cyclone feed. Screening is achieved by presenting particles to the screen deck surface and moving particles smaller than the aperture through the sieve surface. Vibration of the screen assists this process by stratifying the bed, giving particles more opportunity to present to the screen surface.

Both CHPPs will be based on conventional wet beneficiation processes using proven technology that is used extensively throughout the Australian coal industry, for example Daunia, Caval Ridge, Maules Creek and Bengalla. The coarse coal rejects fraction (>1 mm to 50 mm) will be beneficiated in dense medium cyclones. In this process, the coarse material from the de-sliming screens is mixed with a magnetite / water medium and pumped to a single large diameter dense medium cyclone. Dense medium cyclones separate based on density with the high-density non-coal material reporting to coarse rejects stockpile and the lower density coal reporting to the product coal stockpile after dewatering in coarse coal centrifuges.

The fine ROM coal slurry from the de-sliming screens is pumped to a classifying cyclone module to remove the fine material and the bulk of the water from this stream. The fine coal fraction (<1 mm) will be beneficiated using spirals in a water based separation. This produces dewatered fine coal that report to the product stockpile. Spirals reject is dewatered on high frequency screens with the coarse spirals reject particles reporting with the dense medium cyclone reject on the plant reject conveyor and the fine spiral reject particles reporting to the tailings thickener.

The proposed tailings system will be a simple filter press system. The filter press system requires the fine particles to be conditioned with flocculants, a process carried out within thickening tanks. The thickening process forms an aqueous tailings slurry allowing tailings to be transported via a pipe network to the filter press system. The filter press method utilizes filter presses to dewater tailings forming a dry paste. The water is recycled to each of the CHPPs while the tailings paste is conveyed to the rejects surge bin for disposal amongst the significantly more prolific overburden waste material. Excess water from the rejects containment structures is also recycled.

Coarse rejects will report from the CHPP to awaiting empty haul trucks via the coarse rejects conveyor which is sized at 100 t/hour. Loaded haul trucks will empty the coarse rejects to the coarse rejects emplacement area.

The reagents required to operate the flotation cell (diesel and Methyl Isobutyl Carbinol) will be provided and stored in a purpose-built storage. The storage will consist of one storage tank for each of the reagents located in a fully bunded area. The diesel tank will also be used for light vehicle and product stockpile dozer refuelling. Pumps and piping will transport the reagents from the storage tanks to the flotation circuit.

3.5.3.4 Product Coal Handling

Both CHPPs will have a single product coal conveyor sized at 250 t/hour discharging washed coal to a product coal stockpile sized at 6,000 t capacity. Product coal stacking will be via a conventional elevated gantry conveyor.

Product coal reclamation will be via front end loader and haul truck. Initially, coal will be offloaded from the haul trucks directly onto the product coal stockpile pad. At peak production, it is anticipated that there will be approximately 62 trucks and 94 truck movements along the haul road per day in Years 11 and 12 respectively. Coal will be loaded into trains for transport to market.

The product coal stockpile at the TLF will have an operational capacity of 50,000 t and be managed using dozers. Coal will be reclaimed by front end loaders and transferred to the empty train wagons. There will be approximately 1,110 train movements per year on average, subject to train and shipping schedules. A rail haulage provider will contract the rolling stock to transport coal. Product coal stockpiles will be less than 20 m high.

3.5.4 Rejects Disposal

Rejects and tailings disposal will be conducted in accordance with the Project's Mineral Waste Management Plan. Over the life of the mine, the total volume of excavated waste rock from open cut activities (i.e. overburden, interburden and fines from the CHPPs) is expected to be approximately 558 million bank cubic metres (Mbcm). The estimation of tonnage and volumes of waste rock and subsoils to be excavated during each year both annually and cumulatively is presented in Table 3-13.

The preferred method to dispose of mine waste is to truck rejects initially to ex-pit dump areas and as the open cuts develop, coarse rejects and filter press tailings will be blended with overburden and disposed of in-pit. These materials will be hauled as back loads to disposal areas using coal haulage trucks after they deliver ROM coal to the ROM stockpile. An estimation of the dump schedule presented in Table 3-14 and is shown at Figure 3-21 to Figure 3-24. A single final void will remain after completion of mining at Open Cut 1. For this EIS a retained void in Open Cut 4 is also assessed. Optimisation of the mine plan is being progressed and there is potentially an option within the mine plan for Open Cut 4 to be backfilled such that no void will remain. Further mine planning and scheduling work is required to confirm the removal of the void in Open Cut 4, and once completed, the EIS will require updating during the Supplementary EIS stage to reflect this potential significant reduction in ex-pit waste and associated changes in final landform. Consequently, the waste volumes and final landform described in this EIS should be considered as the worst-case scenario.

The rejects are expected to have a low capacity to be potentially acid forming. No visible pyrite (FeS_2) was reported in the 2012 data set, although possible pyrite was reported in the described lithology. Total sulphur content in potential coal reject samples in 2012 ranged from 0.005% to 0.69% and averaging 0.10%, indicating low sulfur content for rejects. The proportion of sulfur of the total sulfur content, determined by the chromium reducible method (CRS, to distinguish between biogenic and pyritic sulfur for potential oxidation) in the coal reject samples ranged from 19.3% (coal) to 100% (carbonaceous mudstone, roof).

Predicted salinity of the rejects produced during operation is considered to be moderate (average electrical conductivity of ~0.54 dS/cm of potential reject sample analysed), and is consistent with the EC measurements of other overburden and interburden samples (RGS Environmental, 2012). Reject materials (coarse) will report to the out-of-pit waste rock storage facility during the early stages of mining, with rejects from latter stages to report to the in-pit facility, co-disposed with tailings from the two CHPPs.

The sample analysis data shows the sulfur concentration of the majority (98%) of waste rock samples was low (<0.2%), with these materials classified as Non-Acid Forming (NAF), or NAF (Barren) where the ANC/MPA ratio is >10. The acid neutralising capacity (ANC) values were variable, ranging from 7 to 390 kg H_2SO_4/t. Of the 163 samples analysed, two were classified as "Uncertain" with ANC/MPA ratios <2. One sample (Sandstone and Carbonaceous Mudstone) was classified as Potentially Acid Forming (PAF) due to a high sulfur concentration result (8.18%). The pH (1:5 extract) results of all samples ranged from 8.8 to 10.2 (except the single PAF sample, with a pH of 6.8), indicating the waste is alkaline. There is a moderate potential for saline leachate generated from the waste materials, with an average EC of 0.61 dS/cm in the samples.

Predicted salinity of the rejects produced during operation is considered to be moderate (average electrical conductivity ~0.6 dS/cm of potential reject sample analysed) compared to the surface water electrical conductivity range (0.259 to 1.554 dS/cm) recorded in creeks and ponded surface water onsite. The volume of rejects shall be reduced through screening the rejects material and the rejects shall be capped within benign soil to minimise further oxidation and dissolution of metals.

The analytical results of the sulfur concentration of the majority (98%) of waste rock samples was low (<0.2%), with sulfur concentrations being more wide ranging in the unweathered samples analysed from close to the coal seams. The acid neutralising capacity (ANC) values ranged from low to very high (5.3 to 390 kg H_2SO_4/t). Samples classified as NAF (Barren) generally had higher ANC values compared to samples classified as NAF. Of the 147 waste rock samples, 144 samples had calculated negative net acid producing potential (NAPP) values (-1.0 to -390 kg H_2SO_4/t), indicating a significant overall proportion of acid consuming capacity (AC). The three samples with positive NAPP values were described as pyritic sandstone / mudstone. Waste rock samples were alkaline (> pH 7) with 98% samples having high pH (9.0 to 10.0 pH). The minimum pH recorded was 4.8 (the aforementioned pyritic sandstone sample). Electrical conductivity (EC) of samples ranged from low to very high (0.11 to 2.78 dS/cm) with a median EC of 0.61 dS/cm.

Further discussion on the geochemical characteristics of the waste rock material is at Chapter 8 – Waste Rock and Rejects.

