VICKERY EXTENSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

SECTION 2

PROJECT DESCRIPTION

WHITEHAVEN COAL

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

2 PROJECT DESCRIPTION

This section describes the Project. Previous mining in the Project area and the Approved Mine (Development Consent SSD-5000) are described in Section 1.2.

Should Development Consent be granted for the Project (which incorporates and extends upon the Approved Mine), subject to the proponent being satisfied with the consent conditions, Development Consent SSD-5000 would be surrendered so that the Project would operate under the new consent only.

2.1 EXPLORATION ACTIVITIES, GEOLOGICAL FEATURES AND COAL RESOURCE

Exploration within the Project mining area has been conducted since the 1970s, with approximately 1,400 exploration holes investigated to date. Whitehaven has also conducted three ground magnetic surveys to evaluate various geological features.

The Project is located within the Gunnedah Basin, which contains sedimentary rocks, including coal measures, of Permian and Triassic age.

Regionally, there are two coal-bearing sequences in the Gunnedah Basin, namely:

- Early Permian Bellata Group (comprising the Maules Creek sub-basin and Mullaley sub-basin, separated by the Boggabri Ridge); and
- Late Permian Black Jack Group.

The Project coal resource is located within the Maules Creek sub-basin of the Early Permian Bellata Group. The target coal seams are contained within the Maules Creek Formation. The Maules Creek Formation is the primary coal bearing unit and consists of conglomerate, coal, lithic sandstone and mudstones.

Below the Maules Creek Formation are the Goonbri and Leard Formations, which are basal units of the Gunnedah Basin sedimentary sequence and unconformably overlie the Boggabri Volcanics. The Goonbri Formation typically contains pyritic sandstone, siltstone and inferior coal seams.

Figure 2-1 presents the indicative stratigraphy of the Project area, including the target coal seams within the open cut extent, as follows:

- Tralee Seam;
- Gundawarra Seam;
- Welkeree Seam;
- Kurrumbede Seam;
- Shannon Harbour Seam (upper and lower seams);
- Stratford Seam (upper and lower seams);
- Bluevale Seam (upper and lower seams); and
- Cranleigh Seam (upper, middle and lower seams).

Individual coal seams range in thickness from approximately 0.5 m to greater than 3 m.

Two major fault structures are located within the Project region, namely the Boggabri Thrust (to the west of the Project) and the Mooki Thrust (to the east of the Project). There are also a number of minor faults across the Project mining area.

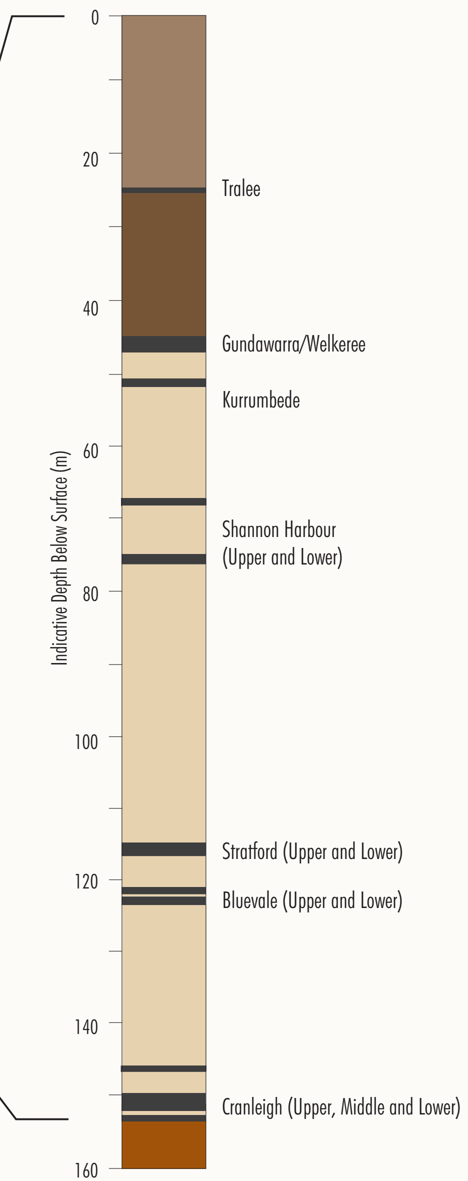
During the life of the Project, exploration activities would continue to be conducted in the Development Application area. These activities, within and external to the open cut footprint, would be used to investigate aspects such as geological features, seam structure and coal/overburden characteristics as input to detailed mine planning and feasibility studies.

Approximately 179 Mt of ROM coal would be mined as part of the Project. ROM coal generated at the Project would be processed to produce a semi-soft coking coal, a PCI coal and thermal coal product for export markets.

A description of the significance of the resource and other Project justification considerations is provided in Section 6.

Project export revenue and NSW Government royalties are described in Appendix J.

BASIN	PERIOD		GROUP/FORMATION	
GUNNEDAH	TRIASSIC	MIDDLE	Napperby Formation	
		EARLY	Digby Formation	
	PERMIAN	LATE	Black Jack Group	
		EARLY	Millie Group	
			Bellata Group	Maules Creek Formation
				Goonbri Formation
				Leard Formation
			Boggabri Volcanics	



LEGEND

- Coal Seam
- Weathered Overburden
- Overburden
- Interburden
- Floor Rock

Source: Engenicom (2012) and NSW Industry and Investment (2011)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Indicative Stratigraphy of the Project Area

Figure 2-1

WHC-15-33 _Sect 2_002B

2.2 PROJECT SUMMARY AND GENERAL ARRANGEMENT

The Project incorporates and extends mining operations of the Approved Mine.

The main activities associated with the development of the Project would include:

- development of an open cut coal mine within CL 316, ML 1471, ML 1718, ML 1464 and MLA 1 in EL 7407 (Figures 2-2 and 2-3);
- use of open cut mining equipment to extract ROM coal from the open cut at an average rate of 7.2 Mtpa over 25 years, with a peak production of up to approximately 10 Mtpa;
- placement of waste rock (i.e. overburden and interburden) in an emplacement to the west of the open cut (i.e. Western Emplacement [Figure 2-2]) and within the footprint of the open cut void;
- construction and operation of mine infrastructure areas, including ROM pads, workshops, offices, a Project CHPP and train load-out facility;
- construction and operation of a Project rail spur and loop (including associated watercourse, powerline and road crossings) to connect the Project to the Werris Creek Mungindi Railway (Figure 2-3);
- on-site excavation and production of waste rock and gravel construction fill materials for use in Project rail spur, mine infrastructure area and road construction;
- receipt of ROM coal transported by road from other Whitehaven mines and processing of this coal at the Project CHPP and/or stockpiling;
- processing of up to approximately 13 Mtpa ROM coal at the Project CHPP (from the combined sources of the Project and other Whitehaven mines);
- rail transport of up to approximately 11.5 Mtpa of metallurgical and thermal coal for the export market (from the combined sources of the Project and other Whitehaven mines);
- mechanical dewatering and co-disposal of coal reject material from the Project CHPP in the Project waste rock emplacement;
- construction of 66 kV/11 kV electricity substations and connection to an existing 66 kV powerline to supply mine infrastructure areas;
- construction and operation of ancillary infrastructure in support of mining, including haul roads, electricity supply, consumable storage areas, explosives storage facilities, light vehicle roads and access tracks;
- construction and use of water supply bores, and a surface water extraction point on the bank of the Namoi River and associated pump and pipeline systems;
- construction and use of dams, sediment dams, up-catchment diversions, channels, dewatering bores and other water management infrastructure;
- construction and use of soil stockpile areas, laydown areas and gravel/borrow areas;
- development of the Blue Vale Road realignment to the east of the open cut;
- closure of a portion of Braymont Road and Shannon Harbour Road;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

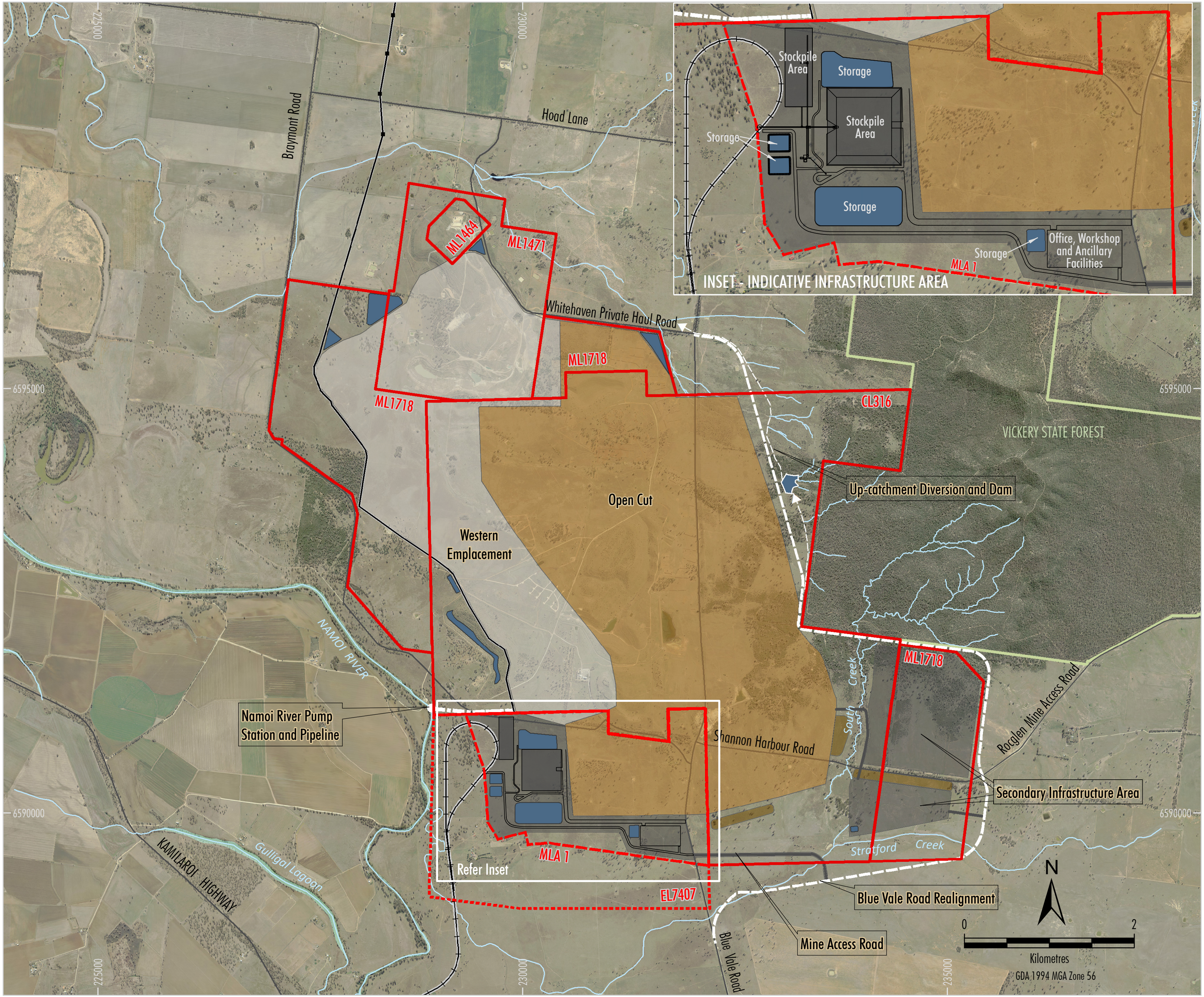
Indicative Project general arrangements for approximately Years 3, 7, 13 and 21 are shown on Figures 2-4 to 2-7.

These general arrangements are based on planned maximum production and mine progression. The mining layout and sequence may vary to take into account localised geological features, coal market quality and volume requirements, mining economics and Project detailed engineering design.

The detailed mining sequence for any given period would be documented in the relevant Mining Operations Plan (MOP).

At the completion of Project mining activities, infrastructure would be decommissioned where an agreement to retain infrastructure is not in place with relevant stakeholders, and final landform earthworks and revegetation would be undertaken. The final landform and rehabilitation strategy for the Project is presented in Section 5.

Table 2-1 provides a summary of the key attributes of the Project.



