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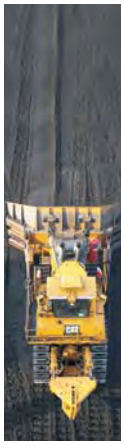
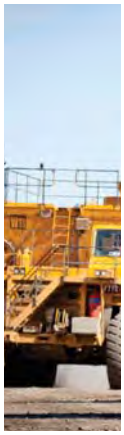
Duralie Open Pit Modification
Environmental Assessment





SECTION 2

EXISTING DURALIE COAL MINE OPERATIONS

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Resource Strategies

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2 EXISTING DURALIE COAL MINE OPERATIONS

DCPL owns and operates the mining operations at the DCM. Coal production commenced at the DCM in 2003 with mining of ROM coal using conventional open pit mining methods.

The DCM currently operates in accordance with Project Approval (08_0203) granted in 2011 by the LEC, and as modified in 2012 for the Duralie Rail Modification.

The DCM operations are supported by on-site facilities including a main infrastructure area, water management infrastructure/storages and rail infrastructure.

The approximate extent of the currently approved surface development (including open pits, waste rock emplacement, soil stockpiles and inundation areas) is also shown on Figure 2-1.

Activities associated with the DCM include:

- development of open pit mining operations in ML 1427 and ML 1646 to facilitate a ROM coal production rate of up to approximately 3 Mtpa;
- open pit mining of the Weismantel Seam in the Weismantel open pit (Figure 2-1);
- open pit mining of the Clareval Seam in the Clareval open pit (Figure 2-1);
- progressive backfilling of the open pits with waste rock as mining develops, and out-of-pit waste rock emplacements, to an elevation of approximately 110 m AHD;
- ongoing exploration activities within existing exploration tenements;
- sized ROM coal rail transport movements on the North Coast Railway between the DCM and SCM via the Duralie shuttle train;
- disposal of excess water through irrigation within ML 1427 and ML 1646;
- development of dewatering bores, pumps, dams, irrigation infrastructure and other water management equipment and structures;
- supporting infrastructure and facilities;
- continued development of soil stockpiles, laydown areas and gravel/borrow pits;
- establishment of a permanent Coal Shaft Creek Diversion alignment adjacent to the existing DCM mining area;
- ongoing monitoring and rehabilitation; and
- other associated minor infrastructure, plant, equipment and activities.

A summary of the existing operations undertaken at the DCM is provided below.

2.1 COAL RESOURCE AND GEOLOGICAL FEATURES

The DCM coal resource is located within the Permian aged Gloucester Basin in NSW.

The Weismantel and Clareval open pits are located in the southern closure of the main synclinal structure of the Gloucester Basin and is associated with the coal bearing strata of the Dewrang Group. The Dewrang Group comprises three main stratigraphic units, namely: Mammy Johnsons Formation; Weismantels Formation; and Durallie Road Formation.

The Gloucester Basin is a fault-controlled depositional trough and subsequent compression tectonics have induced folding, which has accentuated the dip of the strata and, in places, resulted in thrust faulted repetition of the stratigraphic units. The main faulting and fracturing (joints) trend from north-south, east-northeast, and west-southwest in the Project area.

Weismantel Seam

The Weismantel Seam is generally 10 to 12 metres (m) thick. However significant reverse faulting causes repetition of the middle and lower sections of the seam resulting in coal thicknesses of up to 20 m.

Clareval Seam

The Clareval Seam is stratigraphically situated approximately 200 m below and parallel to the Weismantel Seam.

In the Clareval open pit, the Clareval Seam is approximately 8 to 9 m thick, however, sequences of 30 m and up to 50 m thickness exist in the north-west.

2.2 MINING OPERATIONS

DCPL is currently conducting open pit mining at the DCM in the Weismantel and Clareval Coal Seams.

The DCM produces up to 3 Mtpa of ROM coal, operating 24 hours per day.