Table 3-13 Estimated waste generation schedule

	Year															
Project	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Overburden (Mbcm)	7.0	10.7	12.5	23.5	22.9	24.5	22.7	35.9	40.3	61.2	97.4	131.3	45.9	13.1	6.6	2.3
ROM (Mt)	0.5	1.0	1.0	2.0	2.0	2.0	2.0	3.0	3.0	4.0	7.0	10.0	4.0	1.0	0.5	0.2
Coking coal yield (%)	83.0	85.0	85.0	85.0	86.0	85.0	84.0	84.0	82.0	78.0	78.0	80.0	85.0	83.0	83.0	84.0
Thermal coal yield (%)	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
Total product coal (Mt)	0.4	0.8	0.8	1.7	1.7	1.7	1.7	2.5	2.5	3.1	6.1	9.1	3.4	0.8	0.4	0.1

Table 3-14 Estimated waste material dump schedule

Dump Schedule												
Year	**Volume (bcm)**	**Accumulative Volume (bcm)**	**In-Pit Dump (bcm)**	**Ex-Pit dump (bcm)**	**In-pit Pit 2 (bcm)**	**In-pit Pit 1 (bcm)**	**Ex-pit Pit 2 (bcm)**	**Ex-pit Pit 1 (bcm)**	**In-pit Pit 4* (bcm)**	**CHPP Total Rejects (bcm)**	**CHPP 2 (bcm)**	**CHPP 1 (bcm)**
1	9,216,291	9,216,291	-	9,216,291	-		9,216,291	-	-	82,655	82,655	-
2	18,735,164	27,951,455	-	18,735,164	-		18,735,164	-	-	150,444	150,444	-
3	20,695,724	48,647,179	-	20,695,724	-		20,695,724	-	-	150,910	150,910	-
4	32,648,831	81,296,010	25,424,564	7,224,267	25,424,564		7,224,267	-	-	291,361	291,361	-
5	33,850,728	115,146,738	33,850,728	-	33,850,728		-	-	-	281,292	281,292	-
6	33,587,960	148,734,698	33,587,960	-	33,587,960		-	-	-	298,384	298,384	-
7	32,722,286	181,456,984	32,722,286	-	32,722,286		-	-	-	324,845	324,845	-
8	47,825,108	229,282,092	47,825,108	-	47,825,108		-	-	-	486,919	486,919	-
9	53,810,048	283,092,140	53,810,048	-	53,810,048		-	-	-	547,301	547,301	-
10	58,783,646	341,875,786	32,748,482	26,035,164	32,748,482		-	26,035,164	-	845,003	416,565	428,439
11	92,509,126	434,384,913	83,847,299	8,661,827	35,004,920	48,842,379	-	8,661,827	-	911,475	259,198	652,277
12	138,889,917	573,274,830	138,889,917	-	42,326,636	63,797,618	-	-	32,765,663	1,008,847	513,820	495,027
13	58,974,584	632,249,414	58,974,584	-	-	41,152,653	-	-	17,821,932	600,163	136,156	464,007
14	19,275,774	651,525,188	19,275,774	-	-	19,275,774	-	-	-	167,939	-	167,939

Dump Schedule												
Year	Volume (bcm)	Accumulative Volume (bcm)	In-Pit Dump (bcm)	Ex-Pit dump (bcm)	In-pit Pit 2 (bcm)	In-pit Pit 1 (bcm)	Ex-pit Pit 2 (bcm)	Ex-pit Pit 1 (bcm)	In-pit Pit 4* (bcm)	CHPP Total Rejects (bcm)	CHPP 2 (bcm)	CHPP 1 (bcm)
15	11,458,087	662,983,275	11,458,087	-	-	11,458,087	-	-	-	86,345	-	86,345
16	3,127,489	666,110,764	3,127,489	-	-	3,127,489	-	-	-	28,528	-	28,528
Total	**666,110,764**	**666,110,764**	**575,542,327**	**90,568,437**	**337,300,732**	**187,654,000**	**55,871,446**	**34,696,991**	**50,587,595**	**6,262,411**	**3,939,851**	**2,322,561**

