

3.0 APPROVED OPERATIONS

3.1 Consents, Licences and Authorities

3.1.1 Development Consents

Mandalong Mine, which is an extension of the old Cooranbong Colliery, was originally granted Development Consent DA 97/800 by the then Minister for Urban Affairs and Planning on 14 October 1998 under Part 4 of the EP&A Act following the submission of the *Cooranbong Colliery Life Extension Project Environmental Impact Statement* (Umwelt 1997) and a Commission of Inquiry. The currently approved Mandalong Mine comprises the underground workings and surface infrastructure of the:

- Mandalong Mine, including the Mandalong Mine Access Site, encompassing underground workings and associated surface infrastructure near Morisset; and
- Cooranbong Entry Site encompassing a coal delivery system and surface infrastructure (coal handling and processing) near Dora Creek; and

The other operations directly related to the currently approved Mandalong Mine are the two components which comprise the Delta Link Project, namely:

- The construction and use of the Mandalong Coal Delivery System for the underground transportation of coal from the Mandalong Mine to the Delta Entry Site; and
- The receipt and handling of coal at the Wyee Coal Handling Plant at the Delta Entry Site.

The approved Mandalong Mine, and the other operations which directly relate to it, are currently regulated by the three planning approvals listed below.

Development Consent DA 97/800 for the Mandalong Mine - being development application DA 97/800 lodged with LMCC on 27 November 1997 and described in the *Cooranbong Colliery Life Extension Project Environmental Impact Assessment* (Umwelt 1997), including the Applicant's submissions to the Commission of Inquiry, and as modified on nine occasions as follows:

- **MOD 1 (August 2001)** - minor changes to the conditions of consent relating to the preparation of subsidence management plans and notification of landholder requirements, as described in the modification application prepared by Powercoal, dated 29 March 2001.
- **MOD 2 (February 2005)** - installation of methane drainage plant and the transport of 1,000 tonnes of mined coal by road, as described in *Mandalong Mine Methane Drainage Plant and Coal Haulage, Statement of Environmental Effects*, dated 28 October 2004 and prepared by Sinclair Knight Merz.
- **MOD 3 (March 2006)** - installation and operation of enclosed methane gas flare units for high purity methane drainage gas. This was undertaken in response to condition 60a(iii) imposed as part of MOD 2, which required Centennial Mandalong to submit a report on the progress towards implementing greenhouse gas abatement measures. This modification is as described in the *Statement of Environmental Effects for the Installation and Operation of Enclosed Methane Gas Flare Units*, dated February 2006 and prepared by Umwelt.
- **MOD 4 (July 2009)** - installation and operation of gas engines (yet to be constructed) to produce up to 12 megawatts of electricity using high purity methane drainage gas, increase the coal production rate from 4 Mtpa to 6 Mtpa, relocate a ballast borehole and update subsidence conditions. This modification is as described in the Environmental Assessment entitled *Mandalong Mine Modification to Development Consent Environmental Assessment*, dated September 2008.

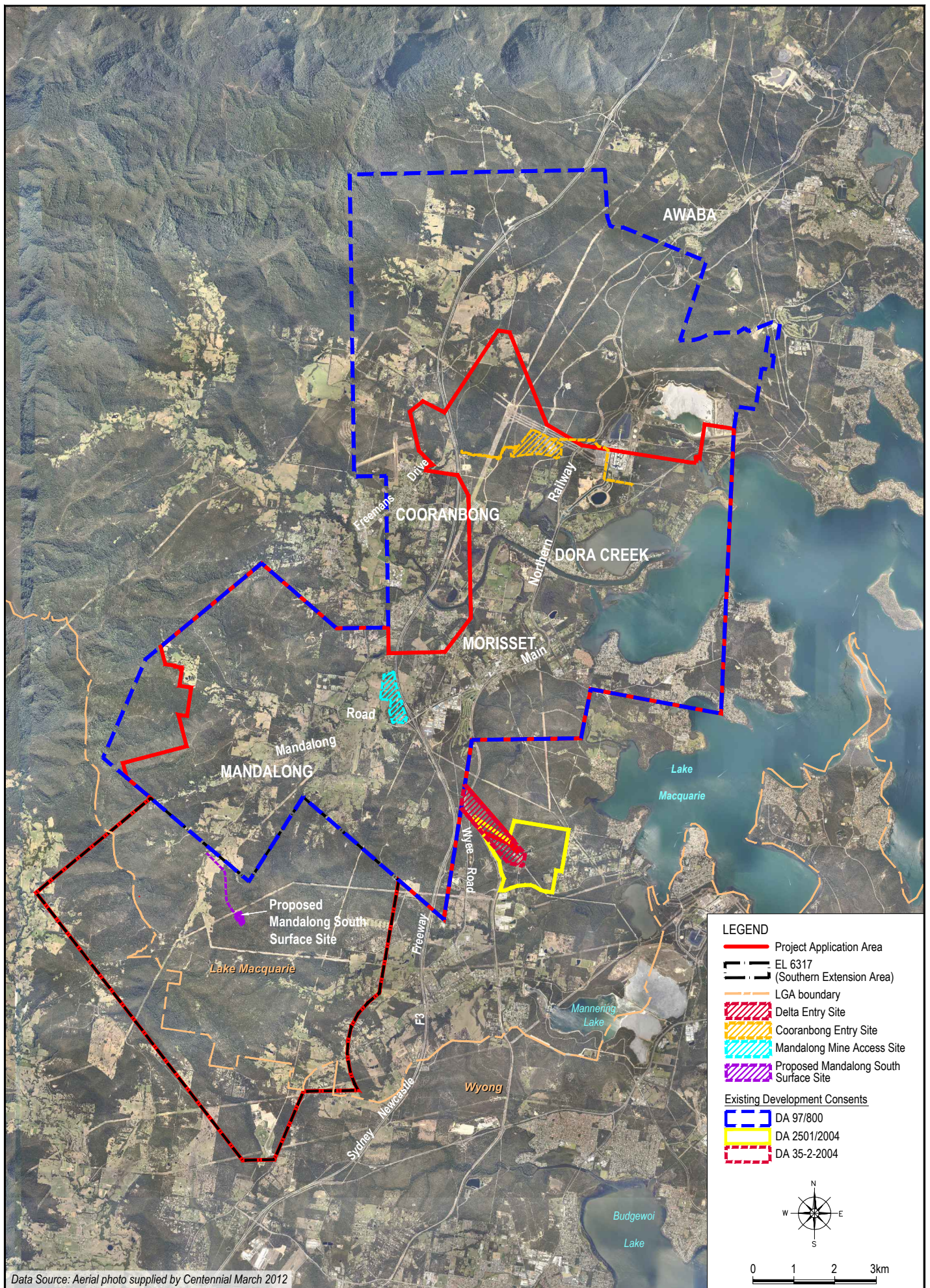
- **MOD 5 (November 2009)** - coal from Mandalong Mine (Cooranbong Entry Site) permitted to be washed at Newstan Colliery and a temporary increase in the volume of coal transported by conveyor from the Cooranbong Entry Site to the Eraring Power Station stockpiles for subsequent road haulage to Newstan Colliery (until construction of the Cooranbong Private Haul Road was complete). This modification is as described in the Statement of Environmental Effects entitled *Washing of Mandalong Coal at Newstan Section 96(A) Application Statement of Environmental Effects*, dated October 2009.
- **MOD 6 (November 2009)** - changes to the locations and heights of approved (but not previously constructed) coal handling infrastructure at the Cooranbong Entry Site. This modification is as described in the Statement of Environmental Effects entitled *Relocation of Infrastructure within the Mandalong Services Site Section 96(1A) Application Statement of Environmental Effects*, dated November 2009.
- **MOD 7 (October 2011)** - installation and operation of a new technology known as a ventilation air methane regenerative after burner (VAM-RAB) as a trial unit to demonstrate the ability of the technology to capture and abate ventilation air methane from the underground mine. This modification is as described in the *Environmental Assessment: Ventilation Air Methane Abatement Demonstration Project, Mandalong Mine – Section 75W Modification*, dated June 2011 and additional information provided in the document entitled *Mandalong Mine Ventilation Air Methane Abatement Demonstration Project – Response to Submissions* dated September 2011.
- **MOD 8 (August 2012)** - increase in the volume of coal permitted to be transported from the Cooranbong Entry Site to both Newstan Colliery and Eraring Power Station from 2 Mtpa to up to 4 Mtpa and back haulage of middlings (middle quality coal product) from Newstan Colliery to Cooranbong Entry Site for subsequent supply to the Eraring Power Station. This modification is as described in the *Environmental Assessment: Mandalong Mine – Cooranbong Entry Site – Cooranbong Distribution Project – Section 75W Modification to Development Consent DA 97/800*, dated May 2012 and additional *Noise Mitigation Assessment*, dated 31 May 2012.
- **MOD 9 (February 2013)** - administrative amendment to conditions 1A(c) and (d) to allow the coal delivery limits approved as part of MOD 8 (i.e. up to 4 Mtpa from Cooranbong Entry Site to both Newstan Colliery and Eraring Power Station).

A copy of the latest consolidated consent for DA 97/800 is contained within **Appendix A**.

Development Consent DA 35-2-2004 for the Delta Entry Site – being for the transportation of coal to the Delta Entry Site via the underground Mandalong Coal Delivery System, as approved by development consent DA 35-2-2004 and described in the *Delta Link Project – Statement of Environmental Effects* (Umwelt 2004). This development consent is held by Centennial Mandalong.