DURALIE OPEN PIT MODIFICATION

FIGURE 2-1
Existing General Arrangement

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2.2.1 DCM Open Pits

Weismantel Open Pit

The Weismantel open pit is an extension of the original open pit at the DCM (i.e. mined prior to the granting of Project Approval [08_0203]). At the completion of the Weismantel open pit, mining would have occurred along approximately 4 km of the strike of the Weismantel Coal Seam.

The majority of the Weismantel open pit has been backfilled with waste rock (Figure 2-1).

The Weismantel open pit would be up to approximately 90 m deep (i.e. in comparison to the surrounding natural topography).

For the DEP, approximately 4 Mt of ROM coal would be mined from the Weismantel open pit.

Clareval Open Pit

The Clareval open pit forms a strike length pit approximately 2 km long and up to 600 m wide.

The Clareval open pit would be up to approximately 190 m deep (i.e. in comparison to the surrounding natural topography).

Approximately 15 Mt of ROM coal would be mined from the Clareval open pit.

2.2.2 Mining Schedule

Mining at the DCM is scheduled to complete in approximately 2019. The mine schedule includes mining of up to 3 Mtpa.

2.2.3 Mining Method

The DCM is a conventional open pit coal mining operation.

The general sequence of mining at the DCM is as follows:

- vegetation clearance ahead of the mine progression in accordance with vegetation clearance protocols;
- topsoil stripping and stockpiling;
- removal of weathered and weak overburden by excavator;
- drilling and blasting of overburden;
- removal of general non-acid forming (NAF) overburden and trucking to the waste rock emplacement;
- selective mining of potentially acid forming (PAF) overburden for placement with limestone within the waste rock emplacement;
- selective mining of coal and haulage to the ROM pad and DCM coal handling area; and
- progressive backfilling of the open pit with mined waste rock, prior to profiling and progressive rehabilitation.

2.2.4 Mine Progression

The mining progression described in the DEP EA was the completion of mining in the Weismantel open pit followed by mining of the Clareval open pit.

However, the DEP EA stated:

> *The staging of the development of the open pits 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 of the individual open pits and coal extraction rates may also vary.*

The actual progression of mining since approval of the DEP in 2011 has involved the commencement of mining in the Clareval open pit, with mining in the Weismantel pit to be completed at the end of the mine life. Further detail regarding the revised mining progression for the remainder of the DCM life is provided in Section 3.2.4.

2.2.5 Mine Fleet

The currently approved mine fleet at the DCM includes excavators, haul trucks, dozers, graders, water trucks and drill rigs. Further detail regarding the DCM mine fleet is provided in Appendix A.

2.2.6 Overburden Drill and Blast

The method of overburden material removal at the DCM is by drill and blasting techniques.

Overburden material is typically drilled in 15 to 25 m benches. A mixture of ammonium nitrate and fuel oil (ANFO) (dry holes) and emulsion blends (wet holes) are used at an average powder factor of approximately 0.8 kilograms per bank cubic metre (kg/bcm). Blast sizes typically range from 50,000 bank cubic metres (bcm) up to 250,000 bcm.

The approved DCM blast frequency is three blasts per week on average over any 12 month period.

Blasting only occurs between the hours of 9.00 am and 5.00 pm, six days per week (excluding public holidays or Sundays).

2.2.7 Coal Mining, Handling and Transportation

Mining and Handling at the DCM

ROM coal is loaded by excavator into haul trucks from the open pit and transported to the coal handling area at the main infrastructure area (Figure 2-1) for sizing in the rotary breaker.

Sized ROM coal from the rotary breaker is transferred by conveyor to the coal loadout bin for loading to train wagons. Oversized ROM coal reject material (e.g. overburden roof rock and floor rock) from the rotary breaker is periodically trucked to the waste rock emplacement for management along with PAF material (Section 2.2.8).

Rail Transportation to the SCM

Sized ROM coal from the DCM is transported to the SCM on a dedicated train (i.e. the Duralie shuttle train) that runs on the North Coast Railway. The rail transport route from the DCM to SCM is shown on Figure 1-1.