*Pit 4 waste will report to Pit 2 for in-pit disposal

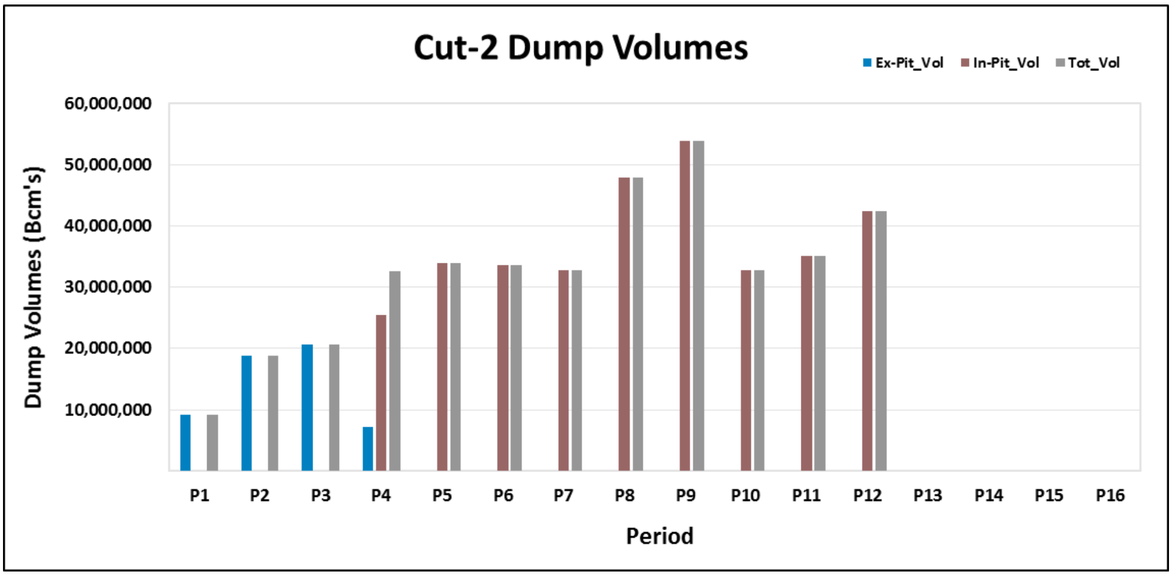

Figure 3-21 Waste material dump schedule – Open Cut 2

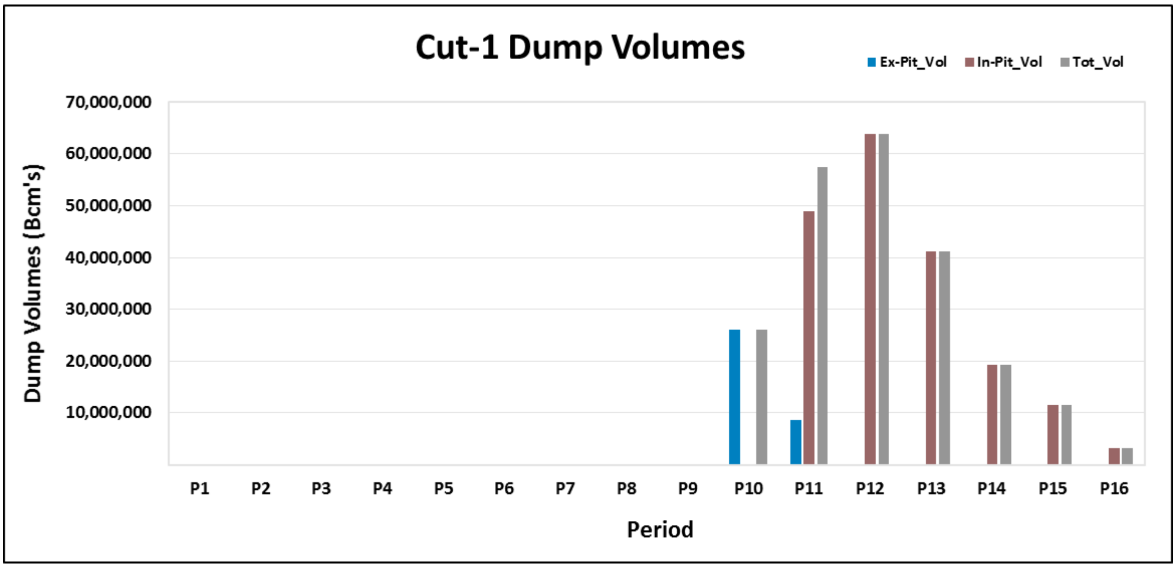

Figure 3-22 Waste material dump schedule – Open Cut 1

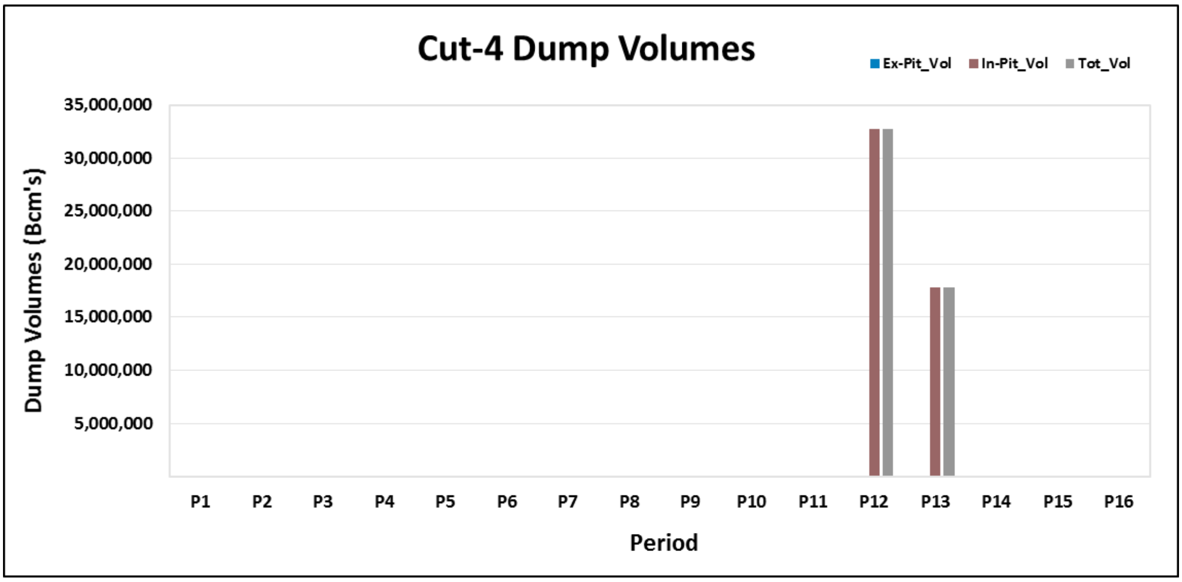

Figure 3-23 Waste material dump schedule – Open Cut 4

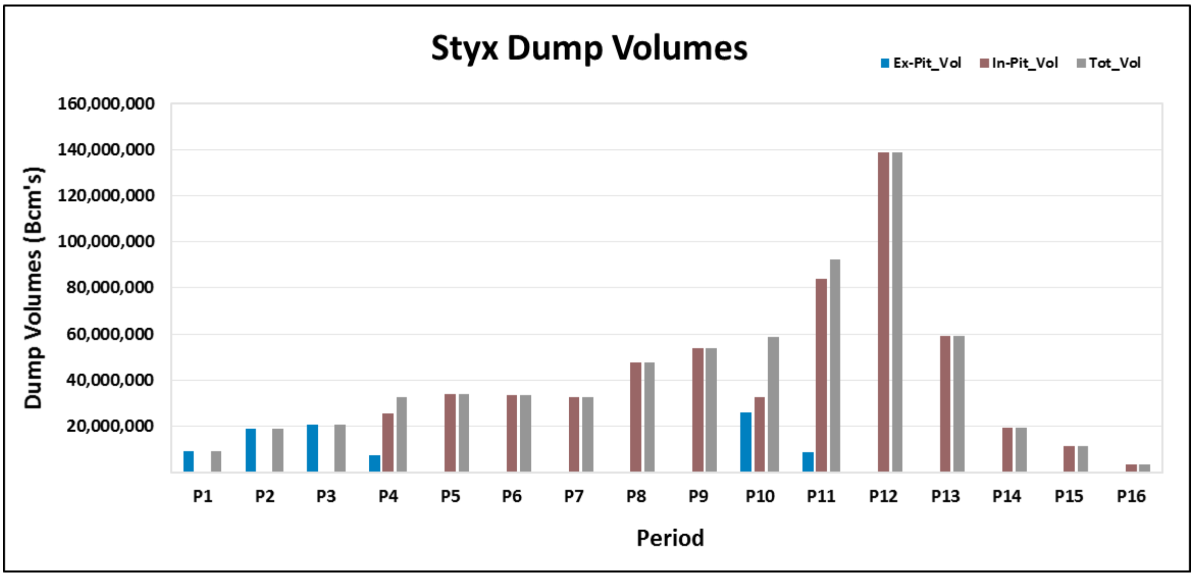

Figure 3-24 Waste material dump schedule – total volume

3.5.5 Water Management

A schematic of the proposed water management network for the Project is shown in Figure 3-25. Approximately 1,373 megalitres (Ml) per annum of water will be required during peak operations with dust suppression and coal washing forming the major water demands. This water requirement will be supplied from harvesting on-lease stormwater runoff, mine affected water from pit dewatering activities, water reuse within the CHPP, and from flood harvesting from Tooloombah Creek. These combined sources provide a 99% reliable supply. In times of extreme drought, dust suppression, product moisture correction and coal washing water use will be decreased and / or alternative water supply options explored to sustain operations. Water supply alternatives are also discussed in Chapter 2 – Project Need and Alternatives and mine water balance discussed in Chapter 9 – Surface Water.

The water within the mine site can be divided into four main classes as follows:

- Raw water – clean water runoff from catchments that are undisturbed or relatively undisturbed by mining activities;
- Sediment laden water – surface water runoff from disturbed catchments such as the active MIA and overburden stockpiles, all of which could contain elevated levels of sediment;
- Mine affected water – water collected in open mine pits from groundwater ingress or surface water runoff, likely to contain elevated levels of salts and metals; and
- Contaminated water - surface water runoff and process water which could potentially contain hydrocarbons, salts or other chemical contaminants, possibly because of unintended spills.

The primary objective of site water management is to separate clean water and dirty water runoff for appropriate management, to maximise water harvesting for supply operations, to contain contaminated water for reuse and to prevent uncontrolled discharges.

