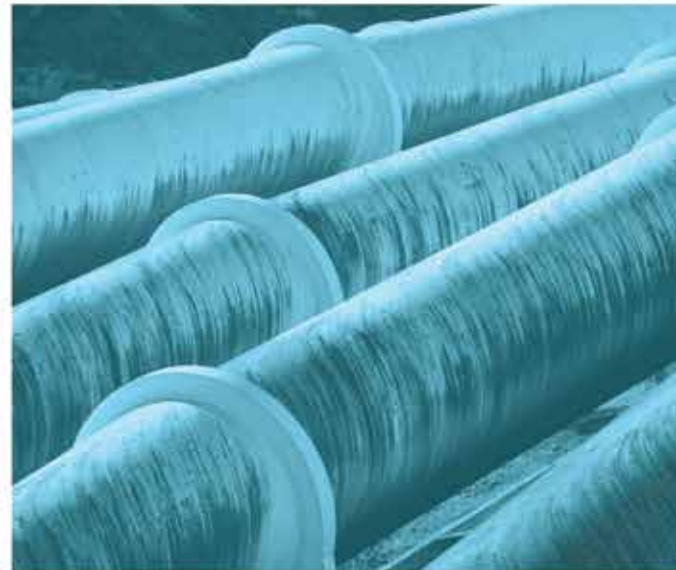




Wongawilli Colliery Modification Report

PA 09_0161 MOD 2 - North West Mains Development

Prepared for Wollongong Coal Limited
November 2020





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Wongawilli Colliery Modification Report

PA 09_0161 MOD 2 - North West Mains Development

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Prepared by



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23 December 2020

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23 December 2020

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Executive Summary

ES1 Project overview

Wongawilli Colliery (the Colliery) is an underground coal mine located approximately 15 kilometres (km) south-west of Wollongong within the Wollongong and Wingecarribee local government areas (LGAs). The Colliery is currently under care and maintenance having stop production in 2019. The site is owned and operated by Wollongong Coal Pty Limited (Wollongong Coal). Wollongong Coal is majority owned by Jindal Steel and Power Limited (JSPL).

The Colliery operates under Project Approval 09_0161 (PA 09_0161) originally approved in November 2011 and subsequently modified in December 2015 (MOD1).

The Colliery is seeking Modification 2 (MOD2) to PA 09_0161 under section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). MOD2 seeks to extend the life of the Colliery by 5 years to enable Wollongong Coal to continue development of the approved North West Mains Development (NWMD). Furthermore, the modification largely seeks approval to extend the length of the approved NWMD alignment to access the existing Wongawilli Ventilation Shaft 1 and minor surface activities.

The scope of the proposed modification is described in detail in Chapter 3 of this modification report and is summarised as follows:

- extend the life of the mine by five years to 31 December 2025 to enable Wollongong Coal to continue development of the approved NWMD;
- additional driveage and underground mains heading of approximately 2.9 linear km to access the existing Wongawilli Ventilation Shaft 1;
- provide additional access to the NWMD to that currently approved via existing Portals W10 and W9;
- minor alignment changes to the approved NWMD as ventilation infrastructure is no longer proposed at the western end of the approved NWMD alignment;
- relocation of coal handling infrastructure including the crusher, sizer and screen from the Wongawilli lower pit top to underground; and
- construction of a new section of coal conveyor system, approximately 60 m in length, and coal storage bin at the Wongawilli upper pit top.

ES2 Proposed modification benefits

MOD2 will extend the life of the existing Colliery by five years, enable completion of the NWMD and prevent the sterilisation of a high-quality coal resource within Wollongong Coals mining tenements whilst utilising existing site infrastructure.

MOD2 would allow for existing social and economic benefits of the Colliery to continue as a result of the extended mine life. Enabling the employment of up to 150 FTE employees, while supporting local and regional suppliers. The modification would also provide stability and certainty to local and regional communities, contributing to negating possible social and economic impacts during a period financial hardship caused by COVID-19. Economic benefits would extend to state and national levels with ongoing royalty payments and export sales.

The MOD2 aligns with the strategic policies for the region, including the NSW Strategic Statement on Coal Exploration and Mining in NSW (DPIE - Division of Resources and Geoscience, 2020), and would assist the state to continue to meet predicted growing coal demand, particularly from Asian markets with the majority of coal production to be sold to JSPL's for steel and power generation.

This modification report has assessed and determined the proposed modification MOD2 will not result in any new significant biophysical, social and economic impacts. As such, the residual impacts can continue to be managed in accordance with the modified consent, updated mitigation measures and management plans which will be revised as part of MOD2 this proposed modification.

In addition, the modification will enable the continuation of a brownfield site in a long-established coal mining precinct. Minimal or no changes are proposed to a number of key aspects of the existing operations at the Colliery; in particular, there is no proposed increase in annual coal extraction volumes, nor is any perceptible subsidence predicted or further groundwater impacts. Potential environmental impacts of the project, such as impacts in relation to air quality and noise are therefore expected to be much the same as that of the existing operations. Or as is the case with noise and traffic related impacts, reduced given mitigation and management measures documented within this report.

ES3 Engagement

Wollongong Coal has engaged with the local community during the preparation of this modification report. Community engagement was undertaken in consideration of COVID safe protocols, engagement was carried out via means of a community information session, community newsletters a community survey and website updates. This engagement will continue as part of the ongoing Colliery operations.

Similarly, Wollongong Coal have engaged with government agencies in regard to MOD2. Much of this consultation focussed on proposed management and mitigation measures to be employed by the Colliery to effectively manage potential impacts to local receptors. A key outcome of this consultation was to incorporate improvements to the existing coal conveyance system in which potential noise sources would be effectively removed.

ES4 Impact assessment

Chapter 7 of this modification report provides a summary of detailed noise, air quality, traffic, surface water, groundwater, subsidence, biodiversity, historic heritage, Aboriginal cultural heritage, social and economics technical assessments carried out to assess the potential impacts associated with MOD2. These assessments have been appended to this modification report.

Key findings of the impact assessment are:

- Noise
 - Operational noise from the Colliery has been assessed in accordance with the methodology outlined in the Noise Policy for Industry (NPfI) for existing sites. The assessment considered noise data recorded whilst the Colliery was in operation and proposed reasonable and feasible mitigation measures. Results of the assessment indicated that, with the inclusion of all reasonable and feasible mitigation measures, noise emissions from the mine would reduce by up to 3 to 8 dB at surrounding receptors with minimal residual noise impacts; one receptor is predicted to experience marginal impacts and six receptors predicted to experience negligible impacts, in accordance with the NPfI. Wollongong Coal propose a series of operational controls in which noise emissions would be monitored and managed to reduce the potential of noise impacts to local receptors.

- Air Quality
 - There will be no cumulative exceedances of the air quality criteria for the annual average PM₁₀ concentration, annual average PM_{2.5} concentration, annual average TSP concentration, annual average dust deposition level, 24-hour average PM₁₀ concentration or 24-hour average PM_{2.5} concentration at any assessment location.
- Groundwater and surface water
 - During mining groundwater will be drawn down to the base of the Bulli and Wongawilli Seams. Groundwater modelling has predicted there will be negligible groundwater drawdown in the upper units of the alluvium/weathered zone or Hawkesbury Sandstone and consequently there are unlikely to be any losses or diversions of surface water.
 - Groundwater dependant ecosystems situated within the shallow groundwater systems were identified as potentially being at risk due to MOD2. As there is negligible drawdown predicted in the upper formation and cracking is unlikely to extend into the Bulgo Sandstone and overlying hydrostratigraphic units, it is assessed to be unlikely that additional surface water will be lost to groundwater due to the MOD2.
 - A review of the registered bores near the Project area indicated that the water supply bores were located within the Hawkesbury Sandstone, Bulgo Sandstone or alluvium flanking the Nepean River or Mount Hunter Rivulet. Since it is predicted that there will be negligible groundwater drawdown within the Hawkesbury Sandstone, Bulgo Sandstone or alluvium it is considered there will be negligible impact on water supply bores due to the Project. Similarly, since it is predicted that there will be negligible groundwater drawdown within the Hawkesbury Sandstone, Bulgo Sandstone or alluvium it is considered there will be negligible impact on baseflow to rivers and creeks due to the Project.
 - The existing surface water management system will be maintained for MOD2, with minimal changes to Wongawilli pit top surface infrastructure, no impacts to the surface water systems or the surface water management system is expected to occur as a result of the proposed modification.
- Subsidence
 - There is no potential for the proposed NWMD roadways to cause any significant surface ground movement. Any surface subsidence is expected to be so small as to be imperceptible. Any potential impacts to natural and built features are expected to be imperceptible.
- Biodiversity
 - Avoidance of impacts to native vegetation, threatened ecological communities and fauna habitat have been undertaken to restrict proposed direct impacts associated with MOD2 to the removal of 0.01 hectares of Plant Community Type (PCT) 906 (Illawarra Subtropical Rainforest in the Sydney Basin Bioregion) and 0.02 hectares of PCT 1245 (Illawarra Escarpment Blue Gum wet forest), and the habitat it supports from the subject land.
 - The vegetation integrity scores for vegetation at the subject land are such that a total of two ecosystem credits are required to offset impacts to the two vegetation zones identified within the subject land.

- No threatened fauna species were recorded at the subject land however the presence of four credit species identified by the BAM calculator have been assumed. These are Pink Robin, Large-eared Pied Bat, Large Bent-winged Bat and Little Bent-winged Bat. Based on the impact area and biodiversity risk weighting attributed to these species, four species credits are required to offset impacts to fauna habitat.
- There were no threatened flora species recorded or assumed to be present within the subject land.
- The groundwater assessment for the project undertaken by SLR (2020) predicts negligible impacts to surface or groundwater as a result of the proposed extension to the NWMD. Hence, impacts to ecosystems that rely on groundwater are unlikely to be impacted by MOD2. Matters of National Environmental Significance are not likely to be significantly impacted by the proposed works and as such, MOD2 is not required to be referred to the Commonwealth.

This modification report presents management measures to minimise impacts from MOD2 and ongoing Colliery operations. These are summarised in Appendix D.

ES5 Conclusion

MOD2 has been designed to avoid and minimise adverse biophysical, social and economic impacts. MOD2 is anticipated to result in minimal environmental impacts beyond those previously assessed and approved under the PA. The residual impacts have been identified and assessed.

All aspects relating to environmental management will continue in accordance with the PA (as modified), Environment Protection Licence, revised site management plans, and the mitigation measures consolidated in Appendix D.

MOD2 will create jobs and provide immediate economic benefits to the local and regional area as well as maximising the utilisation of the state significant resource at an existing Colliery.

As the potential environmental impacts can be managed and mitigated with few residual impacts and there are a range of immediate and longer-term economic benefits from the Colliery approval of the proposed modification is considered warranted.

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1 Introduction

1.1 Overview

Wongawilli Colliery (the Colliery) is an underground coal mine located approximately 15 kilometres (km) south-west of Wollongong within the Wollongong and Wingecarribee local government areas (LGAs). The Colliery is owned and operated by Wollongong Coal Pty Limited (Wollongong Coal). Wollongong Coal is majority owned by Jindal Steel and Power Limited (JSPL). The Colliery operates on a site known as the Project Application Area (PAA).

This environmental assessment (EA) (or modification report) has been prepared to accompany a modification application (MOD2) to the existing Project Approval (PA) for the Colliery (PA 09_0161). The PA was originally approved in November 2011 under the former Part 3A provisions of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) and subsequently modified in December 2015 (MOD1) under former section 75W of the EP&A Act.

In this EA, a reference to the PA, PA 09_0161, Project Approval 09_0161 or Project Approval means the planning approval for the Colliery as modified by MOD1.

The transitional arrangements for former Part 3A projects have closed and the PA for the Colliery has transitioned into a State significant development (SSD) approval.

MOD2 is sought under section 4.55(2) of the EP&A Act.

MOD2 seeks to extend the life of the Colliery by 5 years to enable Wollongong Coal to continue development of the approved North West Mains Development (NWMD). Furthermore, the modification largely seeks approval to extend the length of the approved NWMD alignment to access the existing Wongawilli Ventilation Shaft 1 and minor surface activities. MOD2 is described in detail in Section 3.

Of note, Wollongong Coal committed in 2019 to no longer undertake mining via longwall extraction methods, as such no longwall mining is proposed as part of this modification application.

1.2 Approved activities

The Colliery is a well-established underground coal mine with mining activities having occurred at the site since 1916, principally producing metallurgical coal for steel production.

The Colliery is located within the Nebo Project Area and was approved under the now repealed Part 3A of the EP&A Act by the Planning Assessment Commission (PAC) (now the Independent Planning Commission (IPC)). The PA permits:

- continued use of the surface infrastructure at the Wongawilli pit top as currently operated;
- run of mine (ROM) coal production of up to 2 million tonnes per annum (Mtpa);
- mining of six longwalls panels (N1 to N6) in the Nebo Project Area;
- continued development and construction of the NWMD;
- continued transportation of ROM coal from Wongawilli Colliery to Port Kembla Coal Terminal by rail; and
- rehabilitation of the site.

Under the conditions of PA, the Colliery is approved to undertake mining operations until 31 December 2020, with the coal extracted transported via rail to Port Kembla for export to JSPL's steel production facilities and other markets.

1.3 Project need

Approval of MOD2 will enable the NWMD to be completed, and during this period Wollongong Coal propose to seek approval for mining activities within the North West and South West Domain utilising the existing Wongawilli pit top infrastructure with a 30 year mine life. The proposed North West Domain and South West Domain mining operations would use first workings place change mining method only. The North West Domain and South West Domain would be accessed via the completed NWMD and are displayed in Figure 3.2.

The North West Domain has coal resource contained within the Bulli Coal Seam and Wongawilli Coal Seam. The South West Domain has coal resource contained within the Wongawilli Coal Seam and the Tongarra Coal Seam.

The completion of the NWMD development during the MOD2 period is essential for the proposed North West Domain and South West Domain mining operations project, as this would ensure that there is mining operations continuity assuming that the approval for the proposed North West Domain and South West Domain mining operations project will require a 3 to 5 year period for application preparation, submission and determination.

Wollongong Coal acknowledges that approval of this modification does not guarantee approval of mining activities in the North West Domain or South West Domains.

1.4 The proponent

Wollongong Coal is the proponent for MOD2 (Table 1.1).

Wollongong Coal owns and operates two mines in NSW, including Russell Vale Colliery and the Wongawilli Colliery, both located in the Illawarra region near Wollongong and close to the Port Kembla Coal Terminal. Wollongong Coal was previously known as Gujarat NRE Coking Coal Limited (Gujarat NRE), until it was renamed Wollongong Coal on 25 March 2014 following JSPL of India acquiring a majority shareholding in the company.

JSPL is listed on the Indian Stock Exchange and is an international steel and power company with operating steel capacity of about 7 Mtpa and power generation capacity of about 2,500 megawatts (MW).

Table 1.1 Applicant details

Requirement	Detail
Applicant	Wollongong Coal Limited
Name of MOD 2 Contact	Richard Sheehan
Position	Group Environment and Approvals Manager
Postal address	7 Princes Highway, cnr Bellambi Lane Corrimal NSW 2518
Website	http://wollongongcoal.com.au/

1.5 EIS study team

This EA has been prepared by EMM Consulting Pty Ltd (EMM) and is accompanied by the following appendices and technical assessments:

- Appendix A: Department of Planning, Industry and Environment correspondence regarding MOD2;
- Appendix B: Legal advice;
- Appendix C: Updated project description;
- Appendix D: Updated mitigation measures table;
- Appendix E: Noise and vibration impact assessment (EMM 2020a);
- Appendix F: Air quality and greenhouse gas assessment (EMM 2020b);
- Appendix G: Traffic impact assessment (TUP 2020);
- Appendix H: Surface water impact assessment (HEC 2020);
- Appendix I: Groundwater impact assessment (SLR 2020);
- Appendix J: Groundwater peer review report (EMM 2020c);
- Appendix K: Subsidence impact assessment (SCT 2020);
- Appendix L: Biodiversity development assessment report (Biosis 2020a);
- Appendix M: Historical heritage assessment and statement of heritage impact (Biosis 2020b);
- Appendix N: Archaeological assessment (Biosis 2020c);
- Appendix O: Social impact assessment (EMM 2020d); and
- Appendix P: Economic impact assessment (Gillespie Economics 2020).

1.6 Consent authority

Based on current delegations and legislation, an SSD modification application (as opposed to a new SSD application) with more than 50 objections will not be referred to the Independent Planning Commission (IPC), unless the application is made by a person who has disclosed a reportable political donation under section 10.4 of the EP&A Act in connection with the modification application (see clause 8A(2) of State Environmental Planning Policy (State and Regional Development) 2011 (SEPP (SRD))).

Clause 8A of SEPP (SRD) was amended in March this year following a NSW Productivity Commission review into the role and function of the IPC. The amendment handed consent authority functions for SSD modifications to the Department of Planning and Environment (DPIE), with the exception of a disclosed reportable political donation as noted above.

Accordingly, Wollongong Coal has not disclosed a reportable political donation under section 10.4 of the EP&A Act, as such the consent authority is the Minister for Planning and Public Spaces (or his delegate).

2 Background

2.1 The site and surrounds

The approved NWMD and proposed additional driveage underlies the eastern extent of the Illawarra Plateau within the Upper Nepean State and Illawarra Escarpment Conservation Areas, including the south-western part of Lake Avon, Gallahers Creek and Flying Fox No. 3 Creek, smaller tributary streams and two identified swamps. The existing Wongawilli Colliery lower and upper pit top site infrastructure is situated on the eastern escarpment of the Illawarra Plateau, approximately 15 km south-west of Wollongong (Figure 2.1).

The Colliery occupies 14,767 hectares (ha) under mining leases CCL 766, ML 1565 and ML 1596 located within the Wollongong and Wingecarribee LGAs in the Illawarra region of NSW (Figure 2.2). The mining leases provide the boundary for the Project Application Area (PAA) which falls under PA 09_0161 and is displayed in Figure 2.2.

The Colliery is generally within the Upper Nepean catchment, which covers almost 900 square kilometres (km²) of native bushland. The catchment is at the southern end of the Illawarra Plateau, which stretches from the Heathcote National Park, at the southern outskirts of Sydney, to the town of Robertson, in the Southern Highlands (WaterNSW 2020). The catchment forms part of Sydney's drinking water catchment, parts of which are designated as Metropolitan 'Special Areas'.

The Metropolitan 'Special Areas' are the lands which surround Sydney's drinking water storages and are declared under the *WaterNSW Act 2014* (WNSW Act) and managed by WaterNSW (refer Chapter 4). 'Special Areas' usually have high biodiversity values with access restricted to protect biodiversity and water quality in these areas.

The existing Colliery mine access point and surface infrastructure facilities are at approximately 260 metres Australian Height Datum (mAHD) (referred to as the 'Wongawilli upper pit top'), while the coal handling facilities are at the base of the Illawarra Escarpment at approximately 40 m AHD (referred to as the 'Wongawilli lower pit top'). The Wongawilli lower and upper pit tops are connected by an existing coal conveyor and an access road.

Wongawilli Road/West Dapto Road connects the Colliery to the Princess Highway approximately 4.3 km west of the mine. The Collieries private rail line runs east from the Wongawilli lower pit top to the south of Wongawilli before joining the main Illawarra railway line. Whilst the state-owned Unanderra to Moss Vale rail line is west of the Wongawilli upper pit top and runs in a north south direction.

Other built infrastructure located in the vicinity of the Colliery includes the Avon to Marulan 330 Kilovolt (Kv) power transmission line and a series of trails for the purpose of bushfire access.

The nearest major population centres are the Wollongong suburbs of Horsley, approximately 2.7 km south-east, and Dapto, approximately 4 km south-east of the Wongawilli lower pit top. The residential suburbs of Wongawilli and Dombarton neighbour the Colliery (Figure 2.2).

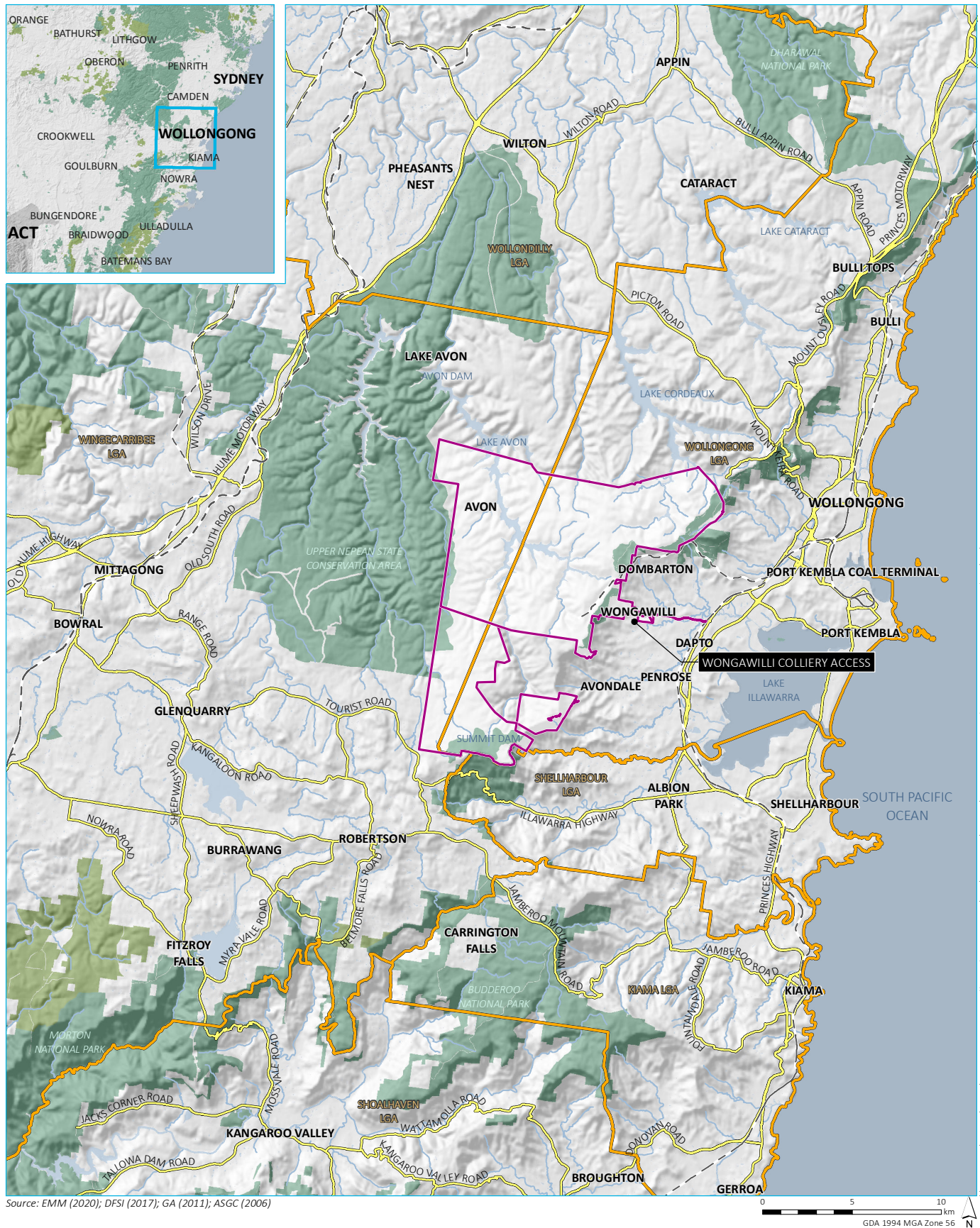
2.2 The project area

MOD2 will allow for the completion of the approved NWMD, comprising approximately 4.5 km of the remaining underground mains heading with an additional driveage extension of approximately 2.9 km to the existing Wongawilli Ventilation Shaft 1.

The connection to this shaft will ensure ventilation requirements are met for the NMWD.

The modification proposes to utilise existing Wongawilli lower and upper pit top (surface) infrastructure with the exception of minor changes to the Wongawilli upper pit top conveyor network and relocation of coal handling infrastructure. This change is proposed to improve the conveying of coal from the NWMD to the existing coal handling and train loading facilities located at the Wongawilli lower pit top. All aspects of the modification fall within the existing PAA.

The PAA encompasses three mining lease CCL 766, ML 1565 and ML1596, as displayed in Figure 2.2. The schedule of land which the PAA encompasses and activities proposed under this modification are consistent with that listed under PA 09_0161.

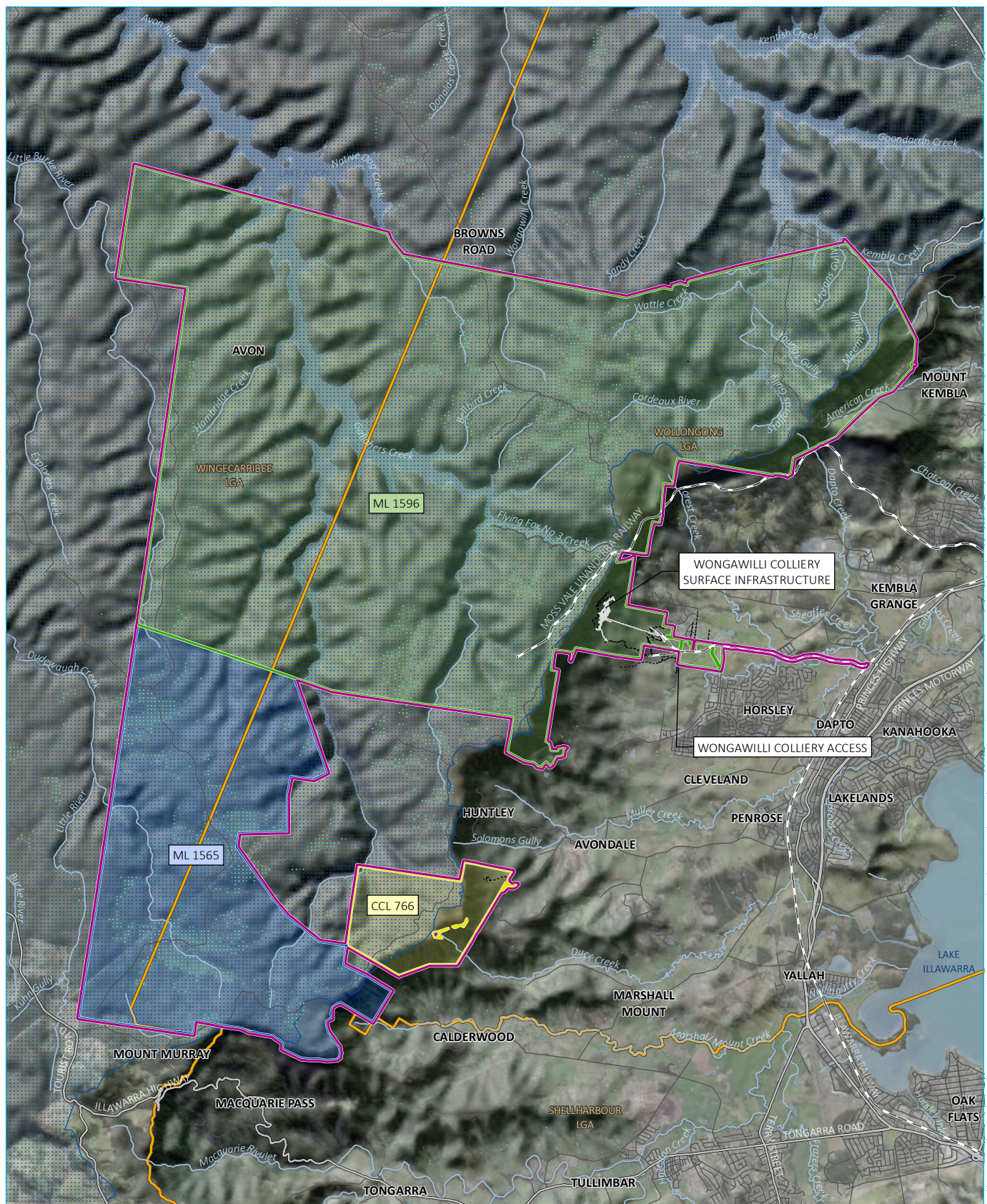


KEY

- Project application area
- Rail line
- Major road
- Named watercourse
- Waterbody
- Local government area
- NPWS reserve
- State forest

Regional setting

Wollongong Coal Limited
Modification Assessment Report
Figure 2.1



Source: EMM (2020); DFSI (2017); WaterNSW (2016); OEH (2015); GA (2011)

KEY

 Project application area	 Wongawilli Colliery surface infrastructure	 Waterbody
Mining title	 Wongawilli Colliery access track	 Upland swamp
 ML 1565	 Major road	 Metropolitan special area
 ML 1596	 Minor road	 Local government area
 CCL 766	 Rail line	
	 Named watercourse	

Local setting

Wollongong Coal Limited
Modification assessment report
Figure 2.2

2.3 Local land use

The majority of the Colliery surrounds is zoned for environmental management and conservation under the relevant Local Environmental Plans (LEPs), including E1 National Parks and Nature Reserves, E2 Environmental Conservation and E3 Environmental Management. There are small areas zoned for public recreation (RE1), primary production (RU1) and rural landscapes (RU2), low density (R2) and large lot residential (R5) and infrastructure (SP2) located to the east of the Colliery (Figure 2.3).

As previously noted, the Wongawilli area has a long history of mining spanning from the early 1900s. Historically, the suburb of Wongawilli was approximately 1.5 km east of the Wongawilli lower pit top, however in recent years, land close to the Colliery has been rezoned and subdivided for residential development. New residential areas have been developed north of Wongawilli Road, including along Bankbook Drive, McDermid Lane and Coral Vale Drive.

The nearest residence to the Colliery is located on Bankbook Drive, approximately 150 m from the boundary of the Wongawilli lower pit top. A community hall and Dapto Rural Fire Brigade Station on Wongawilli Road, east of the Wongawilli lower pit top separate residences and the Wongawilli Coals operations.

The closest school is a preschool, the Little School Preschool Incorporated, located approximately 2 km north-east from the Lower Wongawilli pit top at the base of the Illawarra Escarpment.

Agricultural areas exist to the south, east and north of the Wongawilli lower pit top.