Development Consent DA 2501/2004 for the Wyee Coal Handling Plant at the Delta Entry Site - as approved by development consent DA-2501/2004 and described in the *Delta Link Project – Statement of Environmental Effects* (Umwelt 2004) and revised information letter dated 27 April 2004. This development consent is held by Delta Electricity.

The operations approved by each of the abovementioned planning approvals are described below and the location of each of the approved operations is shown on **Figure 11**.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg11_CCC14-009_ExistDevConsents_V3.dwg

To be printed A4

Existing Development Consents

FIGURE 11

Underground longwall mining operations commenced at Mandalong Mine in January 2005 following construction of the Mandalong Mine Access Site and decline tunnel. Since this time, Centennial Mandalong has extracted up to 6 Mtpa of ROM coal from the West Wallarah Seam utilising a combination of longwall and continuous mining methods.

The primary components of the currently approved Mandalong Mine operation are:

- Extract up to 6 Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams using a combination of longwall mining methods and traditional bord-and-pillar mining methods within the current mining lease areas (see **Section 3.5.2**);
- Deliver ROM coal from the underground workings to the Cooranbong Entry Site at a rate of up to 4 Mtpa and to the Delta Entry Site at a rate of up to 4 Mtpa;
- Operation of coal handling and processing infrastructure, along with coal stockpiling, at the Cooranbong Entry Site up to 4 Mtpa of ROM coal;
- Transport coal from Cooranbong Entry Site to Eraring Power Station at a rate of up to 4 Mtpa via a dedicated overland conveyor owned and operated by Eraring Energy;
- Transport coal from Cooranbong Entry Site to Newstan Colliery at a rate of up to 4 Mtpa by truck via the Cooranbong Private Haul Road owned by Centennial Mandalong and the Newstan-Eraring Private Haul Road owned by Eraring Energy;
- Transport stone material from the Cooranbong Entry Site by truck, via the above-mentioned private haul roads, to Newstan Colliery for use in rehabilitation or emplacement with the Newstan Colliery reject emplacement areas;
- Transport reject material from the Cooranbong Entry Site to the Hawkmount Quarry (owned by LMCC) by truck, via the above-mentioned private haul roads, for emplacement;
- Dispose of fine reject material (tailings) from the Cooranbong Entry Site underground into disused workings of the Cooranbong Colliery;
- Employ up to 305 full-time employees; and
- Operate 24 hours per day, seven days per week.

Under the provisions of Development Consent DA 97/800, Mandalong Mine has an approved life of 21 years expiring on 14 October 2019.

3.1.2 Environmental Protection Licence

Mandalong Mine is a premises-based activity under Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act). On this basis, the occupier of the premises must hold an Environmental Protection Licence (EPL) administered by the Environment Protection Authority (EPA) under Section 43(b) of the POEO Act. Mandalong Mine operates under EPL 365, which covers coal mining to a scale of greater than 5 million tonnes produced per annum and coal works to a scale of greater than 5 million tonnes handled per annum. A copy of this EPL is contained within **Appendix D**.

EPL 365 permits the discharge of water from the Cooranbong Entry Site via two licensed discharge points (LDP001 and LDP002) into an unnamed drainage path that reports to Muddy Lake on the western side of Lake Macquarie.

3.1.3 Water Licencing

Centennial Mandalong currently holds several groundwater monitoring licences under the provisions of the *Water Act 1912* for the purposes of monitoring groundwater levels in the Mandalong Mine lease area.

A groundwater dewatering licence (licence number 20BL169424) is also held by Centennial Mandalong under the *Water Act 1912* permitting the extraction of up to 1,825 megalitres per year of groundwater from the coal seam as part of the process of mining (dewatering).

3.1.4 Mineral Authorities

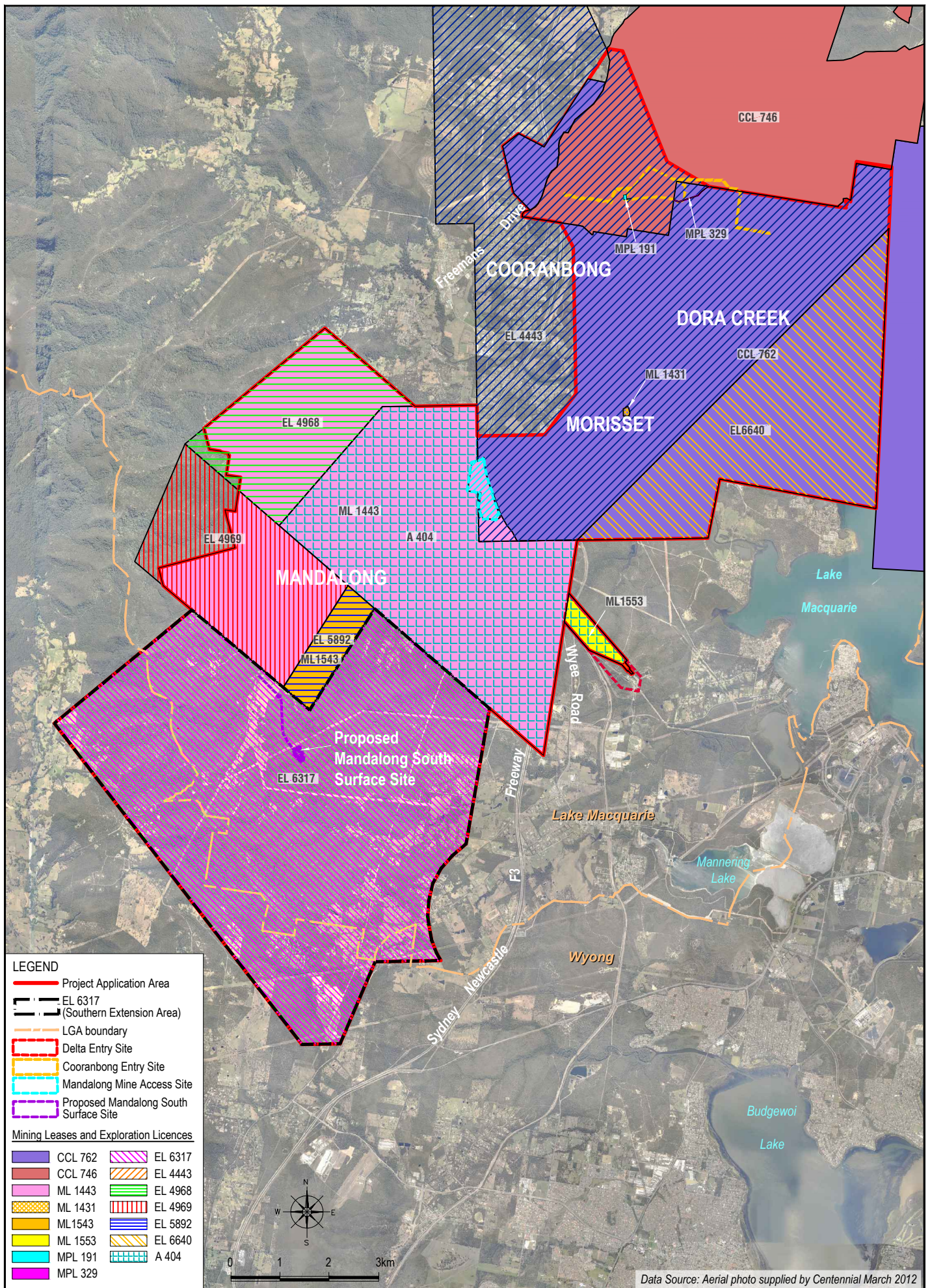
As shown on **Figure 12** and listed in **Table 6**, exploration, mining and mining-related operations at Mandalong Mine occur under the provisions of various mineral authorities.

Table 6 – Existing Mineral Authorities

Reference	Title	Description	Expiry Date
CCL 762	Consolidated Coal Lease 762	Title of Cooranbong workings, includes some surface land.	13 Oct 2022
CCL 746	Consolidated Coal Lease 746 (sublease)	Title of Cooranbong workings, includes some surface land.	31 Dec 2028
ML 1443	Mining Lease 1443	Title for Mandalong Mine workings, includes Mandalong Mine Access Site.	1 Mar 2020
ML 1431	Mining Lease 1431	Title to surface land for proposed shaft at the back of Morisset	27 May 2019
ML 1543	Mining Lease 1543	Title for Mandalong Mine workings	25 Nov 2024
ML 1553	Mining Lease 1553	Title for Delta Link Project	7 Sep 2025
MPL 191	Mining Purposes Lease 191	Title to surface land for water tanks at Cooranbong.	24 Feb 2023
MPL 329	Mining Purposes Lease 329	Title to surface land for old water supply line from Eraring Power Station.	4 Aug 2015
EL 6317	Exploration Licence 6317	Title for exploration activities in the Southern Extension Area	8 Aug 2014
EL 4443	Exploration Licence 4443		23 Oct 2012*
EL 4968	Exploration Licence 4968		31 July 2012*
EL 4969	Exploration Licence 4969		31 July 2012*
EL 5892	Exploration Licence 5892		31 July 2012*
A 404	Authorisation 404		31 July 2012*

* Applications for renewal of these leases and authorisation have been submitted to the DRE. These titles continue to have effect even though they are past their expiry date as long as a valid application for renewal has been made.

