APPENDIX 14c

Alpha Coal Project
EIS Extracts

Section 02 Description of the Project

2.1 Overview of Project

Hancock Prospecting Pty Ltd (HPPL) (the Proponent), through its wholly owned subsidiary company, Hancock Coal Pty Ltd (HCPL), is proposing to develop the Alpha Coal Project (the Project), a 30 million tonnes per annum (Mtpa) product open cut thermal coal mine to target the C and D seams in the Upper Permian coal measures of the Galilee Basin, Queensland, Australia. The coal mine will be supported by privately owned and operated rail and port infrastructure facilities. At the Project site the coal will be mined, washed and conveyed to a Train Load-out (TLO) facility where it will be transported 495 kilometres (km) to the east coast of Australia to the port facility of Abbot Point for export.

2.1.1 Project Components

2.1.1.1 Coal Mine

The coal mine will be a new open cut thermal coal mine. The mine is located within Mining Lease Application (MLA) 70426. MLA 70426 is over Exploration Permit for Coal (EPC) 1210 and Mineral Development Licence (MDL) 333 and MDL 285. The open cut coal mine is proposed to produce 30 Mtpa of thermal coal for the export market. The scheduled life of mine (LOM) is 30 years, with sufficient coal resources to potentially extend the Project life beyond 30 years.

The Project consists of four open cut pits (with a total strike length of 24 km) in a north to south direction along the centre of MLA 70426. The overburden will be removed by truck and shovel, excavators and dragline operations. The overburden will initially be stockpiled in out-of-pit spoil emplacement areas and then used to backfill the open cut pits. The coal will be mined by excavators and transported by truck operations. Raw coal will pass through one of two run-of-mine (ROM) facilities where it will be reduced in size for further processing at the Coal Handling and Preparation Plant (CHPP).

2.1.1.2 CHPP and Mine Infrastructure

Sized raw coal will be transferred from the ROM facilities via conveyors to the multi-module CHPP, where it will be washed. All of the coal resource mined and placed through the ROMs will be processed to produce a 9.5% ash export thermal product. A tailings storage facility is required for the fine rejects (tailings) for up to the first five years of operation. The coarse rejects from the CHPP will be placed in designated locations within the open cut pit spoil emplacement areas.

The mine infrastructure will include:

- Main workshop; warehouse; administration buildings; training and emergency services building; tyre bay; light vehicle workshop; and bucket repair shop;
- TLO facility and rail loop;
- Raw water dams and environment dams;
- Construction accommodation village and operational accommodation village;
- Mine access roads;
- General waste landfill;

- Quarry/borrow pits;
- Fuel, oil, and explosives storage facilities;
- Creek diversions, drainage channels and levee bunds;
- Water and wastewater systems;
- Water treatment plant and sewerage treatment plant;
- Electrical systems;
- Communications systems;
- Conveyors; and
- Stockpile areas.

Figure 1-2 (Volume 2, Section 1) illustrates the location of all the above key components of the Project, including the four open cut pits.

2.1.2 Project Timing and Employment

Refer to Table 2-1 for timing and employment for the Project.

Table 2-1 Project timing and employment

Stage	Commences	Duration	Employment Numbers (Estimated peak)
Construction	**2011**	**48 months**	**1,060**
Coal mine operation	**2013**	**30 years**	**2,300**

Construction and development of the mine will commence when the mining lease is obtained. The majority of construction activities occur over a 27-month period into first ROM coal delivered to the CHPP in December 2014. The mining operations will gradually ramp up to full production over an ensuing five-year period.

Refer to Volume 2, Section 22 for information on the cost of the construction and operational stages of the Project.

2.1.3 Summary of Environmental Design Features

Environmental design features of the Project are detailed in Volume 2, Sections 1 and 23.

2.1.4 Employment Benefits

Employment benefits that arise from the construction and operational stages of the Project are detailed in Volume 2, Sections 1, 20 and 22.

2.2 Location

The Project is located in the Galilee Basin, Queensland, Australia. The Project is 130 km south-west of Clermont and approximately 360 km south-west of Mackay. The nearest residential area to the Project is the Township of Alpha, located approximately 50 km south of the Project. Access to the mining lease is from the Hobartville Road north off the Capricorn Highway at Alpha.

Refer to Figure 1-1 (Volume 2, Section 1) for the Project regional location.

Figure 2-1 illustrates the property descriptions and the applicable mining tenure. Figure 2-2 illustrates the underlying Exploration Petroleum Permits (EPPs) and Authorities to Prospect (ATPs).

For details on the coal resource base to be mined or potentially sterilised refer to Section 2.4.1 below and Volume 2, Section 4.

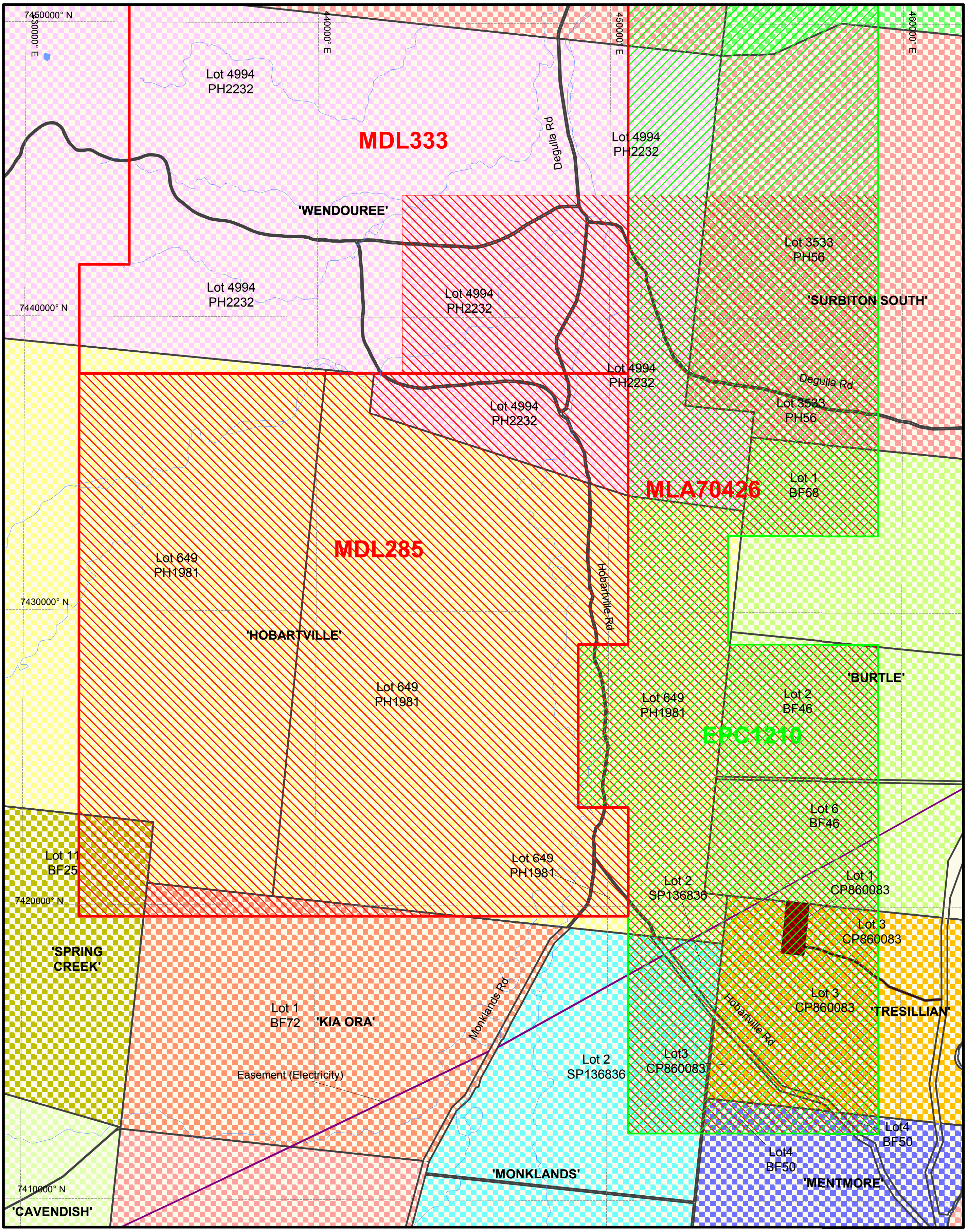
There are no proposed buffers surrounding working areas.

Figure 2-3 illustrates the locations of all proposed Project road and rail infrastructure, including access points, ramps, haul roads, stock routes, rail loop and TLO facility.

Figure 2-4 illustrates the proposed Mining Infrastructure Area (MIA) buildings and layout.

Figure 2-5 illustrates the Project disturbance area and easements over the Project site.

Information on the total area of land vegetation to be disturbed, the ecological communities to be disturbed and other environmentally sensitive areas are provided in Volume 2, Section 5, Section 9 and Section 10.



Mining Lease Application (MLA70426) Boundary	Cadestral Boundary
Exploration Permit Coal (EPC1210)	Reserve (Gravel)
Mineral Development Lease (MDL333,285)	Easement (Electricity)

Note: Colour fill indicates extend of indivual Stations.

Source: See Copyright Details below and for full disclosure Please Refer to the EIS *Volume 4 - References*

0 2.5 5km
Scale 1:175,000 (A4)

Datum: GDA94, MGA Zone55

N W E S

HANCOCK PROSPECTING PTY LTD

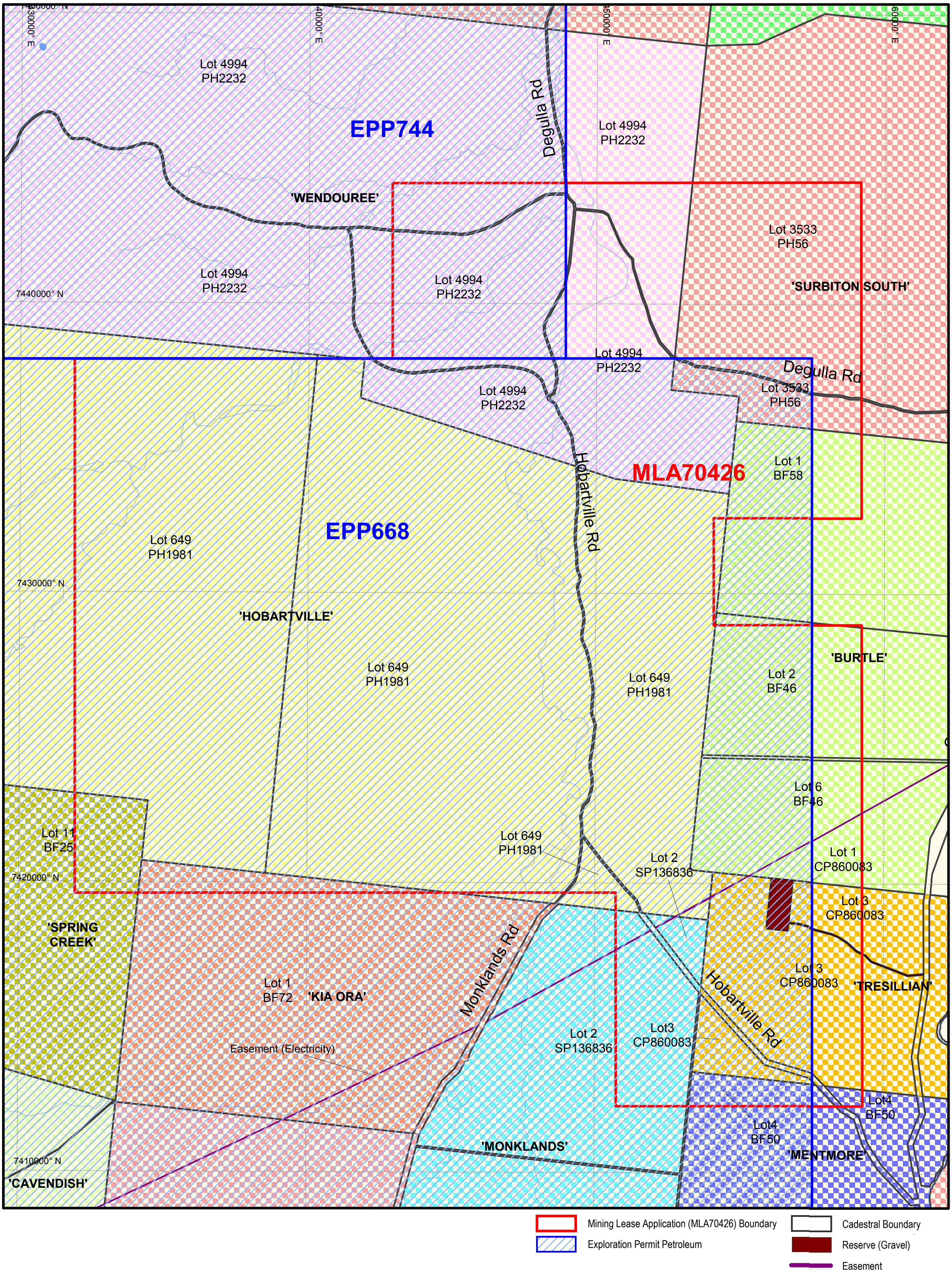
Alpha Coal Project
Environmental Impact Statement

LAND TENURE
AND MINING TENURE

Job Number | 4262 6580
Revision | A
Date | 24-09-2010

Figure: 2-1

File No: 42626580-g-2068.wor



Note: Colour fill indicates extend of indivual Stations.

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0 2.5 5km
Scale 1:175,000 (A4)
Datum: GDA94, MGA Zone55

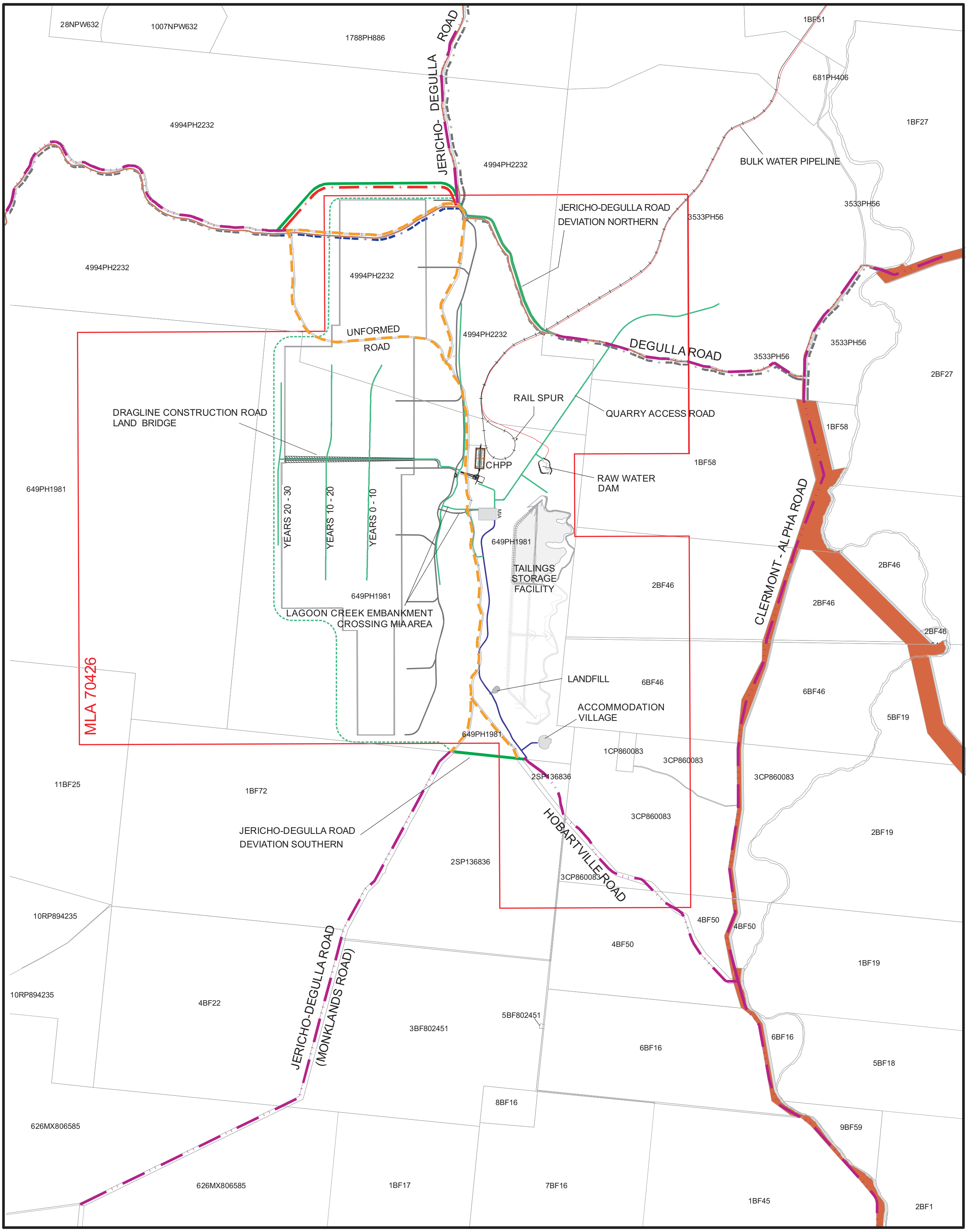
HANCOCK PROSPECTING PTY LTD
Alpha Coal Project
Environmental Impact Statement

PETROLEUM TENURE

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-2

File No: 42626580-g-2083.wor



Source: ParsonsBrinkenhoff, Figure No 97000 - 801 02/07/2010

GENERAL LEGEND

MINING LEASE APPLICATION (MLA70426) BOUNDARY

EXISTING
- EXISTING STOCK ROUTE RESERVE
- EXISTING STOCK ROUTE (WITHIN ROAD RESERVE)
- EXISTING ROADS

PROPOSED
- PROPOSED ROAD DEVIATIONS/UPGRADES
- PROPOSED ROAD CLOSURES
- PROPOSED STOCK ROUTE CLOSURE
- PROPOSED TWO-WAY SEALED ROAD
- PROPOSED TWO-WAY UNSEALED ROAD
- PROPOSED SINGLE LANE UNSEALED ROAD
- PROPOSED HAUL ROAD
- PROPOSED STOCK ROUTE

Source: See Copyright Details below and for full disclosure Please Refer to the EIS *Volume 4 - References.*

0 1000 2000 4000 6000
SCALE (m)

Datum: GDA94, MGA Zone55

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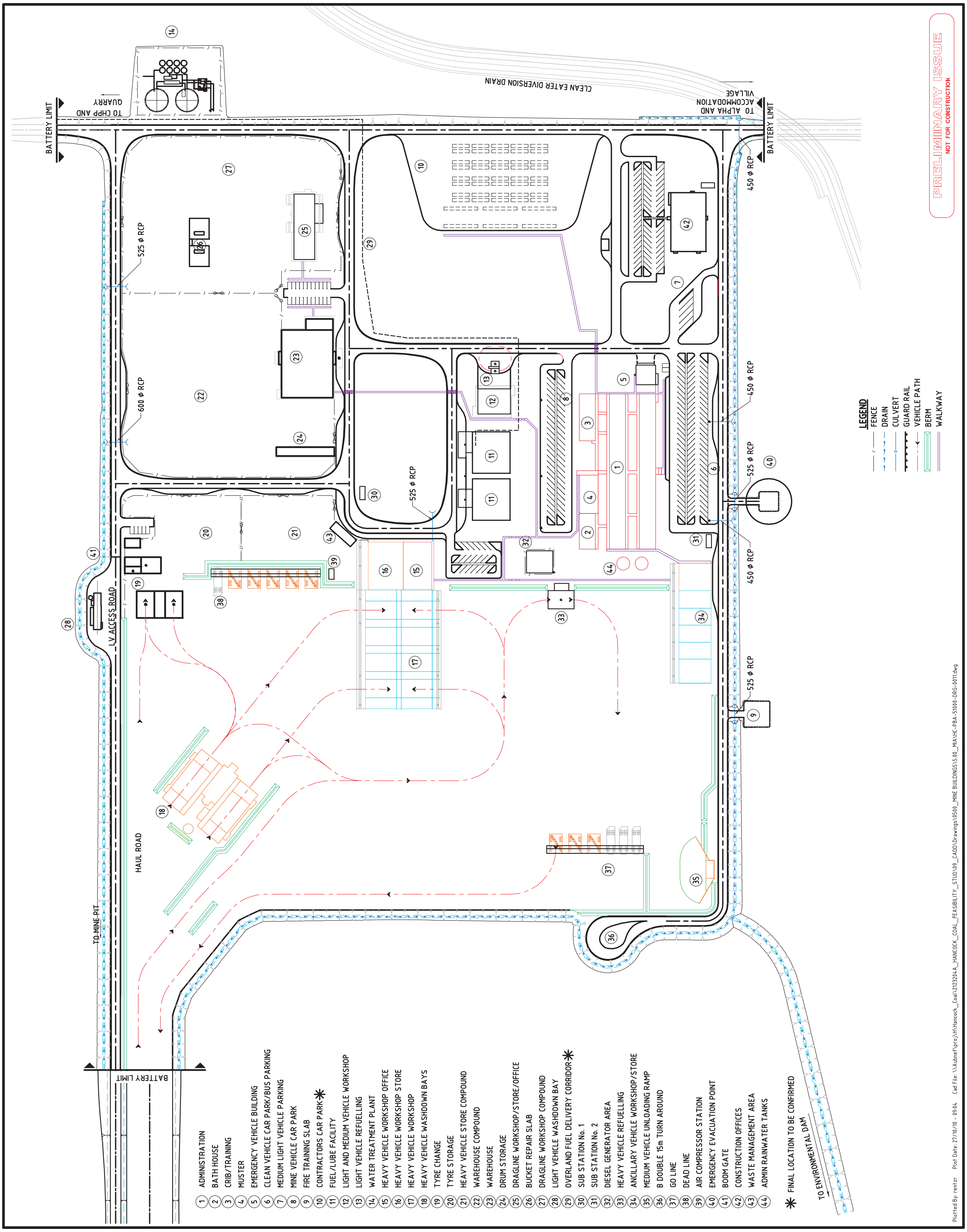
Alpha Coal Project
Environmental Impact Statement

PROJECT ROAD
AND RAIL INFRASTRUCTURE

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-3

File No: 42626580-g-2069.cdr



Source: See Copyright Details below and for full disclosure Please Refer to the EIS *Volume 4 - References.*

0 25 50 75
SCALE (m)

Datum: GDA94, MGA Zone55

HANCOCK PROSPECTING PTY LTD

Alpha Coal Project
Environmental Impact Statement

Job Number	4262 6580
Revision	B
Date	27-10-2010

Figure: 2-4a

File No: 42626580-g-2070b.cdr

DRAFTING ABREVIATIONS:

BLDG	BUILDING
B/S	BOTH SIDES
COL	COLUMN
CRS	CENTRES
C/W	COMPLETE WITH
DIA	DIAMETER
DWG	DRAWING
ELEV	ELEVATION
FCL	FINISHED CEILING LEVEL
FFL	FINISHED FLOOR LEVEL
FGL	FINISHED GROUND LEVEL
GA	GENERAL ARRANGEMENT
GALV	GALVANISED
GFL	GROUND FLOOR LEVEL
IP	INTERSECTION POINT
I/S	INSIDE
LG	LONG
MIN	MINIMUM
MISC	MISCELLANEOUS
NB	NOMINAL BORE
NOM	NOMINAL
NTS	NOT TO SCALE
N/A	NOT APPLICABLE
OAE	OR APPROVED EQUIVALENT
OD	OUTSIDE DIAMETER
O/A	OVERALL
O/S	OUTSIDE
PREFAB	PREFABRICATED
REF	REFERENCE
REINF	REINFORCEMENT
SFL	STRUCTURE FINISHED LEVEL
SOP	SET OUT POINT
SPEC	SPECIFICATION
SQ	SQUARE
STD	STANDARD
THK	THICK
TOC	TOP OF CONCRETE
TOG	TOP OF GRATING
TOS	TOP OF STEEL
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
U/S	UNDERSIDE
WP	WORKING POINT

FIRE ABREVIATIONS:

FBG	FIRE BREAK GLASS ALARM
FE	FIRE EXTINGUISHER
FH	FIRE HYDRANT
FHR	FIRE HOSE REEL
FIP	FIRE INDICATOR PANEL

FIRE SYMBOLS:

EXIT	FIRE EXIT WITH ILUMINATED SIGNAGE
	FIRE MANUAL CALL POINT
	FIRE WARNING SPEAKER (HORN TYPE)

FIRE EXTINGUISHER SCHEDULE:

■ EX1	4A:80B:E 4.5kg ABE HI PERF. DRY CHEMICAL POWDER (DCP) PORTABLE FIRE EXTINGUISHER.
● EX2	5B:E 5.0kg CO2 PORTABLE FIRE EXTINGUISHER.
◆ EX3	9.0kg ABE DRY CHEMICAL POWDER (DCP) FIRE EXTINGUISHER.

ARCHITECTURAL ABREVIATIONS:

A/C	AIR CONDITIONING
B	BASIN
BC	BOOKCASE
BOL	BOLLARD
BTH	BATH
BV	BRICK VENEER
C	COOKER
CC	CHEMICAL CLOSET
CD	CLOTHES DRYER
CORR	CORRUGATED
CPD	CUPBOARD
CS	CLEANERS SINK
D	DOOR
DF	DRINK FOUNTAIN
DG	DOUBLE GLAZING
DP	DOWN PIPE
DW	DISH WASHER
FW	FLOOR WASTE
HC	HOSE COCK
HTR	HEATER
HWU	HOT WATER UNIT
KS	KITCHEN SINK
KS-BWU	KITCHEN SINK WITH WATER BOILER / CHILLER
LVR-F	LOUVRE FIXED
LVR-O	LOUVRE OPERABLE
M	MICROWAVE OVEN
MSB	MAIN SWITCHBOARD
R	REFRIGERATOR
RD	ROLLER DOOR
RS	ROLLER SHUTTER
SHR	SHOWER
ST	SEPTIC TANK
SVP	SEWER VENT PIPE
SWP	STORM WATER PIT
TV	TELEVISION
U	URINAL
W	WINDOW
WC	WATER CLOSET (TOILET)
WM	WASHING MACHINE
WR	WARDROBE
WT	WASH TROUGH
W	WINDOW

MATERIAL ABREVIATIONS:

AL	ALUMINIUM
ASPH	ASPHALT
BIT	BITUMEN
BLK	BLOCK
BWK	BRICKWORK
CR	CEMENT RENDER
DPC	DAMP PROOF COURSE
DPM	DAMP PROOF MEMBRANE
FC	FIBRE CEMENT
LINO	LINOLEUM
MS	MILD STEEL
RC	REINFORCED CONCRETE
SS	STAINLESS STEEL
V	VINYL

LEVELS:

RL 0.000	RELATIVE LEVEL FOR AN AREA
FFL 0.000	FINISHED FLOOR LEVEL FOR AN AREA
TOC 0.000	TOP OF CONCRETE LEVEL FOR AN AREA
+ RL 0.000 or RL 0.000	RELATIVE LEVEL (SPOT LEVEL)
+ TOC 0.000 or TOC 0.000	TOP OF CONCRETE LEVEL (SPOT LEVEL)

OTHER COMMONLY USED LEVEL ABREVIATIONS

TOF - TOP OF FOOTING
TOH - TOP OF HOB
TOP - TOP OF PLINTH
TOW - TOP OF WALL

ARCHITECTURAL SYMBOLS:

KITCHEN - G.01 4.0 - SQM	ROOM TITLE AND REFERENCE NUMBER FLOOR AREA IN SQUARE METRES
D.01	DOOR REFERENCE NUMBER REFER TO SCHEDULE
W.01	WINDOW REFERENCE NUMBER REFER TO SCHEDULE
B-MV	BOLLARD MEDIUM VEHICLE (TRUCK)
B-HV	BOLLARD HEAVY VEHICLE
B-LV	BOLLARD LIGHT VEHICLE (CAR)
WC	WATER CLOSET
DP	DOWN PIPE
FW	FLOOR WASTE
B	BASIN
KS	KITCHEN SINK
KS-ZIP	KITCHEN SINK WITH UNDER SINK WATER BOILER / CHILLER
DF	DRINK FOUNTAIN
WT	WASH TROUGH
FHR	FIRE HOSE REEL
RWR	RAW WATER HOSE REEL
AO	COMPRESSED AIR OUTLET
AHR	AIR HOSE REEL (RETRACTABLE)
LHR	LUBE HOSE REEL (RETRACTABLE)
ER	EARTHING HOSE REEL (RETRACTABLE)
S-SHR	SAFETY SHOWER AND EYE WASH
MSB	MAIN SWITCH BOARD (ELECTRICAL)
HWU	HOT WATER UNIT
M	MICROWAVE OVEN
R	REFRIGERATOR
E	ELECTRICAL COMBO UNIT
WO	WELDING OUTLET
FL-(10)	FLOOD LIGHT POLE (10m HIGH)

SERVICES LINETYPES:

LO	LUBE OIL (LO)
DO	DIESEL OIL (DO)
GG	GREASE (GG)
DG	DETERGENT (DG)
RW	RAW WATER (RW)

Source: Parsons Brinckerhoff Plan :HC-PBA-57000-DRG-4501-A-D.DWG, Date 26/06/2010

Source: See Copyright Details below and for full disclosure Please Refer to the EIS *Volume 4 - References.*

Datum: GDA94, MGA Zone55

HANCOCK PROSPECTING PTY LTD

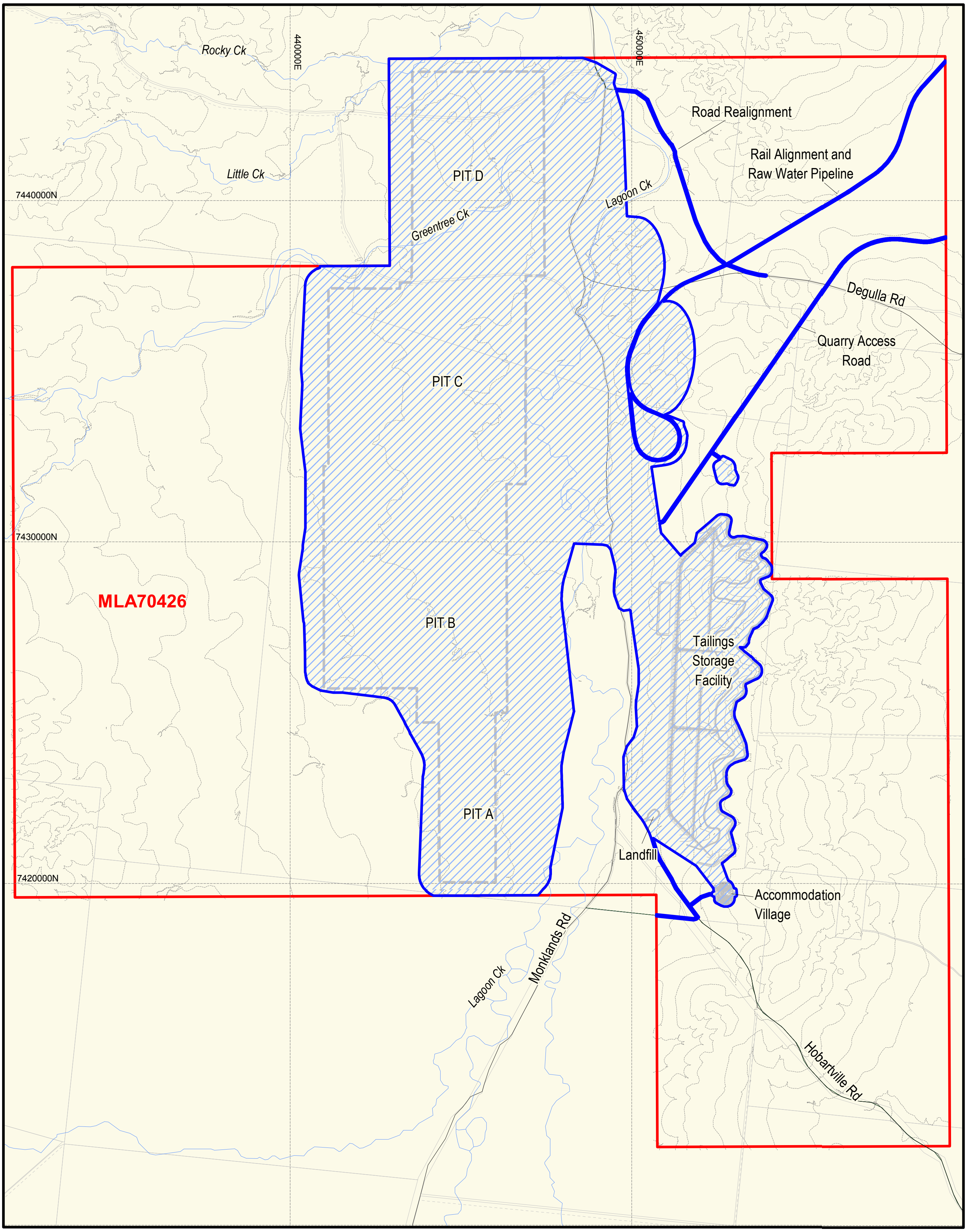
Alpha Coal Project
Environmental Impact Statement

ARCHITECTURAL LEGEND AND SYMBOLS

Job Number | 4262 6580
Revision | A
Date | 24-09-2010

Figure: 2-4b

File No: 42626580-g-2071.cdr



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0 2 4Km

Scale 1:150,000 (A4)

Datum: GDA94, MGA Zone55

N W E S

HANCOCK PROSPECTING PTY LTD

Alpha Coal Project
Environmental Impact Statement

PROJECT DISTURBANCE AREA

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure:2-5

File No: 42626580-g-2072.wor

2.3 Construction

Construction stage activities will only begin once the Mining Lease (ML) has been granted. Where necessary all licences and permits will be obtained per legislative requirements prior to commencing the applicable works. The construction period is nominally 48 months. Within the initial nominal 27 month time frame, the following activities are planned:

- Mine operational equipment will be delivered, constructed and commissioned;
- Mine infrastructure will be constructed, such as site administration buildings, workshops, water management infrastructure, roads, accommodation, hardstands, draglines, electrical and communication systems, etc.; and
- The initial modules of the CHPP will be constructed and commissioned.

Coal mining activities are detailed in Section 2.4.1 below. Throughout the LOM, infrastructure construction, maintenance, rehabilitation or decommissioning activities will be undertaken. As mining advances, infrastructure such as internal roads and additional water management infrastructure will be constructed, relocated, maintained or upgraded as required in order to fulfil operational and regulatory requirements.

The construction stage has three components:

- Site preparation (Section 2.3.1 below);
- Civil works (Section 2.3.2 below); and
- MIA building and CHPP construction (Section 2.3.3 below).

Construction stage activities will occur during daylight hours, seven days a week. Some activities may require to be conducted over a continuous 24-hour period; these may include but are not limited to:

- Deliveries of materials, plant and equipment;
- Concrete batching and pouring;
- Electrical installation;
- Building fit-out; and
- Plant and equipment commissioning.

Due to the close proximity to Lagoon Creek all critical infrastructure is to be located at least 0.5 m above the predicted 1 in 3,000 year flood inundation level. This is in excess of the general requirement for protection from the Q100 flood inundation level.

2.3.1 Site Preparation

2.3.1.1 Removal of Existing Structures

All structures, buildings and infrastructure within MLA 70426 currently in use by local landholders will be acquired and then removed as necessary. The Proponent will consult with affected landowners and other third parties to develop an appropriate relocation plan.

2.3.1.2 Site Clearance

Site clearance will include vegetation clearing, topsoil stripping and stockpiling, bulk earthworks, and temporary drainage and water runoff management works. Site clearance will be staged to minimise the time of exposure of disturbed areas and degradation of topsoil. Refer to Volume 2, Section 9 for details on the extent and types of vegetation to be removed. Plant and equipment involved in site clearance activities will include, but not be limited to excavators, dozers, scrapers, graders, and water carts. All site vehicles and equipment will be properly serviced and maintained.

2.3.1.3 Access Road

During the initial construction period and prior to the permanent mine access road being completed; a temporary access road will need to be constructed from the Hobartville Road to the construction office site immediately to the west of the MIA.

2.3.1.4 Initial Temporary Water Supply and Wastewater Management

Temporary potable water treatment and sewage treatment plants will be installed on site to provide for the initial construction workforce. Both of these treatment plants will be decommissioned once permanent plants are commissioned. Refer to Section 2.5.4 below.

2.3.1.5 Power Supply

For the initial construction accommodation village, power will be supplied using temporary diesel driven generators.

The power supply authority may also provide a connection to the existing 132 kV power line near the Project site to supply power during the construction stage.

2.3.1.6 Communications

Communications during the construction stage will be via a microwave link to the Alpha Township. The provision of this link will be undertaken by a third party.

2.3.1.7 Emergency and Security

A security service will provide controlled access to the mine. The security building will be one of the first buildings constructed, and will provide access control during all stages of the Project. The security building will be located on Hobartville Road, adjacent to the intersection with the accommodation village access road.

Temporary emergency first aid facilities will be constructed prior to the completion of the MIA. The MIA and associated fire and emergency infrastructure are detailed on Figure 2-4.

A temporary relocatable structure will be required while the permanent security structure is established.

The Project will implement an Emergency Management Plan (refer to Volume 2, Section 24).

2.3.2 Civil Works

Civil works will generally occur early in the construction phase and will include, but may not be limited to:

- Civil earthworks, including piling and foundation construction;

- Installation of permanent and temporary drainage;
- Waterway diversions;
- Trenching and laying of reticulated services and any other underground pipelines and services;
- Road construction
- Ramps and walls; and
- Hardstand construction.

Hardstand areas will be constructed according to relevant design criteria, and include items such as building construction pads, hardstands for CHPP, TLO, ROMs, car park areas, dragline construction areas, ammonium nitrate fuel/oil (ANFO) storage compound, workshop areas, and product stockpile areas. Refer to Section 2.5 below for further details.

Road works and road construction will be undertaken in accordance with appropriate road construction standards (e.g. Austroads Standards for public roads; DTMR Road Planning and Design Manual for intersections, etc.) and will occur both on and off MLA 70426. Road works and specific standards are described further in Section 2.5 below.