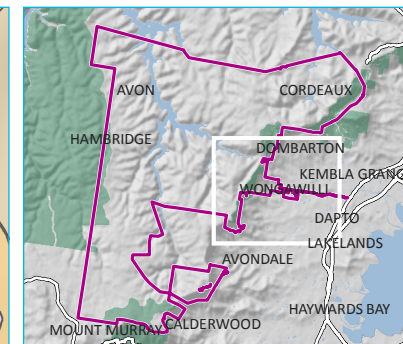
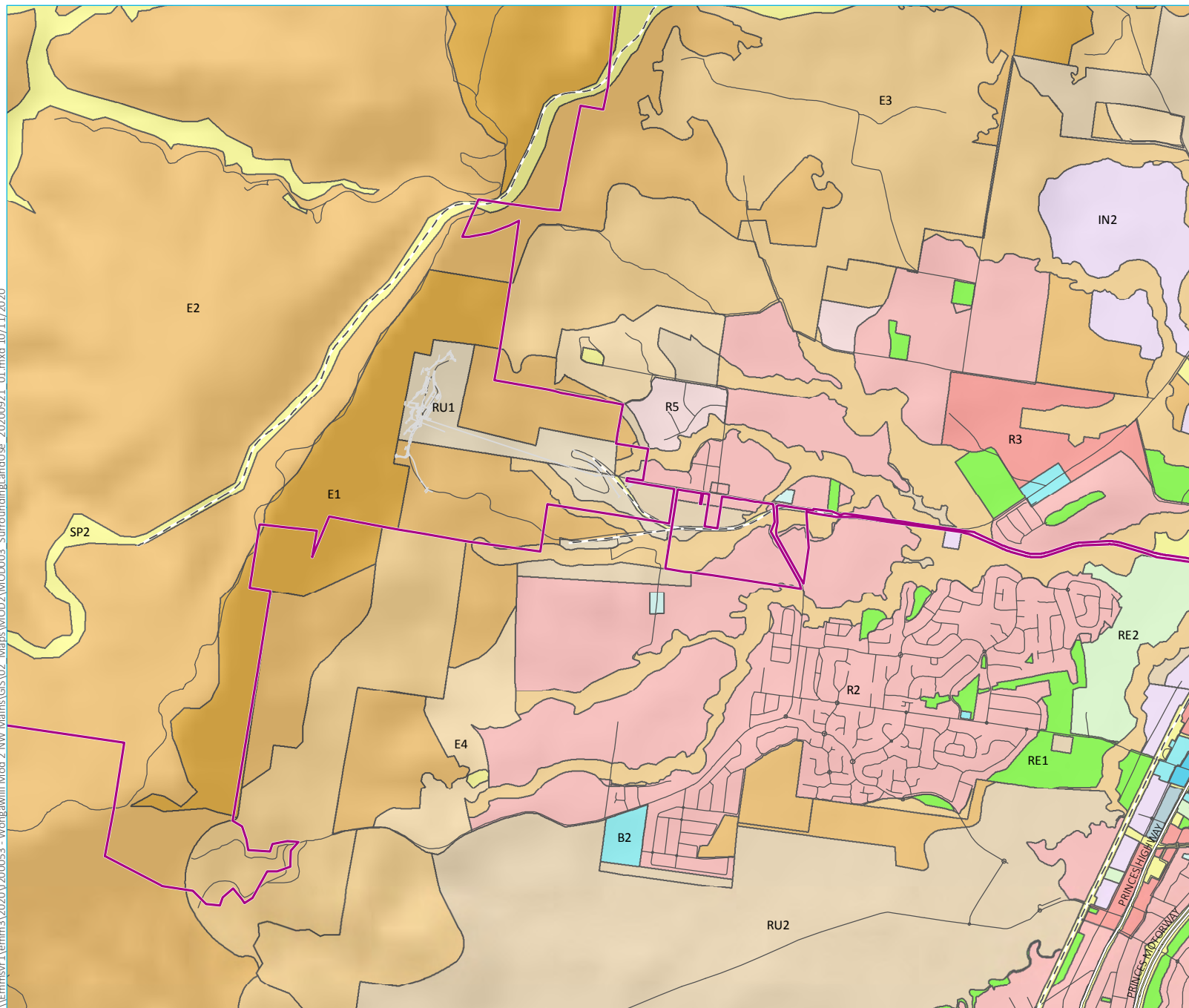
Land uses surrounding the site include:

- north – the Illawarra Escarpment Conservation Area (IECA) and land which falls within the Sydney drinking water catchment;
- east – housing development inclusive of small residential holdings and low density rural holdings;
- south – housing development inclusive of small residential holdings and low density rural holdings; and
- west – the IECA and land which falls within the Sydney drinking water catchment.

Surrounding land uses can be seen in Figure 2.3.

No lands subject of the PAA are on the Strategic Agricultural Land Map or subject to a site verification certificate in respect of *clause 119A of the EP&A Regulations*.

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- KEY**
- Project application area
 - Rail line
 - Wongawilli Colliery surface infrastructure
 - Major road
 - Minor road
- Land zone**
- B1 Neighbourhood Centre
 - B2 Local Centre
 - B3 Commercial Core
 - B6 Enterprise Corridor
 - E1 National Parks and Nature Reserves
 - E2 Environmental Conservation
 - E3 Environmental Management
 - E4 Environmental Living
 - IN2 Light Industrial
 - R2 Low Density Residential
 - R3 Medium Density Residential
 - R5 Large Lot Residential
 - RE1 Public Recreation
 - RE2 Private Recreation
 - RU1 Primary Production
 - RU2 Rural Landscape
 - SP2 Infrastructure
- INSET KEY**
- Waterbody
 - NPWS reserve

Surrounding land use

Wollongong Coal Limited
Modification assessment report
Figure 2.3



Source: EMM (2020); DFSI (2017); DPE (2017); GA (2011); ASGC (2006)



2.4 Current approvals and licences

The Colliery operates in accordance with the following approvals:

- Project Approval 09_0161 (MOD1 approved 27 November 2015 under former section 75W of the EP&A Act);
- Wongawilli Mine – Bathhouse Project (MP09_0030);
- Environment Protection Licence (EPL) 1087;
- Mining Leases including:
 - CCL 766;
 - ML 1565; and
 - ML 1596.
- Water Access Licence (WAL) 36487; and
- Subsidence Management Plan.

The proposed modification subject of this EA is MOD2 to PA09_0161.

Proposed changes to PA09_0161 under MOD2 are detailed in Section 3, with mitigation and management measures detailed in Section 7 and summarised in Appendix D.

No changes are proposed to MP09_0030 under MOD2. For clarity EPL 12441 permitting activities at the Avondale Colliery and the associated Pollution Incident Response Management Plan listed on Wollongong Coals website are not subject of this modification.

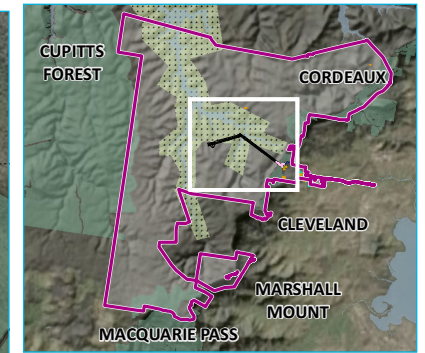
2.5 Approved NWMD

The approved NWMD, consists of four separate roadways and interconnecting cut-throughs developed using first workings mining methods, accessed via two portals located at the Wongawilli upper pit top.

The approved NWMD is approximately 4,990 m long. To date, approximately 500 m of the NWMD has been developed prior to the Colliery going into care and maintenance in 2019. Since approval of the NWMD, headings have been realigned approximately 35 m south-west of the approved alignment to improve the functionality of the Colliery and avoid interaction with built infrastructure associated with the Lake Avon reservoir. The realignment of the headings was undertaken in accordance with condition 1 of schedule 2 of the PA and as such the realignment of the approved headings is not the subject of this modification. This realignment is supported by legal advice included within Appendix B.

The approved NWMD alignment is displayed in Figure 2.4.

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KEY

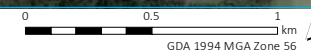
- Vent shaft
- Project application area
- Approved NWMD portal
- Additional NWMD access portal
- North West Mains Drivage completed workings
- Existing approved drivage
- Built infrastructure barrier
- Avon notification area
- Existing surface infrastructure
- Site workshop/shed
- Historic mining infrastructure
- Site infrastructure
 - ETL - 33kV
 - Access roads and tracks
 - Conveyor belt
 - Wongawilli Colliery rail
- Existing environment
 - Rail line
 - Minor road
 - Vehicular track
 - Named watercourse
 - Named waterbody
 - NPWS reserve

Approved NWMD alignment

Wollongong Coal Limited
Modification assessment report
Figure 2.4



Source: EMM (2020); WCL (2020); DFSI (2017); GA (2011); ASGC (2006)



3 Proposed modification

3.1 Overview

MOD2 is seeking to:

- extend the life of the mine by 5 years to 31 December 2025 to enable Wollongong Coal to continue development of the approved NWMD;
- additional driveage and underground mains heading of approximately 2.9 linear km to access the existing Wongawilli Ventilation Shaft 1;
- provide additional access to the NWMD to that currently approved via existing Portals W10 and W9;
- minor alignment changes to the approved NWMD as ventilation infrastructure is no longer proposed at the western end of the approved NWMD alignment;
- relocation of coal handling infrastructure, including the crusher, sizer and screen, from the current location at the Wongawilli lower pit top to a location underground; and
- construction of a new section of coal conveyor system, approximately 60 m in length, and coal storage bin at the Wongawilli upper pit top. Coal conveyor system is proposed to transport material from the North West Mains B Portal to the existing Main North Underground Conveyor.

Wollongong Coal propose to continue coal production at up to 2 Mtpa, noting restricted production during the MOD2 approval period given stone driveage requirements. Stone driveage includes the excavation of material to provide access to economic coal seams. Wollongong Coal in addition propose to utilise largely existing surface infrastructure (ie coal handling, water management systems, administration facilities) at the Wongawilli lower and upper pit tops. Product coal will continue to be transported from the Colliery to Port Kembla by rail.

The modification does not seek to change any of the other aspects of the mining operations including the extraction rate, coal processing and handling activities, offsite coal transportation routes or hours of operation which will remain as currently approved. With the exception of the above identified changes to the coal conveyor network and relocation of coal handling infrastructure.

MOD2 compared to the current PA is outlined in Table 3.1. A site layout is provided in Figure 3.1.

Table 3.1 **Proposed modification**

Element	The Colliery (Current Project Approval)	MOD2
Operating hours	24 hours per day, seven days per week Unloading from coal handling / train loading infrastructure occurring during normal operational hours: <ul style="list-style-type: none">• 7 am to 6 pm Monday to Friday• 8 am to 4 pm Saturday• no time on Sundays and public holidays	No change other than the conveyance of coal from the Wongawilli upper pit top to the lower pit top to occur only during the normal operational hours of: <ul style="list-style-type: none">• 7 am to 6 pm Monday to Friday• 8 am to 4 pm Saturday• no time on Sundays and public holidays.
Coal seams	Bulli and Wongawilli Coal Seams	No change

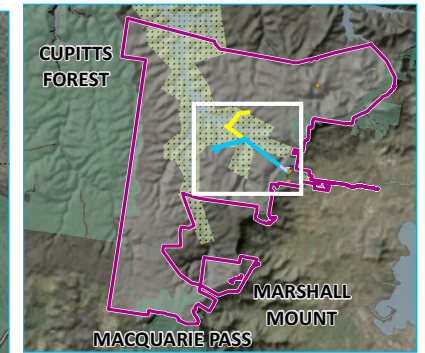
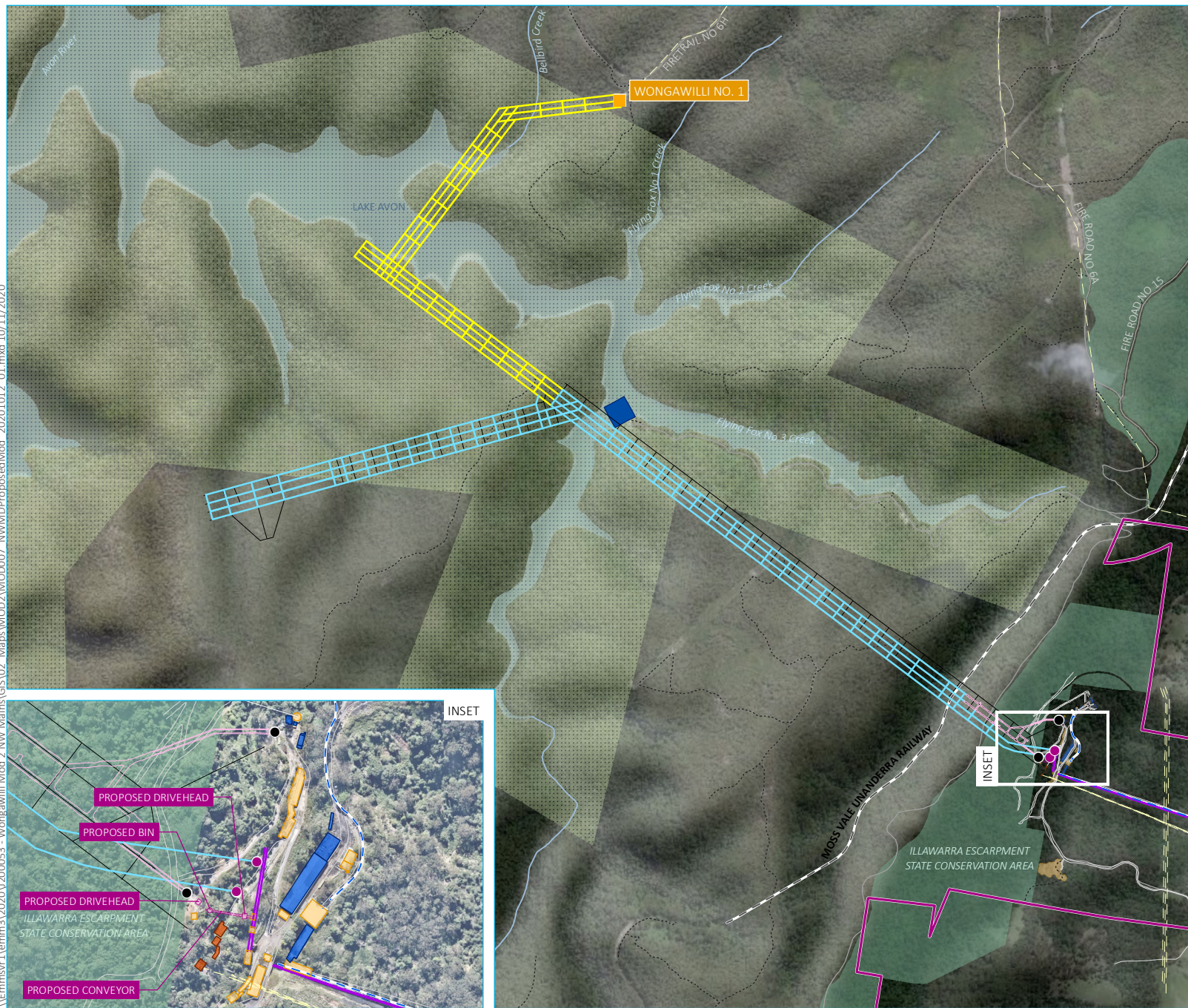
Table 3.1 Proposed modification

Element	The Colliery (Current Project Approval)	MOD2
Extraction rate	2 million tonnes per annum	No change
Approval period ending	31 December 2020	31 December 2025
Mine life	9 years consisting of 4 years (original consent), plus 5 years (MOD1)	Coal extraction until 31 December 2025, representing an extension of the approved mine life by 5 years.
Mining method	Longwall and first workings mining methods	First working mining methods only.
Underground workings	Four 5.5 m wide by 3.6 m high roadways Access from existing portals	Additional first workings proposed to enable access to the existing Wongawilli Shaft 1.
Mine infrastructure, coal stockpiles and product transport	Wongawilli lower and upper pit top facilities and coal handling / load out infrastructure to rail	<p>No change to rail transport requirements.</p> <p>No change to Wongawilli pit top administration and workshop facilities.</p> <p>Additional access to the NWMD via existing Portals W9 and W10.</p> <p>Relocation of crusher, sizer and screen to underground.</p> <p>Improvements to the coal conveyance network including the construction of a new section of coal conveyor, approximately 60 m in length and coal storage bin at Wongawilli upper pit top.</p> <p>Extension of the Wongawilli lower pit top noise wall.</p>
Rail transport requirements	<p>No transport of coal by road.</p> <p>Train movements restrictions:</p> <ul style="list-style-type: none"> • 8 train movements (calendar year average) a day; • 10 train movements (max. weekly rolling average) a day; • 3 train movements a night during normal operations; and • 4 train movements a night during advertised campaigns, with a maximum of 10 such campaigns per year. 	<p>Maximum of 4 train movements a day.</p> <p>No train movements at night.</p>
Waste management	Waste rock to be stored underground in two of the four Western Driveage roadways. Waste rock which does come to the surface to be utilised for ballast or fill underground or used on the surface for landscaping and rehabilitation.	<p>Waste rock to be stored underground within existing and NWMD workings.</p> <p>Maintain approval for waste rock to be utilised on the surface for landscaping and rehabilitation purposes.</p>
Mine ventilation	<p>Mine portals and vent shafts including:</p> <ul style="list-style-type: none"> • two portals for personnel and materials; • one portal for coal extraction; • two portals into the NWMD; and • Wongawilli Shaft 1, Nebo Shaft 3 and 4. <p>Existing Nebo area portals (Wonga Belts and Wonga Track) and ventilation shafts (Vent Shaft 3 and 4) are proposed to be closed off and rehabilitated so will no longer be in use.</p>	No change – noting additional access to NWMD via 4 existing portals (W9 and W10).

Table 3.1 **Proposed modification**

Element	The Colliery (Current Project Approval)	MOD2
Workforce	Approved for up to 300 Full Time Equivalent (FTE) and contract personnel.	Employment of up to 150 FTEs.

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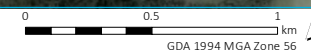
- KEY**
- Vent shaft
 - Project application area
 - Approved NWMD portal
 - Additional NWMD access portal
 - North West Mains Drivage completed workings
 - Proposed additional drivage
 - Proposed NWMD alignment
 - Existing approved drivage
 - Built infrastructure barrier
 - Avon notification area
 - Proposed surface infrastructure
 - Existing surface infrastructure
 - Site workshop/shed
 - Historic mining infrastructure
 - Site infrastructure**
 - ETL - 33kV
 - Access roads and tracks
 - Conveyor belt
 - Wongawilli Colliery rail
 - Existing environment**
 - Rail line
 - Minor road
 - Vehicular track
 - Named watercourse
 - Named waterbody
 - NPWS reserve

North West Mains Development and the proposed modification

Wollongong Coal Limited
Modification assessment report
Figure 3.1



Source: EMM (2020); WCL (2020); DFSI (2017); GA (2011); ASGC (2006)



3.2 Project description

3.2.1 Proposed additional driveage

MOD2 includes an extension of the NWMD to the north-west by approximately 1,300 m and by a further 1,600 m to the north-east (Figure 3.1). The extension will provide access to the existing Wongawilli Shaft 1 to provide ventilation for the full extent of the NWMD.

The proposed extension of the NWMD would be developed as per the existing alignment by means of first working mining methods. Allowing the continued development of four 5.5 m wide (approximate) headings, roadways and interconnecting cut-through via the use of continuous miners and bolting machines. Headings are predominately located in the Bulli seam before mining down to the Wongawilli Seam at the western end of the NWMD. The alignment of the existing NWMD and proposed additional driveage has been designed to avoid potential interactions as far as practicable with previous mine workings. In addition, the alignment has been designed as to be located outside of the Avon Water Intake Structure barrier.

As previously stated, the approved NWMD and proposed additional driveage are located within the Sydney Water Supply Catchment (Metropolitan Special Area). The NWMD also underlies the eastern extent of the Illawarra Plateau within the Upper Nepean State and Illawarra Escarpment Conservation Areas. The approved NWMD and proposed additional driveage headings proceed under the south-western part of Lake Avon, Gallahers Creek and Flying Fox No. 3 Creek, smaller tributary streams and two identified swamps (identified in Section 7.5). The depth in which the headings proceed under the base of the reservoir are 60 m at the first crossing point (as currently approved), 113 m at the second crossing point and 134 m at the third crossing point.

Built features which exist within the vicinity of the Colliery include the Moss Vale – Unanderra Railway Line and power lines, as displayed in Figure 2.2. Potential impacts and appropriate mitigation measures associated with MOD2 are defined in Section 7. The NWMD proposed extension would assist ventilation for any future mining within the North West Domain and South West Domain areas (which would be subject to a separate environmental assessment and planning approval) and thereby minimise the potential for a future ventilation shaft in the Metropolitan ‘Special Areas’. As such, Wollongong Coal proposes minor changes to the existing NWMD alignment (refer to the discussion under Section 2.5 regarding the realignment of the NWMD) whereby removing approved roadways to support previously proposed ventilation infrastructure at the western end of the NWMD. The North West Domains and South West Mining Domains are displayed in Figure 3.2.

3.2.2 Wongawilli pit top

Wollongong Coal propose to largely utilise existing pit top surface infrastructure at the Wongawilli lower and upper pit top areas. The exception being the construction of a new section of coal conveyor, approximately 60 m in length, a coal storage bin at the Wongawilli upper pit top and relocation of coal preparation infrastructure including the crusher, sizer and screen to underground. The proposed coal conveyor system is to transport material from the North West Mains B Portal to the existing Main North Underground Conveyor. Wollongong Coal in addition, propose to utilise two additional existing portals located at the Wongawilli upper pit top, Portals W9 and W10, to provide improved access to the NWMD. Surface infrastructure including the Wongawilli Shaft 1 is displayed in Figure 3.3, the Wongawilli lower and upper pit top facilities are identified respectively in Figure 3.4 and Figure 3.5.

ROM coal has historically been conveyed from the NWMD from the existing conveyor belt portal using the Main North Underground Conveyor via the Transfer House to the Decline ROM Coal Conveyor before being placed within either of the Coal Storage Bins or at the Lower Wongawilli pit top stockpile area. Existing coal preparation infrastructure is located at the Wongawilli lower pit top, in which ROM is subject to crushing and sizing prior to being placed within the coal storage bins or at the stockpile area. ROM coal is directly loaded to trains from the Coal Storage Bins or from stockpiles via a front hand loader.

MOD2 seeks to improve the coal conveyor network by constructing a new conveyor section from North West Mains B Portal to the existing Main North Underground Conveyor. The new conveyor section comprises the construction of a coal storage bin in which ROM coal would be placed before being transported via the new section of conveyor, approximately 60 m in length, to the existing Main North Underground Conveyor. The new conveyor section would also require the construction of drive heads and ancillary support infrastructure, as displayed in Figure 3.4

Minor modifications to the existing Main North Underground Conveyor will also be required to facilitate the upgrade of the conveyor network. All new and upgraded conveyor sections will be enclosed to reduce impacts as is consistent with existing infrastructure. Proposed minor changes to the existing conveyor network are identified in Figure 3.4.

The proposed changes to the conveyor network will improve the transportation of ROM coal from the NWMD portals to the existing coal handling and train loading infrastructure and will result in the redundancy of approximately 50 m of the existing Main North Underground Conveyor. This section of the existing conveyor will be decommissioned in accordance with the Mining SEPP and does not form part of this modification application.

The relocation of coal preparation equipment, including the crusher, sizer and screen to underground is proposed to remove noise sources at the Wongawilli lower pit top and will provide improved noise outcomes for residents neighbouring the operation. The relocated coal preparation equipment would be integrated into the existing coal conveyance system located within the NWMD workings. The existing crusher, sizer and screen will be removed from the Wongawilli lower pit top. To further reduce potential noise impacts to local receivers the existing noise barrier located at the Wongawilli lower pit top will be extended, as displayed in Figure 3.5. The extension to the noise barrier is proposed to be located within the existing rail corridor disturbance area.

No further changes are proposed to existing surface infrastructure to that currently approved.

3.2.3 Hours of operation

This modification does not propose to change the existing Wollongong Colliery hours of operation, being 24 hours per day, seven days per week with unloading from coal handling/train loading infrastructure occurring during normal operational hours as follows:

- 7am to 6pm Monday to Friday;
- 8am to 4pm Saturday; and
- no time on Sundays and public holidays.

However, to further minimise potential impacts to residents neighbouring the operation Wollongong Coal propose to restrict the conveyance of coal from the Wongawilli upper pit top to the lower pit top to during normal operational hours as defined above. Coal is proposed to be stored within the proposed coal storage bin located at the Wongawilli upper pit top outside of normal operating hours.

3.2.4 Workforce requirements

As result of longwall mining no longer occurring at the Colliery, FTE personnel requirements will reduce to approximately 150 persons.

3.2.5 Mining operations

As previously stated, MOD2 does not seek to change any of the other aspects of the mining operations, including the coal processing and handling activities, offsite coal transportation routes, proposed rehabilitation activities or hours of operation which will remain as currently approved. Except for the identified changes to the coal conveyor network and relocation of coal handling infrastructure.

3.2.6 Construction activities

Minor surface construction works as described in Section 3.2.2 will be undertaken to improve the coal conveyance and handling system. Construction activities are minor in nature and accounted for under the proposed work force requirements identified in Section 3.2.4.

Improvements to existing infrastructure, as necessary, will be undertaken in accordance with the existing PA.

3.2.7 Schedule of works

Initial works following approval of MOD2 will likely involve the following prior to commencement of mining operations:

- establishment of the surface mine services for the NWMD;
- re-support existing (underground) workings to the design support criteria;
- installation of underground services;
- delivery and introduction to site for mining and ancillary equipment for underground works; and
- onboarding of new staff and mine workforce.

It is likely that these initial works will take approximately three months to complete and enable progression to the initial underground mining activities. The first stage of mining will be completed in approximately 26 weeks and involve stone driveage with limited coal production during this time. The coal stockpile area will likely not be used during this first stage.

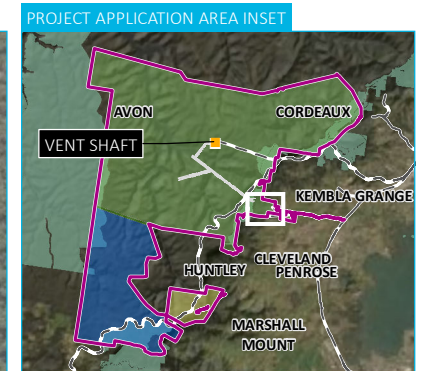
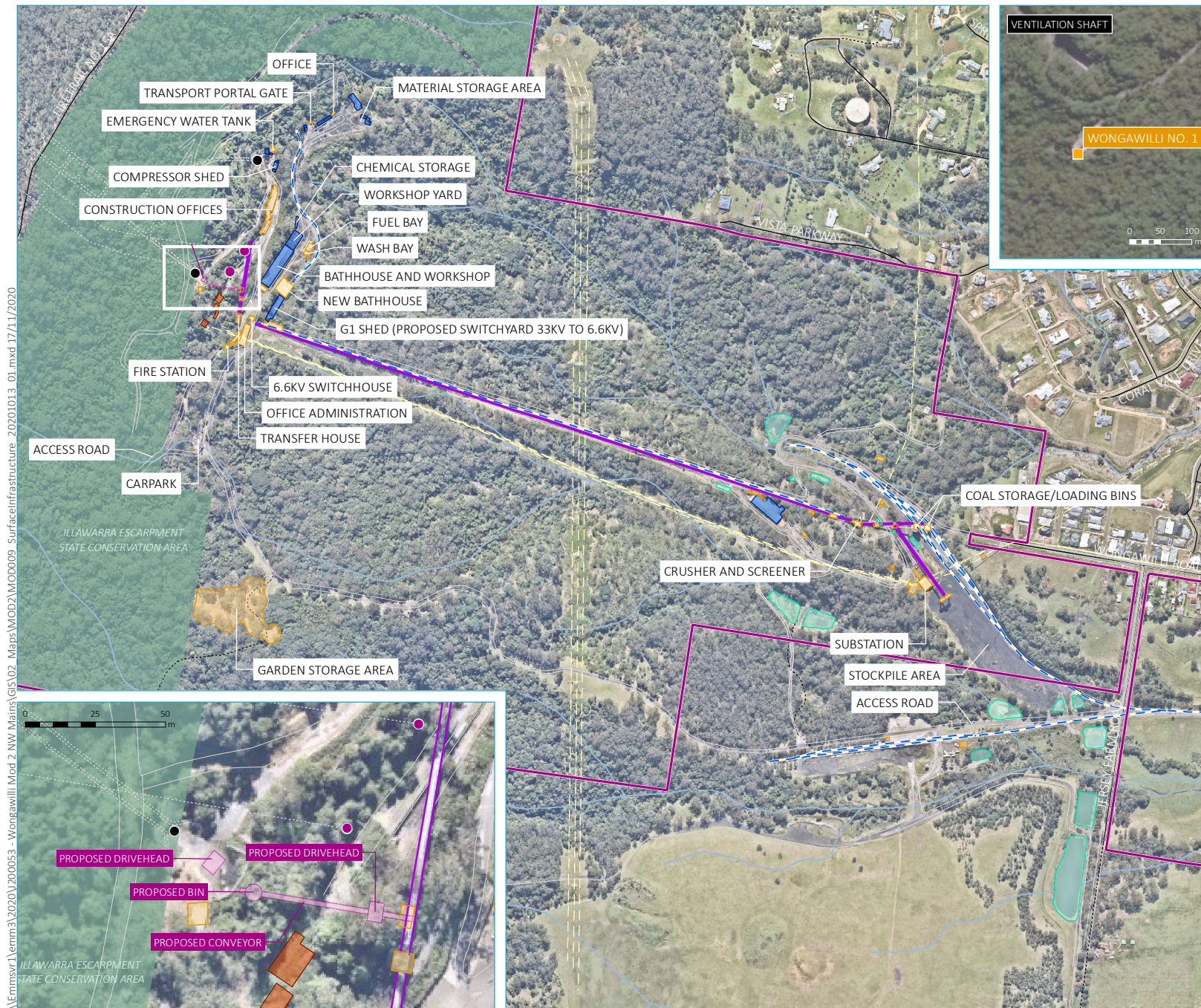
The second stage of the mine development will produce coal that will be sent to the storage bin or stockpile area during day shift only. It is estimated that the second stage will be approximately 26 weeks duration.

Full operations are not expected to commence until two years after the MOD2 approval is granted. This is due to the nature of the initial mine entry construction which will entail a significant amount of stone excavation and support to reach the thicker and economic sections of the Bulli Coal Seam. Limited use of the surface facilities will be required through the initial period of mine establishment. It is further proposed that the use of the surface coal clearance system (conveyor belt) will only be used during the dayshift hours to handle the limited quantity of coal that will be produced.

While the mine is completing the initial works further engineering will be completed to design and procure a coal handling and clearance system that aims to reduce potential impacts, most notably noise emission to neighbouring landholders. Areas that have been initially identified for consideration in this regard are as follows:

- conveyance from the mine portal to the lower stockpile area - redesigned to minimise the transfer points of the material and replace the existing decline conveyor belt system;

- coal storage and train loading facility - redesigned to minimise noise emissions (eg use of mobile equipment will be minimised or contained in an enclosed facility, lower impact loading system);
- coal bins - the location and design will be reviewed; and
- additional noise barriers and/or enclosures.