In accordance with Project Approval (08_0203) the Duralie shuttle train is:

- dispatched from the DCM between 6.00 am and 10.00 pm;
- received at the DCM between 6.00 am and midnight; and
- only operated on the North Coast Railway between midnight and 1.00 am in exceptional circumstances (which must be described and reported on the DCPL website).

Rail loading and transport services are provided by a rail contractor (Aurizon) that supplies a dedicated train service and co-ordinates all loading, unloading and train movements with the Australian Rail Track Corporation.

Processing and Transportation at the SCM

Sized ROM coal from the DCM is unloaded at the SCM, where it is blended with ROM coal from the SCM and washed at the SCM Coal Handling and Preparation Plant (CHPP).

The blended product coal is then railed to the Port of Newcastle for export.

The processing of DCM coal at the SCM and transport of product coal from the SCM to the Port of Newcastle is currently conducted in accordance with the SCM Development Consent (DA 23-98/99).

2.2.8 Waste Rock Management

Waste rock mined during the development of the open pits is generally backfilled in the open pit voids with some waste rock emplaced out-of-pit. The mine plan results in the maximum practicable portion of the waste rock being placed within the confines of the pits.

The currently approved height of the waste rock emplacement (i.e. the backfilled open pit) is approximately 110 m AHD.

The waste rock emplacement is shaped by dozer prior to commencement of rehabilitation activities (i.e. re-contouring, topsoiling and revegetation).

Section 5 provides further detail regarding rehabilitation activities.

Waste Rock Geochemistry

A small percentage of the mined waste rock at the DCM is PAF and is managed by selective mining and management in accordance with a Potentially Acid Forming Material Management Plan (PAFMMP) (DCPL, 2013).

PAF management at the DCM includes the following components:

- PAF material identification and separation procedures;
- PAF material storage procedures; and
- monitoring of surface water and groundwater to determine the effectiveness of PAF material controls.

PAF waste material is segregated and selectively handled. Segregation is determined in the field by a suitably qualified person upon consideration of the working bench height, strata dip and thickness of the PAF band. Confirmation of the thickness of the PAF band is periodically assessed by field sampling and laboratory analysis (using net acid generation [NAG] testing).

Limestone is placed on the open pit floor and PAF waste rock emplacement lifts/faces to neutralise any potential release of acid rock drainage products.

PAF material is stored in two distinct manners at the DCM, both in the out-of-pit waste rock emplacement and in-pit waste rock emplacement.

In the out-of-pit waste rock emplacement, the PAF material was encapsulated within constructed containment cells and capped with a clay capping layer.

For in-pit waste rock emplacement, once PAF material has been placed within the designated PAF management area of the open pit, a minimum 20 m layer of NAF material is placed above the emplaced PAF material. Upon final placement of sufficient NAF material to construct the design profile for the given section of the emplacement area, shaping, drainage construction, topsoil placement and revegetation is undertaken.

2.3 EXISTING INFRASTRUCTURE

2.3.1 Main Infrastructure Area

The main infrastructure area is located at the end of the DCM access road (Figure 2-1). Existing infrastructure includes the following:

- administration, workshop, stores and ablution buildings;
- heavy vehicle servicing, parking and washdown facilities; and
- sewage treatment facilities.

2.3.2 Water Management Infrastructure/ Storages

Existing and/or approved water management infrastructure at the DCM includes the following:

- Main Water Dam (MWD) and Auxiliary Dams (No. 1, No. 2 and No. 3) (Figure 2-1);
- Coal Shaft Creek Diversion, diversion dams and sediment dams (Figure 2-1);
- irrigation systems (including travelling irrigators, fixed sprays, pumps, pipelines and irrigation monitoring equipment); and
- open pit and sediment dam dewatering pumps and pipelines.

Further description of the existing water management system at the DCM is provided in Section 2.4.2.

2.3.3 Rail Infrastructure

Existing rail infrastructure at the DCM includes a rail siding (off the North Coast Railway), coal loadout bin (Figure 2-1) and associated conveyor systems.

2.3.4 Electricity Supply and Distribution

The electricity supply and distribution system at the DCM is fed by an 11 kilovolt (kV) distributor line that runs along The Bucketts Way and a spur off this line that supplies the main infrastructure area.