2.3.2.1 Excavated Material Assessment

In order to minimise handling costs and area of impact, the aim is to achieve as far as is possible, balanced cut and fill earthworks. An initial estimate of volumes of material to be moved during bulk civil earthworks is 5 million cubic metres (m^3). Imported material to the site is estimated at 4 million m^3. Earthworks for the two ROM facilities are in the order of 4 million m^3 to 5 million m^3 for each pad.

2.3.3 Mining Infrastructure Area Building and Coal Handling Preparation Plant Construction

Building construction will commence following completion of components of the civil works. Where practicable and cost effective, infrastructure components will be modularised units, utilising off-site fabrication and assembly.

Concrete will be batched on site, with suitable batching materials delivered to site by third parties. Gravel suitable for concrete production, hardstand and road base construction purposes will be sourced from the on-site quarry pits and selected borrow sites.

The MIA will service a range of mine operation activities, including administration, workshop, maintenance areas, fuel and lube storage and dispensing and other mine associated services.

2.3.3.1 Quarry Pits

There is currently one main quarry area identified within the mining lease that contains appropriate grade material for use on site; the location is shown on Figure 1-2 (Volume 2, Section 1). The Project requires approximately 2.3 million m^3 of on-site gravel material over the life of the Project. Material will be sourced from this area on an as-needed basis.

2.3.3.2 Dragline Construction

Nine draglines are required for overburden removal. The draglines will be constructed on the designated dragline construction hardstand area. This area and the supporting infrastructures are described in Section 2.5 below. Dragline construction will commence late in the Project construction stage in preparation for the mine operations.

2.3.3.3 Clean-up of Construction Areas

After construction, the contactors will be required to clear all construction waste, equipment and plant per their construction environmental management plan (EM Plan). Disturbed areas that are not proposed to be utilised during operational activities will be rehabilitated.

2.3.4 Construction Equipment and Materials

Refer to Section 2.5.2.2 below for details on the equipment and materials to be transported to the site during the construction stage.

2.4 Project Operations

Following construction, operational activities will be ramped-up over five years, reaching full production of approximately 42 Mtpa of ROM coal to produce 30 Mtpa of product coal.

2.4.1 Mine

The development of the Project and associated mine plan have been based on the following criteria:

- A staged build-up to a target production rate of 30 Mtpa of product;
- 100% export thermal coal product from the C and D coal seams;
- LOM of 30 years;
- 80% of scheduled reserves to be in the Proven or Probable JORC Reserves category; and
- An owner-operator mining scenario.

2.4.1.1 Coal Resource Base and Mine Life

The Alpha coal deposit and the adjacent Kevin's Corner deposit are situated in the Galilee Basin in central Queensland, Australia. The Galilee Basin is of Palaeozoic to Triassic age. The Galilee Basin is approximately 480 km long and extends from the town of Tambo in the south to Pentland in the north, as shaded in Figure 4-1 (Volume 2, Section 4). There are six logged coal seams in the Alpha Coal Project (Mine) area designated (in descending stratigraphical order) as A, B, C, D, E and F. Seams A through D are considered to be economically recoverable via open cut mining. The seams dip slightly to the west by < 1° and are mapped to be relatively free of faults.

In general, seams include some thin parting plies, particularly Seam B. Seam thicknesses vary in multiple directions but range from less than 1 metre (m) (Seam C at sub-crop) to up to 8 m thick (Seam B). Overburden depth varies from a minimum of 20 m upwards.

Seams A and B sub-crop in the western area of MLA 70426, while the deeper C and D seams sub-crop in the eastern area, adjacent to the Lagoon Creek. Figure 2-6 and Figure 4-2 (Volume 2, Section 4) depict a generalised west-east cross section of the C and D seams to be mined.

The coal can generally be described as high volatile (30–35%) bituminous with low to moderate ash (8–35%). The primary use for this coal is expected to be in export thermal applications.

The Project resource estimate is fully outlined in Volume 2, Section 4, and Table 4-5. It is estimated that the total combined resources from the seams are 1.475 billion tonnes (Bt), of which 805 million tonnes (Mt) are Measured and 520 Mt are Indicated.

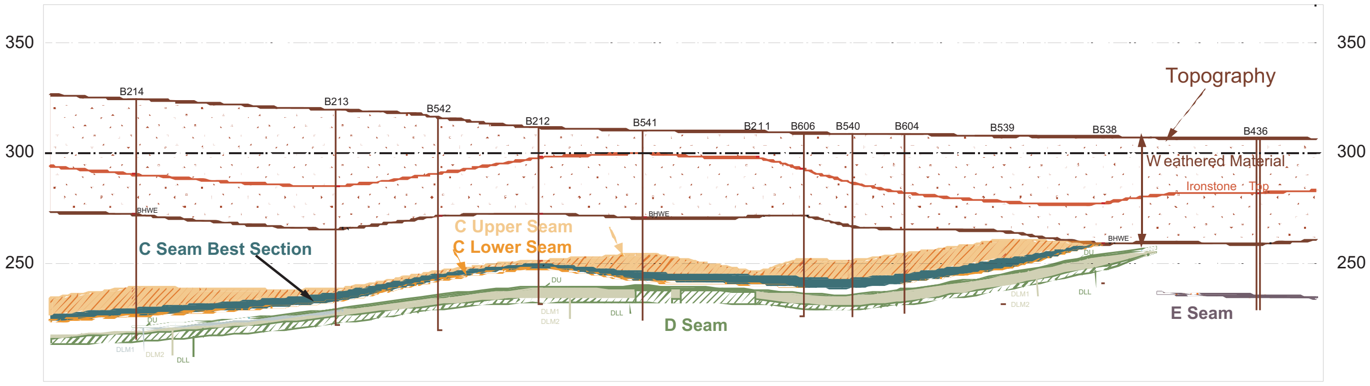
Refer to Volume 2, Section 4 for further details on the geology, JORC compliance, and coal resource base.

Table 2-2 quantifies the coal anticipated to be mined annually over the scheduled LOM, including the amount of product coal produced annually. The schedule highlights that the mine will be in full production by year 5 of operations.

The proposed mine plan minimises the potential for coal resource sterilisation; this is achieved by:

- Commencing the D seam boxcuts where the seam thickness is economic to mine; and
- Rolling the dragline land bridges, allowing 100% coal recovery under this infrastructure. The proposed dragline method allows rehandling of the land bridge from south to north and then again from north to south.

However, due to the requirement to establish stream diversion and access corridors at the south and north of the mine pit area, approximately 18 Mt of coal will be sterilised over the 30-year mine life, which represents approximately 2% of the total coal resource.



Source: Hancock Coal Pty Ltd

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Datum: GDA94, MGA Zone55

HANCOCK PROSPECTING PTY LTD

Alpha Coal Project
Environmental Impact Statement

CROSS SECTION OF COAL SEAMS

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-6

File No: 42626580-g-2073.cdr

Table 2-2 Schedule of coal mined over the life of the mine

LOM year	Prime Waste	ROM Coal	Product Coal
	Mbcm	Mt ROM	Mt Product
	16.7	–	–
1	71.6	4.8	3.8
2	146.9	16.6	12.0
3	192.3	25.4	18.1
4	243.5	35.1	25.0
5	265.6	43.1	30.0
6	247.7	43.8	30.0
7	246.7	44.0	30.1
8	266.3	45.5	30.1
9	263.1	45.2	30.0
10	259.2	44.8	30.0
11	255.5	45.1	30.0
12	277.0	45.6	30.0
13	263.1	45.9	30.0
14	267.9	45.6	30.0
15	283.4	45.6	30.0
16	292.4	45.4	29.9
17	300.6	45.3	30.0
18	311.8	45.4	30.0
19	307.4	45.4	30.0
20	323.3	45.8	30.1
21	334.0	46.2	30.1
22	344.3	46.5	30.0
23	340.1	46.7	30.0
24	346.3	46.1	30.0
25	356.0	46.0	30.0
26	378.2	45.7	30.1
27	391.9	46.1	30.1

LOM year	Prime Waste	ROM Coal	Product Coal
	Mbcm	Mt ROM	Mt Product
28	394.4	46.4	30.1
29	411.9	46.7	30.1
30	411.8	46.4	30.0

Note: Million bank cubic meters (Mbcm)

2.4.1.2 Mining Method

The mine will consist of a conventional dragline and truck-shovel pre-strip operation with coal haulage by bottom-dump coal hauler to one of two ROM dump stations located adjacent to the box cut. The total mine strike length of approximately 24 km will be divided into four main pit areas as shown in Figure 1-2 (Volume 2, Section 1), and further subdivided into operating ramp areas with an average spacing of 2.5 km.

The four pits have been colloquially named after local rural properties, as follows:

- Pit A Hobartville Pit
- Pit B Wendouree Pit
- Pit C Surbiton Pit
- Pit D Forrester Pit

2.4.1.2.1 Overburden Removal

The topsoil is proposed to be stripped in advance of mining activities. The topsoil will be stockpiled for future use or placed directly onto the regraded areas.

The Tertiary and weathered Permian overburden will be excavated by large rope shovels and backhoe excavators, and then hauled to out-of-pit emplacement areas adjacent to the low walls by rear-dump truck. Much of the truck-shovel overburden will be free-dig material, however, some blasting will be required to maintain productivity of digging where harder bands are intersected.

All overburden material will be relocated by excavator until the draglines are introduced.

Once the thickness of fresh overburden in each pit is sufficient for efficient dragline operations, the truck shovel operation will continue on pre-strip operations ahead of the dragline benches hauling around the end-wall of each pit or across an in-pit bridge.

It has been estimated that a total of up to 12 pre-strip fleets will be required to service the 9 draglines.

2.4.1.2.2 Drill and Blasting

Blasting will be carried out using ANFO explosive and emulsion-based nitrate explosives. The transportation, storage and use of explosives will be in accordance with the relevant Australian Standards (i.e. AS 2187 Explosives – storage, transport and use) and all state legislation (i.e. *Explosive Act 1999*). The greatest annual amount of explosives is estimated to be approximately 72,000 tonnes. A secured explosives magazine will be constructed for the storage of blasting initiation equipment.

2.4.1.2.3 Coal Mining

The coal mining operation has been designed to ensure effective resource extraction within the mining lease.

The C and D coal seams will be mined using front end loaders, backhoe excavators and bottom-dump coal haulers as detailed in Table 2-3. The coal will be loaded into bottom-dump coal haulers by a backhoe excavator. The bottom-dump coal haulers will transport the ROM coal to one of two ROM stations.

The ramps will be backfilled and re-graded as appropriate as they progress down dip to allow the backfill dumps to be progressively rehabilitated, minimise backfill height and limit the water catchment for the open pits.

2.4.1.2.4 Overburden and Waste Disposal

As all four mine pits will be mined at the same time, there will be a rapid increase of truck-shovel operations over the first three years with all box-cut material hauled to the out-of-pit emplacement areas. The out-of-pit emplacement areas are located to the east of the disturbed area, as close as possible to the low walls with a nominal 200 m set-back for stability purposes. The estimated out-of-pit dump volume required for the box cuts is 340 m^3 (loose); and at the end of mining the final landform is expected to be about 15 m above the natural surface.

All CHPP coarse rejects will be hauled into the designated emplacement areas by rear-dump trucks. There is potential for a permanent reject conveyor system to be established between Ramps 19 and 29. The reject will be placed in the top 20 m of the backfill horizon and capped by the final backfill pass. Other than the box-cut spoil, only a small fraction of the overburden is expected to be placed out of pit limits, and the final landform will rise gently to the west as the mine deepens. Further information is provided Volume 2, Section 16.

2.4.1.3 Mining Equipment

With the scale of operation that is planned, it has been recognised that even with the largest equipment capacity, the earthmoving fleet sizes will be large. Continuous mining operations such as bucket-wheel excavators and conveyor systems are deemed not suitable for the overburden material that occurs within the Project area.

Details of the expected major equipment to be used for the mining operation are provided in Table 2-3, for transport details refer to Volume 2, Section 17.

Table 2-3 Major mine equipment

Unit Type	Application	Number
Main waste		
Overburden drill	Main waste drilling	11
Dragline	Main waste removal	9
Rope shovel	Main waste loading	9
Excavator	Main waste loading	12
Rear-dump truck	Main waste haulage	112

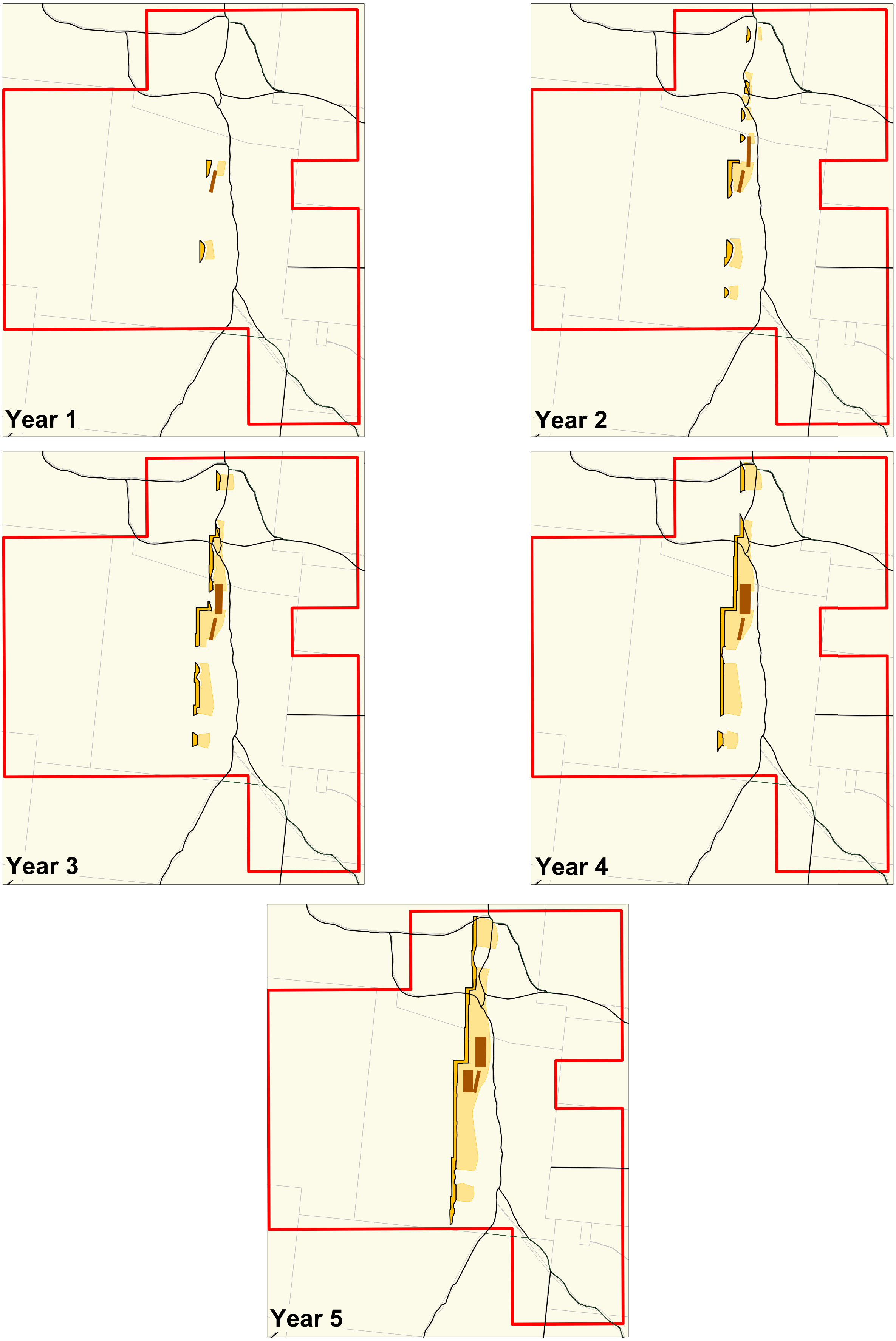
Unit Type	Application	Number
Secondary waste		
Overburden drill	Secondary waste drilling	3
Excavator	Secondary waste loading	3
Front end loader	Backup and thin waste loading	2
Rear-dump truck	Secondary waste haulage	10
Coal mining		
Coal drill	Coal drilling (if required)	3
Front end loader	Coal loading – thin seams	1
Excavator	Coal loading – thick seams	3
Bottom-dump truck/coal haulers	Coal haulage	42
Reject haulage		
Rear-dump truck	Reject haulage and pre-strip backup	8
Major ancillaries		
Bulldozer	Waste face clean-up, dragline dozer, spoil dump maintenance, misc. construction, thin waste ripping, CHPP	34
Bulldozer	Coal face clean-up, road maintenance, misc. construction, thin coal and waste ripping	12
Rubber-tyred dozer	Coal and waste face clean-up, road maintenance, misc. construction	14
Grader	Coal and waste face clean-up, road maintenance, misc. construction	11
Water truck	Road maintenance, misc. construction	8

The largest available draglines have been selected with the objective to minimise the volume of truck-shovel pre-strip and minimise the number of draglines required. For the coal fleet, the large bottom-dump truck has been selected to limit the coal fleet size.

2.4.1.4 Mine Sequencing

Table 2-2 details the quantity of coal anticipated to be mined annually over the LOM, including the amount of product coal produced annually. The schedule highlights that the mine will be in full production by year 5 of the mine.

Figure 2-7 and Figure 2-8 are overviews of the mine sequence figures for the years 1, 2, 3, 4, 5, and 10, 15, 20, 25 and 30, respectively. Figure 2-9 through Figure 2-18 illustrate each of the mine sequence figures.



Mining Lease Application (MLA704026) Boundary
Working Face and Void
Spoil Dump Area
Rejects

Source: See Copyright Details below and for full disclosure Please Refer to the EIS *Volume 4 - References*

0 5 10Km
Scale
Datum: GDA94, MGA Zone55

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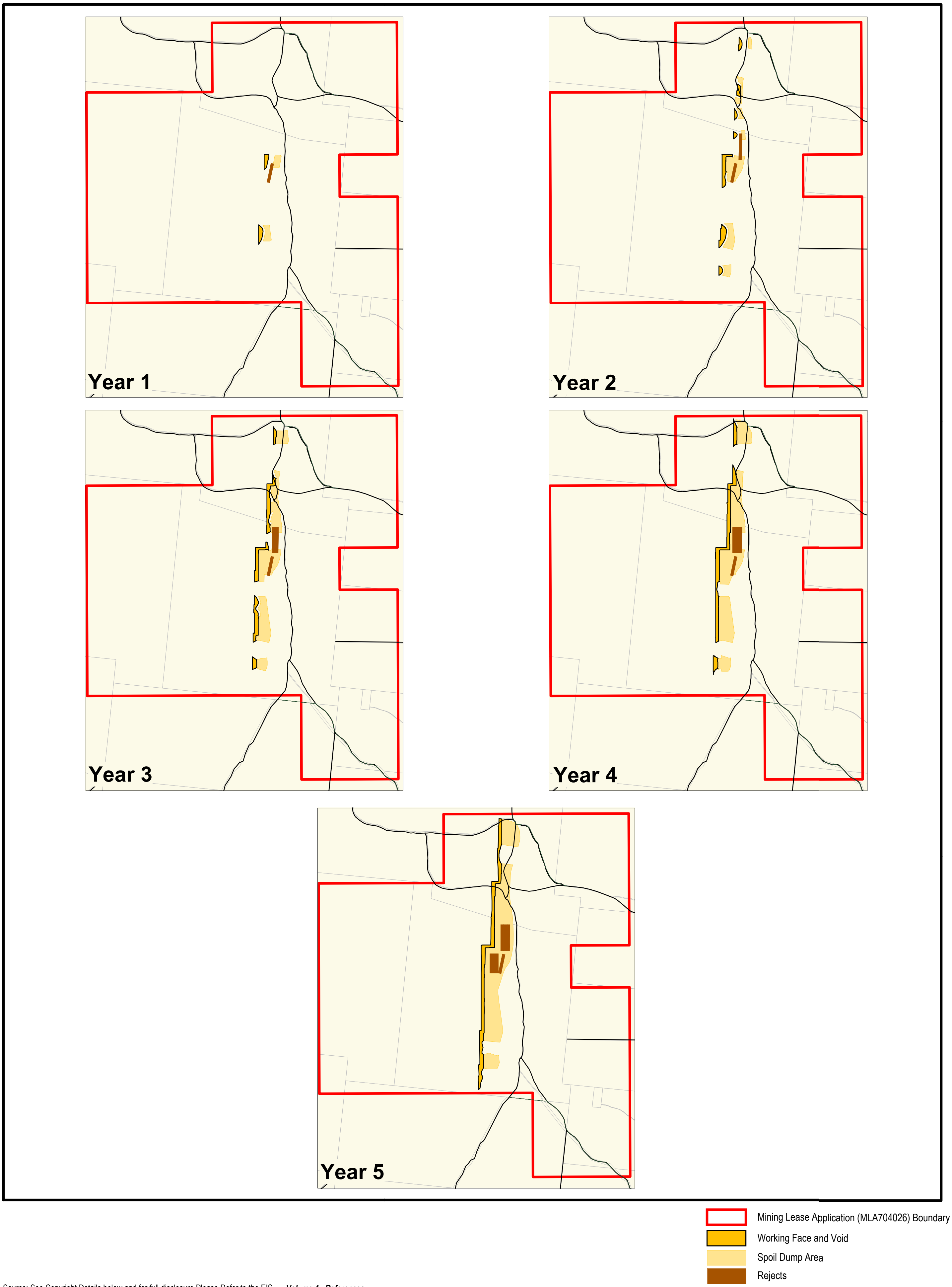
Alpha Coal Project
Environmental Impact Statement

MINING SEQUENCE OVERVIEWS
YEARS 1 - 5

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-7

File No: 42626580-g-2074.wor



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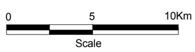

Datum: GDA94, MGA Zone55

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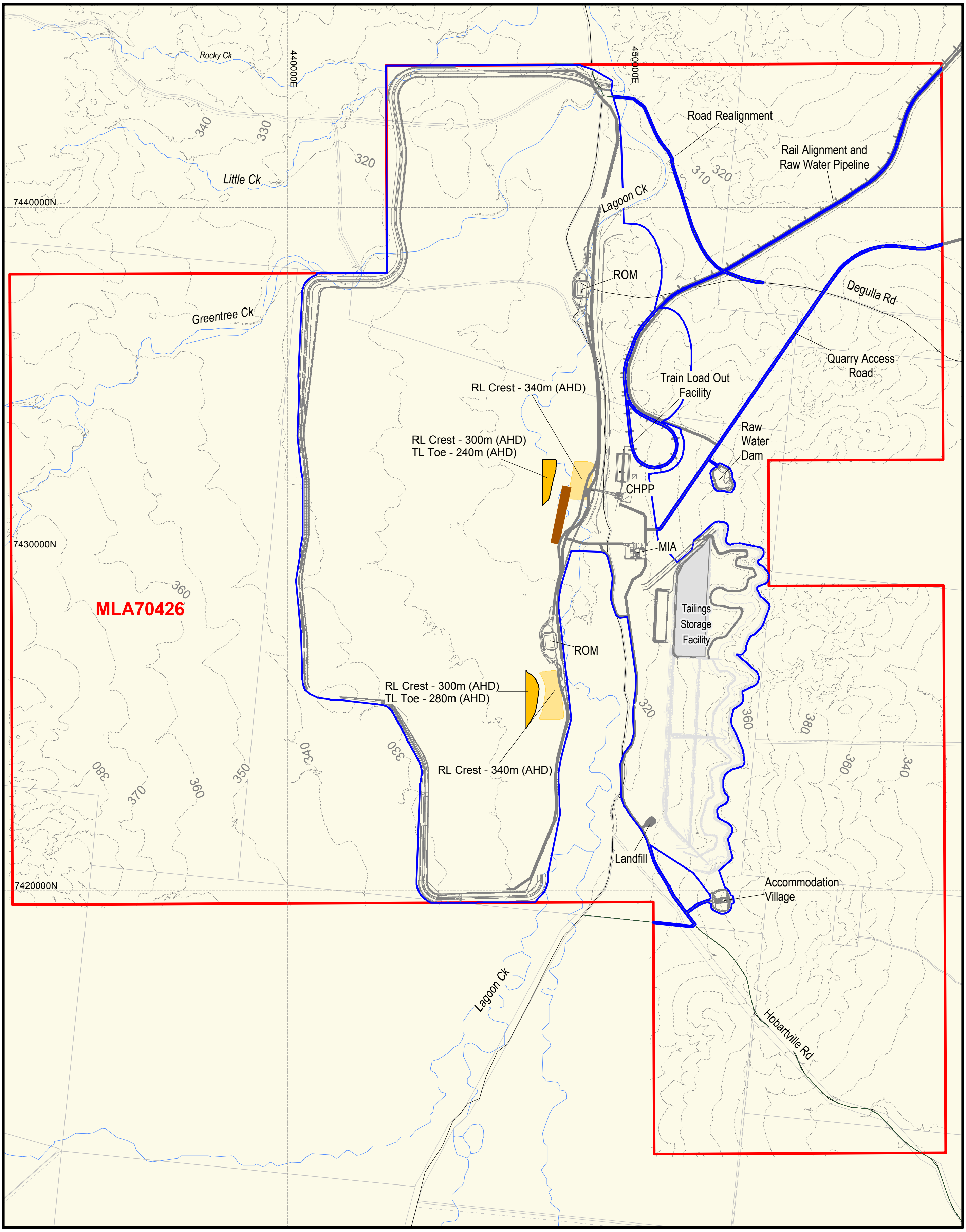
MINING SEQUENCE OVERVIEWS
YEARS 1 - 5

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-7

File No: 42626580-g-2074.wor



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0 2 4Km

Scale 1:150 000 (A4)

Datum: GDA94, MGA Zone55

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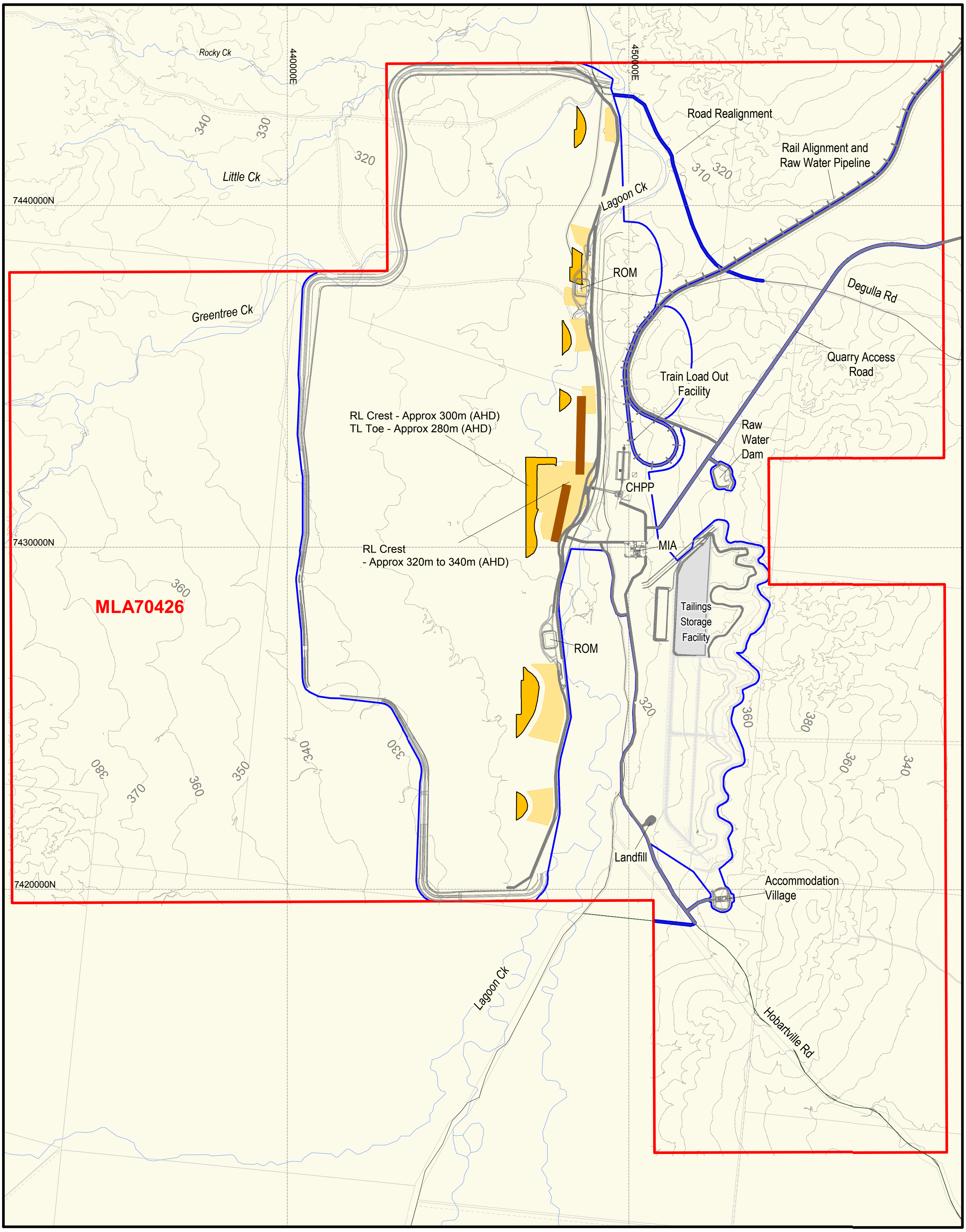
MINE SEQUENCE
YEAR 1

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-9

File No: 42626580-g-2076.wor



(red outline)	Mining Lease Application (MLA70426) Boundary	(orange)	Working Face and Void
(blue outline)	Disturbance Area	(pale yellow)	Spoil Dump Area
		(brown)	Rejects

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0 2 4Km
Scale 1:150 000 (A4)
Datum: GDA94, MGA Zone55

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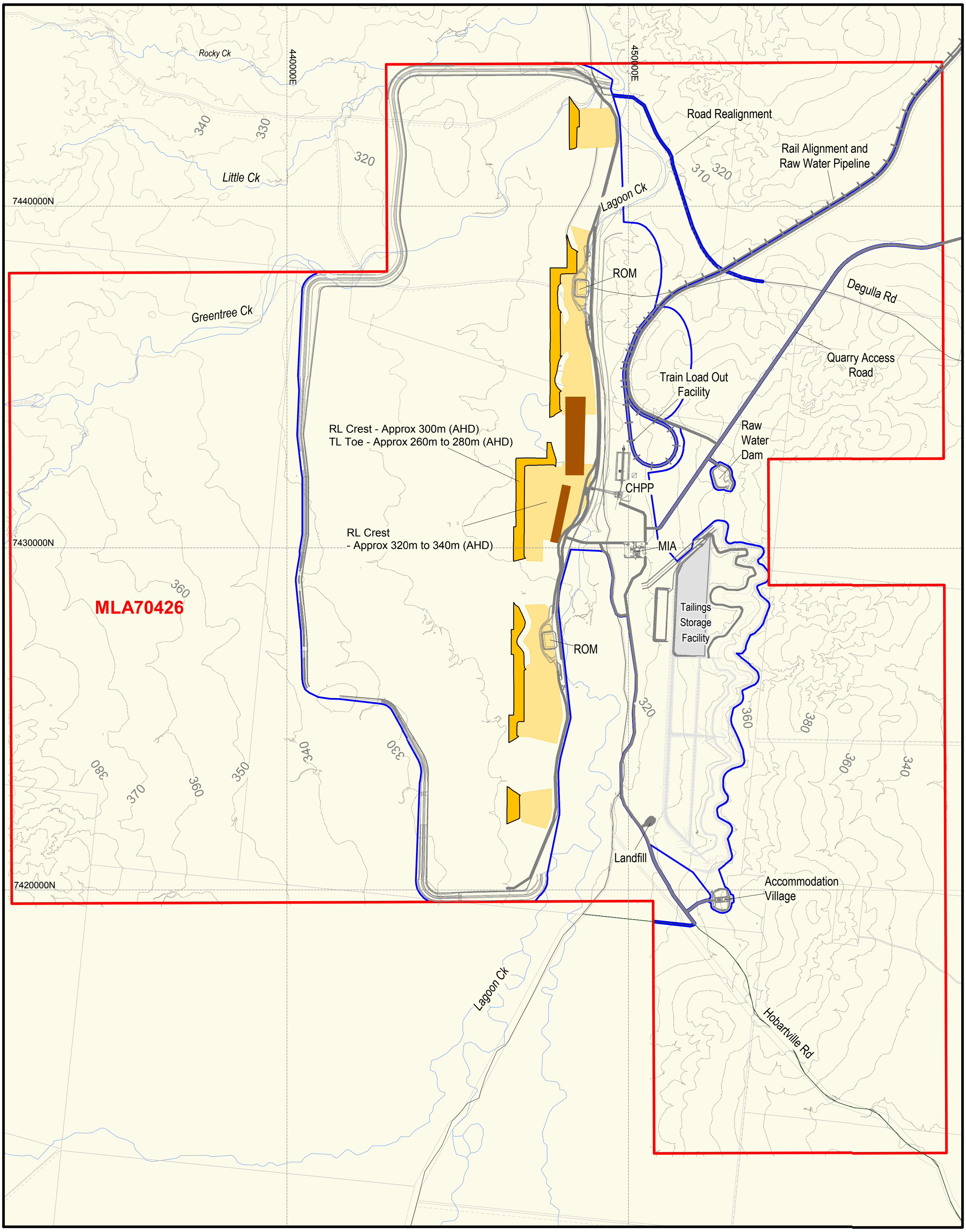
MINE SEQUENCE
YEAR 2

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-10

File No: 42626580-g-2076.wor



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	Disturbance Area		Spoil Dump Area
			Rejects

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0 2 4Km

Scale 1:150 000 (A4)

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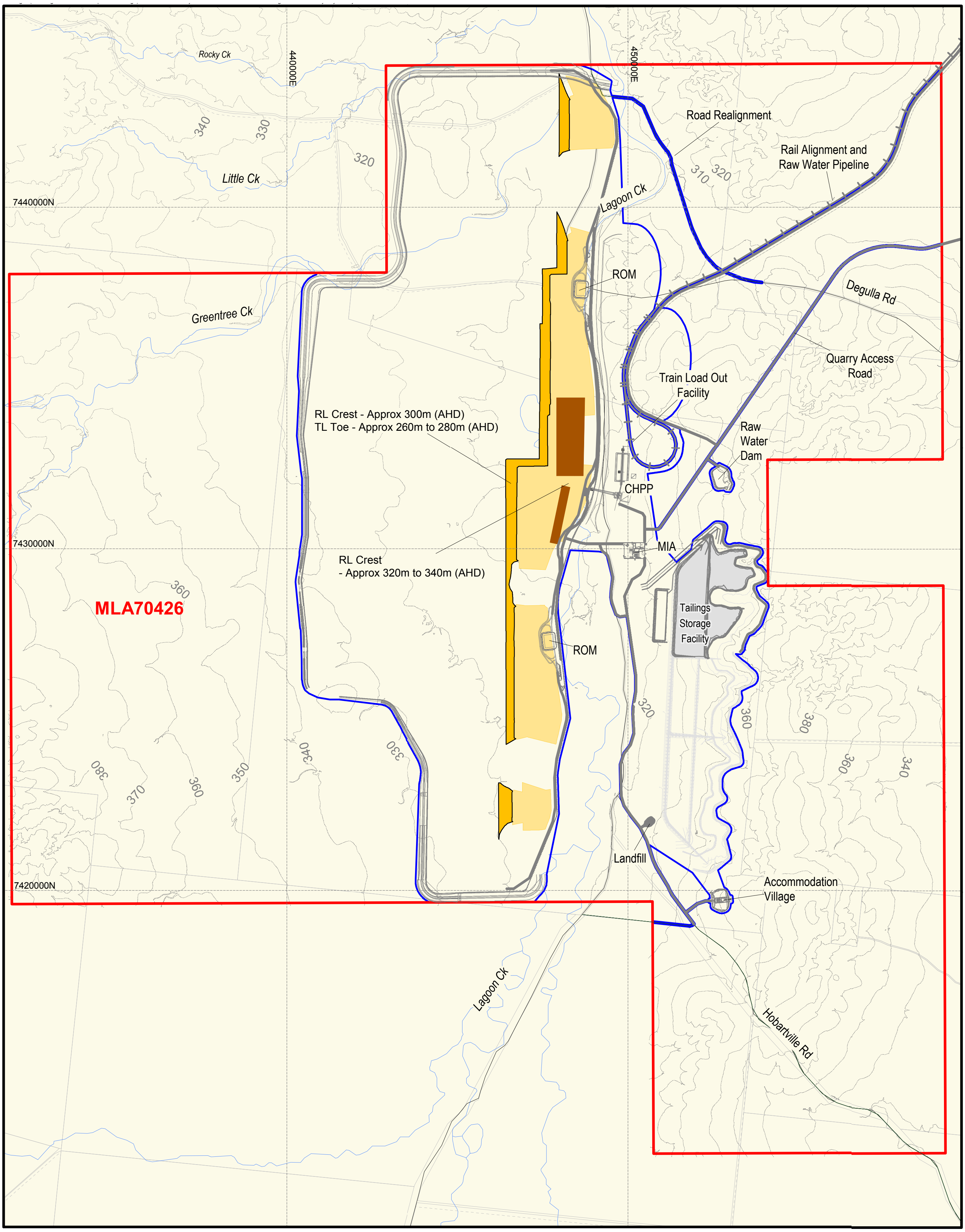
MINE SEQUENCE
YEAR 3

Job Number | 4262 6580
Revision | A
Date | 24-09-2010

Figure: 2-11

File No: 42626580-g-2076.wor



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	Disturbance Area		Spoil Dump Area
			Rejects