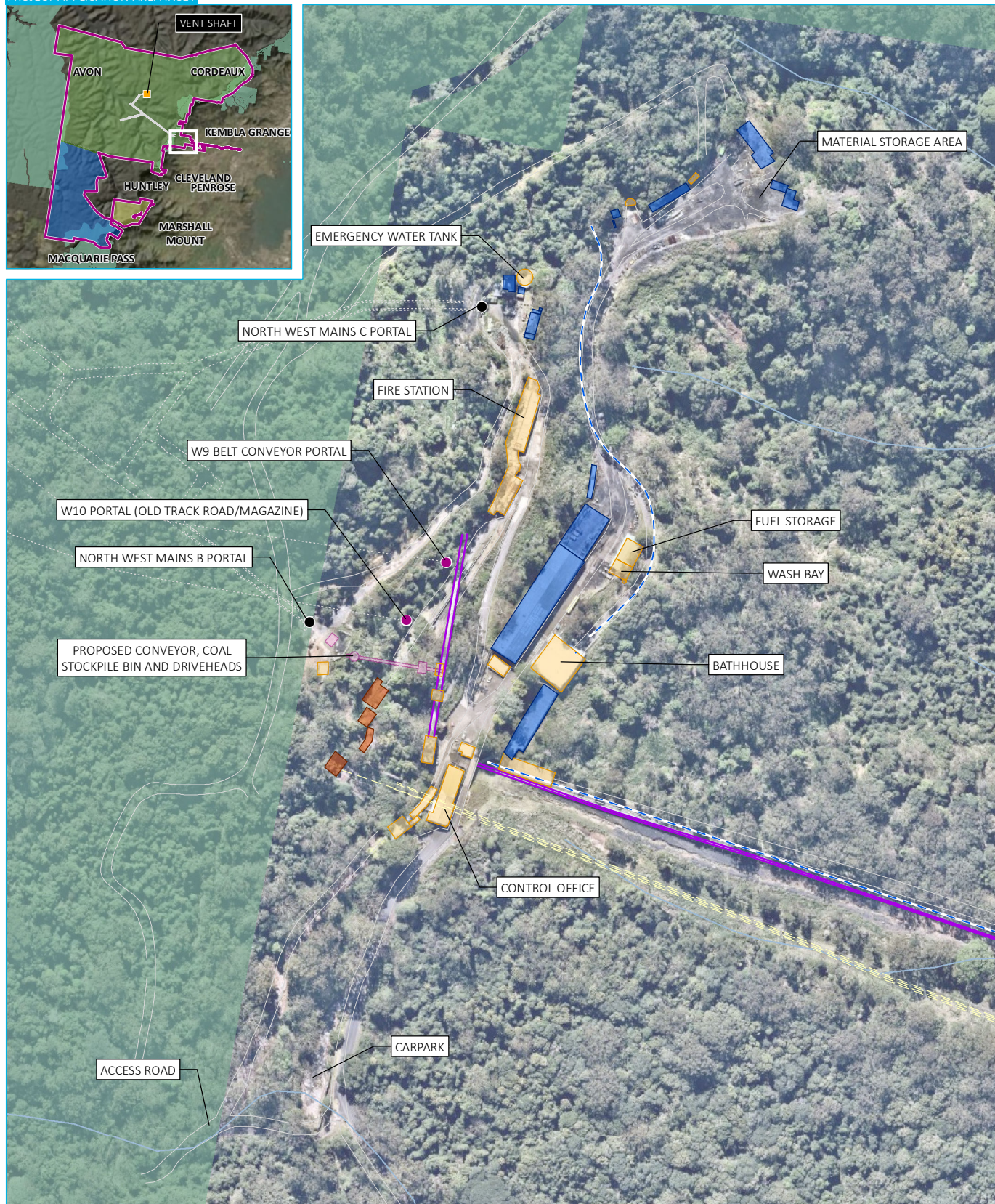
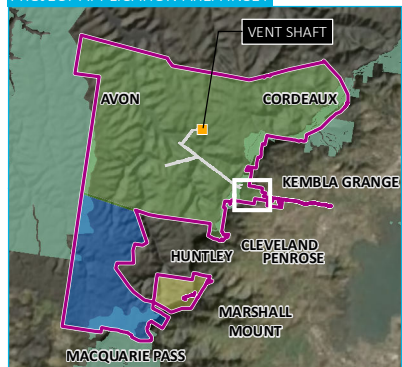


- KEY**
- Project application area
 - Approved NWMD portal
 - Additional NWMD access portal
- Site infrastructure**
- ETL - 33kV
 - Access roads and tracks
 - Conveyor belt
 - Wongawilli Colliery rail
 - Underground workings
 - Proposed surface infrastructure
 - Existing surface infrastructure
 - Site workshop/shed
 - Water collection and treatment
 - Historic mining infrastructure
- Existing environment**
- Minor road
 - Vehicular track
 - Watercourse/drainage line
 - NPWS reserve
- PROJECT APPLICATION AREA INSET KEY**
- Vent shaft - Wongawilli 1 fan
 - Underground workings
 - Rail line
- Mining title**
- ML 1565
 - ML 1596
 - CCL 766

Surface infrastructure

Wollongong Coal Limited
Modification assessment report
Figure 3.3

PROJECT APPLICATION AREA INSET



Source: EMM (2020); WCL (2020); DFSI (2017); GA (2011); ASGC (2006)



KEY

- Project application area
- Approved NWMD portal
- Additional NWMD access portal

Site infrastructure

- ETL - 33kV
- Access roads and tracks
- Conveyor belt
- Wongawilli Colliery rail
- Underground workings

- Proposed surface infrastructure
- Existing surface infrastructure
- Existing site workshop/shed
- Historic mining infrastructure
- Existing environment
- Minor road
- Watercourse/drainage line
- NPWS reserve

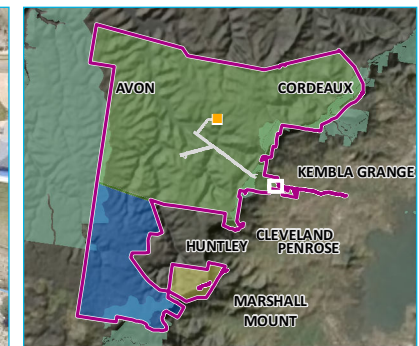
PROJECT APPLICATION AREA INSET KEY

- Vent shaft
- Underground workings
- Mining title
- ML 1565
- ML 1596
- CCL 766

Wongawilli upper pit top

Wollongong Coal Limited
Modification assessment report
Figure 3.4





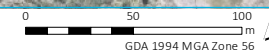
- KEY**
- Project application area
 - Site infrastructure**
 - ETL - 33kV
 - Access roads and tracks
 - Conveyor belt
 - Wongawilli Colliery rail
 - Noise barrier (6 m height)
 - Proposed noise barrier extension
 - Existing surface infrastructure
 - Site workshop/shed
 - Water collection and treatment
 - Existing environment**
 - Minor road
 - Vehicular track
 - Watercourse/drainage line
 - INSET KEY**
 - Vent shaft
 - Underground workings
 - NPWS reserve
 - Mining title**
 - ML 1565
 - ML 1596
 - CCL 766

Wongawilli lower pit top

Wollongong Coal Limited
Modification assessment report
Figure 3.5



Source: EMM (2020); Wollongong Coal Limited (2020); NearMap (2020); DFSI (2017); GA (2011); ASGC (2006)



4 Strategic context

This chapter addresses the strategic context of MOD2, with consideration of Government plans and policies, social and economic trends, and the existing and future natural and built environment. This chapter also outlined the project's strategic need and potential benefits, in accordance with the draft EIS guidelines (DPE 2019).

4.1 Introduction

The Wongawilli Colliery is located within the Illawarra region of NSW, also referred to as the Illawarra-Shoalhaven region. The Illawarra region is located south of Sydney and constitutes the LGAs of Wollongong, Shellharbour, Kiama and Shoalhaven.

The Illawarra is a region of national significance, with recognised high environmental value, agricultural productivity and resources which are economically and environmentally important to the region and NSW (DPIE 2015 (formerly Department of Planning and Environment)). The Illawarra has a long history of mining, with Port Kembla established in the late 1980s to facilitate the export of coal from the mines of the Illawarra region (Port Authority 2020). Today, mining is still one of the largest industry sectors in the Illawarra region. In 2015, mining contributed to \$2.6 billion in output regionally, \$2.5 billion of which derives from within the Wollongong LGA (RDA Illawarra 2015).

4.2 NSW Government's Strategic Statement on Coal Exploration and Mining in NSW 2020

NSW Government's *Strategic Statement on Coal Exploration and Mining in NSW* (2020) (the 'Coal and Mining Statement') seeks to provide clarity for the coal industry and the community in relation to the states policy position on the future of coal exploration and mining projects in NSW.

The Coal and Mining Statement notes that:

as we see a reduction in demand for thermal coal, the use of metallurgical coal (or metallurgical coal) in the manufacture of steel is likely to be sustainable longer as there are currently limited practical substitutes available.

The Coal and Mining Statement acknowledges the economic and social benefits related to coal mining in NSW. In particular, the coal industry provides 22,000 direct and 89,000 indirect jobs in the state. The ongoing demand from South Asian countries means that the industry is economically sustainable, with regular contributions to the State's budget with \$2 billion in royalties from coal used to fund public services and infrastructure in 2018-2019 (DPIE – Division of Resources and Geoscience 2020).

A *Strategic Statement on NSW Coal* (Coal Statement) issued in 2014 by the NSW Government, identified that NSW had 18 billion tonnes of recoverable coal reserves at that time. The majority of this coal was identified within the Sydney-Gunnedah Basin, which extends from south of Wollongong to north of Newcastle and north-westerly through to Narrabri.

MOD2 aligns with NSW Government's goals and vision for the coal industry in NSW, which broadly aims to support and encourage mining and the export of thermal and metallurgical coal, particularly in the short to medium term as the industry transitions to alternative forms of energy generation and practical substitutes for steel manufacture. As previously stated, the majority of Wollongong Coal's coal production from the Colliery is sold to JSPL for power steel manufacture.

4.3 Illawarra Shoalhaven Regional Plan 2036

The NSW Government's Illawarra Shoalhaven Regional Plan 2036 (IS Regional Plan) (DPE 2015) is a 20-year blueprint for the future of the Illawarra Shoalhaven region. The region benefits from its proximity to both Sydney and Canberra as well as its global connections via Port Kembla which supports over 3,500 jobs and contributes \$418 million to the regional economy each year (RDA Illawarra 2015).

Direction 4.2 of the IS Regional Plan being 'secure the productivity and capacity of resource lands' closely aligns with the objectives of MOD2. It notes that the region lies partially within the Southern Coalfield, which provides the only hard coking coal in NSW. Hard coking coal, also known as metallurgical coal, is used as an input into the production of steel. This type of coal is in high demand globally for steel production as outlined in Section 3.2.

Action 4.2.1 of the IS Regional Plan acknowledges the need for 'sequence release areas, in the vicinity of mineral resources, to allow the continuation of working extraction activities', including the Dendrobium, Wongawilli, Russell Vale and Metropolitan Collieries which are all located near current or future residential developments. This action recognises the challenge of balancing the ability of these mines to continue to operate proximate to current and future residents. For this reason, the NSW Government has committed to considering *"the need to protect the ongoing operation of existing collieries and future development of known resources in assessing rezoning proposals"* (pp 48-49, DPE 2015).

As noted in Section 2.1, the Wongawilli Colliery is located close to new growing residential areas. The Australian Bureau of Statistics (ABS) 2016 Census QuickStats show that there were 141 persons living in Wongawilli during the last census. This number is expected to increase significantly with the new residential developments along Wongawilli Road and beyond (Figure 2.2), as well as the growing residential suburbs of Horsley and West Dapto. Specialist technical assessments undertaken as part of this modification have considered potential environmental, social and economic impacts, and where practicable proposed mitigation and management measures to minimise potential residual impacts to the growing residential community close to Wongawilli Colliery (Chapter 6).

4.4 Our Wollongong 2028 Community Strategic Plan

Wollongong City Council's (Council's) Our Wollongong 2028 Community Strategic Plan (WCSP 2028) was developed in consultation with the local community to help guide activities and plans within Wollongong LGA to ensure the Council is actively working to achieve the community's goals.

MOD2 aligns with Council's the following strategic objectives:

- 2.1.1 Support educational and employment opportunities that retain young people and local talent, attract new workers and provide opportunities for the unemployed;
- 2.1.2 Grow the national competitiveness of Metro Wollongong to drive economic growth, employment and diversification of the region's economy; and
- 2.1.5 West Dapto urban growth is effectively managed to balance employment and population growth.

Wollongong Coal propose to employ 150 FTE employees at the Wongawilli Colliery during construction and operation should MOD2 be approved.

In addition, the Wongawilli Colliery supports the local economy through a number of indirect employment opportunities relevant to maintenance and contractor services, transportation services, and the use of Port Kembla facilities.

4.5 Resource demand

The NSW Government's Coal and Mining Statement acknowledges that coal mining's most significant contribution to the state's economy is derived from exports, with approximately 85% of coal mined in the NSW exported mostly to countries in Asia.

The demand for Australian metallurgical coal, as mined at the Colliery, is fuelled by limited resource availability and global market trends. Australia is the largest exporter of metallurgical coal in the world (OCE 2020). In 2017, Australia had a global share of 54% in metallurgical coal exports. In 2019, Australia exported most of its metallurgical coal to China (25%) followed by India (17%), Japan (15%) and South Korea (12%). While the value of Australia's metallurgical coal exports declined from \$44 billion in 2018-19 to an estimated \$35 billion in 2019-20, driven by the lower prices and export trends due to COVID-19, this trend is expected to reverse in the coming years (OCE 2020).

In 2018, India was the world's second largest steel producer with imports of metallurgical coal increasing by 14% to 60 Mt and are projected to grow at an average annual rate of 4.7% to overtake China as the world's largest importer of metallurgical coal (OCE 2019). While this trend may have temporarily reversed due to the COVID-19 crisis, growth is expected to continue once the global economy recovers.

The Office of the Chief Economist's *Metallurgical coal – Resources and Energy Quarterly June 2020* notes that a key risk to coal mines is being placed on care and maintenance during the COVID-19 crisis. With reduced demand, many mines are halting their operations temporarily. In contrast, Wollongong Coal is proposing to reactivate mining operations and continue exporting coal.

This modification is proposed to supply ongoing demand for high-quality metallurgical coal from JSPL, an Indian-based business entity that form part of the OP Jindal Group who produced approximately 32 Mt (25%) of India's steel during 2019, making them the largest steel group in the country. JSPL's steel making business is growing to meet strong domestic demand and is supported by the Government of India's vision to achieve 300 Mta of steel production (JSPL 2020).

4.6 International relations

India represents Australia's single biggest customer for metallurgical coal and represents a significant percentage of Australia's export earnings from metallurgical coking coal sales. Based upon India and Australia strong trade partnership approximately 76% of India's metallurgical coal being sourced from Australia (JSP 2020).

JSPL has strategically invested over USD \$1.2 billion in Australia to secure high quality metallurgical coking coal supply from its two Wollongong Coal mines, including the Wongawilli Colliery. JSP currently sources approximately 5.2 Mt of metallurgical coal from suppliers in Russia, Mozambique and Australia (JSPL 2020).

JSPL's also plans to increase its Indian steel output to 40 Mtpa by 2030, which will see demand for metallurgical coal increase to approximately 27 Mtpa. In 2019, JSPL's sister company, JSW Steel, for example produced 20 Mt of steel with current and future demand for high quality metallurgical coking coal forecast.

Wollongong Coal's output from the Wongawilli Colliery, and the Russell Vale Colliery, is intended to be sold to JSPL and other customers as ROM product. JSPL integrated steel plants include coal washery plants, whereby coal imported from various sources are washed and blended on site. This coal, when washed, produces a primary product of low ash, high calorific metallurgical coal and a secondary product of high ash, high calorific metallurgical coal.

Secondary high ash, high calorific value metallurgical coal is ideal for blending and is used to upgrade locally sources low ash, low caloric metallurgical coal. Any coal washery rejects are further used within the integrated plant processes, either in the manufacture of cement or used within the thermal power plants for the generation of electricity. This results in very minimal waste products being produced and supports JSPL commitment to the Circular Economy.

4.7 Alternatives

A review of feasible alternatives has been undertaken to demonstrate that MOD2 constitutes the most appropriate option to meet social, environmental and economic outcomes. Alternatives considered by Wollongong Coal as part of the scoping for the proposed modification included:

- not proceeding with MOD2 and operating the Wongawilli Colliery as per current project approval until 31 December 2020;
- undertaking mining via means of alternative mining methods;
- alternative mine plan design for the mine workings; and
- alternative mine life.

These alternatives are considered below.

4.7.1 Not proceed with MOD2

The International Energy Agency (IEA) anticipates that the demand for high quality coal such as that produced by the Colliery will continue to grow particularly in the short to medium term, and MOD2 would play an important role in meeting this demand as other coal mines reach the end of their mine life.

Significantly, MOD2 presents an opportunity to meet the ongoing demand without establishing a greenfield site. Rather, MOD2 will enable the continued servicing of existing and growing markets from a brownfield site in a well-established coal mining region. Not proceeding would mean the opportunity to recover reserves of a significant coal resource from within an approved mining lease area would not be realised.

Should the mine cease to operate, 150 FTE job opportunities near the growing residential communities of the Illawarra-Shoalhaven and benefits to local, State and national economies would not be realised.

4.7.2 Alternative mining method

Wollongong Coal have made a commitment to no longer undertake longwall mining within the Illawarra coal fields. Mining proposed to be undertaken at the Colliery involves traditional first working mining methods using two continuous miners.

Wollongong Coal has determined that mining via first workings mining methods negates potential environmental risks, when compared to that of longwall mining. First working mining methods leave the pillars intact and the overlying strata fully supported to ensure no potential for the main heading development roadways (ie approved and proposed NWMD driveage) to cause surface ground movement of any consequence (SCT 2020). As such longwall mining has not been considered and does not form part of MOD2.

4.7.3 Alternative mine plan design

In completing MOD2 scoping report, Wongawilli Coal assessed geotechnical data obtained via exploration activities and mining within the PPA. Assessment of geotechnical data determined underground mining within the proposed NWMD would be the most feasible design, as it avoids previously mined areas (as far as reasonable practical and feasible), high-risk mining areas, minimise risk to the Avon Dam reservoir and will provide access to the existing Wongawilli Shaft 1 to provide ventilation for the full extent of the NWMD.

The NWMD extension could also be used to provide ventilation for any future mining within the Western Area (which would be subject to a separate planning process and full merit assessment) and thereby avoid the requirement to develop a new ventilation shaft in the Metropolitan 'Special Areas' for this purpose.

4.7.4 Alternative mine life

The IEA anticipates the demand for quality coal such as that produced by Wongawilli Coal will continue to grow in the short to medium term, and MOD2 will play an important role in meeting this demand as other coal mines reach the end of their mine life.

The proposed 5-year extension would enable the Wongawilli Colliery to complete the NWMD and prevent the sterilisation of a high-quality resource with the majority of coal production to be sold to JSPL's for steel generation.

4.8 Conclusion

The Wongawilli Colliery has been operating since the early 1900s, under different ownerships and colliery names.

MOD2 will extend the life of mine for the Wongawilli Colliery by five years, enabling development and recovery of available coal resources within the approved mining footprint utilising existing site infrastructure. The modification aligns with the strategic policies for the region and would assist the state continue to meet predicted growing coal demand, particularly from Asian markets.

5 Statutory context

This chapter describes the planning framework under which MOD2 will be assessed and relevant provisions of Commonwealth and State legislation and policy.

5.1 Commonwealth legislation

5.1.1 Commonwealth Environmental Protection and Biodiversity Conservation Act 1999

The *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect matters of national environmental significance (MNES). If an action will, or is likely to, have a significant impact on any MNES, it is deemed to be a controlled action and requires approval from the Commonwealth Minister for the Environment, or the Minister's delegate.

MOD2 is not within a world heritage area, Ramsar wetland or Commonwealth marine environment. The site does not contain national heritage places or migratory species habitat. The Wongawilli Colliery upper pit top is located on the outskirts of the IECA, which is a nationally protected area. However, the surface infrastructure changes proposed as part of the modification are within the existing footprint and will not encroach on this area.

The surface infrastructure at the Wongawilli lower and upper pit top areas and at the Wongawilli No. 1 Shaft area are generally disturbed from previous underground mining operations. MOD2 involves minor changes to surface infrastructure at the Wongawilli upper pit top and will result in the clearing of 0.03 ha of native vegetation. A total of 2 ecosystem credits and 4 species credits are required to offset the residual impacts of MOD2 pursuant to Part 6 of the BC Act. No changes are proposed to the Wongawilli lower pit top and Wongawilli No. 1 Shaft area. Ecological and heritage impacts are summarised in Section 7.

Given the first workings mining method proposed to develop the proposed NWMD alignment, significant groundwater impacts are not predicted to occur as identified in Section 7.6.

Given that the proposed surface infrastructure changes are minor in nature and the proposed mining method, MOD2 is unlikely to have a significant impact on any MNES listed under the EPBC Act and consequently has not been referred to the Department of Agriculture, Water and the Environment (DAWE). This is consistent with the Colliery not being identified as a controlled action (EPBC 2010/5404) when previously referred. Wollongong Coal will consult with DAWE in regard to MOD2 to ensure adequate consideration of potential impacts.

5.1.2 National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) establishes a national framework and reporting scheme for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, energy consumption and production. The NGER Act requires corporations that control facilities which emit 25 kilotonnes (kt) or more of greenhouse gases per year to register and report their greenhouse emissions.

Wollongong Coal is a registered corporation under the NGER Act with the Colliery emitting and reporting on air emissions during operations above the 25 kt threshold.

5.2 NSW legislation

5.2.1 Planning approval history

Wongawilli Colliery commenced operations in 1916 and until 2 November 2011 operated under Section 74 of the NSW *Mining Act 1992* (Mining Act).

Section 74 exempted mines operating in a mining lease from the provisions of environmental planning instruments and the EP&A Act. However, a repeal of Section 74 of the Mining Act and an amendment of NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) meant that an approval under the EP&A Act was required for the Wongawilli Colliery's continued operation.

A 'Major Project' application under Part 3A of the EP&A Act and an accompanying EA to enable continued operation of the Wongawilli Colliery was lodged in October 2010 with Project Approval (PA 09_0161) granted on 2 November 2011.

The PA 09-016 has been subject to one Modification application (MOD1), which was approved on 27 November 2015 under former section 75W of the EP&A Act, permitting continued operation until 31 December 2020.

The transitional arrangements for former Part 3A projects have closed and the PA for the Colliery has transitioned into an SSD approval.

5.2.2 Environmental Planning and Assessment Act 1979

i Proposed approval pathway

Wollongong Coals propose to modify Project Approval 09_0161 under Section 4.55(2) of the EP&A Act, as MOD2 is "*substantially the same development*" as that which was the subject of the PA as modified by MOD1. Legal advice supporting this position is available within Annexure B.

DPIE's Director of Resource Assessment confirmed that this is the appropriate approval pathway for MOD2 in a letter dated 9 April 2020 (refer Appendix A). The requirements of Section 4.55(2) are provided in Table 5.1.

Table 5.1 Compliance with Section 4.55(2) requirements

Section 4.55(2) requirement	Comment
(2) Other modifications A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:	
(a) It is satisfied that the development to which the consent as modified relates is substantially the same development as the development that was last modified under section 75W of the EP&A Act (ie the development (as to be modified) will remain substantially the same as the PA as modified by MOD1), and	<p>MOD2 is substantially the same development for which the Project Approval as modified by MOD1 was granted being an underground coal mine within the same PAA.</p> <p>MOD2 will optimise the productivity and efficiency of ongoing operations at the Wongawilli Colliery.</p> <p>Again, this position is supported in both correspondence from DPIE and legal advice sought for MOD2. DPIE correspondence and legal advice is available in Appendix A and Appendix B respectively.</p>
It has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and	The consent authority must satisfy itself on compliance with this obligation.
(c) It has notified the application in accordance with: <ul style="list-style-type: none"> (i) the regulations, if the regulations so require, or (ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification of advertising of applications for modification of a development consent; and 	<p>The consent authority must satisfy itself on compliance with this obligation.</p> <p>Clause 118 of the EP&A Regulation relates to the notification period associated with Section 4.55(2) modifications.</p> <p>Notice of the application must be published in a local newspaper by DPIE. DPIE must also cause notice of MOD2 to be given to each person who made a submission in relation to the original EA.</p> <p>MOD2 will be placed on public exhibition for a minimum of 14 days.</p>
(d) It has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.	<p>The consent authority must satisfy itself on compliance with this obligation.</p> <p>We note, any submissions made concerning MOD2 will be reviewed by DPIE and forwarded to Wollongong Coal to consider and respond to (via a response to submissions (RTS) report).</p>

ii Matters for consideration

In accordance with Section 4.55(3) of the EP&A Act, the consent authority must take into consideration the matters referred in Section 4.15(1) of the EP&A Act when determining an application modify a project approval. These matters and where they are addressed in this modification report are detailed in Table 5.2.

Table 5.2 EP&A Section 4.15(1) matters for consideration

Section 4.15(1) matter for consideration	Where addressed
(a) the provisions of:	
(i) any environmental planning instrument, and	Relevant planning instruments are addressed in Section 5.4.1.
(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred definitely or has not been approved); and	There are no proposed instruments relevant to the modification.
(iii) any development control plan; and	Wollongong Development Control Plan 2009. Noting MOD2 is permitted under the Mining SEPP
(iv) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4; and	There are no planning agreements relevant to the modification.
(v) the regulations (to the extent that they prescribe matters for the purposes of this paragraph) that apply to the land to which the development application relates;	The requirements of the EP&A Regulation are addressed in Table 5.3.
(b) the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	This modification report and accompanying appendices and technical assessments, comprehensively describes the likely impacts of MOD2, including environmental impacts on both the natural and built environments, and social and economic impacts in the local area and the region.
(c) the sustainability of the site for the development;	It is considered that the PAA is suitable for the NWMD as it has been approved under the Project Approval 09_0161. The suitability of the site and its location is further addressed in Chapter 3.
(d) any submissions made in accordance with this Act or the regulations;	The consent authority must satisfy itself on compliance with this obligation. This modification report will be placed on public exhibition for a minimum of 14 days by DPIE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPIE will be reviewed and forwarded to Wollongong Coal to consider and respond to (via a RTS report).
(e) the public interest	To assist the consent authority in determining whether MOD2 is in the public interest, this modification report provides a justification for the project (Chapter 3 and Chapter 8), taking into consideration its potential environmental impacts and the suitability of the subject site. DPIE will also be required to consider all submissions received during the public exhibition of the modification report.

5.2.3 NSW Environmental Planning and Assessment Regulation 2000

Clause 115 of the EP&A Regulation states the required information an application for development consent under Section 4.55(2) of the EP&A Act must include. Table 5.3 provides an outline of where the required information is addressed. The modification is considered SSD under the EP&A Regulation.

Of note, no lands subject of the PAA are on the Strategic Agricultural Land Map or subject to a site verification certificate in respect of *clause 119A of the EP&A Regulations*.

Table 5.3 EP&A Regulation Clause 115 information requirements

Clause 115 information requirement		Where addressed
(1)(a)	The name and address of application	Section 1.4
(1)(b)	A description of the development to be carried out under the consent (as previously modified)	Chapter 3
(1)(c)	The address, and formal particulars of title, of the land on which the development is to be carried out	Chapter 2
(1)(d)	A description of the proposed modification to the development consent	Chapter 3
(1)(e)	A statement that indicates either: <ul style="list-style-type: none"> (i) That the modification is merely intended to correct a minor error, misdescription or miscalculation, or (ii) That the modification is intended to have some other effect, as specified in the statement. 	Chapter 3
(1)(f)	A description of the expected impacts of the modification	Chapter 7
(1)(g)	An undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was last modified under section 75W of the EP&A Act (ie the development (as to be modified) will remain substantially the same as the PA as modified by MOD1	Refer to Table 5.1
(1)(g1)	In the case of an application that is accompanied by a biodiversity development assessment report, the reasonable steps taken to obtain the like-for-like biodiversity credits required to be retired under the report to offset the residual impacts on biodiversity values if different biodiversity credits are proposed to be used as offset in accordance with the variation rules under the <i>Biodiversity Conservation Act 2016</i>	An assessment of the ecosystem credits and the species credits required for threatened species impacted by MOD2 is included in Appendix L and is summarised in Section 7.8.
(1)(h)	If the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consent to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner)	<p>The applicant owns the land and the surface infrastructure at the Wongawilli upper and lower pit top.</p> <p>The applicant has permission to undertake mining activities within the PAA subject to conditions specified in CCL 766, ML 1565 and ML 1596, and Project Approval 09_0161.</p>
(8)	An application for modification of a development consent under section 4.55 (2) of the Act relating to land owned by a Local Aboriginal Land Council may be made only with the consent of the New South Wales Aboriginal Land Council.	Not applicable.

5.3 Other relevant NSW State legislation and environmental planning instruments

An outline of other relevant NSW State legislation and environmental planning instruments (EPIs) is provided in Table 5.4.

Table 5.4 Other relevant NSW State Legislation

NSW legislation or EPIs	Comment
POEO Act	Wongawilli underground mine is a 'premised-based scheduled activity' under Schedule 1 (10) and (28) of the POEO Act. Wongawilli Colliery operates under EPL 1087 (as modified on 28 October 2018) which is administered by the NSW EPA under Section 43(b) and 48 of the POEO Act. No changes to EPL 1087 are proposed as part of this modification. MOD2 will operate under EPL 1087.
Mining Act	<p>The Mining Act encourages and facilitates the discovery and development of mineral resources in NSW, while encouraging ecologically sustainable development. Wongawilli Colliery operates under three mining leases including CCL 766, ML 1565 and ML 1596.</p> <p>A Mining Operations Plan (MOP) for the Wongawilli Colliery has previously been updated and approved. The MOP will be updated as required to reflect changes resulting from MOD2.</p>
NSW <i>Biodiversity Conservation Act 2016</i>	<p>Under the NSW <i>Biodiversity Conservation Act 2016</i> (BC Act), impacts to biodiversity are assessed and, if required, offset in accordance with the clearing thresholds prescribed by the Biodiversity Conservation Regulation 2017.</p> <p>MOD2 will result in clearance of 0.03 ha of native vegetation (Section 7.8 and Appendix L). A total of 2 ecosystem credits and 4 species credits are required to offset the residual impacts of MOD2 pursuant to Part 6 of the BC Act.</p>
NSW <i>National Parks and Wildlife Act 1974</i>	<p>Aboriginal objects and places are protected in NSW under Part 6 of the NSW <i>National Parks and Wildlife Act 1974</i> (NPW Act). The <i>Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW</i> (due diligence guidelines) (DECCW 2010) is adopted by the NSW National Parks and Wildlife Regulation 2009 (NPW Regulation).</p> <p>No Aboriginal heritage objects, sites or places will be impacted by MOD2 (Section 7.10 and Appendix N).</p>
<i>Heritage Act 1977</i>	<p>Historic heritage sites are known to occur within or in close proximity to MOD2. Potential impacts to historic heritage items are identified and appropriately managed or mitigation as detailed in Section 7.</p>
<i>Dangerous Goods (Road and Rail Transport) Act, 2008</i>	Wollongong Coal may from time to time require the transport of dangerous goods to the Colliery via the local road and rail network. Wollongong Coal will comply with the relevant requirements of the <i>Dangerous Goods Act 2008</i> when transporting items to the Colliery.