The approved underground mine workings in the West Wallarah Seam lie within the bounds of MLs 1443 and 1543, and the Mandalong Mine Access Site is located within ML 1443.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg12_CCC14-009_MineAuth_V4.dwg

To be printed A4

3.2 Life of Mine

Mandalong Mine currently has an approved life of 21 years pursuant to Development Consent DA 97/800, expiring on 14 October 2019.

Development Consent DA 35-2-2004 for the Mandalong coal delivery system, which links Mandalong Mine to the Wyee coal unloader by an underground tunnel, expires in July 2021.

3.3 Operational Hours

Mandalong Mine operates up to 24 hours per day, seven days per week.

3.4 Operational Employment

Mandalong Mine is currently approved to employ up to 305 full-time equivalent employees.

3.5 Underground Mining

3.5.1 Access

Materials and personnel access to the underground mine workings is achieved from the Mandalong Mine Access Site via the approved 1,400 metre long decline tunnel constructed on a 12.5 percent gradient (1 in 8) and using diesel-powered rubber tyred transport.

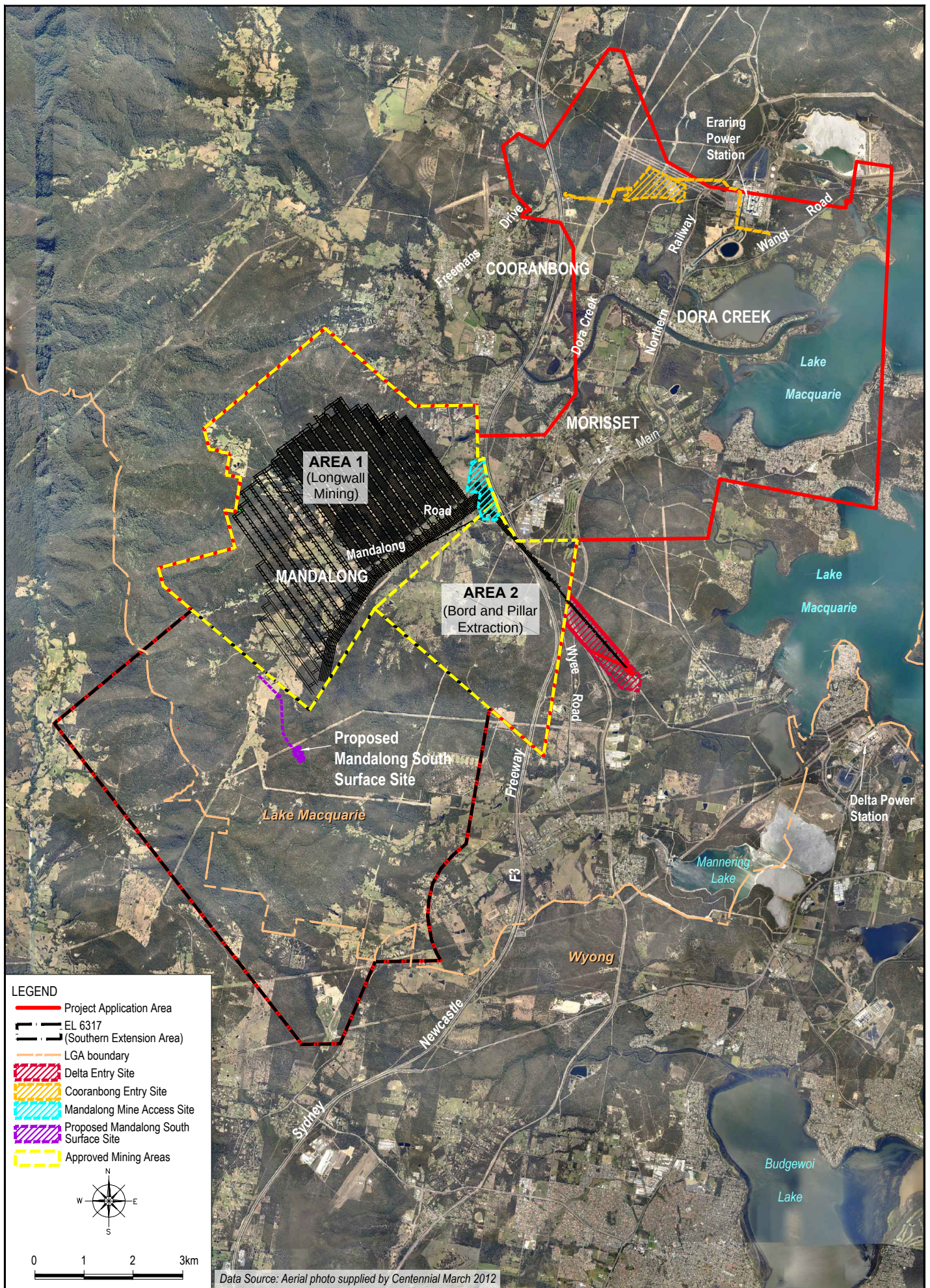
3.5.2 Mining Method and Mine Plan

Centennial Mandalong has approval to use longwall mining and bord-and-pillar mining methods to extract up to 6 Mtpa of ROM coal from the West Wallarah Seam within the current mining lease areas. As shown on **Figure 13**, two separate mining areas (Areas 1 and 2) have been delineated at Mandalong Mine. The mineable coal resource varies in thickness from approximately 7 metres in Area 1, down to approximately 1.75 metres in the eastern extent of Area 2.

Area 1 - Longwall Mining

Area 1 was identified as the main mining area and is currently being extracted using longwall mining techniques. **Figure 13** illustrates the mine plan for the extraction of coal from the West Wallarah Seam within Area 1, which consists of 24 longwall panels ranging in width from 125 metres to 160 metres. Seedsman Geotechnics Pty Ltd (2003) identified the presence of a massive conglomerate unit in the overburden that could be used to achieve reduced surface subsidence effects. The potential for 170 metre wide longwall panels was identified, with a recommendation that the initial longwalls be limited to 125 metres wide until subsidence monitoring data was available to calibrate the predictive model. This led to longwalls 1 to 4 being limited to 125 metres wide and subsequent longwalls being increased to 160 metres wide.

The main headings, which comprise a seven parallel roadway configuration, have been developed in a south-west direction along the eastern extent of the West Wallarah Seam, where the seam thins to approximately 3.5 metres. These headings typically measure 5.2 metres wide and 3.4 metres high and provide for access, services, coal transport and ventilation throughout the mine.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg13_CCC14-009_ApprovMineAreas_V4.dwg

To be printed A4

The longwall panels have been developed in a north-west orientation from the main headings where the seam thickens in excess of 7 metres before thinning to less than 1.5 metres near the north-west boundary of the mining lease. The longwall panels extend for approximately 3 kilometres, before terminating where the seam thins to less than 3.6 metres. Coal is extracted up to 4.8 metres in the longwall panels where seam thickness permits.

Centennial Mandalong is currently mining longwall 14 and expects to have extracted the final approved longwall panel (longwall 24) in Area 1 in 2018. Centennial Mandalong has approved Subsidence Management Plans (SMPs) to mine up to and including longwall 17, with the SMP for longwalls 18 to 21 currently being prepared.

Area 2 – Bord-and-Pillar Mining

Area 2 is approved for coal extraction from the Wallarah-Great Northern Seam using traditional bord-and-pillar and panel extraction mining techniques. This mining method creates a grid of mining tunnels and involves progressively cutting panels into the coal seam whilst leaving behind pillars of coal to support the mine. Mining in Area 2 has included the construction of the underground coal conveyor system to the Delta Entry Site.

3.5.3 Mining Production

Mandalong Mine is approved to extract up to 6 Mtpa of ROM coal from the West Wallarah and Wallarah-Great Northern Seams using the mining methods outlined above within the current mining lease areas.

3.6 Mine Ventilation

Mandalong Mine is currently ventilated by two surface fans located at the Mandalong Mine Access Site and one surface fan at the Cooranbong Entry Site. The two surface fans at the Mandalong Mine Access Site currently exhaust approximately 300 cubic metres per second and the fan evasees are orientated to the north-northwest. These fans are used to ventilate the active mining areas of the mine.

The ventilation fan at the Cooranbong Entry Site currently exhausts approximately 140 cubic metres per second and ventilates the main headings that accommodate the underground conveyors that run from the Mandalong Mine workings through to both the Cooranbong Entry Site and the Delta Entry Site.



Plate 3 – Ventilation Fans at the Mandalong Mine Access Site

3.7 Gas Drainage and Management

Gas within the West Wallarah and Wallarah-Great Northern Seams comprises between 95 to 99 percent methane. As the mine develops into virgin ground the seam gas is released into the mine workings and this is known as “rib emissions” (fugitive emissions). To allow for safe and efficient mining of the coal, and in accordance with the *Coal Mines Health and Safety Act 2002* (and its Regulations), the gas is pre-drained in advance of the longwall panels using a series of boreholes drilled in to the coal seam from the existing underground roadways. The seam gas is then drained via a network of pipes to the methane gas drainage plant located at the Mandalong Mine Access Site. This plant has a design capacity of 1,400 litres per second at between 70 and 95 percent methane purity. The plant currently vents drainage gas to the atmosphere and operates 24 hours per day, seven days per week.



Plate 4 – Methane Gas Drainage Plant at the Mandalong Mine Access Site

The enclosed methane gas flare units and gas engines at the Mandalong Mine Access Site are for the abatement of high purity methane drainage gas. The approved infrastructure includes:

- Up to six enclosed methane gas flare units, each with a generator and a flare stack of approximately 10 metres in height (to screen the flame produced by the flare) adjacent to the existing methane gas drainage plant;
- Operation of the flares and gas drainage plant 24 hours per day, seven days per week; and
- Gas engines fuelled by coal mine methane gas with a total electricity generation capacity of up to 12 megawatts. These engines are yet to be constructed.