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0 2 4Km
Scale 1:150 000 (A4)
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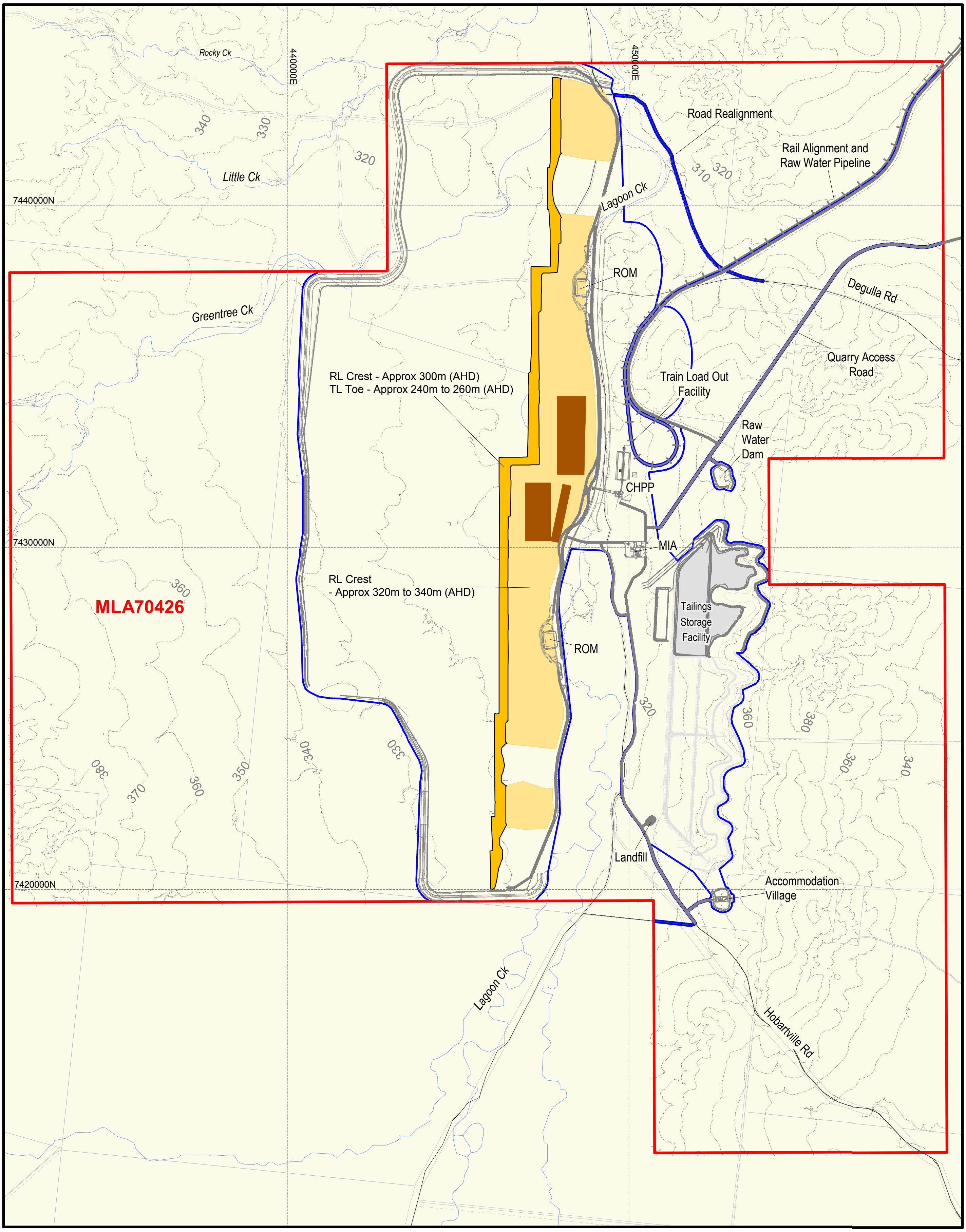
MINE SEQUENCE
YEAR 4

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-12

File No: 42626580-g-2076.wor



Mining Lease Application (MLA70426) Boundary	Working Face and Void
Disturbance Area	Spoil Dump Area
	Rejects

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0 2 4Km
Scale 1:150 000 (A4)
Datum: GDA94, MGA Zone55

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MINE SEQUENCE
YEAR 5

Job Number 4262 6580
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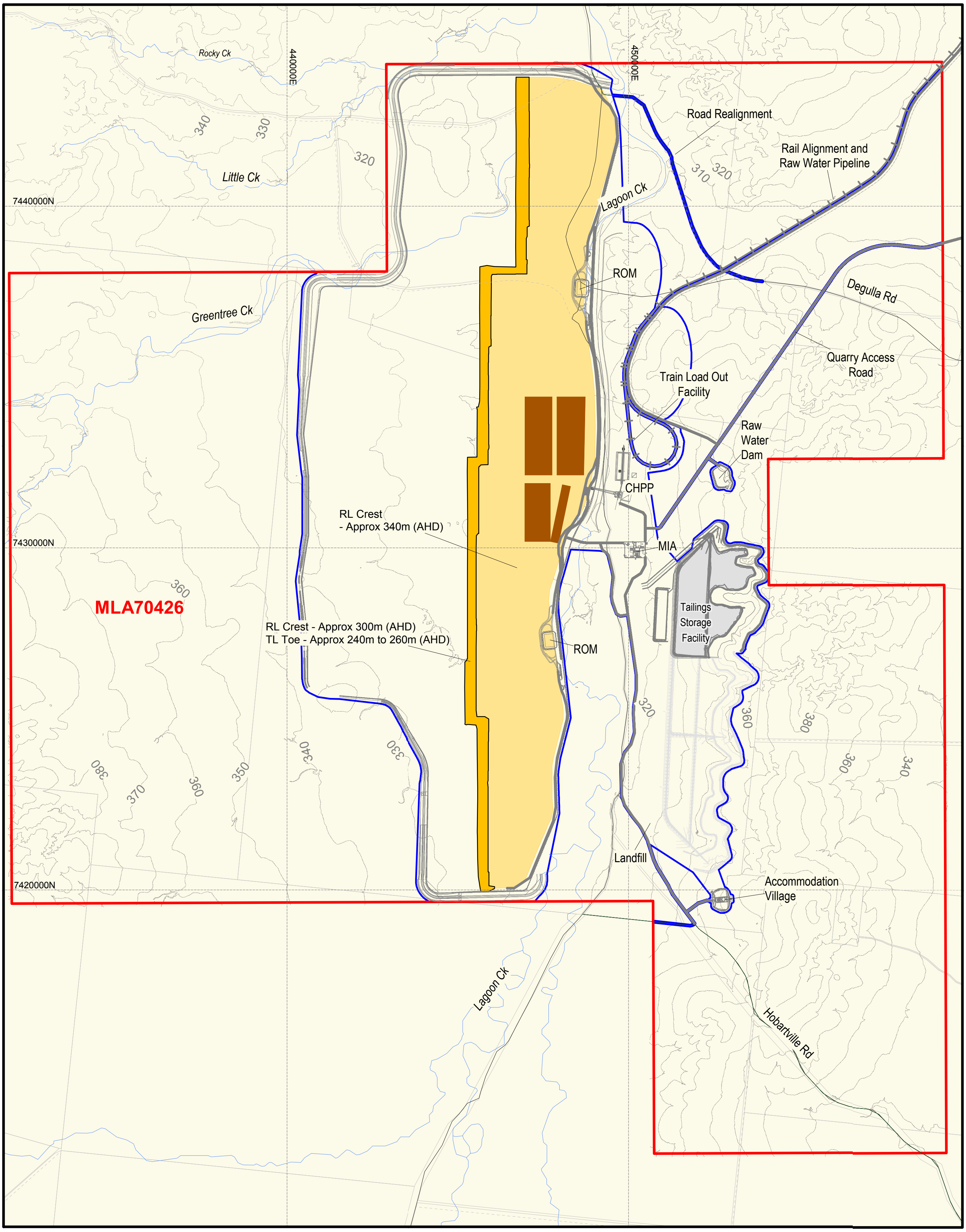
Date 24-09-2010

Figure: 2-13

File No: 42626580-g-2076.wor



Mining Lease Application (MLA70426) Boundary	Working Face and Void
Disturbance Area	Spoil Dump Area
	Rejects

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0 2 4Km

Scale 1:150 000 (A4)

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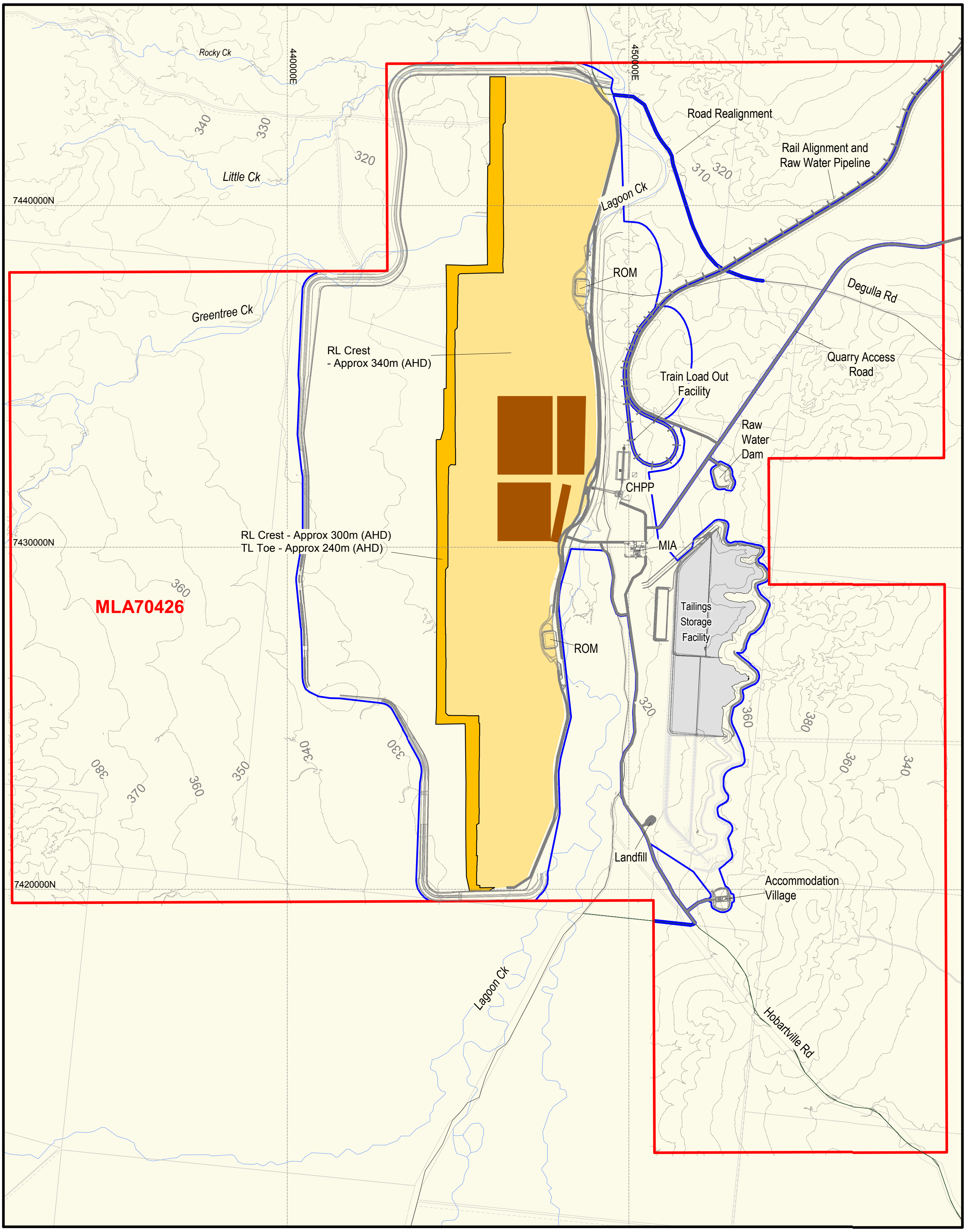
MINE SEQUENCE
YEAR 10

Job Number | 4262 6580
Revision | A
Date | 24-09-2010

Figure: 2-14

File No: 42626580-g-2075.wor



Mining Lease Application (MLA70426) Boundary	Working Face and Void
Disturbance Area	Spoil Dump Area
	Rejects

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0 2 4Km

Scale 1:150 000 (A4)

Datum: GDA94, MGA Zone55

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MINE SEQUENCE
YEAR 15

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-15

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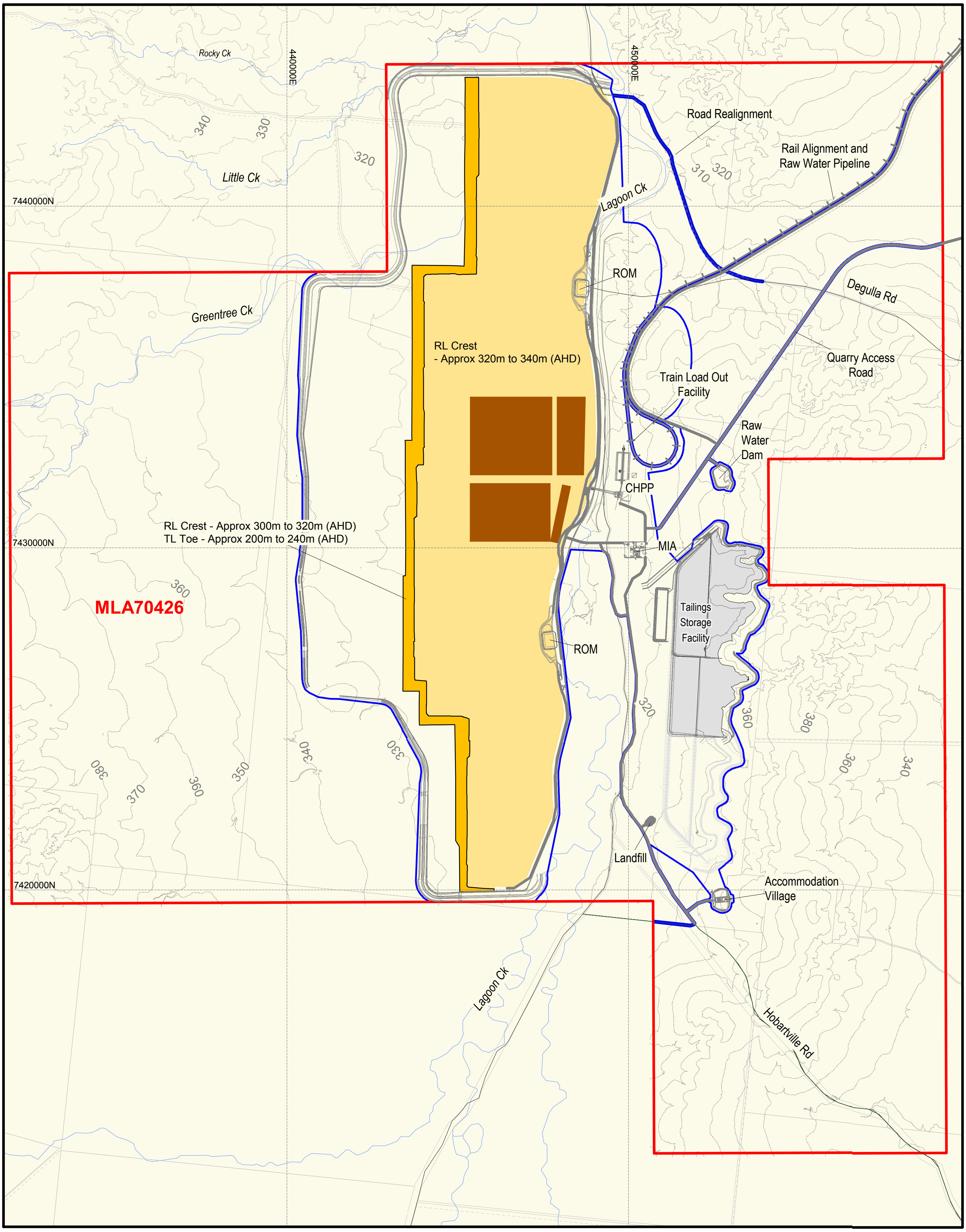

Mining Lease Application (MLA70426) Boundary
Disturbance Area
Working Face and Void
Spoil Dump Area
Rejects

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Scale 1:150 000 (A4)
Datum: GDA94, MGA Zone55

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MINE SEQUENCE
YEAR 20

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-16

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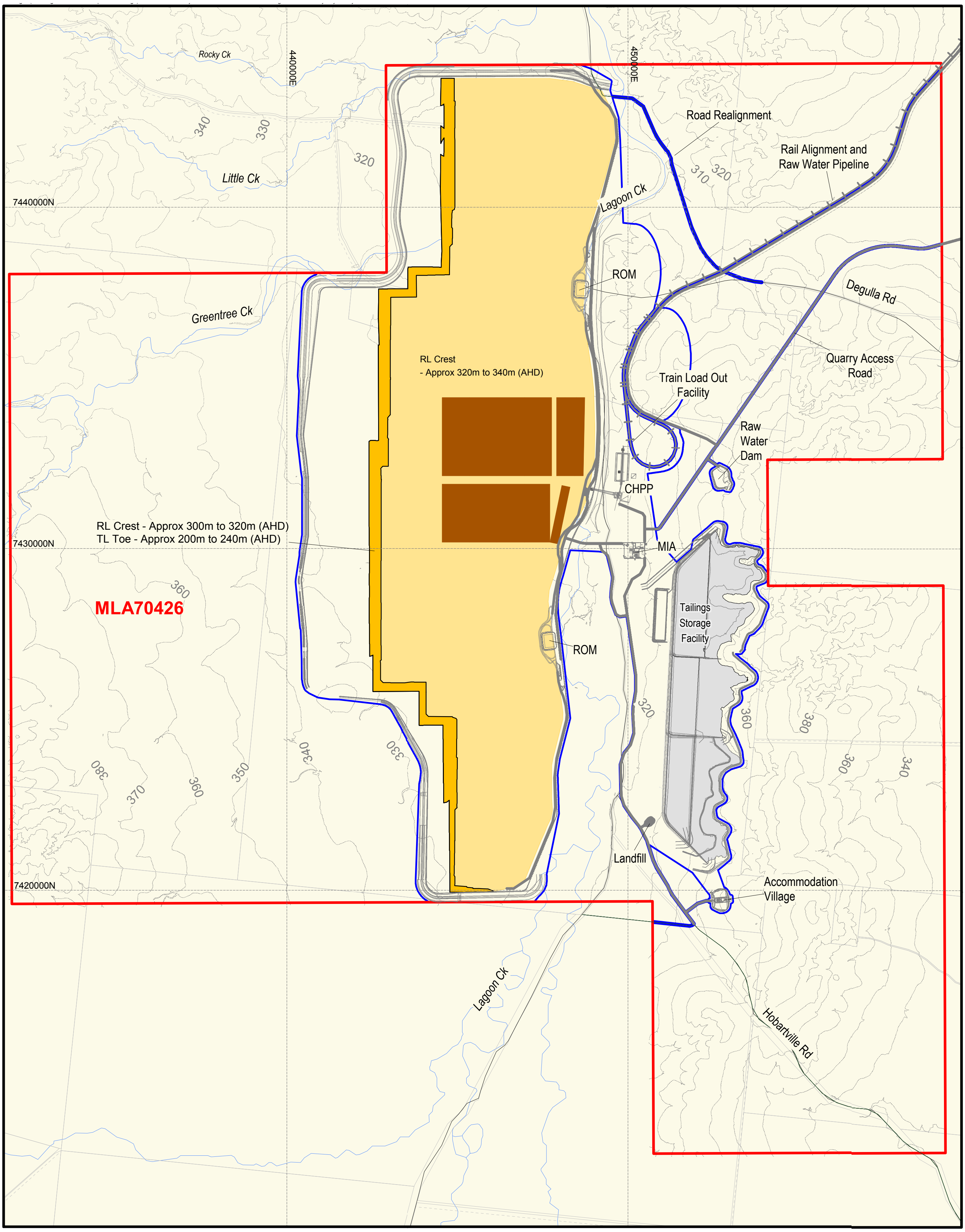

(red outline)	Mining Lease Application (MLA70426) Boundary	(orange)	Working Face and Void
(blue outline)	Disturbance Area	(light yellow)	Spoil Dump Area
		(brown)	Rejects

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0 2 4Km

Scale 1:150 000 (A4)

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MINE SEQUENCE
YEAR 25

Job Number 4262 6580
Revision A
Date 24-09-2010

Figure: 2-17

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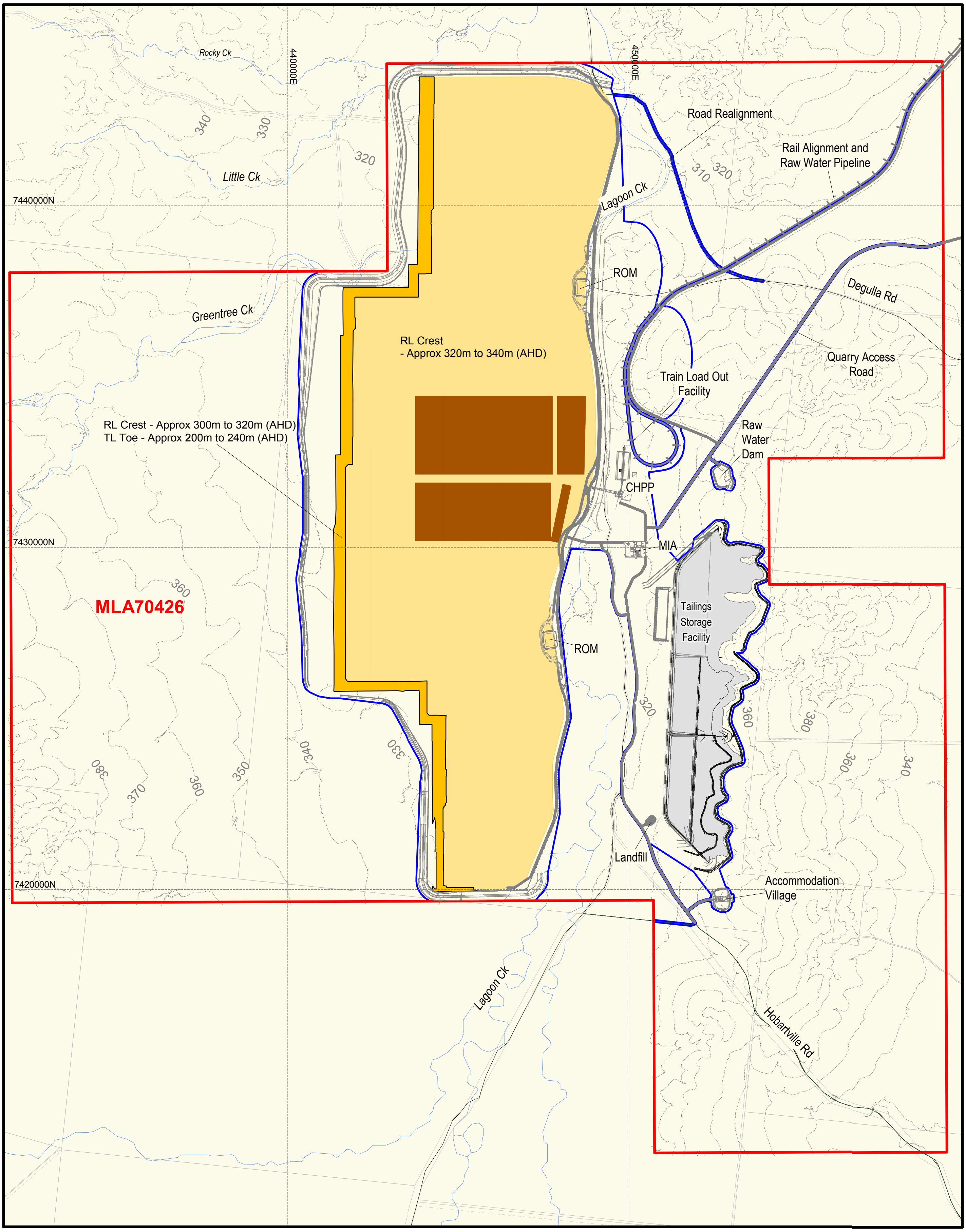

Mining Lease Application (MLA70426) Boundary	Working Face and Void
Disturbance Area	Spoil Dump Area
	Rejects

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0 2 4Km
Scale 1:150 000 (A4)
Datum: GDA94, MGA Zone55

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MINE SEQUENCE
YEAR 30

Job Number 4262 6580
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Date 24-09-2010

Figure: 2-18

File No: 42626580-g-2075.wor

2.4.1.5 Ongoing Evaluation and Exploration Activities

Considerable exploration was undertaken by several companies in the 1970s and early 1980s in the Galilee Basin. These previous exploration efforts adequately covered the present-day Alpha and Kevin's Corner MDL areas. A significant quantity of slim core and open-hole drilling data were obtained together with nine large diameter (LD) bore cores from the Alpha lease deposit.

The following exploration activities will be conducted as the Project progresses:

- Coal quality drilling – in areas of early mining to add confidence in early product to be produced, and CHPP utilisation;
- Bypass studies – similar to coal quality drilling, but specifically focused in areas of potential bypass coal. Potential for significant capital and operating savings;
- Underground studies – deeper drilling towards the west to evaluate underground potential;
- Geotechnical drilling – specialised drilling to evaluate the mechanical properties of the coal and overburden or interburden. This is a new basin with potentially problematic overburden; and
- Hydrology studies – specialised drilling to further evaluate groundwater capacity and effect of operations on supply.

2.4.2 Coal Handling and Preparation Plant

The proposed CHPP incorporates two remote ROM sizing facilities conveying crushed raw coal to a multi-module single stage dense medium cyclone (DMC)/Reflux Classifier plant. Automated stacking and reclaim facilities are provided, including an automated train load-out bin. Tailings (fine rejects) disposal is to conventional tailings dams. Coarse rejects disposal involves conveying to a remote bin and trucking to a designated reject dump. There is potential for an automated reject handling system in the future. The estimated CHPP capacities are detailed in Table 2-4.

Table 2-4 Coal Handling and Preparation Plant estimated capacities

Option	Required Product Mtpa	Coal Processing Plant (CPP) Yield %	ROM Mtpa	ROM t/h	Approximate CHPP Feed t/h
100% Washed	30.0	76.2	40.2	6040	6,040 up to 6,500

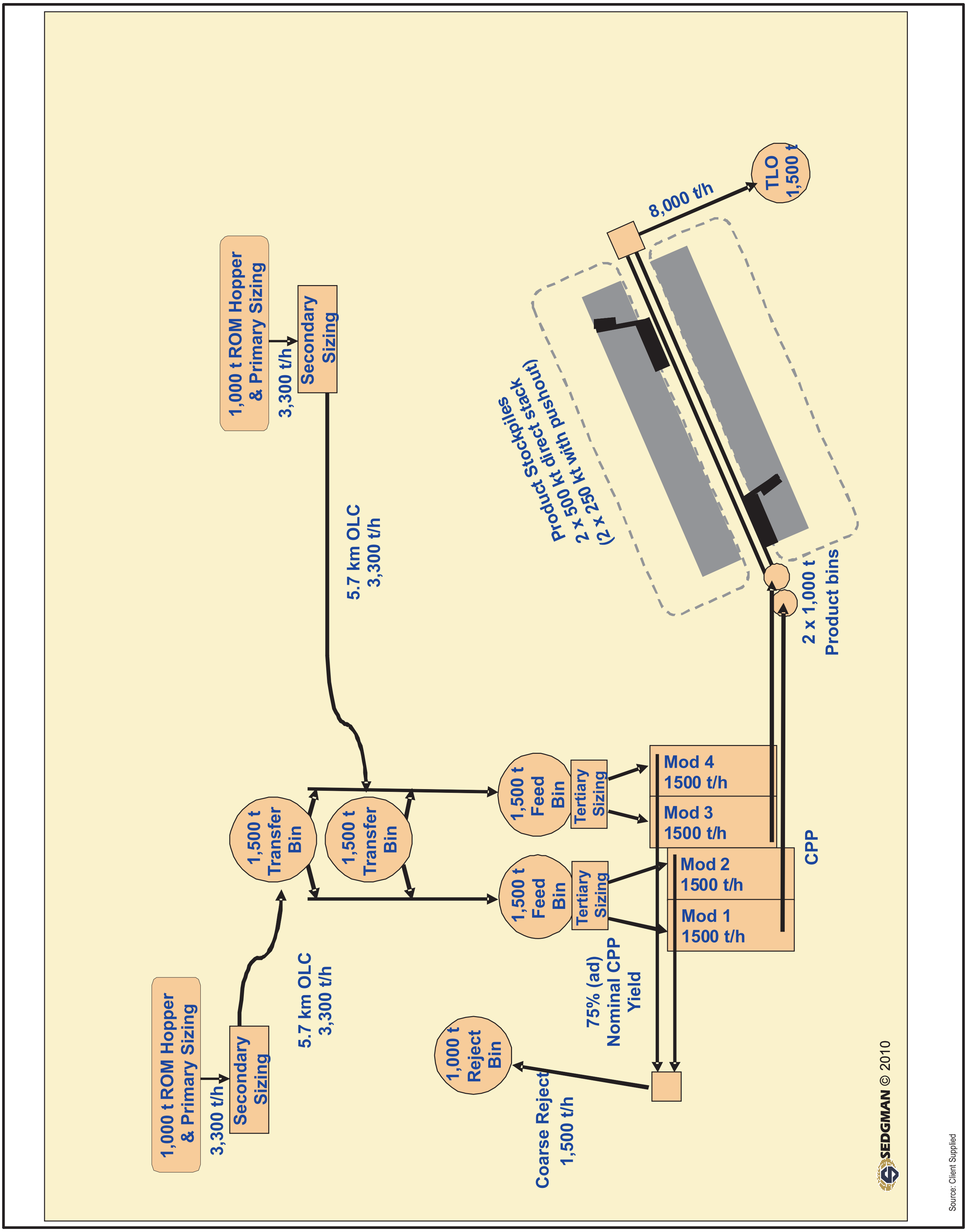
The following principal design objectives were considered when designing the CHPP:

- The CHPP facility will be designed to produce 30 Mtpa export thermal coal;
- The CHPP facility will be constructed over a period of four years to meet production requirements;
- The CHPP facility will be designed for a 30-year mine life, operating 24 hours per day, seven days per week, up to 7,200 hours per year;
- The CHPP facility will be based on a safe, economical, durable and functional design suitable for heavy duty mining application; and
- The CHPP facility will be designed to minimise water and power consumption.

On average for every 100 tonnes (t) of ROM coal processed, the CHPP will produce approximately 78 t of product coal, 16 t of coarse reject, and 6 t of tailings.

A block diagram illustrating the concept for the CHPP and approximate capacities is shown in Figure 2-19. The CHPP will consist of the following process components:

- Raw Coal Handling:
  - ROMs and sizing
  - Overland conveyors
- Coal Processing Plant:
  - Desliming
  - Coarse coal circuit
  - Correct medium and magnetite recovery circuits
  - Fine coal circuit
  - Tailings (fine rejects)
  - Coarse rejects
- Product coal handling
  - Train Load-Out



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COAL HANDLING AND PREPARATION PLANT (CHPP) BLOCK FLOW DIAGRAM

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Figure: 2-19

File No: 42626580-g-2076.cdr

2.4.2.1.1 Raw Coal Handling

ROMs and Sizing

Two ROM facilities are required to service the mine and CHPP. Each ROM will process approximately 50% of the ROM coal. One remote ROM facility will be located approximately 2.5 km northwest of the CHPP (the northern ROM), and the other will be approximately 5.5 km southwest of the CHPP (the southern ROM).

The ROMs will be suitable for delivery by both 220 t belly and rear dump trucks. Each ROM system will have a 1,000 t hopper and feeder breaker. The raw coal will be reduced to 250 mm. The primary sized coal will be conveyed from the hoppers to a secondary sizing station via transfer conveyors.

Each secondary sizing station will consist of a low speed secondary crusher to crush coal from 250 mm to 120 mm. The secondary sized coal will be transferred to the CHPP by conventional overland conveyors. Each overland conveyor will discharge into two 1,500 t transfer bins at the CHPP.

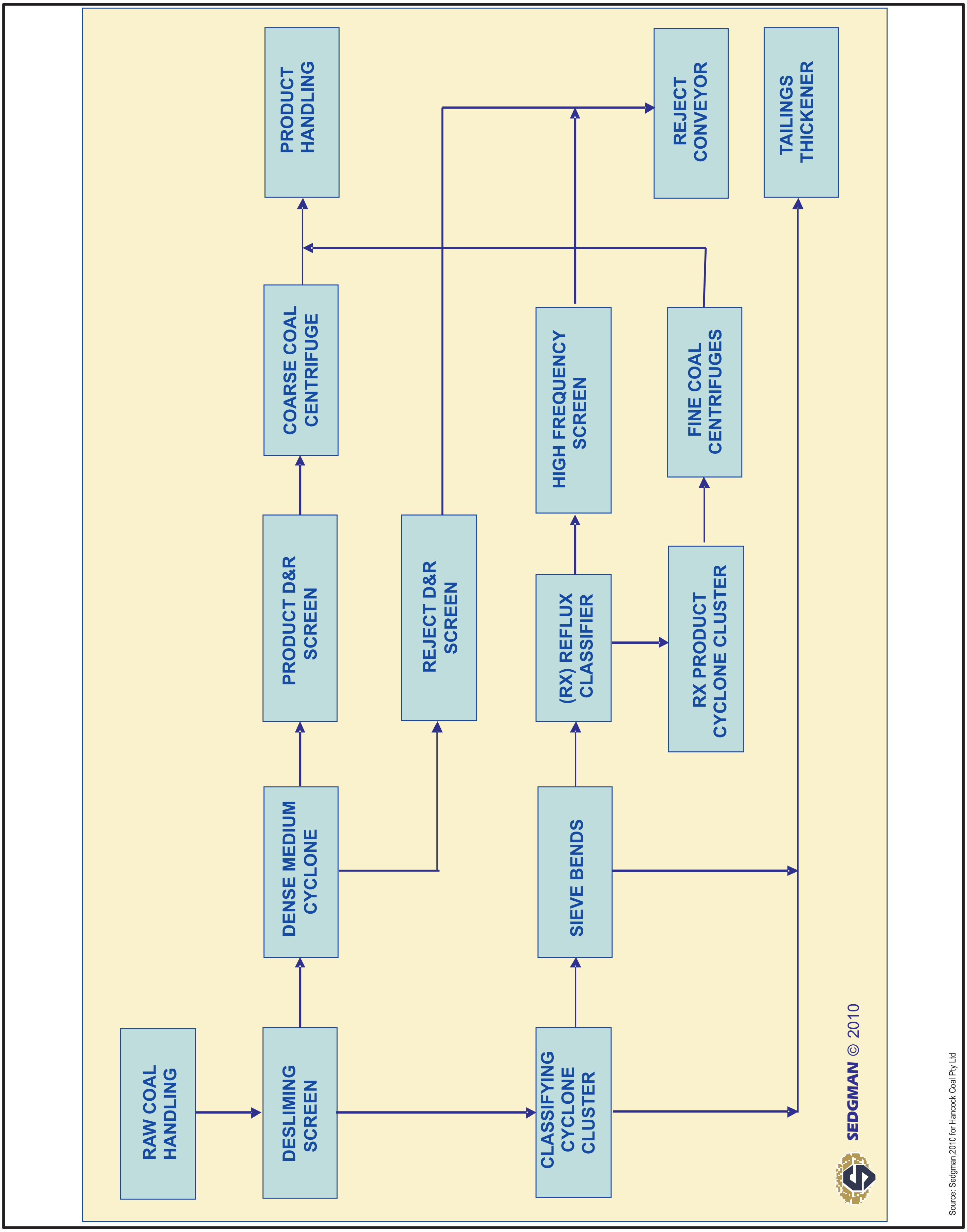
Two belt feeders at the base of the transfer bins will discharge the coal to either one of two conveyors feeding the two CHPP feed bins. The discharge of the CHPP feed bins will be via vibrating feeders, feeding tertiary sizers. Tertiary sizing will reduce the coal size from 120 mm to 50 mm.

The size reduction of ROM coal to < 50 mm will be achieved in three crushing stages. This is the most effective means of size reduction while minimising the production of fine particles.

2.4.2.1.2 Coal Processing Plant

The Coal Processing Plant (CPP) will consist of four separate plant modules rated at 1,500 tonnes per hour (t/h) to process nominally 6,000 t/h. Two tailings thickener systems will be installed and each one will service two CPP modules. The four plant modules will be identical with the tailings thickener, clarified water, plant services and conveyors (product and reject) considered as common equipment items.

A schematic block flow diagram of the CPP is given in Figure 2-20



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CHPP PROCESS SCHEMATIC

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Revision | A
Date | 24-09-2010

Figure: 2-20

File No: 42626580-g-2077.cdr

Desliming

Each module will be fed by two desliming screen feed pumps. The intent of the desliming screens is to separate the coarse (> 1.4 mm) material from the fine (< 1.4 mm) material.

The coal material will be pumped on to multi-slope desliming screens with water sprays to assist with desliming. The < 1.4 mm material and water will be collected and piped to the desliming cyclone feed sump. The oversize material will be flushed by correct medium into two dense medium cyclone (DMC) feed sumps per module.

Coarse Coal Circuit

The intent of the DMC is to separate the coarse product from the coarse reject material. The oversize material from the desliming screens will be pumped to the DMC. Product coal and reject medium will overflow from each DMC and discharge to a product drain and rinse screen. Oversize material will be transferred to the coarse coal centrifuge for dewatering then onto the product conveyor.

Reject medium will underflow from each DMC into a tile-lined screen feed box to a reject drain and rinse screen. The reject screens will discharge onto the rejects conveyor.

Correct Medium and Magnetite Recovery Circuits

There will be eight correct medium sumps, two per module. Correct medium will sluice the coarse coal from the desliming screen discharge chutes to the DMC feed sumps.

Adhering medium will be rinsed from the coal and pumped to 16 magnetic separators. Concentrate from the separators will gravitate back to the respective correct medium sump. Separator effluent will be collected and recycled.

Fine Coal Circuit

The fine coal (< 1.4 mm) is transferred from the desliming screens to four desliming cyclone clusters. The cyclone overflow will flow to the tailings thickeners.

The underflow will be transferred to reflux classifiers, to beneficiate the fine coal into rejects and fine product. The rejects will be dewatered on eight high-frequency screens and then discharged onto the plant reject conveyor.

Fine coal product from the reflux classifiers will be transferred to reflux classifier product sumps and then pumped to reflux classifier product-thickening cyclone clusters. The thickened cyclone underflow product will be distributed to the fine coal centrifuges for dewatering and will be discharged onto the plant product conveyor.

Tailings

Desliming cyclone overflow (< 0.125 mm) will gravitate to the tailings thickeners. There will be two 45 m diameter high-rate thickeners to process the fine reject tailings from the CPP modules.