Table 5.4 Other relevant NSW State Legislation

NSW legislation or EPIs	Comment
<i>Native Title (New South Wales) Act 1994</i>	<p>The Native Title Act, 1994 provides for the recognition and protection of Native Title rights in Australia.</p> <p>The Native Title Act, 1994 provides a mechanism to determine whether Native Title exists and identify the rights and interests that comprise that Native Title. The process is designed to ensure that Indigenous people who claim to have an interest in a parcel of land have the opportunity to express this interest formally, and to negotiate with the Government and the applicant about the proposed grant or renewal of a mining tenement, or consent to access Native Title land.</p> <p>The Mining Act, 1992 must be administered in accordance with the Native Title Act, 1993. The primary effect of the Native Title Act, 1994 on exploration and mining approvals is to provide Native Title parties with 'Rights to Negotiate' about the grant and some renewals by Governments of exploration and mining titles.</p> <p>The Native Title Act, 1994, where applicable, would be complied with in relation to the renewal of any necessary mining tenements for the Colliery.</p>
<i>Crown Land Management Act 2016</i>	As noted under PA09_0161 Crown land exists within the PAA. However, no activities associated with MOD2 are to occur on Crown land parcels.
<i>NSW Waste Avoidance and Resource Recovery Act 2001</i>	All wastes produced by the proposed activities will continue to be classified, stored and handled in accordance with the <i>Waste Classification Guidelines – Part 1: Classifying Waste</i> (EPA 2014).
<i>NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013</i>	<p>The <i>NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013</i> (WHS Mines and Petroleum Act) aims to assist in securing and promoting the health, safety and welfare of people at work at coal operations.</p> <p>Wollongong Colliery hold all necessary approvals and operations will continue to be regulated under the provisions of the WHS Mines and Petroleum Act.</p>
<i>NSW Fisheries Management Act 1994</i>	<p>The <i>NSW Fisheries Management Act 1994</i> (FM Act) contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities.</p> <p>MOD2 will not impact any threatened aquatic species, populations, communities, habitats and key fish habitats (Section 7.8 and Appendix L). The site water management system and discharges will continue to be regulated under the provisions of EPL 1087.</p>
<i>NSW Water Act 1912</i> <i>NSW Water Management Act 2000</i>	<p>The <i>NSW Water Act 1912</i> (Water Act) and <i>Water Management Act 2000</i> (WM Act) regulate the use and interference with surface water (streams, creeks, rivers, etc) and groundwater in NSW. The Water Act only applies where equivalent provisions of the WM Act are not yet in force.</p> <p>Mine water will largely be managed and reused within the mine water management system. Excess water not reused by the site may be discharged via one of the Colliery's existing EPA licensed discharge points.</p> <p>MOD2 will not introduce new groundwater or surface water impacts with Wollongong Coal's water take regulated under WAL 36487, while water quality and discharges are regulated against the provisions of EPL 1087 (sections 7.5 and 7.6).</p>

Table 5.4 Other relevant NSW State Legislation

NSW legislation or EPIs	Comment
<i>WaterNSW Act 2014</i>	<p>One of the principal objectives of the WNSW Act is “to ensure that declared catchment areas and water management works in such areas are managed and protected so as to promote water quality, the protection of public health and public safety, and the protection of the environment”.</p> <p>The Colliery and MOD2 is within the Upper Nepean catchment, which forms part of Sydney’s drinking water catchment and designated as Metropolitan ‘Special Areas’. and as such it is subject to the provisions of the WNSW Act as well as the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (Sydney Drinking Water Catchment SEPP) (Table 5.5 and relevant section in this table).</p>
<i>Dams Safety Act, 2015 and Dams Safety Act, 1978</i>	<p>The Dams Safety Act, 2015 was assented on 28 September 2015, although some provisions of this Act have not yet commenced. The objects of the Dams Safety Act, 2015 are to manage matters relating to dam safety, and promote the application of risk management.</p> <p>The Dams Safety Act, 1978 continues to regulate the safety of certain dams until the relevant provisions of the Dams Safety Act, 2015 commence.</p> <p>Avon Dam is a “prescribed dams” under the Dams Safety Act, 1978 and “declared dams” under the Dams Safety Act, 2015.</p> <p>Portions of the NWMD are located within the declared Notification Areas for the Avon Dam (Figure 3-3).</p> <p>Wollongong Coal would comply with any Dam Safety Committee requirements or conditions relating to mining within the Avon Dam Notification Areas for MOD2.</p> <p>Section 48(4) of the Dams Safety Act, 2015 requires the following relevant provision:</p> <p>(4) A consent authority must, before granting development consent for the carrying out of any mining operations under the Mining Act 1992 in a notification area:</p> <ul style="list-style-type: none"> (a) refer the application for the development consent to Dams Safety NSW, and (b) take into consideration any matters that are raised by Dams Safety NSW in relation to the application within 28 days (or such other period as is agreed between the consent authority and Dams Safety NSW) after the application is referred to Dams Safety NSW
<i>NSW Roads Act 1993</i>	<p>Under section 138 of the <i>NSW Roads Act 1993</i> (Roads Act), any works that impact on a road requires approval of the relevant road authority, however road works are not proposed as part of the modification.</p>
<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>	<p>Under Part 2 of the State Environmental Planning Policy (Mining, Petroleum production and Extractive Industries) 2007 (Mining SEPP), mining may be carried out only with consent on land that is, immediately before the date of 16 February 2007, the subject of a ML under the Mining Act.</p> <p>MOD2 and associated mining is on land subject to MLs that were granted before 16 February 2017 and is therefore permitted with consent.</p>
<i>State Environmental Planning Policy No 33 – Hazardous and offensive Development (SEPP 33)</i>	<p>MOD2 will not involve any additional hazardous activities such as additional storage, handling or transportation of dangerous goods, other than what was already assessed as part of the EA for the original PA and licenced under EPL 1087. MOD2 is not considered to be a potentially hazardous and/or offensive development.</p>
<i>State Environmental Planning Policy No. 44 – Koala Habitat Protection</i>	<p>Schedule 1 of State Environmental Planning Policy 44 – Koala Habitat Protection (SEPP 44) identifies LGAs where koalas are known to occur. Wollongong and Wingecarribee LGAs are identified in Schedule 1 of SEPP 44. Thus, the PAA represents potential koala habitat under SEPP 44 of the EP&A Act.</p> <p>MOD2 will not impact upon potential koala habitat (Section 7.8).</p>

Table 5.4 Other relevant NSW State Legislation

NSW legislation or EPIs	Comment
State Environmental Planning Policy (Infrastructure) 2007	<p>State Environmental Planning Policy (Infrastructure) 2007 (SEPP Infrastructure) facilitates the effective delivery of infrastructure across NSW.</p> <p>SEPP Infrastructure was considered as part of the EA for the original PA, in consideration of the impacts from the associated railway infrastructure to the east of the Wongawilli Colliery. Given that this MOD2 does not involve any upgrades or changes to the railway infrastructure, SEPP Infrastructure does not need to be addressed as part of this modification.</p>
State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011	<p>Part 2 of the Sydney Drinking Water Catchment SEPP outlines the assessment and approval requirements for development and activities carried out on land to which the policy applies.</p> <p>The permissibility of MOD2 against relevant clauses of Part 2 of the Sydney Drinking Water Catchment SEPP is summarised in Table 5.5.</p>

The permissibility of MOD2 against relevant clauses of Part 2 of the Sydney Drinking Water Catchment SEPP is summarised in Table 5.5.

Table 5.5 Consideration of the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

Clause	Consistency with the project
9(1) Any development or activity proposed to be carried out on land to which this Policy applies should incorporate WaterNSW's current recommended practices and standards.	MOD2 will be undertaken in accordance with all relevant practices and standards.
9(2) If any development or activity does not incorporate WaterNSW's current recommended practices and standards, the development or activity should demonstrate to the satisfaction of the consent authority or determining authority how the practices and performance standards proposed to be adopted will achieve outcomes not less than those achieved by WaterNSW's current recommended practices and standards.	As above.
10(1) A consent authority must not grant consent to the carrying out of development under Part 4 of the Act on land in the Sydney drinking water catchment unless it is satisfied that the carrying out of the proposed development would have a neutral or beneficial effect on water quality.	The Surface Water Assessment ((SWA) see Section 7 and Appendix H)) determined that there are no potential impacts to water quality within the Sydney drinking water catchment, specifically the Lake Avon catchment area. As such MOD2 has not been assessed in accordance with <i>Neutral or Beneficial Effect (NorBE) on Water Quality Assessment Guideline</i> (Sydney Catchment Authority 2015). This also satisfies the aim of clause 3(b) of the Sydney Drinking Water Catchment SEPP.
10(2) For the purposes of determining whether the carrying out of the proposed development on land in the Sydney drinking water catchment would have a neutral or beneficial effect on water quality, the consent authority must, if the proposed development is one to which the NorBE Tool applies, undertake an assessment using that Tool.	N/A – given no impact is predicted.

Table 5.5 Consideration of the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

Clause	Consistency with the project
11(a) A consent authority must not grant consent to the carrying out of development under Part 4 of the Act on land in the Sydney drinking water catchment except with the concurrence of the Regulatory Authority.	Clause 11 does not apply as the Minister for Planning and Public Spaces is the consent authority for the modification.
11A(3) If: (a) development consent was granted for continuing development ("the existing development consent"); and (b) a development application is made for consent to extend or expand the carrying out of the development ("the proposed development"); and (c) the development application is made before the authority conferred by the existing development consent expires or is exhausted. the carrying out of the proposed development will have a neutral or beneficial effect on water quality if it will have the same or a lesser adverse impact on water quality when compared to the adverse impact that the continuing development would have if it were extended or expanded under similar conditions as the existing development cons.	Clause 11A(3)(a), (b) and (c) is satisfied by the MOD2 application, and the SWA has determined that the carrying out of the MOD2 will have a neutral or beneficial effect on water quality.

5.4 Other approvals

Under sections 4.41 and 4.42 of the EP&A Act, certain separate environmental approvals would not be required for the project or would be required to be issued consistent with the planning approval granted the project. Each of these separate environmental approvals is considered in Table 5.6.

Further environmental and other approvals may be required in addition to those referred to under sections 4.41 and 4.42 of the EP&A Act, and these would be considered and outlined where relevant to the assessment of the project as part of the modification.

Table 5.6 Other State approvals and licenses

Approval	Relevance to project	Comment
Approvals not required under section 4.41		
A permit under section 201, 205 or 219 of the NSW <i>Fisheries Management Act 1994</i> (FM Act)	Relevant but not required	Consistent with section 4.41 of the EP&A Act, these approvals are not required for SSD or any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements in connection with an application for approval.
An approval under Part 4 or an excavation permit under section 139 of the NSW <i>Heritage Act 1977</i>	Not relevant	
An Aboriginal heritage impact permit under section 90 of the NSW <i>National Parks and Wildlife Act 1974</i>	Not relevant	
A bushfire safety authority under section 100B of the NSW <i>Rural Fires Act 1997</i>	Relevant but not required	
A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than a groundwater interference approval) under section 91 of the NSW <i>Water Management Act 2000</i>	Relevant but not required	
Approvals required to be issued consistently under section 4.42		
An aquaculture permit under section 114 of the NSW <i>Fisheries Management Act 1994</i>	No	The project does not involve aquaculture.
Approval under section 15 of the NSW <i>Mine Subsidence Compensation Act 1961</i>	Yes	The project will not induce subsidence impacts, as first workings mining method results in 'zero' subsidence.
A mining lease under the Mining Act	Yes	The project holds three ML's within the PAA area, including CCL 766, ML 1565 and ML 1596.
A production lease under the NSW <i>Petroleum (Onshore) Act 1991</i>	No	The project does not involve petroleum production.
An environment protection licence (EPL) under Chapter 3 of the NSW <i>Protection of the Environment Operations Act 1997</i>	Yes	Wongawilli Colliery operates under EPL 1087 (as modified on 28 October 2018). No changes to EPL 1087 are proposed as part of this modification.
A consent under section 138 of the NSW <i>Roads Act 1993</i>	No	Road works are not proposed as part of this modification.
A licence under the NSW <i>Pipelines Act 1967</i>	No	The project does not involve the construction or operation of pipelines.

5.4.1 Permissibility

The PPA is within the Wingecarribee and Wollondilly LGAs (Figure 2.1), which are covered by the:

- Wollongong Local Environmental Plan 2009 (Wollongong LEP); and
- Wingecarribee Local Environmental Plan 2010 (Wingecarribee LEP).

The PPA area includes land zoned under the Wollongong LEP as:

- RU1 Primary Production;
- SP2 Infrastructure;
- RE1 Public Recreation;
- E1 – National Parks and Nature Reserves;
- E2 – Environmental Conservation;
- E3 – Environmental Management; and
- E4 – Environmental Living.

The Project area includes land zoned under the Wingecarribee LEP as:

- Zone E2 (Environmental Conservation); and
- Zone SP2 (Infrastructure).

In the absence of the State Environmental Planning Policy (Mining, Petroleum and Extractive Industries) 2007 (Mining SEPP), underground mining would be prohibited under the Wollongong and Wingecarribee LEPs in these zones.

Clause 4 of the Mining SEPP relevantly provides:

4 - Land to which Policy applies:

This Policy applies to the State.

Clause 5(3) of the Mining SEPP gives it primacy where there is any inconsistency between the provisions in the Mining SEPP and the provisions in any other environmental planning instrument (subject to limited exceptions).

The practical effect of clause 5(3) for MOD2 is that, if there is any inconsistency between the provisions of the Mining SEPP and those contained in the Wollongong and Wingecarribee LEPs, the provisions of the Mining SEPP will prevail.

Clauses 6 and 7 of the Mining SEPP lists the types of mining development that are permissible without development consent and what types are permissible only with development consent.

In this regard, clause 7(1) states:

Development permissible with consent:

1. Mining - Development for any of the following purposes may be carried out only with development consent:

- a) Underground mining carried out on any land,
- b) Mining carried out
 - i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or
 - ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,
-
- d) facilities for the processing or transportation of minerals or mineral bearing ores on land on which mining may be carried out (with or without development consent), but only if they were mined from that land or adjoining land

The term “underground mining” in the Mining SEPP is given an extended definition in clause 3(2) as follows:

underground mining means:

- a) mining carried out beneath the earth’s surface, including bord and pillar mining, longwall mining, top-level caving, sub-level caving and auger mining, and
- b) shafts, drill holes, gas and water drainage works, surface rehabilitation works and access pits associated with that mining (whether carried out on or beneath the earth’s surface), but does not include open cut mining.

The effect of clause 7(1), in conjunction with the operation of clause 5(3) of the Mining SEPP, is that notwithstanding any prohibition in the Wollongong and Wingecarribee LEPs, development for the purposes of the following may be carried out with development consent: underground mining; development on land that was the subject of a mining lease under the *Mining Act 1992* prior to commencement of the Mining SEPP; and facilities for the processing and transportation of coal.

Accordingly, the Minister or delegate would not be precluded from granting approval under section 4.38 of the EP&A Act for MOD2 in respect of those parts of the PPA land where mining is prohibited under the Wollongong and Wingecarribee LEPs.

6 Engagement

6.1 Introduction

This chapter provides an overview of the community and stakeholder (including agency) engagement, and outcomes of undertaken and planned consultation during the preparation of this modification report.

As part of the engagement process, a social impact assessment (SIA) has been prepared for MOD2 to examine the likely impacts of the NWMD on the nearby local and regional communities (EMM 2020c). While the details of the SIA are provided in Section 7.11 of this report, this chapter summarises only the engagement outcomes, assumptions and plans.

6.2 Engagement approach and requirements

As previously noted, the Scoping Report for NWMD was prepared by Wollongong Coal and submitted to DPIE on 3 March 2020. The Scoping Report outlined Wollongong Coal's commitment to community consultation, which would inform the SIA for this modification report in accordance with SIA guidelines.

A response letter from DPIE dated 9 April 2020 confirmed that DPIE was satisfied with the issues identified in the Scoping Report to be addressed in this modification report (Appendix A). The letter also noted the approval pathway (refer Chapter 5) and requested that a stability assessment of the proposed roadway configuration is included within the assessment of subsidence impacts (refer Section 7.7).

The SIA has been prepared in accordance with the *Social impact assessment guideline: For State significant mining, petroleum production and extractive industry development* (SIA Guideline) (DPE 2017) and is supported by alternative research methods described in this chapter and in Section 7.11.

The SIA has been informed by data collected as part of the social baseline, community consultation and engagement findings, findings from technical studies, previous SIA reports from the same regional area, academic research, and relevant government and agency reports.

Government agencies were consulted in regard to MOD2 during the assessment process, as detailed in Section 6.4. The local community was informed of MOD2 via a community information day, two direct mailbox newsletter drops to local residents, one newsletter made available via the MOD2 website and via online resources described in this chapter. The Collieries established CCC was kept informed of MOD2 via briefings during regularly scheduled meetings and via direct email of newsletters.

6.3 Community engagement

6.3.1 Community engagement approach

Stakeholder engagement used several different communications methods to consult, record and respond to those stakeholders and is outlined in Table 6.1. The variety of methods used ensure stakeholders were fully informed of the proposals and could use at least one of several options to provide feedback during the preparation of the modification report.

Table 6.1 Overview of community engagement tools

Engagement activity	Description
Emails	Emails were sent to the Community Consultative Committee (CCC) and Registered Aboriginal Communities (RAPs) inviting them to participate in face-to-face/online consultation meetings.
Website	A website was created (https://emm.mysocialpinpoint.com/colliery) which included a project description, planning and approvals pathway, project updates, engagement material (ie community newsletters), a interactive project map that allows for comments, input and feedback and contact details of the community engagement team.
Community newsletter	<p>Three community newsletters have been issued to date.</p> <ul style="list-style-type: none"> The first community newsletter was delivered to all households as a hardcopy, with 3,614 copies delivered during the last week of August 2020. The second newsletter was published via the website. The third community newsletter was delivered to all households as a hardcopy, with 864 copies delivered during the first week of December 2020.
Community information day	<ul style="list-style-type: none"> Community information day held on the 16th of December 2020 at the Wongawilli Community Hall between 8am and 6pm. <p>Community information day was advertised via an article placed within the Illawarra Mercury newspaper, project website and via the CCC</p>
Community Survey	A community survey was made available via the MOD2 website. The survey provided an opportunity the community to provide feedback and identify items of interests regarding MOD2.
Dedicated email addresses and telephone lines	<ul style="list-style-type: none"> Email addresses and telephone lines were provided as part of the consultation process, both on the website and in the newsletters distributed in person and on-line.

6.3.2 Community engagement outcomes

The results of the engagement actions and research that were undertaken as part of the are summarised below. The results should be considered along with the results of the SIA. The SIA provides further detail and context on MOD2 social impacts to local and regional stakeholders.

A summary of participation by engagement activity is provided in Table 6.2, with further discussion provided below the table.

Table 6.2 Participation by engagement activity

Stakeholders	Method	Administered	Invited	Participation outcomes
CCC	Meeting	Face-to-face/online	CCC members and Chair	<ul style="list-style-type: none"> December 2019 meeting was held with the CCC which included a discussion on the proposed MOD2. This meeting is outlined in the Scoping Report.
Wider community	1st community newsletter	Posted hardcopy	Wider community	<ul style="list-style-type: none"> Distributed to 3,614 households
	2 nd community newsletter	Online via MOD2 website	Wider community	<ul style="list-style-type: none"> 734 (unique users that visited 2033 pages within the website)
	3rd community newsletter	Posted hardcopy	Wider community	<ul style="list-style-type: none"> Distributed to 864 households

Table 6.2 Participation by engagement activity

Stakeholders	Method	Administered	Invited	Participation outcomes
	Community information session	Face-to-face	Wider community	<ul style="list-style-type: none"> Advertised via the 3rd community newsletter, advertisement within the Illawarra Mercury Newspaper and online platform and WIN new media coverage. Advertisement were shared by the community via local community social media groups. Attended by 30 members of the public. Event was covered by local media on the day including WIN News and the Illawarra Mercury
	Community survey	Online	Wider community	<ul style="list-style-type: none"> 5 surveys were completed by the community.
	MOD2 website	Online	Wider community	<ul style="list-style-type: none"> As at 17 November 2020, 1,138 community members have visited the website created for MOD2 3,286 times. Five community member comments on map.
RAP	Site survey and draft review	Face-to-face	All RAPs	<ul style="list-style-type: none"> All RAPs were invited to attend surveys and provided a copy of the draft heritage assessment to confirm it reflects the survey methodology and assessment findings. Consultation with RAPs was undertaken in accordance with the <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> (DECCW 2010). 12 individual RAPs registered interest in MOD2 and were consulted. The heritage assessment will be updated once the RAP response period has ended.

Along with the existing opportunities provided for comment (refer Table 6.2), Wollongong Coal will continue to provide the local community with opportunities to comment. The SIA emphasises the importance of community engagement and consultation. Lack of meaningful engagement with the community may exacerbate existing community concerns, especially those of special interest groups.

Given the unusual circumstances brought on by COVID-19, which have influenced the level of face-to-face engagement and consultation, the SIA has taken a pre-emptive approach by acknowledging the views of the community in relation to Wollongong Coal's Russell Vale Revised Underground Expansion Project (Russell Vale) approved by the Independent Planning Commission (IPC) in December 2020 (refer Table 6.3). In order to avoid and/or minimise concerns, a number of thorough technical assessments have been prepared for MOD2. Table 6.3 shows where each of the environmental and/or community concerns would have been taken into consideration. They are addressed in further detail in the SIA (refer Appendix O).

Both Wongawilli and Russell Vale are proposed to be mined via first workings mining methods, which minimises the likelihood of subsidence occurring (DE 2014).

However, the community has still expressed concern over Russell Vale as noted in numerous articles, and more than 80 parties making a submission to the IPC with fewer than a quarter in favour of the project (Dewitt Smith 2020; Smith 2020; McIlroy 2015; Savage 2020; Langford 2020a; Langford 2020b).

It is likely that similar sentiments may be encountered for MOD2 as those for the Russell Vale. Coupled with the restricted consultation for MOD2, and given the location of the NWMD (underneath the Special Metropolitan Area), the perception of the proponent and MOD2 could be affected. For these reasons, the views of the main interest groups for the Russell Vale Colliery have been acknowledged and are outlined below (Smith 2020; McIlroy 2015).

Table 6.3 Key concerns for Russell Vale Colliery, as applied to MOD2

Special interest groups or key events	Key concerns regarding Russell Vale Colliery	Where these environmental aspects are considered in this modification report or the SIA (as relevant to MOD2)
Protect Our Water Alliance (POWA)	<ul style="list-style-type: none"> Expansion of Russell Vale Underground would “threaten both surface and ground water from the Cataract Reservoir catchment” (Smith 2020) Concern communities will not see any benefits of the project Concern about climate change 	<p>Appendix O – SIA, Section 7.2.1 Access to groundwater</p> <p>Appendix O – SIA, Section 7.6.1 Impacts on livelihood from groundwater depressurisation</p> <p>Appendix O – SIA, Section 7.8.2 West Dapto (Horsley) Water Infrastructure</p> <p>Appendix H – SWA</p> <p>Appendix I – GWA</p> <p>Section 7.3 Air quality and greenhouse gas</p> <p>Section 7.11 Social</p> <p>Chapter 8 Evaluation of merits</p>
Lock the Gate	<ul style="list-style-type: none"> Concerns about company’s financial stability, ie not being able to cover estimated \$215 million rehabilitation cost of existing Russell Vale Colliery site Concerns about trust and safety of the Wongawilli Colliery 	<p>Section 7.12 Economic</p> <p>Section 1.4 The proponent</p> <p>Chapter 4 Strategic context</p>
Scientists and academics (general)	<ul style="list-style-type: none"> Calling for an end to mining in the Sydney drinking water catchment Concerns over disappearing creeks, bulging valleys, shifting dam wall Subsidence and diversions causing loss of 25 million litres of water from Sydney’s dam each day 	<p>Chapter 4 Strategic context</p> <p>Section 7.7 Subsidence</p> <p>Appendix H – SWA</p> <p>Appendix I – GWA</p> <p>Appendix K - SGA</p>
Seacliff Coasters trail running ground	<ul style="list-style-type: none"> Concerns over signs prohibiting public access along Lower Escarpment Trail restricting public amenity and access Environment and climate concerns 	<p>Section 2 – The project falls within the existing PAA</p> <p>Section 7.3 Air quality and greenhouse gas</p>
POWA and Lock the Gate public webinar held on 6 October 2020	This webinar informed the community about the Russell Vale Mine Expansion and how to participate in the IPC’s assessment process by speaking directly to the IPC or making a written submission by 27 October. According to Facebook event, 44 persons attended with 130 interested in the event.	Chapter 8 Evaluation of merits
2015 protest	In 2015, a protest was held against Wollongong Coal triple-seam mine under the Sydney water catchment. This resulted in the ‘Risky Business: Undermining Sydney’s Water’ report presented to NSW Department of Industry’s Resources and Energy Division (McIlroy 2015).	Chapter 8 Evaluation of merits

Furthermore, the SIA considers a number of other potential social impacts and benefits. These are addressed in Section 7.11.

6.4 Agency consultation

Agency consultation during the preparation of this modification report, and consultation outcomes, are outlined in Table 6.4.

Table 6.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
DPIE	Wollongong Coal met with DPIE on 16 January 2020 for a pre-submission meeting for the Scoping Report, at DPIE's Sydney office.	At the meeting, the DPIE-Planning Mining Projects Assessments team was introduced to MOD2, in accordance with DPIE's Draft Guidelines.	N/A – meeting provided an initial introduction to MOD2.
	Wollongong Coal and MOD2 project team met virtually with DPIE on 15 October 2020.	<ul style="list-style-type: none"> • EMM provided an overview of MOD2 and the status/preliminary findings of specialist technical assessments to support MOD2. • DPIE requested the modification report include legal advice confirming the following MOD2 aspects: <ul style="list-style-type: none"> – regarding the proposed NW Mains heading realignment; – confirming that MOD2 is '<i>substantially the same development</i>' as approved under PA_0161; and – confirming environmental assessment predict no significant biodiversity and groundwater impacts to MNES and that a new EPBC Referral is not required to be submitted to DAWE. • DPIE recommended engagement with EPA regarding potential noise impacts, prior to MOD2 submission. DPIE also queried opportunities for further mitigation and investigating historic noise monitoring results to reassess potential impacts. 	<ul style="list-style-type: none"> • A subsequent meeting was arranged with DPIE and EPA to address the potential noise related impacts. EPA's representatives acknowledged residential encroachment close to the Wongawilli Colliery, and agreed that noise impacts would likely be a key stakeholder concern for MOD2. However, it was noted that the site has only been in care and maintenance for just over 12 months and the majority of residences had been established prior to 2018. • Additional mitigation measures were discussed at the meeting with DPIE and EPA and are outlined in section 7.2.

Table 6.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
	Wollongong Coal and the MOD2 project team met virtually with DPIE and EPA on 28 October 2020.	<ul style="list-style-type: none"> • EMM provided an overview of MOD2. • Discussions with DPIE and EPA focused on potential noise impacts and stakeholder concerns. • EPA sought confirmation that the noise assessment includes modelling scenarios for both ROM coal being directly loaded to trains from the coal storage bins and from stockpiles via mobile plant. • EPA noted the intention to minimise the use of the stockpile area but queried whether the noise modelling factored in the height of stockpiling and potential for mobile plant to be operating above the height of the noise barrier. • EMM was asked to confirm updated noise and vibration assessment report clearly justifies the use of 2018 historic data as being representative of typical operating conditions prior to care and maintenance and residential encroachment having occurred (ie residences exposed to site operating conditions). 	<p>Refer to response above.</p> <ul style="list-style-type: none"> • It was agreed that the relocation of the crusher from loading area to underground was a positive mitigation measures. • It was also acknowledged that the proposed installation of an additional noise monitor would be beneficial to help guide operational activities and compliance monitoring.
DPIE – Water	Wollongong Coal contacted DPIE – Water 21 December 2020 via phone.	<ul style="list-style-type: none"> • Wollongong Coal provided an overarching briefing letter of MOD2 to DPIE – Water dated 22 December. 	<ul style="list-style-type: none"> • DPIE – Water requested a letter identifying providing further detail regarding MOD2 and noted their particular interest in the scope and intent of the modification. • Wollongong Coal provided a briefing letter dated 22 December 2020 to DPIE – Water. The letter provided a MOD2 description and assessment outcomes of key aspects of interest to DPIE -Water including subsidence, surface water, groundwater and rehabilitation. • DPIE – Water requested a further briefing of MOD2 via virtual meeting to be scheduled in early January 2021. Wollongong Coal have committed to meeting with DPIE – Water to further discuss MOD2 and the outcomes of assessments completed to date. Wollongong Coal will continue to consult with DPIE -Water to ensure any recommendations are adequately considered as MOD2 navigates the approvals process.

Table 6.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
DPIE - Mining, Exploration and Geoscience (MEG)	DPIE – MEG contacted Wollongong Coal following a briefing to the Resource Regulator via email 16 December 2020.	<ul style="list-style-type: none"> DPIE MEG requested information regarding MOD2 to determine if a Resource and Economic Assessment was required. 	<ul style="list-style-type: none"> Wollongong Coal provided the requested information to DPIE – MEG 22 December 2020.
DPIE - Biodiversity and Conservation Division (DPIE – BCD)	Representatives of Wollongong Coal contacted DPIE – BCD 21 December 2020 via phone.	<ul style="list-style-type: none"> Wollongong Coal provided an overarching briefing of MOD2 to DPIE – BCD dated 22 December. 	<ul style="list-style-type: none"> Wollongong Coal will continue to consult with DPIE - BCD to ensure any recommendations are adequately considered as MOD2 navigates the approvals process.
Dam Safety NSW	<p>Wollongong Coal consulted with Dam Safety NSW via the following means:</p> <ul style="list-style-type: none"> 4 December 2020 - Wollongong Coal provided a briefing of MOD2 to a representative of Dam Safety NSW via phone. 18 December 2020 – Wollongong Coal issued a letter (via email) to Dam Safety NSW providing further information regarding MOD2. 21 December 2020 - Wollongong Coal and the MOD2 project team met virtually with Dam Safety NSW. 	<p>4 December 2020:</p> <ul style="list-style-type: none"> Dam Safety NSW requested a briefing letter to confirm details regarding MOD2. <p>18 December 2020:</p> <ul style="list-style-type: none"> Briefing letter provided. <p>21 December 2020:</p> <ul style="list-style-type: none"> Meeting to provide overview of MOD2. 	<ul style="list-style-type: none"> Dam Safety NSW requested further information regarding the depth of mining under the Avon Reservoir and detail regarding mitigation and management measures to prevent inrush. Furthermore, Dam Safety requested water inflows are monitored to determine the likely source. Wollongong Coal confirmed the depth of mining under the approved and proposed sections of the NWMD. Wollongong Coal confirmed a subsidence and pillar stability had been completed for MOD2 by SCT Pty Ltd, see Section 7.7. Wollongong Coal confirmed in-seam drilling ahead of mining will occur to actively assess, mitigate and manage potential for inrush. Wollongong Coal confirmed water inflows would be monitored to determine the likely sources. Wollongong Coal note that this commitment will be made within the Colliery revised Water Management Plan. Wollongong Coal confirmed MOD2 is proposed to be undertaken by first working mining methods only and that no longwall mining is proposed under the application. As such no impacts to surface features are proposed by the application.

Table 6.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
EPA	<p>Wollongong Coal consulted with the EPA via the following means:</p> <p>28 October 2020 – Wollongong Coal and the MOD2 project team met virtually with DPIE and EPA.</p> <p>3 December 2020 - Wollongong Coal contact the EPA via phone to provide a further MOD2 briefing.</p> <p>18 December 2020 – Wollongong Coal issued a briefing letter to the EPA.</p>	<p>28 October 2020:</p> <ul style="list-style-type: none"> Refer to above DPIE meeting. <p>3 December 2020:</p> <ul style="list-style-type: none"> Wollongong Coal called the EPA to and provided a further update of MOD2. <p>18 December 2020:</p> <ul style="list-style-type: none"> Briefing letter sent to the EPA. 	<p>Meeting 28 October 2020:</p> <ul style="list-style-type: none"> Refer to above DPIE meeting. <p>Phone call 3 December 2020:</p> <ul style="list-style-type: none"> The EPA expressed that they are familiar with MOD2 noting previous MOD2 meetings attended by the EPA and DPIE. The EPA requested a briefing letter for records. The EPA requested that a briefing letter be provided for the purposes of keeping a record of MOD2. Wollongong Coal provided a briefing letter 18 December 2020.
Heritage NSW	Representatives of Wollongong Coal contacted Heritage NSW 21 December 2020 via phone.	Wollongong Coal provided an overarching briefing letter of MOD2 to Heritage NSW dated 22 December 2020.	<ul style="list-style-type: none"> Wollongong Coal will continue to consult with Heritage NSW to ensure any recommendations are adequately considered as MOD2 navigates the approvals process.
Resources Regulator	Wollongong Coal met virtually with the Resources Regulator 17 December 2020.	Wollongong Coal provided a briefing of MOD2 to the Resource Regulator.	<ul style="list-style-type: none"> Wollongong Coal provided a detailed overview of the mining methods proposed and initial outcome assessment concerning MOD2. No further information or assessment was requested by the Resource Regulator

Table 6.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
WaterNSW	<p>Wollongong Coal consulted with WaterNSW via the below methods.</p> <ul style="list-style-type: none"> 29 April 2020 - Face-to-face meeting via the Technical Working Group Meeting. The Technical Working Group provides for semi regular meetings between Wollongong Coal and WaterNSW to discuss matters as they relate to mining activities within the catchment. 4 December 2020 – Technical Working Group meeting to discuss MOD2 and ongoing Wollongong Coal operations. 7 December 2020 – Wollongong Coal issued a letter (via email) to WaterNSW providing further information regarding MOD2. 	<p>Meeting 29 April 2020:</p> <ul style="list-style-type: none"> Wollongong Coal notified WaterNSW of MOD2. Provided an operational update of Wollongong Coal mining operations. <p>Meeting 4 December 2020:</p> <ul style="list-style-type: none"> Provided an overview of MOD2 and Wollongong Coal proposed activities within the catchment. <p>Letter 7 December 2020:</p> <ul style="list-style-type: none"> The letter summarised assessment outcomes of key aspects of MOD2 which would likely be of interest to WaterNSW including subsidence, surface water, groundwater and rehabilitation. 	<p>WaterNSW did not issue further comments or recommendations in regard to MOD2, during noted consultation events. Wollongong Coal will continue to consult with WaterNSW via the Technical Working Group. Should comments or recommendation be received from WaterNSW, Wollongong Coal will ensure they are adequately considered as MOD2 progress through the approvals process.</p>
Wollongong City Council (WCC)	<p>Wollongong Coal consulted with WCC:</p> <ul style="list-style-type: none"> WCC representative attend regular CCC meetings on 2 September 2020 and 2 December 2020. Wollongong Coal provided WCC a briefing letter providing further information regarding MOD2. 	<p>CCC meetings held 2 September 2020 and 2 December 2020:</p> <ul style="list-style-type: none"> Wollongong Coal provided an overview of MOD2 and the status/preliminary findings of specialist technical assessments to support MOD2. <p>Briefing Letter dated 18 December 2020:</p> <ul style="list-style-type: none"> The letter summarised assessment outcomes of key aspects of MOD2 which would likely be of interest to WCC including employment, traffic, subsidence, water, noise, rehabilitation, air quality and greenhouse gases. 	<p>WCC did not issue further comments or recommendations in regard to MOD2, during noted consultation events. Wollongong Coal will continue to consult with WCC via the regular CCC meetings. Should comments or recommendation be received from WCC, Wollongong Coal will ensure they are adequately considered as MOD2 progress through the approvals process.</p>

Table 6.4 **Summary of government agency consultation**

Stakeholder	Consultation methods	Outcomes	Response
Transport for NSW (TfNSW)	Wollongong Coal distributed an overarching briefing letter to TfNSW regarding MOD2 dated 22 December 2020.	An automated response to the briefing letter was received from TfNSW.	Wollongong Coal will continue to consult with TfNSW to ensure any recommendations are adequately considered as MOD2 navigates the approvals process.