A private substation (owned by DCM) provides an 11 kV/415 volt supply which is reticulated around the site at variable voltages according to requirements.

2.3.5 Other Supporting Infrastructure and Services

Other existing infrastructure and services located at the DCM include:

- DCM access road off The Bucketts Way;
- minor internal roads, haul roads and heavy vehicle hardstands;
- potable water holding tank at the main infrastructure area for potable water supplied by MidCoast Water;
- gravel pits and quarry;
- explosives storage;
- communication systems;
- electricity transmission line, sub-station and on-site electrical distribution systems; and
- other ancillary infrastructure (e.g. diesel/oil tanks/storage, pumps and pipelines).

2.4 WATER MANAGEMENT

2.4.1 Water Supply and Demand

Dust suppression represents the only significant water requirement at the DCM. Water is also required for washdown of mobile equipment and other minor non-potable water uses (e.g. fire fighting).

Water captured by the water management system (Section 2.4.2) from rainfall runoff and groundwater inflow to the open pit is used to meet the on-site water demand. As there is limited water demand the water balance at the DCM is generally in surplus, and therefore, DCPL does not require water from external water supplies (e.g. groundwater bores or surface water entitlements).

Excess water captured by the water management system is disposed through on-site irrigation.

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

2.4.2 Water Management System

The water management system at the DCM comprises the following:

- water management storages;
- diversion of runoff from catchment areas upslope of the mine disturbance area;
- runoff control on disturbed and rehabilitated areas at the mine;
- runoff control on infrastructure areas;
- sedimentation control;
- open pit dewatering;
- disposal of excess water through on-site irrigation; and
- sewage treatment and disposal of effluent.

DCPL operates the water management system such that water captured is used on-site (e.g. for dust suppression and irrigation of rehabilitation areas.

A schematic of the existing water management system is provided in Figure 2-2.

The site water balance prepared for the DEP simulated the performance of the water management system. It was predicted there would be no overflow from the mine water dam or open pits (Gilbert & Associates, 2009).

Water Management Storages

Water stored on-site includes groundwater inflows to the open pit and incident rainfall and runoff from mine disturbance areas at the DCM.

Water pumped from sumps in the open pit is currently stored in the MWD and Auxiliary Dams No. 1 and 2. The dams are also used to store water collected from selected sediment dams and runoff from the main infrastructure area.

Up-catchment Runoff Control

Surface water runoff controls aim to prevent up-catchment runoff water from entering the open pit and waste rock emplacement areas.
The main runoff water control structures at the DCM include the following:

- MWD and Auxiliary Dam Diversions located around the MWD and Auxiliary Dams intercept runoff from the catchments upstream of the dams and divert the up-catchment runoff water to Coal Shaft Creek and Mammy Johnsons River. The MWD diversion is a component of the irrigation first flush protocol and is discussed further below.
- Coal Shaft Creek Diversion channel allows for the flow of up-catchment runoff reporting to Coal Shaft Creek to avoid the open pit, waste rock emplacement and infrastructure areas.
- Eastern Diversion drain located along the ridgeline to the east of the existing open pit to intercept runoff from the catchments upstream and divert the up-catchment runoff water to Mammy Johnsons River.
- Permanent up-catchment diversions around the Clareval and Weismantel open pits.
- A culvert beneath an internal haul road crossing Coal Shaft Creek.

Sedimentation Control

Erosion and sediment control structures used at the DCM include:

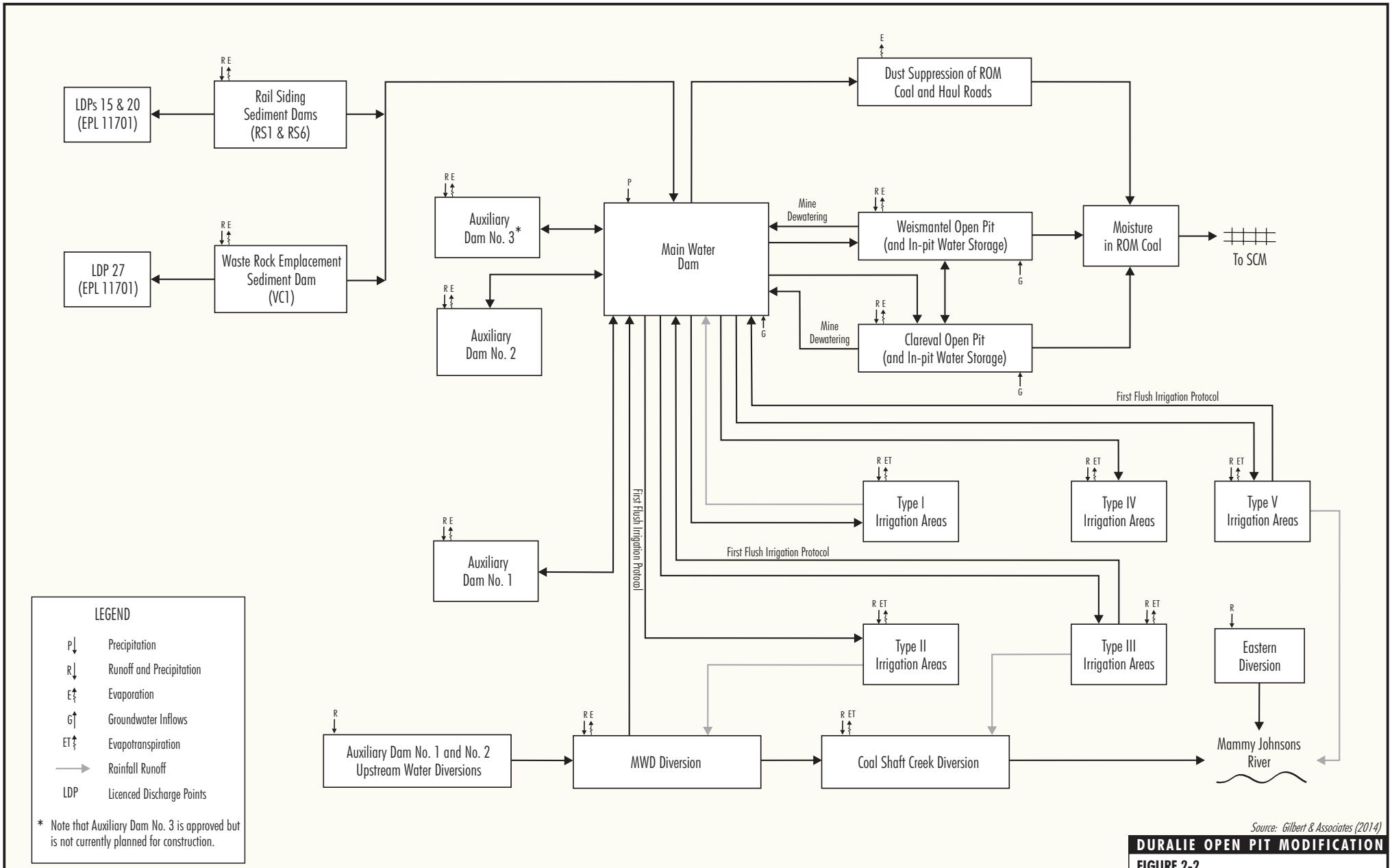
- rail siding sediment dams; and
- waste rock emplacement sediment dams.

Open Pit Dewatering

The open pits are sinks for groundwater inflow, incident rainfall, infiltration through waste rock emplacements and rainfall runoff.

Sumps are excavated in the floor of the active open pits as part of routine mining operations to facilitate efficient dewatering operations and to minimise interruption to mining.

Water removed from the open pits is initially transferred to out-of-pit water supply storages for use in dust suppression and controlled irrigation.



Source: Gilbert & Associates (2014)

DURALIE OPEN PIT MODIFICATION

FIGURE 2-2

Water Management Schematic

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DCPL holds an existing Bore Licence (20BL168404) that allows for up to 300 megalitres (ML) of groundwater to be extracted in any 12 month period.