Thickened rejects (thickener underflow) will be pumped to the tailings dam. Decant water from the tailings storage facility (TSF) will be pumped back to the clarified water sump for re-use within the CPP. Raw water will be pumped from the raw water dam to the clarified water tanks to maintain level as required.

The TSF is located approximately 3 km to the south-east of the CHPP. The tailings will be deposited into the TSF from upslope via two pipelines. Discharge of tailings into the TSF will be managed to optimise beaching and surface water management requirements. Tailings will be discharged into the closest cells before moving into adjacent cells. Refer to Volume 2, Section 16 and Volume 5, Appendix J for further details.

Coarse Reject Handling

Coarse and fine coal reject will discharge from their respective screens onto the plant reject conveyor. This conveyor will transfer the reject material onto an overland conveyor that will deliver the plant reject coal to a 1,000 t bin capable of loading haul trucks with a capacity of 220 t for transfer to the reject emplacement area.

The proposed reject emplacement area is in the overburden dumps of the Surbiton South and Wendouree pits (pits B and C). The reject emplacement area will have a 4,000 m strike length parallel to the low wall and will be in close proximity to the proposed reject bin location.

Coarse rejects produced during the first years of the mine production will be dumped using rear dump trucks into the initial box cut void. Once the draglines have commenced, the reject material will be placed into the voids between the dragline spoil to a depth of 25 m, with an allowance for 5 m of overburden to cap the reject material.

The reject placement would be approximately 350 m (~5 dragline passes) behind the advancing dragline's working in the Surbiton South and Wendouree pits to provide flexibility for the mining operation. Reject placement will be sequenced such that capping of the reject will be completed progressively as the working face progresses down dip. Refer to Volume 2, Section 16 and Volume 5, Appendix J for further details.

Chemicals

The estimated amount of flocculants and magnetite to be used within the CHPP per annum for processing 42 Mt ROM are detailed in Table 2-5.

Table 2-5 CHPP chemicals

	Approximate amount
ROM (tonnes)	41,000,000
Magnetite (tonnes)	20,000
Anionic Flocculants (tonnes)	400
Cationic Flocculants (m^3)	60

2.4.2.1.3 Product Coal Handling and Train Load Out

The plant product conveyor will transport coarse and fine product material to two 1,000 tonne surge bins.

Belt feeders will reclaim coal from the surge bins and discharge onto conveyors feeding the two bucket-wheel stacker/reclaimers. Feed rates to the bucket-wheel reclaimers will be controlled via a weightometer located close to the tail end of the product stacking/reclaim conveyors. The product will be either stacked out to the product stockpiles (two 500 kilotonne [kt] stockpiles) or conveyed directly to the TLO system. While direct loading, the bucket-wheel stacker reclaimer machines will be required to simultaneously reclaim additional coal from the product stockpiles to achieve the maximum reclaim rate.

A transfer station at the head end of the two stacking/reclaiming conveyors loads product coal onto a TLO conveyor, which feeds a single TLO batch weigh bin. This provides for the capability of loading trains with a net loading rate of 8,000 t/h using direct loading and/or reclaim from the stockpiles. Approximately 3.5 product coal trains with a 24,000 t capacity will be loaded each day.

2.5 Associated Infrastructure

2.5.1 Workforce and Accommodation

2.5.1.1 Construction Personnel Numbers

Figure 2-21 is a histogram showing the personnel numbers for the construction stage of the Project.

The construction workforce builds up to a peak of approximately 1,358 (for all aspects associated with the Alpha Coal Project) personnel, then steadily decreases through to commissioning and the commencement of operations. Refer to Volume 2, Section 20 for further details.

The construction workforce is split into the following areas:

- CHPP;
- Rail; and
- MIA and enabling infrastructure.

Construction personnel will generally work ten days on, four days off. Programmed shifts will be 10 to 12 hours duration, daytime only. Night-time shifts may be required on occasions. The rail workforce roster is likely to be one 12-hour shift per day working 21 days on and 7 days off. Due to the large numbers of personnel needed to be moved in and out of the Project area at each rotation, consideration is being given to a split shift for each of the major construction workforces.

Travel arrangements between the construction accommodation village and construction sites for the Project will include bus-in bus-out (BIBO) and drive-in, drive-out (DIDO) depending on work equipment requirements (e.g. vehicle-mounted equipment or equipment stored on site). It is likely that approximately 80% of the construction workforce will be fly-in fly-out (FIFO) and the remainder will be DIDO or BIBO. Refer to Volume 2, Sections 17 and 20 for further details.

The construction and operational workforce will be managed through a fatigue management policy covering FIFO, DIDO and BIBO transport options. No personnel will be required to work more than 14 hours in any 24-hour period, including driving.

It is expected that the majority of the construction and operational workforce will originate, or at least depart for the mine site from south-east Queensland. Based on experience of new mine developments a percentage will originate from central and north Queensland regional centres such as Townsville, Mackay and Rockhampton.

2.5.1.2 Operational Personnel Numbers

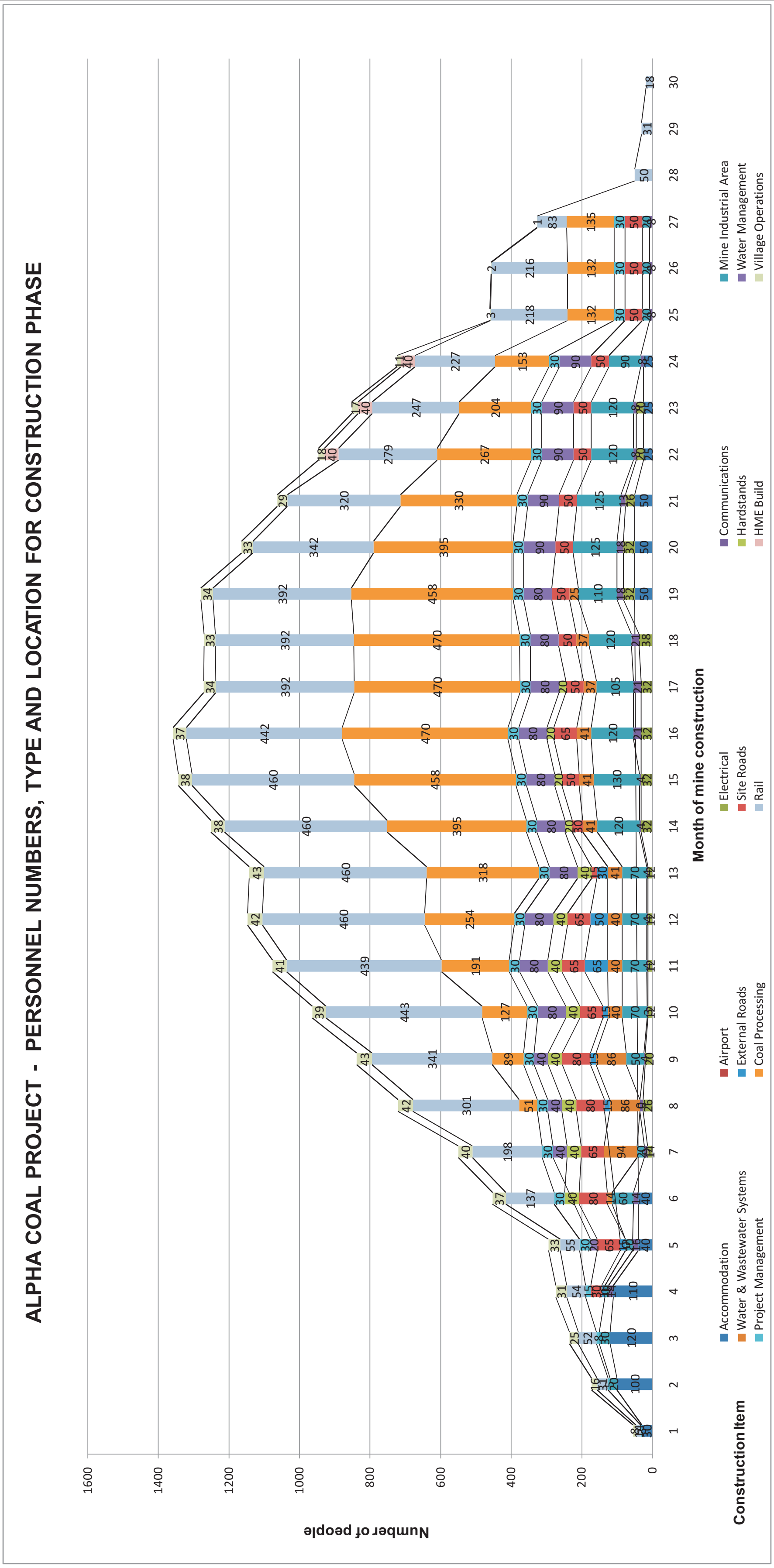
Figure 2-22 is a histogram showing the personnel numbers for the operational stage of the Project.

Numbers rise rapidly from an initial 350 people in year 1 of the operations, through to 2,172 personnel at around year 3 (all aspects of the Project). After this period, numbers fluctuate slightly, mainly due to in-pit and MIA operations, increasing to a peak in the second last year of operations at 2,384 personnel. The personnel numbers do not decrease as the mine life progresses, as the amount of overburden removal required increases to the west, which requires more personnel. There is potential for the mine to continue operating beyond the proposed 30 year LOM; however, this will be dependent on the economic and market conditions at that time. The decommissioning and rehabilitation plan will be further developed with the Queensland Government as the Project progresses.

There will be a number of different shift rosters. These are:

- Five days on, two days off, day shift roster;
- Ten days on, four days off roster, day shift roster;
- Seven days on, seven days off, seven nights on, seven days off, being a four panel roster. These will be 12 or 12.5 hour shifts. Shift change will occur at 6:00 or 7:00 am/pm; however, shift change times may vary seasonally to suit daylight hours; and
- Operational staff shift change will be split over three days.

Refer to Volume 2, Sections 17 and 20 for further details.



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Alpha Coal Project
Environmental Impact Statement

CONSTRUCTION PERSONNEL HISTOGRAM

Job Number	4262 6580
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Figure: 2-21

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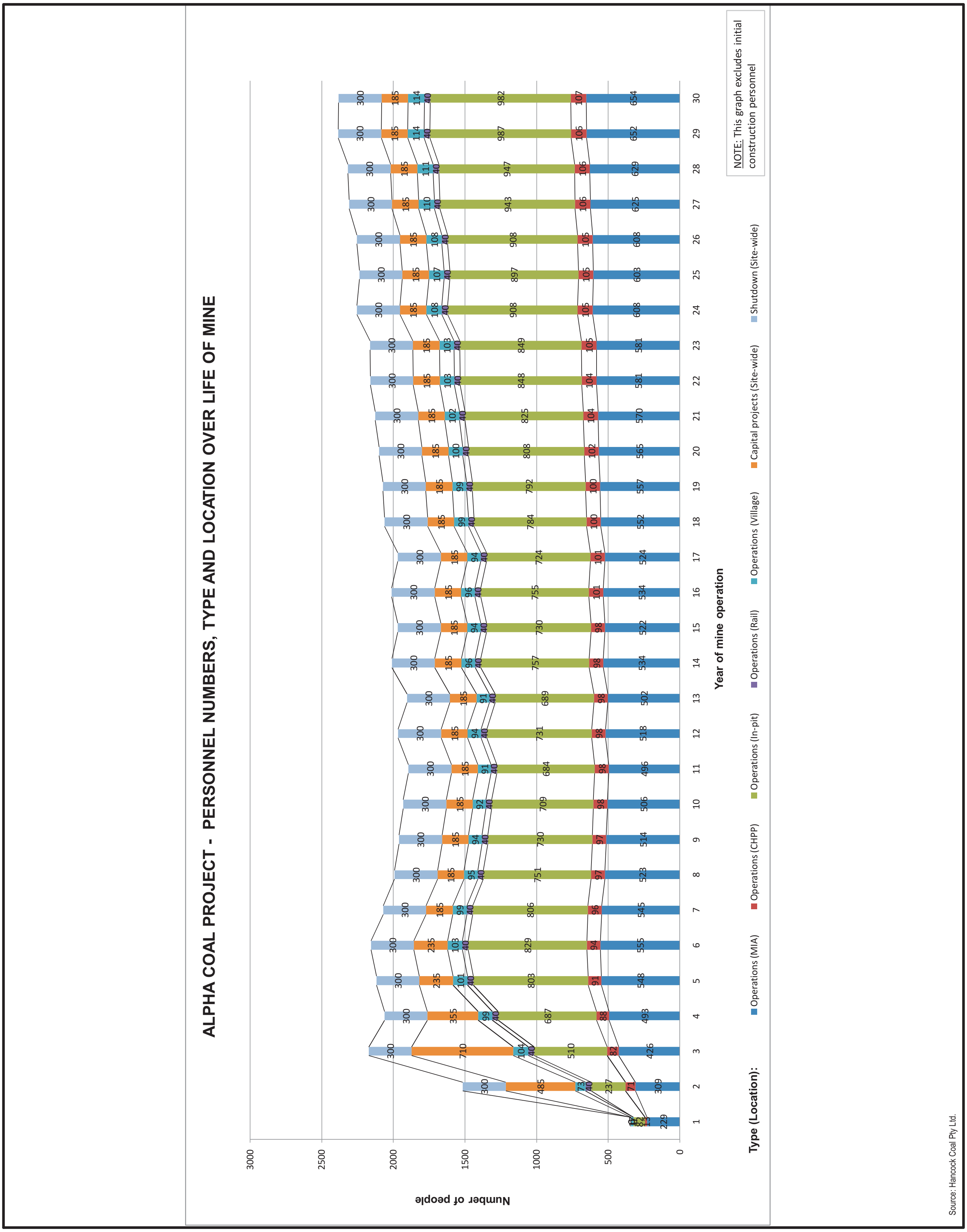

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Alpha Coal Project
Environmental Impact Statement

OPERATIONAL PERSONNEL HISTOGRAM

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-22

File No: 42626580-g-2079.cdr

2.5.1.3 Accommodation

There is a limited amount of available accommodation within a reasonable travel distance of the Project. To ensure employee fatigue is appropriately managed stand-alone accommodation will be required for both the construction and operational phases. The location of the accommodation village is shown on Figure 1-2 (Volume 2, Section 1).

An initial temporary construction accommodation village will be required to accommodate the initial construction workforce. This will be removed as soon as sufficient units of the more permanent construction accommodation village are available to accommodate this workforce.

A construction accommodation village will be required for the duration of the construction of the mine infrastructure and an operational accommodation village will be required to house the operational workforce. It is expected that the construction accommodation village will be converted to the operational accommodation village towards the end of the construction phase.

2.5.1.3.1 Initial Temporary Accommodation

The initial temporary facilities will be located in close proximity to the accommodation village site, which is proposed to be located to the south of the MIA. The temporary camp will be accessed from the mine site access road. The initial temporary camp will be required for approximately three months for approximately 100 personnel. The initial temporary construction camp will have the following infrastructure:

- All relocatable modules will be manufactured off site and transported for installation and fit out;
- Potable water will be trucked in to the site, stored in an above ground tank and reticulated to the units through a temporary above ground pipe system;
- Sewage will be collected from the units using a temporary pipe system and stored in an underground tank (similar to a septic tank), pumped out into a truck-mounted tank for transportation and discharged to an existing sewage treatment works (Alpha or Emerald);
- Power will be provided by suitably sized diesel generators and reticulated to the units;
- Initial communications will rely on the locally available mobile network; and
- Basic earthworks only will be undertaken to provide an area for the construction of the initial temporary camp, car parking areas and hardstands.

2.5.1.3.2 Construction Accommodation Village

A construction accommodation village is required to provide accommodation for the Mine construction workforce, anticipated to peak at approximately 1,060 workers. It is to be located to the south of the MIA and will be accessed via a sealed road from the mine site access road after passing through the site security facility. The requirements of the construction accommodation village are as follows:

- All relocatable modules will be manufactured off site and transported to site for installation and fit out;
- Potable water will be provided from the Potable Water Treatment facility and connecting underground mains constructed as an early works package and potable water demand to be based on a consumption of 240 L per person per day;

- Sewage disposal will be to the Sewage Treatment Facility constructed as an early works package and sewage disposal based on waste generation rate of 240 L per person per day;
- Power will be provided from either diesel generators or from the nearby existing 132 kV power lines and power demand equivalent to 2.5 kVA peak per person at 415 Volts (V);
- One person per room, no shared rooms; and
- Access and circulating roadways to be two-way, 7.2 m wide, bitumen sealed and designed to accommodate a road registrable B-Double delivery vehicle.

It is likely that major components of the construction accommodation village will remain for the operational accommodation village for the LOM.

2.5.1.3.3 Operational Accommodation Village

An operational accommodation village is to be provided to accommodate approximately 97% of the anticipated mine operational workforce (2,300 personnel). The operational accommodation village will replace the construction accommodation village. It is likely that the mess and recreational facilities constructed with a 30-year design life as part of the construction accommodation village will be retained when the majority of the construction facilities are demobilised. All of the operational phase facilities will be designed for a 30-year design life. The requirements of the operational accommodation village are as follows:

- Motelling of beds will be permitted with additional beds being provided to meet the accommodation required during the overlap of operational personnel on site at the start and end of each shift rotation;
- All relocatable modules will be manufactured off site and transported to site for installation and fit out;
- Potable water will be provided via underground mains from the site's potable water treatment plant, the potable water demand is based on a consumption of 240 L per person per day;
- Sewage disposal will be via a gravity or rising main to the site's sewage treatment plant, the sewage disposal based on waste generation rate of 240 L per person per day;
- Power will be provided from the Mine power reticulation, the power demand being equivalent to 2.5 kVA peak per person at 415 V;
- To avoid the possibility of insufficient accommodation being available at critical times, dragline and CHPP shutdowns will be carefully scheduled;
- Construction and commissioning of the operational accommodation village will continue over three years until all accommodation requirements are fulfilled for the operational workforce of approximately 2,300 at the commencement of operational year 5. Towards the end of the mine life, additional accommodation may need to be arranged;
- All car parking areas for the operational workforce are likely to be bitumen sealed, and all car parking spaces are likely to be covered; and
- Access and circulating roadways to be bitumen sealed and designed to accommodate a road registrable B-Double delivery vehicle.

2.5.2 Transport

2.5.2.1 Road

Road works associated with the Project are detailed on Figure 2-3.

Road work and road construction will be undertaken in accordance with appropriate road construction standards and will occur both on and off MLA 70426. Road works and specific standards are described further in Volume 2, Section 17, including:

- Off-lease road works include:
  - Upgrades to Clermont-Alpha Road and Hobartville Road; and
  - Relocation of a portion of the Degulla Road.
- On-lease road construction includes:
  - Mine site access road;
  - Accommodation village access road;
  - MIA roads and West Road (main north-south internal road);
  - Dragline construction site access road;
  - Stubline roads (access to dragline power transformers);
  - Access roads to proposed basalt quarry / borrow pit areas and landfill;
  - Haul roads; and
  - Dragline walk routes.

2.5.2.1.1 Temporary Site Access

During the initial construction period and prior to the permanent mine access road being completed; a temporary access road will need to be constructed from the Hobartville Road to the construction office site, which will be located immediately to the west of the MIA.

2.5.2.1.2 Hobartville Road Upgrade (to MLA 70426 Boundary)

With access to the mine being via Hobartville Road, the existing formation and roadway from the Clermont-Alpha Road to the MLA boundary will require upgrading to cater for the anticipated traffic volumes during construction and operations. This upgrade will also require an upgrade to the existing intersection with the Clermont-Alpha Road.

2.5.2.1.3 Mine Site Roads

Site roads are shown on Figure 2-3.

MIA Roads and West Road

Light vehicle (LV) roads within the MIA will be constructed to both sealed and unsealed standards as appropriate, suitable for up to B-Double sized traffic. Heavy vehicle roads within the MIA will be constructed to the same standard as the site haul roads. Pavement design for the LV MIA roads and West Road will be as for the site access road.

The West Road describes the road providing north-south access to the pit feeder power lines, high wall facilities and the pre-strip areas, including field fuel facilities and pre-start/crib facilities. It is to be constructed to an unsealed standard suitable for regular use by B-Double sized vehicles, light vehicles and buses. As all of the areas accessed by this road will be mined out as mining and waste rock removal progresses westwards, the road will be required to be rebuilt every so often.

Dragline Construction Site Access Road

The dragline construction site access road will run east-west along a reserved land bridge between pit areas B & C. It serves many functions, including providing access to the dragline construction facilities located to the west of the initial mining pits, gaining access to the West Road and providing general access and egress across the pits from the western extent of the mining area. The road will occupy part of the mentioned land bridge along with other services such as water transfer pipelines and power reticulation lines.

Coal Haul Road Corridor

The main trunk coal haul road runs north-south, providing the main thoroughfare for coal haulers between the tops of all pit ramps and the two proposed ROM dump stations. The road and associated intersections are intended to remain in service for the entire productive duration of the mine.

2.5.2.2 Transport of Materials

All materials and equipment will be transported to the site by road. Once the rail infrastructure is commissioned, consideration will be given to transporting equipment and materials by rail.

The three tables below (Table 2-6, Table 2-7, and Table 2-8) provide indicative estimates of the quantities of materials and equipment required for construction.

Table 2-6 Indicative Mining Infrastructure Area (MIA) construction phase materials

Material	Approximate weight (tonnes)
Bitumen	13,000
Cable	290
Cement	31,500
Concrete – precast	1,200
Miscellaneous	19,500
Special items	550
Steel – reinforcement	1,200
Steel – structural	1,800
Pipe	1,000

Table 2-7 Indicative Coal Handling and Preparation Plant (CHPP) construction material truck loads

Material	Indicative number of truck loads
Steel – Raw	550
Steel – CPP, rejects and product	950
Specialised vendor equipment (screens, desliming cyclones etc.)	190
Electrical (cable, transformers etc.)	60
Civil work (crane rails, caging etc.)	200
Site offices for construction	60

Table 2-8 Indicative construction plant and equipment

Type of plant and equipment		Approximate number
Crawler 400 t	Cranes	1
Crawler 200 t		2
Crawler 100 t		2
Hydraulic 80 t		1
Hydraulic 50 t		1
Rough terrain 30 t		2
Franna 20 t		3
Elevated work platform (EWP) 120 ft	Plant	2
EWP 80 ft		2
EWP 40 ft		1
Welder diesel		18
Compressor		12

Large and over-size loads are anticipated for delivery during the construction phase, particularly for the CHPP, ROM facilities, stacker/reclaimer, dragline and heavy mining equipment erection and installation. Loads will originate from ports at Brisbane, Mackay or Gladstone, with some loads requiring an escort. Where possible, consideration will be given to the timing of such transportation to minimise disruption to other road users.

Construction materials delivery 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.

Major mining equipment details are provided in Table 2-3.

For further details on construction and operational equipment and materials to be transported to the site over the LOM refer to Volume 2, Section 17.

2.5.2.3 Air Transport

As detailed in Section 2.5.1, a large percentage of the workforce will be FIFO due to the remote location of the Project.

Due to the large number of construction and operational personnel over the LOM, the current Alpha Township Airport (ATA) runway length and pavement are adequate for landing the Dash-8 Q300 (50 seater) and the Fokker F50 (56 seater) for the duration of the Project.

The preferred option for air transport during the construction and operational phases of the Project is for personnel to FIFO of ATA. The ATA is a multi-user facility, owned and operated by Barcaldine Regional Council. Upgrade of the airport will be required, and will be the subject of a separate impact assessment and regulatory approvals process, including consultation with all relevant agencies and community organisations.

2.5.3 Waste Management

2.5.3.1 Industrial Waste

The Project will generate non-mining waste during the construction phase and the operations phase. These will include:

- Regulated wastes such as hydrocarbons, spent chemicals, solvents, paints and resins;
- General waste;
- Human waste and wastewater;
- Recyclables;
- Wood waste;
- Tyres; and
- Scrap metal.

The characteristics of non-mining waste for the construction and operation of the Project are discussed in Volume 2, Section 16. The scale of the Project requires development of a suitable on-site landfill, recycling facilities, and treatment systems to effectively handle and manage the volumes and types of waste that will be generated throughout the life of the mine.

2.5.3.2 Mine Waste

Mine waste will include overburden, rejects and tailings. Refer to the following sections for details:

- Overburden management: refer to Section 2.4.1.2.4 above and Volume 2, Section 16.
- Tailings and rejects details: refer to Section 2.4.2.1.2 above and Volume 2, Section 16.

2.5.4 Water and Wastewater Systems

2.5.4.1 Construction Water Supply

Water in sufficient quantities and quality for construction activities is to be supplied or sourced from site bores and/or existing site storages. Raw water will be stored in a raw water dam to be constructed on-site. Construction stage water requirements are estimated at 480 kL per day. Construction water will be required for the following tasks:

- Dust suppression on cleared construction areas;
- Moisture adjustment for compaction of engineered fill;
- Concrete mixing; and
- Construction accommodation village potable water requirements.

2.5.4.2 Operational Water Supply

It is likely that a combination of groundwater, sourced from advanced mine dewatering, and a surface raw water pipeline, will be utilised to supply operational raw water. A number of options for raw water supply are being investigated with SunWater (refer to Volume 2, Section 11 for details). SunWater will provide a raw water pipeline to the mining lease and all associated infrastructure within the mining lease will be provided by the Proponent. A raw water dam will serve as terminal storage for the bulk supply pipelines, whether or not raw water is from the commercial supplier or from local groundwater resources. The purpose of the raw water dam is to provide a storage reserve in the event of a bulk water supply interruption and to facilitate transfer of raw water to the MIA and CHPP for process, fire, dust suppression, and general use.

Bulk water pipeline and associated infrastructure will deliver sufficient water to the raw water dam. There will be a delivery pump station, pipeline, discharge infrastructure and all associated control and communications necessary for the operation of the system.

The raw water dam will have:

- A 400 ML raw water storage capacity;
- Capacity to provide for 10 days operational reserve; and
- Dam spillway designed for a 1:1,000 year flood event.

Refer to Volume 2, Section 11 for further details.

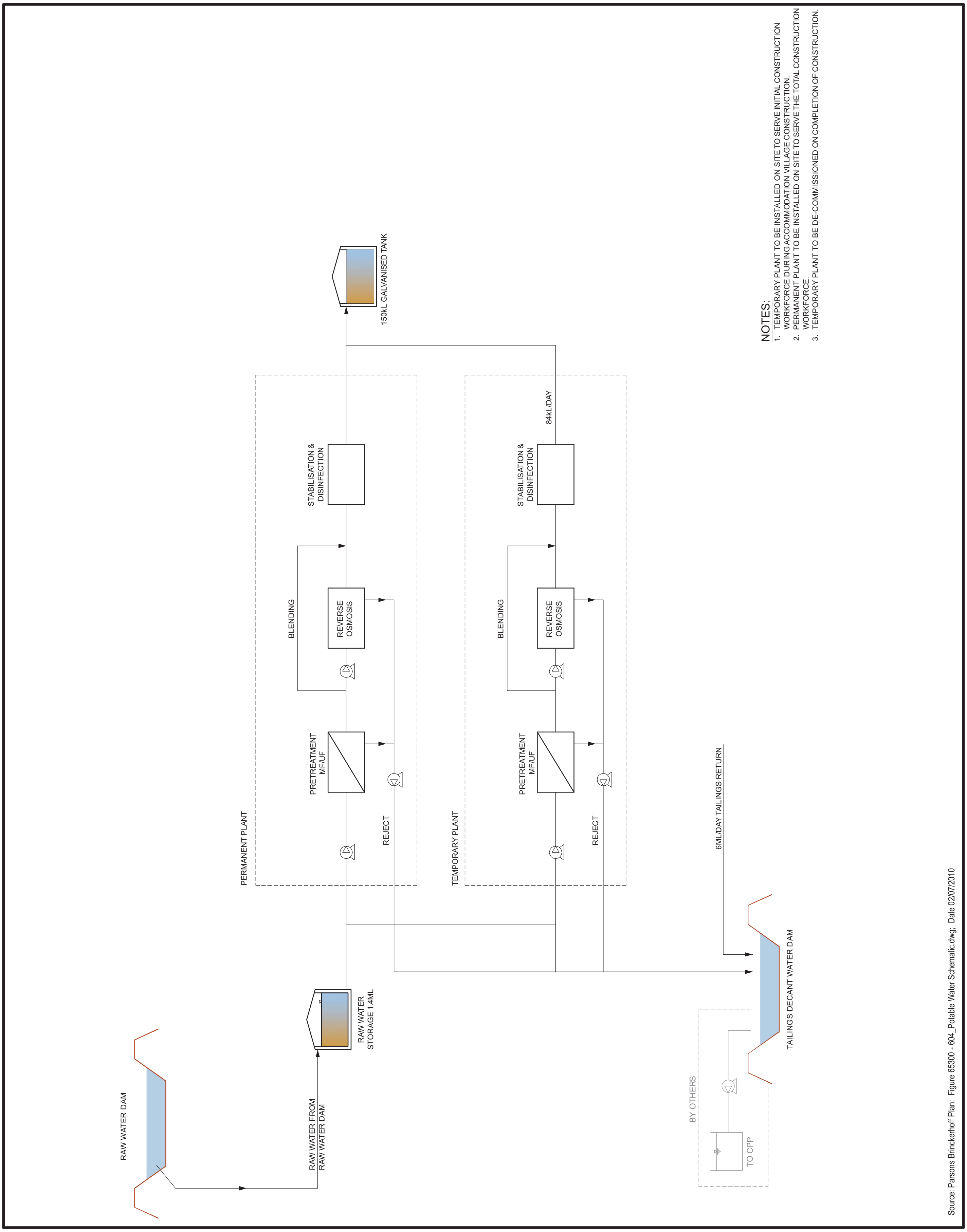
2.5.4.3 Potable Water Treatment and Reticulation

Potable water in sufficient quantities (estimated at 480 kL/day during construction stage and 366 kL/day during operational stage) and quality is to be generated on-site by treating water from the raw water supply dam through a package potable water treatment plant (WTP), such as a reverse osmosis system (refer to Figure 2-23) . Potable water is to be reticulated throughout the site in the dedicated services corridors proposed to be created throughout the MIA/CHPP areas and in a dedicated corridor to the accommodation village. The operational requirement of the potable water supply is:

- All potable water required on site will be supplied by a package WTP;

- Potable water will be piped underground to the MIA, CHPP, and accommodation village;
- Potable water will be trucked to a storage tank at the remote dragline erection site;
- Waste from the WTP will be potentially piped to the TSF; and
- The accommodation village will have a combined potable/fire water reticulation network and the MIA /CHPP will have separate potable and fire/raw water reticulation networks.

Water storage tanks for potable water will be required at the WTP and at the accommodation village as the potable water supply there is used for fire fighting (a portion of the water contained in the water storage tanks will be maintained for fire fighting).



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Alpha Coal Project
Environmental Impact Statement

SITE WIDE POTABLE WATER SCHEMATIC - OPERATIONAL

Job Number	4262 6580
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Figure: 2-23

File No: 42626580-g-2080.cdr

2.5.4.4 Raw and Fire Water Storage and Reticulation

The accommodation village will have a combined potable/fire water reticulation network and the MIA / CHPP will have separate potable and fire/raw water reticulation networks (refer to Volume 2, Section 11).

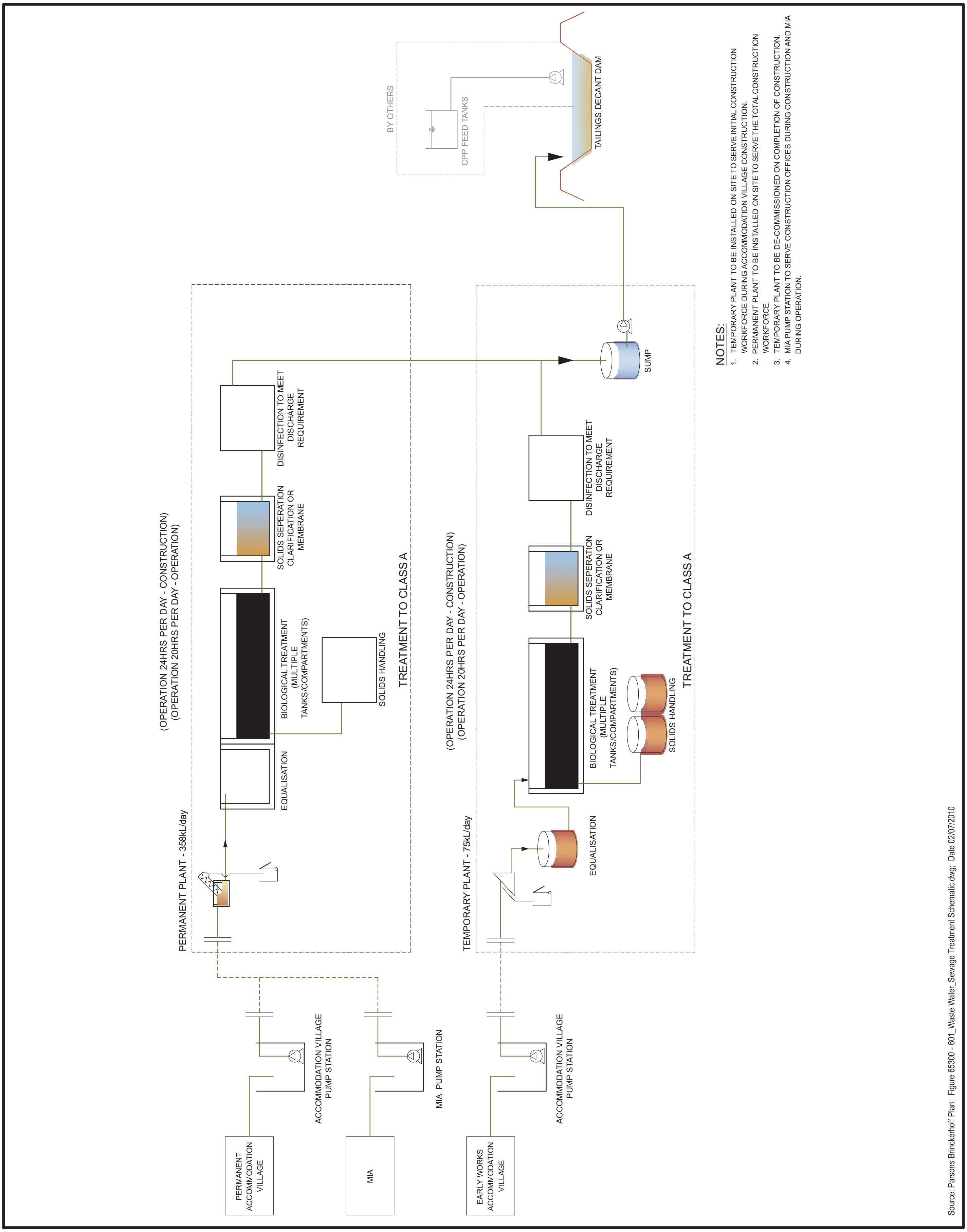
2.5.4.5 Sewage Collection and Treatment

All sewage waste generated during the Project is to be collected and treated to Class A effluent quality on site. Sewage from the ablution facilities will be collected and pumped to a package sewage treatment plant (STP) and the effluent disposed of on-site by recycling, spray irrigation or trickle irrigation, etc. (refer to Figure 2-24).

Waste from the remote dragline construction site, TLO and ANFO facility will be collected in septic tank systems and the effluent disposed of by trickle irrigation or evapotranspiration trenches. Solids from septic tank systems will be removed by a contractor on a regular basis.

Wherever possible, the sewage reticulation and rising mains will be constructed in the dedicated services corridors proposed to be created throughout the MIA/CHPP areas and in a dedicated corridor between the accommodation village and MIA/CHPP.

Average daily wastewater generation is 55 litres per capita per day water use at the MIA, CHPP and dragline construction site, and 240 litres per capita per day at the accommodation village, with 90% of this being returned to the sewerage system as wastewater. Further details regarding wastewater generation and water quality are provided in Volume 2, Section 11.



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Alpha Coal Project
Environmental Impact Statement

WASTE WATER AND SEWERAGE SCHEMATIC - OPERATIONAL

Job Number	4262 6580
Revision	A
Date	24-09-2010

Figure: 2-24

File No: 42626580-g-2081.cdr

2.5.5 Water Management System

A water management system (WMS) has been developed in compliance with current legislation (refer to Volume 2, Section 11 for details). The WMS for the mine site comprises the following elements:

- TSF sized to accommodate tailings produced for LOM;
- Environmental dams for retention of contaminated stormwater run-off and pit dewatering storage;
- Environmental dam pipes and pumps for moving water to the CHPP for use during wet weather;
- Pipes and pumps for moving water from the raw water dam to the mine site during periods of dry weather;
- Spoil runoff water management system to contain runoff from overburden stockpiles and rehabilitated landforms;
- Levees to protect pits adjacent to creeks from inundation during flood event;
- Creek diversions to divert watercourses away from active pits;
- Clean water drains to channel clean surface water runoff around disturbed (mine) areas; and
- Dirty water drains to channel contaminated surface water into an environmental dams or sedimentation dams.