6.5 Ongoing consultation

The community and stakeholder (including agency) engagement undertaken to date is the start of a wider ongoing engagement initiative, which will take place over the life of the mine.

Regular community newsletters will be provided about any ongoing matters or changes at the Colliery. Any community queries and concerns will be responded to promptly.

7 Assessment of impacts

7.1 Introduction

The potential environmental impacts of the project are identified in the *Wongawilli Colliery NW Mains Modification 2 Scoping Report* (WC 2020) (Scoping Report). The assessment approach for each environmental aspect was determined based on the potential environmental impacts identified in the Scoping Report. The environmental aspects for which stand-alone technical reports were prepared are detailed in Table 7.1. The findings of each technical report are summarised in this chapter.

Table 7.1 Environmental assessments

Environmental aspect	Technical assessment	EIS section
Noise and vibration	Appendix E	Section 7.2
Air quality and greenhouse gas	Appendix F	Section 7.3
Traffic and transport	Appendix G	Section 7.4
Surface water	Appendix H	Section 7.5
Groundwater	Appendix I Appendix J	Section 7.6
Subsidence	Appendix K	Section 7.7
Biodiversity	Appendix L	Section 7.8
Historical heritage	Appendix M	Section 7.9
Aboriginal heritage	Appendix N	Section 7.10
Social	Appendix O	Section 7.11
Economic	Appendix P	Section 7.12

7.2 Noise and vibration

7.2.1 Introduction

EMM was commissioned to undertake a noise and vibration impact assessment (NVIA) to accompany the application for MOD2.

DPIE did not issue any assessment requirements for the proposed modification, however the NVIA was completed with reference to the following guidelines and policies:

- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI);
- NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline* (ICNG);
- NSW EPA 2013, *Rail Infrastructure Noise Guideline* (RING);
- NSW Department of Environment, Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP); and
- Department of Environment and Conservation NSW 2006, *Assessing Vibration: a technical guideline*.

7.2.2 Assessment approach

The NPfI provides a methodology for the assessment of operational noise from existing industrial sites. The NPfI acknowledges that some industrial sites were designed for higher allowable noise emissions than those outlined in current NSW noise policy and may have been in existence before neighbouring noise-sensitive developments. This is certainly the case for the Colliery with the encroachment of residential properties, as displayed in Figure 2.2.

The process for applying the NPfI assessment methodology to existing sites is outlined in Section 6.1.1 of the NPfI and is summarised as follows as applicable to MOD2:

1. Undertake an initial evaluation, including whether approvals/licences include noise limits and whether they are being met.
2. Establish relevant project noise trigger levels (PNTLs), in accordance with the NPfI, to establish a benchmark level to assess the need to consider noise mitigation. The NPfI allows for noise from the existing premises to be included in background noise measurements used to establish PNTLs if it has been operating for a significant period of time (ie greater than 10 years) and is operating in accordance with noise limits and requirements imposed in a consent or licence.
3. Measure/predict the noise levels produced by the source in question, having regard to meteorological effects such as wind and temperature inversions.
4. Compare the measured/predicted noise level with the PNTLs.
5. Where the PNTLs are exceeded, assess feasible and reasonable noise mitigation strategies.
6. Develop and refine achievable noise limits that will become long-term noise goals for the site. This may involve interaction between the regulator and proponent as well as consultation with the community. Regulators and operators need to consider the technical practicalities and cost of noise reduction measures, and how long it will take to implement these measures, along with the environmental consequences of exceeding the PNTLs.

7. Monitor compliance with the agreed noise limits, and review and amend the noise performance of the site as required.

Consideration has also been given to the NPfl requirements regarding low frequency noise and the potential for sleep disturbance as part of the assessment of operational noise. The Voluntary Land Acquisition and Mitigation Policy (VLAMP) (DPE 2018) has been referenced in determining the category of residual noise impacts.

Road and rail traffic noise levels associated with the project have been predicted and compared to relevant limits provided in the RNP and RING, respectively.

7.2.3 Existing environment

i Existing, approved Colliery noise emissions

An evaluation of approved mine noise emissions was undertaken. Results of noise compliance monitoring, which has been undertaken quarterly, indicates that the Colliery has been predominantly compliant with existing operational noise limits as well as rail noise limits associated with noise from use of the rail spur. Night-time mine noise levels were generally identified as a 'continuous hum' with no maximum noise events observed. No annoying characteristics were observed that triggered the application of modifying factors as defined in the INP and NPfl.

The site has had minimal complaints in relation to noise and vibration with three complaints recorded in the five-year period prior to the mine entering care and maintenance in 2019.

ii Existing acoustic environment

To establish relevant ambient and background noise levels for the purpose of determining PNTLs, current and historical noise levels were considered. The NPfl allows for noise from the existing premises to be included in background noise measurements if it has been operating for a significant period of time (eg greater than 10 years) and is operating in accordance with noise limits and requirements imposed in a consent or licence.

A long-term, unattended ambient noise survey was undertaken by EMM during March 2020 to establish background noise levels at neighbouring noise sensitive receptors. Since the site is currently in care-and-maintenance, historical data from the Wollongong Coal real-time noise monitor was analysed to determine background noise levels for when the mine was operational.

a Current ambient noise levels – mine in care-and-maintenance

To establish current ambient and background noise levels unattended noise monitoring was completed by EMM at three locations surrounding the Colliery in July 2020 in accordance with the NPfl. The locations of relevant long-term noise loggers are shown on Figure 7.1.

The noise loggers were in place from 21 July until 4 August 2020 and were programmed to record statistical noise level indices continuously in 15-minute intervals. Calibration of each noise logger was checked prior to and following unattended noise monitoring. The equipment carried appropriate and current NATA calibration certificates. Weather data for the unattended noise monitoring period was obtained from the nearest relevant NSW Office of Environment and Heritage weather station. Wind speed and rainfall data were used to exclude noise data during periods of any rainfall and/or wind speeds exceeding 5 m/s (approximately 9 knots) in accordance with the methodology provided in the NPfl.

A summary of the background and ambient noise monitoring results is provided in Table 7.2. Detailed daily graphs of the data obtained by EMM are provided in Appendix E. It is noted that the requirement for a minimum of seven days of valid noise data was not met at any of the noise monitoring locations primarily due to weather conditions. However, since assessment background levels were measured at or below the minimum NPfl background levels, the limited sampling does not impact the assessment outcomes.

Table 7.2 Summary of existing measured background and ambient noise levels (March 2020)

Monitoring location (relevant NCA)	Period ¹	RBL ² (dB)	L _{Aeq, period} noise level ³ (dB)
L1 - Rural Fire Service, Wongawilli Road, Wongawilli RA2	Day	29	44
	Evening	31	40
	Night	29	49
L2 – near Illoura Place, Wongawilli RA3	Day	30	43
	Evening	28	40
	Night	23	38
L3 – Vista Parkway, Wongawilli RA1	Day	35	47
	Evening	31	37
	Night	28	37

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am.
2. The RBL is an NPfl term and is used to represent the background noise level.
3. The energy averaged noise level over the measurement period and representative of general ambient noise.

Based on observations whilst on-site, the main contributors to overall ambient noise levels, noting that the site is currently in care and maintenance, are as follows:

- L1 – local residential activity, natural sounds (eg birdsong) and aircraft;
- L2 – local residential activity, distant traffic and natural sounds (eg insects and wind in foliage); and
- L3 – local residential activity, distant traffic, natural sounds (eg birdsong) and aircraft.

b Historical ambient noise levels – mine operational

The Colliery went into care and maintenance in July 2019. The approximate timing of the recent residential development in the vicinity of the Colliery was determined via a review of historical Google Earth imagery. It was determined that the majority of the residential development in close proximity to the mine was established by December 2018 with major earthworks and road construction for the development occurring over 2016 and 2017.

In order to determine ambient noise levels representative of when the Colliery was operational and residential development was present, historical data from the Wollongong Coal real-time noise monitor (refer Table 7.3) for the period June 2018 to June 2019 was analysed. The real time noise monitor is located at a similar distance from the processing and loading facility at the Colliery as the nearest residence. Daily train movement data was used to indicate periods when the site was operational.

Assessment background levels (ABL) for each period (day, evening and night) are provided in the NVIA report, provided in Appendix E. It is noted that some data during the period under consideration was not available from the noise monitor. Notwithstanding, there were approximately 57 days of valid noise data taking into account the available data coinciding with times when the mine was operational after the development of residences in the area. A summary of the historical noise monitoring data is provided in Table 7.3.

Table 7.3 Wongawilli Colliery real time noise monitoring summary – June 2018 – June 2019

	Day			Evening			Night		
	L _{Aeq,period} low pass ¹	L _{Aeq,period} ²	RBL ³	L _{Aeq,period} low pass ¹	L _{Aeq,period} ²	RBL ³	L _{Aeq,period} low pass ¹	L _{Aeq,period} ²	RBL ³
All available data June 2018 – June 2019	46	51	38	45	48	39	45	47	37
Mine operational only	47	50	40	46	48	41	46	48	40
Mine not likely operational	45	51	37	44	48	37	44	47	34

1. This value is the logarithmic average of the L_{Aeq,period} low-pass noise level; the equivalent continuous energy average noise level excluding noise above 800Hz third octave frequency band.
2. This value is the logarithmic average of the L_{Aeq,period} noise level.
3. RBL – Rating Background Level; median of all ABL.

7.2.4 Impact assessment

i Operational noise impact assessment

The assessment of noise emissions from Wongawilli Colliery was undertaken in accordance with the methodology outlined in Section 6.1.1 of the NPfI which describes the application of the NPfI to existing sites (as per Section 7.2.2).

Project noise trigger levels (PNTLs) were established, in accordance with the NPfI, to set a benchmark level to assess the need to consider noise mitigation. The NPfI allows for noise from the existing premises to be included in background noise measurements used to establish PNTLs if it has been operating for a significant period of time (ie greater than 10 years) and is operating in accordance with noise limits and requirements imposed in a consent or licence. Wongawilli Colliery has been in operation since 1916 and a review of results of the most recent quarterly monitoring indicate that the Colliery has been predominantly compliant with existing noise limits.

Noise emissions from the approved Colliery operations were predicted, having regard to noise-enhancing meteorological effects such as wind and temperature inversions, as per the NPfI. Approved operations noise emissions were validated via a comparison to results of historical noise compliance surveys.

Predicted approved noise emission levels were compared to PNTLs including consideration of applicable modifying factors to account for annoying characteristics of noise as per the NPfI. This comparison found that approved noise emissions were above the contemporary PNTLs at various noise-sensitive receptors surrounding the mine.

Predicted residual noise impacts from the two operational scenarios considered (ie loading trains via bins or front-end loader) have been categorised as per Table 1 of the VLAMP with reference to noise predictions under noise-enhancing weather conditions. These residual noise impact categorisations are displayed spatially in Figure 7.2.

Given the preceding, an assessment of feasible and reasonable noise mitigation strategies was undertaken (refer Section 7.2.5). Comparison of predicted mitigated mine noise levels to approved levels indicated a general improvement to noise emissions in the order of 3-8 dB. Residual noise impacts after incorporating feasible and reasonable noise mitigation strategies were categorised in accordance with the VLAMP and showed a considerable reduction in the number of properties affected by residual noise impacts from the Colliery (refer Figure 7.3)

To assist the negotiation process that will likely be an outcome of this study, achievable noise limits were determined for the Colliery at six locations around the mine expected to represent the nearest potentially most affected residences in each direction from the Colliery (refer Table 7.4). These are proposed to form the basis of revised noise goals for the Colliery and would be appropriate locations for future noise compliance monitoring.

Table 7.4 Predicted 'achievable' noise levels (noise enhancing) (dB)

Location	PNTL (L _{Aeq,15min})			Existing noise limit as per PA 09-0161						Achievable noise levels (Approved operations)			Achievable noise levels (Mitigated operations)		
				Intrusive (L _{Aeq,15min})			Amenity (L _{Aeq,period})			(L _{Aeq,15min})			(L _{Aeq,15min})		
	Day	Eve	Nt	Day	Eve	Nt	Day	Eve	Nt	Day	Eve	Nt	Day	Eve	Nt
R2	40	35	35	43	43	43	60	50	45	45	41	41	41	38	38
R9	45	45	43	n/a	n/a	n/a	60	50	45	47	45	45	41	35	35
R20	45	45	45	n/a	n/a	n/a	60	50	45	52	48	48	47	39	39
R55	40	35	35	40	40	38	60	50	45	<40	<35	<35	<40	<35	<35
R57	40	35	35	40	40	38	60	50	45	<40	<35	<35	<40	<35	<35
R58	40	35	35	n/a	n/a	n/a	60	50	45	<40	<35	<35	<40	<35	<35

Notes: 1. Noise level predictions presented in this table include the relevant LFN modifying factor.

It is of note that the achievable noise levels for mitigated operations are predicted to achieve the existing intrusive noise limit (where applicable) and comply with the existing amenity noise limit at all assessment locations. Further, implementation of all feasible and reasonable mitigation measures is predicted to result in reduction of mine noise emissions of 3-8 dB at all nearest assessment locations.

As per the results of historical noise compliance monitoring, night-time noise emissions from the Colliery are generally steady-state; typically described as 'mine hum'. Maximum noise events from the site have typically not been observed during the night period. Predicted maximum noise levels at the assessment locations are below the relevant sleep disturbance L_{Amax} screening levels. Hence, as per the NPfl requirements, a detailed assessment of maximum noise level events is not required.

ii Road traffic noise impact assessment

Based on predicted road traffic noise levels and estimates of current road traffic volumes on Wongawilli Road and Jersey Farm Road, it is likely that the addition of mine-related traffic will not increase total road traffic noise levels above the relevant criteria.

In addition, the traffic generation associated with the modification will be less than that currently approved due to the reduction of the workforce from 300 full time equivalent personnel (approved) to 150 full time equivalent personnel.

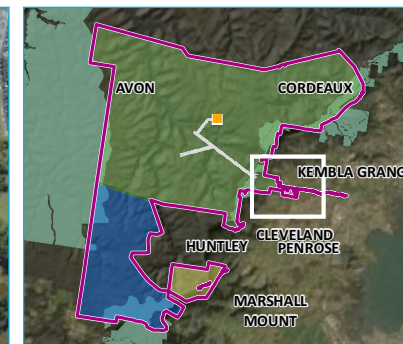
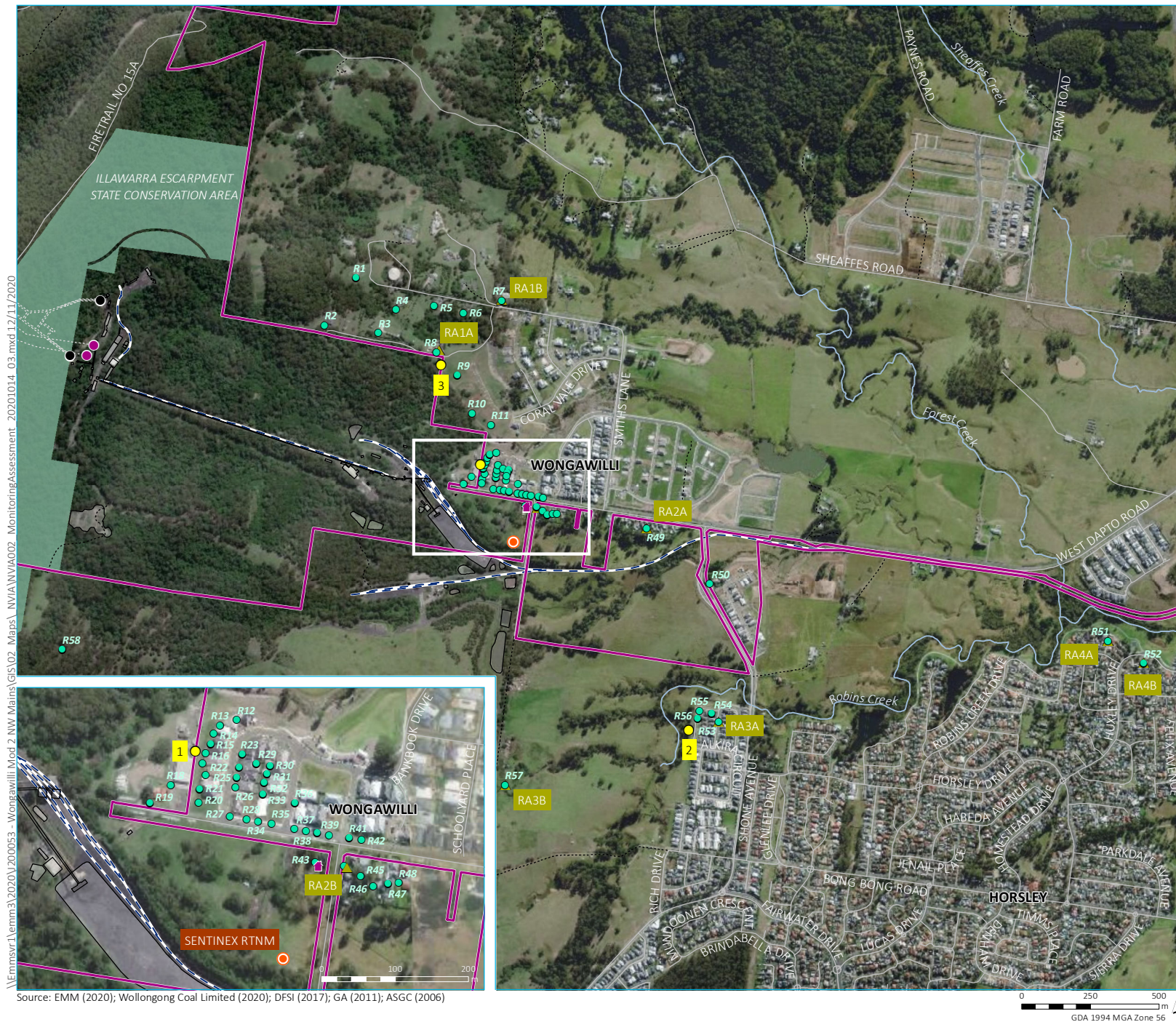
West Dapto is being developed as a series of linked residential urban areas with subdivisions being developed at Wongawilli and the neighbouring suburbs of Horsley and Sheaffes. Wollongong City Council has developed the West Dapto Access Strategy and is undertaking transport and road upgrade works in stages, in various parts of the West Dapto urban release area with a number of projects already completed including the Princes Highway / West Dapto Road intersection and upgrades to Shone Avenue. As part of the current projects, Council is proposing to upgrade Wongawilli Road between the Community Hill at Wongawilli and Shone Avenue, to provide safer access for pedestrians, cyclists, residents and visitors. Future works include the upgrading of West Dapto Road, between Shone Avenue and Princes Highway.

Based on the preceding, it is likely that road traffic volumes in the vicinity of the Colliery, unrelated to operation of the mine, will increase as a result of the continued and future development of residential subdivisions.

iii Rail traffic noise impact assessment

Rail traffic noise was predicted at the nearest potentially affected residential location based on the results of historical noise compliance measurements. Rail noise from up to two trains during the daytime period is predicted to comply with the rail noise goal of $L_{Aeq,day}$ 60 dB determined in accordance with the RING (EPA, 2013) and is also below the current rail noise limit provided in PA 09 – 0161.

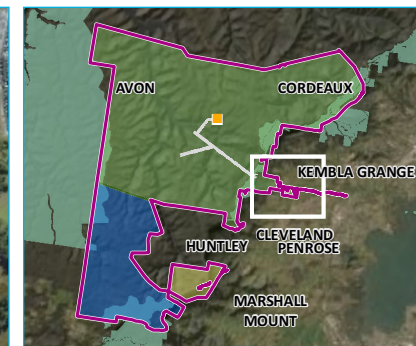
Further, rail noise levels are not proposed to change compared to those currently approved.



- KEY**
- Project application area
 - Sensitive receiver
 - Mine-owned residence
 - Noise logger
 - ▲ Existing noise compliance monitoring
 - Real-time noise monitor
- Portal locations**
- Approved NWMD portal
 - Additional NWMD access portal
- Site infrastructure**
- Wongawilli Colliery rail
 - Underground workings
 - Site layout
- Existing environment**
- Minor road
 - Vehicular track
 - Named watercourse
 - NPWS reserve
- INSET KEY**
- Vent shaft
 - Underground workings
- Mining title**
- ML 1565
 - ML 1596
 - CCL 766

Noise monitoring and assessment locations

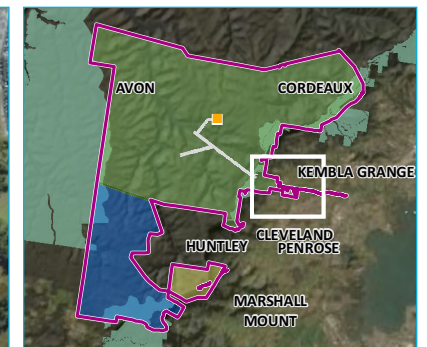
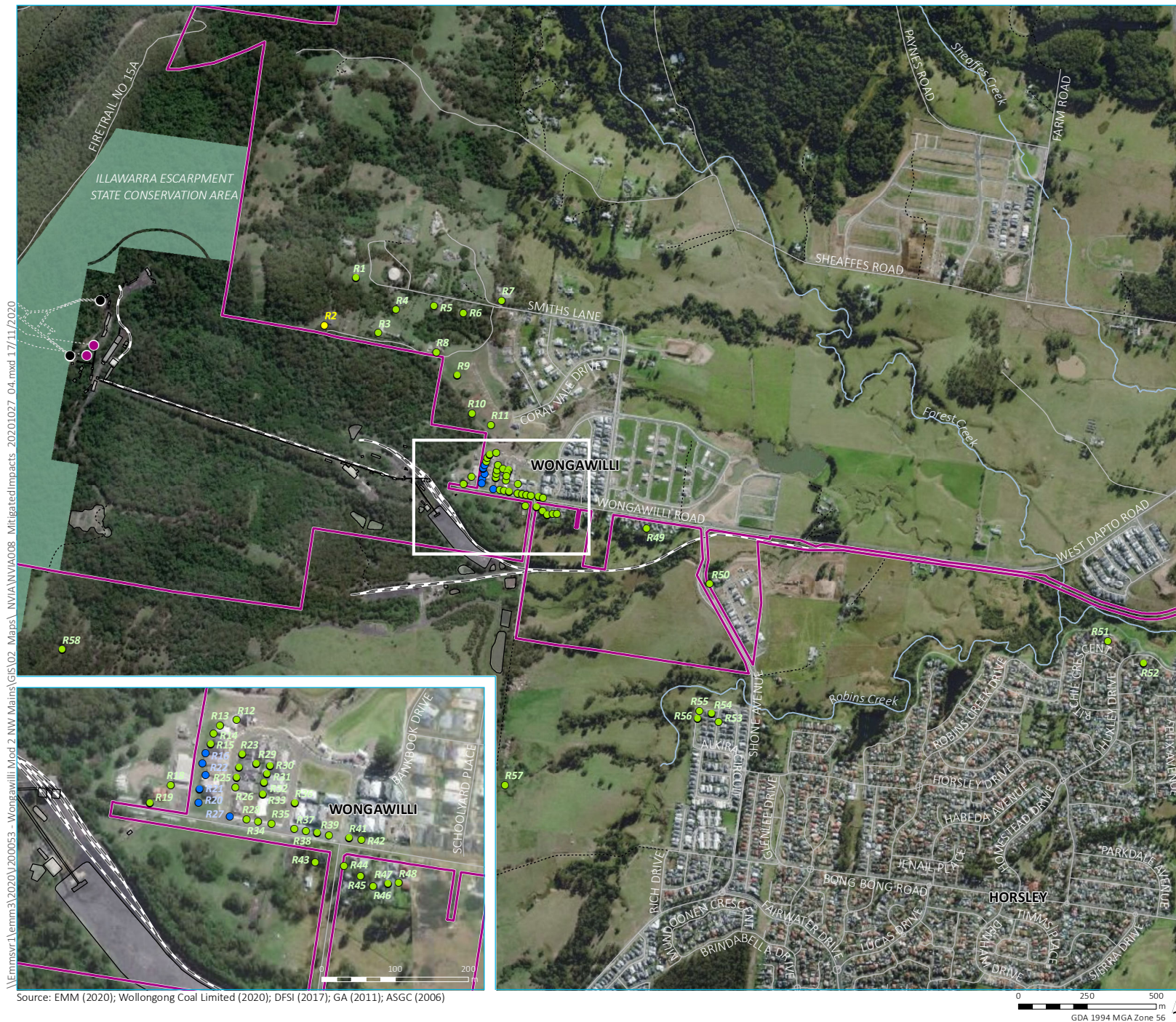
Wollongong Coal Limited
Modification assessment report
Figure 7.1



- KEY**
- Project application area
 - Predicted noise impacts (approved operations)
 - Significant
 - Moderate
 - Marginal
 - Negligible
 - None
 - Portal locations
 - Approved NWMD portal
 - Additional NWMD access portal
 - Site infrastructure
 - Wongawilli Colliery rail
 - Underground workings
 - Site layout
 - Existing environment
 - Minor road
 - Vehicular track
 - Named watercourse
 - NPWS reserve
 - INSET KEY**
 - Vent shaft
 - Underground workings
 - Mining title
 - ML 1565
 - ML 1596
 - CCL 766

Residual noise impacts
approved operations

Wollongong Coal Limited
Modification assessment report
Figure 7.2



- KEY**
- Project application area
 - Predicted noise impacts (mitigated operations)
 - Marginal
 - Negligible
 - None
 - Portal locations
 - Approved NWMD portal
 - Additional NWMD access portal
 - Site infrastructure
 - Wongawilli Colliery rail
 - Underground workings
 - Site layout
 - Existing environment
 - Minor road
 - Vehicular track
 - Named watercourse
 - NPWS reserve
 - INSET KEY**
 - Vent shaft
 - Underground workings
 - Mining title
 - ML 1565
 - ML 1596
 - CCL 766

Residual noise impact categories – mitigated operations

Wollongong Coal Limited
Modification assessment report
Figure 7.3



Source: EMM (2020); Wollongong Coal Limited (2020); DFSI (2017); GA (2011); ASGC (2006)

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m
GDA 1994 MGA Zone 56

7.2.5 Mitigation measures

The site has been in operation since approximately 1916 and, given the proximity of surrounding residential areas, is aware of the potential for noise impacts at neighbouring noise sensitive receptors. Quarterly noise compliance monitoring is undertaken and reported on the Colliery website. Wollongong Coal also operate and maintain a real-time noise monitor the results of which are reported quarterly on their website. It is noted that site has been in care and maintenance since 2019 and hence data collected since that time is considered baseline data only.

A significant amount of mitigation works has been undertaken over many years with a focus on reducing noise from mobile plant operating on the stockpile area and noise from the screen and sizer enclosure. The following noise mitigation measures are currently implemented at the site:

- all conveyors and transfer points are enclosed;
- 6-m high concrete barrier adjacent the rail line (as shown in Figure 3.5);
- upgrades to the screen/ sizer enclosure as per the PRP in EPL 1087; and
- preference is for all product to go directly to rail loadout bins and avoid stockpiling of product. This, in turn, avoids the use of the dozer in the stockpile area and the requirement to load trains via FEL.

Consideration of the feasibility and reasonableness of existing and additional noise mitigation measures has been undertaken with reference to the guidance provided in Section 3.4 of the NPfI. The NPfI also acknowledges that some industrial sites were designed for higher allowable noise emissions than those outlined in current NSW noise policy and may have been in existence before neighbouring noise-sensitive developments. Further, the range of noise reduction strategies for existing situations is generally more limited than those available for new developments.

The main operational noise sources at the site contributing to off-site noise levels are the screen and sizer building and elevator, rail load out bin, locomotives, dozer and front-end loaders. Preliminary mitigation options targeting these noise sources have been considered as provided in Table 7.5 noting that additional investigations will be undertaken during initial and early works upon approval of the modification.

Table 7.5 Mitigation decision making matrix

Mitigation option	Feasible?	Reasonable?	Justification for adopting / disregarding and expected noise benefit
At-source controls			
Rail load out improvements; this could be in the form of new/improved enclosure, engineering design solutions to reduce noise emissions from coal leaving bin and entering wagons (or a combination of any of these)	Yes, to be confirmed through further investigations	Yes	These measures will require consideration of engineering design and capital investment, but it is expected that a reduction of noise levels would be possible. For assessing noise from a mitigated rail load out activity an overall reduction in sound power level of 3dB has been adopted.
Noise suppression kit for dozer or new dozer	Yes	Yes	It is expected that a 5dB reduction to the overall dozer sound power level would be achievable. Being one of the main contributors to off-site mine noise emissions these controls to the dozer will have the benefit of reducing mine noise at all neighbouring residences.

Table 7.5 Mitigation decision making matrix

Mitigation option	Feasible?	Reasonable?	Justification for adopting / disregarding and expected noise benefit
Noise suppression kit for FEL or new FEL	Yes	Yes	It is expected that a 5dB reduction to the overall FEL sound power level would be achievable. Being one of the main contributors to off-site mine noise emissions these controls to the dozer will have the benefit of reducing mine noise at all neighbouring residences.
Relocate sizing and screening infrastructure underground	Yes	Yes	This measure will require consideration of engineering design and capital investment and will result in a significant reduction to mine noise emissions at nearby residences, in particular with regard to low frequency noise emissions. It is expected that the current enclosure housing the sizing and screening plant would be retained with coal transferred via conveyor within the current enclosure.
Improvements to elevator enclosure	Yes, to be confirmed through further investigations	Yes	This measure will require consideration of engineering design and capital investment, but it is expected that a reduction of noise levels would be possible. For the purpose of assessing noise from these improved enclosures an overall reduction in sound power level of 4dB has been adopted for the elevator enclosure.
Reduce noise from locomotives	No	No	As per the findings of the Noise Audit report (WMPL 2013) the proponent has made an effort to reduce noise from their rail operations through the use of locomotives that meet the noise limits of RailCorp's EPL, increasing the number of carriages (from 17 to 21) and minimising (now excluding) train loading activity during the night time.
Control transmission of noise			
Relocation of significant noise sources to increase separation distance between site and nearest residents	Yes	No	Relocation of the site would require a significant and prohibitive capital cost as well as potential long-term down-time for the mine.
Extend existing 6m high rail barrier further north to the rail loadout bin	Yes	Yes	Extending the rail barrier north would provide additional acoustic shielding to, primarily, locomotives on the track whilst loading wagons. Approximate extension of the rail noise barrier is shown in Appendix E. The extension will be located within the existing Wongawilli lower pit top disturbance footprint.
Mitigation at the receptor			
Receptor mitigation	Yes	No	The implementation of the preceding noise mitigation measures will result in improved noise emissions compared to emissions from approved operations at all assessment locations.

It is anticipated that all the noise mitigation measures identified as both feasible and reasonable will be adopted. The implementation of all noise mitigation measures proposed will require significant operational planning, engineering design and, in some cases, significant capital investment. Wollongong Coal will require an appropriate timeline to coordinate and implement all these measures.

7.2.6 Conclusion

Operational noise from the Colliery has been assessed in accordance with the methodology outlined in the NPfI for existing sites. Contemporary noise goals (PNTLs) were established based on the results of ambient noise monitoring undertaken in July 2020 as well as historical noise monitoring when the mine was operational. The NPfI allows for noise from the existing premises to be included in background noise measurements if it has been operating for a significant period of time (ie greater than 10 years) and is operating in accordance with noise limits and requirements imposed in a consent or licence. Wongawilli Colliery has been in operation since 1916 and a review of results of the most recent quarterly monitoring indicate that the Colliery has been predominantly compliant with existing noise limits.

Operational noise levels from approved operations were predicted based on information provided in previous noise studies and compared to the results of historical noise compliance monitoring.