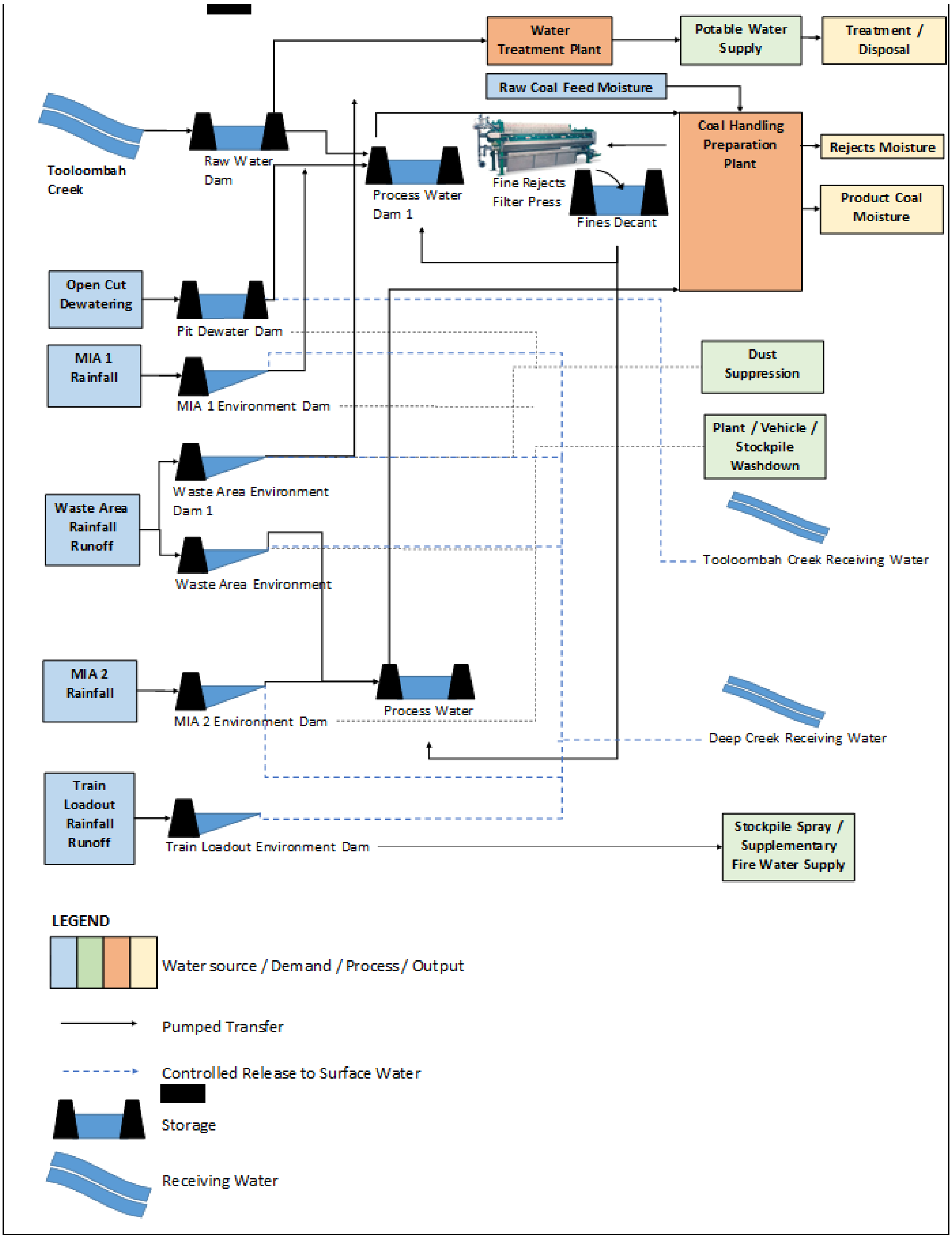

Figure 3-25 Water balance schematic

The proposed water management system for the Project principally comprises the following components:

- The collection mine affected water in turkey's nest storages for reuse;
- The collection of sediment laden runoff from the MIA, TLF and overburden stockpiles; for treatment and reuse and / or discharge;
- The transfer of water from the raw water dam, pit dewater dam, and environment dams to the process water dam where it is used for coal washing;
- The decant of effluent from coal washing activities and reuse of decant water within the CHPP;
- The use of water by the workforce, industrial processes, dust suppression and for firefighting (if required); and
- The managed release of mine affected water to receiving waters, governed by flow conditions, water quality objectives and instream dilution achieved within the receiving waters.

3.5.5.1 Project Water Demand

Project water usage including potable water, emergency use water (fire), raw water and mine water is outlined in Table 3-15. A more detailed discussion and assessment of water usage including water balance is described in Chapter 9 – Surface Water. The water demand for the rehabilitation activities in Years 17 – 20 is unknown at this stage; however, it is anticipated that demand will be <20 ML per year.

Table 3-15 Mine water demands

Water Use	Annual Water Use Per Year of Mine Life (ML)							
	1	2	3	4	5	6	7	8
Potable	3.1	3.8	4	4.2	4.5	5	5.4	5.6
Sewage	2.8	3.4	3.6	4	4.2	4.4	4.6	4.8
CHPP	-	-	100	100	200	200	300	300
Dust suppression	15	30	45	60	75	90	105	120
Washdown	10	10	12	12	15	20	22	25
Totals	**28.1**	**43.8**	**161**	**176.2**	**294.5**	**315**	**432.4**	**450.6**
Water Use	**Annual Water Use Per Year of Mine Life (ML)**							
	9	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Potable	5.8	6	6.3	6.3	6	5.8	5.4	5
Sewage	5	5.3	5.6	5.6	5.3	5	4.8	4.6
CHPP	400	400	500	500	400	300	200	100
Dust suppression	135	140	150	150	135	120	105	90
Washdown	28	30	36	36	30	28	25	22
Totals	**568.8**	**576**	**692.3**	**692.3**	**571**	**453.8**	**335.4**	**217**

3.5.5.2 Potable Water

A potable water demand of approximately 6.3 ML/annum is estimated for the MIA and CHPP operations at full capacity. The potable supply will comply with standards outlined in the Australian Drinking Water Standard Guidelines (NHMRC and NRMMC 2011). A potable water treatment plant (WTP) will treat water from the raw water supply and maintain a secure supply in a potable water holding tank. The capacity of the WTP will be 18 kilolitres per day (kl/d). The WTP is modular and can be readily procured, installed and operated to comply with the above guidelines. An additional unit can be added if required to meet any increases in demand. Sludge from the water treatment effluent stream will be disposed of in-pit or transported offsite to an authorised waste facility. A sewage treatment plant is proposed to be located near the MIA. Effluent and sludge waste streams will be appropriately treated and discharged to pits or used as mulching media, respectively.

3.5.5.3 Clean Water Runoff Management

Clean water is defined as runoff from catchments undisturbed by mining and non-mining activities. The mine has been designed to avoid any diversions of defined watercourses of high environmental value, namely Deep Creek and Tooloombah Creek. However, low order tributary gullies that discharge into Deep Creek and Tooloombah Creek and that transect the ML are diverted around mine affected areas. These clean water diversions are aimed at maintaining the health of defined watercourses of higher environmental value and to reduce contamination of otherwise clean water runoff.

3.5.5.4 Contaminated Water Management

Several types of dams will be required to hold mine affected runoff, including:

- Environmental dams that capture rainfall runoff from the two MIA, TLF and overburden dump areas. The primary function of the environment dams is to capture sediment laden runoff for sediment removal. A perforated riser pipe outlet is proposed to allow gravity draining of the sediment dam within 48 hours of filling. A gated outlet is proposed for potentially storing water for use (overburden and CHPP environment dams) or for stockpile spray and supplementary fire supply (TLF environment dam – dam 3). Oil/water separators are proposed for vehicle wash and workshop areas to treat hydrocarbon contaminated runoff prior to release or containment in environment dams;

- A pit dewater dam that accepts water pumped from the open cut sumps to ensure dewatering of pits and continued access to the coal resource. The pit dewater stored volumes take preference for dust suppression supply, washdown and transfer to the PWD for coal washing use;

- A process water dam (PWD) located at the MIA that supplies water to the CHPP. The PWD holds a 14-day CHPP demand volume to buffer against water supply maintenance and breakdown. The PWD is kept full from transfers from the pit dewater dam (priority 1) and the raw water dam (RWD) (priority 2). The PWD does not discharge to the environment and has a design storage allowance to ensure overtopping does not occur;

- CHPP dewatering ponds that accept high moisture coal fines from coal washing and facilitate decant return to the PWD for reuse within the CHPP. The dewatered fines are then stored in exhausted mine pits; and

- Open cuts that contain a sump (nominally 5 ML) from which groundwater inflow and rainfall runoff is stored. Water is transferred from the pit sump to an ex-pit mine dewater dam at a rate of 200 l/s.

3.5.5.5 Regulated Structures – Dams and Levees

All proposed storages and levees have undergone preliminarily assessment under the DEHP Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EHP 2013) to determine the minimum hydraulic performance requirements. A summary of the consequence assessment is shown in Table 3-16. The pit dewater dam (dam 2), process water dam and CHPP fines dewatering ponds were classified under the "significant" consequence category for the "failure to contain-overtopping" and "dam break" scenarios. Levees were determined to be regulated structures and hence must have a crest elevation that diverts the peak 1:1000 AEP flood level.