LEGEND

- Mining Tenement Boundary (ML and CL)
- Exploration Licence Boundary (EL)
- Mining Lease Application (MLA)
- State Forest

Project Components

- Indicative Extent of Open Cut
- Indicative Extent of Out of Pit Waste Rock Emplacement
- Indicative Extent of Infrastructure Area
- Indicative Extent of Soil Stockpile
- Indicative Extent of Water Storage
- Indicative Extent of Coal Stockpile
- Indicative Mine Access Road Alignment
- Indicative Namoi River Pump Station and Pipeline
- Indicative Road Realignment
- Indicative Up-catchment Diversion and Dam Location
- Indicative Rail Spur Alignment
- Indicative Location of Groundwater Bores and Pipeline

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Department of Industry (2015); Essential Energy (2015)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project General Arrangement - Project Mining Area

Figure 2-2

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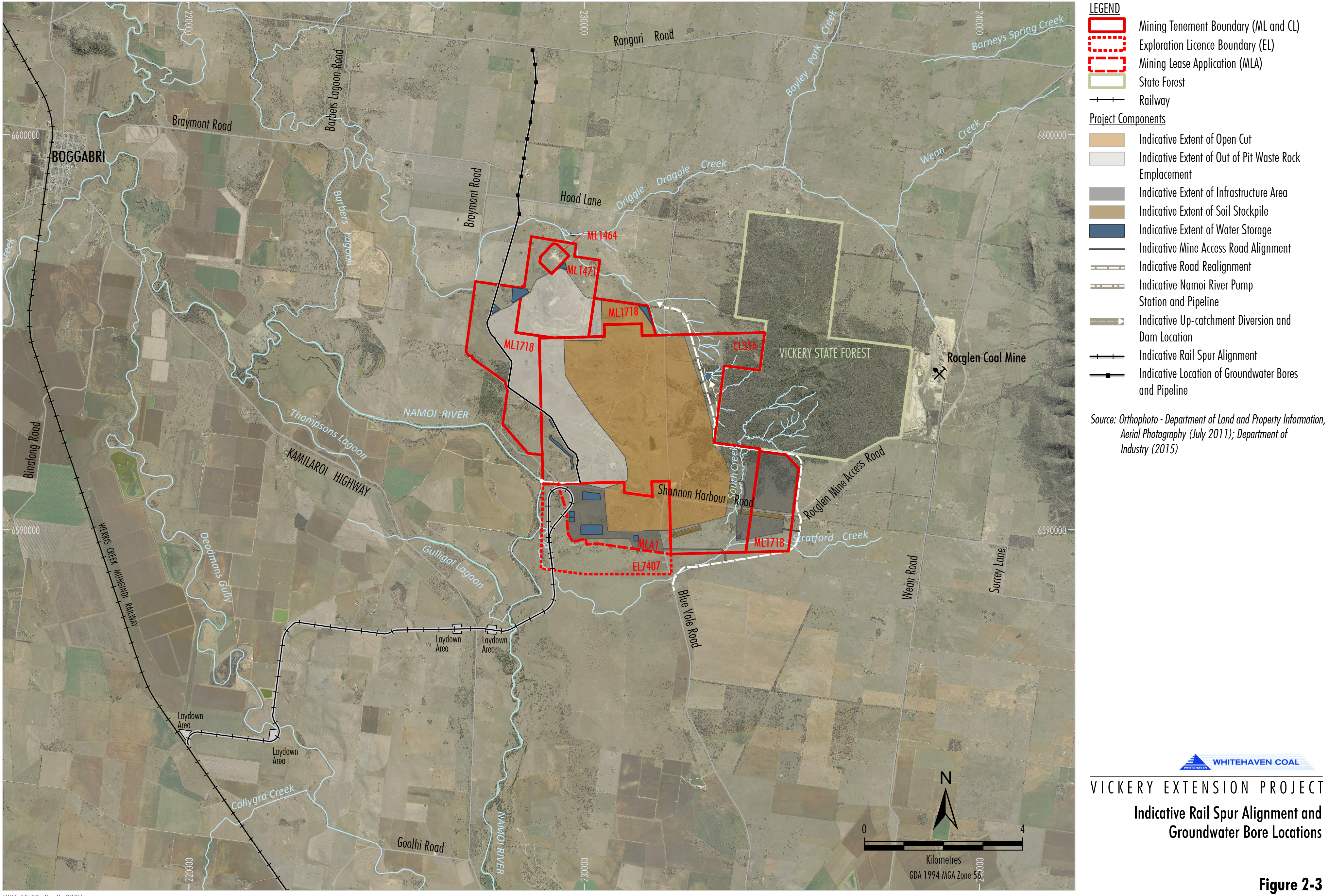


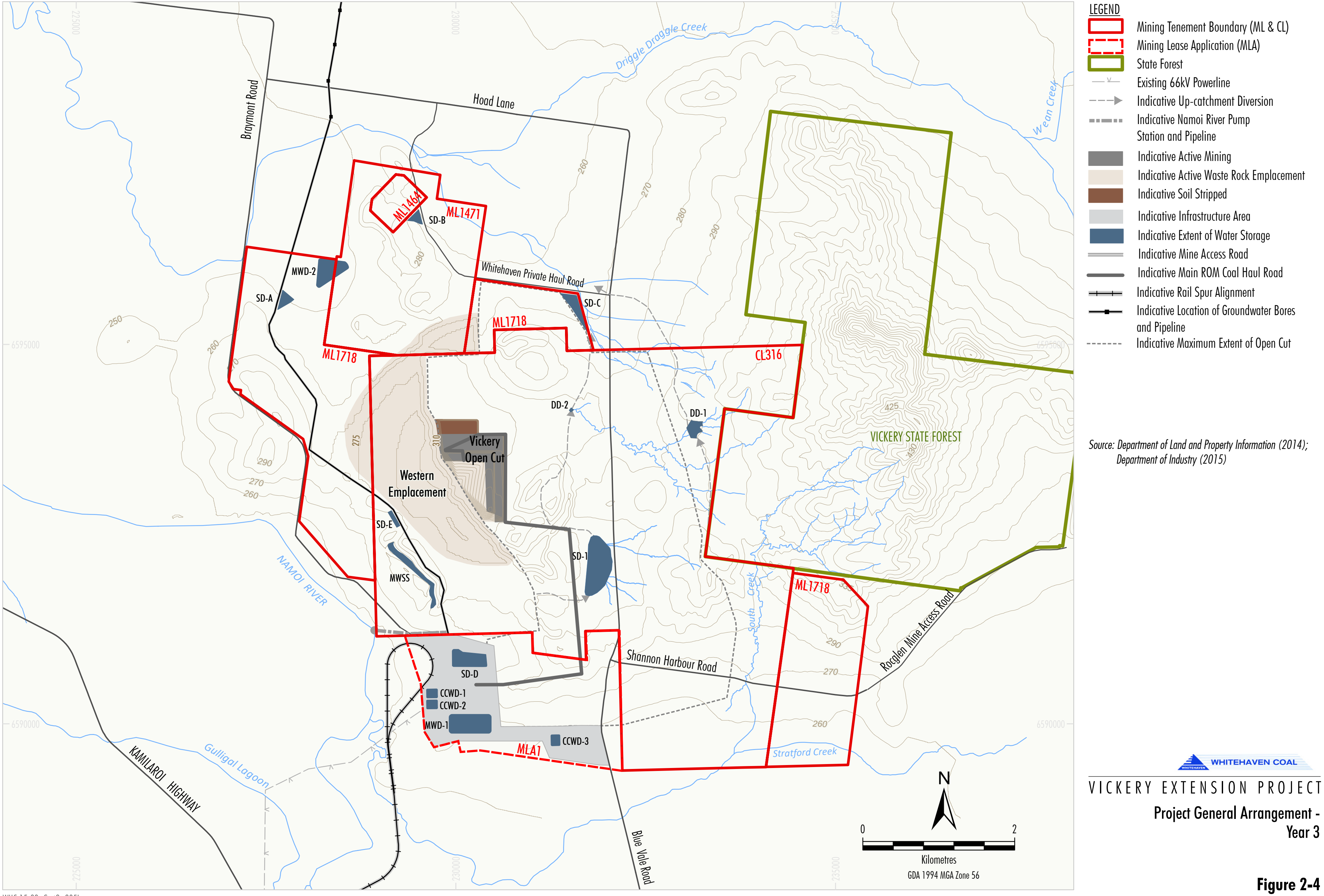
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Indicative Rail Spur Alignment and Groundwater Bore Locations

Figure 2-3

WHC-15-33_Sect2_209H



Source: Department of Land and Property Information (2014); Department of Industry (2015)

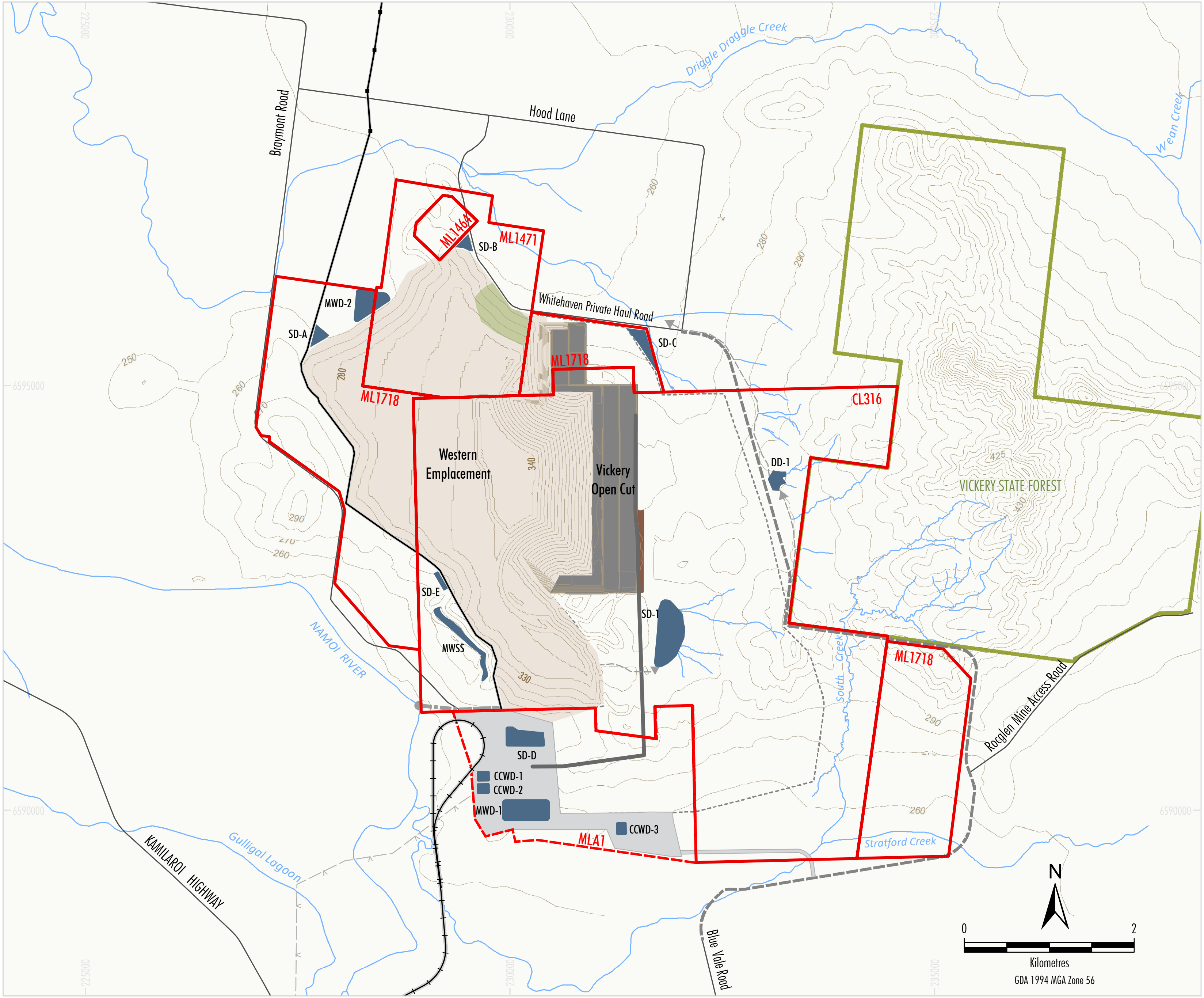
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project General Arrangement - Year 3

Figure 2-4

WHC-15-33_Sect2_205I



LEGEND

- Mining Tenement Boundary (ML & CL)
- Mining Lease Application (MLA)
- State Forest
- Existing 66kV Powerline
- Indicative Road Realignment
- Indicative Namoi River Pump Station and Pipeline
- Indicative Up-catchment Diversion
- Indicative Active Mining
- Indicative Active Waste Rock Emplacement
- Indicative Soil Stripped
- Indicative Initial Rehabilitation
- Indicative Infrastructure Area
- Indicative Extent of Water Storage
- Indicative Mine Access Road
- Indicative Main ROM Coal Haul Road
- Indicative Rail Spur Alignment
- Indicative Location of Groundwater Bores and Pipeline
- Indicative Maximum Extent of Open Cut

Source: Department of Land and Property Information (2014); Department of Industry (2015)