Plate 5 – Gas Flares at the Mandalong Mine Access Site

In 2011 Centennial Mandalong received approval for a trial Ventilation Air Methane (VAM) Regenerative Afterburner (VAM-RAB) at the Mandalong Mine Access Site to demonstrate the ability of the technology to capture and abate VAM from the underground mining operation. The unit has now been constructed and will be trialled during 2013 in order to determine whether it is a viable strategy for VAM abatement in the future.



Plate 6 – VAM-RAB Trial Unit at Mandalong Mine Access Site

The gas drainage plant, gas flares and engines, and VAM-RAB unit at the Mandalong Mine Access Site are identified on **Figure 14**.

3.8 Surface Infrastructure Sites

3.8.1 Mandalong Mine Access Site

Mandalong Mine Access Site is accessed off Mandalong Road (via Kerry Anderson Drive) approximately 2.5 kilometres west of the Morisset township adjacent to the F3 Sydney-Newcastle Freeway. As shown on **Figure 14**, the primary items of existing approved infrastructure at the Mandalong Mine Access Site are summarised below.

Decline Tunnel

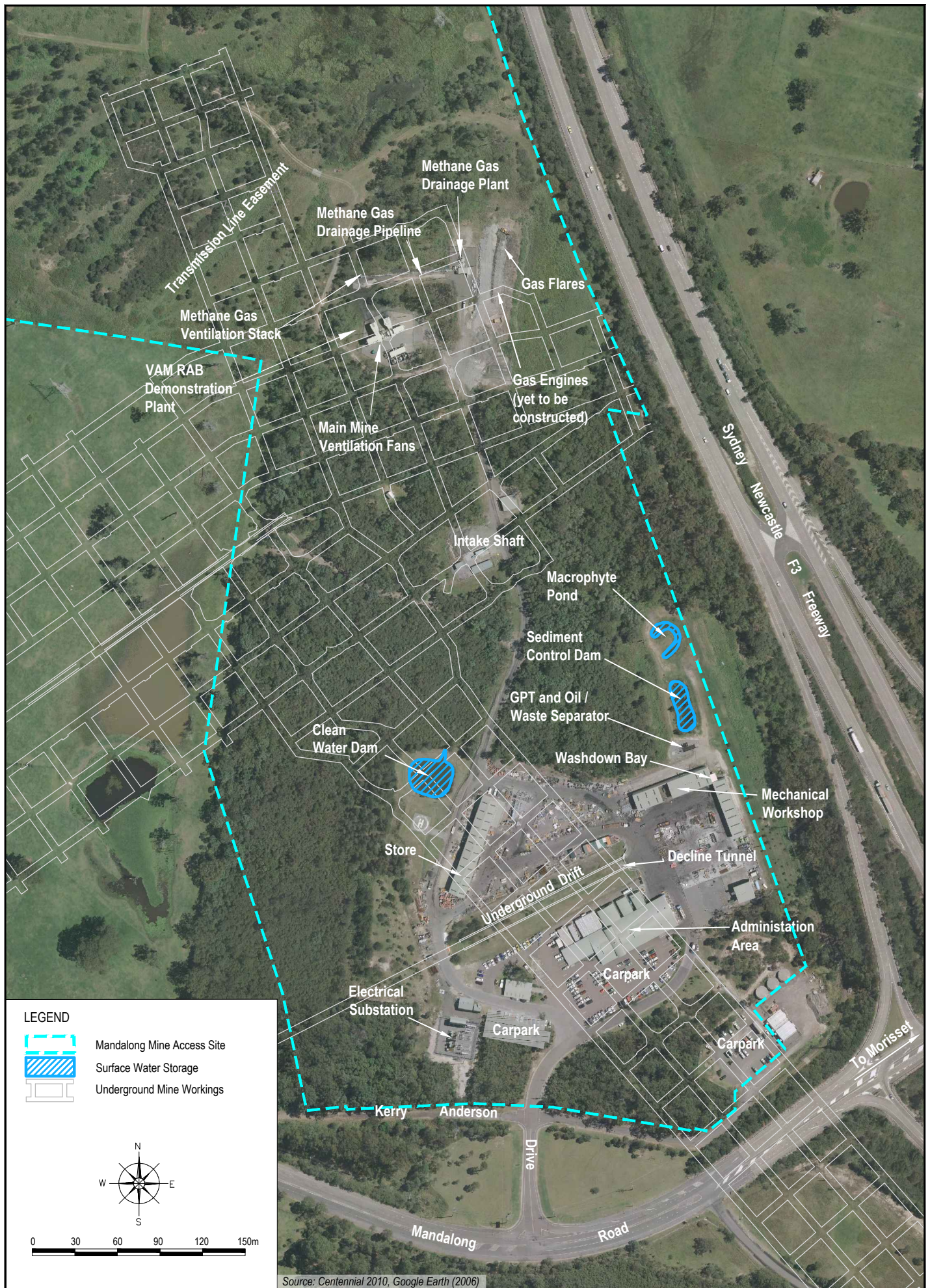
Materials and personnel access to the underground mine workings is via a decline tunnel commencing at the Mandalong Mine Access Site (see **Section 3.5.1**).

Administration Buildings and Bathhouse

Administration buildings and bathhouse facilities cater for the existing Mandalong Mine personnel and visitors.

Car Parking Areas

Sealed car parking areas, which are accessed immediately off the adjoining Mandalong Road, cater for Mandalong Mine personnel and visitors. These areas currently provide approximately 200 parking spaces.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg14_CCC14-009_SurfaceInfra_V6.dwg

To be printed A4



GSS ENVIRONMENTAL
Environmental, Land and Project
Management Consultants

Mandalong Mine Access Site Layout

FIGURE 14

Mechanical Workshop and Store

A mechanical workshop and store is utilised for day-to-day maintenance work and storage. Major maintenance and rebuilding activities are undertaken on a contract basis off site.

Mine Ventilation and Gas Drainage Infrastructure

The existing mine ventilation and gas drainage infrastructure is outlined in **Sections 3.6** and **3.7**.

Other Infrastructure Items

Other items of infrastructure at the Mandalong Mine Access Site are:

- Diesel refuelling station and hydrocarbon storage shed;
- Equipment and materials storage areas;
- Machinery washdown bay;
- Fire fighting and emergency equipment store;
- Compressor shed;
- Core shed;
- Training room;
- Emergency services helipad;
- Tube bundle shed;
- Electrical sub-station; and
- Solcenic mixing plant.

Servicing

The Mandalong Mine Access Site is serviced via connections to Hunter Water Corporation's (HWC) reticulated potable water and sewer systems, Ausgrid's reticulated electricity network and Telstra's telecommunications network.

3.8.2 Cooranbong Entry Site

The Cooranbong Entry Site, which is located approximately 2 kilometres north of Dora Creek, was approved as part of the Mandalong Mine in 1998 under Development Consent DA 97/800. The primary items of existing infrastructure at the Cooranbong Entry Site are shown on **Figure 15** and summarised below.

Coal Handling Plant

As outlined in **Section 3.9**, ROM coal is delivered from the underground workings of Mandalong Mine to the surface at Cooranbong Entry Site via the south drift conveyor. The coal handling plant (CHP) at the Cooranbong Entry Site comprises aerial conveyor systems, a rotary breaker and sizer, a crushing plant, coal bins and coal stockpiles.

Mine Ventilation Infrastructure

The existing mine ventilation shaft and fan at Cooranbong Entry Site as outlined in **Section 3.6**.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg15_CCC14-009_CoorEntrySiteLO_V7.dwg
To be printed A4



Plate 7 – Truck Loading Bin and Coal Stockpile

Mechanical Workshops and Service Buildings

Mechanical workshops and service buildings at the Cooranbong Entry Site are utilised for maintenance work. Major maintenance and rebuilding activities are undertaken on a contract basis off site.

Administration Buildings and Bathhouse

Personnel will continue to utilise the existing administration buildings and bathhouse facilities, which are capable of catering for the current and proposed manning levels.

Car Park

A sealed car parking area, which is accessed off the adjoining Gradwells Road, caters for site personnel and visitors. This area provides approximately 200 parking spaces.

Other Infrastructure Items

Other items of infrastructure at the Cooranbong Entry Site are:

- Equipment and materials storage areas;
- Machinery washdown bay;
- Fire fighting and emergency equipment store;
- Compressor building;
- Electrical sub-station;
- Water management infrastructure; and
- Emergency services helipad.

Servicing

The Cooranbong Entry Site is serviced via connections to HWC's reticulated potable water system, Ausgrid's reticulated electricity network and Telstra's reticulated telecommunications networks. Sewage generated by on-site staff amenities at the Cooranbong Entry Site is collected (pump-out system) on a regular basis by a licensed contractor for off-site disposal.

Cooranbong Private Haul Road

The Cooranbong Private Haul Road links the Cooranbong Entry Site to Newstan Colliery via the Newstan-Eraring Private Haul Road. This initial section of the haul route (i.e. Cooranbong Private Haul Road) is approximately 3.4 kilometres long and is owned by Centennial Mandalong.