The "failure to contain – seepage" scenario has a minimum classification of "significant" in the DEHP consequence manual. Leak detection and monitoring may be imposed through EA conditions for regulated dams containing contaminants, such as the PWD, CHPP dewatering ponds and the pit dewater dam. Design provisions for these dams include the use of, where practicable, low permeability clay as the dam foundation or liner to prevent the migration of contaminants. Monitoring of the seepage front may also be required as is discussed further in the Chapter 9 – Surface Water.

Table 3-16 Consequence assessment summary

Storage	Scenario	Consequence Category	Overall Consequence Category	Comments
Raw Water Dam	Failure to Contain	Low	Low	Clean water with negligible environmental harm expected from overtopping discharge.
	Dam Break	Low		The 1.5 GL storage capacity is not considered a likely risk to populations and infrastructure downstream.
Pit Dewater Dam	Failure to Contain	Significant	Significant	Possible harm to the receiving environment of moderate or significant values, however the harm is unlikely to meet the thresholds for the "High" consequence category.
	Dam Break	Significant		Possible harm to the receiving environment of moderate or significant values due to contaminant release. Volume is too small to be considered a risk to populations and infrastructure downstream. The PDD has a small containment volume of ~153 ML and is unlikely to create a downstream population at risk.
Process Water Dam	Failure to Contain	Significant	Significant	Possible harm to the receiving environment of moderate or significant values, however the harm is unlikely to meet the thresholds for the "High" consequence category.
	Dam Break	Significant		Possible harm to the receiving environment of moderate or significant values due to contaminant release. Volume is too small to be considered a risk to populations and infrastructure downstream. The PWD has a small containment volume of ~13 ML and is unlikely to create a downstream population at risk.
Environment Dams	Failure to Contain	Low	Low	Sediment laden, but otherwise clean water with negligible environmental harm expected from overtopping discharge.
	Dam Break	Low		Volume is too small to be considered a risk to populations and infrastructure downstream.
Levee	Dam Break	Regulated Structure	Regulated Structure	Levees are designed to prevent ingress of clean flood water into an operational area or containment system.

Only dams with an embankment height greater than 10 m will possibly qualify as a new referable dam requiring a Failure Impact Assessment (FIA). The RWD could possibly qualify for this assessment, pending outcomes of further assessment and design. The dam FIA, if required, will be undertaken as outlined in the DERM document "Guidelines for Failure Impact Assessment of Water

Dams (2010)”. The population at risk (PAR) determined by the FIA will inform the failure impact category that applies to the dam and subsequently the minimum design requirements outlined in applicable Australian National Committee on Large Dams guidelines. The chief executive will then impose dam safety conditions, likely including the following documentation requirements:

- The provision of design and construction reports;
- The preparation of an Emergency Action Plan as prescribed by the DEWS framework for referable dams;
- The production of Operation and Maintenance Manual procedures in accordance with DNRM guidelines; and
- Standing operating Procedures.

It is not anticipated that any of the dams conceptualised herein will create a PAR due to the sparse population density and small containment volume of the dams. Furthermore, apart from environment dams, all other storages have no external contributing catchment and therefore only overtop if the pumps that feed water to the storages fail to shut off at full supply level. The spillways will therefore be designed to pass the maximum pump rate that supplies each storage to mitigate against dam break due to overtopping failures.

3.5.6 Existing Water Users

The Project is generally situated within the Mamelon cattle grazing property, which both runs cattle and produces dryland cropping. A small section of the haul road is located within “Brussels” and the TLF within Strathmuir. The Mamelon property is owned by the Proponent and is currently being leased for cattle grazing and use. Supporting this land use is a series of farm dams and surface contour bunds that capture and store runoff generated by the local contributing catchments. Groundwater bores also lift water to dams and / or storage tanks in the surrounding region for domestic and stock water use (refer to Chapter 10 – Groundwater for further discussion).

There are several surface water entitlements in Tooloombah and Deep Creek for irrigation, stock and domestic supply. These entitlements are summarised in Table 3-17. The entitlements that may be impacted by the Project by being located adjacent to or downstream of operations include the following:

- 119/CP900367 - Irrigation entitlement located on parcel of land adjacent to the Mamelon property, separated by Deep Creek, and approximately 3 km downstream of mine infrastructure and environment dam release point locations on Deep Creek;
- 1/RP616700 - Domestic / stock supply entitlement located on parcel of land adjacent to the Mamelon property and straddling Tooloombah Creek. The extraction point appears to supply a small off-stream storage on the western overbank of Tooloombah Creek, approximately 1 km downstream of the pit dewater dam discharge location; and
- 45/MPH26062 - Irrigation entitlement on parcel of land directly bordering the Project to the north and extracting approximately 6 km downstream of the pit dewater dam proposed discharge location on Tooloombah Creek.

Table 3-17 Environmental values for waters associated with the Project

Water Source	Location	Authorised Use	Entitlement Per Water Year	Maximum Extraction Rate	Water Name / Type
Tooloombah Creek	1/RP616700	Domestic Supply; Stock	18.0 ML	-	Tooloombah Creek / Watercourse (Surface Water)
Deep Creek	119/CP900367	Irrigation	20.0 Ha	-	Deep Creek / Watercourse (Surface Water)
Tooloombah Creek	45/MPH26062	Irrigation	8.0 Ha	-	Tooloombah Creek / Watercourse (Surface Water)
Tooloombah Creek	633/MC630	Irrigation; Stock	3.0 Ha	50.0 Litres Per Second	Tooloombah Creek / Watercourse (Surface Water)

3.5.7 Storage Assessment

Based on the consequence assessment summarised in Section 3.5.5.5 the following Design Storage Allowance (DSA), Extreme Storm Storage (ESS) and spillway capacities have been selected in accordance with the EHP consequence manual:

- Spillway capacity of 1:1,000 AEP with freeboard allowance for wave run-up from a 1:10 AEP wind;
- DSA for a 1:20 AEP wet season:
  - Water balance modelling informed the 1:20 AEP wet season storage through Monte Carlo simulation of 127 years of historic climate data and by adding a 50% contingency to the increase in storage volume from 1 November.
- ESS for a 1:10 AEP, 72 hr duration rainfall event:
  - The corresponding 1:10 AEP, 72 hr design rainfall depth is 300 mm as per the Bureau of Meteorology's Intensity Frequency Duration curves for the Project location.

The pit dewater dam, RWD, dewatering ponds and the PWD are designed as turkey's nest storages with no external contributing catchment. Contributing catchments to environment dams are restricted to the area of disturbance generating dirty water runoff i.e. clean water runoff is diverted around areas of disturbance.

The required storage size for the dams was informed by simulating the mine water balance as discussed in Chapter 9 - Surface Water and / or by applying the following performance criteria:

- Raw Water Dam –Provide 99% reliable water supply for the life of the Project;
- Environment Dams – Sized to capture the 1:10 year ARI, 24 hr duration storm event in accordance with The Department of Environment and Heritage Protection Stormwater Guideline (2014a);
- Pit Dewater Dam – Sized to have no non-compliant discharges for the maximum rainfall and assuming licenced discharges, dust suppression and washdown demands, and transfer to the PWD for use within the CHPP; and
- CHPP Dewatering Ponds – Sized to have no non-compliant discharges for the maximum rainfall and assuming return of decant to the PWD.