2.5.5.1 Creek Diversions and Crossings

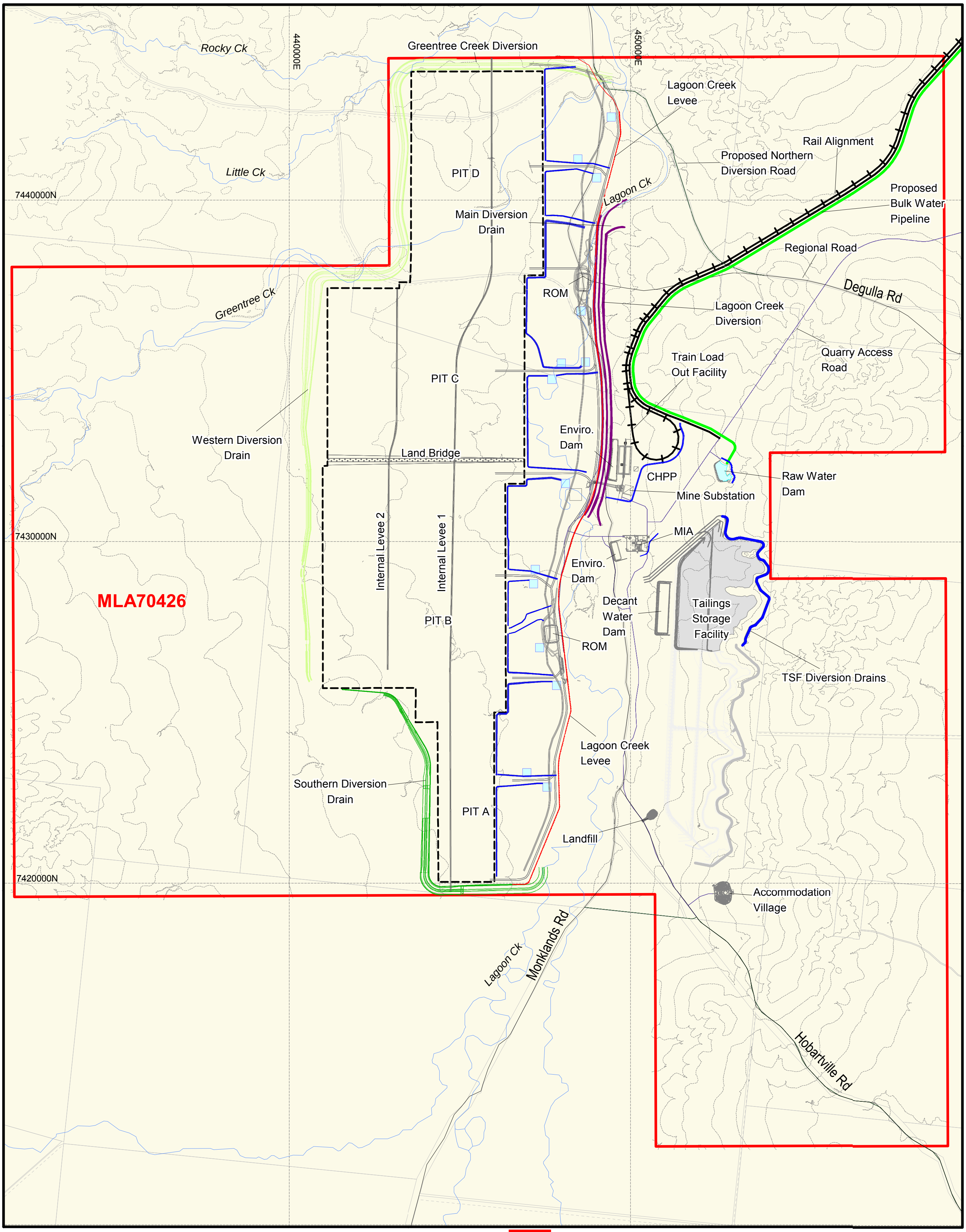
A number of creek diversions and crossings are required for the proposed Project. The creek diversions and levees are required to minimise the potential of fresh water coming into contact with the proposed mining activities. The creek crossings are required to ensure safe access to all Project components.

2.5.5.1.1 Lagoon Creek Diversion

The main channel of Lagoon Creek requires a levee and a diversion to ensure safe working conditions within the open pits and minimise the potential of fresh water coming into contact with disturbed mining areas. The location of the Lagoon Creek diversion and levee is shown on Figure 2-25.

Design requirements will be consistent with the requirements of Department of Natural Resources and Mines Central West Regional Office, Water Management and Use Regional Guideline: Watercourse Diversions - Central Queensland Mining Industry, and water licence requirements under the *Water Act 2000*. The diversion will remain following completion of mining operations.

The Lagoon Creek diversion will allow unimpeded access to mine coal reserves. The route allows adequate area between the diverted Creek and proposed mining operations, reducing any impact that the mining operations will have on the water flow in Lagoon Creek. The diversion is anticipated to provide a stable and sustainable creek alignment for Lagoon Creek into the future.



Mining Lease Application (MLA70426) Boundary	Diversion Drain - Lagoon Creek
Contour (10m interval)	Diversion Drain - Western
Water Pipeline	Diversion Drain - South
Water Dam	Diversion Drains
Pit Outline	Levee - Lagoon Creek

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0 2 4Km

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N W E S

HANCOCK PROSPECTING PTY LTD

Alpha Coal Project
Environmental Impact Statement

WATER INFRASTRUCTURE MANAGEMENT

Job Number | 4262 6580
Revision | A
Date | 24-09-2010

Figure: 2-25

File No: 42626580-g-2082.wor

2.5.5.1.2 Lagoon Creek Levee

The Lagoon Creek Levee is required on the western side of Lagoon Creek, for the full length of the mine pit, to keep floodwaters from entering the mine pits. The coal haul road, coal service road, and the ROM conveyor will be located to the west of the levee (refer to Figure 2-25 and Volume 2, Section 11 for details). The levee is to be located and sized to protect pits that are adjacent to Lagoon Creek from flooding in a 3,000 year ARI flood event with a freeboard allowance of at least 0.5 m to accommodate wave action and uncertainty in the flood height analysis.

2.5.5.1.3 Western and Southern Diversion Channels

Two permanent diversion channels will be located on the western edge of the mine pits to redirect creek and overland flow from entering the pit areas. All diversions will occur within the MLA 70426 boundary.

Western Diversion (Sandy Creek)

The larger of the western diversion channels (approximately 26 km) to the northwest will direct Greentree (also labelled Sandy) Creek, flows from various unnamed ephemeral creeks, and overland flow along the western and northern sides of the pits. This diversion rejoins Greentree / Sandy Creek approximately 100 m before the confluence with Lagoon Creek (refer to Figure 2-25 and Volume 2, Section 11 for details).

Southern Diversion (Spring Creek)

A diversion channel (approximately 9 km) will direct Spring Creek along the southern side of the pits, discharging into Lagoon Creek (refer to Figure 2-25 and Volume 2, Section 11 for details).

2.5.5.1.4 Diversion Channels / Internal Levees

Two temporary diversion channels will be constructed on the western side of the pits within the disturbed area to redirect water from the numerous small creeks on the highwall side of the mine, away from the mine pits. These diversions will be mined out as the pits progress westward over the life of the mine.

2.5.5.1.5 Lagoon Creek Embankment Crossing – Mining Infrastructure Area (MIA) and Coal Handling and Preparation Plant (CHPP) Areas

A heavy and light vehicle embankment-style crossing will be required for the area of Lagoon Creek adjacent to the MIA and the CHPP. The crossing will be located to minimise interaction and congestion at infrastructure locations. Crossing design will be based on:

- Width per the requirements for a heavy vehicle haul road;
- Flood immunity to ensure that maximum non-availability during and after a flood event in Lagoon Creek does not exceed two continuous days; and
- Flood immunity to ensure that the crossing will statistically not be overtopped more than once in 10 years.

Where riparian vegetation is to be cleared or banks of a watercourse disturbed, a waterworks licence will be obtained per the *Water Act 2000*. Refer to Volume 2, Section 11 for further details.

2.5.5.1.6 Lagoon Creek Embankment Crossing – Degulla Road Relocation Area

The Degulla Road crossing of Lagoon Creek is on a public road (refer to Figure 2-25 and Volume 2, Section 11). It will need to be designed to an unsealed rural road standard, based on the following:

- Suitable to accommodate 19 m heavy articulated vehicle;
- Two 3.5 m wide lanes with 1 m shoulders (total width is 9 m);
- Design speed of 100 km/h; and
- Sealed or concrete protected causeway with low flow culverts.

Where riparian vegetation is to be cleared or banks of a watercourse disturbed, a waterworks licence will be obtained per the *Water Act 2000*. Refer to Volume 2, Section 11 for further details.

2.5.6 Stormwater Drainage

To protect the environmental values of downstream water the Project water management system has been designed to:

- Divert clean stormwater runoff away from areas disturbed by mining activities;
- Progressively rehabilitate spoil stockpiles;
- Contain runoff within disturbed areas; and
- Maximise the reuse of water.

Refer to Volume 2, Section 11 for details.

2.5.7 Energy

2.5.7.1 Construction Power Supply

Power for the construction phase is to be provided by a temporary diesel engine generator until connection to the nearby existing 132 kV power line (between Clermont and Barcaldine) (refer to Figure 2-1) is installed and a sufficient amount of the final site power reticulation is installed to feed the following sites:

- Accommodation village;
- Construction offices;
- Dragline construction pad;
- MIA; and
- Security building.

This will be dependent on the availability of the existing system capacity and Ergon's ability to supply power to meet these temporary power requirements prior to the provision of the permanent supply by Powerlink.

During the construction period, the site power requirements increase from approximately 10 MW to 30 MW peak load. There will be 7 x 6.5 MW diesel reciprocating engines. The total installed capacity is 45.5 MW; however, some of this capacity is intended to be used as redundancy for the diesel plant. This enables one machine to be out of operation due to either breakdown or maintenance while still meeting all required loads.

2.5.7.2 Operational Power Supply, Reticulation and Lighting

2.5.7.2.1 Power Supply

During the operational phase of the Project, power demands of the draglines, CHPP and mining infrastructure will far exceed the supply available during the construction phase. The permanent power supply to the site is to be via a 275 kV transmission line and connection (bulk connection) provided by the supply authority (Powerlink) from Lilydale, which will be required prior to the commissioning of the CHPP and any draglines by operational year 1.

The electrical system in the operational phase will include all infrastructure required to supply the ultimate mine load. The design will make use of an initial 140 MW (30-minute average) available capacity from the supply authority substation, with provision allowed for future expansion to the ultimate mine electrical demand of approximately 480 MW maximum demand. Refer to Volume 2, Section14 for details on electricity usage and fuel consumption over the LOM, including proposed energy conservation measures. It is not proposed to use natural gas or coal seam gas for the Project.

2.5.7.2.2 Power Reticulation

Overhead reticulation will be used wherever possible. Underground reticulation will only be used at locations where unacceptable risk of interaction with vehicles, mining equipment and process equipment is expected. Emergency power supply requirements are as follows:

- Generator facilities are to be provided at the MIA and accommodation village to provide emergency backup generation;
- Emergency generation at the accommodation village need only supply a selection of essential loads for health, safety and hygiene purposes; and
- Emergency generation at the MIA need only supply a selection of essential loads.

2.5.7.2.3 Lighting

Lighting will be available in all areas, particularly the:

- MIA;
- Access roads (intersections, boom gate access, etc.);
- Accommodation village; and
- Dragline construction pad.

2.5.8 Communications

2.5.8.1 Construction Communication

Construction communications will be required for the construction phase of the Project. Design and implementation of the construction communications will be maximised for reuse and provide a smooth transition between construction and permanent communications.

Construction communications will likely to be a microwave link to Alpha. This will require a number of towers between the mine and Alpha. Telstra will undertake all relevant construction communications supply external to the mine site. The following requirements are integral to the construction communications network design:

- Backbone fibre optic network is to be the distribution network for the communications system. The backbone is required to connect between various sites on the network;
- Trunked mobile radio network is to provide highly responsive voice communication services and guaranteed connection in the event of a *man down* emergency. It is to provide data logging, guaranteed quality of service in emergency situations, secure access and communication and flexible configuration. The trunked mobile radio system is intended to be integral to the safe and efficient construction and operation of the mine;
- Telstra microwave link will utilise existing communication towers to provide a link to the Telstra exchange in Alpha; and
- Optional Wide Area Network (WAN).

2.5.8.2 Operational Communications

Permanent communications systems will be required for the operational phase of the Project. All systems and communications aspects will be designed to re-use the systems and assets installed for construction. Optic fibre cables will supply communications to the site, and will likely enter the mine site along the Powerlink powerlines, with a potential redundant link along the rail corridor. The main aspects on the mine site are as follows:

- Trunked mobile radio for up to 350 users;
- WiMax for up to 100 vehicles and to provide full coverage of mine operations areas and workshops/wash-down areas;
- Wi-Fi for operational accommodation village coverage;
- Fire detection and communications/electrical room suppression;
- Security;
- Closed circuit television (CCTV) Network;
- Telephony;
- Operational accommodation village internal and external communications;
- Public Address;
- Water systems control communications, network architecture, structured cabling;
- Communications backbone – fibre optic cabling; and
- Microwave links.

04 Geology

Section 04 Geology

Hancock Prospecting Pty Ltd (HPPL) proposes to establish an open cut mine in the Galilee Basin, Central Queensland, to service international export energy markets for thermal coal. The geology environment associated with the mine component of the proposed project is discussed in this section.

4.1 Tenure

The Alpha Coal Project (Mine) (the Project) coal tenements are situated approximately 50 km north of Alpha and 420 km west of Rockhampton. The mine is located within mining lease application (MLA) 70426. HPPL currently holds two mineral development licences (MDLs), 333 and 285, in the Galilee Basin and has an exploration permit for coal (EPC 1210), a Mining Lease Application (MLA 70426) overlies this tenure as described Volume 2, Section 6.

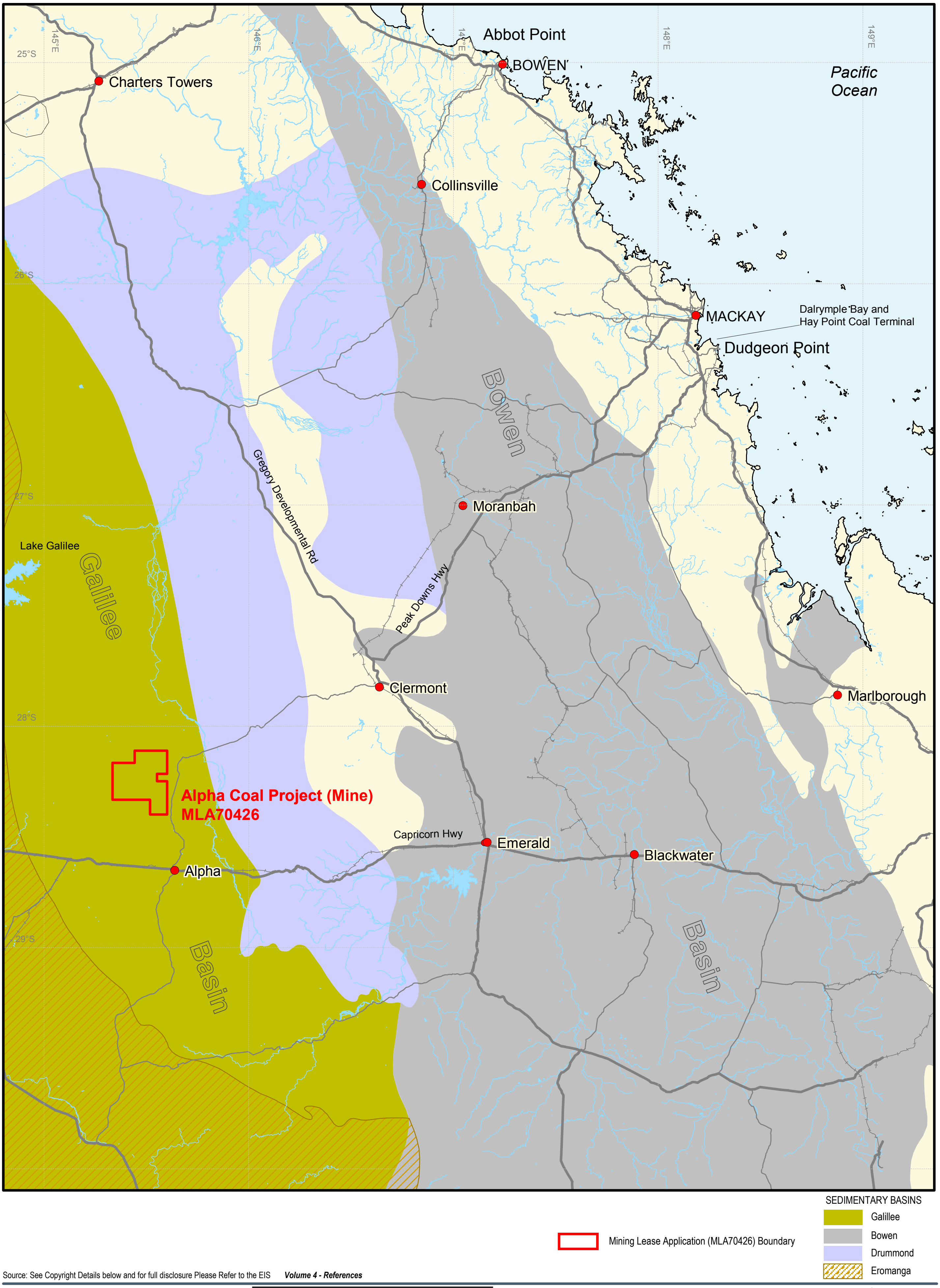
4.2 Regional Geology

The Alpha coal deposits occur within the Galilee Basin, a sequence of Late Carboniferous to Middle Triassic sedimentary rocks overlying Late Devonian to Early Carboniferous sedimentary and volcanic rocks of the Drummond Basin, exposed in a linear belt between the towns of Pentland in the north and Tambo in the south. Refer to Figure 4-1.

The rocks of the Galilee Basin are of similar age to those of the Bowen Basin (Late Permian) which are exposed to the east of the Drummond Basin. The Bowen and Galilee basins are separated along a north-trending structural ridge between Anakie and Springsure, referred to as the Springsure Shelf. Much of the western portion of the Galilee Basin is interpreted as occurring beneath Mesozoic sediments of the Eromanga Basin. The Anakie Inlier comprises older Palaeozoic rocks.

Late Permian, coal-bearing strata of the Galilee Basin sub-crop are found in a linear, north-trending Belt in the central portion of the exposed section of the Basin and are essentially flat lying (dip estimated at < 1° to the west). No major, regional scale fold and fault structures have been identified in regional mapping of the project area (Golder, 2007a and Bridge Oil, 1993). This being the case, the geology is very stable and consistent throughout the region.

The stratigraphy of the Galilee Basin in the Alpha area is described in Table 4-1. A schematic geological cross-section of the geology mapped within the region is presented in Figure 4-2.



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Alpha Coal Project
Environmental Impact Statement

GALILEE BASIN AND
THE PROJECT REGIONAL SETTING

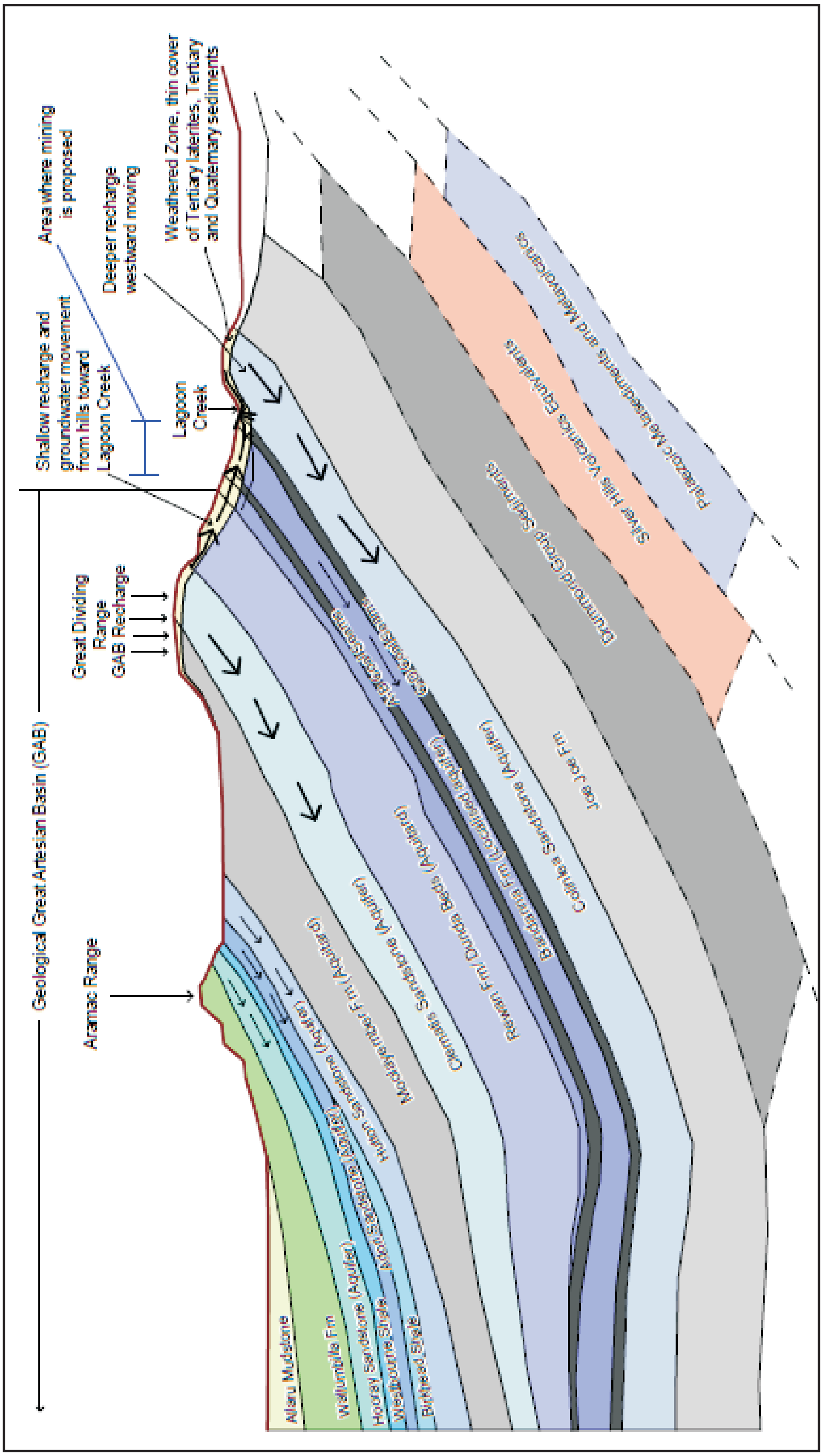
Job Number	4262 6580
Revision	A
Date	27-10-2010

Figure: 4-1

File No: 42626580-g-2033.wor

Table 4-1 Galilee Basin Stratigraphy - Alpha Area

Era	Period	Basin	Unit	Rock Types
Cainozoic	Quaternary	-	-	Alluvium
	Tertiary	-	-	Argillaceous sandstones and clays
Mesozoic	Jurassic	Sub Eromanga Surat equivalent	Hutton Sandstone	
			Moolayember Formation	
			Clematis Sandstone	Quartz sandstone, minor siltstone and mudstone
	Triassic	Galilee	Rewan Formation	Green-grey mudstone, siltstone and labile sandstones
Paleozoic	Permian		Bandanna Formation	Coal seams (A and B), labile sandstones, siltstone and mudstone
			Colinlea Sandstone	Coal seams C,D and E, Labile and quartz sandstone
	Late Carboniferous to Early Permian		Joe Joe Formation	Mudstone, labile sandstone, siltstone, shale and thin carbonaceous beds
	Early Carboniferous	Drummond Basin		



(Source: JBT, 2010a)

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SCHEMATIC GEOLOGICAL CROSS-SECTION ACROSS STUDY AREA

Job Number	4262 6580
Revision	B
Date	27-10-2010

Figure: 4-2

File No: 42626580-g-2034b.cdr

The revised coal measure stratigraphy, based on the data compiled by HPPL and Wright in the Golder Associates Report (Golder, 2007a), is presented in Table 4-2.

Table 4-2 Late Permian Coal Measure Stratigraphy - Galilee Basin, Alpha Project area

Era	Period	Lithology	Stratigraphic Unit	Thickness (m)	Comments
Mesozoic	Triassic	Green brown-purple mudstone, siltstone and labile sandstone	Rewan Formation		Only in west
Palaeozoic	Late Permian	Sandstone	Bandanna Formation	10–30	Increasingly argillaceous
		Coal seam A. Seam contains thin dirt bands that thicken from south to north.		1–2.5	
		Labile sandstone, siltstone and mudstone		10	
		Coal seam B. Seam contains numerous dirt bands that constitute between 15 and 30% of seam. Variable in quality.		6–8	
		Labile sandstone, siltstone and mudstone		70–90	
		Coal seam C. Coal seam thins northward and splits apart	Colinlea Sandstone	2–3	Increasingly arenaceous
		Labile sandstone, siltstone and mudstone		5–20	
		Coal seam D. Stone bands present with seam thickening westward, upper section splits off main seam to north west		4.5–6	
		Labile sandstone, siltstone and mudstone		15	
		Coal seam E. Thin (0.2 m) clean coal bands, usually 2 bands E1 and E2		0.1 – 0.4	
		Labile sandstone, siltstone and mudstone		15 – 20	
		Coal seam F. Localised thick geological section, no working section		0.5 – 5	
		Labile sandstone, siltstone and mudstone		Unknown	
	Early Permian	Labile and quartz sandstone	Undefined	Transition to Joe Joe Formation	

4.3 Project Specific Geology

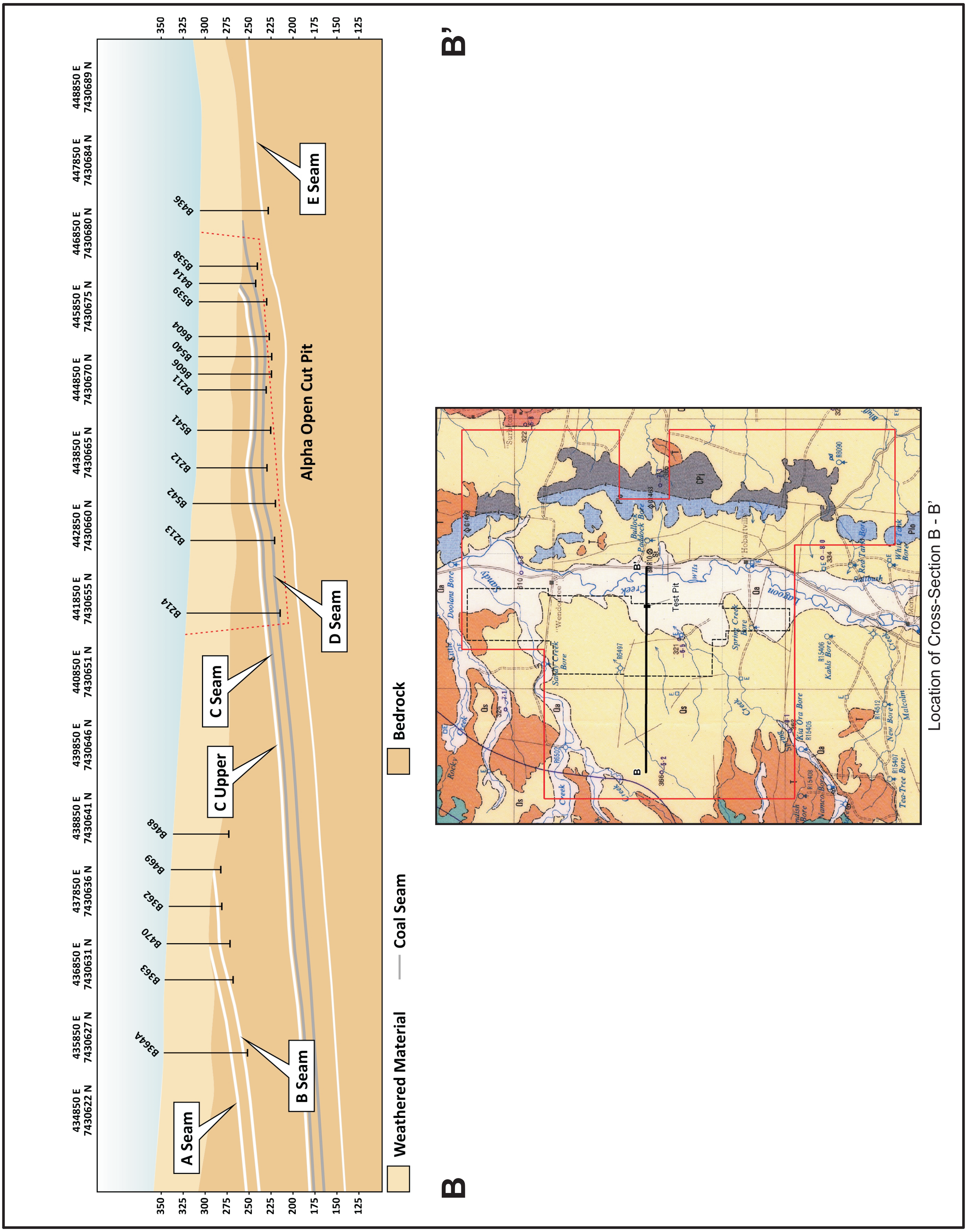
The Alpha Coal deposit lies on the eastern side of the Galilee Basin. The geology consists of gently westerly dipping sediments of Upper Permian age, overlain by Tertiary and Quaternary (Cainozoic) sediments, which is an unconformable and erosional contact (refer to Table 4-1).

Both historical and recent borehole data shows that the thickness of Tertiary and Quaternary sediments varies from greater than 60 m in places to less than 20 m in the north of MLA 70426. In addition to the Tertiary and Quaternary sediments, a variable thickness of weathered Permian material is also commonly present.

The coal bearing strata subcrop, based on the Project's Geological model, in a north/south strip along the eastern section of the project area and are essentially flat lying (dip estimated at 0.5° to 1° to the west). No major, regional scale fold and fault structures have yet been identified in regional geology of the project area. This would indicate a stable depositional history with little structural activity post-deposition. This is supported by analysis of sedimentary units, finding that all holes contain consistent characteristics which form marker horizons that can be seen across the project area (Dr Sasha Pontual, HyChips Report, 2008). The uniform geology, dip and strike, is presented in the east-west cross-section, Figure 4-3.

The geology and coal seam continuity persist along strike and down dip to the west. Figure 4-3 is a cross-section of the project representing the coal seams of the lease area and indicating the Alpha Project open cut pit area in section. The same coal seams can be correlated with drilling 100 km to the west. See Figure 4-4, the Splitters Creek 1 oil and gas well, showing correlatable A, B, C and D seams at depth. This well is located 100 km west (down-dip) of the Alpha project

Figure 4-5 indicates the approximate sub outcrops of the A, B, C, and D coal seams as well as the Rewan Formation, to the west of MLA 70426. An additional schematic stratigraphical column is presented in Figure 4-6 based on site specific data.



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GEOLOGICAL W-E CROSS-SECTION THROUGH THE MLA

Job Number	4262 6580
Revision	B
Date	27-10-2010

Figure: 4-3

File No: 42626580-g-2123.cdr

Figure 4-5: Enron; Splitters Creek 1, oil and gas well. (CR28226A) – Collar = 349302E, 7458186.5N

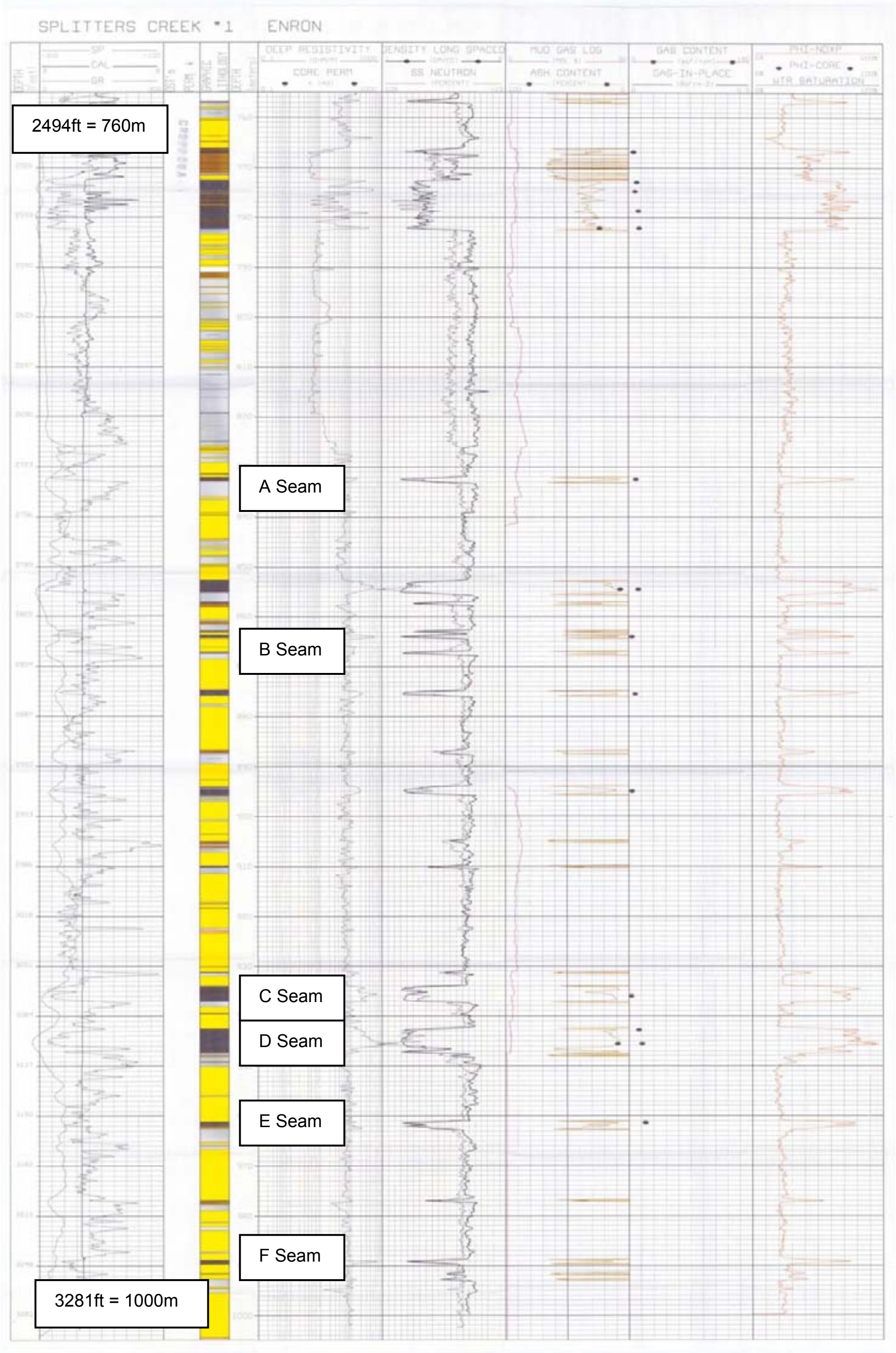


Figure 4-6: Plan showing the subcrop of A - B and C- D seams and Rewan Subcrop

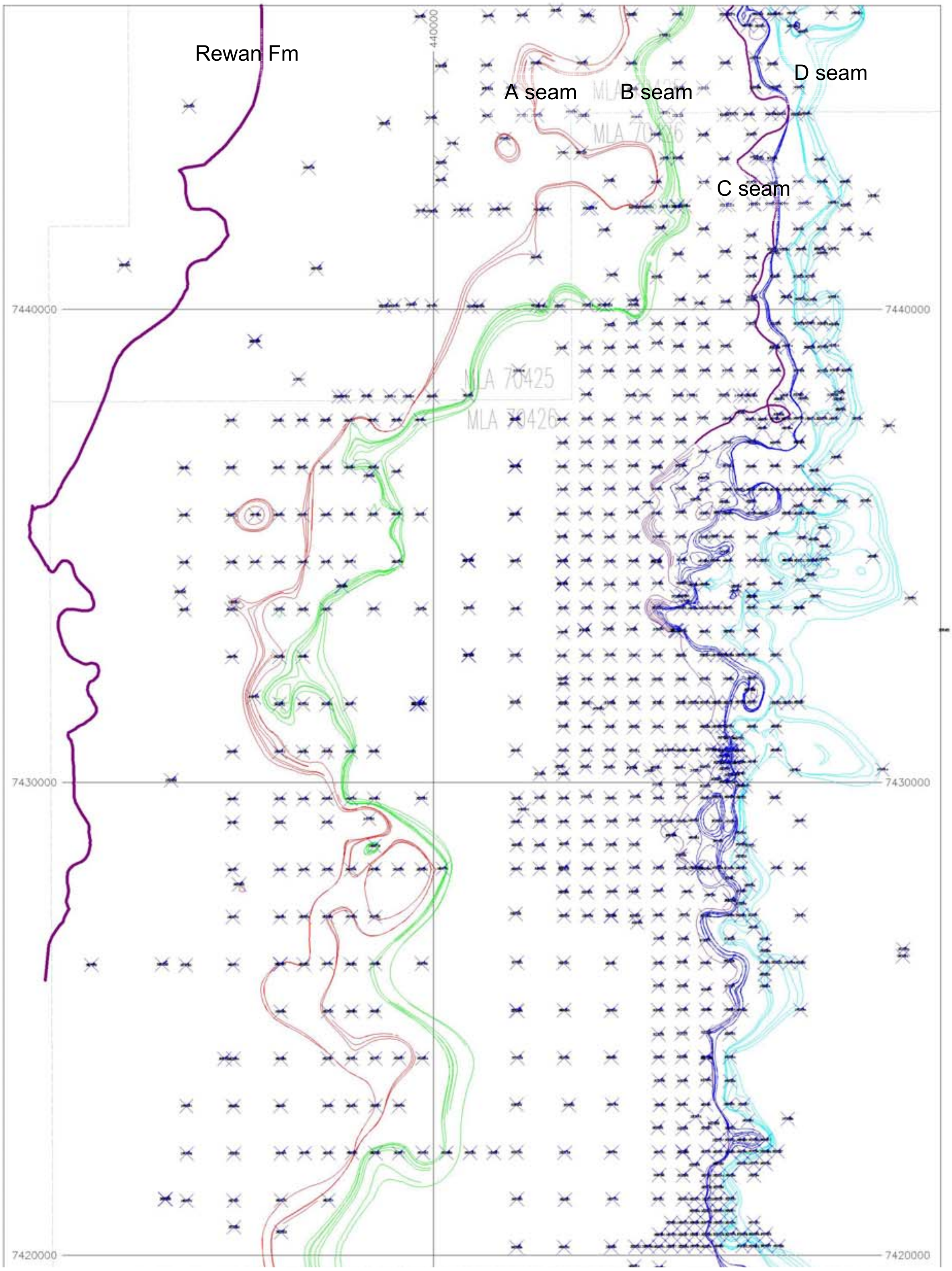
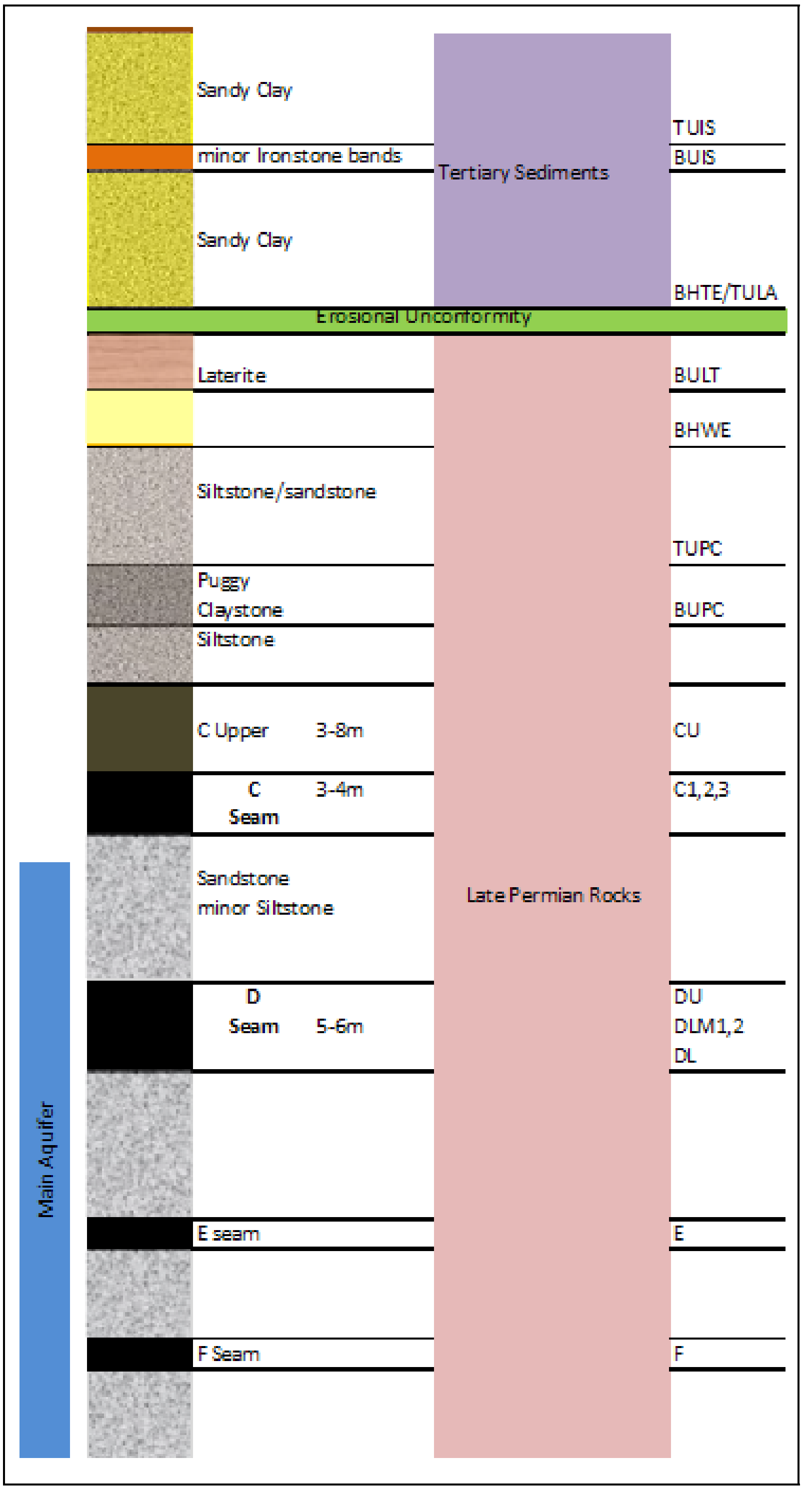


Figure 4-7: Schematic stratigraphic section in the Project area



4.3.1 Quaternary and Tertiary (Cainozoic)

An unconsolidated sequence of sand, fine gravel and minor clay horizon having an average thickness of 40 m in the east and central regions of the deposit and thin towards west (5 m), record sedimentation within an alluvial-coastal plain in a low-accommodation basin-margin setting (J.P. Allen and C.R. Fielding, 2007).