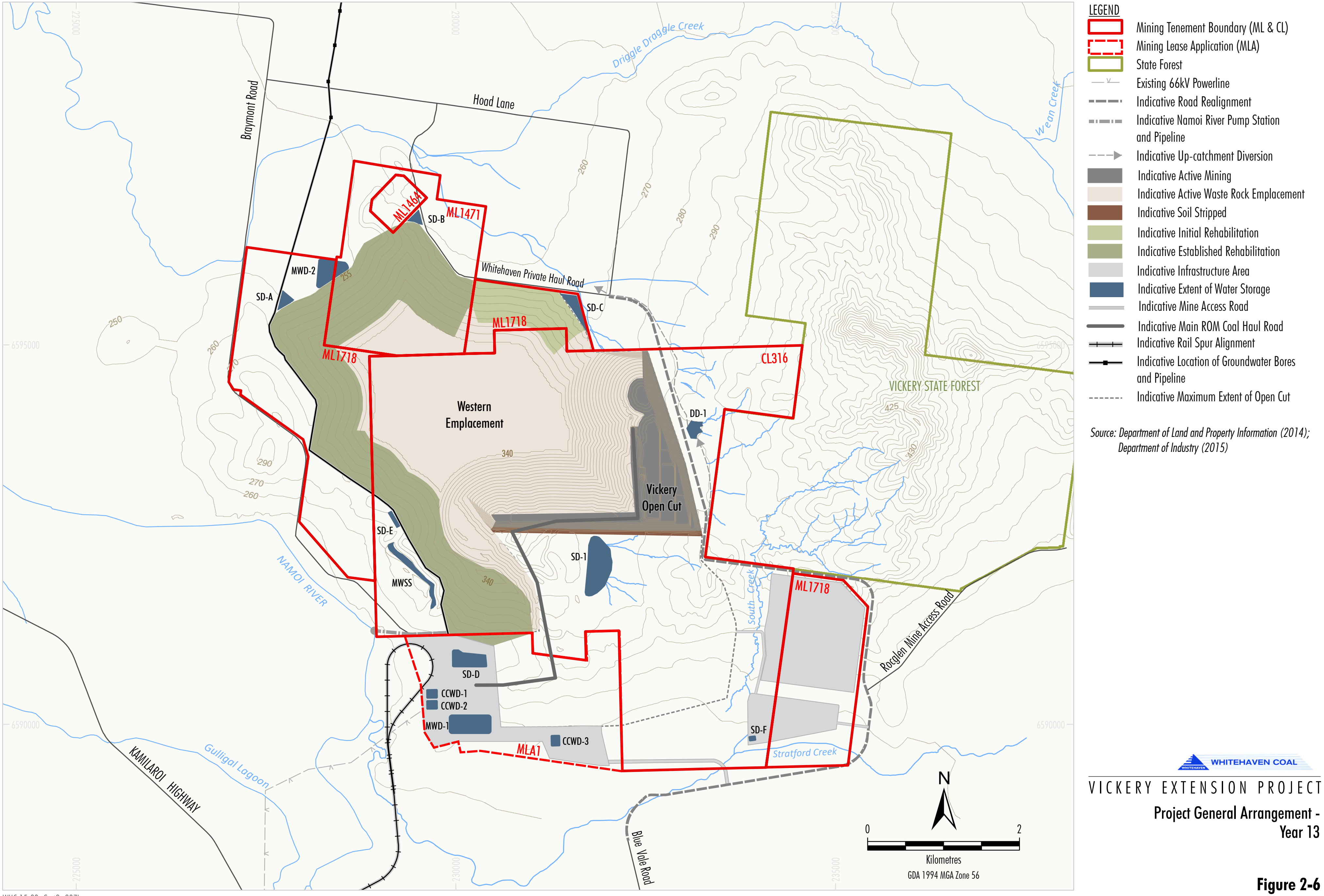
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project General Arrangement - Year 7

Figure 2-5

WHC-15-33_Sect2_206I

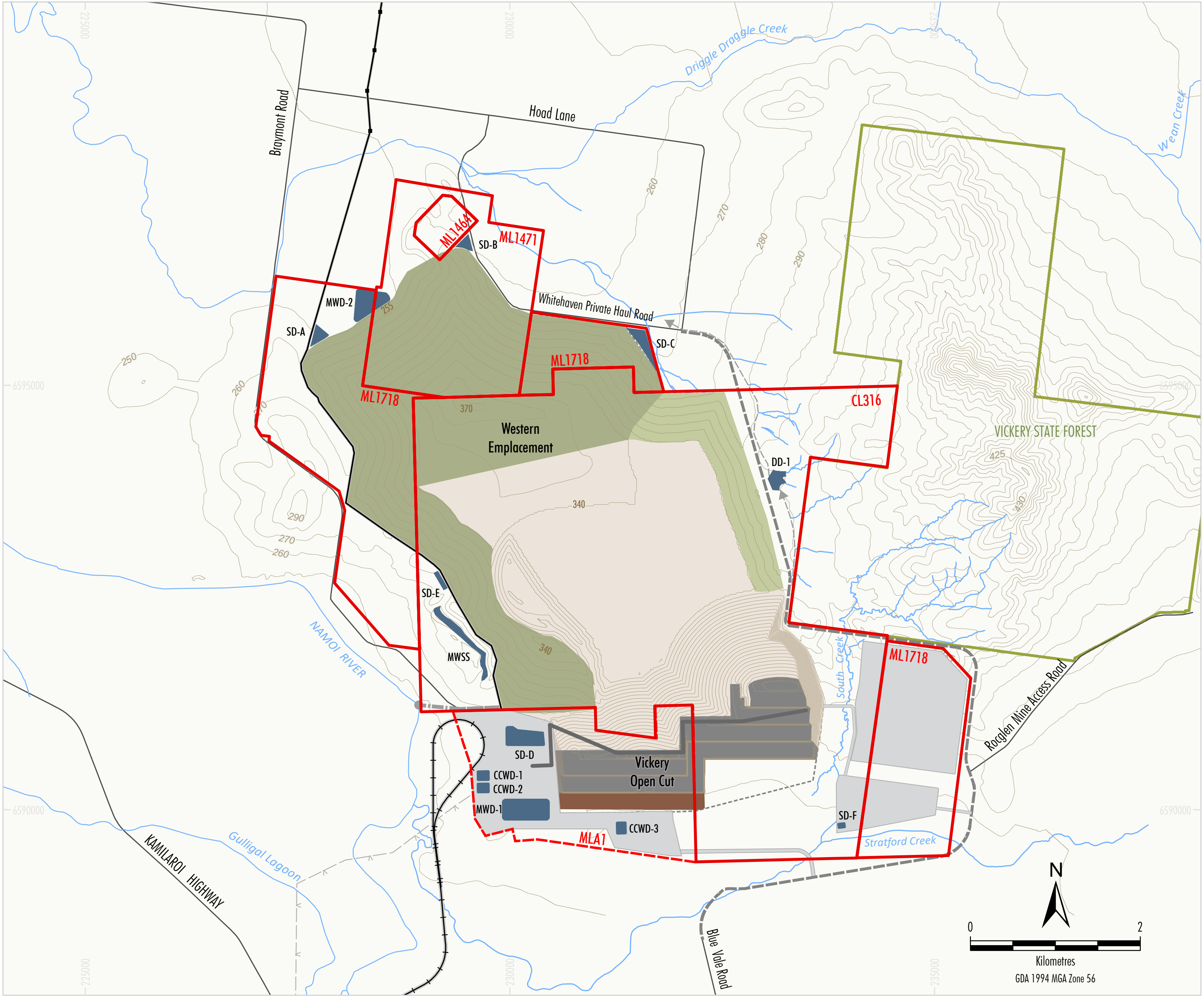


VICKERY EXTENSION PROJECT

Project General Arrangement - Year 13

Figure 2-6

WHC-15-33_Sect2_207I



Source: Department of Land and Property Information (2014); Department of Industry (2015)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project General Arrangement - Year 21

Figure 2-7

WHC-15-33_Sect2_208I

Table 2-1
Summary of Key Project Attributes

Project Component	Summary Description
Project life	▪ Approximately 26 years (one year of construction and 25 years of mining operations).
Mining method	▪ Open cut mining to a depth of approximately 250 m below ground level.
Resource recovery	▪ Approximately 179 Mt of ROM coal from eight target coal seams (Tralee, Gundawarra, Welkeree, Kurrumbede, Shannon Harbour, Stratford, Bluevale and Cranleigh).
Annual ROM coal production rate	▪ Average rate of 7.2 Mtpa over 25 years, with a peak production of up to approximately 10 Mtpa from the Project. ▪ Up to approximately 13 Mtpa ROM coal combined from the Project and other Whitehaven mines (to be transported by truck to the Project for processing and train loading).
Beneficiation	▪ Facilities for the on-site stockpiling and processing of a total of 13 Mtpa of ROM from the Project and other Whitehaven mining operations. ▪ Production of up to approximately 11.5 Mtpa of metallurgical and thermal product coals from the Project CHPP and coal handling facilities (combined from the Project and other Whitehaven mining operations).
Product transport	▪ Until the Project CHPP, train load-out facility and rail spur infrastructure reach full operational capacity, the Approved Road Transport Route would continue to be used to transport Project ROM coal to the Whitehaven CHPP[1]. ▪ Construction and use of train load-out and rail spur infrastructure for the transport of up to approximately 11.5 Mtpa of product coal by rail to market. ▪ All Project coal to be transported off-site by rail, once the Project CHPP, train load-out facility and rail spur infrastructure reach full operational capacity. ▪ An average of five and a maximum of eight loaded train departures per day.
Management of waste rock and coal rejects	▪ Approximately 1,830 million bank cubic metres (Mbcm) of waste rock would be placed in the Western Emplacement and within the footprint of the open cut void. ▪ Co-disposal of dewatered CHPP coal reject material from the Project CHPP and/or Whitehaven CHPP within waste rock emplacement areas.
Public road realignments and closures	▪ Staged construction of Blue Vale Road realignment. ▪ Closure of the southern section of Braymont Road and Shannon Harbour Road.
Water management	▪ On-site water management system comprising water management storages and collection drains, up-catchment diversions, sediment control and open cut dewatering.
Water supply	▪ Mine water supply to be obtained from inflows to open cut areas, sediment dams and storage dams, plus existing surface water and/or groundwater licences as required.
Electricity supply	▪ Connection to the regional electrical grid via an existing dedicated 66 kV powerline and 66 kV/11 kV substations.
General infrastructure	▪ A range of supporting infrastructure within the mine infrastructure area, secondary infrastructure areas, temporary infrastructure area and other ancillary infrastructure.
Workforce	▪ Up to 500 full-time equivalent construction personnel. ▪ Up to 450 full-time equivalent on-site operational personnel.
Rehabilitation	▪ Progressive rehabilitation of waste rock emplacements and surface disturbance areas. ▪ At the cessation of mining, the Project would reduce the number of final voids from five (current landscape) to two (Blue Vale void [existing] and open cut void [the Project]).
Operating hours	▪ Mining, processing and train loading and rail movements on the Project rail spur would occur 24 hours per day, seven days per week. ▪ Road transport of ROM coal mined at the Project would occur between 6.00 am to 9.15 pm Monday to Friday, and 7.00 am to 5.15 pm on Saturday. ▪ Receipt of ROM coal and coal rejects from other Whitehaven operations would occur during the hours specified in the other relevant consent(s).
Estimated capital investment value	▪ Approximately $607 million (Attachment 7).

[1] Refer Section 2.3.4.

2.3 INTERACTIONS WITH OTHER PROJECTS

This section describes the potential interactions between the Project and regional mining activities.

Mining and processing operations with direct potential interactions with the Project are as follows (Figure 1-2):

- Rocglen Coal Mine;
- Tarrawonga Coal Mine;
- Canyon Coal Mine (currently in closure); and
- Whitehaven CHPP.

2.3.1 Rocglen Coal Mine

The Rocglen Coal Mine (Figure 1-2) is operated by Whitehaven. The Rocglen Coal Mine (PA 06 0198) was approved in 2008 to extract 1.5 Mtpa ROM coal for an approved mine life of 12 years.

In September 2011, the Rocglen Extension Project was approved under Part 3A of the EP&A Act (Project Approval 10_0015). The Rocglen Extension Project involved an additional four years of mine life and continuation of the approved extraction rate of 1.5 Mtpa ROM coal.

ROM coal from the Rocglen Coal Mine is trucked along the Approved Road Transport Route to the Whitehaven CHPP for processing (where required) and train loading.

Project Interaction

ROM coal from the Rocglen Coal Mine would be hauled via the Approved Road Transport Route to the Project CHPP. This would be subject to separate modification of the Rocglen Coal Mine Project Approval, if required.

Road haulage of ROM coal from the Rocglen Coal Mine to the Project would be conducted in a manner that is consistent with the haulage of ROM coal from the Rocglen Coal Mine to the Whitehaven CHPP.

2.3.2 Tarrawonga Coal Mine

The Tarrawonga Coal Mine (Figure 1-2) is operated by Whitehaven. The Tarrawonga Coal Mine (PA 11-0047) is approved to extract up to 3 Mtpa until 2030.

ROM coal from the Tarrawonga Coal Mine is trucked along the Approved Road Transport Route to the Whitehaven CHPP for processing (where required) and train loading.

Project Interaction

ROM coal from the Tarrawonga Coal Mine would be hauled via the northern section of the Approved Road Transport Route to the Project CHPP. This would be subject to separate modification of the Tarrawonga Coal Mine Project Approval, if required.

Road haulage of ROM coal from the Tarrawonga Coal Mine to the Project would be conducted in a manner that is consistent with the haulage of ROM coal from the Tarrawonga Coal Mine to the Whitehaven CHPP.

2.3.3 Canyon Coal Mine

The Canyon Coal Mine site (Figure 1-2) was operated by Whitehaven. The Canyon Coal Mine ceased operations in 2009 and is currently in closure, in accordance with the *Closure Mining Operations Plan* (Whitehaven, 2015) and Development Consent DA 8-1-2005.