On-site Irrigation System

An on-site irrigation system of pumps, piping and water distribution equipment is used to supply water from the MWD to the DCM irrigation areas, and comprises the following:

- electrically powered centrifugal pumps;
- travelling irrigators, each delivering some 18 litres per second (L/sec) of water;
- fixed sprays; and
- evaporators (currently located on the waste rock emplacements and adjacent Auxiliary Dam 2).

Operation of the irrigation areas is managed in accordance with the Irrigation Management Plan (IMP) (DCPL, 2013). Five irrigation areas are approved, including:

- *Type I* – Irrigation areas located between the MWD diversions and the water storage inundation area of the MWD.
- *Type II* – Irrigation areas located upslope of the MWD diversions within ML 1427.
- *Type III* – Irrigation areas located upslope of the northern extent of the Weismantel and Clareval open pits, including the upper reaches of Coal Shaft Creek. Type III irrigation has not been established to date.
- *Type IV* – Irrigation areas located on partially rehabilitated and rehabilitated areas of the waste rock emplacement.
- *Type V* – Irrigation areas located on inactive (but not yet topsoiled or rehabilitated) areas of the waste rock emplacement.

A mixture of pasture, woodland and cropping occurs within the irrigation areas.

First Flush Protocol

The IMP (DCPL, 2013) includes a first flush protocol. The first flush protocol is designed to collect initial (or "first flush") rainfall runoff from Type II and Type III irrigation areas following prolonged dry spells when this runoff would be expected to contain some salt loads as a result of irrigation.

Sensors measuring electrical conductivity (EC) have been installed in the MWD diversion southern and northern drains to monitor runoff from the Type II irrigation areas.

The first flush system for the Type II irrigation areas generally operates as follows:

- When EC readings in the MWD diversion drain sumps are equal to or greater than 1,326 microSiemens per centimetre (µS/cm), or if the EC reading at Site 11 in the Mammy Johnsons River (approximately 3 km south of the confluence with Coal Shaft Creek) is equal to or greater than 400 µS/cm, motorised butterfly valves in pipelines at the downstream end of the MWD diversion northern and southern drains open, directing runoff from the irrigation areas to the MWD.
- When the EC readings in the MWD diversion drain sumps are below 1,326 µS/cm and the EC reading in the Mammy Johnsons River (at Site 11) is below 400 µS/cm, the valves close, allowing the runoff in the MWD diversion to report to the Coal Shaft Creek Diversion and Mammy Johnsons River downstream of the DCM.

As the waste rock emplacement areas expand and are rehabilitated, irrigation occurs on these areas (Type IV irrigation areas). Runoff from these areas is collected in the collection dam in the south-west corner of the waste rock emplacement which overflows to Coal Shaft Creek. Where the measured EC in the collection dam is equal to or greater than 1,326 µS/cm, or if the EC reading in the Mammy Johnsons River at High Noon is equal to or greater than 400 µS/cm, the accumulated water in the collection dam will be pumped out to the MWD.

Type I irrigation areas are within the MWD catchment area and Type V irrigation areas drain to the open pit workings, and therefore no first flush protocol is required for these areas.

Coal Shaft Creek Re-establishment

The final alignment of Coal Shaft Creek would comprise a reworked section of the existing Coal Shaft Creek Diversion channel, a drop-down section outside the in-pit waste rock emplacement, and a section constructed over the in-pit waste rock emplacement at the southern end of the Weismantel open pit extent.

Meandering of the creek within the reconstructed corridor would replicate the original meandering geometry.

2.5 FINAL VOIDS

At the cessation of mining, the northern extents of the currently approved DEP include final voids in the Clareval open pit and Weismantel open pit.

The surface catchment of the final voids would be reduced to a practicable minimum by maximising partial backfilling of open pits to the natural surface and the use of up-catchment diversions and contour drains around their perimeter.

The final void water balance conducted for the DEP EA indicated the final voids would slowly fill over time and would become an integrated pit lake approximately 40 year post-mining. Water levels were predicted to continue to rise post-mining before reaching an equilibrium level below the spill level.