At the base of Tertiary there is a stacked lateritic horizon (Plate 4-1) recorded along with mottled clay palesols, which has been interpreted as the beginning of the weathered Permian sequence. Minor, localised perched groundwater was recorded during exploration drilling within the Cainozoic.

Sediments of the Mesozoic / Palaeozoic are not present in the project area. Tertiary intrusive and extrusive rocks have not been encountered on site.

Plate 4-1 Chip tray showing Tertiary sediments and Lateritic zone Chip tray showing Tertiary sediments and Lateritic zone

4.3.2 Rewan Formation

The Cainozoic is unconformable and erosional onto the underlying Rewan Formation and Permian Sequence. Drilling shows the contact to undulate. The Rewan Formation occurs only in the far west of MLA 70426 and MLA 70425 (HPPL's Kevin's Corner Project), where it subcrops under Cainozoic cover. The Rewan Formation comprises typical green to brown-purple siltstone and fine grained sandstone. The base of the Rewan Formation is unconformable onto the Permian, and can be located some 30 to 50 m above the uppermost A seam coal ply.

The Rewan Formation does not exist over the current project area (see Figure 4-7).

4.3.3 Permian

The over burden, within the Upper Permian layer in the Project consists primarily of Betts Creek Group, this formation has the local equivalent units of the Bandana Formation and the Colinlea Sandstone. This Group has been mapped to outcrop along the south-easterly section of the Galilee Basin, running northward and represents the eastern flank of the intracratonic Galilee Basin (Senior; 1973, Jenson 1975).

The coal measures are equivalent in age to the Rangal coal measures of the Bowen Basin, the Newcastle Coal measures of the Sydney Basin, and tuffaceous stony coal facies of the Black Jack Formation of the Gunnedah Basin (Permian-Triassic Pangean Basins, 1994).

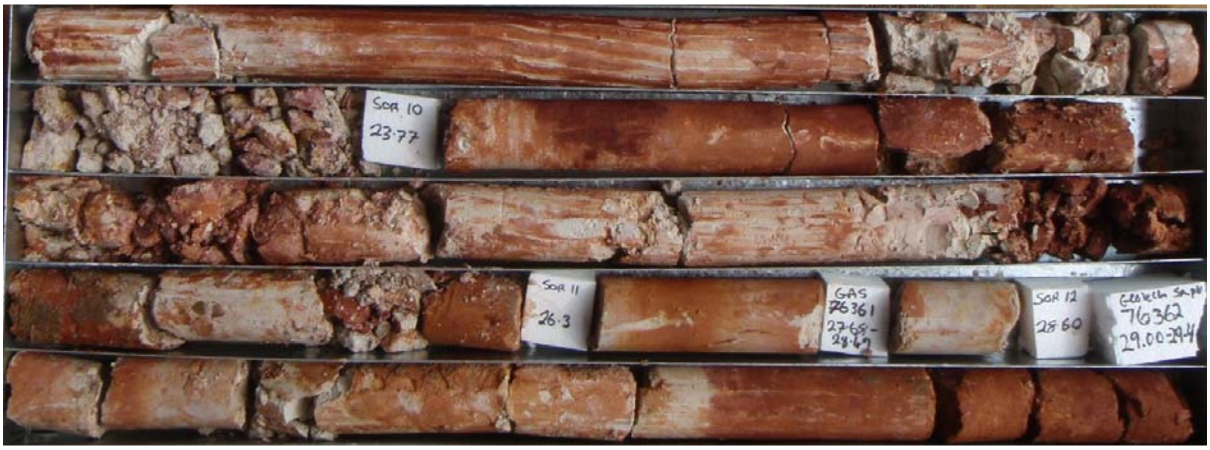
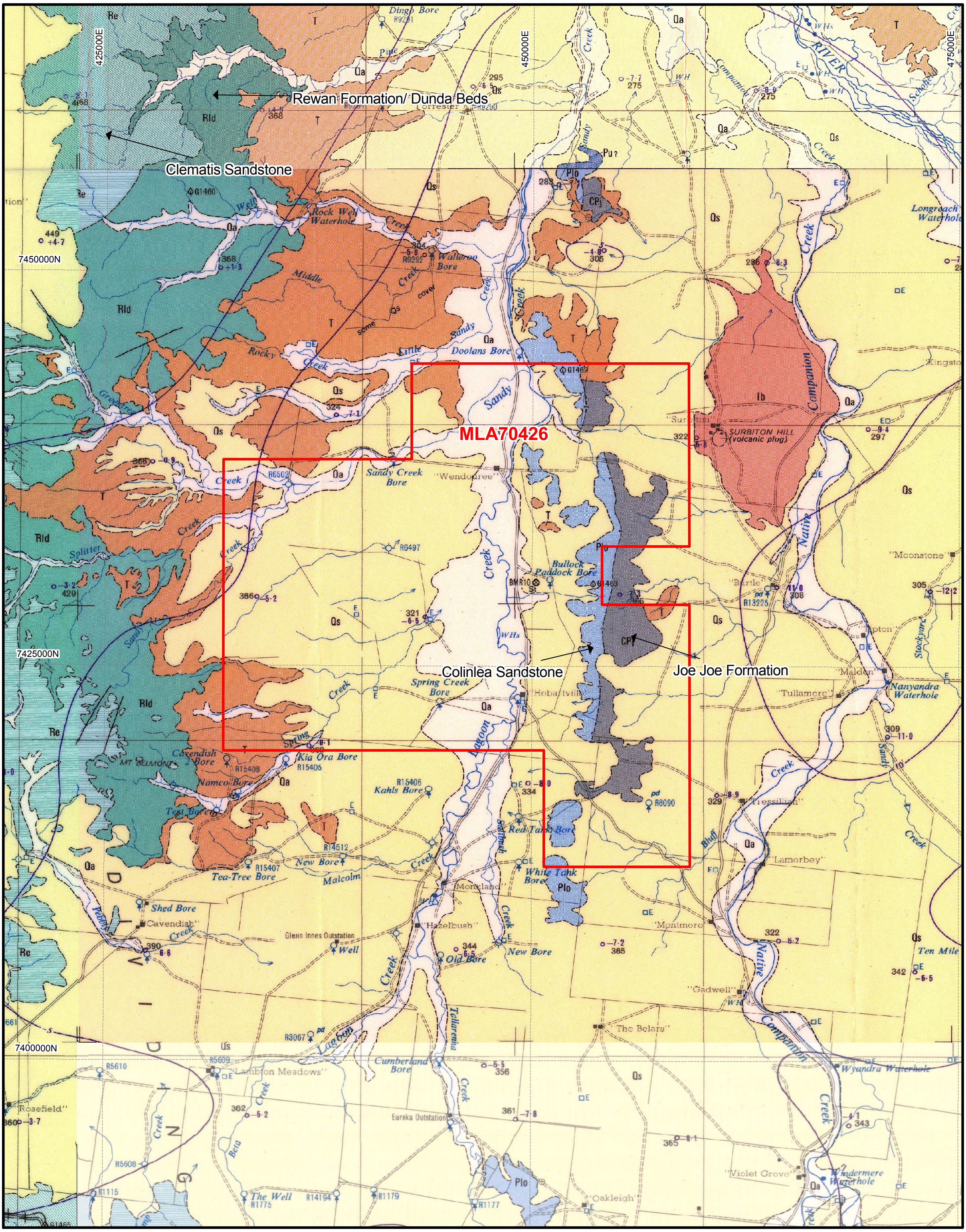


Plate 4-2 Permian overburden reddened alluvial sediments, approximately 22.5 to 30 m below surface

Jenson (1975) clearly states that uplift within the Permian, coupled with an inferred climatic change gave rise to the accumulation of reddened alluvial sediments throughout the basin (Plate 4-2). This is also supported by Senior (1973) that the Galilee Basin was a depression west of the Belyando Feature (Permian-Triassic Pangean Basins, 1994; Senior, 1973). The lower Permian sediment spread to the west, as the surrounding areas of the Galilee Basin were elevated, the area was washed with alluvial sands and sediments. At the end of the glacial period, paludal and lacustrine sediments were deposited, and the source areas were lowered by erosion (Senior, 1973).

As the late Permian was a time of great stability, (APEA, 1993) an outcrop of the Betts Creek Group coal measures showed two distinct, fluvial sandstone facies. These two facies include:



Mining Lease Application (MLA70426) Boundary

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0 3.75 7.5km

Scale 300:00 (A4)

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N W E S

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Alpha Coal Project
Environmental Impact Statement

EXTENT OF REWAN FORMATION
WITHIN MLA70426

Job Number	4262 6580
Revision	B
Date	27-10-2010

Figure: 4-7

File No: 42626580-g-2110b.wor

- A lower thickly bedded, medium course grained quartzose, sandstone facies; and
- An upper laminated to massively bedded, fine grained, labile to sublabile sandstone with interbedded mudstone facies (APEA; 1993, Hawkins; 1992).

The consistency of the overburden is also demonstrated by its mineralogy, Figure 4-8 is a selection of 6 holes from the mineralogy of 2,972 samples from 32 bores across the Project, analysis was undertaken using visible, near infrared, short wavelength infrared (vis-NIR-SWIR) reflectance measurements using the HyChips system.

Coal seams within the lease area are schematically represented in Figure 4-9. Note only seams C and D are planned to be mined in the Project area.

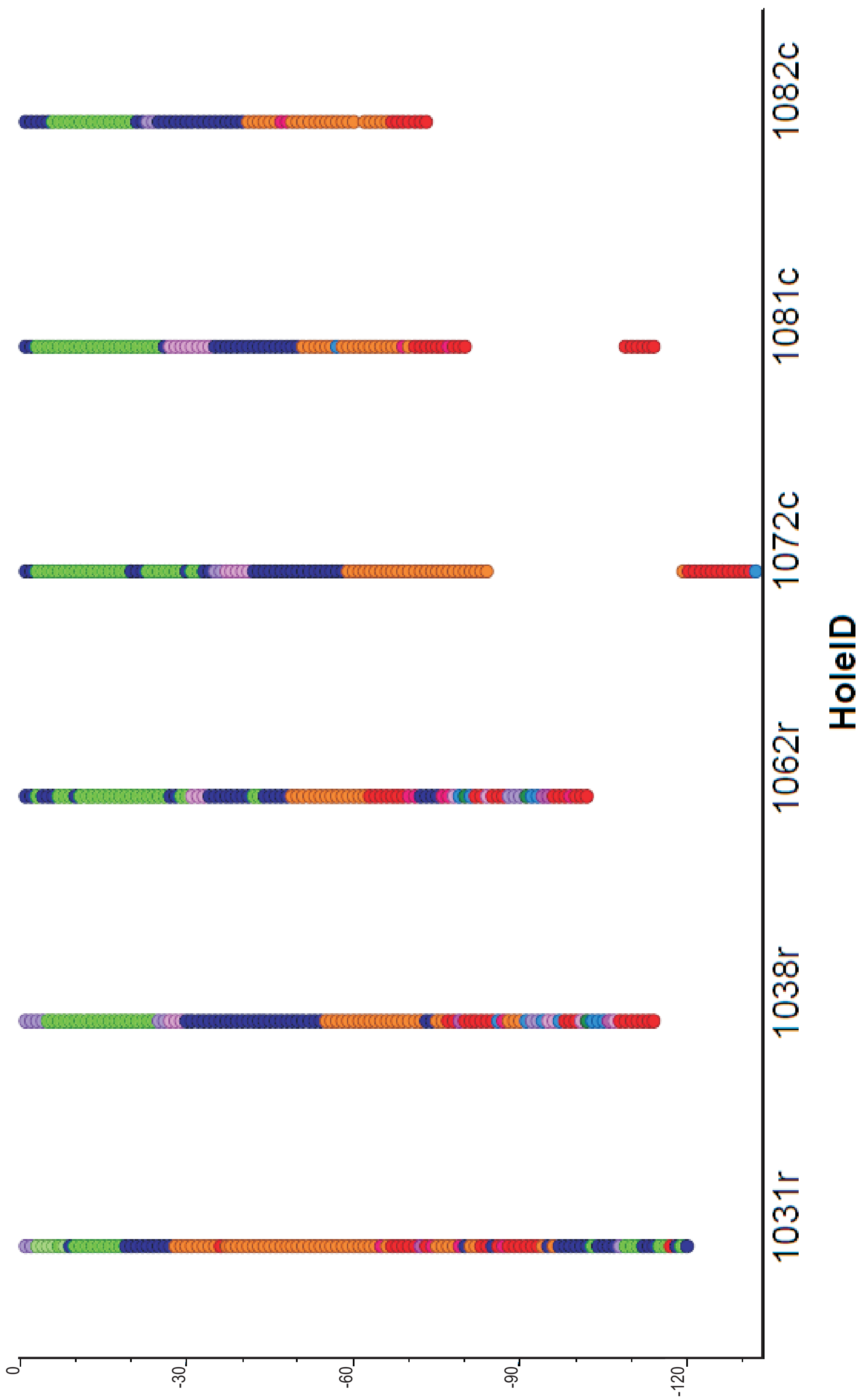
4.3.3.1 A Seam

The A coal seam exists in the Bandanna Formation, which underlies the Rewan Formation in the sequence (where the Rewan is absent, it is replaced by Cainozoic cover) and 15 to 25 m above the roof of the B seam.

The A seam is present only in the far west of MLA 70426. Insignificant A seam within the Project area means that no A seam resource evaluation has not been conducted nor are there plans to mine it as part of the Alpha Coal Project.

The A seam averages approximately 1 m in thickness and is generally described as a dull to dull and brightly banded coal. Normal coal quality for the full A seam interval is in the order of 18% - 20% ash.

The A seam is comprised of the A1, A2, and A3 plies, but these are inconsistent across the lease. The most common form the A seam takes is the A1 splitting off to the south (see Figure 4-10).



Red and orange sections showing the thickly bedded sandstone and the upper fine grained in orange to blue sections tertiary sections in green

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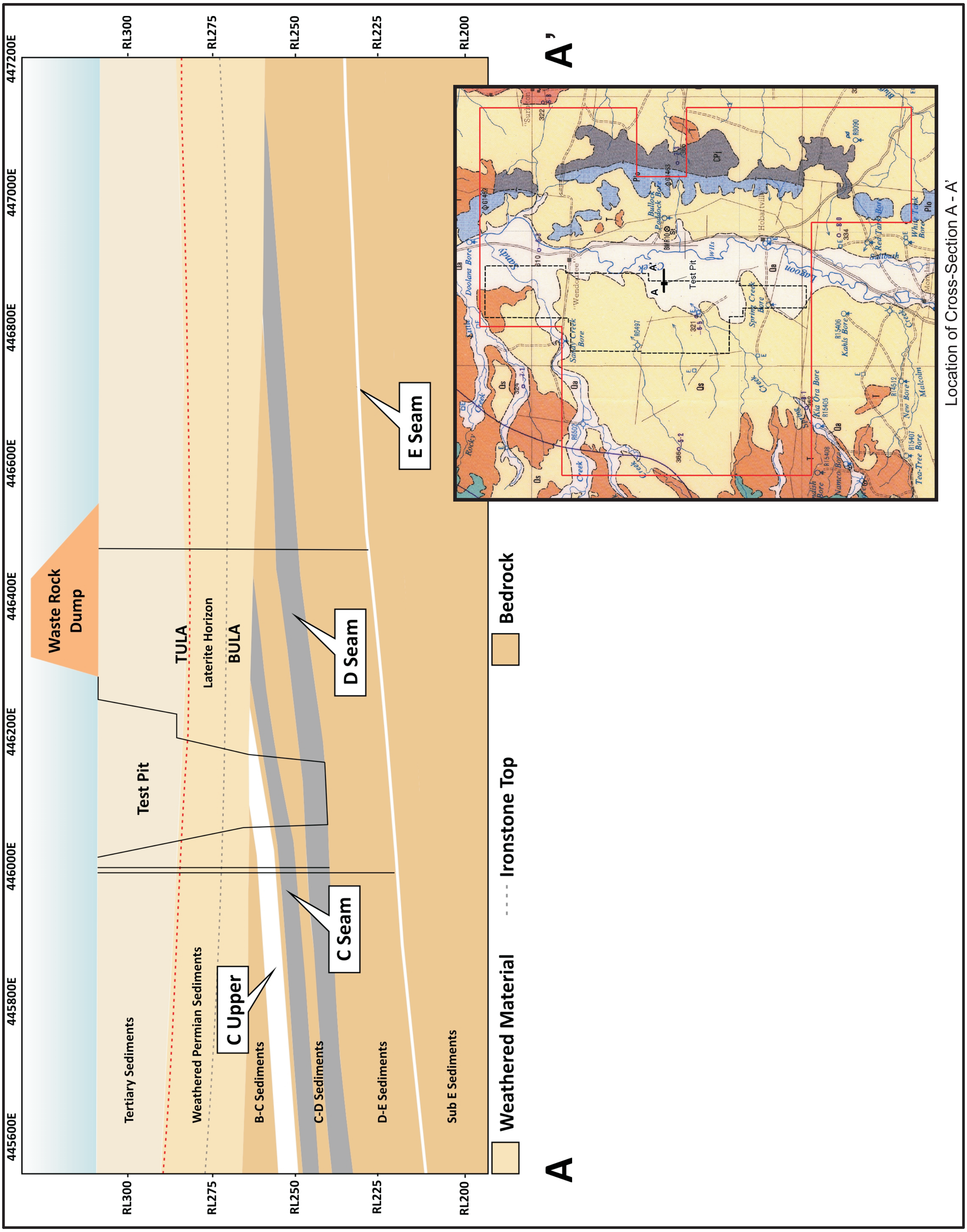
Alpha Coal Project
Environmental Impact Statement

RED AND ORANGE SECTIONS SHOWING THE THICKLY BEDDED SANDSTONE

Job Number | 4262 6580
Revision | A
Date | 27-10-2010

Figure: 4-8

File No: 42626580-g-2124.cdr



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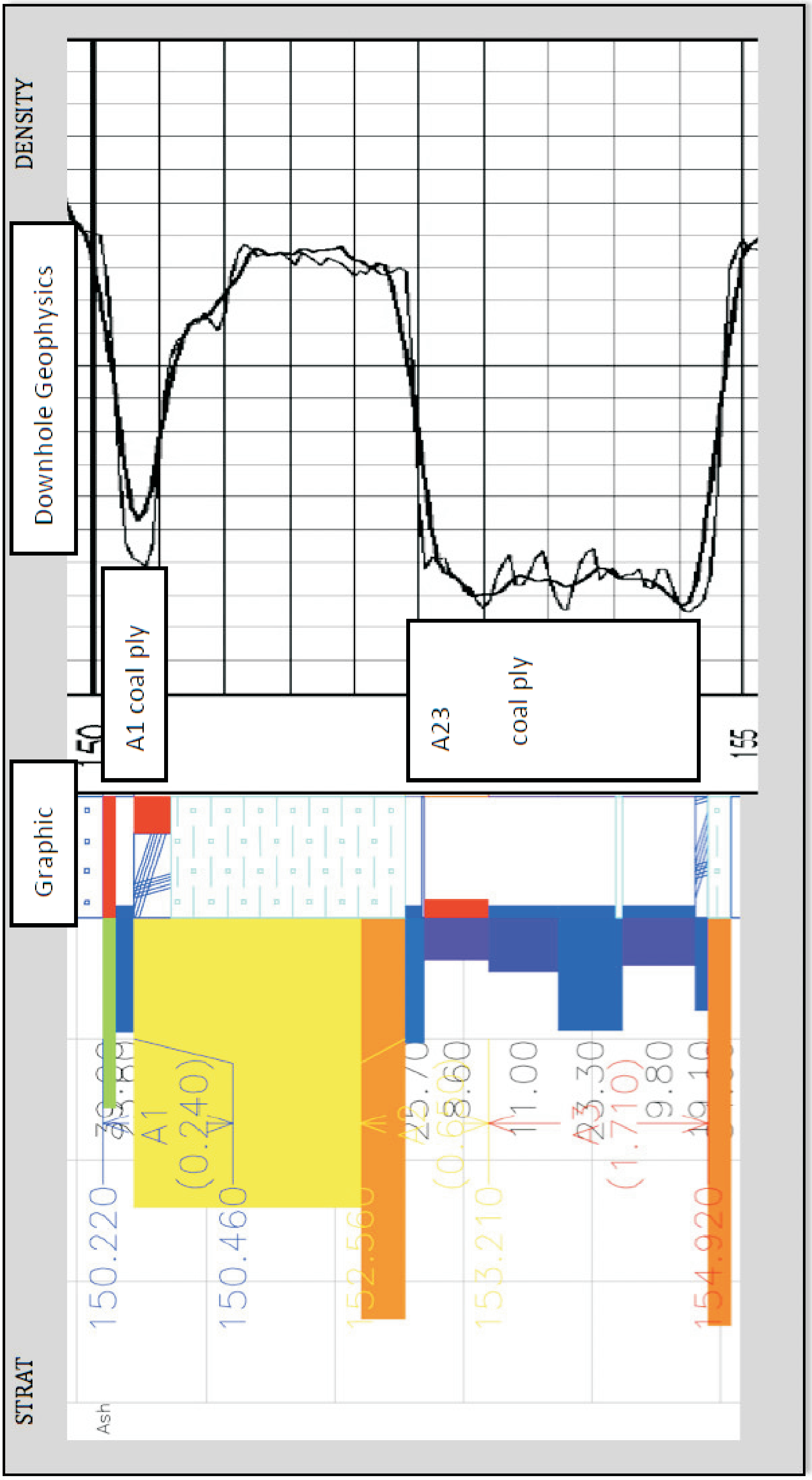
WEST - EAST SCHEMATIC CROSS-SECTION ACROSS THE ALPHA PROJECT OPEN-CUT PIT AREA INDICATING THE TEST-PIT AREA

Job Number | 4262 6580
Revision | A
Date | 27-10-2010

Figure: 4-9

File No: 42626580-g-2125.cdr



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Alpha Coal Project
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TYPICAL SECTION
THROUGH THE A SEAM

Job Number | 4262 6580
Revision | A
Date | 27-10-2010

Figure: 4-10

File No: 42626580-g-2126.cdr

4.3.3.2 B Seam

The B seam exists in the Bandanna Formation, which sits stratigraphically above the Colinlea Sandstone unit; this seam is logged on the western boundary of the lease area only. The B seam is made up of four main plies (but up to six in places), which are B1 through to B6 (Figure 4-11).

The B1 through to B4 plies are consistent over the Project area, and the B4 ply can often be made up of up to three sub-plies (B41, B42, B43) or a combination of these (B412, B423). Across the majority of MLA 70426, the B3-B4 interval has the best quality, with an average raw ash of approximately 25%. The upper plies (B1 and B2) generally have a raw ash greater than 30% and the coal plies are separated by distinctive soft, pale, tuffaceous claystone. As with the A coal seam, due to seam structure and arrangement of the Project boundary, only minor B seam is present within the Project area and the B seam only contributes a nominal resource tonnage over a restricted geography.

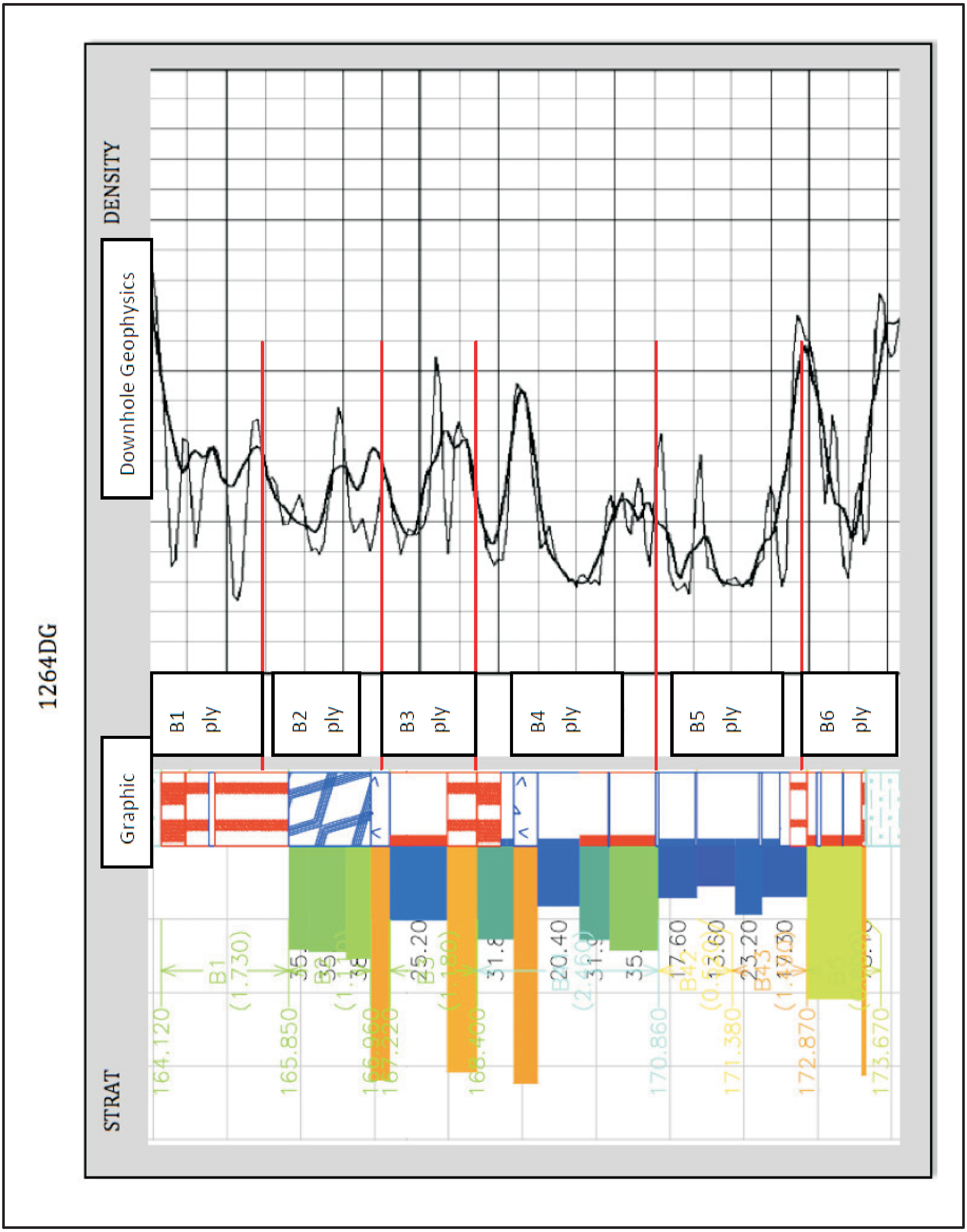
The B1 and B2 plies are present throughout the far west of the lease; their average thickness is 1.12 m and 1.28 m, respectively. The coal in these plies is described as dull to brightly banded coal with minor stone bands present. The top of the B1 ply is usually marked by a sharp contact with the overlying sediments and the parting between B1 and B2 is a tuffaceous claystone which also forms the stone bands present in the B2 ply. The B3 ply of the B seam is a consistent unit of dull coal with bright bands, which has an ash content of around 25% with an approximate thickness of 1.2 m (although this can be variable in places). Again it is separated from the surrounding plies by a slightly carbonaceous or tuffaceous claystone.

The B4 ply of the B seam is consistent across the western area of the lease. It is broken down into sub plies; B41, B42, and B43 that are separated by stone bands of varying sizes, the biggest of these tends to separate the B41 from the B42 and can be in the order of 0.5 m thick. This parting is representative of the others included in the B4 unit and is seen as a tuffaceous claystone that can often be puggy in nature. The B4 sub plies are dull to brightly banded coal, with moderate (25%) ash content and are generally clean in nature.

The sub plies of the B4 can be variable, but generally the B41 and B43 are the largest of these sub plies representing the bulk of the B4. The B41 can be up to 2 m in thickness, with the B43 similar with a thickness in the order of 1.5 m. The B42 sub ply is usually 0.5 m thick. The most erratic plies of the B seam are the B5 and B6, which are often of a dull to stony coal with bright bands and can contain numerous tuffaceous claystone bands throughout.

4.3.3.3 B-C Interburden

The interburden between the B and C seams is generally greater than 60 m. The sediments above the C seam comprise labile sandstone with a clayey matrix and subordinate siltstone (Plate 4-3). Drilling has intersected an area of puggy claystone or clay matrix sandstone mid way down into the C seam interburden. This zone may be of importance to highwall and waste stability considerations (see Section 4.5) and thus has been included as surfaces in the geological model.



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TYPICAL SECTION
SHOWING B SEAM PLIES

Job Number	4262 6580
Revision	A
Date	27-10-2010

Figure: 4-11

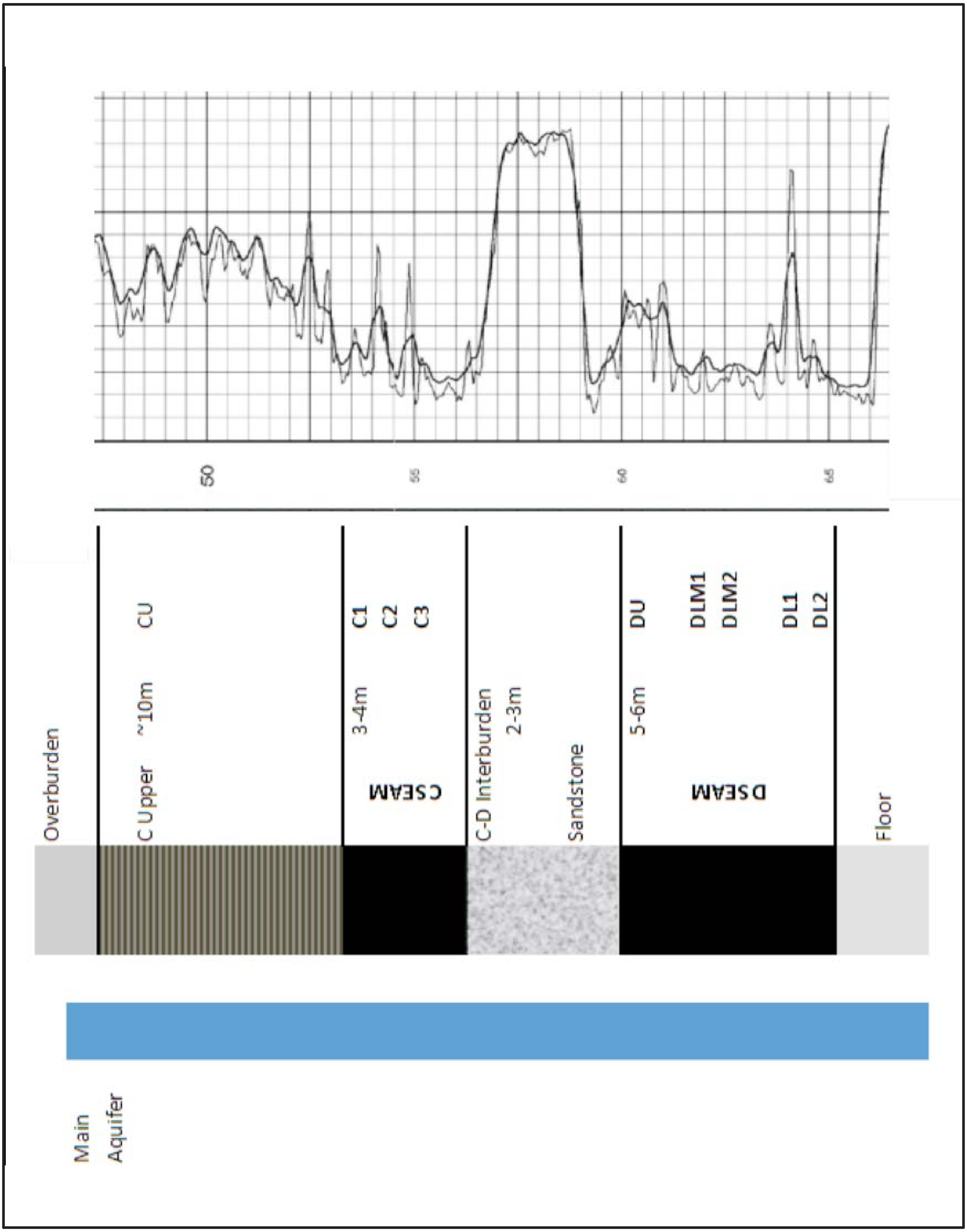
File No: 42626580-g-2127.cdr

Plate 4-3 Representative samples of the B-C interburden material

4.3.3.4 C Seam

The economic coal seams within the Project area include the C and D coal seams. The details of the coal plies making up the C seam within MLA 70426 are shown on Figure 4-12.

The C seam exists in the Colinlea Sandstone and consists of two distinct zones, the non-coal C Upper (CU) section and the main economic interest, the Lower C seam (which is historically referred to as the 'C Best'). Below (Figure 4-13) is a typical section of the C seam. The C Upper is represented in red and the Lower C seam in blue (showing plies C1, C2 and C3).