The Project involves placement of waste rock in the Canyon Coal Mine final void (along with other waste rock emplacement areas).

2.3.4 Whitehaven CHPP

The Whitehaven CHPP is operated by Whitehaven, in accordance with Development Consent (DA 0079-2002). The Whitehaven CHPP is approved to receive and process ROM coal from the Rocglen, Tarrawonga and Sunnyside Coal Mines and the Approved Mine until October 2022.

ROM coal from the Rocglen and Tarrawonga Coal Mines is currently hauled along the Approved Road Transport Route to the Whitehaven CHPP for processing and train load-out.

Project Interaction

Until the Project CHPP, train load-out and rail spur infrastructure reach full operational capacity, the Approved Road Transport Route would continue to be used for transport of Project ROM coal to the Whitehaven CHPP.

Combined transport of ROM coal from the Project, Tarrawonga Coal Mine and Rocglen Coal Mine to the Whitehaven CHPP would not exceed 3.5 Mtpa, or 4.5 Mtpa with the construction of the approved private haul road and Kamilaroi Highway overpass, in accordance with the conditions of SSD-5000, PA 10_0015 and PA 11-0047.

Once the Project CHPP, train load-out and rail spur infrastructure reach full operational capacity, ROM coal from the Project would no longer be processed at the Whitehaven CHPP.

2.3.5 Other Developments

Sunnyside Coal Mine

The Sunnyside Coal Mine (PA 06_0308) (Figure 1-2) is operated by Whitehaven. The Sunnyside Coal Mine is approved to extract up to 1 Mtpa until November 2020.

ROM coal from the Sunnyside Coal Mine is approved to be transported by trucks along public roads (including the realigned Coocooboonah Lane) to the Whitehaven CHPP.

The road transport route used by Sunnyside Coal Mine does not overlap with the Approved Road Transport Route. Therefore, no material interactions between the Project and the Sunnyside Coal Mine are anticipated.

Boggabri Coal Mine

The Boggabri Coal Mine (Figure 1-2) is operated by Idemitsu Australia Resources Pty Ltd (Idemitsu) and is located approximately 12 km north of the Project, immediately adjacent to the Tarrawonga Coal Mine. Operations at the Boggabri Coal Mine commenced in 2006.

The Boggabri Coal Mine received Project Approval (09_0182) in July 2012 for:

- the continuation of operations until December 2033, producing up to 8.6 Mtpa of ROM coal and 7 Mtpa of product coal;
- construction and use of a CHPP and upgrades to other mine infrastructure; and
- construction and use of a private rail spur and loop (including a common section of rail spur with the Maules Creek Coal Mine).

No material interactions between the Project and the Boggabri Coal Mine are anticipated.

Maules Creek Coal Mine

The Maules Creek Coal Mine (Figure 1-2) is operated by Whitehaven. On 23 October 2012, the Maules Creek Coal MIne received Project Approval (10_0138) for a 21 year open cut mining operation with an extraction rate of 13 Mtpa ROM coal, and the construction and use of associated surface infrastructure, including:

- a CHPP;
- train loading facilities; and
- a rail spur and loop connecting to the Werris Creek Mungindi Railway (including shared sections with the Boggabri Coal Mine).

No material interactions between the Project and the Maules Creek Coal Mine are anticipated.

Other Coal Mining Operations

Other developments that are remote from the Project, but may be of potential relevance to future cumulative rail movements and regional population and community infrastructure demand, include:

- Narrabri Coal Mine, operated by Whitehaven;
- Werris Creek Coal Mine, operated by Whitehaven; and
- the approved Watermark Coal Project (SSD-4975), operated by Shenhua Watermark Pty Limited.

Potential cumulative impacts associated with these developments (where relevant) have been considered in this EIS (Section 4).

Regional Oil and Gas Developments

Petroleum Exploration Licence (PEL) 1, which partly overlies the Project area, is held by Australian Coalbed Methane Pty Ltd and Santos QNT Pty Ltd (Santos). It is considered unlikely that any significant or sustained cumulative impacts would arise from the exploration activities being undertaken in PEL 1, as these activities are generally short-term, of a limited extent and will be closely regulated by the NSW Environment Protection Authority (EPA).

PEL 238 is located to the south-west of the township of Narrabri and is held by Santos. Santos has lodged an EIS (Santos, 2017) for the proposed Narrabri Gas Project, which is located wholly within PEL 238 (approximately 35 km from the Project).

There would be no direct interaction between the Project and the proposed Narrabri Gas Project. Relevant cumulative impacts with the Project have been considered in this EIS (Section 4).

2.4 PROJECT CONSTRUCTION ACTIVITIES

Construction would occur during a number of stages over the life of the Project.

The major construction period would be in the first 12 months of the Project.

Construction activities during Year 1 of the Project would be focused on the development of the following key Project infrastructure components:

- mine infrastructure area (incorporating the Project CHPP) and mine access road;
- rail spur and rail loop;
- water management infrastructure; and
- water and electricity supply infrastructure.

Construction activities would generally be restricted to daylight hours and would be conducted up to seven days a week (Section 2.15).

An indicative list of mobile equipment expected to be required for Project construction activities is included in the Noise and Blasting Assessment (Appendix D).

Other construction activities undertaken progressively over the life of the Project would include:

- progressive development and augmentation of dams, pumps, pipelines, up-catchment diversions, drains, storages and other water management equipment and structures;
- progressive development of haul roads, light vehicle access roads and services;
- relocation of public infrastructure and services;
- construction and installation of ancillary infrastructure (e.g. internal roads, electricity distribution infrastructure, explosives storage facilities, potable water supply, sewage treatment facilities, site communications, remote crib huts and security);
- replacement and/or upgrades to open cut mining and coal handling and processing machinery;
- installation or replacement of environmental monitoring equipment;
- construction of the approved Blue Vale Road realignment to accommodate the progressive development of the open cut; and
- construction of secondary infrastructure areas.

2.4.1 Mine Infrastructure Area and Associated Access Road

The mine infrastructure area would be constructed to the south of the Western Emplacement. The mine infrastructure area would include:

- ROM coal and product coal pads and stockpiles, ROM handling and dumping facilities, product coal stacking and reclaim facilities;
- CHPP incorporating coal handling, reject handling, crushing, screening and washing infrastructure;
- rail spur, rail loop and train load-out facilities;
- water and flood management infrastructure;
- administration, crib room, ablution and first aid facilities;
- emergency management facilities;
- light and heavy vehicle parking and delivery facilities;

- bulk fuel, liquid petroleum gas, lubrication and other hazardous goods storage and handling facilities;
- stores, light vehicle and heavy vehicle workshop facilities;
- tyre change and storage facilities;
- communication facilities;
- a laydown and waste management area;
- hot work areas;
- vehicle wash facilities;
- soil stockpiles;
- light and heavy vehicle roads;
- substation and electricity distribution infrastructure;
- sewage and water treatment facilities; and
- other associated minor ancillary infrastructure.

The mine infrastructure area would generally be constructed within the footprint shown on Figure 2-2.

Construction of the mine infrastructure area would be undertaken in stages and augmentations may occur over the life of the Project.

Access to the mine infrastructure area (Figure 2-2) would be one of the initial construction activities. Access roads would initially connect to Braymont Road and the Approved Road Transport Route. Upon closure of Blue Vale Road, the access road would be extended to the Blue Vale Road realignment (Section 2.12.3) as shown on Figure 2-2.

Temporary Infrastructure Area

An existing infrastructure area associated with previous mining activities at the Vickery Coal Mine (Figure 1-3) may be developed into a temporary infrastructure area during the initial stage of the Project.

Consistent with that of the Approved Mine, the temporary infrastructure area may include development of temporary ROM coal crushing and screening facilities, a truck load-out facility, workshops, offices, washdown facilities, laydown areas, fuel storage and associated mining and water management infrastructure.

Development of the temporary infrastructure area would allow for the early commencement of ROM coal mining as it would facilitate road transport of ROM coal to the Whitehaven CHPP prior to the construction of the Project CHPP.

The temporary infrastructure area would no longer be used once the footprint is required for waste rock emplacement.

Secondary Infrastructure Areas

The Approved Mine includes a mine infrastructure area and an Eastern Emplacement to the east of the open cut (Section 1.2). For the Project, these areas would be used as secondary infrastructure areas during the latter stages of the Project as the open cut progresses to the south and east.

The secondary infrastructure areas would be used for laydown and storage areas, vehicle parking areas, waste management areas and/or soil storage areas. If required, mine water surge storage dams, mine water dams and water supply dams would also be constructed within the secondary infrastructure areas.

2.4.2 Coal Handling and Processing Plant and ROM Pad

The Project CHPP would be constructed at the mine infrastructure area for handling, sizing and select washing of ROM coal at the Project.

It is anticipated that construction of the CHPP would take approximately 12 months, with bulk earthworks expected to be completed within the first three months of construction.

A ROM pad for storage of ROM coal prior to processing would also be constructed with associated infrastructure.

Details regarding washing of ROM coal and a conceptual schematic diagram of the CHPP components are provided in Section 2.6.

2.4.3 Project Rail Spur and Rail Loop

The Project would include construction of a rail spur and loop connecting to the Werris Creek Mungindi Railway with an approximate total rail length of 14 km (Figure 2-3).

Laydown areas would be used during construction of the Project rail spur to store materials and equipment (Figure 2-3.)

The eastern part of the Project rail spur would be located on land owned by Whitehaven (Figure 1-5a). Whitehaven has entered into access agreements for the western part of the Project rail spur. The Project rail spur would cross the Kamilaroi Highway and a parcel of Crown Land.

The Kamilaroi Highway rail overpass would be approximately 6.5 m above the existing road level, designed in accordance with relevant Roads and Maritime Services (RMS) and Australian Rail Track Corporation (ARTC) standards. An indicative cross-section of the Kamilaroi Highway overpass is shown on Figure 2-8.

Whitehaven would enter into a Works Authorisation Deed with RMS for works on the classified road network, including the works on the Kamilaroi Highway.

In accordance with the draft *Floodplain Management Plan for the Upper Namoi Valley Floodplain* (Draft FMP), the Project rail spur would be designed to minimise afflux upstream, minimise changes to flood velocities and minimise the diversion of flood flows (Appendix C).

The Project rail spur and loop would generally be an elevated structure with some in-filled embankment sections where conditions permit.

Where the Project rail spur crosses the Namoi River (and Kamilaroi Highway) it would be elevated on a viaduct structure to minimise impacts to the flooding regime and provide sufficient clearance for vehicles travelling along the Kamilaroi Highway. The viaduct structure would consist of spans between piers supporting the rail track. An indicative cross-section of the elevated crossing of the Namoi River is shown on Figure 2-9.

An assessment of the potential impacts on the Namoi River floodplain flooding regime associated with the construction of the Project rail spur is provided in Appendix C.

An unsealed rail service road would also be constructed adjacent to the Project rail spur.

It is anticipated construction of the Project rail spur and rail loop would take approximately 12 months.

Detailed design and construction of the Project rail spur would be undertaken in accordance with relevant engineering standards.

2.4.4 Site Up-catchment Water Management Infrastructure

A permanent up-catchment diversion system would be constructed to divert up-catchment runoff from the Vickery State Forest around the advancing open cut (Figure 2-2).

The diversion system would consist of a diversion dam of approximately 80 megalitre (ML) capacity (DD-1) and two contour drains (one upslope of DD-1 and one downslope) that would run in a northerly direction parallel to the realigned Blue Vale Road and ultimately join a tributary of Driggle Draggle Creek (referred to as the 'north drainage line') (Figure 2-2).

The up-catchment diversion system is unchanged from the Approved Mine.