Approved operational noise emissions were predicted to exceed the relevant PNTL at the nearest assessment locations. Hence, a preliminary assessment of feasible and reasonable noise mitigation measures was undertaken noting that additional investigations will be undertaken in this regard during initial and early works upon approval of the modification.

An estimated reduction of 3-8 dB in operational noise levels is predicted to be achievable at most assessment locations compared to predicted noise levels from approved operations. Further, incorporation of feasible and reasonable mitigation measures is predicted to result in a significant reduction in the number of properties predicted to be affected by residual noise impacts from the Colliery compared to approved operations.

Given that the mine is currently in care and maintenance there will likely be a noticeable increase in road traffic noise when operations recommence. Notwithstanding, road traffic noise generated by mine-related traffic is predicted to achieve relevant road traffic noise goals. There is significant development occurring in the vicinity of the Colliery in relation to residential urban areas. Thus, it is likely that road traffic volumes in the vicinity of the Colliery, unrelated to operation of the mine, will increase as a result of the continued and future development of residential subdivisions.

Rail noise levels from operation of trains on the Wongawilli rail spur are not proposed to change compared to those currently approved. Rail noise from up to two trains during the daytime period is predicted to comply with the relevant rail noise goal established in accordance with the RING (EPA, 2013) and is also below the current rail noise limit provided in PA 09 – 0161.

7.3 Air quality and greenhouse gas

7.3.1 Introduction

This air quality impact assessment (AQIA) has been prepared by EMM on behalf of Wollongong Coal to assess potential air quality and greenhouse gas impacts associated with the Colliery on the surrounding environment.

7.3.2 Assessment approach

The AQIA has been prepared in general accordance with the guidelines specified by the NSW Environment Protection Authority (EPA) in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA 2016), referred to from now on as “the Approved Methods for Modelling”. The AQIA supports the EA for MOD2 (EMM 2020). The assessment approach applied to the assessment of greenhouse gases is identified in Section 7.3.8.

The AQIA consists of the following:

- a description of the local setting and surrounds of the Colliery;
- the pollutants which are relevant to the assessment, and the applicable impact assessment criteria;
- a description of the existing environment, specifically:
 - the meteorology and climate; and
 - the existing air quality environment;
- a detailed air pollutant emissions inventory for the Colliery;
- atmospheric dispersion modelling, including an analysis of Colliery-only and cumulative impacts accounting for baseline air quality;
- an overview of mitigation measures and air quality monitoring for the Colliery; and
- a greenhouse gas assessment.

7.3.3 Assessment criteria

The NSW EPA’s impact assessment criteria for particulate matter, as documented in Section 7 of the Approved Methods for Modelling, are presented in Table 7.6. The assessment criteria for particulate matter less than 10 micrometres (μm) in aerodynamic diameter (PM_{10}) and particulate matter less than 2.5 μm in aerodynamic diameter ($\text{PM}_{2.5}$) are consistent with the national air quality standards that are defined in the *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM) (Department of the Environment 2016).

Total suspended particulates (TSP), which relates to airborne particles less than around 50 μm in diameter, is used as a metric for assessing amenity impacts (reduction in visibility, dust deposition and soiling of buildings and surfaces) rather than health impacts (NSW EPA 2013). Particles less than 10 μm in diameter, accounted for in this assessment by PM_{10} and $\text{PM}_{2.5}$, are a subset of TSP and are fine enough to enter the human respiratory system and can therefore lead to adverse human health impacts. The NSW EPA impact assessment criteria for PM_{10} and $\text{PM}_{2.5}$ are therefore used to assess the potential impacts of airborne particulate matter on human health.

The Approved Methods for Modelling classifies TSP, PM₁₀, PM_{2.5} and dust deposition as ‘criteria pollutants’. The impact assessment criteria for criteria pollutants are applied at the nearest existing or likely future off-site sensitive receptors¹, and compared against the 100th percentile (ie the highest) dispersion modelling prediction for the relevant averaging. Both the incremental (Colliery-only) and cumulative (Colliery plus background) impacts need to be presented, with the latter requiring consideration of the existing ambient background concentrations.

For dust deposition, the NSW EPA (2016) specifies criteria for the project-only increment and cumulative dust deposition levels. Dust deposition impacts are derived from TSP emission rates and particle deposition calculations in the dispersion modelling process.

Table 7.6 Impact assessment criteria for particulate matter

PM metric	Averaging period	Impact assessment criterion
TSP	Annual	90 µg/m ³
PM ₁₀	24 hour	50 µg/m ³
	Annual	25 µg/m ³
PM _{2.5}	24 hour	25 µg/m ³
	Annual	8 µg/m ³
Dust deposition	Annual	2 g/m ² /month (project increment only)
		4 g/m ² /month (cumulative)

7.3.4 Background air quality

Background values adopted for cumulative assessment, are based on the analysis presented in section 5.3 of Appendix F, are as follows:

- annual average TSP – 49.3 µg/m³, derived from the annual average PM₁₀ concentration;
- 24-hour PM₁₀ – daily varying concentrations from the DPIE Kembla Grange AQMS during the 2016-2017 modelling period. Concentrations range from 4.0 µg/m³ to 54.6 µg/m³;
- annual average PM₁₀ – 19.7 µg/m³, from the DPIE Kembla Grange AQMS during the 2016-2017 modelling period;
- 24-hour PM_{2.5} – daily varying concentrations from the DPIE Kembla Grange AQMS during the 2016-2017 modelling period. Concentrations range from 0.6 µg/m³ to 32.0 µg/m³;
- annual average PM_{2.5} – 6.8 µg/m³, from the DPIE Kembla Grange AQMS during the 2016-2017 modelling period; and
- annual dust deposition – 1.0 g/m²/month, from the Colliery air quality monitoring network during the 2016-2017 modelling period.

¹ NSW EPA (2016) defines a sensitive receptor as a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area.

7.3.5 Existing environment

The National Pollutant Inventory (NPI) and NSW EPA environment protection licence databases have been reviewed to identify significant existing sources of air pollutants within 5 km of the Colliery. The review identified small scale industrial operations including an asphalt production plant, a sewage filtration plant, materials recycling facility and several natural gas pipeline metering stations.

Further afield in the Unanderra and Port Kembla areas, more than 10 km to the east of the Colliery, are significant existing industrial developments including the BlueScope Steel Plant, Port Kembla terminal and other assorted manufacturing facilities. To the south-east is the Energy Australia Tallawarra gas-fired power station.

Other contributing non-Colliery sources of air pollutant emissions to baseline air quality include:

- dust entrainment due to vehicle movements along unsealed and sealed town and rural roads with high silt loadings;
- dust emissions from agricultural activities;
- fuel combustion-related emissions from on-road and non-road engines;
- wind generated dust from exposed areas within the surrounding region;
- seasonal emissions from household wood burning for heating during winter; and
- sea salts contained in sea breezes.

More remote sources which contribute episodically to suspended particulates in the region include dust storms and bushfires. It is considered that all of the above emission sources are accounted for in the monitoring data analysed in the following sections of this report.

7.3.6 Emissions inventory

A summary of annual site emissions, using information from on-site assessments undertaken when the Colliery was operational, by source type is presented in Table 7.7. Further, the contribution of source type to total annual emissions by particle size are illustrated in Figure 7.4.

Across all particle sizes, the most significant sources of emissions are the front end loader (FEL) and bulldozer operations associated with the ROM coal stockpile. Wind erosion from the run of mine (ROM) coal stockpile is also a notable contributing source of particulate matter on an annual basis.

Table 7.7 Calculated annual TSP, PM₁₀ and PM_{2.5} emissions – 2 Mtpa operations

Emissions source	Calculated annual emissions (kg/annum) by source		
	TSP	PM ₁₀	PM _{2.5}
Conveyor transfer point - NW Mains portal to new transfer bin	41.2	19.5	2.9
Conveyor transfer point - new transfer bin to pit top conveyor	41.2	19.5	2.9
Conveyor transfer point - pit top conveyor to transfer house/decline belt	41.2	19.5	2.9
Conveyor transfer point - decline belt to sizing station	41.2	19.5	2.9
Coal sizing	324.0	144.0	26.7

Table 7.7 **Calculated annual TSP, PM₁₀ and PM_{2.5} emissions – 2 Mtpa operations**

Emissions source	Calculated annual emissions (kg/annum) by source		
	TSP	PM ₁₀	PM _{2.5}
Conveyor transfer point - coal sizer to elevator tower	41.2	19.5	2.9
Conveyor transfer point - elevator tower to rail loading bins	41.2	19.5	2.9
Conveyor transfer point - elevator tower to rill towers	4.1	1.9	0.3
Conveyor transfer point - rail wagon loading	13.7	6.5	1.0
Conveyor transfer point - rill tower to stockpile	13.7	6.5	1.0
FELs loading coal to rail wagons (stockpile handle and wagon loading)	5,880.9	955.2	111.7
Bulldozer on ROM stockpile	2,088.3	1,155.7	91.9
Wind erosion of ROM stockpile	724.4	362.2	54.3
Wind erosion of timber yard/flat top	511.1	255.5	38.3
Wongawilli Shaft 1	109.6	109.6	109.6
Site surface diesel combustion	1.5	1.5	1.4
Diesel locomotive emissions	93.6	93.6	89.9
Total	10,011.8	3,209.0	543.7

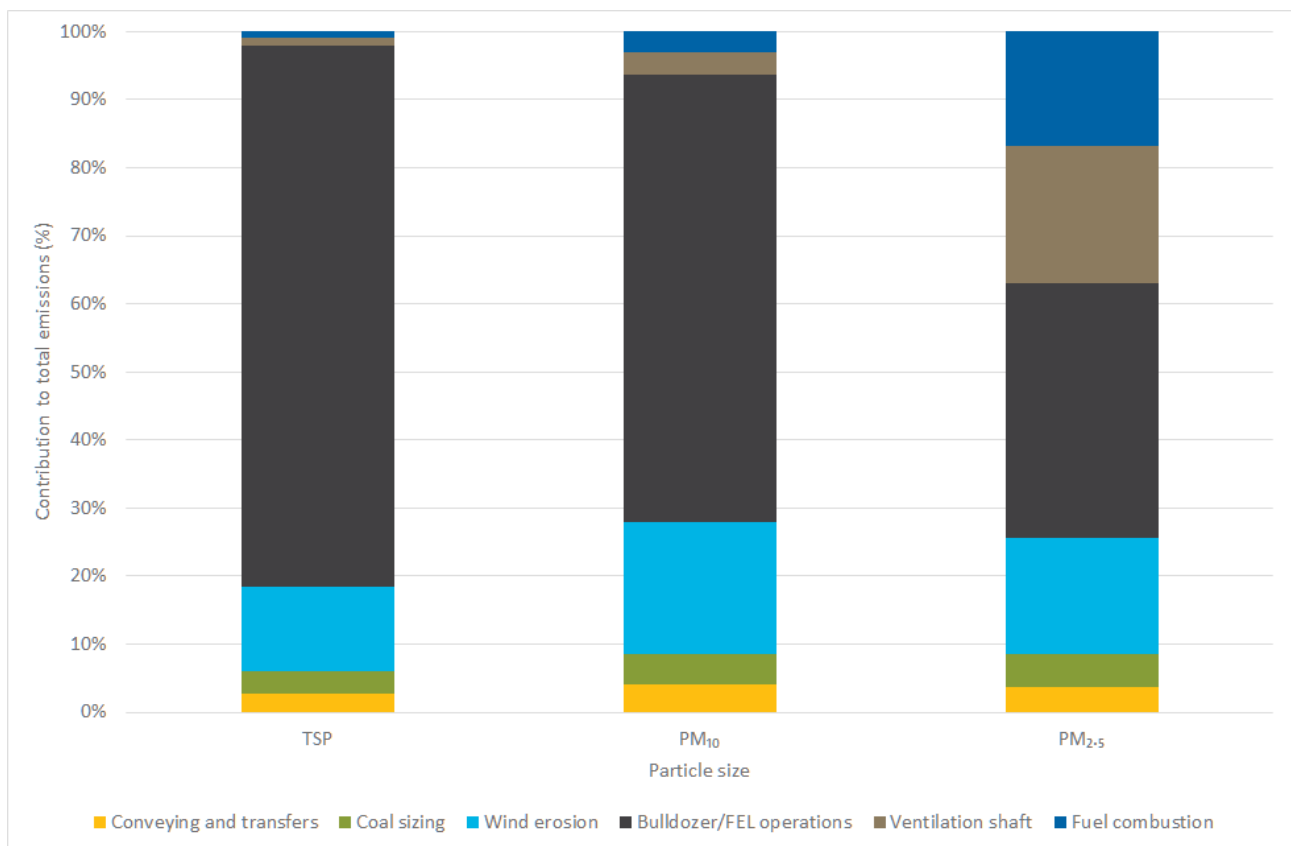


Figure 7.4 Contribution to annual emissions by emissions source type and particle size

7.3.7 Air dispersion modelling

The atmospheric dispersion modelling completed for the AQIA used the AERMOD dispersion model (version v19191). AERMOD is designed to handle a variety of pollutant source types, including surface and buoyant elevated sources, in a wide variety of settings such as rural and urban as well as flat and complex terrain.

In addition to the 58 assessment locations identified in Figure 7.5, air pollutant concentrations were predicted over a 8 km by 8 km model domain featuring the following nested grids:

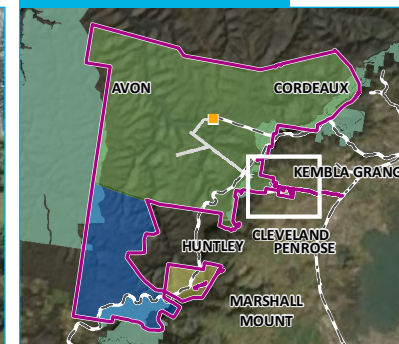
- a 0.6 km by 0.6 km domain with 20 m resolution;
- a 1.2 km by 1.2 km domain with 50 m resolution;
- a 2.2 km by 2.2 km domain with 100 m resolution;
- a 4.2 km by 4.2 km domain with 200 m resolution; and
- a 8 km by 8 km domain with 500 m resolution.

Simulations were undertaken for the 12-month 2016-2017 modelling period using the AERMET-generated file based largely on the WCM dataset as input (see Chapter 4 of Appendix F for a description of input meteorology).

\\Emmsvr1\emms3\2020\200053 - Wongawilli Mod 2 NW Mains\GIS\02 Maps\ AQIA\AQIA001 AssessmentLocations 20200929 01.mxd 17/11/2020



PROJECT APPLICATION AREA INSET



KEY

- Project application area
- Sensitive receiver
- Mine-owned residence
- Portal locations
 - Approved NWMD portal
 - Additional NWMD access portal
- Site infrastructure
 - Underground workings
 - Site layout

Existing environment

- Rail line
- Minor road
- Vehicular track
- Named watercourse
- NPWS reserve

PROJECT APPLICATION AREA INSET KEY

- Vent shaft - Wongawilli 1 fan
- Underground workings
- Rail line

Mining title

- ML 1565
- ML 1596
- CCL 766

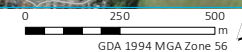


Assessment locations

Wollongong Coal Limited
Modification assessment report
Figure 7.5



Source: EMM (2020); Wollongong Coal Limited (2020); DFSI (2017); GA (2011); ASGC (2006)



To illustrate the contribution of background concentrations and Colliery emission sources to cumulative concentrations, the following figures have been generated:

- Figure 7.6 – cumulative 24-hour average PM_{10} concentrations at the most impacted assessment location (R19 – Wongawilli Community Hall);
- Figure 7.7 - cumulative 24-hour average $PM_{2.5}$ concentrations at the most impacted assessment location (R19 – Wongawilli Community Hall);
- Figure 7.8– cumulative annual average PM_{10} concentrations at all assessment locations; and
- Figure 7.9 – cumulative annual average $PM_{2.5}$ concentrations at all assessment locations.

These figures illustrate that the predicted daily-varying cumulative concentrations are below applicable impact assessment criteria at all assessment locations. Further, the figures illustrate that ambient background concentrations are the major contributor to cumulative concentrations.

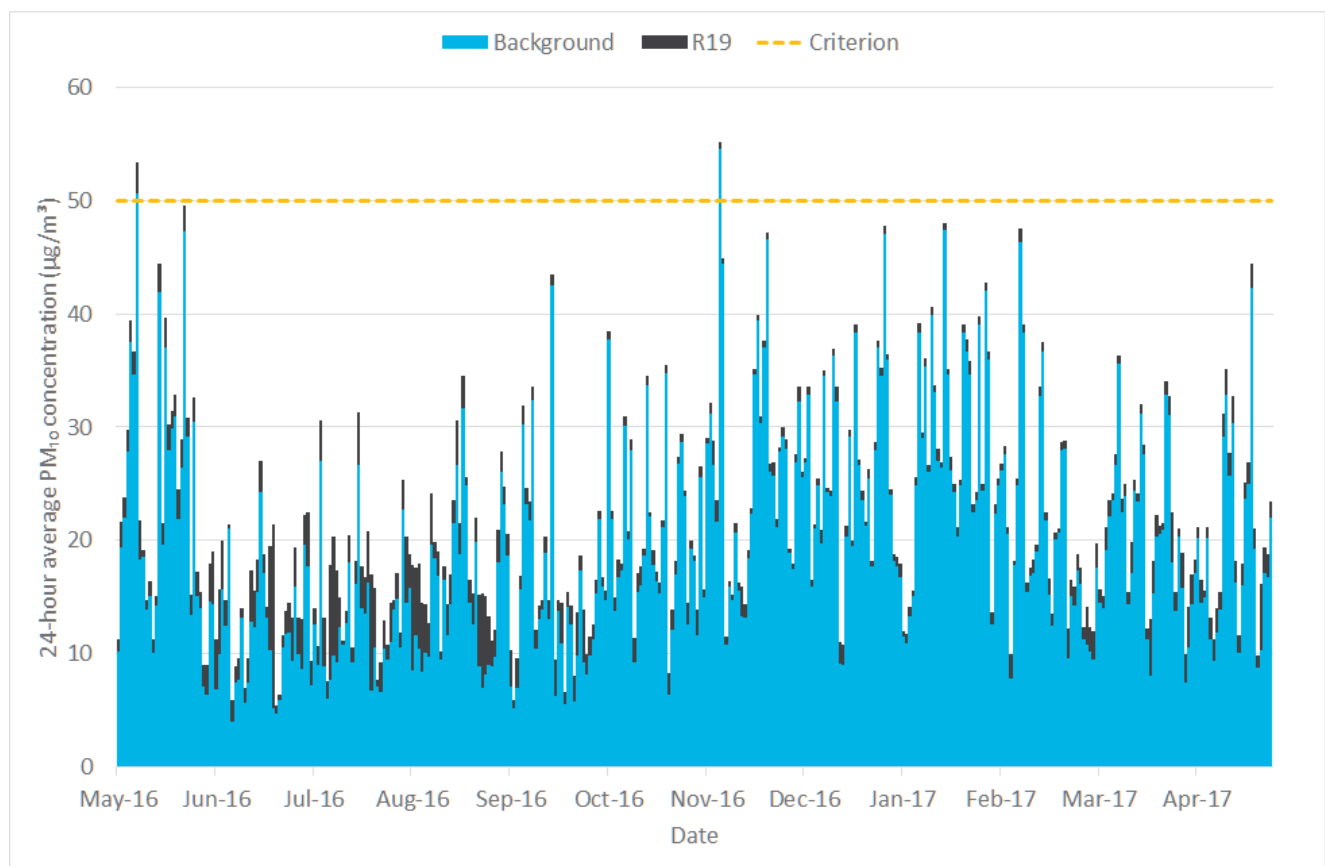


Figure 7.6 Daily-varying cumulative 24-hour average PM_{10} concentrations – assessment location R19

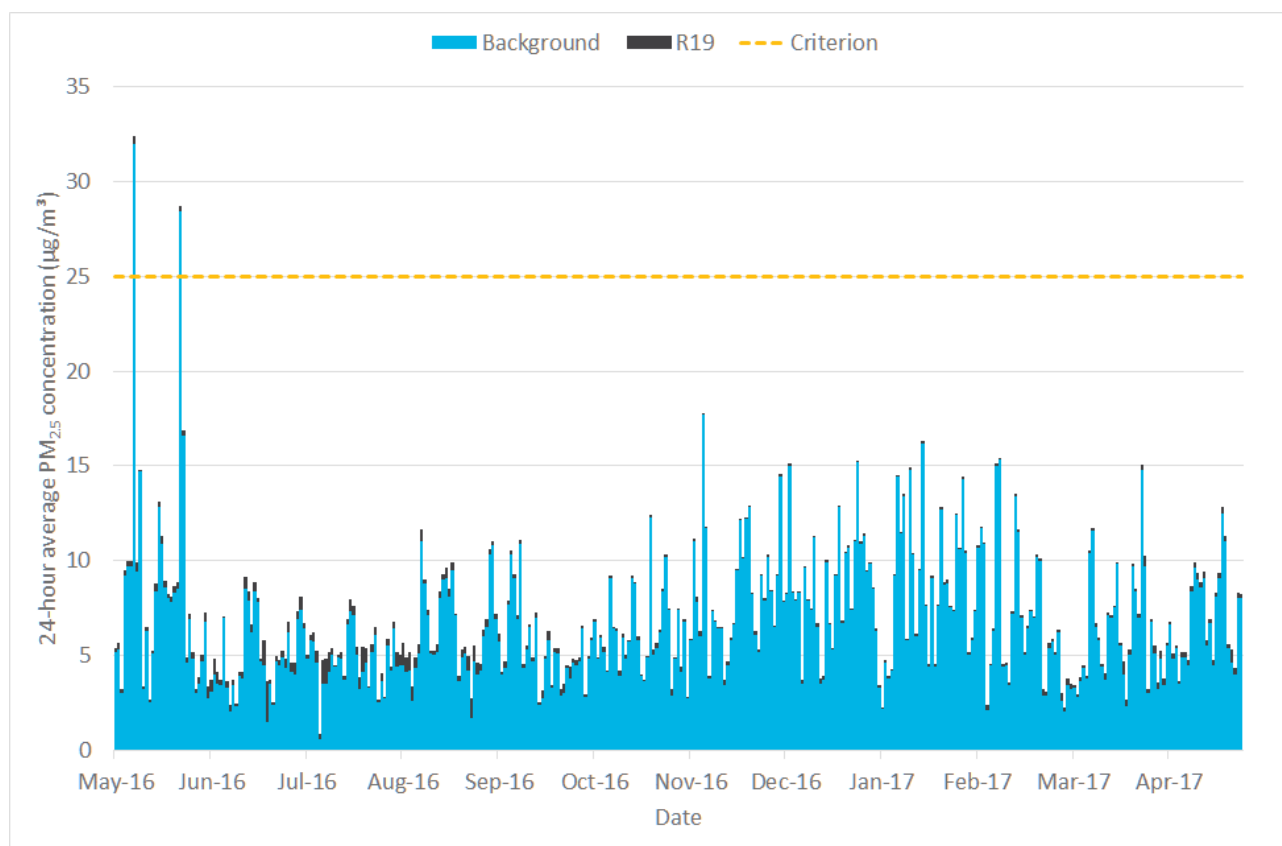


Figure 7.7 Daily-varying cumulative 24-hour average PM_{2.5} concentrations – assessment location R19

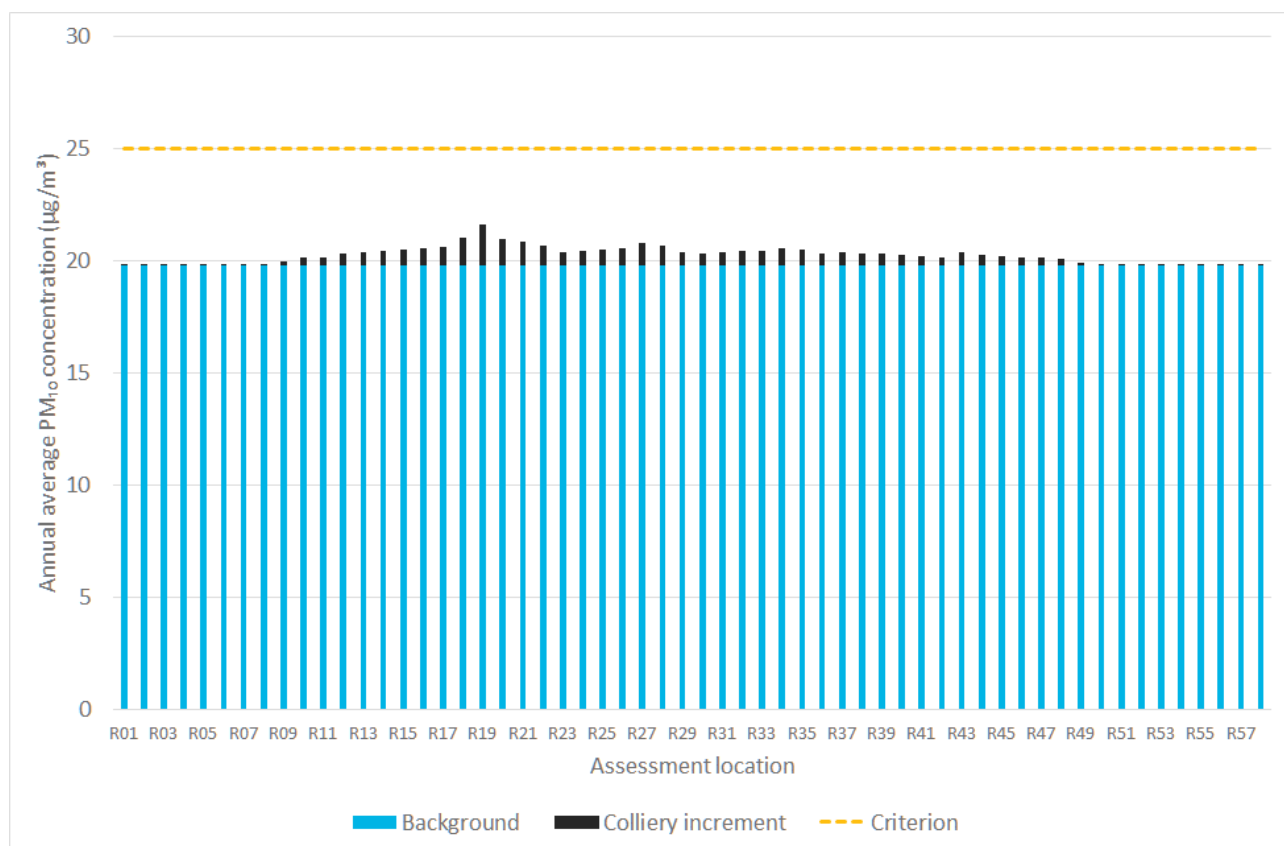


Figure 7.8 Cumulative annual average PM₁₀ concentrations – all assessment locations

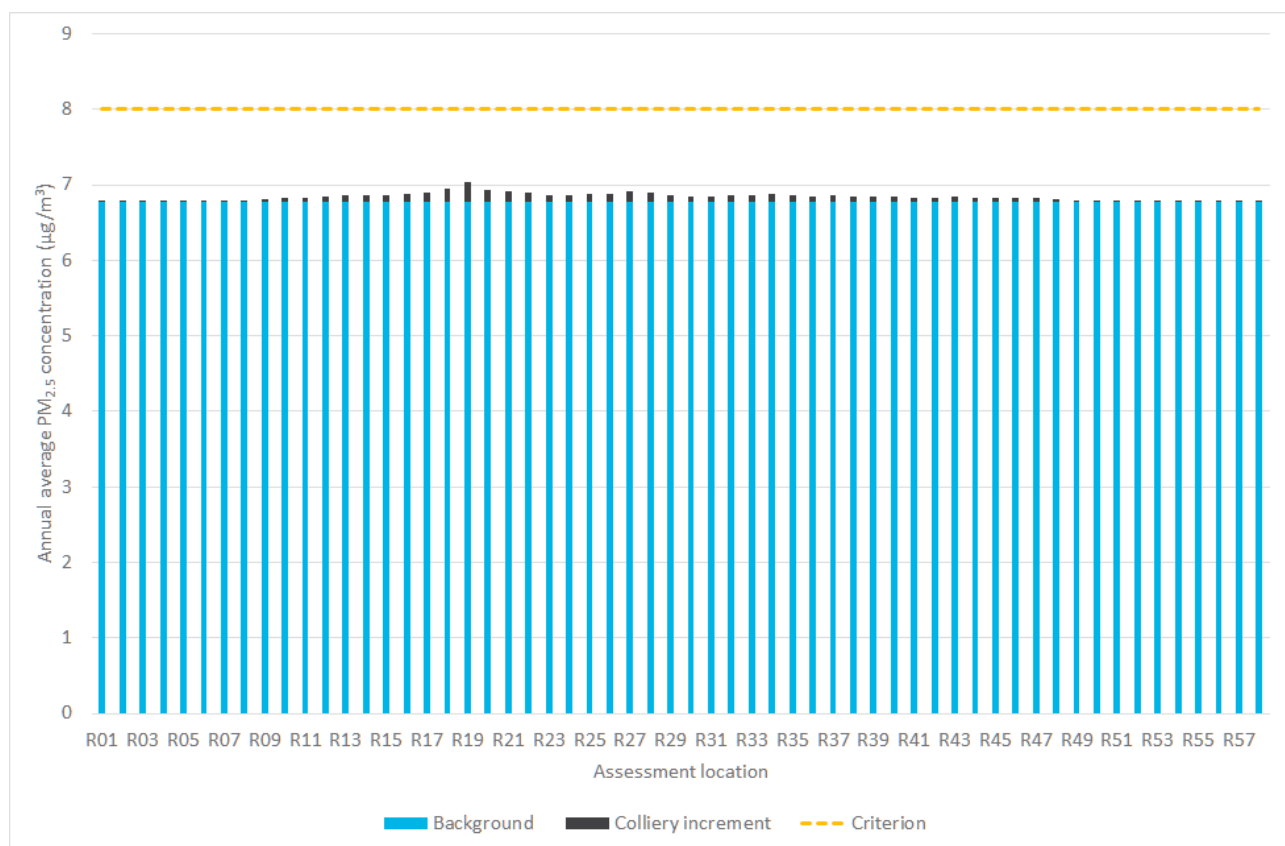


Figure 7.9 Cumulative annual average PM_{2.5} concentrations – all assessment locations

7.3.8 Greenhouse gas assessment

i Assessment approach

The estimation of greenhouse gas (GHG) emissions for the Colliery was based on the Australian Government Department of the Environment and Energy (DoEE) National Greenhouse Accounts Factors (NGAF) workbook (DoEE 2019). The methodologies in the NGAF workbook follow a simplified approach, equivalent to the 'Method 1' approach outlined in the National Greenhouse and Energy Reporting (Measurement) Technical Guidelines (DoE 2014). The Technical Guidelines are used for the purpose of reporting under the National Greenhouse and Energy Reporting Act 2007 (the NGER Act).

For accounting and reporting purposes, GHG emissions are defined as 'direct' and 'indirect' emissions. Direct emissions (also referred to as scope 1 emissions) occur within the boundary of an organisation and as a result of that organisation's activities. Indirect emissions are generated as a consequence of an organisation's activities but are physically produced by the activities of another organisation (DoEE 2019). Indirect emissions are further defined as scope 2 and scope 3 emissions. Scope 2 emissions occur from the generation of the electricity purchased and consumed by an organisation. Scope 3 emissions occur from all other upstream and downstream activities, for example the downstream extraction and production of raw materials or the upstream use of products and services.

ii Impact assessment

The GHG emission sources included in this assessment are listed in Table 7.8, representing the most significant sources associated with the Colliery.

Table 7.8 Scope 1, 2 and 3 emission sources

Scope 1	Scope 2	Scope 3
Direct emissions from fuel combustion (diesel) by onsite plant and equipment.	Indirect emissions associated with the consumption of purchased electricity.	Indirect upstream emissions from the extraction, production and transport of diesel.
Fugitive emissions from underground mining operations.		Indirect upstream emissions from electricity lost in delivery in the transmission and distribution network.
Post mining emissions from extracted coal in the ROM coal stockpiles.		Combustion of extracted coal by end users.
		Transportation of extracted coal to market (rail and shipping).

Table 7.9 provides a breakdown of GHG emission sources included in the assessment, scope 1 emissions are identified as 'direct' emissions while scope 2 and 3 are identified as 'indirect' emissions.