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Alpha Coal Project
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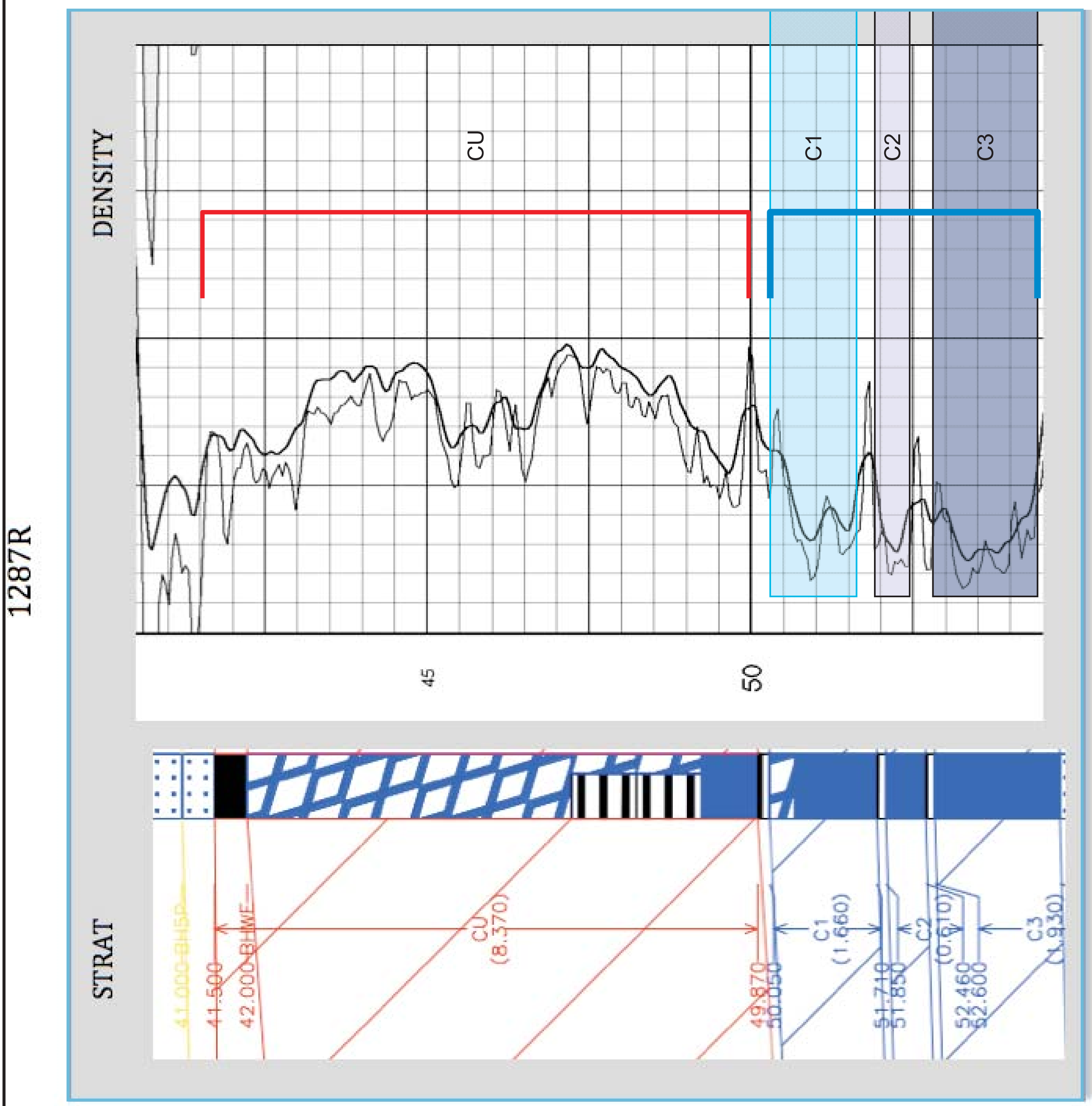
WORKING SECTION THROUGH C AND D SEAMS WITH DENSITY LOG

Job Number	4262 6580
Revision	A
Date	27-10-2010

Figure: 4-12

File No: 42626580-g-2128.cdr



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Alpha Coal Project
Environmental Impact Statement

TYPICAL SECTION OF THE C SEAM

Job Number | 4262 6580
Revision | A
Date | 27-10-2010

Figure: 4-13

File No: 42626580-g-2129.cdr

4.3.3.4.1 C Upper, non-coal unit

The C Upper unit (CU) sits directly above the C seam, and is seen as a unit of interbedded minor stony coal, clayey tuffs and carbonaceous mudstone (see Plate 4-4 below). There is generally only stony coal, however, some thin sections of dull to bright coal bands can be found, but these are inconsistent in nature.

Plate 4-4 Typical C Upper unit in 10" large diameter core

The C Upper unit has an average thickness of around 7.5 m but can be up to 10 m or more in areas towards the Subcrop. There is no resource potential in this unit, due to the inferior nature of the coal bands and dominance of waste rock within the sequence. Results from previous drilling programs have confirmed that the C Upper is excessively high in ash (>70% raw ash) and is not suitable as export quality thermal coal.

The C Upper section is not of resource potential and, while included in the structural model, it is not considered as part of the current resource. In order to mine the lower seams, the C Upper will need to be excavated; therefore, it needs to be understood in terms of waste disposal.

4.3.3.4.2 C Seam

The C seam lies directly beneath the C Upper and has an average cumulative thickness of around 3 m. The C seam has been split into 3 separate plies, namely C1, C2 and C3. These plies are comprised of dull to dull banded coal usually with claystone partings. It is generally greater than 20% ash, but in places it can contain plies of less than 10% ash. The plies of the Lower C seam are fairly consistent, but can at times combine to form variations, commonly C1 and C2 combine to form C12, also C2 and C3 can form C23.

The C1 ply of the Lower C seam sits under the C Upper in the sequence, and can usually be seen as quite an obvious change from the banded claystone and carbonaceous mudstone (see Plate 4-5 below). The average thickness of the C1 is around 1.2 m, and it consists of dull coal with bright bands, no partings and occasional stony coal bands toward the top of the unit.

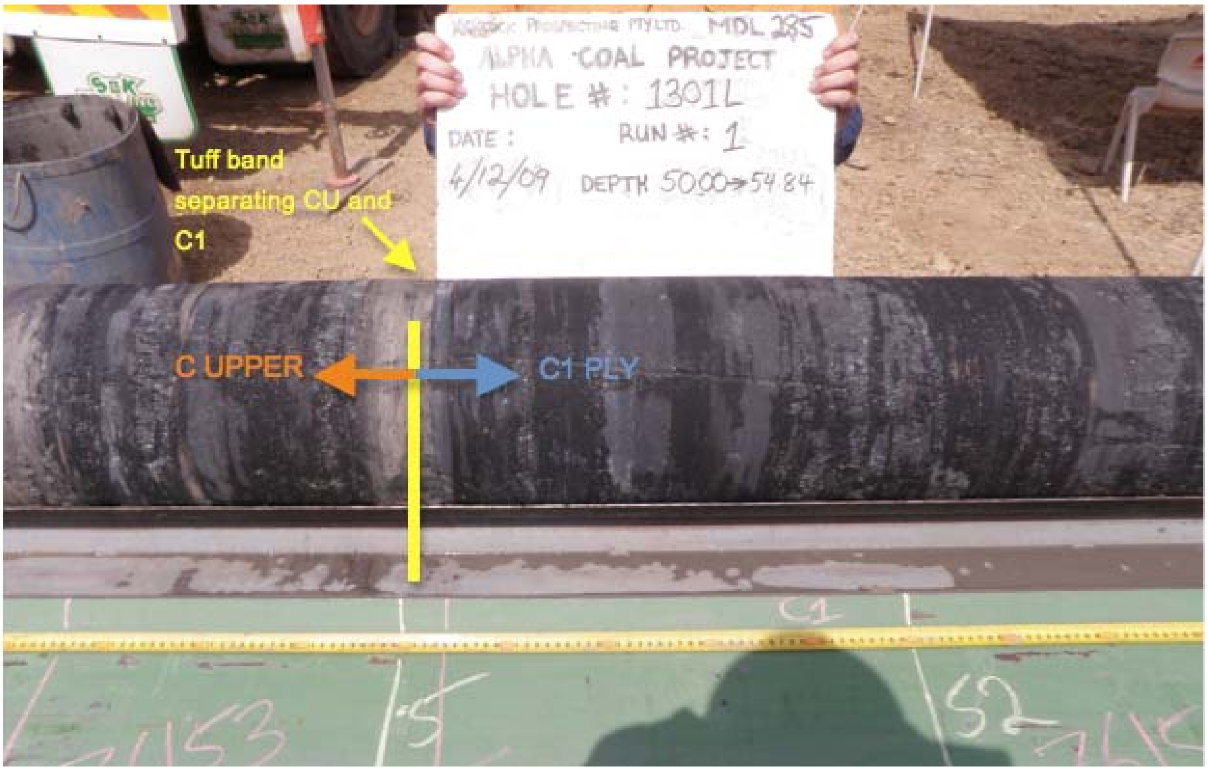


Plate 4-5 Boundary between CU and C1

The C2 ply follows the C1, and is the smallest of the three plies, usually being around 0.6 m thick. It is separated from C1 and C3 by small claystone bands that do not usually exceed 0.1 m each. Again, this is a fairly clean ply of dull, brightly banded coal, with occasional minor stone bands (Plate 4-6).

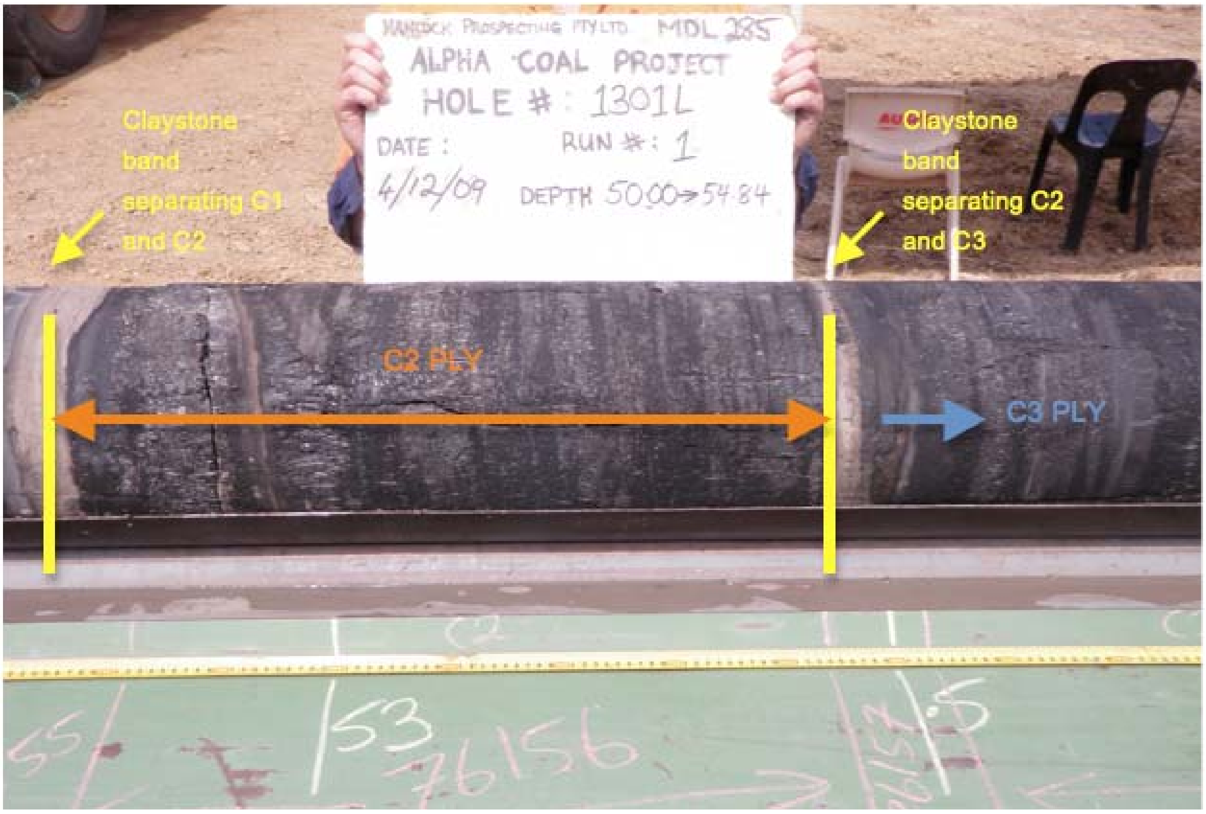


Plate 4-6 C2 ply separated from C1 and C3 by small claystone bands

The C3 ply of the Lower C seam is the generally the largest ply with an average thickness of 1.55 m. It has the same characteristics as the other plies in the seam, with occasional stone bands present throughout the unit. The C3 ply can often have a gradational base, grading from a dull to dull banded coal into a carbonaceous siltstone with some coaly bands, and finally into a medium grey siltstone (Plate 4-7).

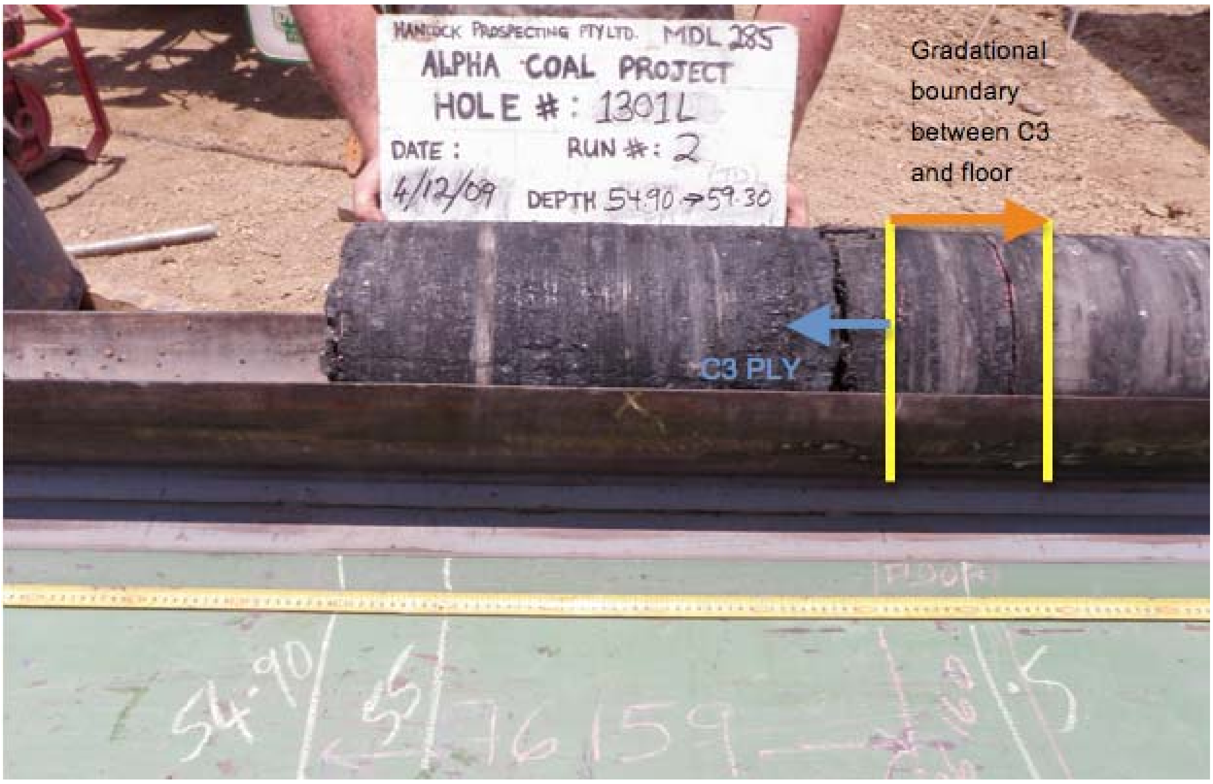


Plate 4-7 Gradational boundary at the base of the C3 ply

4.3.3.5 C-D Interburden

The interburden between the C and D separation can vary from around 3 m in the subcrop area to 7 m or more in the west. This unit is generally composed of competent sandstone, interlaminated with silty bands and wisps, with occasional coaly traces and in places can grade into siltstone (generally where interburden thickens) (Plate 4-8).

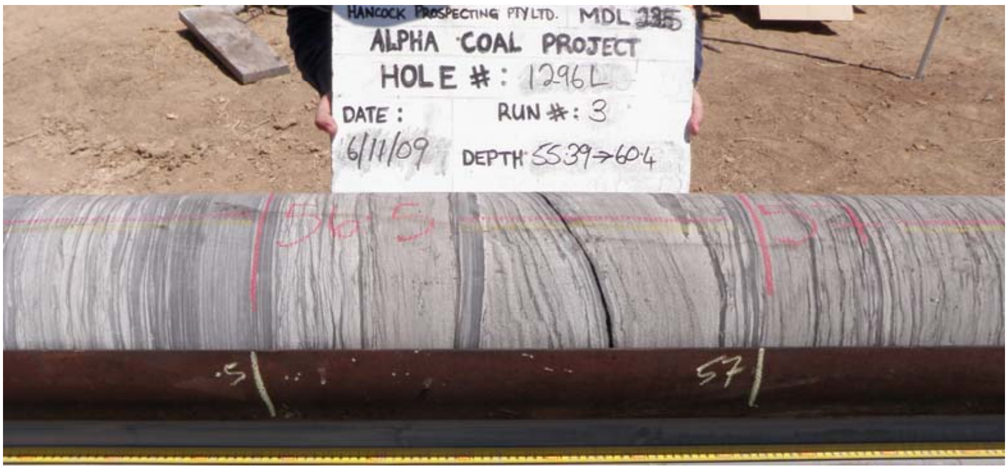


Plate 4-8 Interburden between C and D seams showing laminated sandstone/siltstone

4.3.3.6 D Seam

The D seam occurs within the Colinlea sandstone and consists of the three main plies that can be divided in to five. These plies are:

- D Upper (DU);
- D Middle (DLM), which can consist of DLM1 and DLM2; and
- D Lower (DLL) with can consist of DL1 and DL2.

Stone bands within the D seam thicken to the west, with smaller bands to the east. The D seam usually has a thickness of 6 to 7.5 m inclusive of stone bands with 4.5 m of clean coal (Figure 4-14).

4.3.3.6.1 D Upper (DU)

The D Upper seam (DU) is a dull to dull and brightly banded ply of coal that ranges from 0.3 to approximately 1 m thick. It is commonly separated from the rest of the D seam by a band of coaly shale around 0.75 m. This can be difficult to define due to the coaly nature of the unit (Plate 4-9). The D Upper to DLM parting thins significantly to the south, but can be up to 1 m thick in the north of the Project area.

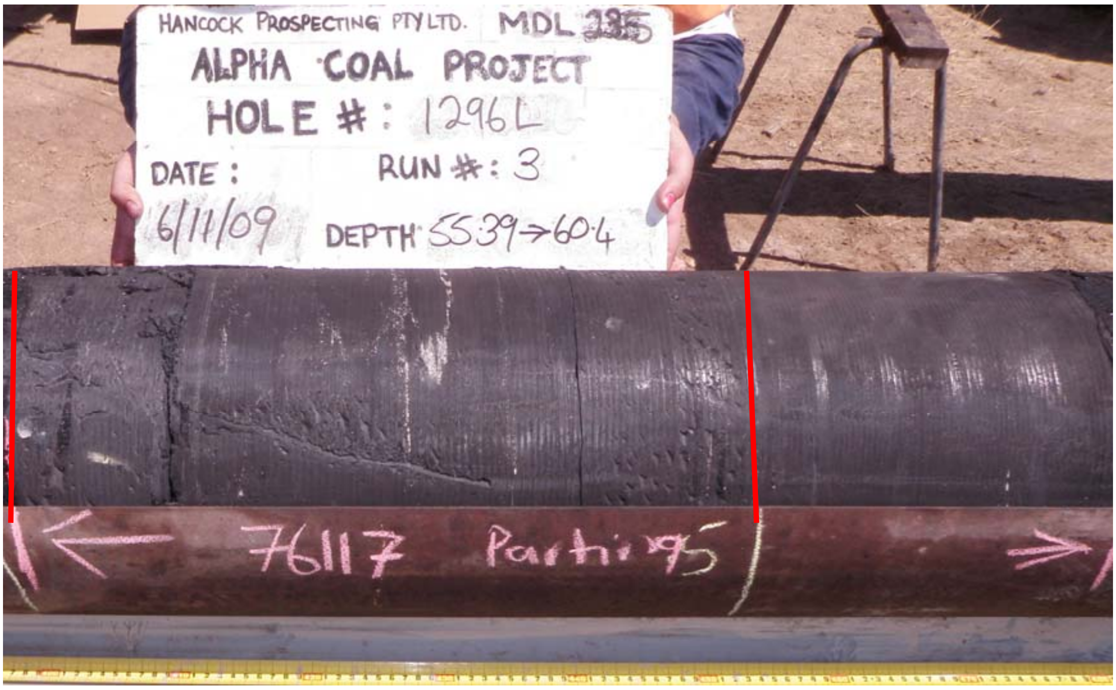
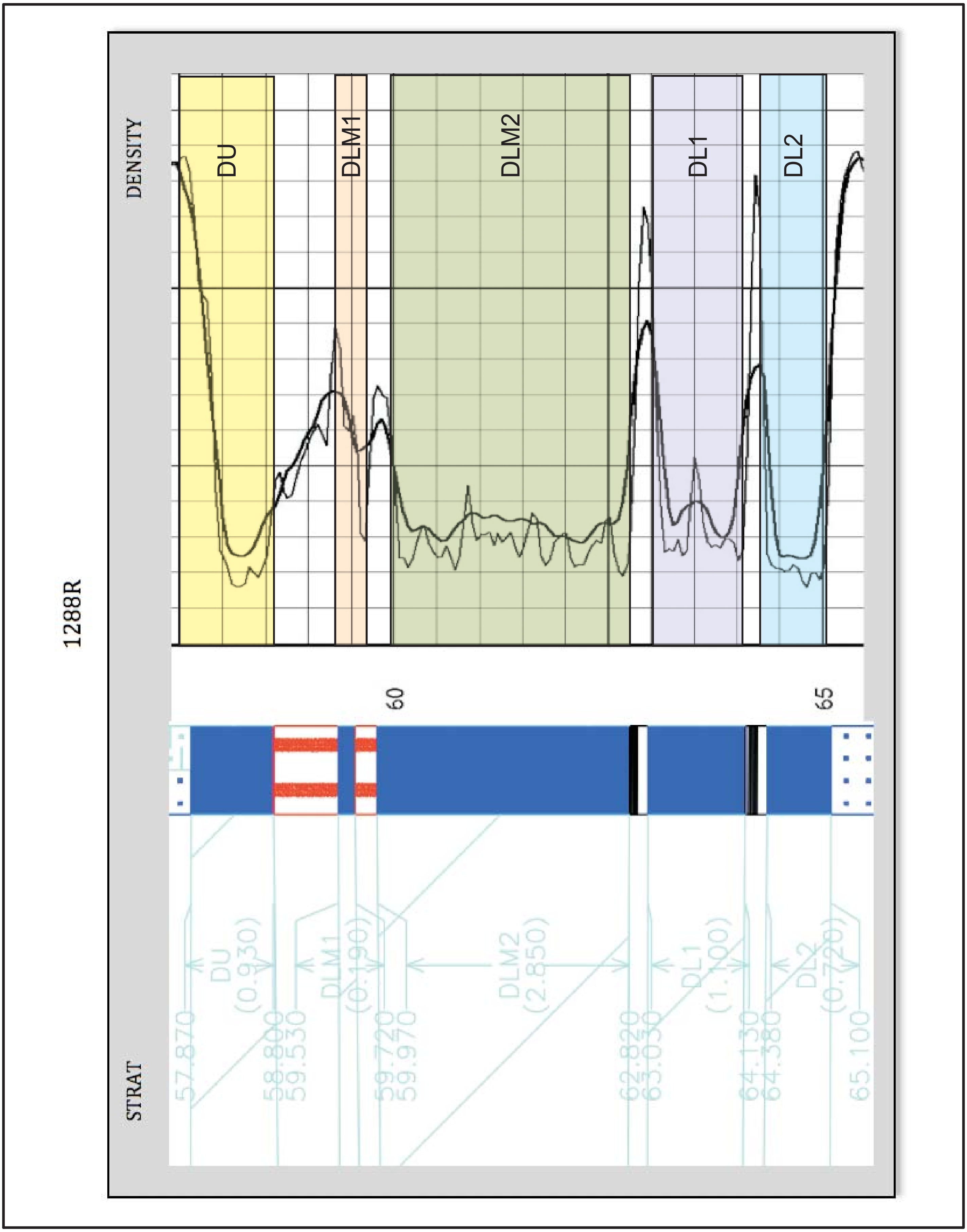


Plate 4-9 The splitting of the D seam showing the coaly shale parting

4.3.3.6.2 D Middle (DLM1 and DLM2)

The DLM1 ply is a high ash (approximately 30%) ply of dull coal to coaly shale that is located above the DLM2 ply and is around 1 m thick. The DLM1 ply generally combines with the DLM2 seam to form DLM to the south of the lease, but this trend can be unreliable.



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TYPICAL SECTION OF D SEAM
SHOWING ALL 5 PLIES

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Figure: 4-14

File No: 42626580-g-2130.cdr

The DLM2 ply of the D seam is a consistent unit ranging in thickness from 2.5 – 3 m. This ply consists of dull to dull and brightly banded coal and often contains small stony bands within the seam, with DLM2 containing the better quality coal within the D seam, having a raw ash content of between 10 and 15%. DLM2 combines with DLM1 towards the north of the lease forming DLM. DLM2 is separated from DLL by an interbedded sequence of siltstone/sandstone (Plate 4-10).

Plate 4-10 Interburden between DLM2 and DLL, showing the interbedded sandstone/siltstone

4.3.3.6.3 D Lower (DL1 and DL2)

DL1 and DL2 sometimes combine to form the DLL ply of the D seam. No major separation exits between the DL1 and DL2, however, claystone band partings have been shown to separate DL1 and DL2 (Plate 4-11). The average thickness of the DLL ply is approximately 1.5 m and is generally the best quality coal of the D seam and commonly has a raw ash of less than 10%.

Plate 4-11 DLL ply comprised of DL1 and DL2 showing the stony parting

4.3.3.7 D to E Interburden

The D to E interburden can range from a fine to course sandstone and becomes pebbly toward the top of the E seam. The interburden and is usually around 15 m thick (Plate 4-12).

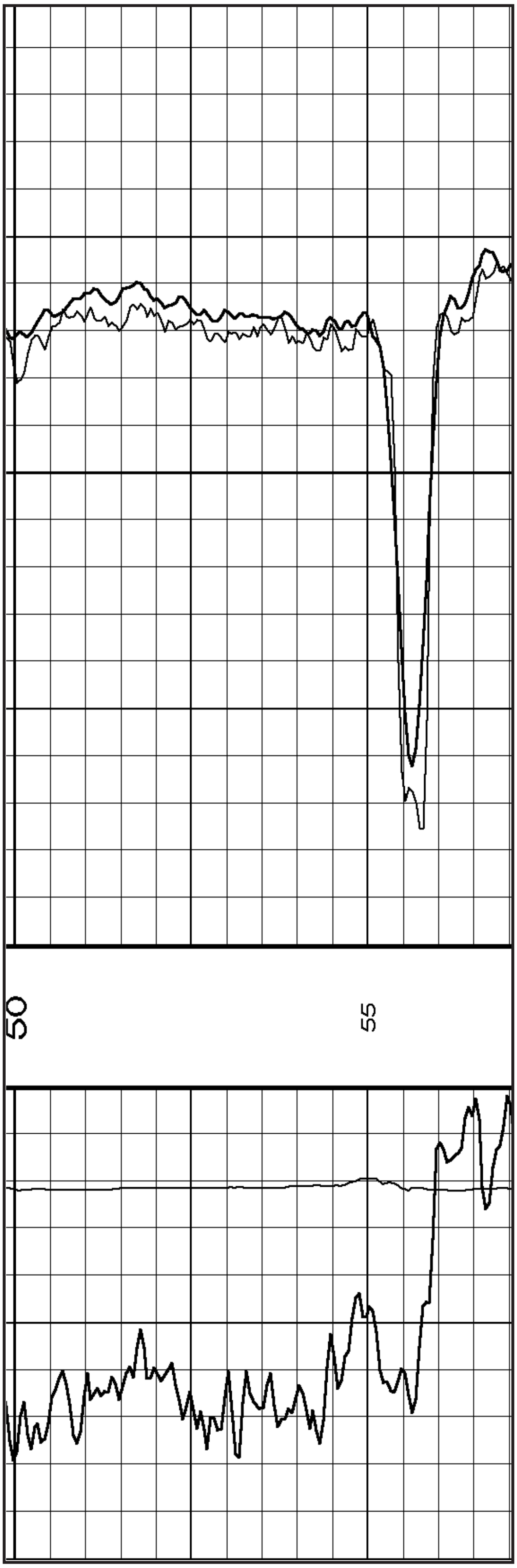
Plate 4-12 E to D interburden showing pebbly sandstone overlying the E seam

4.3.3.8 E and F Seams

The E seam is present as two 0.2 m thick clean coal bands (E1 and E2 (Plate 4-13)) that reside ~ 15 m below the D seam (Figure 4-15). The F seam displays patchy development and the full geological section can reach in excess of 5 m in isolated areas. However, excessive banding with non-coal parting, excessive and poor coal quality makes the F seam sub-economic. The F seam sits around 30 m below the D seam floor. No resource potential is currently attributed to either E or F seams within the project area (Figure 4-15 and Figure 4-16).

Plate 4-13 The E seam located between large sandstone/siltstone partings

All coal seams undulate slightly throughout the deposit, but generally the dip is < 1 ° towards the west. The dip increases to ~ 2–3 ° in the central and north of project area.



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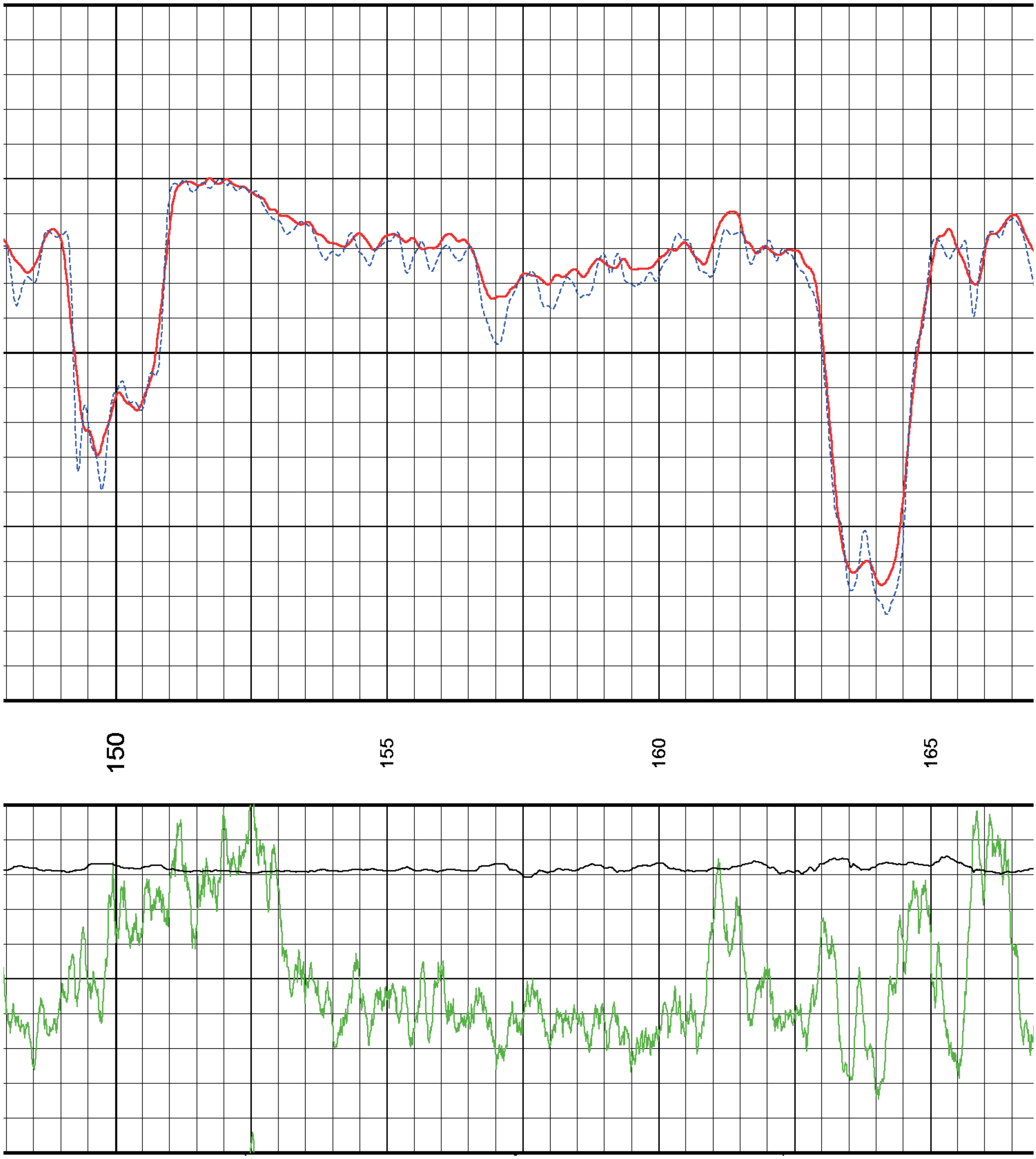
GEOPHYSICAL DENSITY LOG
SHOWING A TYPICAL E SEAM SPIKE

Job Number	4262 6580
Revision	A
Date	27-10-2010

Figure: 4-15

File No: 42626580-g-2131.cdr



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Alpha Coal Project
Environmental Impact Statement

DENSITY LOG SHOWING
BOTH THE E AND F SEAMS

Job Number | 4262 6580
Revision | A
Date | 27-10-2010

Figure: 4-16

Datum: GDA94, MGA Zone55

File No: 42626580-g-2132.cdr

4.4 Geological Structures within the Area of Disturbance

No major regional scale fold and fault structures have been identified to date in the geology logged across the Project area (Salva, 2010). Based on the high density drilling for the Project there is very little seam conflict to indicate the presence of large scale faulting.

Geological modelling of the coal resources at the Project does not include faults or intrusions. This is because there is no evidence of intrusive activity and major faulting appears to be absent, although small faults are likely to be distinguished when drill hole spacing becomes closer.

4.5 Geological Factors that may Influence Ground Stability

4.5.1 Geological studies

Two historical studies were conducted into the geotechnical considerations for open cut mining of the Alpha deposit. Additional geotechnical investigations have been undertaken as part of recent mine planning and infrastructure placement activities. Investigations included the assessment of slaking or swelling properties, rock strength, trafficability loads and handling ability and pit floor stability.

4.5.2 Slope Stability

During the historical geotechnical investigations some bedding parallel shear zones were detected in the sediments overlying the C seam. These appear to be persistent. It is noted that the dip of the strata will be into the walls at a low angle, which is a more favourable orientation for the shears in terms of slope stability.

Some weathering and erosion effects are expected on slopes containing these overburden materials, however, they are not expected to unduly affect the stability of the landform.

4.6 Metallurgical and Environmental Consideration

4.6.1 Coal Characterisation

Coal quality data was loaded into an Oracle global database for validation.

Where the coal seams have partings, they have been sampled on a ply-by-ply basis. In such cases, there is also often an analysed composite for the full seam. There are 454 holes yielding raw quality data and 372 holes yielding float 1.50 or float 1.60 data.

Coal quality data consists of:

- Raw Proximate Analysis, Specific Energy, Total Sulphur and Relative Density;
- Float 1.50 and float 1.60 product proximate analysis, specific energy, total sulphur, ash analysis, ash fusion temperatures, ultimate analysis, hardgrove grindability index, chlorine, trace element analyses; and
- Washability data.

Drill hole statistics for key raw parameters are listed in Table 4-3, while statistics for key product parameters are listed in **Table 4-4.**

Table 4-3 Drill hole statistics raw quality

Seam	IM				Ash				RD				GCV				TS			
	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean
A	67	3.1	14.2	7.96	69	11.82	42	20.24	45	1.38	1.72	1.51	3	5148.14	5540.11	5316.05	1	0.36	0.36	0.36
B	2	7.81	8.21	8.01	2	34.02	43.61	38.81	2	1.66	1.71	1.68	0	–	–	–	0	–	–	–
B1	94	4.6	10.9	7.71	96	19.2	52.4	33.15	64	1.48	1.82	1.63	8	3338.88	4789.63	4306.25	1	0.66	0.66	0.66
B2	112	3.3	12	7.67	117	17.4	49.2	28.84	77	1.45	1.9	1.59	10	4383.33	5793.45	4876.87	1	0.55	0.55	0.55
B234	2	6.8	9.38	8.09	2	21.89	22.1	22	0	–	–	–	0	–	–	–	0	–	–	–
B3	120	1.6	23.6	7.75	123	16.7	49.2	30.71	89	1.45	1.81	1.59	13	4177.78	5155.31	4662.04	1	0.39	0.39	0.39
B34	1	8.26	8.26	8.26	1	18.48	18.48	18.48	0	–	–	–	0	–	–	–	0	–	–	–
B4	125	5.1	14.2	8.08	129	16.8	57.3	24.5	67	1.42	1.91	1.56	14	4636.67	5611.81	5129.87	2	0.32	0.57	0.44
C	193	2.2	13.63	8.51	195	6.98	49.18	18.87	77	1.36	1.91	1.54	49	4897.19	6610.84	5587.62	20	0.45	0.9	0.54
CL	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
CU	20	4.5	11.9	7.67	20	12.8	55	30.6	2	1.49	1.75	1.62	2	2595.58	4184.95	3390.27	0	–	–	–
D	7	6.44	10.7	7.78	7	14.68	24.85	19.57	3	1.47	1.54	1.5	1	5695.46	5695.46	5695.46	0	–	–	–
DL	9	7	9.6	8.39	9	13.6	23.56	17.86	4	1.43	1.52	1.49	3	5253.3	6113.71	5671.56	2	0.65	0.87	0.76
DL1	299	2.7	13.9	7.93	300	5.8	49.4	14.67	136	1.35	1.89	1.49	93	5023.86	6794.88	6177.17	29	0.31	0.87	0.54
DL2	300	2.7	13.9	8.01	301	5.4	49.4	13.82	137	1.3	1.89	1.47	93	5023.86	6794.88	6177.17	29	0.31	0.87	0.54
DLL	256	2.7	13.9	8.09	257	5.8	49.4	13.3	103	1.35	1.89	1.47	89	5023.86	6794.88	6199.62	27	0.31	0.76	0.53
DLM	52	4.05	13.9	8.41	52	8.8	24	14.92	14	1.37	1.47	1.44	20	5210.28	6338.38	5807.85	6	0.5	1.67	0.75
DLM1	139	2.5	13.9	8.42	142	6.2	41.3	17.65	48	1.36	1.83	1.51	48	4316.41	6431.59	5744.73	13	0.43	1.67	0.7
DLM2	263	2.2	13.9	7.9	264	8.2	56.5	16.03	116	1.37	1.99	1.48	78	5210.28	6505.68	5867.22	26	0.4	1.67	0.63
DU	163	3.7	14	8.48	164	7	36.8	14.5	85	1.31	1.68	1.46	36	2430.67	6479.39	5915.78	12	0.43	1.2	0.61

Seam	IM				Ash				RD				GCV				TS			
	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean	No.	Min	Max	Mean
E	3	6.9	8.9	7.77	3	11.4	16.6	14.27	3	1.39	1.51	1.46	0	–	–	–	0	–	–	–
F	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
F1	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
F2	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–

IM – Inherent Moisture
RD – Relative Density
GCV – Gross Calorific Value
TS – Total Sulfur

Table 4-4 Drill hole statistics product quality

Seam	Yield				Ash				GCV				TS			
	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean
A	44	20.6	93.4	76.81	45	6.8	19.8	10.79	27	5578.35	6309.7	6007.87	26	0.22	0.78	0.38
B	2	62.3	76.4	69.35	2	13.6	14.77	14.18	2	5809.82	5879.49	5844.65	2	0.38	0.45	0.41
B1	27	8.3	78.4	49.32	26	9.4	22.2	17.43	10	5444.5	6687.32	5759.03	9	0.25	0.5	0.4
B2	37	29.2	83.9	60.77	36	10.8	20.7	16.72	18	5382.36	6037.23	5746.71	16	0.34	0.63	0.41
B234	2	72.9	76.16	74.53	2	10.8	11.78	11.29	1	6037.23	6037.23	6037.23	1	0.36	0.36	0.36
B3	31	16.1	90.5	56.87	31	10.8	30.3	17.55	19	5379.97	6042.01	5755.96	16	0.35	0.63	0.45
B34	1	87.5	87.5	87.5	1	10.8	10.8	10.8	1	5970.31	5970.31	5970.31	1	0.39	0.39	0.39
B4	101	48.2	97.2	74.79	101	9	16.2	12.83	57	5430.16	6352.72	5898.15	52	0.26	0.58	0.4
C	131	55	97.8	81.06	135	4.7	16.6	8.88	99	5611.81	6849.85	6406.62	102	0.26	0.88	0.54
CL	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
CU	10	23.9	74.4	57.05	10	9.1	18.2	13.76	3	6037.23	6658.64	6328.02	2	0.7	0.88	0.79

Seam	Yield				Ash				GCV				TS			
	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean	No.	Minimum	Maximum	Mean
D	3	76.6	83.3	80.87	3	5.7	9.4	8.03	3	6443.54	6615.62	6510.46	3	0.42	0.67	0.54
DL	8	73.5	88.12	79.95	8	6.4	8.4	7.29	7	6531.97	6871.36	6711.57	5	0.44	0.77	0.61
DL1	223	39	98.3	82.95	224	3.6	19.7	6.74	122	5401.48	7234.64	6605.16	132	0.27	0.83	0.52
DL2	223	39	98.3	83.07	224	3.6	19.7	6.72	122	5401.48	7234.64	6605.16	132	0.27	0.83	0.52
DLL	204	40.1	98.3	84.06	203	3.6	15.5	6.27	102	5678.73	7234.64	6690.04	113	0.27	0.83	0.51
DLM	44	66.94	91.4	83.84	44	6.9	10.6	8.32	14	6338.38	6811.61	6622.88	20	0.45	0.81	0.54
DLM1	89	4.2	96.4	80.98	89	4.2	18.7	8.08	45	6338.38	7012.37	6659.32	47	0.42	0.88	0.6
DLM2	203	31.1	94.3	81.27	205	0.87	19.7	8.59	118	5401.48	7045.83	6485.84	125	0.33	0.9	0.55
DU	94	47.4	97.1	81.64	91	5.2	28.8	8.35	88	4703.59	7012.37	6442.16	81	0.36	1.16	0.6
E	2	83.2	94.9	89.05	2	8.1	9.9	9	2	6367.06	6438.76	6402.91	2	0.48	0.52	0.5
F	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
F1	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–
F2	0	–	–	–	0	–	–	–	0	–	–	–	0	–	–	–

4.6.2 Coal Quality

The Project deposit (MLA 70426) comprise five recognised coal seams, designated (in descending stratigraphical order) as A, B, C, D,E and F seams A through D are considered to be economically recoverable. However, at this time only seams C and D are considered to be economically viable via open-cut mining in today's market.