2.4.5 Water Supply Infrastructure

Namoi Pump Station and Pipeline

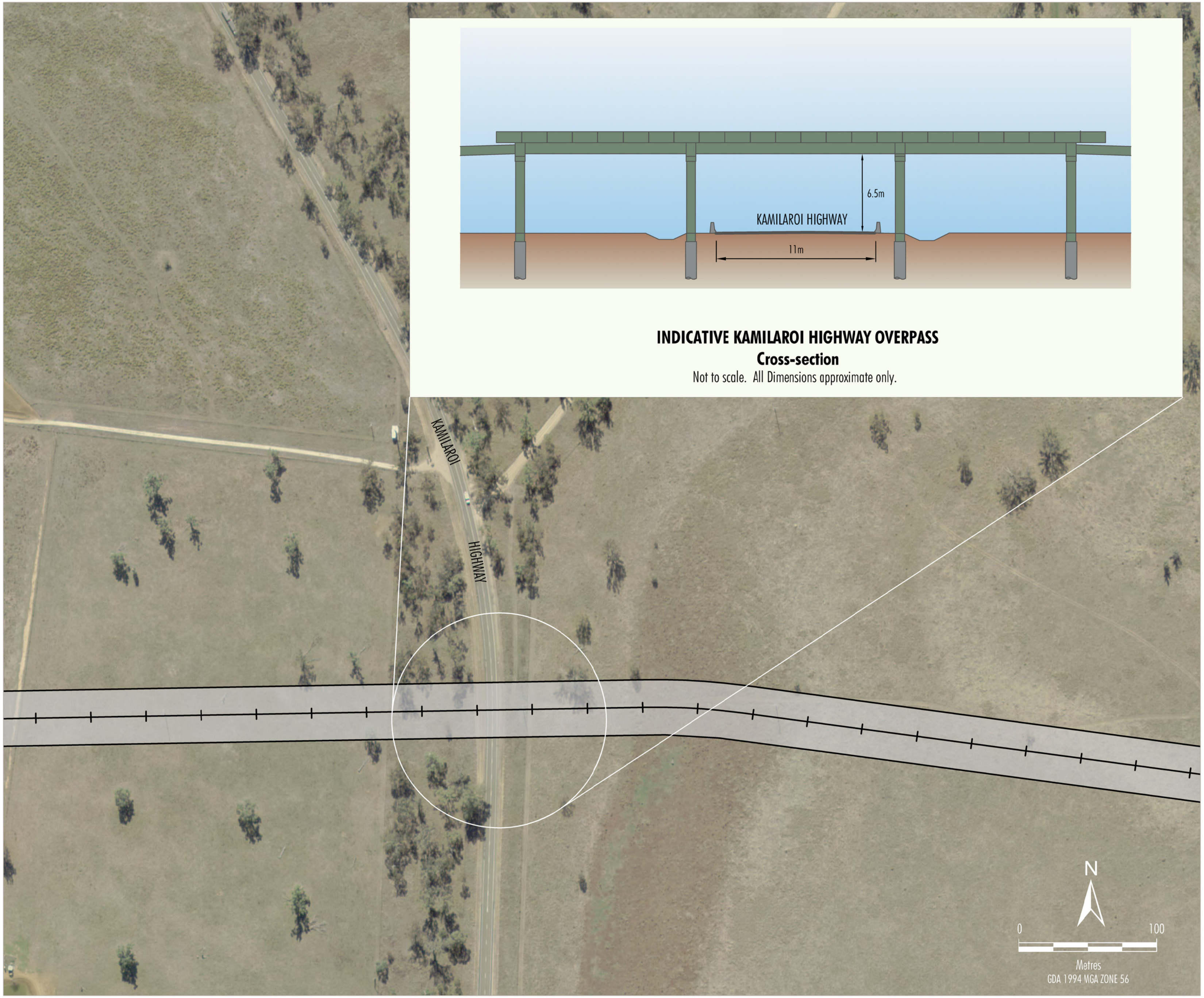
A pump station and associated infrastructure would be constructed near the mine infrastructure area on the eastern bank and within the Namoi River, at the same location as the pump station for the Approved Mine (Figure 2-2). The pump station and associated pipeline would be used to provide make-up water at the Project when required during dry periods, in accordance with Whitehaven's water licences (Section 2.10).

The pipeline would transfer water from the pump station to the mine infrastructure area (Figure 2-2).

Water Supply Borefield

Water supply bores would be constructed for the Project on Whitehaven-owned land along a corridor to the north of the Project (Figures 2-2 and 2-3). It is expected that up to 10 bores would be constructed, along with associated piping and power supply infrastructure.

The bores would be positioned consistent with the requirements of Division 2 of Part 10 of the *Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2003*.



LEGEND
Indicative Rail Spur Alignment

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

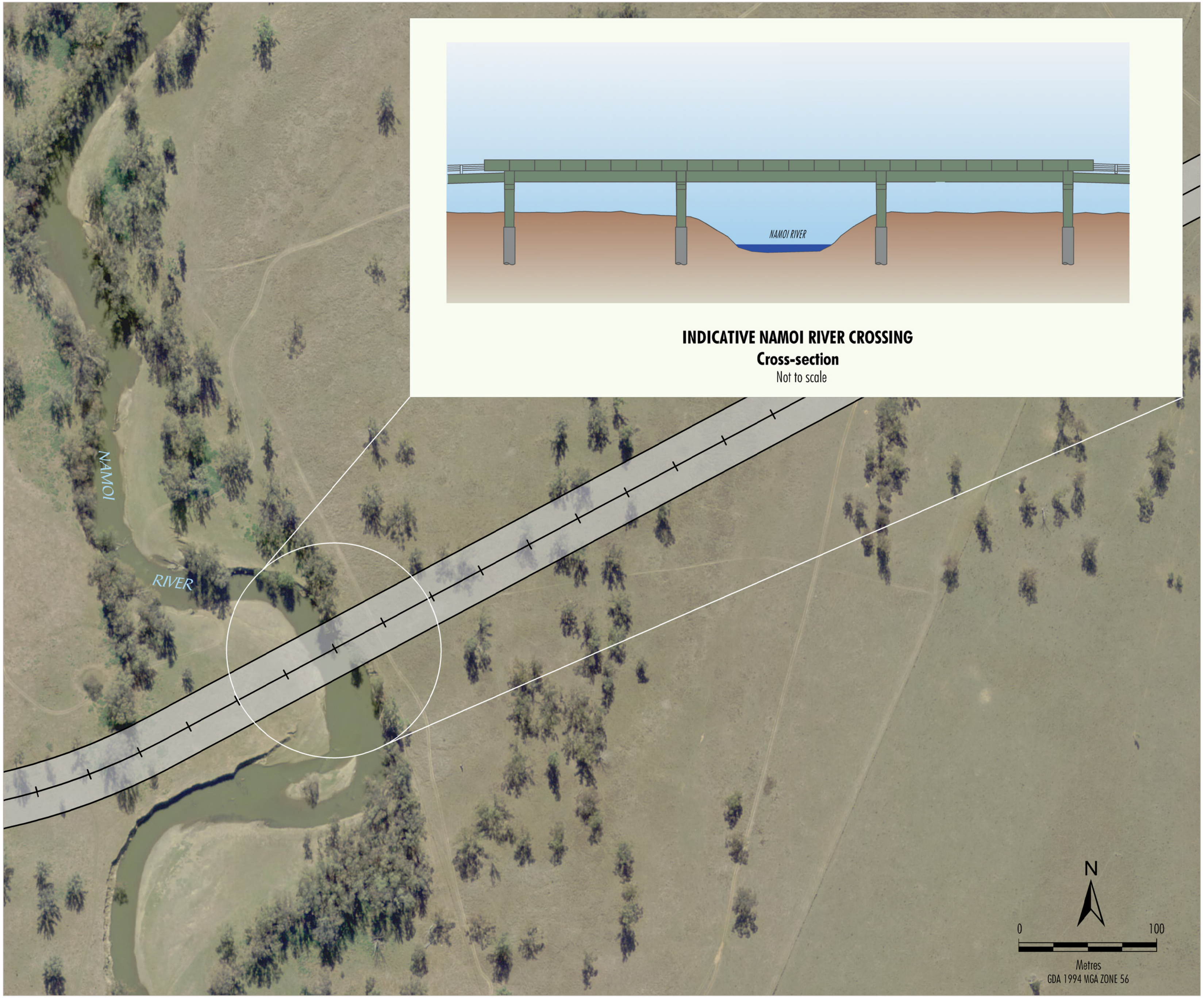
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Indicative Kamilaroi Highway Overpass Design

Figure 2-8

WHC-15-33 EIS_Section 2_103B



LEGEND

Indicative Rail Spur Alignment

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Indicative Namoi River Crossing Design

Figure 2-9

WHC-15-33 EIS_Section 2_102B

The volume of groundwater pumped from the bores would be within Whitehaven's licensed entitlements.

2.4.6 Electricity Supply Infrastructure

A new 66 kV/11 kV substation would be constructed in the mine infrastructure area.

An existing 66 kV overhead powerline (i.e. comprising poles, insulators and electrical conductors) would be realigned within MLA 1 to service the Project.

The realigned 66 kV powerline would then provide electricity to the Project mine infrastructure area for on-site distribution as required. The powerline would also provide electricity to the Namoi River pump station (via a separate substation) and groundwater supply borefield. Project on-site distribution of electricity is described in Section 2.12.5.

Diesel powered electricity generators would also be used during the construction and operational phases of the Project.

2.5 MINING OPERATIONS

2.5.1 Hours of Operation

Project mining operations would be conducted up to 24 hours per day, seven days per week.

2.5.2 Open Cut Extent

The Project would involve expansions to the Approved Mine open cut (Figure 1-4). Up to eight coal seams of the Maules Creek Formation would be mined, with the Cranleigh Seam generally defining the base of the open cut.

It is estimated that approximately 179 Mt of ROM coal would be mined over the life of the Project.

2.5.3 Mining Equipment

The mobile equipment used for the Project would vary according to the requirements of the open cut mining operations. It would include a combination of excavators and/or shovels and haul trucks, with a support fleet that includes dozers, scrapers, graders, front end loaders, drill rigs and water trucks.

An indicative list of major mobile equipment used for impact assessment purposes for the Project is provided in the Noise and Blasting Assessment (Appendix D). Mining equipment would be selected as part of the detailed mine design.

2.5.4 Indicative Mine Schedule

An indicative mine schedule used for impact assessment purposes for the Project is provided in Table 2-2.

Table 2-2
Indicative Mine Schedule

Year	Open Cut Waste Rock (Mbcm)[1]	Open Cut ROM Coal (Mt)[1]
1	-	-
2	12.2	1.0
3	34.0	2.7
4	54.0	4.3
5	74.0	5.5
6	89.0	7.2
7	89.0	8.4
8	89.0	8.5
9	89.0	9.8
10	89.0	9.3
11	89.0	8.8
12	91.9	8.6
13	95.0	8.6
14	95.0	8.3
15	95.0	9.1
16	95.0	9.9
17	95.0	9.6
18	95.0	9.7
19	95.0	9.5
20	90.0	8.9
21	95.0	9.9
22	70.0	7.8
23	55.0	6.5
24	35.0	4.0
25	15.0	2.1
26	5.4	1.1
Total	**1,830**	**179**

Note: Discrepancies in totals due to rounding.
[1] The mining schedule would be regularly reviewed and documented in the relevant MOP.

Construction of the Project is expected to commence in 2019 (Year 1), with the first coal expected to be extracted during the first half of 2020 (Year 2). With open cut mining expected to occur for approximately 25 years, the Project has a total mine life of 26 years.

The staging of the open cut mining operations would be determined by the requirements of the coal market, product specification and/or blending requirements.

As these requirements are likely to vary over the life of the Project, the development sequence of the open cut and coal extraction rates may also vary.

The mining schedule would be regularly reviewed and documented in the relevant MOP.

2.5.5 Vegetation Clearance and Soil Stripping

Progressive vegetation and soil clearing would be undertaken ahead of the advancing open cut mining operation. Specific vegetation clearance procedures are described in Section 5.4.

Soil stripping would be undertaken progressively and stockpiling procedures would aim to minimise soil degradation prior to its use for progressive rehabilitation.

Soil stockpile volumes and locations will vary over the life of the Project. The indicative locations of temporary soil stockpile areas that would be used and then rehabilitated during the mine life are shown on Figures 2-4 to 2-7.

Additional temporary soil stockpiles may be constructed within the approved disturbance area for the Project and/or on unused areas of the waste rock emplacements.

Specific soil management, stockpiling and re-application procedures are described in Section 5.

2.5.6 Overburden/Interburden Mining

Drill and blast techniques would be used for the removal of competent overburden and interburden material for the open cut. A range of explosive materials would be used (Section 2.14).

The number of blast events per week would typically be five, however, up to six blast events per week may occur on some occasions. For the purposes of any conditions, a blast event includes up to three individual blasts located within the boundary of the mine and fired in succession.

Additional blasts, which generate ground vibration of 0.5 mm per second or less at any residence on privately-owned land, or blasts required to ensure the safety of the mine or its workers, may be conducted.

Blast designs and sizes would vary over the life of the Project and would depend on factors such as the depth of coal seams, the design of benches and the proximity to sensitive receivers and infrastructure.

Blast modelling results for the Project are presented in Appendix D.

Following blasting, the overburden and interburden would be moved to waste rock emplacement areas (Section 2.8).

As required, sections of Braymont Road, Blue Vale Road, the Blue Vale Road realignment and Hoad Lane would be temporarily closed for short intervals during blast events that are within 500 m of these public roads (and occasionally larger distances where considered necessary from a safety perspective).

2.5.7 Coal Mining

Approximately 179 Mt of ROM coal would be mined over the life of the Project. By comparison, 135 Mt of ROM coal would be mined over the life of the Approved Mine.

Coal mining would involve loaders, excavators and/or shovels loading ROM coal into trucks for haulage to the ROM pad at the mine infrastructure area via internal haul roads (Section 2.4.2).

ROM coal would be either dumped directly into a ROM hopper feeding the CHPP, or dumped onto a ROM pad.

2.5.8 Landform Profiling and Rehabilitation

Landform profiling and rehabilitation of waste rock emplacement areas would be undertaken progressively over the life of the Project.

Temporary rehabilitation would occasionally be undertaken to stabilise landforms until further mining operations are carried out in the future.

A description of the rehabilitation strategy and proposed post-mine landform and land use for the Project is provided in Section 5.

2.6 COAL PROCESSING

The ROM coal mined during the life of the Project (approximately 179 Mt) would be handled and processed at the Whitehaven CHPP or Project CHPP.