3.9 Coal Handling

Mined coal is transported from the Mandalong Mine underground workings via underground drift conveyor systems to either the Cooranbong Entry Site at a rate of up to 4 Mtpa or the Delta Entry Site at a rate of up to 4 Mtpa. These conveyors operate 24 hours a day, seven days per week. A schematic outlining the transportation of coal to these facilities is provided on **Figure 16**.

Cooranbong Entry Site

The ROM coal that arrives at the Cooranbong Entry Site is processed through the CHP at a rate of up to 800 tonnes per hour. The CHP upgrades completed in 2010 included a changeover gate to supply either the 2,000 tonne ROM coal bin or the aerial conveyor that transfers coal to either 1,200 tonne ROM coal loading bin or the 100,000 tonne ROM coal stockpile. ROM coal transferred into the truck loading bin is loaded into haulage trucks at the base of the bin by a dual telescopic chute fitted with automated loading and override safety controls. When the truck loading bin is nearing capacity, coal is directed by the changeover gate arrangement onto the aerial conveyor, which discharges coal onto the 100,000 tonne stockpile. As needed, coal is loaded from the 100,000 tonne stockpile by front end loader directly into the haulage trucks for transport to Newstan Colliery Surface Site.

Coal from the 2,000 tonne ROM coal bin is discharged via a feeder onto a conveyor belt where a magnet removes any steel prior to the coal being discharged into a rotary breaker. This breaker processes coal down to a size of less than 200 millimetres in diameter. Large fragments of stone are separated in the breaker module before being discharged into a separate 50 tonne stone bin. From the breaker, coal is conveyed into a 400 tonne capacity storage bin where it is then fed via feeders through a crushing and screening plant. The crushing process reduces the size of the coal to less than 31 millimetres prior to being conveyed to Eraring Power Station via a 2,000 tonne final product bin and dedicated overland conveyor (both owned, operated and maintained by Eraring Energy). The conveyor has a capacity of 1,000 tonnes per hour (following an upgrade in 2010) and operates 24 hours a day, seven days per week.

Delta Entry Site

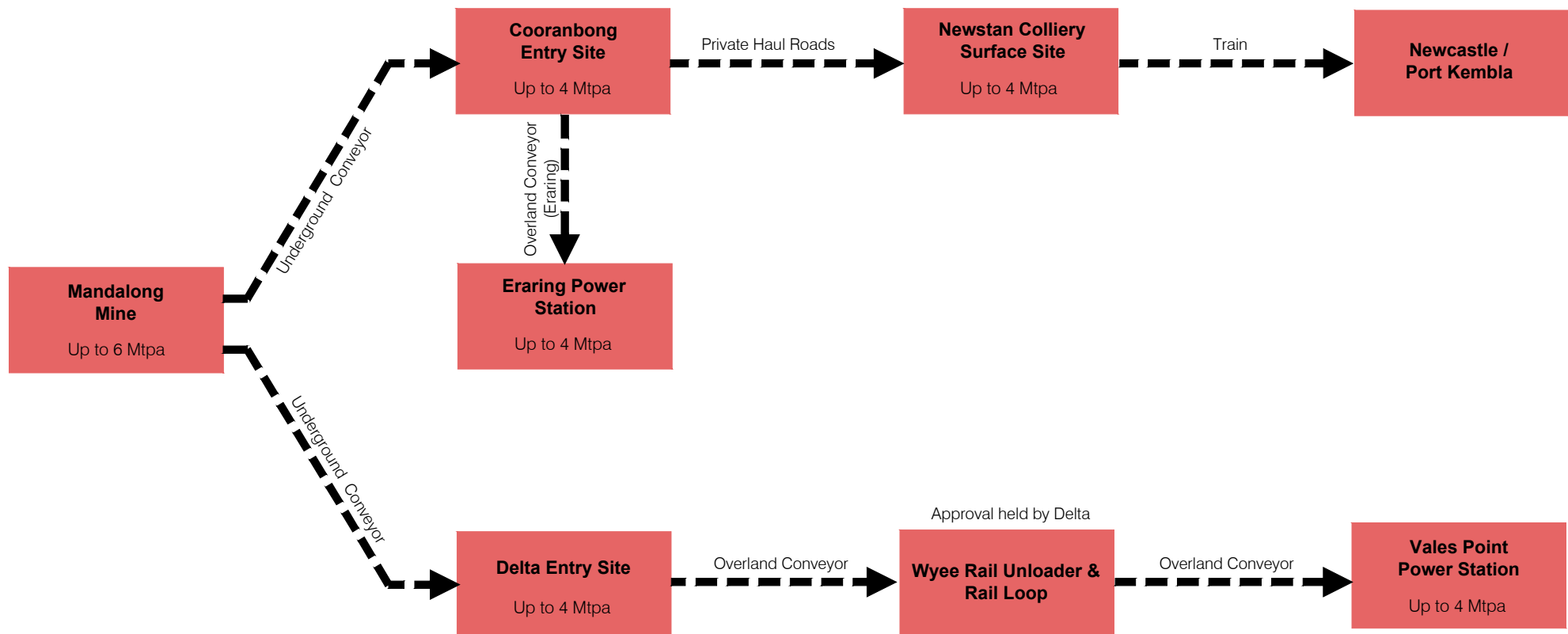
As outlined in **Section 1.8** and **Section 3.1**, the ROM coal delivered from the Mandalong Mine underground workings to the surface at the Delta Entry Site is handled by two separate (but related) components of the Delta Link Project, comprising:

- The transportation of coal to the Delta Entry Site via the underground Mandalong Coal Delivery System approved by Development Consent DA 35-2-2004 and described in the *Delta Link Project – Statement of Environmental Effects* (Umwelt 2004); and
- The receipt and handling of coal at the Wyee Coal Handling Plant at the Delta Entry Site approved by Development Consent DA-2501/2004 and described in the *Delta Link Project – Statement of Environmental Effects* (Umwelt 2004) and revised information letter dated 27 April 2004.

In short, these development consents permit the construction and use of the Mandalong Coal Delivery System, which links the Mandalong Mine to the Wyee coal unloader by an underground tunnel, and construction and use of new infrastructure at the Wyee coal unloader to enable it to receive and size coal from the Mandalong Mine before transporting it to the Vales Point Power Station by the Delta Electricity overland conveyor. These components of the Delta Link Project do not form part of this Project.

3.10 Product Coal Transport

Figure 16 depicts the product coal transport approved as part of Mandalong Mine operation.



Data Source: Hansen Bailey / Centennial Coal Mandalong

G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (1st External Review)\Fig16_CCC14-009_ApprSchemCoalHand_V3.dwg
To be printed A4

3.10.1 Product Coal to Newstan Colliery Surface Site

Up to 4 Mtpa of coal is approved to be transported by truck from the Cooranbong Entry Site to the Newstan Colliery Surface Site via private haul roads for further processing and subsequent transport into domestic and export markets. The Cooranbong Private Haul Road links the Cooranbong Entry Site to Newstan Colliery via the Newstan-Eraring Private Haul Road. This initial section of the haul route is approximately 3.4 kilometres long and is owned by Centennial Mandalong.

The Newstan-Eraring Private Haul Road, which is approximately 13 kilometres long and links the Newstan Colliery to the Eraring Power Station, is owned by Eraring Energy.



Plate 8 – Start of the Private Haul Route at the Cooranbong Entry Site



Plate 9 – Private Haul Road

3.10.2 Product Coal to Eraring Power Station

Mandalong Mine is permitted to transport up to 4 Mtpa of coal from the Cooranbong Entry Site directly to the Eraring Power Station by a dedicated overland conveyor, which is owned, operated and maintained by Eraring Energy. The conveyor has a capacity of 1,000 tonnes per hour and operates 24 hours a day, seven days per week.

3.10.3 Middlings to Cooranbong Entry Site

Mandalong Mine is permitted to undertake back-haulage of middlings at a rate of up to 0.5 Mtpa from Newstan Colliery Surface Site to Cooranbong Entry Site for subsequent supply to the Eraring Power Station. The term “middlings” describes a middle quality coal product produced from the washing of coal. Once middlings are blended with coal from Mandalong Mine at the Cooranbong Entry Site it is of suitable quality for supply to Eraring Power Station for power generation.

The middlings are, in most cases, transported in the coal haulage trucks as backloads from Newstan Colliery and, as such, do not generate any additional traffic movements. Once at the Cooranbong Entry Site the middlings are stockpiled at the 3,000 tonne stockpile before being reclaimed and transported to Eraring Power Station via the existing overland conveyor.

3.11 Water Management

The water demands of the Mandalong Mine are for underground operations, surface facilities (including machinery operation and wash-down), dust suppression, fire-fighting storage and staff amenities. Potable water is obtained via the existing connections to HWC's reticulated water supply infrastructure at the Mandalong Mine Access Site and Cooranbong Entry Site. Additional water sources comprise mine water and rainfall runoff.

The key functions of the Mandalong Mine water management systems are to:

- Separate clean and dirty water sources, and allow for diversion, collection and treatment as appropriate;
- Facilitate water recycling and water sharing to support the mining operation;
- Minimise discharges by maximising, where practicable, available water storages; and
- Manage water discharge, in terms of volume and quality, to a level that is acceptable for environmental management.

Surface runoff from areas where there is no coal storage, handling, processing or transportation and no equipment servicing is considered to be clean water. It is typically from undisturbed catchment areas and impervious areas such as sealed roads and car parks. This runoff is directed around dirty water catchments to avoid potential contamination and minimise the volume of dirty water required to be managed.