Table 3-18 Storage Sizing Assessment Summary

Storage	Design Capacity (ML)	Regulated Structure (Y/N)	Design Storage Allowance	Extreme Storm Storage (ESS)	Spillway Capacity
Raw Water Dam	350	N	N/A	N/A	1 in 1,000 AEP rainfall or pump supply rate, whichever is greater.
Pit Dewater Dam	177	Y	50 ML based on 1:20 AEP wet season volume increase plus 50%.	56.3 ML based on a storage surface area of 19 ha and 300 mm rainfall depth.	1 in 1,000 AEP rainfall or pump supply rate, whichever is greater.
Process Water Dam 1	5	Y	3.6 ML based on 1:20 AEP wet season volume increase plus 50%.	0.2 ML based on a storage surface area of 0.1 ha and 300 mm rainfall depth.	1 in 1,000 AEP rainfall or pump supply rate, whichever is greater.
Process Water Dam 2	5	Y	3.6 ML based on 1:20 AEP wet season volume increase plus 50%.	0.2 ML based on a storage surface area of 0.1 ha and 300 mm rainfall depth.	1 in 1,000 AEP rainfall or pump supply rate, whichever is greater.
CHPP Dewatering Ponds	8.3	Y	4.2 ML based on 1:20 AEP 3-month rainfall depth of 849 mm.	1.5 ML based on a storage surface area of 0.5 ha and 300 mm rainfall depth.	1 in 1,000 AEP rainfall or pump supply rate, whichever is greater.
CHPP Environment Dam 1	58	N	N/A	N/A	1 in 100 AEP rainfall#
CHPP Environment Dam 2	32	N	N/A	N/A	1 in 100 AEP rainfall#
Waste Environment Dam 1	275	N	N/A	N/A	1 in 100 AEP rainfall#
Waste Environment Dam 2	340	N	N/A	N/A	1 in 100 AEP rainfall#
TLF Environment Dam	52	N	N/A	N/A	1 in 100 AEP rainfall#

#1 in 100 AEP spillway capacity proposed for environment dams that are not regulated structures

3.6 Mine Infrastructure

3.6.1 Mine Industrial Area

MIAs will be located adjacent to each of the CHPPs. The likely MIA arrangement for both CHPPs is shown Section 3.2.4.1. The key components of the MIA are:

- Administration offices and staff parking;
- Petroleum, oil and lubricant storage and handling facilities;
- Vehicle and equipment wash down facilities;

- Vehicle fuelling facilities;
- Workshops and stores facilities;
- Laydown and hardstand areas;
- Electrical power substations and associated facilities;
- Raw water supply for potable water production, firefighting, coal dust suppression and coal washing; and
- Internal road network including light-vehicle access roads, heavy-vehicle haul roads and a site access road.

Diversion structures will be formed at each of the MIAs to direct clean water around the area and direct potentially contaminated water to an environmental control pond. Areas storing fuels or oils and washdown areas will be appropriately designed and bunded with runoff from these areas directed to a sump to separate oils and water prior to releasing water to the environment control pond.

3.6.1.1 Administration Facility

The administration facility will provide office facilities for staff, a muster area for shift changes and locker room and change facilities for personnel. Access to the administration facility will be via two-way internal access roads. Key features of the administration facility are likely to include:

- Conformity with the building requirements in accordance with the Building Code of Australia and the Queensland Development Code;
- Air-conditioned office facilities, kitchen facilities, toilets, safety showers, meeting and training rooms and information technology rooms;
- Crib room with a covered area, sized to accommodate shift changes;
- Centrally located muster area;
- Car parking for light vehicles and bus drop off;
- First aid facility;
- Emergency equipment store and fire vehicle garage; and
- External lighting.

3.6.1.2 Workshop and Stores

Workshop facilities will be centrally located at the MIA for servicing heavy mining equipment and are proposed to include the following features:

- Maintenance bay for servicing mine site vehicles (including tyre change area and equipment store);
- Secure store;
- Electrical, tools, hydraulics machining and welding shops;

- Covered drum store and bunded lube area;
- Eyewash and shower facilities;
- Switchboard and compressor;
- Covered battery storage area; and
- Secure waste storage hardstand area.

3.6.1.3 Fuel Facility

During peak production, it is estimated that approximately 163.58 ML of diesel fuel will be consumed. This consumption rate will decrease to approximately 0.73 ML as the open cut operations cease.

The fuel storage facility will be located at the MIA and will comprise several interconnected self-bunded bulk diesel storage tanks. It is anticipated that approximately 660,000 L of diesel will be stored onsite at the two fuel storage areas. Diesel will be reticulated to heavy vehicle service bays, and heavy and light vehicle bowsers. Access to the fuel facility will be via the internal MIA access roads. The fuel facility will be designed and located at a safe operating distance from other MIA and surrounding facilities in accordance with Australian Standard AS1940 - The Storage and Handling of Flammable and Combustible Liquids.

There will be no in-field fuel storage. Fuel trucks will transfer fuel from the fuel storage tanks to mine vehicles.

3.6.1.4 Petrol Oil Lubricant Storage and Handling Facilities

The petroleum, oil and lubricant will be located at the MIA. The petroleum, oil and lubricant facility is anticipated to store various quantities of transmission oil, hydraulic oil, diesel engine oil, final drive oil and waste oil. In addition, the facility will have a storage capacity for lubricants and coolants. The petroleum, oil and lubricant facility will also comprise:

- Self-bunded lube and oil storage tanks for several different types of oil and lubricants;
- Hardened on ground oil and lube tanker unloading area, allowing for oil transfer from the delivery vehicle to the storage tanks; and
- Some reticulation of oils and lubricants depending on the final configuration of the MIA facilities.

3.6.1.5 Washdown Facilities

Heavy vehicle and light vehicle washdown facilities will be located at the MIA. The washdown facilities will comprise:

- Prewash bays to remove excessive amounts of large material;
- Washpad for washing with handheld high pressure water cannons;
- Grit traps and oil / water separators; and
- Reticulation of washdown water to an environmental water storage pond.

3.6.2 Additional Site Infrastructure

3.6.2.1 Power Supply

The power supply for the mine site will most likely be provided by 415V, three-phase diesel generators, installed at the MIA and the CHPPs. The MIA will incorporate two 300kVA 415V diesel generator sets mounted in a fully bunded area adjacent to the MIA 415V Switchrooms. The normal mode of operation for the generators is synchronised and connected to the load through a bus tie. The generators will be sized to provide redundancy with each generator capable of carrying the total load.

The generators will include their own diesel day tanks capable of holding sufficient diesel for a minimum of seven days' operation on full load. The generators will be hired to minimise initial capital costs and the hire company will be responsible for all repairs and maintenance.

The CHPP area will be serviced by two substations, one at the raw coal area and the other at the CHPP. The raw coal substation will likely consist of one 500kVA 415V diesel generator set mounted in a fully bunded area adjacent to the raw coal 415V Switchroom. Conceptually the CHPP substation will have three 500kVA 415V diesel generator sets mounted in a fully bunded area adjacent to the CHPP 415V Switchroom. The normal mode of operation for the four generators is synchronised and connected to the load through bus ties with an interconnecting cable installed between the two substations. The generators will be sized to provide redundancy with three generators capable of carrying the total load. Like the generators used at the MIA, each have their own diesel tanks capable of holding sufficient diesel for a minimum of seven days' operation on full load.

The switchrooms house the motor control centres (MCC), programmable logic controls (PLC) and instrumentation equipment, as well as the 415 V Distribution Board which supply light and power. The area lighting consists of hinged lighting towers fitted with 1,000 W floodlights.

A separate option to connect into the existing 11 kilovolt (kV) transmission line maintained by Ergon Energy which provides power to the nearby township of Ogmore is under consideration. From discussion with Ergon this 11 kV line has limited capacity to support the Project; however, depending on the final power demand needed to support the CHPP operations an opportunity to connect to the Ogmore substation may still be possible.

There is also a regional 275 kV line which crosses the southwest EPC boundary. From discussions with Powerlink (275 kV), it is not feasible to connect to this power supply. Currently there is no transformer in the area to step down the high voltage for mine supply. Consequently, this option is no longer under consideration.

3.6.2.2 Onsite Road Infrastructure

Access to the Operational Area of the Project will be via the Bruce Highway and the Mount Bison Road, which will have new turn out lanes constructed connecting to the entry points to the eastern and western operational areas. The turnout lanes will be designed to DTMR standards (see Chapter 6 – Traffic and Transport for further details).

Current designs indicate a requirement of approximately 15 km of roads for access around the MIA and CHPP. Roads will rely on existing farm access tracks wherever possible and, during their construction, clearance of any sensitive environmental features such as remnant vegetation will be avoided to the extent practicable.