2.6 WASTE MANAGEMENT

The key waste streams from the DCM comprise:

- waste rock and oversized ROM coal reject (as described in Sections 2.2.7 and 2.2.8);
- recyclable and non-recyclable general wastes;
- sewage and effluent; and
- other wastes from mining and workshop activities (e.g. waste oils, scrap metal and used tyres).

General waste minimisation principles (i.e. reduce, re-use and recycling) apply at the DCM to minimise the quantity of wastes requiring off-site disposal.

All general domestic waste (e.g. general solid [putrescibles] waste and general solid [non-putrescible] waste as defined in *Waste Classification Guidelines Part 1: Classifying Waste* [NSW Department of Environment and Climate Change, 2008]) and general recyclable products are collected by an appropriately licensed contractor.

Scrap metal is collected by a scrap metal merchant for recycling. Waste tyres are disposed in the backfilled waste rock emplacement.

2.6.1 Sewage Treatment and Disposal

Sewage and wastewater from ablution facilities on-site is collected and transferred via a sewerage system to the existing on-site sewage treatment plant.

Sewage is treated in the on-site sewage treatment plant (that consists of an aerobic treatment system) and is disposed of in a manner to the satisfaction of the EPA (i.e. EPL 11701) and the Great Lakes Council.

2.7 MANAGEMENT OF DANGEROUS GOODS

The transportation, handling and storage of all dangerous goods at the DCM is conducted in accordance with the requirements of the *Storage and Handling of Dangerous Goods – Code of Practice 2005* (WorkCover, 2005).

Transport

Dangerous goods required at the DCM are transported in accordance with the relevant State legislation.

Hydrocarbon Storage

Hydrocarbons used at the DCM include fuels (diesel and petrol), oils, greases, degreaser and kerosene. Existing hydrocarbon storage facilities (including the two bunded 110,000 litre capacity diesel storage tanks) are operated in accordance with the requirements of Australian Standard (AS) 1940: *The Storage and Handling of Flammable and Combustible Liquids*.

Waste hydrocarbons are collected, stored and removed by licensed contractors on a periodic basis.

Explosives Storage

Explosives required at the DCM include initiating products and detonators, ANFO and emulsion explosives. Explosives are transported and used in accordance with the existing safety and operational procedures at the DCM.

Detonators, bulk explosives and explosive products (e.g. emulsion, prill) are stored at the explosives storage, located west of the main infrastructure area in accordance with the requirements of AS 2187-1998 *Explosives – Storage Transport and Use – Storage*.

Chemical Storages and Material Safety Data Sheets

The management and storage of chemicals at the DCM is conducted in accordance with the existing management procedures, Australian Standards and codes. All chemicals brought on-site for use at the operation are recorded in the inventory registers at the DCM.

No chemicals or hazardous material are permitted on-site unless a copy of the appropriate Material Safety Data Sheet (MSDS) is available on-site or, in the case of a new product, it is accompanied by an MSDS.