Dirty water is runoff from disturbed areas and areas likely to contain coal, oils, greases and hydrocarbons, including workshop and fuel storage areas.

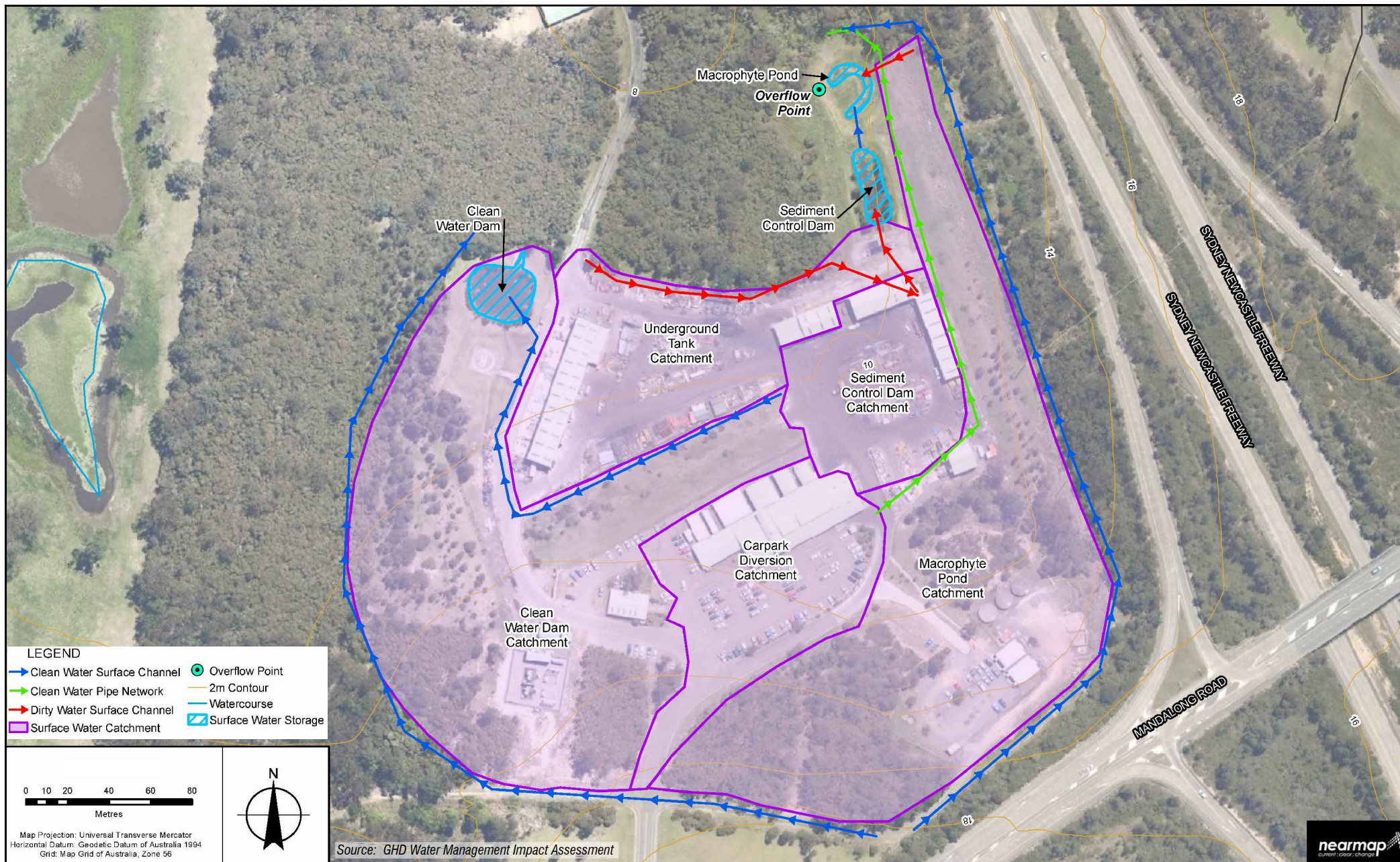
3.11.1 Mine Dewatering

During mining operations, water is released from the coal seam and collects in the underground workings. Additional potable water used in the mining process also collects in the underground workings. The process whereby collected water is pumped out of the mining area is called mine dewatering. Mandalong Mine's existing underground water management system collects mine water in various low points in the underground workings and subsequently pumps it to the Cooranbong Colliery goaf storage area, which has a capacity of approximately 4,200 megalitres. The goaf provides a large storage volume of approximately 4.2 gigalitres and enables filtration and sediment settlement prior to the water being pumped to the surface via a dewatering bore to the Borehole Dam at the Cooranbong Entry Site (see **Section 3.11.3**).

Mandalong Mine's current dewatering licence at the Cooranbong Entry Site, which is identified as licence number 20BL169424 under the *Water Act 1912*, permits Centennial Mandalong to extract up to 1,825 megalitres per year of groundwater from the coal seam.

3.11.2 Mandalong Mine Access Site

The existing management systems for clean water and dirty water at the Mandalong Mine Access Site are outlined below and illustrated on **Figure 17**.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg17_CCC14-009_ManMineAccessSWM_GHD5-1_V4.dwg
 To be printed A4

Clean Water Management

Diversion drains to the east and west of the site divert clean water runoff from external catchments around the site, this includes water runoff from the adjoining Mandalong Road and Sydney-Newcastle F3 Freeway on-ramps. Clean water runoff from vegetated areas and sealed surfaces in the western extent of the site is directed to the Clean Water Dam, which has a capacity of approximately 860 kilolitres. Runoff from the south-eastern portion of the site, which includes vegetated areas and the contractors' car park, along with runoff from the main car park, is diverted via a pipe around the dirty water catchments and discharged downstream of the Macrophyte Pond.

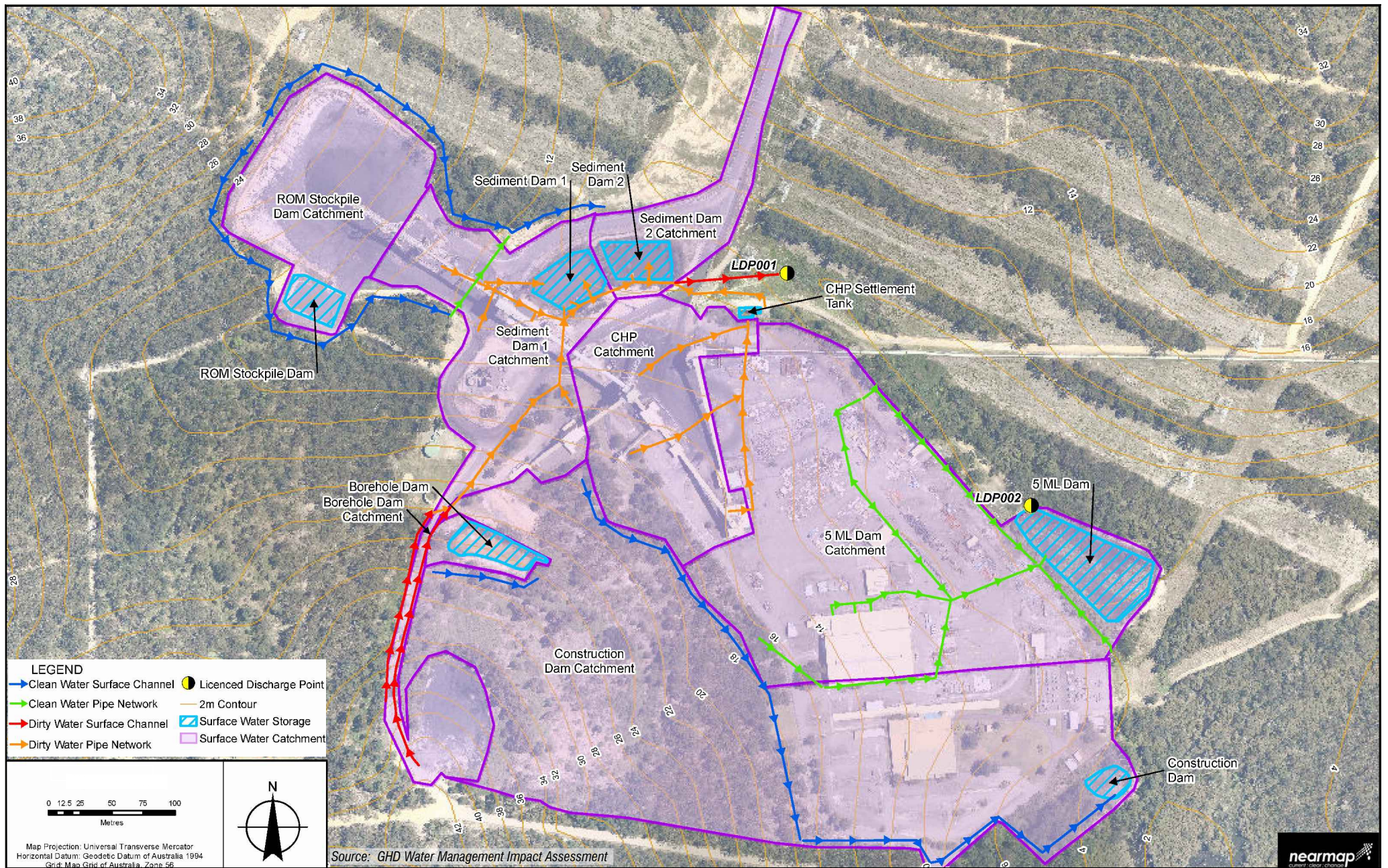
Dirty Water Management

Water from all other surface areas within the site is considered dirty water and is directed, via surface and sub-surface drainage, to a number of dirty water management structures. A gross pollutant trap and an oil-water separator act to remove solids and hydrocarbons from runoff that originates at the fuel storage area, workshop, washdown buildings and equipment yard. Water from these structures is collected in an underground tank with the storage capacity of 0.1 megalitres before being directed to the Sediment Control Dam for retention and sediment settling. Dirty water runoff from other surface areas within the site is also directed to the Sediment Control Dam.