3.6.2.3 Sewerage

At the commencement of construction and prior to the commissioning of sewage and waste water treatment infrastructure, temporary shower and toilet facilities will be used at the mine site.

Sewage treatment will occur at a central intermittent aeration type package treatment plant planned to be located at the accommodation camp (note the accommodation camp is not included as part of the EIS process). Toilet facilities at the MIA will be pumped out at an appropriate schedule and taken to a licenced facility for treatment. Should the accommodation camp be developed septic waste may be trucked to the sewage treatment plant at the accommodation camp for treatment.

3.6.2.4 Telecommunications

Local Area Network and Data Communications

A site local area network (LAN) and temporary servers will be installed to service voice and data requirements during construction phase. A permanent computer and communications room will be constructed as part of the administration building at the MIA. Equipment associated with all site communications such as the satellite system, radio system and servers for voice and data transmission will be installed here. An optical fibre (OF) will run from the Marlborough exchange to the MIA and an OF backbone line will be installed between the administration building and all offices, switch rooms and buildings at the MIA, CHPP and TLF. The CHPP Supervisory Control and Data Acquisition (SCADA) control system will be interfaced by the OF backbone to provide a site wide control system with nodes at the control room, administration office and security office and gate, workshops and other authorised users as required. CCTV cameras at the security office and gate, the CHPP, TLF and ROM pad will be installed and connected to the LAN using the OF backbone cabling.

A computerised log on system, also connected to the LAN using the OF backbone, will be used by employees, contractors and visitors for recording personnel onsite. This system is used for contractor management, fatigue management and identification of onsite personnel during emergency evacuations.

Radio Communications

A digital trunked radio communication system (based on TETRA technology) will be installed in stages commencing with communications for the construction phase. This initial installation will provide coverage over the entire tenement, and the highway road access for response to calls for assistance when travelling to and from site.

The initial installation will consist of a 26 m cyclonic concrete pole mast, located at the construction site, with easy access to the construction site LAN and mains power. An air conditioned relocatable building will house the electronic equipment with provision to install a microwave backbone radio LAN system at a later date when mining commences. This installation will be relocated to the MIA when construction is complete.

The second stage is an upgrade of the system to provide illumination of any working pit areas. A radio trailer with stabilised legs, a mast to ensure adequate coverage over the pit, and housing a TETRA base station will be positioned in the mining area to provide a full duplex microwave link backbone between the original site LAN at the MIA and the trailer. Power for the equipment will be provided by solar panels recharging a battery system. The system supports full duplex communications to provide full duplex private one on one and telephony calls and embraces IP technology and interfaces with the site LAN and fixed voice systems.

Fixed Voice Communications

Fixed phones using IP telephony will be connected to the LAN for integration with the satellite and radio systems.

3.6.2.5 Lighting

Artificial lighting will be designed, installed, operated and maintained in accordance with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting, to minimise the amount of light spill. Controls stipulated in this standard include consideration of the location and orientation of lighting as well as the selection and maintenance of luminaries. Any further mitigation (for example shielding, further restricting the use of lighting) will be implemented on an as needed basis.

3.7 Workforce

It should be noted that the Project is in its design stage, and while it is possible to predict the skills required in both construction and operation workforces, workforce requirements are indicative only. Workforce numbers have been developed to allow for the assessment of social impacts to take place at this early stage of the Project. Changes in workforce requirements are not likely to affect the overall conclusions of the assessment, and any changes in overall workforce numbers are expected to be minor.

3.7.1 Workforce Demand

A construction workforce for the Project of approximately 200 people will be required at peak construction period. The workforce will be a combination of local workers and DiDo.

A proposed workforce of between 250 to 500 employees will be required during the mine operations. The Project's labour resources will be sourced from within the general local area (Marlborough, St Lawrence, Clairview, Sarina, Mackay and Rockhampton) as a DiDo workforce. A workforce of approximately 25 will be required during decommissioning.

The development of the Project is expected to operate with construction workers on a two shift, seven days even time rotating roster. Once operational, management will be on a five on and two off rosters and the operational workforce will be structured on a two shift even time, seven-day rotating roster.

Indicative workforce numbers for each phase of the Project are shown at Table 3-19.

Table 3-19 Indicative workforce numbers

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Construction	350	200	150	-	-	-	-	30	150	50
Operation	80	100	100	167	167	167	167	250	250	333
Total	430	300	250	167	167	167	167	280	400	383
Year	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**
Construction	25	-	-	-	-	-	-	-	-	-
Operation	389	500	333	83	50	30	30	-	-	-
Decommissioning	-	-	-	-	-	20	20	20	20	20
Total	414	500	333	83	50	50	50	20	20	20

3.7.2 Workforce Skills

The skills required for the Project will vary depending upon the stage of development. The construction workforce is likely to be mainly contractors and subcontractors appointed to undertake various components of the Project. As these contractors are not yet appointed, it is not possible to provide details on where the construction workforce may be sourced. As most workers involved in the construction phase will be employed by contractors and subcontractors, the recruitment, training and education of these workers will be the responsibility of these employers. Most contractors have training programs in place to address workforce management and recruitment of required skill sets.

Main construction skills required will be:

- Equipment operators and supervisors;
- Tradespeople (for example fabrication, boilermakers, carpenters, plumbers and electricians);
- Designers, surveyors and engineers; and
- Superintendents and managers.

Operation of the open cut mines will require workers in the following categories:

- Open cut mine operators including operators of truck and shovel fleet;
- Tradespeople including diesel fitters, electrical tradespeople and mechanical fitters;
- Technical services and support including:
  - Geological
  - Engineering
  - Health and safety
  - Environmental services
  - Laboratory and quality control
- Machinery operation and maintenance workers;
- Managers and production supervisors; and
- Administrative and support areas such as office staff, catering, cleaning and transportation.

3.7.3 Rosters

Site management and support staff will work on a five day on, two days off roster. The remaining workers will operate on various rosters yet to be finalised, to cover the 24/7 operations of the mine.

3.7.4 Workforce Accommodation

Most of the workforce for the Project is anticipated to come from the local area, Marlborough, Ogmore, Clairview and St Lawrence region, as a DiDo workforce. If these regional towns are not able to service the personnel an accommodation camp will be developed. The proposed location of the accommodation camp is shown in Figure 3-8. The proposed accommodation camp is not within the scope of this EIS.

3.8 Relationship to Other Projects

The Project is interrelated with other external infrastructure projects which are not encompassed in this EIS assessment or approval process. The potentially interrelated projects below may be undertaken as part of supporting and servicing the Project following further design and consultation with stakeholders. Should these projects be required they will be subject to separate assessment and approvals undertaken by the respective service providers. They are provided here for the sake of completeness and include:

- Accommodation camp; and
- Alternative access road to Mount Bison Road.

Any related developments will be constructed and owned by third party service providers who will obtain any necessary approvals (local, state or federal government approvals) to construct or maintain the infrastructure. As part of the design process for this infrastructure, Central Queensland Coal commits to avoid, minimise and manage any impacts on environmental values (EVs) because of the development of any associated infrastructure.

3.9 Mine Decommissioning and Rehabilitation

Rehabilitation is defined as the process of making a former mine site safe, stable, and self-sustaining (EHP 2014b). This section describes the options, strategic approaches and methods for progressive and final rehabilitation of the environment disturbed by the Project. Without effective rehabilitation, mining has the potential to permanently reduce the capacity of land and ecosystems to provide economic and ecological services, and be unsafe for future use. The incorporation of rehabilitation and decommissioning considerations within the Project description demonstrates Central Queensland Coal's commitment to integrating these stages of the Project into its environmental management system.

The Project is not expected to be decommissioned for approximately 20 years or following depletion of the target coal resource. Progressive rehabilitation is proposed to be carried out as operations progress (opposed to a large operation once mining is complete). Thus, staged treatments will be applied as soon as areas become available for such. Rehabilitation of the MIAs; however, will take place once mining is completed and plant and structures decommissioned.