Over the life of the Project, additional ROM coal would be hauled from other Whitehaven mining operations to the Project CHPP by on-road haul trucks. This ROM coal would be placed on the Project ROM pad for subsequent rehandling and processing over the life of the Project.

For impact assessment purposes, based on the indicative mine schedule for the Project (Table 2-2) and indicative ROM coal haulage rates from the Tarrawonga and Rocglen Coal Mines, the total indicative coal processing and production rates for the Project are provided in Table 2-3.

The Project processing rate would be determined by the requirements of the coal market, product specification and/or blending requirements, and may involve processing varying volumes of ROM coal from the other Whitehaven mining operations.

A description of the operation of the Project CHPP is provided below and an indicative materials handling flowsheet is shown on Figure 2-10.

2.6.1 Raw Coal Handling

ROM coal would be reclaimed from the ROM bin via a feeder/primary sizer and conveyed to the secondary/ tertiary sizing station.

Sized coal would be conveyed to a raw coal surge bin or the product coal stockpile (bypass coal).

From the raw coal surge bin, coal would be fed to the coal preparation plant (CPP) for processing.

2.6.2 Coal Preparation Plant

Within the CPP, raw coal would undergo wet sizing. The larger fraction would report to the Coarse Coal Circuit and the smaller fraction would report to the Fine Coal Circuit.

Product coal from both circuits would be conveyed to the product coal stockpile.

Reject material from both circuits would be conveyed to the rejects bin and then co-disposed with waste rock (Section 2.9.3). A portion of the fine reject material would be concentrated in a thickener and dewatered prior to conveying to the reject bin.

2.6.3 Product Coal Handling and Train Load-out

Product coal stockpile infrastructure would include a travelling stacker, dozers, coal valves, reclaim tunnel and associated reclaim conveyors.

Reclaimed product would be conveyed to the train load-out bin for rail transportation to market once the train load-out facility and rail spur infrastructure is commissioned.

2.7 PRODUCT TRANSPORT

2.7.1 Continued Road Transport to the Whitehaven CHPP

Until the Project CHPP, train load-out facility and rail spur reach full operational capacity, transport of ROM coal from the Project by road to the Whitehaven CHPP (Figure 1-2) would be conducted consistent with the Development Consent conditions for coal haulage for the Approved Mine (i.e. up to a total of 3.5 Mtpa, or up to 4.5 Mtpa ROM coal transport subject to the construction of the approved private haul road and Kamilaroi Highway overpass).

Once the Project CHPP, train load-out facility and rail spur reach full operational capacity, ROM coal from the Project would no longer be processed at the Whitehaven CHPP.

2.7.2 Product Coal Rail Transport

Once the Project train load-out facility and rail spur are commissioned, product coal would be conveyed to the train load-out facility located at the rail loop.

Product coal would then be loaded onto trains for transportation to market via the Werris Creek Mungindi Railway and Main Northern Railway.

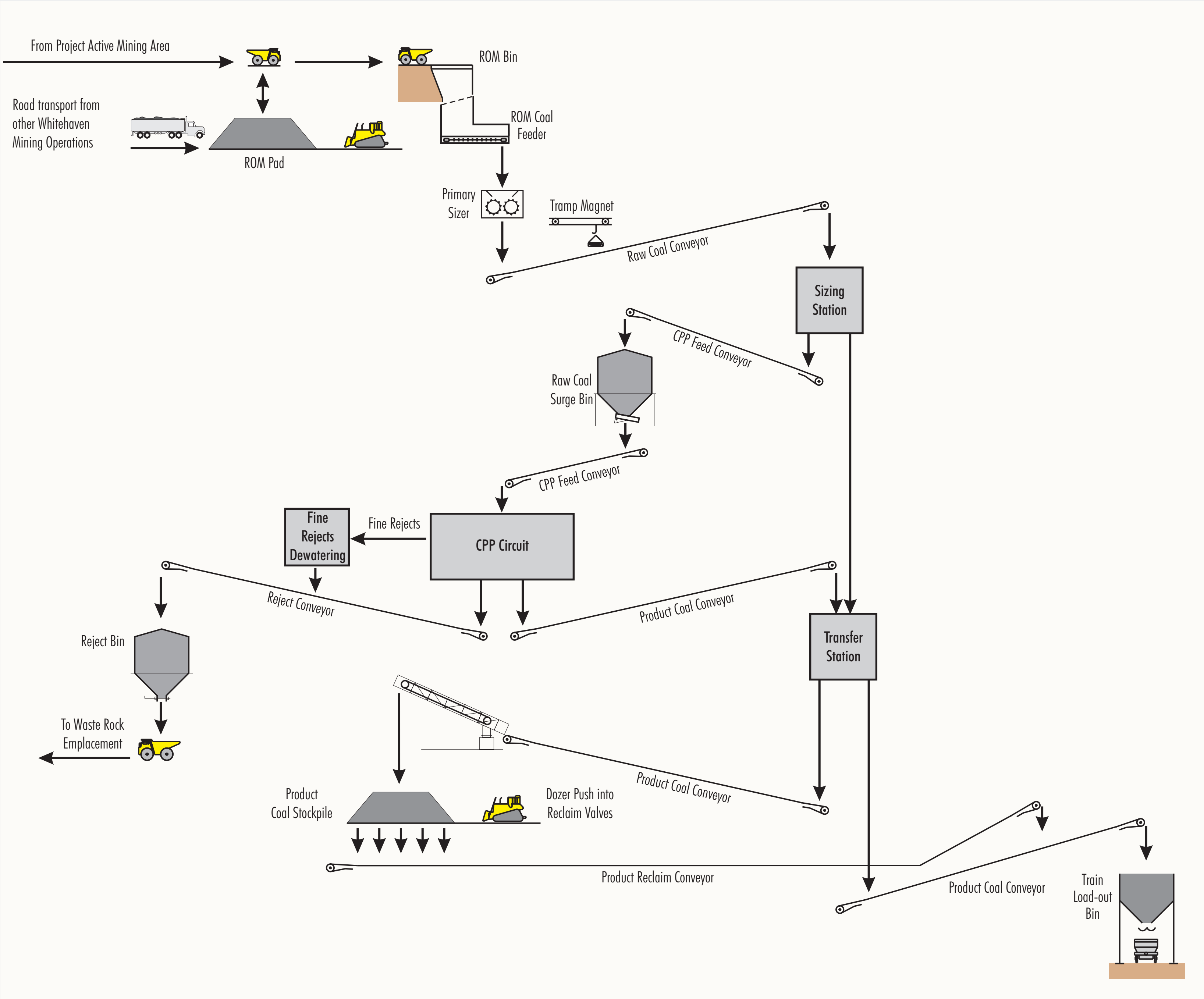
Table 2-3
Indicative Project Coal Processing Schedule

Year	ROM Coal (Mtpa)		
	Project	Other Whitehaven Mining Operations[1]	Total
1	-	N/A[2]	-
2	1.0	2.7	3.7
3	2.7	3.4	6.1
4	4.3	3	7.3
5	5.5	3	8.5
6	7.2	3	10.2
7	8.4	3	11.4
8	8.5	3	11.5
9	9.8	3	12.8
10	9.3	3	12.3
11	8.8	3	11.8
12	8.6	3	11.6
13	8.6	-	8.6
14	8.3	-	8.3
15	9.1	-	9.1
16	9.9	-	9.9
17	9.6	-	9.6
18	9.7	-	9.7
19	9.5	-	9.5
20	8.9	-	8.9
21	9.9	-	9.9
22	7.8	-	7.8
23	6.5	-	6.5
24	4.0	-	4.0
25	2.1	-	2.1
26	1.1	-	1.1
Total	**179**	**33.1**	**212.2**

Note: Discrepancies in totals due to rounding.

1 ROM coal rates used here are for impact assessment purposes only, reflecting Whitehaven's anticipated production schedule at the time of preparation of the EIS. Actual production rates may vary, within approved limits.

2 Prior to the commissioning of the Project rail spur and CHPP ROM coal from other Whitehaven mining operations would be transported to the Whitehaven CHPP in accordance with their respective consents.



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WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project CHPP Indicative Materials Handling Flowsheet

Figure 2-10

Annual volumes of product coal to be transported by rail would vary over the life of the Project, with a peak product rate of approximately 11.5 Mtpa (inclusive of product coal processed on-site from the other Whitehaven mining operations).

An average of 10 train movements per day would be required (i.e. five arrivals and five departures), with a maximum of 16 train movements per day (i.e. eight arrivals and eight departures).

Project train arrivals and departures would occur 24 hours per day.

Coal train capacities may vary over the life of the Project due to progressive rail capacity upgrades and changes to train configurations.

2.7.3 Access to Suitable Rail Capacity

Whitehaven has entered into long-term arrangements with the ARTC for rail track access from Whitehaven's operations to the Port of Newcastle.

Whitehaven regularly reviews its future capacity requirements and, as necessary, consults with ARTC to increase Whitehaven's contracted and prospective rail volumes to the Port of Newcastle to match projected future demand.

Expansion plans of capacity on the single-track section between Narrabri and Muswellbrook (incorporating both the Gunnedah rail system and the Hunter Valley rail system) are described in the ARTC's *2016-2025 Hunter Valley Corridor Capacity Strategy* (ARTC, 2016).

The rail capacity between Narrabri and Muswellbrook is sufficient for current contracted volumes. Potential options to further increase rail capacity between Narrabri and Muswellbrook include progressive lengthening of selected existing passing loops, constructing additional passing loops and continued development of a dynamic pathing system (ARTC, 2016).

In the event that maximum coal train capacity increases, each train would comprise more wagons (or larger wagons), but this would correspondingly reduce the number of train movements required per annum, thereby achieving improved transport efficiency.

A description of the consultation undertaken with ARTC on the Project is provided in Section 3.

2.8 WASTE ROCK MANAGEMENT

2.8.1 Waste Rock Quantities

Approximately 1,830 Mbcm of waste rock would be mined for the Project (Table 2-2).

2.8.2 Waste Rock Emplacement Strategy

Waste rock (including overburden and interburden) would be placed in the Western Emplacement and within the footprint of the open cut void (Figures 2-4 to 2-7).

The Western Emplacement would be constructed to a maximum height of up to approximately 370 m Australian Height Datum (AHD) (Figure 2-7) (approximately 110 m above the nearby floodplains and approximately 110 m lower than the peak of the ridge in the adjacent Vickery State Forest).

Waste rock emplacement areas would be progressively shaped for rehabilitation activities (i.e. final re-contouring, soil placement and revegetation) (Section 5).

2.8.3 Waste Rock Geochemistry

An assessment of the geochemical characteristics of the waste rock material associated with the development of the Project is provided in the Geochemistry Assessment (Appendix M) prepared by Geo-Environmental Management (GEM). A summary of the findings of the assessment is provided below.

Geochemical tests were conducted on 107 overburden and interburden samples from six boreholes distributed across the proposed open cut and adjoining areas. The test work included pH, electrical conductivity (EC), acid base accounting, net acid generation tests, a sodicity assessment, and element enrichment and solubility testwork.

The Geochemistry Assessment concluded that the majority of the overburden and interburden generated from the Project would generally be expected to have a low sulfur content and be non-acid forming (NAF).

A small quantity of overburden, typically identified as non-continuous units adjacent to some coal seams, was identified as containing increased sulfur concentrations but with low acid generating capacity. These materials are anticipated to produce acidic conditions only when left exposed to the atmosphere for a number of years.

Some interburden material (typically mudstone) was identified as containing increased sulfur concentrations and higher acid generating capacity which would have the potential to generate acidic conditions in a shorter period of time (within weeks of exposure to the atmosphere). Blending of this material during excavation, transport and dumping is expected to produce an overall NAF material. Potentially acid forming (PAF) material would not be placed in the final lift of the waste rock emplacement.

The testwork results also showed that the overburden and interburden materials would typically be alkaline and non-saline. A sub-set of samples was selected by GEM for exchangeable cation analysis and determination of exchangeable sodium percent to assess the potential sodicity risk (i.e. risk of being dispersive).

The sodicity test results indicated that the majority of the overburden and interburden material is expected to be non-sodic or slightly sodic, with a relatively minor amount of material expected to be moderately to highly sodic. The mixing process inherent in a large scale multi-seam operation would result in considerable mixing of the relatively small quantity of moderate to highly sodic material with the predominant slightly to non-sodic material, and is expected to produce an overall low sodicity waste rock blend.

In order to ensure long-term stability and erosion control for the waste rock emplacements, any areas of the final overburden dump face that exhibit some erosion would be treated with gypsum.

2.9 COAL REJECT MANAGEMENT

2.9.1 Coal Reject Quantities

Approximately 25 Mt of dewatered coal rejects would be produced from the processing of ROM coal over the life of the Project.

2.9.2 Coal Reject Geochemistry

Coal rejects (coarse and fine) generated by the processing of ROM coal from the Project (i.e. based on Project coal samples) and other Whitehaven mines (i.e. based on samples from the Whitehaven CHPP) were assessed as part of the Geochemistry Assessment.

The coarse component of the reject material is typically expected to be NAF and non-saline. The fine component of the reject material is also typically expected to be NAF and to be slightly to moderately saline. A small proportion of the rejects are likely to have a very low acid neutralising capacity (ANC) and, as such, there is a risk that some of these materials will be PAF. However, due to the low total sulfur content, any PAF coal rejects are expected to only have a low capacity to generate acid.