Table 7.9 **Estimated annual GHG emissions – 2 Mtpa operations**

Emission sources	Scope 1 (t CO ₂ -e/year)	Scope 2 (t CO ₂ -e/year)	Scope 3 (t CO ₂ -e/year)
Diesel combustion	136	-	7
Fugitive emissions from mining	357,761	-	-
Post-mining emissions	3,400	-	-
Electricity consumption	-	22,029	2,448
End use of product coal	-	-	5,521,200
Transport of product coal via rail	-	-	756
Transport of product coal via ship	-	-	604,800
Total	361,297	22,029	6,129,211

The significance of GHG emissions relative to state and national GHG emissions is made by comparing annual average GHG emissions against the most recent available total GHG emissions inventories (calendar year 2018²) for NSW (131,684.9 kt CO₂-e) and Australia (537,446.4 kt CO₂-e).

Annual scope 1 and 2 GHG emissions generated by the Colliery represent approximately 0.291% of total GHG emissions for NSW and 0.071% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018. Scope 3 emissions are approximately 6.1 Mtpa, with the majority associated with consumption of product coal by end users.

The calculated annual scope 1 and 2 emissions from the Colliery are greater than the NGER Scheme facility reporting threshold of 25,000 tpa CO₂-e. Wollongong Coal currently calculate and report scope 1 and 2 GHG emissions annually in accordance with the requirements of the NGER Act and will continue to do so as long as scope 1 and 2 GHG emissions are above the reporting threshold.

7.3.9 Mitigation measures

The Colliery as approved currently has numerous mitigation and management measures in place to reduce potential air quality impacts. The Colliery operates under an approved Air Quality and Greenhouse Gas Management Plan (AQGHGMP) to ensure all personnel undertaking works at the Colliery understand their responsibility to manage air quality. The mitigation and management measures as described within the AQGHGMP would continue to be implemented and updated where required as part of MOD2.

7.3.10 Conclusion

An AQIA focusing on the quantification of emissions and resultant air quality impacts from 2 Mtpa ROM coal extraction operations at the Colliery has been conducted by EMM. Emissions of TSP, PM₁₀ and PM_{2.5} were quantified for all significant Colliery emission sources. Emissions were quantified predominately using publicly available emission estimation techniques.

Atmospheric dispersion modelling predictions of air pollution emissions were undertaken using the AERMOD dispersion model.

The results of the dispersion modelling highlighted that the predicted impacts from Colliery operations will not result in exceedance of any applicable criteria at any neighbouring assessment locations.

² <https://ageis.climatechange.gov.au/SGGI.aspx>

The GHG assessment determined, annual scope 1 and 2 GHG emissions generated by the Colliery represent approximately 0.291% of total GHG emissions for NSW and 0.071% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory Report for 2018.

Wollongong Coal will continue to implement mitigation and management measures as approved to reduce the potential for air quality and greenhouse gas impacts to the receiving environment.

7.4 Traffic and transport

7.4.1 Introduction

A traffic impact assessment (TIA) for MOD2 has been prepared by Transport & Urban Planning Pty Ltd (Transport & Urban Planning 2020) (Appendix G).

7.4.2 Assessment approach

This TIA has been undertaken in accordance with the requirements of Roads and Traffic Authority's, now Transport for NSW (TfNSW) *Guide to Traffic Generating Developments October 2002*.

Other technical standards/publications referenced in this assessment include:

- Austroads Guide to Road Design and Roads and Maritime Services (RMS) supplements;
- Austroads Guide to Traffic Management and RMS supplements; and
- Austroads Guide to Traffic Management Part 12. Traffic Impacts of Developments.

7.4.3 Existing environment

i Road network

The local road network that services the Colliery include:

- Jersey Farm Road;
- Wongawilli Road/West Dapto Road;
- Shone Avenue; and
- Darkes Road.

The local road network is described below and displayed in Figure 7.1.

The Colliery is directly accessed via the Colliery access road off Jersey Farm Road. Jersey Farm Road is a two lane sealed road, the section of road between Wongawilli Road and the Colliery Access Road is generally 6.5 to 7.0 m wide with no kerb and gutter and grass shoulders.

Wongawilli Road/West Dapto Road is a two lane sealed road that connects between the village of Wongawilli and the Princes Highway at West Dapto. Shone Avenue links the residential suburb of Horsley to Wongawilli Road/West Dapto Road.

The railway line into the Colliery crosses Jersey Farm Road at the mine access road. Railway level crossing lights are provided at the level crossing in Jersey Farm Road and in the Colliery access road.



KEY

- Project application area
- Wongawilli Colliery rail
- Rail line
- Main road
- Local road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest (refer to inset)

Local road network

Wollongong Coal Limited
Modification assessment report
Figure 7.10

ii Traffic conditions

a Traffic count

Traffic counts were undertaken on the road network adjacent Wongawilli Colliery to establish current traffic conditions.

This included volume and vehicle classification counts on Jersey Farm Road, Wongawilli Road/West Dapto Road, Shone Avenue and Darkes Road.

In addition, intersection volume and turning counts were undertaken during the AM and PM periods at the intersections of Wongawilli Road/Jersey Farm Road and Wongawilli Road/West Dapto Road and Shone Avenue.

The volume and vehicle classification counts were undertaken for the week between 25 and 31 August 2020. The intersection counts were undertaken on Thursday 27 August 2020 between 6.00am-8.00am and 2.00pm-4.00pm, which are the times that will coincide with the shift time changes at Wongawilli Mine. Traffic volume, classification and intersection counts are outlined below.

b Daily traffic volumes

Table 7.10 shows the daily volume and vehicle classifications of vehicles using Jersey Farm Road, south of Wongawilli Road. The majority of the vehicles using Jersey Farm Road would be generated by Wongawilli Colliery.

Table 7.10 Jersey Farm Road south of Wongawilli Road, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
North	35	32
South	35	32
Total	70	64
Proportion of heavy vehicles	15.1%	13.6%

Table 7.11 shows the daily volumes and vehicle classifications of vehicles using Wongawilli Road, west of Shone Avenue.

Table 7.11 Wongawilli Road West of Shone Avenue, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
East	1637	1568
West	1620	1568
Total	3259	3126
Proportion of heavy vehicles	14.1%	11.1%

Table 7.12 and Table 7.13 show the daily volumes and vehicle classifications of vehicles using West Dapto Road, east of Shone Avenue and north east of Sheaffs Road, respectively. The higher volumes using West Dapto Road, east of Shone Avenue reflect those vehicles generated by the Horsley residential subdivisions that use West Dapto Road to reach the Princes Highway.

Table 7.12 West Dapto Road east of Shone Avenue, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
East	3054	2937
West	3256	3105
Total	6310	6042
Proportion of heavy vehicles	8.4%	7.2%

Table 7.13 West Dapto Road north-east of Sheaffes Road, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
East	3370	3213
West	3316	3137
Total	6686	6350
Proportion of heavy vehicles	8.2%	6.7%

Table 7.14 shows the daily volume and vehicle classifications of vehicles using Shone Avenue, south of West Dapto Road.

Table 7.14 Shone Avenue south of West Dapto Road, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
East	2558	2482
West	2751	2639
Total	5309	5121
Proportion of heavy vehicles	9.9%	8.9%

Table 7.15 the daily volume and vehicle classification of vehicles using Darkes Road, south of West Dapto Road.

Table 7.15 Darkes Road south of West Dapto Road, 5 day average and 7 day average traffic volumes (ADT) and vehicle classification

Direction of travel	5 day average (weekday)	7 day average (ADT)
East	3370	3213
West	3316	3137
Total	6686	6350
Proportion of heavy vehicles	8.2%	6.7%

c Weekly AM and PM Peak Hour Traffic Volumes at Intersection

The one (1) hour periods between 6.30am–7.30am (AM) and 2.30pm–3.30pm (PM) will coincide with the shift time changes at Wongawilli Mine, showing that:

- Traffic volumes using the Wongawilli Road/Jersey Farm Road are relatively low during the 6.30–7.30am period and the 2.30pm–3.30pm period.
- Traffic volumes using the Wongawilli Road/West Dapto Road/Shone Avenue intersection are higher reflecting the traffic generated by residential development in the area that uses this intersection. The main traffic movements at this intersection are the left turn into Shone Avenue from West Dapto Road and the right turn out of Shone Avenue into West Dapto Road to travel east.

It should be noted that the actual AM and PM peak hours at both intersections does not occur at the same times, as the AM and PM hours that will coincide with the future shift time changes at Wongawilli Mine. In this regard:

- The AM peak hour occurs between 7.00am–8.00am at the Wongawilli Road/West Dapto Road/Shone Avenue intersection.
- The PM peak hour occurs between 3.00pm–4.00pm at both intersections.

A review of traffic conditions on the road network adjacent Wongawilli Mine, including at the above intersection indicates that conditions are generally satisfactory.

Both the Wongawilli Road/Jersey Farm Road/West Dapto Road/Shone Avenue intersection operate with relatively low vehicle delays consistent with Level of Service A operation, as defined by the Guide to Traffic Generating Developments (RMS (formerly Roads and Traffic Authority, now TfNSW), 2002)).

iii Road safety

Road crash statistics were provided by TfNSW for the Wongawilli Road/West Dapto Road route, including intersections between Wongawilli Village and the Princes Highway for the 3 year period between 1 October 2016 and 30 September 2019.

During this period there was a total of 7 crashes including 4 injury crashes on this route.

Six of the crashes were mid block crashes (ie non intersection crashes) involving:

- 1 hit animal (non injury);
- 1 hit fixed object (non injury);
- 3 off road type crashes (3 injury crashes); and
- 1 head on crash (injury crash).

The intersection crash occurred at Wongawilli Road/West Dapto Road/Shone Avenue intersection and was a right angle non injury crash.

A review of the crashes has found that there is no identifiable pattern to the crashes that occurred over this 3 year period.

iv Bus routes

Premier Illawarra operates bus route 32 between Dapto and Wongawilli which provides a weekday peak hour service to Wongawilli. This bus route uses Shone Avenue, Wongawilli Road and Smiths Lane and returns the same way.

Premier Illawarra also operate a number of school bus services which use West Dapto Road and Wongawilli Road, as well as Shone Avenue.

v West Dapto residential development

West Dapto is being developed as a series of linked residential urban areas with new subdivisions being developed at Wongawilli, Horsley and Sheaffes.

The Council has developed the West Dapto Access Strategy and is undertaking transport and road upgrade works in stages, in various parts of the West Dapto urban release area with a number of projects already completed including the Princes Highway/West Dapto Road intersection and upgrades to Shone Avenue.

As part of the current developments, Council is proposing to upgrade Wongawilli Road between the Community Hill at Wongawilli and Shone Avenue, to provide safer access for pedestrians, cyclists, residents and visitors. To assist road improvements Wollongong Coal has made land available to the Council to ensure an adequate easement for the proposed works.

Future works also include the upgrading of West Dapto Road, between Shone Avenue and Princes Highway.

vi Bicycles

Council is developing cycle routes in the Horsley subdivision areas including on Shone Avenue, as well as in the other urban release areas of West Dapto.

Future cycleway links are proposed in City of Wollongong Bike Plan (2014–2018) in Wongawilli Road and West Dapto Road, as well as in Darkes Road and Sheaffes Road.

7.4.4 Impact assessment

i Proposed traffic generation

The traffic generation and traffic impacts of MOD2 will be lower than that of the current approval for the Colliery, due to the reduction of the workforce from 300 FTE personnel (as approved) to 150 FTE personnel.

The maximum traffic generation of MOD2 will occur on weekdays based on the following estimated number of vehicle trips:

- 112 two way light vehicle trips per day associated with the weekday workforce of 56 personnel, (56 inbound trips/56 outbound trips); and
- 10 two way visitor trips in light vehicles per day based on 5 visitors per day (5 inbound trips/5 outbound trips).

Up to 20 two way delivery/maintenance vehicle trips based on 10 delivery/maintenance vehicles per day (i.e. heavy vehicle trips) (10 inbound trips/10 outbound trips). Given the minor construction activities proposed under this modification, construction related traffic has been accounted for within the maximum traffic generation allowances.

ii Assessment of traffic impacts

a Peak time impacts

The largest traffic impacts of MOD2 will occur at the workers shift change over times which will occur on weekdays between 6.30 am-7.30 am and 2.30 pm-3.30 pm. Table 7.16 confirms the number of workers and staff for each shift.

Table 7.16 Details of shift times and number of workers

Shift	Number of Workers and Staff
Monday to Friday	
Day Shift (7.00 am to 3.00 pm)	26
Afternoon Shift (3.00 pm to 11.00 pm)	15
Night Shift (11.00 pm to 7.00 am)	15
Saturday and Sundays	
Day Time Shift Only (7.00 am to 3.00 pm)	6

Delivery and maintenance vehicles will typically be small to large rigid trucks and some 19 m long articulated trucks and access the Colliery intermittently. Delivery and maintenance vehicles were considered within the peak time impacts as defined below.

Based on one (1) vehicle trip per worker, the estimated traffic generation during these hours will be:

- AM Mine peak (6.30 am-7.30 am) a total of 43 trips with 27 inbound trips and 16 outbound trips, which include workers trips (26 inbound trips/26 outbound trips) plus one (1) delivery vehicle (one (1) inbound trip, one (1) outbound trip).
- PM Mine peak (2.30 pm-3.30 pm), a total of 34 trips with 17 inbound trips and 17 outbound trips which include workers trips and one (1) visitor trip (16 inbound trips/16 outbound trips) and one (1) delivery vehicle (one (1) inbound trip/one (1) outbound trip).

The majority of these trips are expected to arrive/depart via Wongawilli Road/West Dapto Road to and from the Princes Highway, with a small proportion of worker trips using Shone Avenue and Darkes Road.

The additional volumes using Wongawilli Road/West Dapto Road would number between 34-43 vehicle per an hour (vph) in the AM mine peak hour and 26-34 vph in the PM mine peak hour.

The impact of this additional traffic on the road network would be relatively minor given that increase in both the AM and PM mine peak hours is less than one (1) vehicle a minute.

b Traffic modelling

SIDRA 8 modelling has been undertaken to examine the proposed traffic impacts of MOD2. SIDRA 8 is a computer software package which assesses the operational performance of intersections under traffic signal roundabout or sign control. Operational performance has been determined on the basis of Level of Service as defined within Guide to Traffic Generating Developments (RMS, 2002). The desirable design criteria for intersections is a Level of Service D or better, with A considered the highest standard.

Modelling was undertaken on the intersections of Wongawilli Road/West Dapto Road. Results are summarised in Table 7.17 and Table 7.18.

Table 7.17 **SIDRA 8 modelling results for Wongawilli Road/Jersey Farm Road in weekday mine peak hours for existing conditions and with MOD2**

Criteria	Existing conditions		With MOD2	
	AM Mine Peak	PM Mine Peak	AM Mine Peak	PM Mine Peak
Level of Service	A	A	A	A
Degree of Saturation	0.010	0.0116	0.020	0.026
Average Vehicle Delay (s)	4.1	3.3	5.3	4.6
Highest Movement Delay (s)	8.1	8.1	8.1	8.1
95 th Percentile Queue Length (m)	0.3	0.3	0.5	0.6

Table 7.18 **SIDRA 8 modelling results for Wongawilli Road/West Dapto Road/Shone Avenue in weekday mine peak hours for existing conditions and with MOD2**

Criteria	Existing conditions		With MOD2	
	AM Mine Peak	PM Mine Peak	AM Mine Peak	PM Mine Peak
Level of Service	A	A	A	A
Degree of Saturation	0.193	0.209	0.202	0.217
Average Vehicle Delay (s)	4.3	4.6	4.1	4.5
Highest Movement Delay (s)	6.3	7.1	6.5	7.3
95 th Percentile Queue Length (m)	5.0	5.7	5.3	5.9

iii Road safety and impact on other road users

MOD2 is not expected to have any negative impacts on road safety on the road network adjacent Wongawilli Colliery, or negative impacts on other road users.

Traffic associated with MOD2 is relatively small and traffic conditions at intersections and on the road network are expected to remain satisfactory with little or no change to the existing level of service and vehicle delay as compared to existing conditions.

iv Internal operation

No changes are proposed to the existing vehicles access roads within the Colliery and the parking provided for the workforce and equipment. Sufficient off street parking is provided to accommodate the workforce.

7.4.5 Conclusion

As summarised above and documented within the TIA, Appendix G, when compared to the approved operation at the Colliery, the road and traffic impacts of MOD2 will be lower than the current approval for the mine, due to the reduction of the workforce from 300 FTEs (as approved) to 150 FTEs.

The TIA has concluded that the traffic associated with MOD2 will be relatively small and traffic conditions on the road network will remain satisfactory.

Noting the minimal traffic impact proposed by MOD2, Wollongong Coal will ensure all personnel undertaking works at the Colliery are made aware of the local traffic network, ensure personnel are courteous of other road users and are respectful of neighbouring residents. The Colliery will also make every effort to schedule deliveries and or site activities to avoid any additional traffic during school times.

7.5 Surface water

7.5.1 Introduction

A surface water impact assessment (SWA) was conducted by HEC and is presented in Appendix H.

7.5.2 Assessment approach

The SWA outlines the current surface water context for both the natural environment above the approved and proposed NWMD and the Wongawilli pit top surface infrastructure. The SWA also reflects any legislative or standard changes since submission of the *NRE Wongawilli Colliery Nebo Area environmental assessment volume 1* in 2010 (ERM 2010), also referred to as the 2010 EA in the SWA. It provides an updated impact assessment to support the modification report, and builds upon the technical specialist reports provided as a component of the 2010 EA including:

- Annex G: *NRE Wongawilli Colliery Nebo Longwall Panels 1 to 6 Surface Water Assessment* (2010 SWA) (GeoTerra 2010a); and
- Annex H: *NRE Wongawilli Colliery Nebo Panels 1 to 6 Groundwater Assessment criteria* (2010 GWA) (GeoTerra 2010b).

The SWA was prepared with reference to the following legislation, guidelines and licences:

- EP&A Act;
- Mining Act;
- POEO Act;
- WM Act;
- *Water NSW Act 2014* (NSW);
- National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000);
- NSW Government Water Quality and River Flow Objectives (OEH 2006);
- Australian and New Zealand Water Quality Guidelines (ANZG 2018);
- Australian Drinking Water Guidelines 2011 (ADWG) (NHMRC 2018);
- Managing Urban Stormwater Soils and Construction – Volume 2E Mines and Quarries (DECC 2008);

- Managing Urban Stormwater, Soils and Construction (Landcome 2004) (collectively referred to as the ‘Blue Book’);
- State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 (Sydney Drinking Water SEPP);
- Neutral or Beneficial Effect on Water Quality assessment Guideline (WaterNSW 2015); and
- EPL 1087.

The key legislative changes and guidelines relating to surface water management which have been implemented since submission of the 2010 EA include the following:

- *Water NSW Act 2014* (NSW);
- Sydney Drinking Water SEPP;
- Neutral or Beneficial Effect on Water Quality Assessment Guideline (WaterNSW 2015);
- Australian and New Zealand Water Quality Guidelines (ANZG 2018); and
- Australian Drinking Water Guidelines (NHMRC 2018).

These changes are addressed in more detail in Section 1.4 of Appendix H.

7.5.3 Existing environment

i Catchment description

The PAA is divided into two distinct catchments by the Independent Expert Scientific Committee (IESC) area, which are shown in Figure 7.11. The NWMD is located predominantly in the Lake Avon reservoir catchment area, while the Wongawilli pit top surface infrastructure is located within the Robins Creek catchment.

a NWMD catchment

The approved and proposed first workings of the NWMD are located predominantly within the Lake Avon reservoir catchment of the Metropolitan Special Area (refer Figure 7.11). Lake Avon reservoir is one of four dams located in the Upper Nepean catchment that make up the Upper Nepean water supply scheme for Sydney (WaterNSW 2020). The Metropolitan Special Area has high biodiversity values with access restricted to protect biodiversity and water quality in these areas.

The NWMD area is predominantly comprised of shallow colluvium which directly overlies the Hawkesbury Sandstone, Bald Hill Claystone and Bulgo Sandstone (GeoTerra 2010a).

The approved and proposed NWMD partially underlie Gallahers Creek, which forms the western arm of Lake Avon reservoir, and tributaries of Gallahers Creek and Lake Avon reservoir. Gallahers Creek flows in a north-northeast direction from the escarpment into Lake Avon reservoir and is a fourth-order stream at its confluence with Lake Avon. A number of smaller streams flow into Gallahers Creek including Bellbird Creek and Flying Fox Creek No. 1, 2 and 3.

The catchment area of the Avon River to Lake Avon reservoir is approximately 4,940 ha and the catchment area of Gallahers Creek to the confluence with the Avon River is approximately 3,213 ha.

Mapping of coastal upland swamps identifies one swamp area overlying the proposed alignment of the NWMD. It is noted that one coastal upland swamp overlays the approved NWMD. Two upland swamps are monitored for water level in the surrounding region of the NWMD at sites PA and P20 shown in Figure 7.11.

b **Wongawilli pit top catchment**

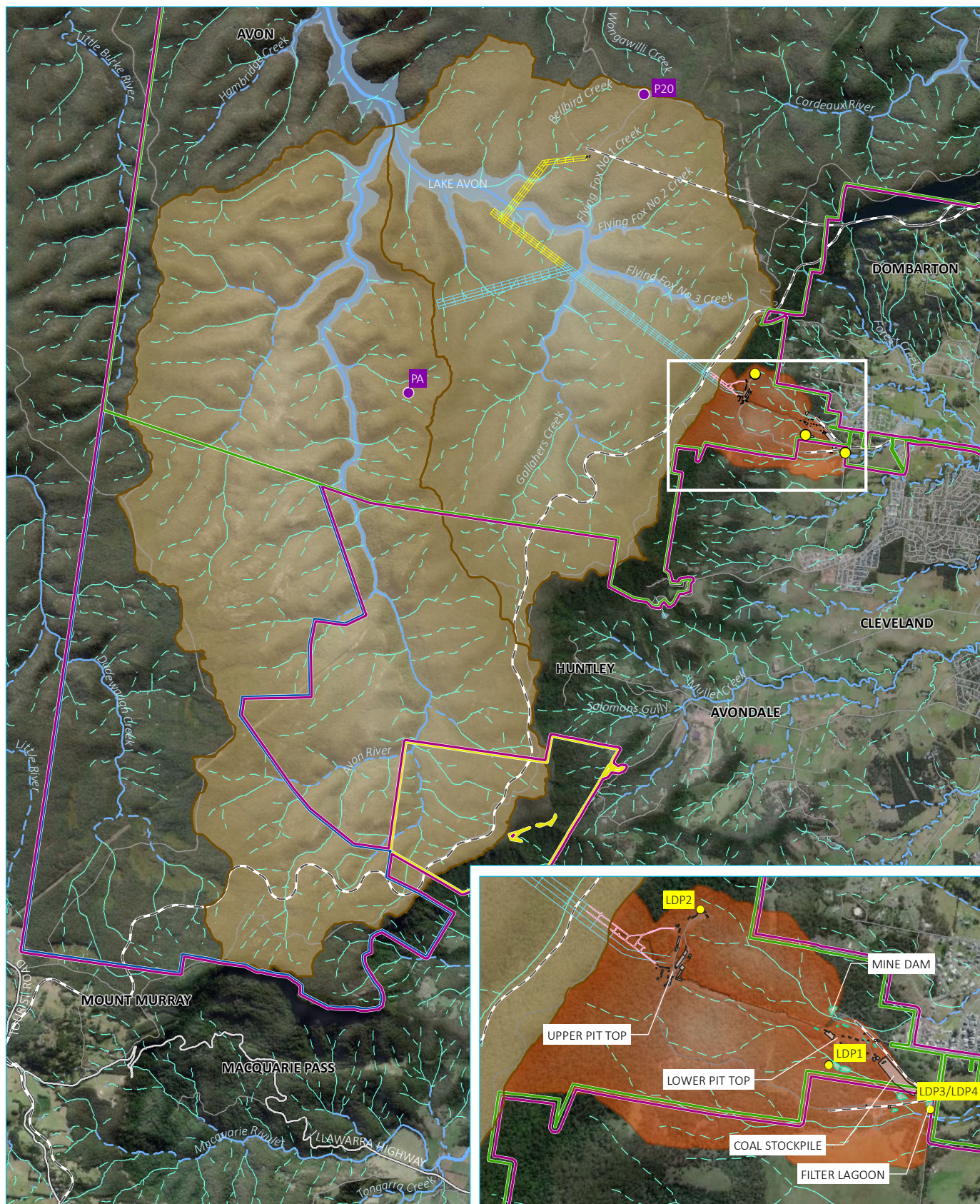
The Wongawilli pit top surface infrastructure is located on the eastern edge of the IESC area, within the catchment area of Robins Creek (refer Figure 7.11). Robins Creek is a tributary of Mullet Creek which flows into Lake Illawarra, a large coastal lagoon approximately 10 km to the east of the pit top. Upstream of the Wongawilli pit top, the catchment area is heavily forested and relatively undisturbed. Runoff from the catchment flows either north or south around the pit top areas to tributaries of Robins Creek. The tributaries of Robins Creek are second-order streams to the downstream boundary of the Wongawilli Colliery surface infrastructure.

The catchment area of the northern tributary of Robins Creek to the Mine Dam is approximately 57.8 ha and the catchment area of the southern tributary of Robins Creek to licensed discharge point 4 (LDP4) is approximately 94.8 ha.

ii **Climate**

Data sourced from the Bureau of Meteorology (BoM) station at Albion Park shows that the region experiences a temperate climate with mean monthly maximum temperatures ranging from 17.8 degrees Celsius (°C) in July to 27.1°C in January. Mean monthly minimum temperatures range from 6.2°C in July to 17.2°C in February.

Data sourced from the BoM stations at Albion Park and Dapto West show the long-term average monthly rainfall recorded at these stations. The annual average rainfall (mm) for the period between 1989–1987 at Dapto West Station is 1,189 mm of rain. The annual average rainfall (mm) for the period between 1892 and present at the Albion Park station is 1,096 mm.



Source: EMM (2020); Wollongong Coal Limited (2020); DPE (2019); WaterNSW (2019); DFSI (2017); OEH (2015); DPI (2015); GA (2011)

KEY

- Project application area
- Site layout
- Water collection and treatment
- Mining title
 - ML 1565
 - ML 1596
 - CCL 766

- Proposed additional driveway
- Proposed NWMD alignment
- North West Mains Drivage completed workings
- Rail line
- Major road
- Minor road
- Waterbody

- Upland swamp monitoring location
- Licensed discharge point
- Lake Avon catchment
- Pit top catchment

- Strahler stream order
- 1st order
 - 2nd order
 - 3rd order
 - 4th order
 - 5th order

Surface water systems

Wollongong Coal Limited
Modification assessment report
Figure 7.11



NOTE: Project application area is offset for viewing purposes

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iii Water quality

a Monitoring program description

Monitoring of surface water systems in the vicinity of the NWMD area was undertaken from September 2009 to May 2019 at the sites shown in Figure 7.12. Water quality monitoring is also undertaken by WaterNSW at one site on Flying Fox Creek No. 3 (E604) and on the Avon River (E610). Grab samples have been collected approximately every six months since June 2009.

Water quality monitoring was undertaken for two suites of parameters, including:

- field analysis for pH, electrical conductivity (EC), dissolved oxygen (DO) and temperature; and
- laboratory analysis for dissolved organic carbon, total dissolved solids, dissolved sodium, dissolved calcium, dissolved potassium, dissolved magnesium, chloride, fluoride, sulphate, total metals, total phosphorous and total nitrogen.

Given the nature of the catchment (ie Special Metropolitan Area surrounded predominantly by rural uses) the following guidelines apply to the surface water quality monitoring program:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018); and
- National Water Quality Management Strategy: Australian Drinking Water Guidelines 6 2011 (ADWG) (NHMRC 2018).

Water quality monitoring parameters and objectives for the area of the proposed modification are outlined in Table 5 of Appendix H. Water quality monitoring results are summarised in Table 7 of Appendix H.

b Monitoring program results

The results of the monitoring program, when compared to the relevant guideline values in ANZECC/ARMCANZ 2000, ANZG 2018 and NHMRC 2018, show:

- a range of slightly acidic to slightly alkaline conditions have been recorded at the Avon River – Summit Tank (E61) monitoring site, as well as the reach of the Avon River spanning from monitoring site AV1 (upstream) to monitoring site AVD1 (upper Lake Avon reservoir);
- the pH of the water in the Upper Napean catchment had been found to be invariably below the ANZECC & ARMCANZ (2000) default trigger value of pH 6.5 (WaterNSW 2018). The low pH is thought to arise naturally in these waters due to silicic acid derived from dissolution of silica and the leaching of organic matter;
- the pH values recorded at Flying Fox Creek No. 3 (E604) indicate slightly acidic to near neutral conditions;
- pH along the reach of Gallahers Creek from monitoring site GC6 upstream to monitoring site GC1 downstream typically ranged from acidic to slightly acidic, and lower default trigger value for pH for upland rivers in NSW was exceeded in 100% of samples from upstream Gallahers Creek sites (GC4, GC5, GC6), 100% of samples from downstream Gallahers Creek sites (GC2, GC3) and 89% of samples from Gallahers Creek downstream (GC1);
- the NHMRC (2018) aesthetic guideline value for turbidity was exceeded in 10% of the Avon River – Summit Tank (E610) samples and 5% of the Flying Fox Creek No. 3 (E604) samples, however the turbidity levels at both sites did not exceed the ANZECC & ARMCANZ (2000) default trigger value for upland rivers in NSW;

- total aluminium exceedances were recorded in 35% of samples from the Avon River – Summit Tank (E610) and 12% of samples from Flying Fox Creek No. 3 (E604);
- the ANZG (2018) default guideline value for protection of aquatic ecosystems was exceeded at a number of locations for various parameters, including:
 - 57% of total aluminium concentrations, 14% of total cadmium concentrations, 7% of total chromium concentrations, 21% of total copper concentrations, 14% of total lead and 36% of total zinc concentrations at the upstream Avon River sites (AV1, AV2);
 - 82% of total aluminium concentrations, 27% of total cadmium concentrations, 18% of total chromium concentrations, 36% of total copper concentrations, 27% of total lead concentrations and 55% of total zinc concentrations at the central Avon River sites (AV3, AV4);
 - 34% of total aluminium concentrations, 16% of total cadmium concentrations, 3% of total chromium concentrations, 13% of total copper concentrations, 6% of total lead concentrations, 3% of total nickel concentrations and 25% of total zinc concentrations at the downstream Avon River sites (AV5, AV6, AV7 and AVT1);
 - total cadmium and total zinc were exceeded (17% and 33% of samples respectively) at the upper Lake Avon reservoir site (AVD1);
 - 40% of total aluminium concentrations, 17% of total copper concentrations, 17% of total lead and 33% of total zinc concentrations at GC4; and
 - 90% of total aluminium concentrations, 18% of total cadmium concentrations, 9% of total chromium concentrations, 18% of total copper concentrations, 9% of total lead concentrations and 55% of total zinc concentrations at GC5 and GC6;
- the water quality records for Bellbird Creek upstream and downstream monitoring sites, summarised in Table 12 of Appendix H, were consistent with the records for Avon River and Gallahers Creek with exceedances of the default guideline values recorded for total aluminium, total copper, total iron, total zinc, total nitrogen and total phosphorus; and
- one exceedance of the ANZG (2018) default guideline value for total arsenic was recorded at the Bellbird Creek downstream site.

c [Licensed discharge points](#)

The Wongawilli Colliery is subject to EPL 1087, which allows for discharge from the Colliery to surface waters. The locations of the licensed discharge points (LDPs) are shown in Figure 7.13.

Water quality limits for discharge at each LDP are summarised in Table 7.19. The discharge rates at each LDP and the quality of discharge at LDP1 and LDP2 are also required to be monitored in accordance with EPL 1087.