The review and audit of rehabilitation work undertaken during operations will be required as part of the Project's EA. More specifically, the Plan of Operations will set out the proposed program of actions to comply with the EA conditions including a program to rehabilitate any disturbed land. This Plan will also provide for compliance measures obliged by applicable legislation. The rehabilitation and decommissioning approaches, including figures showing the modelled final landforms, are described in detail in Chapter 11 – Rehabilitation and Decommissioning.

The Plan of Operations will be submitted to EHP prior to any disturbance occurring onsite and will be reviewed by an independent suitably qualified auditor. Approval by EHP to renew the Plan of Operation will take place on a five-year basis at most but more likely annually. EHP may suspend or cancel the EA in the event of inadequacy or non-compliance of operations in meeting the Plan of Operations. In addition to this, the EA will require Central Queensland Coal to provide financial assurance to EHP prior to any activities taking place onsite to cover any costs or expenses incurred in the highly unlikely event that the conditions of the EA are not met. This includes, for example, conditions relating to rehabilitation.

This section specifically identifies the following key aspects relating to the rehabilitation of the Project:

- The control and management of mine waste;
- Proposed rehabilitation methods;
- The management of topsoil resources for use in rehabilitation of the site;
- Description of the planned progressive rehabilitation and revegetation of areas across the mine site;
- The integration with on-going and future rehabilitation activities across the wider mining area; and
- Rehabilitation monitoring and maintenance requirements which may apply.

The level of detail provided here is commensurate to the level of risk associated with each key closure issue and the time to closure. It sets out acceptable and realistic criteria for rehabilitation and closure that would allow the Project to meet the principles of Ecologically Sustainable Development without any unacceptable liability to the State.

Decommissioning and rehabilitation are discussed in detail in Chapter 11 - Rehabilitation and Decommissioning.

3.10 ToR Cross-reference Table

Table 3-20 ToR cross-reference

Terms of Reference	Section of the EIS
7. Project description and alternatives	
Describe all aspects of the project that are covered by the EIS's assessment. If there are any aspects of the project that would be assessed separately, describe what they are, and how they would be assessed and approved.	Chapter 2 - Introduction
The project description should include all on and off lease activities relevant to the project including construction, operation and decommissioning activities. If the delivery of the project is to be staged, the nature and timing of the stages should be fully described.	Sections 3.4 and 3.5
7.1 Proposed development	
Describe and illustrate the following specific information about the proposed project, including but not limited to:	Section 3.1
▪ project's title;	Chapter 3 – Description of the Project
▪ project objectives;	Chapter 1 - Introduction
▪ expected capital expenditure;	Chapter 2 – Project Need and Alternatives
▪ rationale for the project;	Chapter 2 – Project Need and Alternatives
▪ project description, including the nature and scale of all project components and activities;	Sections 3.4 and 3.5
▪ whether it is a greenfield or brownfield site;	Section 3.1
▪ regional and local context of the project's footprint with maps at suitable scales;	Section 3.2
▪ proposed timing of the development, including construction staging and likely schedule of works;	Sections 3.4.2 and 3.5.1
▪ relationship to other major projects or developments of which the proponent should reasonably be aware;	Section 3.8
▪ the workforce numbers for all project phases;	Section 3.7
▪ where personnel would be accommodated and the likely recruitment and rostering arrangements to be adopted; and	Section 3.7.4
▪ proposed travel arrangements of the workforce to and from work, including use of a FIFO workforce.	Section 3.7.1
7.2 Site description	
Provide real property descriptions of the project land and adjacent properties, any easements, any existing underlying resource tenures, and identification number of any resource activity lease for the project land that is subject to application.	Section 3.2.3.1
Describe and illustrate with scaled maps the key infrastructure in and around the site, including state-controlled and local roads, rail lines and loading yards, airfields, ports or jetties, electricity transmission infrastructure, pipelines, and any other infrastructure in the region relevant to the project.	Section 3.7.1
Describe and illustrate the topography of the project site and surrounding area, and highlight any significant features shown on the maps.	Section 3.2.3 and Chapter 5 - Land
Map the location and boundaries of the project's footprint including all infrastructure elements and development necessary for the project.	Figure 3-8 and Figure 3-9
Show all key aspects including excavations, stockpiles, areas of fill, services infrastructure, plant locations, water or tailings storages, buildings, bridges and culvert, haul and access roads, causeways, stockpile areas, barge loading facilities and any areas of bed levelling.	Figure 3-8 and Figure 3-9
Include discussion of any environmental design features of these facilities including bunding of storage facilities.	Section 3.6

Terms of Reference	Section of the EIS
Describe and map in plan and cross-sections the geology and terrestrial and/or coastal landforms of the project area.	Sections 3.3, and Figure 3-4 and Figure 3-13
Indicate the boundaries of water catchments that are significant for the drainage of the site.	Chapter 9 – Surface Water
Show geological structures, such as aquifers, faults and economic resources that could have an influence on, or be influenced by, the project's activities.	Section 3.3
Describe and illustrate the precise location of the proposed project in relation to any designated and protected areas and waterbodies. This is to include the location of any proposed buffers surrounding the working areas; and lands identified for conservation, either through retention in their current natural state or to be rehabilitated.	Figure 3-4
Describe, map and illustrate soil types and profiles of the project area at a scale relevant to the site. Identify soils that would require particular management due to wetness, erosivity, depth, acidity, salinity or other feature, including acid sulfate soils. Complete an assessment of the potential for acid sulfate soils, risks associated with disturbance and proposed management and mitigation measures consistent with relevant government guidelines, policies and best practice management.	Chapter 5 - Land
7.3 Proposed construction and operations	
Describe the following information about the proposal, and provide maps and concept/layout plans:	See below
▪ existing land uses and any previous land use that might have affected or contaminated the land;	Chapter 5 – Land
▪ existing buildings, infrastructure and easements on the potentially affected land;	Section 3.2.4 and Chapter 18 – Cultural Heritage
▪ all pre-construction activities (including vegetation clearing, site access, interference with watercourses, wetlands and floodplain areas);	Section 3.4
▪ the proposed construction methods, associated equipment and technique;	Section 3.4
▪ road and rail infrastructure, and stock routes, including new constructions, closures and/or realignments;	Section 3.4 and 3.5
▪ location, design and capacity of all other required infrastructure, including water supply and storage, sewerage, electricity from the grid, generators and fuels (whether gas, liquid and/or solid), and telecommunications;	Section 3.4.4 and 3.5.5
▪ changes to watercourses and overland flow on or off the site, including stream diversions and flood levees;	Chapter 9 – Surface Water
▪ any infrastructure alternatives, justified in terms of ecologically sustainable development (including energy and water conservation);	Chapter 2 – Project Need and Alternatives
▪ hours of construction and operation;	Sections 3.4.1 and 3.5.1.1
▪ the proposed extractive and processing methods, associated equipment and techniques;	Section 3.5
▪ the sequencing and staging of activities;	Section 3.5.1
▪ the proposed methods and facilities to be used for the storage, processing, transfer, and loading of product;	Section 3.5.2, 3.5.3, and 3.5.7
▪ the capacity of high-impact plant and equipment, their chemical and physical processes, and chemicals or hazardous materials to be used;	Section 3.4.5 and Chapter 21 – Hazard and Risk
▪ any activity that would otherwise be a prescribed environmentally relevant activity if it were not undertaken on a mining or petroleum lease; and	Chapter 1 - Introduction
▪ any new borrow pits, stream bed excavations, or expanded quarry and screening operations that may be required to service construction or operation of the project.	Section 3.4.4.1
7.4 Feasible alternatives	
Present feasible alternatives of the project's configuration (including conceptual, technological and locality alternatives to the project and individual elements) that may improve environmental outcomes.	Chapter 2 – Project Need and Alternatives

Terms of Reference	Section of the EIS
Summarise the comparative environmental, social and economic impacts of each alternative, with particular regard to the principles of ecologically sustainable development.	Chapter 2 – Project Need and Alternatives
Discuss alternatives in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action while rejecting others.	Chapter 2 – Project Need and Alternatives
Discuss the consequences of not proceeding with the project.	Chapter 2 – Project Need and Alternatives