2.9.3 Coal Reject Disposal Strategy

Dewatered coal rejects from the Project CHPP and/or Whitehaven CHPP would be co-disposed with waste rock. No reject material would be placed within 30 m of the edge of the Western Emplacement, and reject material would be covered with at least 5 m of inert material on the outer surfaces of the waste rock emplacement.

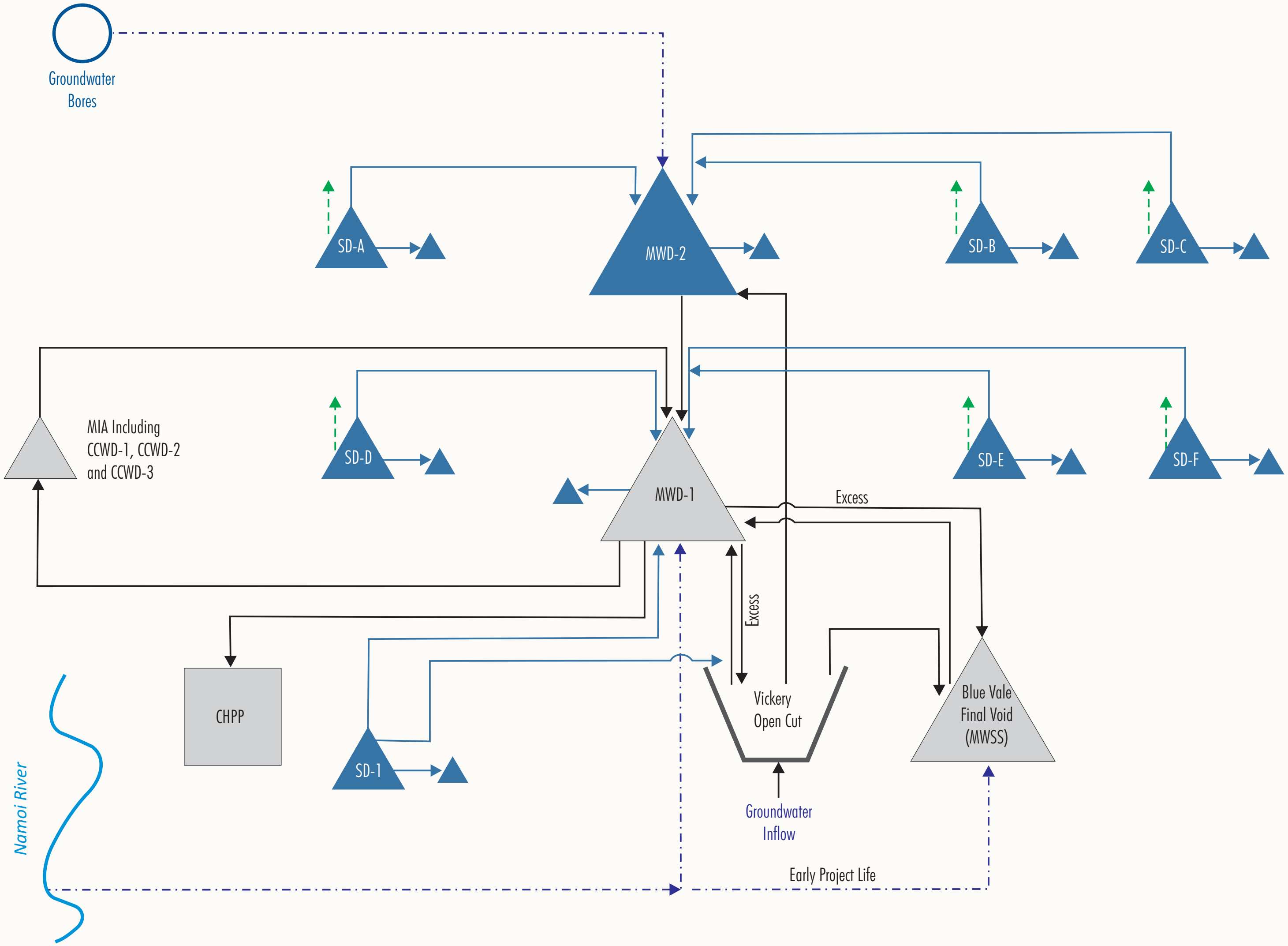
Dewatered reject material would be co-disposed in locations such that any runoff or infiltration would report to the Project Water Management System for mine water (Section 2.10.1). The reject disposal strategy would be provided in the MOP.

Reject material would be periodically sampled during the mine life to confirm geochemical characteristics and to enable the reject disposal strategy to be adjusted as necessary.

2.10 WATER MANAGEMENT

A detailed description of the Project water management strategy is provided in the Surface Water Assessment (Appendix B) prepared by Advisian (2018).

An indicative water management schematic, providing an overview of the water management strategy, is presented as Figure 2-11.



LEGEND
Disturbed Area Runoff Transfer
Mine Water /Coal Contact Water Transfer
Fresh Water Top-up
Controlled Off-site Discharge or Overflow Due to Rainfall in Excess of Design Storm
Dust Suppression Drawn from Mine Infrastructure Area Dams and Reserve Storage in SDs

Notes:

1. All dams are subject to direct rainfall and evaporation.
2. Existing storage dam SD-1 will be used as a water source early in the Project life prior to the commissioning of the other sediment dams. The Blue Vale final void will also be used as a water supply dam early in the Project life and subsequently (once the MWDs as established) as the MWSS.
3. If required, contingency actions including use of the MWSS and/or evaporation cannons and irrigation would be implemented to reduce surplus water.

Source: Advisian (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Indicative Project Water Management System Schematic

Figure 2-11

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2.10.1 Project Water Management System

The objectives and design criteria of the Project Water Management System are consistent with those presented for the Approved Mine, which are to:

- protect the integrity of local and regional water resources;
- separate runoff from undisturbed, rehabilitated and mining affected areas;
- design and manage the system to operate reliably throughout the life of the mine in all seasonal conditions, including both extended wet and dry periods;
- provide a sufficient source of water for use in mining operations, including during periods of extended dry weather;
- provide sufficient storage capacity in the system to store, treat and discharge runoff as required, including during periods of extended wet weather;
- develop facilities required for the long-term functioning of the Project Water Management System as soon as practicable and to minimise the number of facilities that will be removed by mining activities during the Project life;
- avoid the requirement for water to be pumped wherever possible; and
- minimise the number of licensed discharge points.

To effectively develop a Water Management System that addresses the above objectives and design criteria, runoff has been classified into four distinct categories:

- Undisturbed Area Runoff – runoff from catchments that have not been disturbed by mining activities. Undisturbed Area Runoff may be diverted around mining activities to downstream receiving waters.
- Rehabilitated Mine Area Runoff – runoff from rehabilitated mine areas that have established stable vegetation cover. This runoff is expected to have similar water quality characteristics to Undisturbed Area Runoff. The Project Water Management System has been designed to allow runoff from these areas to be discharged without control.
- Disturbed Area Runoff – runoff from active waste rock emplacement areas and areas under active rehabilitation. The Project Water Management System has been designed to capture this runoff in sediment dams and to:
  - either transfer it to the Project Water Management System for re-use in mine operations; and/or
  - discharge off-site after rainfall events that exceed sediment dam design capacity (i.e. to restore their capacity) and subject to achieving the required water quality (50 milligrams per litre [mg/L] total suspended solids).
- Mine Water – water collected in the open cut as a result of runoff from the open cut itself or active waste rock emplacement areas reporting to the open cut and runoff from the mine infrastructure areas. As this water is likely to be high in coal dust, the Project Water Management System is designed to contain and re-use this water on-site.

Water would be required to operate the Project CHPP, for dust suppression on haul roads, washdown of mobile equipment, and for fixed dust emission control sprays. The main water sources for the operation are:

- recovery from dewatered coal rejects;
- catchment runoff and infiltration;
- supplementary licensed extraction from the Namoi River pump station and/or water supply bores (Section 2.4.5); and
- potable water imported to site.

Water used to wash coal would be recycled from dewatered coal rejects/water storage with any necessary make-up water obtained from the mine water dam located within the mine infrastructure area.

A predictive assessment of the performance of the Project Water Management System over a range of climatic scenarios is presented in Appendix B, which demonstrates:

- the Project Water Management System can operate with no uncontrolled overflows to the receiving environment; and
- Whitehaven currently holds sufficient groundwater and surface water licences to account for predicted external water make-up demand.

The progressive development of the Project Water Management System is described and illustrated in Appendix B. The Water Management System accounts for the ongoing development of the mine areas, as well as progressive rehabilitation of available sections of the waste rock emplacements.

The post-mining water management would incorporate some aspects of the Project Water Management System (i.e. some storages and water management structures would be retained as permanent features) (Section 5).

Up-Catchment Runoff Control

Temporary and permanent up-catchment diversion structures would be constructed over the life of the Project to divert runoff from undisturbed areas around the open cut and waste rock emplacement areas.

Stabilisation of the up-catchment diversions would be achieved by the design of appropriate channel cross-sections and gradients and the use of channel lining materials such as grass or rock fill.

The primary up-catchment diversion structure would be the permanent diversion to the north-east of the Project area (Figure 2-2). This permanent diversion would prevent clean up-catchment runoff flowing west from the Vickery State Forest entering the advancing open cut. The diversion system would consist of a diversion dam of approximately 80 ML capacity (DD-1) and two contour drains (one upslope of DD-1 and one downslope) that would run in a northerly direction parallel to the realigned Blue Vale Road and ultimately join a tributary of Driggle Draggle Creek (referred to as the 'north drainage line') (Figure 2-2).

Water captured in DD-1 would either be pumped from the storage for use as mine make-up water (in accordance with harvestable rights), or would overflow into the contour drain and be diverted by gravity around the Project mining area.

Mine Water Dams and Coal Contact Water Dams

Mine water dams for the Project are shown on Figures 2-4 to 2-7. These dams would capture runoff from disturbed areas (e.g. active waste rock emplacement areas). Water captured in the open cut would also be transferred to mine water dams.

Coal contact water dams for the Project are shown on Figures 2-4 to 2-7. These dams would capture runoff from the mine infrastructure areas (e.g. CHPP). Water captured in coal contact water dams would be transferred to mine water dams.

Mine water dams and coal contact water dams have been designed to contain and re-use water on-site. This would involve operating the storages with a maximum operating level to provide freeboard for storm runoff storage. The freeboard for storm storage would be maintained by transferring excess water to other contained storages or, if relevant storages had insufficient freeboard, by pumping or drainage to the open cut.

The existing Blue Vale void would initially be used as the main water storage while the other dams are being constructed. After commissioning the other dams, the existing Blue Vale void would be used to temporarily store excess mine water, consistent with the Approved Mine water management system.

Periodic reviews of the site water balance would be conducted to enable the Project Water Management System to be adjusted as necessary.

Sedimentation Control

Sedimentation control for the Project would be implemented using sediment dams. Sediment dams would contain runoff from partially rehabilitated mine areas that have been shaped to final profiles, covered with soil and seeded.

Sediment dam storage capacity would be restored through transfer of water to other storages or through controlled release via licensed discharge points, in accordance with the requirements of an Environment Protection Licence (EPL) following rainfall events that exceed sediment dam design capacity.

Sediment dams would be maintained until runoff from catchment areas reporting to the sediment dams has similar water quality characteristics to areas that are undisturbed by mining activities (i.e. when vegetation successfully establishes on partially rehabilitated areas).

Outlet structures from sediment dams would also be designed in consideration of the Department of Industry – Water (DI Water) *Guidelines for Outlet Structures* (NSW Office of Water [NOW], 2010).

Transfer of Water

The transfer of water between water storages is integral to the Project Water Management System.

Water transfer infrastructure would include pumps, pipelines and associated power supply. This infrastructure would be developed and relocated progressively over the life of the Project, and as such, this minor ancillary infrastructure is not shown on Figures 2-2 to 2-7.

Flood Bunds

A permanent flood bund around the southern extent of the open cut would be constructed to prevent inundation of the open cut during operations and post-mining.

The permanent flood bund would be designed to a height that would provide protection against the peak flood height associated with a Probable Maximum Precipitation rainfall event.

The width and geometry of the permanent flood bund would be determined during detailed design of the Project, but would be such that it is stable under these extreme flow conditions (Appendix C).

The permanent flood bund would consist of an engineered clay fill core, which would be excavated into the natural surface. Rock fill armouring would be placed on the southern side of the clay fill core. Soil would then be placed on the bund for revegetation.

Further details regarding the design, function and construction of the permanent flood bund are provided in Appendix C.

2.10.2 Water Consumption

The main water requirements for the Project would be for the CHPP make-up supply and dust suppression on haul roads and active waste rock emplacements. Some water would also be used for mobile equipment washdown and other minor non-potable water uses in mine infrastructure areas.

Water required for the Project would be preferentially sourced from mine water dams and other on-site storages. External water supply required over the life of the Project would be sourced from the Namoi River, via the Project pump station and pipeline, or the groundwater supply borefield and associated pipeline to be located to the north of the Project mining area (Section 2.4.5).