The Sediment Control Dam is the final storage structure at the end of the dirty water management system and discharges via an overflow weir into the Macrophyte Pond, which has a capacity of approximately 600 kilolitres and acts as a polishing lagoon. Both the Sediment Control Dam and Macrophyte Pond were installed as permanent surface water controls and are designed to capture and treat stormwater runoff with peak volumes equivalent to a 1 in 10 year ARI storm event. Water is discharged from the Macrophyte Pond via a v-notch overflow weir through a low lying vegetated area with no defined drainage channel and on to Stockton Creek approximately 1.3 kilometres away. The overflow weir was originally a licensed discharge point (LDP003) on Mandalong Mine's EPL 365. In January 2003 it was agreed with the then Department of Environment and Conservation (DEC) that LDP003 be removed from the EPL during the construction phase of the Mandalong Mine Access Site as the water being discharge via LDP003 was not representative of water leaving the site and reaching Stockton Creek due to the large separation distance. In July 2005 Centennial Mandalong informed the DEC that construction of the Mandalong Mine Access Site had been completed however water discharging from the site was still not representative of water entering Stockton Creek, with the DEC agreeing not to reinstate LDP003. In August 2007 Centennial Mandalong applied to the DEC (then Department of Environment and Climate Change, DECC) to again licence the overflow weir on the Macrophyte Pond as a licensed discharge point, however the DECC advised that it was not required on the basis that the discharge was considered a discharge to land, not a discharge to water. Based on this advice, Centennial Mandalong withdrew the application for a licensed discharge point at the sediment control dam and to date the discharges from the Mandalong Mine Access Site remain unlicensed.

3.11.3 Cooranbong Entry Site

The existing management systems at the Cooranbong Entry Site for clean water, dirty water and mine water are outlined below and illustrated on **Figure 18**. Mandalong Mine's EPL 365 permits the discharge of water from the Cooranbong Entry Site via two licensed discharge points (LDP001 and LDP002) (see **Figure 18**) into an unnamed drainage path that reports to Muddy Lake on the western side of Lake Macquarie.



G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fg18_CCC14-009_CoorEntryAccessSWM_GHD5-2_V3.dwg
To be printed A4

Clean Water Management

Clean water is diverted around the Cooranbong Entry Site, with diversions in place around the ROM Coal Stockpile, through the western sector of the site and around the north-east boundary of the site.

Clean water from the vegetated western region of the site and hardstand areas used for the storage of non-contaminated equipment is directed to a clean water dam, known as the Construction Dam, for detention. While this dam is largely grown over with reeds, it is estimated to have a capacity of approximately 5.7 megalitres and stored water can be drawn upon for reuse as appropriate. Overflows from the Construction Dam occur via a weir and contribute to the unnamed watercourse flowing into Muddy Lake.

Clean water runoff from the upslope catchment to the west of the site is directed to an unnamed watercourse on the northern side of the site upslope of LDP001.

Dirty Water Management

Dirty water that is potentially contaminated with hydrocarbons from the workshop, equipment storage and washdown bay areas is drained to an oil-water separator used to remove hydrocarbons from the water stream prior to being directed to the 5 ML Dam. Additional dirty water runoff from the eastern hardstand area is also directed to the 5 ML Dam. This dam is licensed to discharge under the provisions of EPL 365 via an overflow culvert at LDP002 during times of prolonged wet weather.

A dewatering pump on the 5 ML Dam allows low water levels to be maintained in the dam during moderate to significant rainfall events, which promotes increased dirty water retention times. Dewatering occurs to the Sediment Dam 1, which is part of the management system for dirty water and mine water.

Dirty water contaminated with coal fines is directed to treatment facilities that promote the removal/settlement of coal fines. The facilities are known as Sediment Dams 1 and 2, the CHP Settlement Tank and the ROM Stockpile Dam.

Sediment Dams 1 and 2

Runoff from the coal handling areas and conveyors to the east of the ROM Stockpile is directed to Sediment Dams 1 and 2 via a series of coarse sediment sumps connected to a stormwater pit and pipe network. Additional inflows to Sediment Dams 1 and 2 are received from the CHP Settlement Tank (see below) and the 5 ML Dam, which is part of the dirty water management system outlined above.



Plate 10 – Sediment Dam at Cooranbong Entry Site

Sediment Dams 1 and 2 are connected by a concrete weir and have a combined capacity of approximately 7.6 megalitres. They are currently licensed to discharge via LDP001 under the provisions of EPL 365.

To maintain low water levels within these sediment dams and reduce the risk of overflow during moderate to significant rainfall, water is pumped from the dams to the Cooranbong Colliery goaf areas by a surface dewatering pump.

CHP Settlement Tank

Runoff contaminated with coal fines from the CHP, conveyor gantries and the temporary coal stockpile is directed to the CHP Settlement Tank (sump), which has a capacity of approximately 1.25 megalitres, to remove the coarser coal fraction. The tank is dewatered to Sediment Dam 1 for further settlement of coal fines through increased retention times.

ROM Stockpile Dam

The ROM Stockpile Dam, which has a capacity of approximately 1.9 megalitres, and a connected gross pollutant trap (drive-in coarse sediment sump) were constructed in 2010 to capture and treat dirty water runoff from the ROM coal stockpile. When the water stored in the ROM Stockpile Dam is of an appropriate quality it is discharged, via a manually operated valve, to Sediment Dam 1.

Mine Water Management

As outlined in **Section 3.11.1**, mine water generated from the underground mine workings and collected in the Cooranbong Colliery goaf storage area (4,200 megalitre capacity) is pumped to the surface via the dewatering bore (licence number 20BL169424) in to the Borehole Dam at the Cooranbong Entry Site, which has a capacity of approximately 2.44 megalitres.

Within the last two years Centennial has installed and commissioned a direct pipeline from the Borehole Dam to LDP001 (as opposed to firstly discharging into Sediment Dams 1 and 2) as a more efficient system of on-site water management and discharge. This provides additional water management capacity in Sediment Dams 1 and 2, which, in turn, reduces the instances of elevated levels of total suspended solids (TSS) through the LDP001.

3.11.4 Cooranbong Private Haul Road

Water upstream of the Cooranbong Private Haul Road is diverted away from the road by a series of catch drains. Water from the haul road and shoulder batters is captured and diverted to six sediment basins constructed along the haul road in accordance with the *Managing Urban Stormwater Soils and Construction* (the Blue Book) (Landcom 2004). On-going maintenance is undertaken, including daily removal of any coal spilt from the haul trucks on the road and the addition of flocculants on an as-needs basis to the sediment basins, to minimise potential sediment loads in the sediment basins.



Plate 11 – Sediment Basin along Private Haul Road

3.12 Waste Management

3.12.1 Production Waste

Stone material produced from the processing of coal at the Cooranbong Entry Site is transported by truck, via the private haul roads, to Newstan Colliery for use in rehabilitation or emplacement within the Newstan Colliery reject emplacement areas.

There is approval to transport coarse reject material produced from the yet-to-be-constructed coal washing facility at the Cooranbong Entry Site to the Hawkmount Quarry (located along the private haul route), for emplacement. There is also approval to dispose of fine reject material (tailings) generated by the yet-to-be-constructed coal washing facility at the Cooranbong Entry Site underground into disused workings of the Cooranbong Colliery.

3.12.2 General Waste

Management systems are in place for the various non-production waste streams generated by the Mandalong Mine. In summary:

General Waste and Routine Maintenance Consumables

All general wastes and routine maintenance consumables from the daily servicing of equipment are collected on a regular basis from the Mandalong Mine Access Site and Cooranbong Entry Site by a licensed contractor for off-site disposal within a waste facility approved to accept such waste. Recyclable material is also collected by a licensed contractor for recycling on an as-needs basis.

Waste Oil and Grease

The generation of waste oils and grease is currently limited to the routine maintenance of plant and equipment. Waste oils and greases stored at the Mandalong Mine Access Site and Cooranbong Entry Site, along with parts and packaging (for example, cartridges, filters and waste oil drums), are collected by a licensed waste contractor on a regular basis for recycling and/or off-site disposal within a waste facility approved to accept such waste.

Oily water from the workshop, equipment storage and washdown bay areas at Mandalong Mine Access Site and Cooranbong Entry Site is drained to the existing on-site oil-water separators. Licensed contractors regularly service and maintain these separators and remove all waste hydrocarbons for recycling.

Sewage

Sewage generated by on-site staff amenities at the Mandalong Mine Access Site is serviced by the site's existing connection to Hunter Water Corporation's (HWC) reticulated sewer system.

Sewage generated by on-site staff amenities at the Cooranbong Entry Site is collected (pump-out systems) on a regular basis by a licensed contractor for off-site disposal.