2.8 WORKFORCE

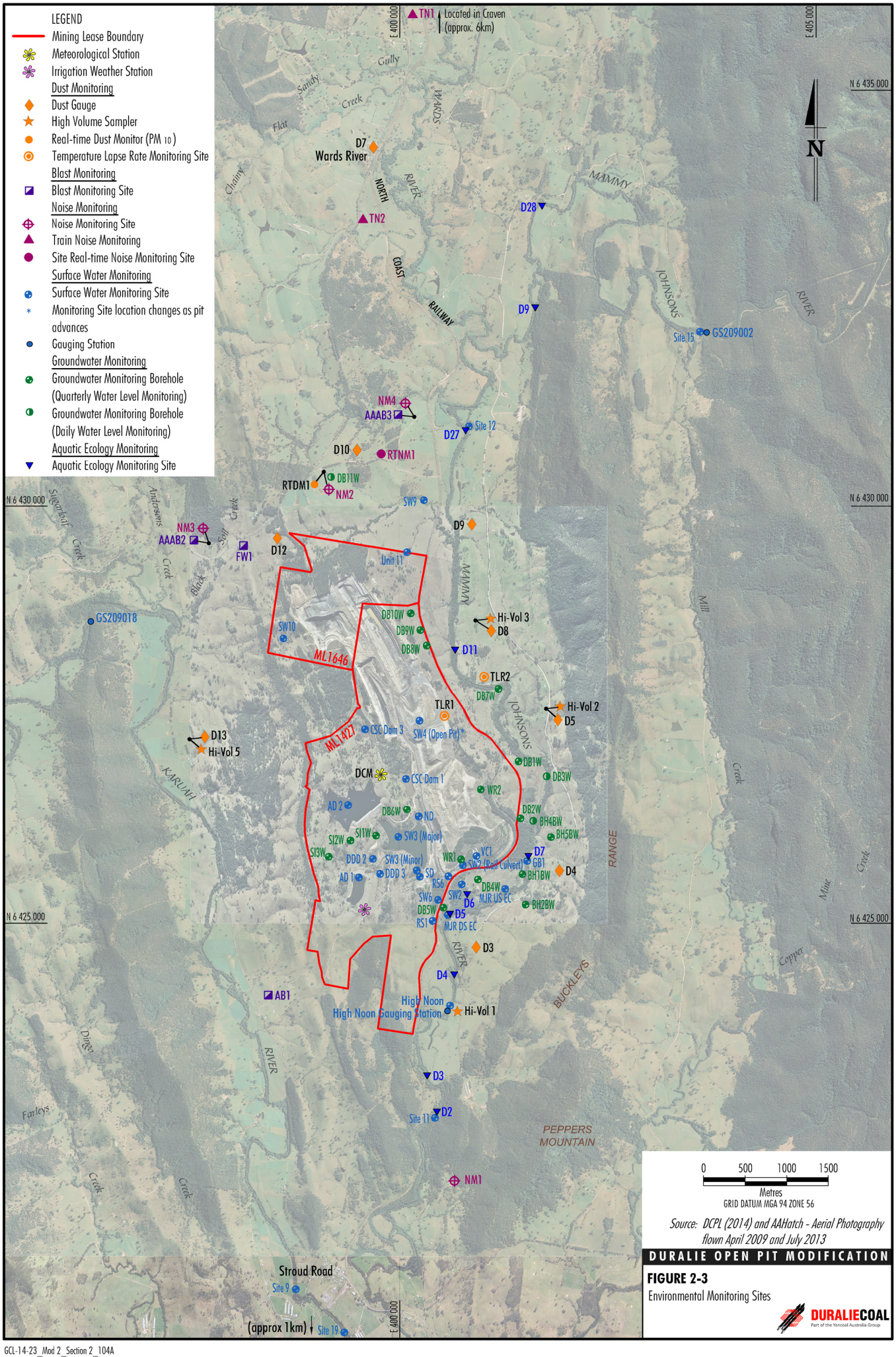
At full development, the DCM requires an average workforce of approximately 135 people.

2.9 ENVIRONMENTAL MONITORING AND MANAGEMENT

Environmental monitoring and management at the DCM is conducted in accordance with a range of plans required in accordance with Project Approval (08_0203) including:

- Noise Management Plan.
- Blast Management Plan.
- Additional Rail Noise Mitigation Measures Consultation Plan.
- Air Quality & Greenhouse Gas Management Plan.
- Water Management Plan (including Site Water Balance, Surface Water Management Plan and Groundwater Management Plan).
- Biodiversity Management Plan (BMP).
- Giant Barred Frog Management Plan (GBFMP).
- Rehabilitation Management Plan.
- Heritage Management Plan.
- Pollution Incident Response Management Plan.
- Waste Management Plan.
- PAFMMP.

Existing DCM monitoring locations are shown on Figure 2-3.



Source: DCPL (2014) and AAHatch - Aerial Photography flown April 2009 and July 2013

DURALIE OPEN PIT MODIFICATION

FIGURE 2-3

Environmental Monitoring Sites

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