The water consumption requirements and water balance of the system would fluctuate with climatic conditions and as the extent of the mining operation changes over time.

The site water balance prepared for the Project (Appendix B) shows that expected external water demands are within Whitehaven's existing groundwater and surface water licensed allocations. If the Namoi River allocation is not sufficient to meet the external demand (e.g. during drought when allocation for Namoi River general security licences is zero), Whitehaven would rely on licensed extraction from the groundwater supply borefield (Section 2.4.5) and/or use chemical dust suppressants to reduce the haul road watering demand.

There may be opportunity to transfer water to or from other mining operations when necessary.

A summary of the estimated Project water demands is provided below.

Coal Handling and Preparation Plant Make-Up

The CHPP make-up water demand is related directly to the rate of ROM coal feed to the CHPP, and the rate of production and moisture content of coal rejects. The gross water demand (i.e. including water re-used on-site) is estimated to be 120 litres per tonne ROM coal based on benchmarking of demands at CHPPs at other Whitehaven operations (Appendix B).

Dust Suppression

Internal haul road and stockpile dust suppression demand was calculated based on estimated areas of the haul roads and stockpiles, and in consideration of daily varying rates of evaporation and rainfall within the climatic sequences modelled for the site water balance (Appendix B).

Irrigation and Evaporation

Excess water held within the Project Water Management System may be used to irrigate land catchments that reports to the Project Water Management System for mine water. Evaporation cannons may also be used in these areas to remove excess water from the Project Water Management System.

2.10.3 Open Cut Dewatering

Predicted groundwater inflows to the open cut over the life of the Project are predicted to be up to approximately 1.5 megalitres per day (ML/day) (Appendix A).

It is considered unlikely that any significant groundwater would accumulate in the open cut after evaporation is considered (Appendix B).

Sumps excavated in the floor of the active open cut would manage any inflows, as well as rainfall runoff.

Water that accumulates in the open cut sumps would be used for dust suppression on Project haul roads and active waste rock emplacement surfaces and/or would be transferred to mine water dams.

Advance dewatering may also be conducted using appropriately licensed temporary bores ahead of the open cut mining operation.

Licensing of the predicted groundwater inflows for the Project are assessed and described in Appendix A, Section 4.4.3 and Attachment 6. Whitehaven currently holds adequate licences to account for predicted groundwater inflows (Appendix A).

2.11 FINAL VOIDS

A final void is a depression below the natural ground level at the completion of open cut mining and closure. There are currently five final voids in the Project area remaining from previous mining operations (Section 1.2.1).

At the cessation of mining, one final void would remain in the south-eastern corner of the open cut (in addition to the existing Blue Vale void) (Table 2-4). The Project would therefore reduce the number of final voids in comparison to the five final voids in the current landscape and three voids proposed for the Approved Mine.

Consideration of alternative Project final void options is presented in Section 6.1.7 of the EIS.

Conceptual cross-sections of the Project final landform are provided in Section 5.

Table 2-4
Final Void Summary

Final Voids	Ultimate Fate of Void	
	Approved Mine Final Landform	Project Final Landform
Existing Final Voids		
Canyon	Filled	Filled
Red Hill	Filled	Filled
Blue Vale	Open	Open
Greenwood	Filled	Filled
Shannon Hill	Filled	Filled
Approved Final Voids		
Northern	Open	Filled
Southern	Open	Open
Total Final Voids	**3**	**2**

Details of the Project final void, including the approximate depth and area, are presented in Appendix B and Section 5.

To reduce the surface area of the final void as far as is reasonable and feasible, waste rock would be progressively placed within the footprint of the open cut over the life of the Project (Figures 2-4 to 2-7). The catchment area reporting to the final void would also be minimised as much as possible through the construction of up-catchment diversions and contour drains around the perimeter of the Project final void, and used as the permanent flood bund.

A water balance for the final void has been prepared for the end of the Project life and is presented in Appendix B, which demonstrates that the final void water level would remain significantly below the crest of the final void.

2.12 INFRASTRUCTURE AND SERVICES

2.12.1 Mine Infrastructure

The mine infrastructure area would be constructed as required during the first year of the Project to the south of the Western Emplacement (Figure 2-2).

Secondary infrastructure areas (Figure 2-2) would be constructed mid-way through the life of the Project to the east of the open cut, within the footprint of the Approved Mine infrastructure area and Eastern Emplacement (Figure 1-3).

The secondary infrastructure areas would support open cut mining operations as they progress towards the south of the open cut extent.

The secondary infrastructure areas may include laydown and storage areas, vehicle parking areas, waste management areas and/or soil storage areas. If required, mine water surge storage dams and water supply dams would also be constructed within the secondary infrastructure areas.

2.12.2 Access Roads and Internal Haul Roads

Access to the mine infrastructure area would initially be via Braymont Road and a private access road from Blue Vale Road. Upon closure of the part of Blue Vale Road to be intersected by the development of the open cut, the access road would be extended to the Blue Vale Road realignment (Section 2.12.3) as shown on Figure 2-2.

Access to the secondary infrastructure areas would be via the realigned Blue Vale Road.

There would also be continued use of ancillary site accesses from Blue Vale Road, Shannon Harbour Road and Braymont Road for environmental monitoring, general land management, exploration activities and other ancillary activities.

Employee, contractor and delivery movements to and from the Project would be managed by the Traffic Management Plan for Whitehaven operations, which would be revised for the Project.

The Project would involve the progressive development of unsealed internal haul roads between the open cut operations, waste emplacements and ROM pad. Active haul roads would be regularly watered to minimise dust generation potential.

Internal access roads for light vehicles would also be constructed progressively within the Project mining area as required.

2.12.3 Blue Vale Road Realignment

The approved Blue Vale Road realignment would be constructed for the Project adjacent to the western and southern boundaries of the Vickery State Forest and around the secondary infrastructure areas to allow continued public access around the Project (Figure 2-2).

The Blue Vale Road realignment would be designed and constructed in accordance with the Austroad Guidelines and in consultation with the Gunnedah and Narrabri Shire Councils.

The Blue Vale Road realignment would generally follow the existing topography, in the section to the south of the open cut and to the west of the Vickery State Forest.

The Blue Vale Road realignment would be designed with the same flood immunity as the existing road (20 per cent [%] Annual Exceedance Probability [AEP] flood event). Appropriately sized culverts would be installed where the road realignment crosses drainage lines, and associated up-catchment drainage infrastructure would be constructed parallel to the road realignment.

Construction of the Blue Vale Road realignment would be undertaken prior to disturbance of Hoad Lane/Blue Vale Road.

During construction of the road realignment, soil would be stripped and stockpiled adjacent to the realigned road corridor (or other suitable previously cleared areas). Stockpiled soil would be used for rehabilitation activities along the realigned road or transported to the Project mining area for use in rehabilitation activities.

The Blue Vale Road realignment would add approximately 5 km to the travel distance along Hoad Lane and Blue Vale Road.

2.12.4 Public Road Closures

Extension of the open cut south of CL 316 into EL 7407 and development of the mine infrastructure area require the closure of approximately 3 km of Braymont Road, from its intersection with Blue Vale Road to the western boundary of CL 316.

There is no privately-owned land along the section of Braymont Road proposed to be closed. Furthermore, Braymont Road, where it runs along the western extent of the Project mining area, is not widely used as a thoroughfare by the public. A Crown Land parcel located adjacent to the Namoi River that is currently accessed from Braymont Road from both the north and south would continue to be publicly accessible from the north.

Closure of part of Braymont Road would prevent graziers from moving cattle from the Travelling Stock Reserve (associated with the parcel of Crown Land near the Namoi River) along the public road to Blue Vale Road. Whitehaven would facilitate continued access for graziers between the Travelling Stock Reserve and Blue Vale Road through Whitehaven-owned land around the mine infrastructure area and across the rail spur, subject to operational and safety requirements.

The section of Shannon Harbour Road west of its intersection with the Blue Vale Road realignment would be closed. There is no privately-owned land on this section of road and the existing Blue Vale Road would remain accessible via the Blue Vale Road realignment.

2.12.5 Electricity Supply and Distribution

Electricity provided by the 66 kV powerline and 66 kV/11 kV substation (Section 2.4.6) would be distributed around the site, to the Namoi River pump station and the groundwater supply bores by above and below ground 11 kV powerlines.

The maximum electricity demand for the Project when fully operational would be approximately 62,700 megawatt-hours per annum.

2.12.6 Raw Water Supply and Potable Water

Raw water would be sourced from the Namoi River pump station and pipeline and the groundwater supply bores (Section 2.4.5).

Potable water would be supplied and transported by a local contractor and stored adjacent to administration and service facilities.

2.13 WASTE MANAGEMENT

The Project would generate waste streams similar in nature to the Approved Mine, as well as an additional waste stream from the Project CHPP (Section 2.9).

The key waste streams generated by the Project would comprise:

- waste rock (as described in Section 2.8);
- coal rejects (as described in Section 2.9);
- recyclable and non-recyclable general wastes;
- sewage and wastewater; and
- other wastes from mining and workshop related activities (e.g. used tyres and waste hydrocarbons).

General waste minimisation principles (i.e. reduce, re-use and recycle) would be applied at the Project to minimise the quantity of wastes that require off-site disposal.

Wastes would be classified in accordance with *Waste Classification Guidelines Part 1: Classifying Waste* (EPA, 2014) and disposed of accordingly, either on-site or off-site.

Sewage and wastewater from on-site ablution facilities would be collected and treated in a biocycle sewage treatment system and serviced by a licensed waste disposal contractor on an as-needs basis. Treated effluent would be irrigated at a small wastewater disposal area in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (NSW Department of Environment and Conservation [DEC], 2004).

2.14 MANAGEMENT OF DANGEROUS GOODS

The transportation, handling and storage of all dangerous goods at the Project would be conducted in accordance with the requirements of the *Storage and Handling of Dangerous Goods – Code of Practice 2005* (WorkCover, 2005) and consistent with the approved methods described in the Approved Mine EIS.

Transport

Dangerous goods required for the Project would be transported in accordance with the appropriate State legislation.

Hydrocarbon Storage

Hydrocarbons used during construction and operation would include fuels (diesel and petrol), liquid petroleum gas, oils, greases, degreaser, kerosene and minor quantities of other hydrocarbons (e.g. acetylene).

Hydrocarbon storage facilities would be operated in accordance with the requirements of AS 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids* and the NSW *Work Health and Safety Regulation, 2011*.

Explosives Storage

Explosive materials required for the Project would include initiating products and bulk explosives. Explosives would be transported, stored, handled and used in accordance with Australian Standards.

Explosive materials would be stored in storage facilities located within the footprint of the Western Emplacement, the open cut or the mine infrastructure area (Figure 2-2). Explosive materials may also be stored in appropriate off-site facilities and transported to site as required.

Throughout the life of the Project, any on-site explosive storages may be relocated to appropriate locations depending on the progression of the open cut.

Chemical Storages and Safety Data Sheets

The management and storage of chemicals at the Project would be conducted in accordance with Whitehaven's prescribed management procedures, Australian Standards and Codes.

2.15 WORKFORCE

The Approved Mine has an approved workforce of approximately 250 full-time equivalent on-site personnel.

At full development, the Project operational workforce would be in the order of 450 full-time equivalent on-site personnel (i.e. an increase of approximately 200 personnel).

Whitehaven would target employment of 10% of the operational workforce being of Aboriginal and/or Torres Strait Islander descent within five years of commencement of operations.

Whitehaven anticipates that the Project operational workforce would be made up of approximately 70% local and approximately 30% non-local hires. For the purposes of impact assessment, it has been assumed that the workforce would reside in the following locations:

- Gunnedah (54% of workforce).
- Boggabri (21% of workforce).
- Narrabri (13% of workforce).
- Manilla (9% of workforce).
- Other (3% of workforce).

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

Nominal Project start and finish shift times at full development are anticipated to be as follows, but subject to change:

- Administration Personnel – 7.00 am to 5.00 pm weekdays.
- Mining Operations (Day) Personnel – 6.30 am to 7.00 pm.
- Mining Operations (Night) Personnel – 6.30 pm to 7.00 am.

Construction/development activities (e.g. construction of the mine infrastructure area and service facilities) would require an additional construction workforce of up to approximately 500 full-time equivalent personnel.

Construction generally requires a labour force with highly specialised skills including specialised welders, fitters, electrical contractors, machinery mechanics and construction engineers. It is therefore anticipated that the majority of the construction workforce would be non-local hires.

Some 90% of the construction workforce is expected to reside in the Boggabri Accommodation Camp (operated by Civeo), with the remaining 10% expected to reside in the local area.

Construction/development activities would generally be undertaken between 7.00 am to 6.00 pm, Monday to Sunday (inclusive). Activities undertaken outside of these hours would include:

- activities that cause $L_{Aeq(15\ minute)}$ (equivalent continuous noise level over a sample period of 15 minutes) of no more than 35 decibels (dB) at any privately-owned residence, or at a higher level that has been agreed with the resident;
- the delivery of materials of which delivery is required, by the NSW Police Department or RMS, to be undertaken for safety reasons outside the normal construction hours; and
- emergency work to avoid the loss of life, damage to property or to prevent environmental harm.