3.13 Post Mining Closure and Rehabilitation

In early 2012 Centennial Mandalong prepared a new Mining Operations Plan (MOP) for Mandalong Mine covering a two year period from January 2012 to December 2013. This period was agreed upon by Centennial Mandalong and the DTIRIS Division of Resources and Energy (DRE) in recognition of the current transition process to the Rehabilitation and Environmental Management Plan (REMP) under the *Mining Amendment Act 2008*. Centennial Mandalong committed to preparing a REMP during this two year period to conform to the new process and confirm the intended closure and rehabilitation strategy.

The underground nature of Mandalong Mine's operations means that surface disturbance and the need for progressive rehabilitation and revegetation is relatively minor compared to open cut mining operations. Regardless, Centennial Mandalong does adopt a progressive approach to rehabilitation in accordance with a series of approved management plans, including on-going maintenance of previously rehabilitated areas.

The majority of the rehabilitation activities were undertaken following the establishment of the Mandalong Mine Access Site at Mandalong in 2005. Rehabilitated areas are now well established and vegetated, providing a stable landform to minimise the potential for dust generation and improve visual amenity. As outlined in **Section 3.11.2**, surface water management controls have also been established and maintained, where required, to minimise erosion and sedimentation.

A number of rehabilitation trials and programs have also been undertaken at Mandalong Mine, including:

- Morans Creek rehabilitation trials;
- Translocation of threatened flora research program; and
- Nest box research program.

In addition, the surface areas above longwall panels are regularly inspected and flood paths are inspected every six months and following flood events, with remedial works undertaken in accordance with the requirements of the approved Subsidence Management Plan (SMP).

3.14 Environmental Management System

Mandalong Mine has an established Environmental Management System (EMS) that has been developed in accordance with the *Centennial Coal Environmental Management System Framework* (2011) and is generally consistent with the elements of ISO 14001. This EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by Centennial Mandalong. It also provides a means for continued improvement in environmental performance.

As part of this EMS, a comprehensive set of environmental management plans has been developed and implemented at Mandalong Mine. The implementation of these plans and the integration of the *Centennial Coal Environmental Management System Framework* (2011) is a strong focus at the Mandalong Mine and demonstrates environmental due diligence. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

The existing environmental management plans include:

- *Underground Mining Environmental Management Plan;*
- *Environmental Management Plan Surface Facilities Operations Stage;*
- *Water Management Plan;*
- *Erosion and Sediment Control Plan;*
- *Land Management Plan;*
- *Air Quality Management Plan;*
- *Noise Monitoring Program;*
- *Waste Management Plan;*
- *Wetland Monitoring and Management Plan;*
- *Energy Savings Action Plan;*
- *Landowner Communication and Consultation Plan;*
- *Cooranbong Haul Road Air Quality Management Plan;*

- *Cooranbong Haul Road Landscape and Rehabilitation Management Plan*;
- *Cooranbong Haul Road Flora and Fauna Management Plan*; and
- *Cooranbong Haul Road Waste Management Plan*.

The environmental management plans are backed by an environmental monitoring network. The various monitoring sites for the approved Mandalong Mine are shown on **Figure 19**. Monitoring results are reported monthly on Centennial's website and on an annual basis in the Annual Environmental Management Report (now known as an Annual Review).

Mandalong Mine has also developed and implemented an Approvals Database which is used as the primary tool for tracking compliance with conditions of consent, licences and leases.

URS was engaged by Centennial Mandalong to carry out Independent Environmental Audits of Mandalong Mine in 2010 and 2012 to satisfy condition 108 of the Development Consent DA 97/800. The audits assessed compliance with relevant development consents, licences and management plans. While Centennial Mandalong is currently waiting to receive the 2012 audit report, the 2010 audit report advised that Mandalong Mine's EMS appears to cover the aspects and impacts of the operation, is well implemented and environmental management at the mine appears sound (URS 2011). It also found the Approvals Database an effective means of managing compliance with the mine's requirements (URS 2011).

3.15 Subsidence Management

Subsidence, as a result of the current Mandalong Mine workings, is currently managed under an approved SMP. The SMP provides the framework for subsidence management, with the specific technical details provided in a series of associated operational management plans:

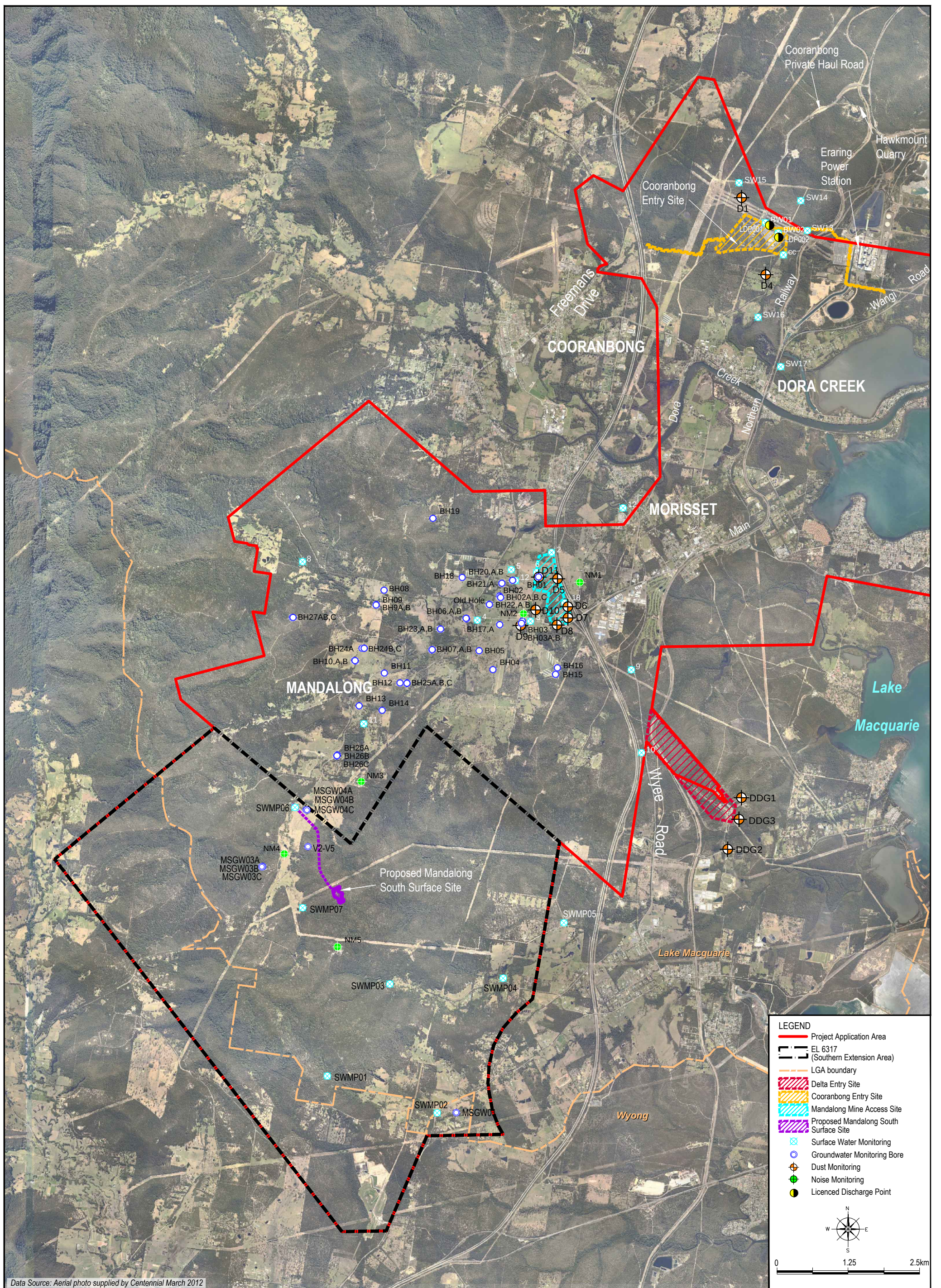
- *Property Subsidence Management Plans* (for each property within the predicted area of impact);
- *Public Safety Management Plan*;
- *Public Roads Management Plan*;
- *Telstra Management Plan*; and
- *Powerline Management Plan*.

These plans are based on the following key elements:

- Subsidence prediction data specific to the particular item of infrastructure or feature;
- Risk assessment – damage impacts, likelihood and consequences;
- Subsidence monitoring to assess performance against predictions and action triggers; and
- Trigger Action Response Plans (TARPs) for each element of interest.

Comprehensive subsidence monitoring has been carried out since commencement of mining along longwall panel centrelines, numerous crosslines and at specific infrastructure items and natural features. The monitoring program is set out in the Subsidence Monitoring Program, which is approved by the Principal Subsidence Engineer, and managed through the Mine's Approvals Database. Every four months a Subsidence Management Status Report is provided to various government agencies and published on Centennial's website. Additionally, End of Panel Reports are prepared and provided to various government agencies following completion of each longwall.

The Independent Environmental Audit undertaken by URS in 2010 to satisfy condition 108 of the Development Consent DA 97/800 concluded that the management of subsidence is taken very seriously at Mandalong Mine. URS (2011) advised that the various operational subsidence management plans provide an excellent basis for subsidence management and are being diligently implemented.



Data Source: Aerial photo supplied by Centennial March 2012

G:\Drafting\Mandalong\CCC14-009\Figures\Final\CAD\FINAL FIGS EB Report\MANDALONG EIS FIGURES\CAD (2nd External Review)\Fig19_CCC14-009_Monitoring Sites_V3.dwg
To be printed A3