The coal can generally be described as high volatile (30–35%) bituminous with low to moderate ash (8–35 %). The coal exhibits little or no swell characteristics crucible swelling number (CSN <0.5) and compares unfavourably to other Australian coals in pulverized coal injection (PCI) applications due to an inferior replacement ratio. The primary use for this coal is expected to be in export thermal applications.

4.6.2.1 Washability

The washability characteristics of Alpha Coal are considered to be good. There are relatively large proportions of material in the low density fractions (~ 66% mass at F1.40), little near-gravity material and relatively low proportions of high density material (~ 8% mass at S2.00). Figure 4-17 depicts the washability in four size fractions for a mass weighted blend of all the large diameter (LD) working sections excluding out-of-seam dilution. This washability is typical of the Alpha Coal quality data provided.

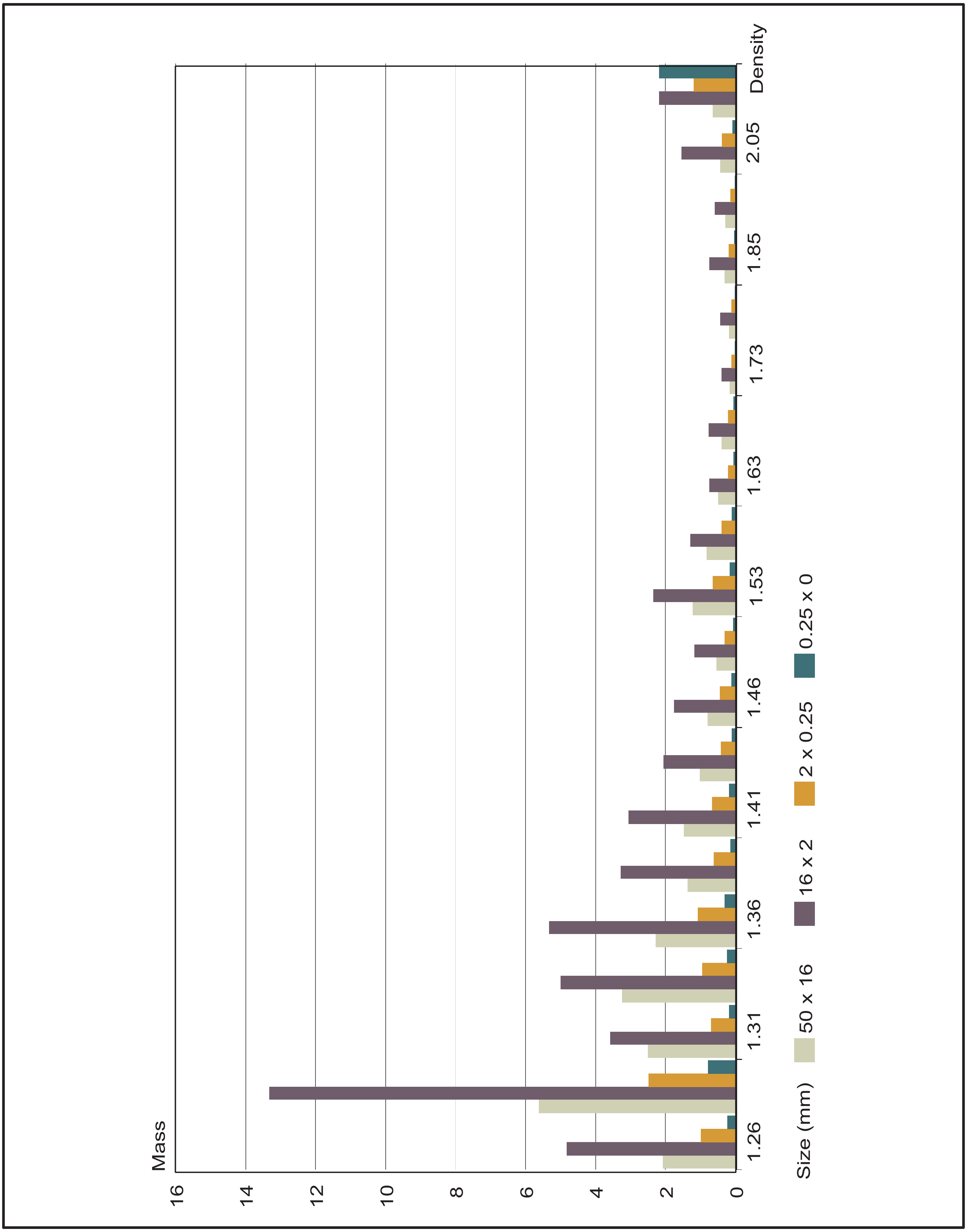
4.6.2.2 Spontaneous Combustion Propensity

A preliminary investigation of the spontaneous combustion propensity of coal from the Alpha Coal Project was conducted by the University of Queensland's Spontaneous Combustion Testing Laboratory (UQSCTL) using an adiabatic oven test procedure that is routinely used by the coal industry to obtain the R70 self-heating rate of the coal. This test also produced a value for the relative ignition temperature of the coal. A large database of R70 and relative ignition temperature values is held by UQSCTL, therefore comparisons between the Alpha Coal Project and other previous studies was used to obtain a relative indication of the propensity of the coal to spontaneously combust.

The samples tested in the adiabatic oven indicated that the R70 values are 3.55 ºC/h and 6.70 ºC/h for ash contents of 25.9% and 18.7%, respectively, on a dry basis. In addition, the relative ignition temperatures range between 132 ºC and 110 ºC. These values indicate the coal has a high intrinsic spontaneous combustion propensity based on Queensland conditions. While these results are not ideal, spontaneous combustion can be managed successfully by using appropriate mining planning techniques.

4.6.3 Mineralogy

The mineralogy of 2,972 samples from 32 bores on site was undertaken using visible, near infrared, short wavelength infrared (vis-NIR-SWIR) reflectance measurements using the HyChips system. The minerals observed included kaolinite, montmorillonite (Al smectite), nontronite (Fe smectite), and white mica.



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Environmental Impact Statement

WASHABILITY FOR BLEND OF ALL SEAMS FROM LD HOLES

Job Number	4262 6580
Revision	A
Date	27-10-2010

Figure: 4-17

File No: 42626580-g-2133.cdr

Test pit floor material is variable with some samples classed NAF and others either UC or PAF. No chemical elements in either the overburden or washery waste material was found to be significantly enriched.

Neutral waters contacting the overburden would remain circum-neutral. Salinity release would be expected to occur over the short term. However, it is not expected to occur in the longer term. Metal and metalloid concentrations of waters contacting the overburden or washery waste are not expected to increase significantly.

Dispersivity testing was conducted on 15 samples selected from overburden and coal washery waste by chemical and physical tests. Results of the testing indicate that the claystone, mudstone, and clays are dispersive or potentially dispersive. The siltstone and sandstone are slightly dispersive and washery waste non-dispersive.

4.6.3.1 Implications

The majority of overburden can be managed as NAF material. However, up to 11% of the overburden waste, comprising stoney coal and mudstone, may have a potential for acid generation and may require special management strategies to prevent acid generation.

The coal washery waste is expected to be net acid generating and will require measures to prevent or control acid generation.

Precautions will be taken to prevent water flow over the dispersive materials of overburden dumps.

Management of poor quality runoff from mine waste rock dumps, the tailings storage facility, and disturbed areas is detailed in EIS Volume 2, Section 11 and Section 16.

4.7 Summary of Exploration Process

The following description of the historical exploration of the Alpha Coal Project is partially sourced from the Golder Associates report (Golder, 2007a).

4.7.1 1970 to 1979

Coal exploration commenced in the area in the 1970s, during which time four exploration permits were explored. Three of these covered the Kevins Corner and Alpha tenements and the fourth covered an area a short distance to the north.

Available historical data suggests that intensive exploration was undertaken within EPC245, covering the current extent of MDL 285. Work concentrated on the evaluation of thermal coal reserves and studies into the potential to produce liquid fuels from coal within the exploration permit areas.

Initial coal exploration was undertaken by the Queensland Department of Mines (QDM) from 1971 to 1972, with results for three drill holes reported in 1973. The drilling indicated the presence of a substantial resource of non-coking, sub-bituminous coal in structurally simple rocks of Late Permian age. The coal resources were identified below a thick Tertiary cover (up to 47 m).

EPC136 was explored by Dampier Mining Company Limited (Dampier) and Queensland Coal Mining Company Ltd (Queensland Coal), both subsidiaries of BHP Limited. Some 148 drill holes were completed by BHP. Five seams were intersected and considered to occur within the Bandanna (A and B) and Colinlea (C, D, E) Formations. Minor coal seams were also identified in deeper, older rocks assigned to the Late Carboniferous Joe Joe Formation. BHP conducted studies into the liquefaction potential of coal within its EPC using hydrogenation and solvent extraction technologies. Coal resources identified during exploration of EPC136 were considered to be uneconomic by Queensland Coal at the time the tenement was relinquished (14 February 1975).

EPC137 was granted to a Joint Venture between Shell Development (Aust) Pty Ltd (Shell) and Western Mining Corporation Ltd (WMC) for three years on 15 February 1974. The exploration permit was relinquished at the end of the second year of tenure upon completion of some fifty drill holes, including five large diameter cored holes. Five seams were identified in the permit area and assigned by Shell geologists to the Late Permian Colinlea and Bandanna Formations. The coal intersected was classified as sub-bituminous, low sulphur, moderate ash (15.5% to 25.8%) coal, with moderate specific energy (22.4 MJ/kg). Bedding was interpreted to dip at between one and two degrees to the west and no major faults were proposed within the Project area. An Indicated Resource of 4.7 billion tonnes was estimated to a maximum depth of 250 m, with little coal being present within 90 m of surface due to the presence of thick Tertiary cover.

EPC244 was granted to Hancock Prospecting Pty Ltd and Wright Prospecting Pty Ltd (HPPL and Wright) in 1978. Some 82 of the 148 holes drilled by BHP under EPC136 occur within EPC244, providing a substantial technical basis for selection and initial exploration of the area. The coal measure stratigraphy defined by HPPL and Wright in the Golder Associates report (Golder, 2007a), supplemented with a description of the individual coal seams by BHP.

4.7.2 1980 to 2007

Coal exploration in the Galilee Basin was subdued during the 1980s and 1990s. Post 2007 there was a rapid upsurge in Galilee Basin coal exploration.

4.7.3 2008 to August 2010

MDL 285, covering an area of 33,706 ha (approximately 337 km^2), was granted to HPPL on 11 March 2008 and is set to expire on the 11 March 2013. Exploration activities to date have been conducted by Salva Resources Pty Ltd with recent exploration activities focused on the planning and execution of an annual drilling program. The purpose of the annual drilling program was to:

- Combine the data yielded with historical data to help develop the Alpha Coal Project;
- Improve the understanding of the coal seams and associated rock units;
- Confirm coal quality and washability characteristics of target seams; and
- Further coal quality characterisation through infill drilling thereby improving JORC status.

A total of 3 drilling campaigns have been conducted within MDL 285 since 2008, the first of which commenced in May and concluded in December of 2008. During this time a total of 153 holes were drilled for 15,714 m and consisted mainly of open holes and partly cored medium diameter (4”) holes. Eight large diameter (8”) holes were also drilled during this period. Down-hole geophysical surveys were conducted on 132 out of the 153 holes using dual density, gamma, calliper, and sonic methods.

A number of confirmation holes were drilled adjacent to historical drill holes during this drilling campaign to address reliability of historical data. Furthermore, a detailed topographic survey was conducted by AAMHatch using the Light Detection and Ranging (LiDAR) technique due to the unavailability detailed topographic data at the time of the commencement of the Pre-feasibility Study

(PFS). The results of the LiDAR survey included high resolution aerial photography with image resolution of 50 cm or better and a new Digital Terrain Model (DTM) accurate to +/- 0.5 m or better for use in the geological model.

A second drilling campaign was conducted from March 2009 to March 2010 involving the drilling of 60 holes for a total of 5,746 m. Drilling consisted primarily of open holes and partly cored medium diameter holes. Ten large diameter holes were also drilled during this period. In addition to these, 12 Rotary Chip holes were drilled for a total of 1,014 m and 12 line of oxidation (LOX) holes were drilled for a total of 846 m. LOX delineation was required to define the initial box cut for mining. Down-hole geophysical surveys were conducted on 49 of the 60 holes drilled using dual density, gamma, calliper, and sonic methods. Exploration drilling during this drilling campaign was more focussed towards better defining the geotechnical aspects of the deposit, pit limits of the proposed open-cut, and updating the coal quality model.

From May to August 2010, 19 holes were drilled for a total of 1,601 m (the third drilling campaign). Drilling consisted mainly of cored holes for geotechnical and coal quality analyses, with the addition of 4 chip holes for geochemical sampling. Down-hole geophysical surveys were conducted on each of the holes with subsequent sampling conducted for geochemical analysis.

4.7.4 Mineral and Petroleum Exploration

Waratah Coal has lodged a number of mineral exploration permit applications over-pegging coal exploration permits held by both Waratah and competitors surrounding the two HPPL MLAs. Golder Associates (Golder, 2007b) suggests that these tenements have been applied for to remove potential for interference in coal exploration and development activities by third parties.

Most of the remaining permit applications covering the Galilee Basin have been lodged by Drummond Uranium Pty Ltd.

The HPPL MDLs are currently over-pegged by a petroleum exploration permit granted to Tri-Star Petroleum Company (EPP668) current until 30 April 2019, and a petroleum exploration permit application lodged by Comet Ridge Ltd (EPP744).

The nearest petroleum well in the area, Jericho 1, drilled in June 1965 and approximately 20 km to the south of Jericho, is more than 50 km from the HPPL MDLs. Only limited seismic surveying has been undertaken in the vicinity of the HPPL MDLs limiting the amount of information available relating to the stratigraphy and structure of the basin in this area.

A single coal seam gas well has been drilled in the area (Splitters Creek 1), approximately 32 km to the east of Aramac ~ 100 km west of the Project area.

4.8 Coal Resources

4.8.1 Geological Modelling

The Mincom's Stratmodel was used for the geological modelling. The model, based on an assessment of geological information, included the following information regarding the coal on site.

4.8.1.1 Weathered zone

The base of weathering was determined by colour change of the lithology. This is shown in Plate 4-14 at 29.61 m. The depth of weathering ranges from 10 m to 70 m with an average depth of 40 m. Base of weathering is used as a coal seam cut-off in the model.

Plate 4-14 Weathering depth defined by colour change

4.8.1.2 A Seam

The uppermost A coal seam occurs in the western half of MLA 70426. It averages 1.5 m in thickness and does not have any splits. It is underlain by the B seam with an average interburden thickness of 18 m.

4.8.1.3 B Seam

The B seam consists of four plies:

- The B1 seam averages 0.8 m in thickness;
- The B2 seam 0.7 m thick;
- The B3 seam 0.5 m thick; and
- The B4 seam 3 m thick.

The interburden between the various splits averages about 0.3 m to 0.5 m and rarely exceeds 1 m.

4.8.1.4 C Seam

The C seam occurs over most of the lease area and is around 2 to 4 m thick. It appears to thicken down-dip in the north-west to around 6 m and thins (< 2 m) towards the south.

Interburden between the B and C seams averages 80 m.

4.8.1.5 D Seam

The D seam occurs over most of the lease area and splits into an upper (DU), middle (DLM), and lower (DLL) section. The middle section splits again.

- The DU seam averages 0.8 m in thickness;
- The DLM1 seam 1 m in thickness;
- The DLM2 seam 2 m in thickness; and
- The DLL seam 2 m.

The interburden between the C and D seams averages 9 m, but ranges up to 20 m.

The seams dip gently to the west generally at < 1°.

4.8.2 Coal Resource Estimation Results

4.8.2.1 Joint Ore Reserves Committee Code Requirements

The Joint Ore Reserves Committee (JORC) Code provides minimum standards for public reporting of Resources and Reserves to the investment community. For coal deposits, the JORC Code is supplemented by the Australian Guidelines for Estimating and Reporting of Inventory Coal, Coal Resources and Coal Reserves (referred to as 'the Guidelines').

The Code and the Guidelines provide a methodology which reflects best industry practice to be followed when estimating the quality and quantity of Coal Resources and Reserves. A Coal Resource is defined as that portion of a coal deposit in such form and quantity that there are reasonable prospects for economic extraction. The location, quantity, quality, geological characteristics and continuity of a Coal Resource are known, estimated or interpreted from specific geological evidence and knowledge. Coal Resources are divided into three categories:

- Measured – for which quantity and quality can be estimated with a high degree of confidence. The level of confidence is such that detailed mine plans can be generated, mining and beneficiation costs and wash plant yields and quality specifications can be determined;
- Indicated – for which quantity and quality can be estimated with a reasonable degree of confidence. The level of confidence is such that mine plans can be generated and likely product coal quality can be determined; and
- Inferred – for which quantity and quality can be estimated with a low degree of confidence. The level of confidence is such that mine plans cannot be generated.

Resources are estimated based on information gathered from points of observation. Points of observation include surface or underground exposures, bore cores, geophysical logs, and drill cuttings in non-cored boreholes. It should be noted that points of observation for coal quantity estimation need not necessarily be used for coal quality estimation.

The estimate is calculated using the area, thickness and in situ density of the coal seam. The basis from which the in situ density is derived will be clearly stated. It is important to note that in situ density is not the same as the density reported by the standard laboratory measurement.

The Guidelines suggest distances that should be used between points of observation when estimating resources:

- Measured – Points of Observation no more than 500 m apart;
- Indicated – Points of Observation no more than 1,000 m apart; and
- Inferred – Points of Observation no more than 4,000 m apart.

4.8.2.2 Resource Estimation Approach and Assumptions

The 2009 drilling program has built on the existing database of both structure and quality. Any old holes for which the data was considered to be unreliable or invalid, have been excluded from the geological model and thus the resource estimate. The Points of Observation used to define the Coal Resources at Alpha are those drillholes with a reliability type of 1, 2 or 3, as shown in Table 4-5.

Table 4-5 Points of Observation Categorisation

<table>
<tr><th>Type</th><th>Point of Observation Description</th><th colspan="4">Value and Use of Point of Observation</th></tr>
<tr><td>1</td><td>Cored and analysed intersection of seam with wireline log, may or may not have lithology log</td><td rowspan="3">Types 1-3
Reliable for structure and thickness</td><td></td><td rowspan="2">Types 1-2
Required for quality confirmation</td><td></td></tr>
<tr><td>2</td><td>Cored and analysed intersection of seam without wireline log, may or may not have lithology log</td><td></td><td></td></tr>
<tr><td>3</td><td>Non cored intersection of seam with wireline log, may or may not have lithology log</td><td></td><td></td><td>Type 3
May support quality</td></tr>
<tr><td>4</td><td>Non cored intersection of seam without wireline log, may or may not have lithology log</td><td></td><td>Type 4
Supportive of structure and thickness</td><td></td><td></td></tr>
</table>

The drill hole spacing for structure and for quality which has been used to define the Resources categories at the Alpha Coal Project (Mine) is as follows:

Measured — Structure – Points of Observation less than 500 m apart

Quality – Points of Observation less than 1,000 m apart

Indicated — Structure – Points of Observation less than 1,000 m apart

Quality – Points of Observation less than 2,000 m apart

Inferred — Structure – Points of Observation less than 2,000 m apart

Quality – Points of Observation less than 4,000 m apart

Resource classification was developed from the confidence levels of key criteria including drilling methods, geological understanding and interpretation, sampling, data density and location, grade estimation and quality (see Table 4-6). This classification was completed in accordance with the guidelines as set out on JORC Code (2004).

4.8.2.2.1 Confidence levels

The Alpha Coal Project resource has been classified as containing Measured, Indicated and Inferred Coal Resources based on the assessment of the input data, geological interpretation and coal quality data. The key criteria assessed as part of the resource categorisation is set out in Table 4-6.

Table 4-6 Confidence Levels of Key Criteria

Items	Discussion	Confidence
Drilling Techniques	Combination of open hole and core (4" air core, HQ and NQ) – Industry standard approach. Cainozoic cover and depth to seams requires HQ wireline drilling in central/western areas which precludes large mass 4" drilling there	Moderate
Logging	Recorded codes match those that have been defined; codes are fitting the deposit and inline with industry practise. Downhole logging is completed on all suitable holes and LAS/graphic output provided. Logs are corrected to downhole geophysical levels as is standard practice.	Moderate - high
Drill Sample Recovery	Core logs generally record recovery and core loss where field geologist identifies recovery issues. Holes with >95% loss are redrilled	Moderate
Sampling Techniques and Sample Preparation	Samples are well identified and recorded with geological logs; sample sheets included in log data	Moderate-high
Coal Quality Data	Coal quality analysis is conducted in experienced, long time established coal labs, with various NATA certifications and Australian Standards, ISO Standards applied. Washability model reduced confidence in wide spaced data areas and in regions with prevelance of old holes	Moderate
Location of Sampling Points	Borehole survey ranges in quality from high precision DGPS to setout collars with hand held stand alone GPS. The lack of survey for some holes with DGPS causes small reduction in confidence; setout locations are available for all holes. Downhole survey is available for recent drilling.	Moderate
Data Density and Distribution	Drilling density supports or exceeds required intervals for the resource allocated	Moderate-high
Audits or Reviews	Several resource estimates have been completed by other parties and reviews have been carried out. Subset of model audited by IMC/Multries March 2010	Moderate - high

Items	Discussion	Confidence
Database Integrity	All historic data was captured from the available reports and was validated before use. Database verification and confirmation drilling undertaken in 2008	Moderate
Geological Interpretation	There is a good understanding of the stratigraphy and structural elements and sufficient data to construct a robust geological model. Coal quality data is adequate to allow definition of product quality.	Moderate
Density	Resource density has been calculated using in situ moisture estimate derived from quality data and ACARP C10042 model.	Moderate
Estimation and Modelling Techniques	Stratigraphic model has been generated using industry standard software and techniques and cross checked with manual samples.	Moderate

4.8.2.2.2 Limits to Resource Areas

The following limits/restrictions have been placed on the resource areas:

- Only within HPPL granted tenure. For Alpha Coal Project this is MDL285, MDL333 and EPC1210. All seams subcrop within MDLs and no resource is present in EPC1210;
- The south eastern corner of MDL333 is included in the Alpha Coal Project (Figure 2-1 in Volume 2, Section 2). The Alpha Coal Project area is covered by MLA 70426;
- Subcrop limits all seams in the east;
- No coal thickness cut-off has been used for resource estimation. In general the seams are thicker than 0.3 metres, except at the subcrop;
- No quality cut-offs have been used;
- The CU, E and F seams have been excluded due to failure to meet thickness, quality or geometry (e.g. ratio) criteria required to be considered for future economic extraction under current mining methods;
- No resource is reported for the B seam within the Torbanite zone mask; and
- No resource is reported for the respective DL seam within the DL seam shale masks.

4.8.2.3 Alpha Coal Project Resource Estimate

The Alpha Coal Project resource estimate is outlined in Table 4-7. It is estimated that the total resources for B, C, and D seams are 1.821 billion tonnes (Bt), of which 821 million tonnes (Mt) are Measured and 700 Mt are Indicated, the balance (300 Mt) are Inferred.

Table 4-7 MDL285 and MDL333 coal resources July 2010

Resource Category	Value	Seam Group				Tonnes Total (Mt)
		A	B	C	D	
Measured	Volume (Mm^3)			155	382	
	Area (Ha)			36	39	
	Thickness (m)			3.2	5.6	
	In situ Density (t/m^3)			1.55	1.52	
	Subtotal Tonnes (Mt)	-	-	**240**	**581**	**821**
Indicated	Volume (Mm^3)		0.60	163	300	
	Area (Ha)		0	36	34	
	Thickness (m)		3.92	3.1	5.4	
	In situ Density (t/m^3)		1.64	1.53	1.50	
	Subtotal Tonnes (Mt)	-	-	**250**	**450**	**700**
Inferred	Volume (Mm^3)	1	23	46	126	
	Area (ha)	1.9	5	10	25	
	Thickness (m)	1.1	6.16	3.2	5.6	
	In situ Density (t/m^3)	1.50	1.76	1.52	1.51	
	Subtotal Tonnes (Mt)	-	**40**	**70**	**190**	**150**
Grand Total Tonnes (Mt)			**40**	**560**	**1,221**	**1,821**

Note for resource table:

- Volumes, areas and tonnages have been rounded and may not total; and
- Coal masses are in situ based on application of in situ moisture model in ACARP C10042 and Preston Sanders formula to adjust density.

4.9 Potential Impacts and Mitigation

Based on the compilation and review of available geology data and mining activities (Volume 2, Section 2), the following potential impacts associated with the geological resources have been identified:

- Floor instability;
- B-C interburden instability;
- Possible Acid Metalliferous Drainage (AMD);
- Possible AMD impacts associated with the CU carbonaceous shale;
- Depressurisation of the C-D aquifer;
- Resource sterilisation;

- Spontaneous combustion;
- Blasting using ANFO;
- Mine efficiency;
- Identification and disturbance of fossils;
- Slaking and tailings; and
- Alteration due to rehabilitation and closure.

4.9.1 Floor Stability

The floor of the D seam comprises relatively competent rock, as testing indicates that the floor of the D seam has the highest strength, straddling two rock classes medium to high strength. Thus the floor should not pose significant instability concerns. However, aquifer pressures (confined D-E sands aquifer) have the potential to cause floor heave (Volume 5, Appendix G Groundwater Technical Report).

Mitigation

Active depressurisation of the D-E sands aquifer may required to reduce the potential for floor heave and minimise the risk of uncontrolled inflows to the floor of the pit. Dewatering systems and impacts have been detailed in EIS Volume 5, Appendix G.

4.9.2 B-C Interburden Stability

The thick (> 60 m) interburden between the B and C coal seams comprises labile sandstone with a clayey matrix and subordinate siltstone. Puggy claystone or clay matrix sandstone is logged within the interburden.

Geochemical studies indicate that the clay-rich sediments are dispersive or potentially dispersive. In addition, this material can have rapid slaking properties, which effects slope stability. The clayey materials will slake on exposure.

The slake-prone strata have clays of high to extremely high plasticity; as such these clays are not suitable for road building (pavement construction) and will tend to adhere to machinery and conveyor belts once they have been exposed to the weather.

The B-C interburden material may, therefore, be of importance to highwall and waste stability considerations.

Mitigation

Good surface water drainage control will be essential to prevent ponding of water as well as traffic-ability and handle-ability problems. Consideration of the puggy claystone or clay matrix sandstone within the interburden must be given when considering high wall slope angles.

Precautions will be taken to prevent water flow over the dispersive materials of overburden dumps.

4.9.3 Acid and Metalliferous Drainage

Preliminary geochemical assessments regarding the potential for the generation of acid and metalliferous drainage (AMD) is discussed in Section 4.6.4. Volume 5, Appendix J (Mine Waste) contains the detailed AMD study. The preliminary results indicate the potential for acid mine drainage, which has implications in terms of waste management, rehabilitation and backfilling, as well as final void considerations.

Mitigation

The stoney coal and mudstone within the overburden has the potential for acid generation and may require special management strategies to prevent/minimise oxidation and thus reduce acid generation.

The coal washery waste is expected to be net acid generating and will require measures to prevent or control acid generation. This has implications for disposal at the tailings storage facility (TSF) and long term impacts of possible acidic and metalliferous seepage.

4.9.4 Upper C Seam Carbonaceous Material

The Upper C seam (CU) includes interbedded stoney coal, puggy clays and carbonaceous shale. This upper zone is not economic due to the inferior nature of the coal bands. The puggy clays within this unit will also present problems for processing.

The carbonaceous shale is potentially acid forming as well as the clay-rich material being dispersive. As it will be necessary to mine the lower seams, the CU will need to be excavated; therefore it needs to be understood in terms of waste disposal.

Mitigation

Consideration of the CU seam must be given when developing the optimum AMD, waste rock, and tailings management schemes.

4.9.5 C-D Aquifer

The main aquifer unit on site within the Bandanna Formation are the sediments comprising the C coal seam, underlying D coal seam, and interburden sediments. The coal seams and interburden are in hydraulic connection and effectively form one hydrostratigraphic unit. This is referred to as the C-D sands aquifer (JBT, 2010a).

High ingress is envisaged to occur from the C-D sandstone aquifer and other higher units, particularly as mining extends to the west and the depth to D seam (and hence thickness of saturated Permian sediments). It's predicted a potential for extensive inflows in areas where coarse sands occur.

Mitigation

In order to ensure a “dry” safe working environment active dewatering will be required within the hanging wall C-D aquifer, as well as the floor. Dewatering behind and within the high wall will ensure reduced pore pressure and ingress, which will reduce pit slope stability risks. EIS Volume 2, Section 12 provides details of the required dewatering.

4.9.6 Resource Sterilisation

Section 4.3 above details the geology underlying the proposed mine infrastructure. The infrastructure is located on the sub outcrop of the Bandanna Formation and Colinlea Sandstone, and younger Quaternary, Tertiary and weathered Permian cover.

It was determined that the E and F coal seams underlie the infrastructure. The E seam is present as two 0.2 m thick clean coal bands (E1 and E2). The F seam displays patchy development and the full geological section can reach in excess of 5 m in isolated areas. However, excessive banding with non-coal parting, excessive and poor coal quality makes the F seam sub-economic. No resource potential by current practices and economic conditions is currently attributed to either E or F seams within the Project area.

The coal associated with the E and F seams below the site is considered sterilised due to the placement of the mine infrastructure. The coal resources associated with the E and F, based on limited available data regarding these seams, are limited and sub-economic due to the poor quality and limited thickness.

Due to the requirement to establish water diversion drains and access corridors at the south and north end of the mine area (Volume 2, Section 2) approximately 18 Mt of coal (within the C and D seams) will be sterilised over the 30 year mine life.

Section 4.7 above details the petroleum and mineral exploration permits granted (over-pegged) on the HPPL MDLs. It is considered that shallow surface mining would not sterilise deep petroleum reserves, should they exist, and that access to these resource would be feasible.

4.9.7 Spontaneous Combustion

The coal is a high moisture, high volatility, low to medium rank thermal coal. These coals have been known internationally to display spontaneous combustion. A 2008 study of borecore from MDL285 revealed steep R70 curves and indicators of a high propensity for spontaneous combustion (Section 4.6.2.2 above).

Mitigation

The deposit run of mine (ROM), product and working places will require attention to detail to prevent spontaneous combustion (Salva, 2010). Management must include consideration of wind direction, compaction, the use of coal wetting systems, and possible burial.

4.9.8 Blasting using Ammonium Nitrate/Fuel Oil

Blasting will be carried out using ammonium nitrate/fuel oil (ANFO) explosive. The average amount of ANFO used per annum is estimated to be approximately 82,000 tonnes. Blasting may be required to maintain productivity of digging in areas where harder bands require drilling and blasting for fragmentation.

The impacts of blasting using ANFO can include increased fracturing and the increase in nitrate concentrations within the groundwater and pit water.

Mitigation

Consideration of a blasting zone around the pit, based on rock mechanics, is required to determine any possible risk to mine infrastructure and neighbouring infrastructure.

An evaluation of the use of ANFO on water resources will be included in the water management studies. Alternative blasting materials and methods could be considered should nitrate concentrations increase to levels which may impact human health or the environment.

4.9.9 Mine Efficiency

The proposed mining methodology was considered to determine the effectiveness in achieving the optimum utilisation of the coal resources within the Project area. The open cut mining using the techniques discussed above will allow for the maximum exposure to the economic C and D seam coal seams across the entire mine lease area. The proposed mining method will also provide access to the A and B coal seams to the west should additional resource evaluation studies indicate that these coal resources are economically viable.

The mine infrastructure is located over the sub outcrop of the E and F coal seams. Current evaluations consider these resources sub-economic, however, the location of the infrastructure does sterilise a portion of these coal seams on the site.

4.9.10 Fossils

Should significant fossil specimens be identified within the mine then steps will be taken to secure and protect the fossils. The Queensland Museum will be notified to allow for the identification and correct preservation and removal.

4.9.11 Slaking and Tailings

The Tertiary strata and some of the Permian deposit contain mudstone, claystone and sandstone, which have a clayey matrix. Sections of the sequence are prone to slaking and thus often rapidly degrade on exposure to air or water. These materials will slake on exposure to water and can lead to handle-ability problems. These materials, if associated with the coal processed in the Coal Handling Preparation Plant (CHPP), can result in:

- Increased fine rejects (tailings);
- Reduced volume of coarse material;
- Difficulties in transport and deposition; and
- Reduction in water recovery due to high water takes (interstitial water).

Results from a single bore test, B1071C, indicates that slaking did not occur from about 9 m above the C seam and in the interburden materials. Thus the likelihood of slaking material being associated and processed with the C and D coal seams is reduced.

4.9.12 Rehabilitation and Closure

Mining will permanently impact on the geological resources within the MLA 70426. Coal, interburden, and overburden will be removed and rehabilitation (backfilling) will result in the alteration to the pre-mining geology.

The mine will develop a closure plan to minimise the impacts and rehabilitate the overburden and soils to restore to pre-mining land use.

The details regarding decommissioning and rehabilitation is presented in this EIS Volume 2, Section 25.

4.10 Infrastructure Corridor Geology

4.10.1 Associated Infrastructure

The mine infrastructure will include:

- Main workshop; warehouse; administration buildings; training and emergency services building; tyre bay; light vehicle workshop; and bucket repair shop;
- Train load out (TLO) facility and rail loop;
- Raw water dams and environment dams;
- Construction camp and main accommodation camp;
- Mine access road;
- Landfill;
- Fire Management System;
- Tailings Storage Facility;
- Quarry/borrow pits;
- Fuel and oil, explosives storage facilities;
- Creek diversions, drainage channels and levee bunds;
- Water and wastewater systems;
- Water treatment plant and sewerage treatment plant;
- Electrical systems; and
- Communications systems.

Volume 2, Section 2 of this EIS presents the location of all the above key components of the Project, including the four proposed open cut pits.

The associated infrastructure is underlain by the same geological units described in Section 4.3 above. The majority of the infrastructure is located adjacent to the open cut pits low walls, to the east. The infrastructure is located on the sub outcrop of the Bandanna Formation and Colinlea Sandstone, and younger Quaternary, Tertiary and weathered Permian cover.

C and D coal seam subcrop in this area while E and F coal seams underlie the infrastructure.

The Colinlea Sandstone and older Joe Joe Formation outcrop within the higher lying areas along the eastern boundary of the Project.

4.10.2 Rail Corridor Geology

The coal mine will be supported by privately owned and operated rail and port infrastructure facilities. At the Project site the coal will be mined, washed and conveyed to a train load-out facility where it will be transported more than 400 km to the east coast of Australia to the port facility of Abbot Point for export.

Volume 3, Section 4 of the EIS contains details of the railway corridor geological information.