Table 7.19 EPL 1087 licensed discharge points

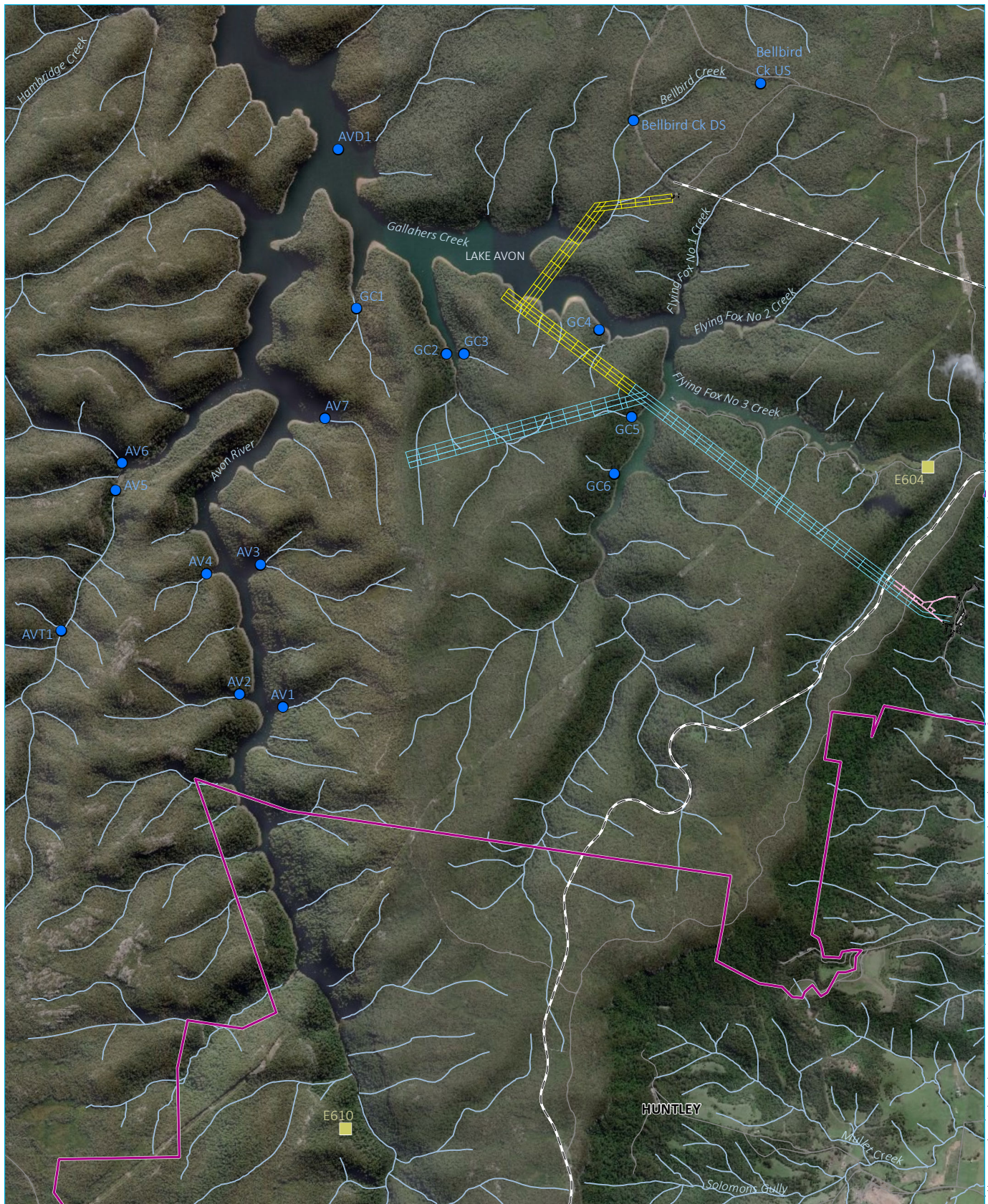
LDP	Description	Discharge limit
1	STP discharge from secondary stabilisation lagoon to Robins Creek	30 kilolitres (kL) per day
2	Mine water discharge from open drain at transport portal to tributary of Robins Creek	10,000 kL/day
4	Overflow from coal sedimentation/ filter pond to Robins Creek	-

Two additional LDPs, LDP7 and LDP8, are included in the EPL 1087 though these are not associated with MOD2. As such the two noted LDPs are not subject of this modification report.

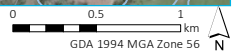
The water quality records for the Mine Dam, LDP2 and LDP3 discharge are summarised in Section 2.5.2 of Appendix H. In accordance with EPL 1087, monitoring of the water quality of discharge to LDP1 is undertaken when water is discharged.

According to the Wongawilli Colliery Annual Review reports, there has been no discharge via LDP1 since prior to 2011. Results of the water quality monitoring for the Mine Dam, LDP2 and LDP3 are presented in Table 13 of Appendix H. The results indicate:

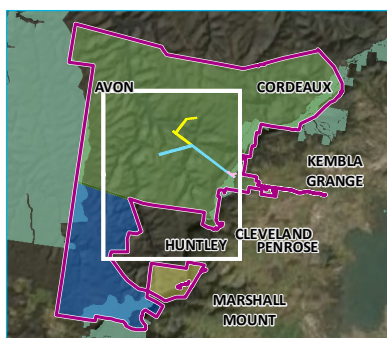
- water quality of the Mine Dam and the discharge to LDP2 and LDP3 ranges from near neutral to alkaline pH conditions;
- there has been one exceedance of EPL 1087 limits for pH, turbidity and oil and grease at LDP2 during the period of monitoring, which was reported to the EPA and documented in the 2020 Wongawilli Colliery Annual Review Report (Wollongong Coal 2020);
- the concentrations of total aluminium recorded in 40% of samples collected from the Mine Dam, 75% of samples collected from LDP2 and the one sample collected at LDP3 exceeded the ANZG (2018) default guideline values for aquatic ecosystems;
- total copper concentrations also exceeded the ANZG (2018) default guideline values for aquatic ecosystems in 44% of samples collected from the Mine Dam, 67% of samples collected from LDP2 and the one sample collected at LDP3;
- the concentrations of total zinc recorded in 75% of samples collected from LDP2 and 50% of samples collected at LDP3 exceeded the ANZG (2018) default guideline values for aquatic ecosystems. It should be noted that these constituents naturally exceed the ANZG (2018) default guideline values for aquatic ecosystems as evidenced by the water quality monitoring results for surface water sites in the Lake Avon catchment; and
- the EC values recorded in all samples collected from the Mine Dam and at LDP2 and LDP3 exceeded the ANZECC & ARMICANZ (2000) default trigger value for lowland rivers in NSW of 300 $\mu\text{S}/\text{cm}$. The EC values of some surface water systems in the vicinity of the Wongawilli Colliery have naturally exceeded the ANZECC & ARMICANZ (2000) default trigger value at times as evidenced by the water quality monitoring results for surface water sites in the Lake Avon catchment (refer Section 2.5.1 of Appendix H).



Source: EMM (2020); Wollongong Coal Limited (2020); DPE (2019); WaterNSW (2019); DFSI (2017)



Surface water monitoring



KEY

- Surface water monitoring
 - WaterNSW water quality monitoring
 - Project application area
 - Site layout
 - North West Mains Drivage completed workings
 - Proposed additional drivage
 - Proposed NWMD alignment
 - Rail line
 - Minor road
 - Watercourse/drainage line
- INSET KEY
- NPWS reserve
 - Mining title
 - ML 1565
 - ML 1596
 - CCL 766

Wollongong Coal Limited
Modification assessment report
Figure 7.12



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7.5.4 Existing surface water management system

i Overview

The existing surface water management system is shown in Figure 7.13. It has been designed so that the runoff from undisturbed and disturbed areas is separated and managed independently. The surface water management system comprises the following water systems within and is illustrated in Figure 7.13:

- surface water runoff management;
- mine dewatering from underground workings;
- potable water supply; and
- wastewater management.

The existing surface water management system is to be maintained for the proposed modification. The minor changes to the Wongawilli pit top surface infrastructure as described in Section 7.5.5, will not result in any changes to surface water catchments or surface water management system infrastructure.

ii Surface water management

The existing surface water management system is broadly divided into two systems.

- Disturbed areas at the Wongawilli pit top include existing mine benches, work areas and access tracks, which have surface drainage infrastructure to direct disturbed area runoff to the on-site water management system.
- Undisturbed areas of the Wongawilli pit top outside of the existing cleared mine benches, work areas and access tracks have surface water drainage infrastructure to direct undisturbed area runoff to local surface water systems and off-site.

An internal drainage system captures and directs runoff that potentially contains coal fines and sediment (from the upper pit top area, decline conveyor and coal storage/loading bins) to a series of sedimentation ponds for coarse particles to settle out (Decline Dam, Decline Surcharge Dam, Elevator Pit, Stackout Pit, Rail Sedimentation Pond). The drainage infrastructure comprises open drains and concrete sub-surface pipes and pits which have been designed to reduce erosional impacts.

Runoff from the coal stockpile area passes through two sediment ponds, including the Primary Treatment Settlement Pond and Secondary Treatment Settlement Pond, before discharging to the Filter Lagoon. Runoff from the coal refuse station is conveyed to Pond C and pumped to the Filter Lagoon.

Excess water stored in the Filter Lagoon is discharged to Robins Creek via LDP3 and LDP 4, in accordance with EPL 1087 licence conditions.

Pond C and the series of sedimentation ponds from the decline conveyor to LDP4 were designed and are managed in accordance with the guidelines in Landcome (2004), DECC (2008) and WRC (2010).

iii Water storage dams

Table 7.20 summarises the characteristics of the main water storages at the Wongawilli Colliery.

Table 7.20 Main water management system storages

Water management structure	Sub-catchment description	Cumulative catchment area (ha)	Estimated storage capacity (ML)
Mine Dam	Underground dewatering and undisturbed catchment	57.8	3.1
Decline Dam	Decline conveyor	4.3	0.4
Decline Surcharge Dam		4.7	0.6
Rail Sedimentation Pond	Disuses bathhouse area, elevator pit and stackout pit	9.1	0.3
Primary Sedimentation Pond	Coal stockpile	13.1	0.6
Secondary Treatment Sedimentation Pond	Rail area	13.3	1.2
Filter Lagoon	Lagoon area	13.9	5.8
Pond C	Coal refuse station	0.5	2.2

iv Mine dewatering and underground workings

Groundwater dewatering, along with excess water sent underground for mine water supply purposes is pumped to the surface and discharged into an open drain at LDP2. The open drain discharges to an unnamed tributary of Robins Creek which flows to the Mine Dam. Groundwater activities are described in more detail in Section 7.7.

v Potable water supply

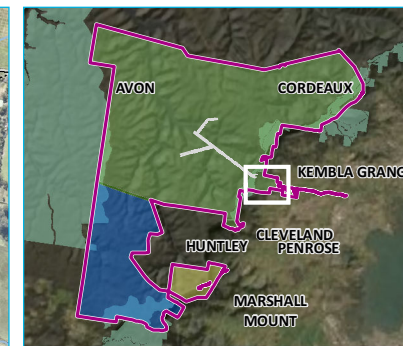
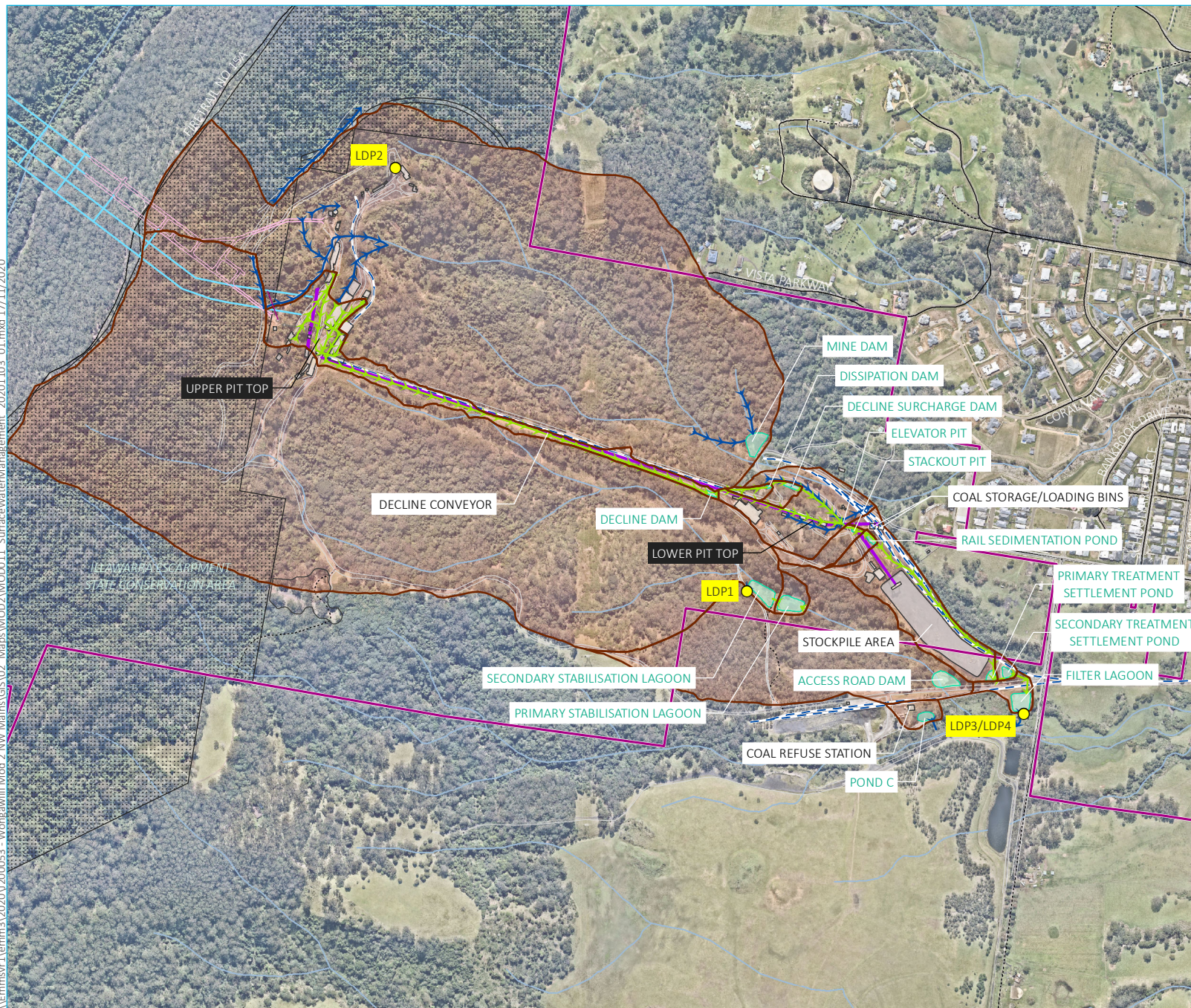
Potable water is supplied via the Wollongong potable water supply reticulation system to the administration area. Additional potable water is supplied to meet mine demands as required when there is a shortfall of supply from the Mine Dam.

During operations, an estimated water demand of 235 ML/year is required for underground mine operations, coal stockpile dust suppression, firefighting purposes and vehicle washdown.

vi Wastewater management

Wastewater from the administration building and bathhouse is collected in tanks and pumped out fortnightly by a licensed waste contractor. Greywater from the administration building and bathhouse is pumped to the Primary Stabilisation Lagoon which overflows to the Secondary Stabilisation Lagoon before discharging to LDP1.

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KEY

- ▭ Project application area
- ▭ Pit top catchment
- Clean water drainage
- Dirty water drainage
- Licensed discharge point
- Site infrastructure
 - ▭ Infrastructure
 - ▭ Water collection and treatment
 - Access roads and tracks
 - Conveyor belt
 - Wongawilli Colliery rail
 - North West Mains Drivage
 - completed workings
 - Proposed NWMD alignment

- Existing environment
 - Minor road
 - Vehicular track
 - Watercourse/drainage line
 - ▨ NPWS reserve

INSET KEY

- ▭ Underground workings
- ▭ NPWS reserve

Mining title

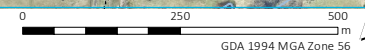
- ▭ ML 1565
- ▭ ML 1596
- ▭ CCL 766

Surface water management

Wollongong Coal Limited
Modification assessment report
Figure 7.13



Source: EMM (2020); Wollongong Coal Limited (2020); NearMap (2020); DFSI (2017); GA (2011); ASGC (2006)



7.5.5 Impact assessment

i Surface water management system

The existing surface water management system is to be maintained for the proposed modification, with minor changes to the surface infrastructure proposed. The proposed modification seeks to improve the coal conveyor network by constructing a new conveyor section approximately 60 m in length and undertaking minor upgrades of the existing conveyor network. All new and upgraded conveyor sections will be enclosed to reduce impacts as is consistent with existing infrastructure. No changes to surface water catchments or surface water management system infrastructure will be required to facilitate the new and upgraded conveyor sections.

ii Subsidence effects

SCT's (2020) subsidence assessment indicates that the proposed workings are not expected to cause any perceptible surface subsidence unless widespread pillar instability was to occur, of which the potential is assessed as negligible. Therefore, the impacts to natural surface and built features are expected to be imperceptible. These findings are consistent with those documented in the 2010 EA.

iii Groundwater effects

The predicted groundwater impacts associated with the NWMD, as outlined in the SLR (2020) GWA are summarised below:

- a maximum annual total groundwater inflow associated with MOD2, for both the approved and proposed NWMD, is estimated at 36.8 ML in 2014 and a maximum daily inflow rate of 1,600 kL/day occurring for a short period in late 2024 to early 2025 (SLR 2020);
- based on the calculations in the GWA, a maximum discharge rate to LDP2 of 7,226 kL/day may be required, which is below the current discharge limit of 10,000 kL/day at LDP2, and, as such, the discharge limits at LDP2 are not expected to be exceeded as a result of MOD2;
- the quality of groundwater inflow dewatered from the NWMD area and subsequently the quality of discharge to LDP2 is expected to be consistent with the quality of dewatering discharged at present;
- negligible drawdown in the upper units of the alluvium/weathered zone or Hawkesbury Sandstone is predicted; and
- fracturing associated with the NWMD is not expected to extend into the Bulgo Sandstone and the overlying hydrostratigraphic units.

Given the above scenario, there is expected to be negligible baseflow loss from surface water systems within the MOD2 area and negligible impacts to surface water systems or Groundwater Dependent Ecosystems (GDEs). These predictions are consistent with that of the 2010 EA.

iv Surface water effects

The 2010 EA concluded that due to the lack of predicted subsidence associated with development of the NWMD, no adverse impacts to surface water systems within the Lake Avon Catchment were expected including:

- no stream-flow loss;
- no adverse effects on water quality in surface water systems or Lake Avon;

- no adverse changes in stream bed or bank stability;
- no adverse effect on stream pools; and
- no adverse effect on the ephemeral shallow soil groundwater system.

The 2010 EA identified that, although there will be some lateral depressurisation of the overburden above Gallahers Creek, the depressurization will not be notably transferred through the claystone to Lake Avon. As such, there will be no observable, adverse effect on the water storage capacity or water quality of Lake Avon (GeoTerra 2010). Additionally, there will be no loss of flow from surface water systems upstream of Lake Avon Reservoir and no adverse effect on the ephemeral shallow soil groundwater system (GeoTerra 2010b).

Given that the existing surface water management system will be maintained for MOD2, with minimal changes to Wongawilli pit top surface infrastructure, no impacts to the surface water systems or the surface water management system is expected to occur as a result of the proposed modification.

v Neutral or beneficial effects

Under the Sydney Drinking Water SEPP, all development in the Sydney drinking water catchment is required to demonstrate a neutral or beneficial effect on water quality. For MOD2, this applies to any area within the catchment or discharging to the catchment of Lake Avon.

In accordance with WaterNSW (2015), it is reasonable to assume that a development will have no identifiable potential impact on water quality if the development is unlikely to result in:

- a concentration of flow of water;
- the impedance of flow water;
- discharge of effluent, dust pollutants or stormwater; and
- other matters considered to result in a water quality impact, such as the potential for contamination.

No surface development associated with MOD2 is proposed to be undertaken in the Lake Avon catchment and negligible impact to surface water systems within Lake Avon catchment are expected to occur as a result of MOD2. As such, MOD2 is expected to result in a neutral effect on water quality of surface water systems within the Lake Avon catchment.

7.5.6 Mitigation measures

Water management is currently documented in the surface water management plan (SWMP) (Wollongong Coal 2019a). Management of wastewater and greywater is documented in the Integrated Wastewater Management Plan (IWMMP) (Wollongong Coal 2019b).

The SWMP details the surface water monitoring program and Trigger Action Response Plans (TARPs) necessary to identify and respond to potential surface water impacts associated with the Wongawilli Colliery operations. The Water monitoring program and TARPs detailed in the SWMP have been developed to ensure that the Wongawilli Colliery complies with the EPL 1087 LDP conditions.

The SWA recommends the following further measures:

- the surface water quality monitoring program for the Lake Avon catchment is recommenced and continued for the duration of the Colliery's operation;

- water quality monitoring is undertaken in the tributary of Robins Creek downstream of the overflow point from the Mine Dam;
- field water quality monitoring is undertaken each month and/or following overflow events;
- sampling and laboratory water quality analysis is undertaken at least at six-monthly intervals;
- water quality parameters to be monitored should comprise:
 - pH, EC, DO and temperature during field analysis; and
 - total alkalinity, total dissolved solids, sulphate, total metals, total phosphorous and total nitrogen via laboratory analysis;
- metering of pumped volumes from key water storages is undertaken including transfer from the Mine Dam and Pond C; and
- outcomes of the surface water monitoring program to be reported in the Wongawilli Colliery Annual Review reports, in accordance with the SWMP (Wollongong Coal 2019).

The above measures will provide an improved understanding of the potential water quality impacts to Robins Creek associated with the Wongawilli Colliery.

7.5.7 Conclusion

The existing and proposed first workings of the NWMD are located within the Metropolitan Special Area, which is a WaterNSW managed water catchment area. The NWMD is proposed to be excavated under the Gallahers Creek arm of Lake Avon reservoir. The following points include the key findings of the SWA:

- the existing surface water management system is to be maintained for the proposed modification;
- there is predicted to be no observable subsidence over the existing and proposed NWMD;
- it is expected that the rate of dewatered groundwater and subsequently the rate of discharge to LDP2 will not exceed the amount discharged at present; and
- MOD2 is expected to result in a neutral effect on water quality of surface water systems within the Lake Avon catchment.

Given that the existing surface water management system will be maintained for the proposed modification, with minimal changes to Wongawilli pit top surface infrastructure, no impacts to the surface water systems or the surface water management system is expected to occur as a result of the proposed modification.

7.6 Groundwater

7.6.1 Introduction

A groundwater impact assessment (GWA) was prepared by SLR and is presented in Appendix I. The GWA considers the potential impacts of the proposed modification on groundwater resources and associated receptors.

Peer review of the groundwater modelling in support of the GWA has been undertaken by Dr Doug Weatherill of EMM and is presented in Appendix J.

A summary of the findings of the GWA is provided in the following sections. A description of the existing groundwater environment is provided in Section 7.6.4. Section 7.6.5 describes the assessment of potential impacts of the proposed modification, while Section 7.6.6 outlines proposed monitoring and mitigation measures.

i Regulatory framework

The GWA was developed in consideration of the following legislation, and in accordance with the below-listed guidelines, technical and policy documents:

- WM Act;
- POEO Act;
- Australian Groundwater Modelling Guidelines (Barnett et al 2012);
- Murray Darling Basin Commission (MDBC) Groundwater Flow Modelling Guideline (Middlemis et al 2001);
- NSW Aquifer Interference Policy (AIP; Department of Primary Industries Office of Water 2012);
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) and National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (Agriculture and Resource Management Council of Australia and Australian and New Zealand Environment and Conservation Council [ARMCANZ & ANZECC 2000]);
- NSW State Groundwater Policy Framework Document (NSW Department of Land and Water Conservation [DLWC] 1998);
- NSW State Groundwater Quality Protection Policy (DLWC 1998);
- NSW State Groundwater Quantity Management Policy (DLWC, undated) Draft;
- NSW Groundwater Dependent Ecosystem Policy (DLWC 2002); and
- relevant Water Sharing Plans (WSP).

7.6.2 Assessment approach

The assessment of project-related impacts to groundwater resources and associated receptors considers the requirements of the WM Act, the relevant WSPs, the AIP and items listed.

Water affecting activities associated with the modification that have the potential to impact groundwater resources and associated receptors are limited to the interception of groundwater via underground mining.

Changes to current groundwater conditions caused by the interception of groundwater for mining purposes (direct impacts) potentially include:

- changes in groundwater quantity, including changes in groundwater levels/pressures and flow; and
- changes in groundwater quality, including changes in salinity and concentrations of other water quality parameters (such as pH, major ions, metals, hydrocarbons and nutrients).

The following summarises groundwater receptors that have the potential to be affected by the mining activities (indirect effects):

- changes to water access and quality for ecosystems that potentially rely on groundwater;
- changes to surface water and groundwater interaction for watercourses, swamps and springs that receive baseflow; and
- changes to water access and quality at third party groundwater users (bores).

A numerical groundwater flow model has been developed by SLR using MODFLOW-USG Beta (Panday et al 2015) to represent the conceptual hydrogeological understanding of the PAA and assess the influence of the proposed modification (ie NWMD) on the groundwater system. The results of the groundwater modelling have been used to assess potential changes in groundwater quality due to the NWMD. Details regarding model development and calibration is outlined in Chapters 5 and 6 of Appendix I.

7.6.3 Assessment criteria

The GWA considers the geological and hydraulic properties of the area of the proposed modification and surrounds, and uses the assessment criteria provided in the guidelines, technical and policy documents outlined in Section 7.6.1. This includes the minimal impact thresholds defined in the AIP.

The AIP divides groundwater sources into 'highly productive' or 'less productive' based on the yield (>5 L/sec for highly productive) and water quality (<1,500 mg/L total dissolved solids (TDS) for highly productive). Thresholds are set in the AIP for the different groundwater sources for the different minimal impact considerations. Groundwater in the PAA is regulated by the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. This WSP further divides the region into separate Groundwater Sources. The PAA is within Management Zone 1 (MZ1) of the Sydney Basin Nepean Sandstone Groundwater Source and is classified by DPIE as 'highly productive'.

Criteria for assessing impacts to groundwater quality is the deviation from current conditions and altering the beneficial use category of the water source (consistent with the AIP and the WM Act).

7.6.4 Existing environment

A description of typical climate conditions and surface water systems are described in Section 7.5 and Appendix H.

i Geology

a Overview

The Wongawilli Colliery is located within the (southern) Sydney Basin, which is a part of the Southern Coalfield. The area is primarily a Permo-Triassic sedimentary rock sequence and is underlain by consolidated sediments of Carboniferous and Devonian age. The stratigraphy of the area is listed in Table 7.21. Surficial geology is shown on Figure 7.14.

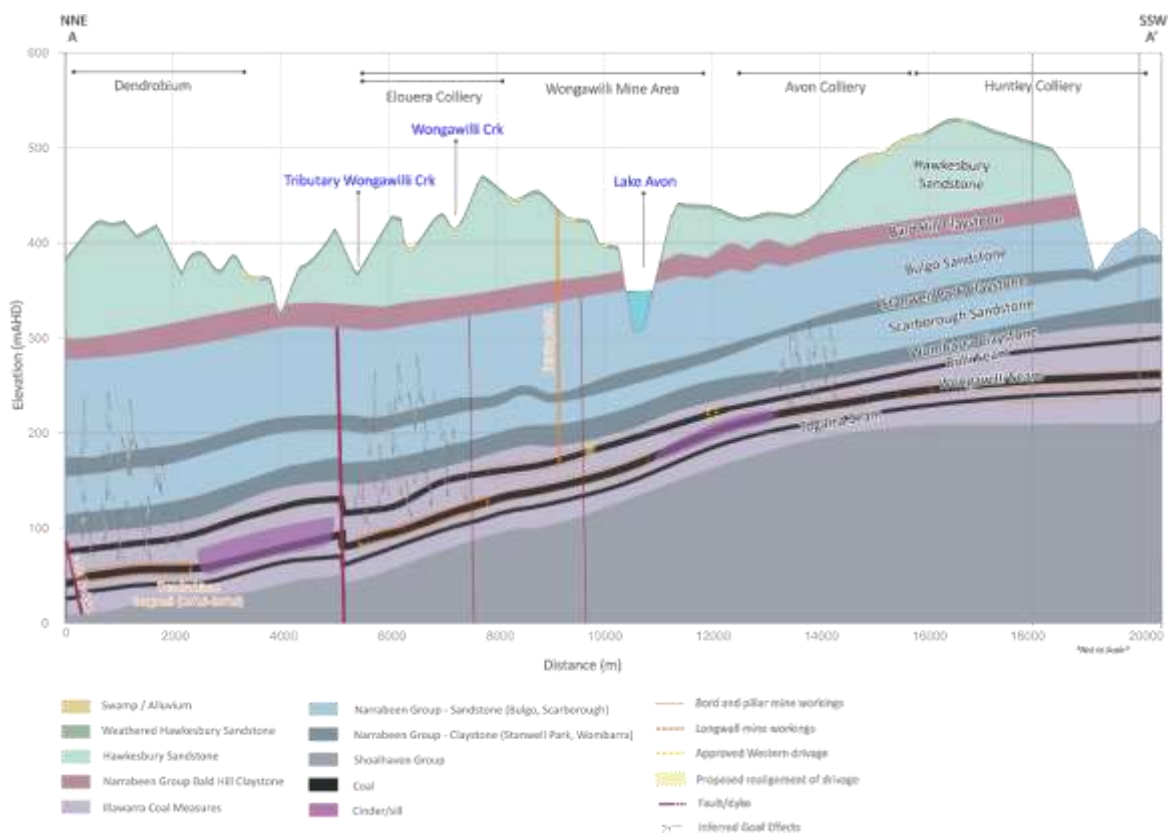
Table 7.21 Summary of the Colliery geological setting

Age	Group	Unit		Description	average thickness (m)
Quaternary	Upland swamp			Headwater drainage deposits and valley infill deposits	-
	Alluvium (valley floor)			Alluvial and residual deposits comprising quartz and lithic fluvial sand, silt and clay	<2
	Colluvium (hillslopes)			Colluvial soil comprising ferruginous clays or sandy soils	<6.5
Tertiary to Jurassic	Volcanic intrusions – sills and dykes			Cordeaux Crinanite (Hawkesbury Sandstone and Narrabeen Group)	<68 (sills)
				Dendrobium Nepheline Syenite (Illawarra Coal Measures – WW)	3 (dykes)
Triassic	Hawkesbury Sandstone			Consists of thickly bedded or massive quartzose sandstone with grey shale lenses up to several metres thick.	87.4
	Narrabeen Group	BACS	Bald Hill Claystone	Newport Formation – interbedded grey shales and sandstones	5.9
				Garie Claystone – grey brown, massive, characteristically oolitic claystone	3.8
				Bald Hill Claystone – Brownish-red coloured “chocolate shale” a lithological stable unit	12.6
		BGSS	Bulgo Sandstone	Strong, thickly bedded, medium to coarse-grained lithic sandstone with occasional beds of conglomerate or shale	65
		SPCS	Stanwell Park Claystone	Greenish-grey mudstones and sandstones	6.6
		SBSS	Scarborough Sandstone	Thickly bedded sandstone with shale and sandy shale lenses up to several metres thick	39.7
		WBCS	Wombarra Claystone	Greenish-grey mudstones and sandstones	9.5
		CCSS	Coalcliff Sandstone	Basal shales and mudstones that are contiguous with the underlying Bulli Coal Seam	8.3
Permian	Illawarra Coal Measures	BUSM	Bulli Coal Seam	Interbedded shales, mudstones, lithic sandstone and coals including the Bulli Seam, Wongawili Seam, Tongarra Seam, plus Loddon & Lawrence Sandstone and Kembla Sandstone	200-300
		LDSS	Lawrence & Loddon Sandstones		
		WWSM	Wongawilli Coal Seam		
		KBSS	Kembla Sandstone		
		TGSM	Tongarra Coal Seam		

Figure 7.15 and Figure 7.16 show north-south and west-east geological cross-sections through the historic, current and proposed Wongawilli mining area. The sections illustrate the relative thickness of the Hawkesbury Sandstone and Bulgo Sandstone in relation to the other units, as well as the layered nature of the geological sequence with alternating sandstones and claystones above the Permian coal seams. Locations of the cross sections are shown on Figure 7.14.

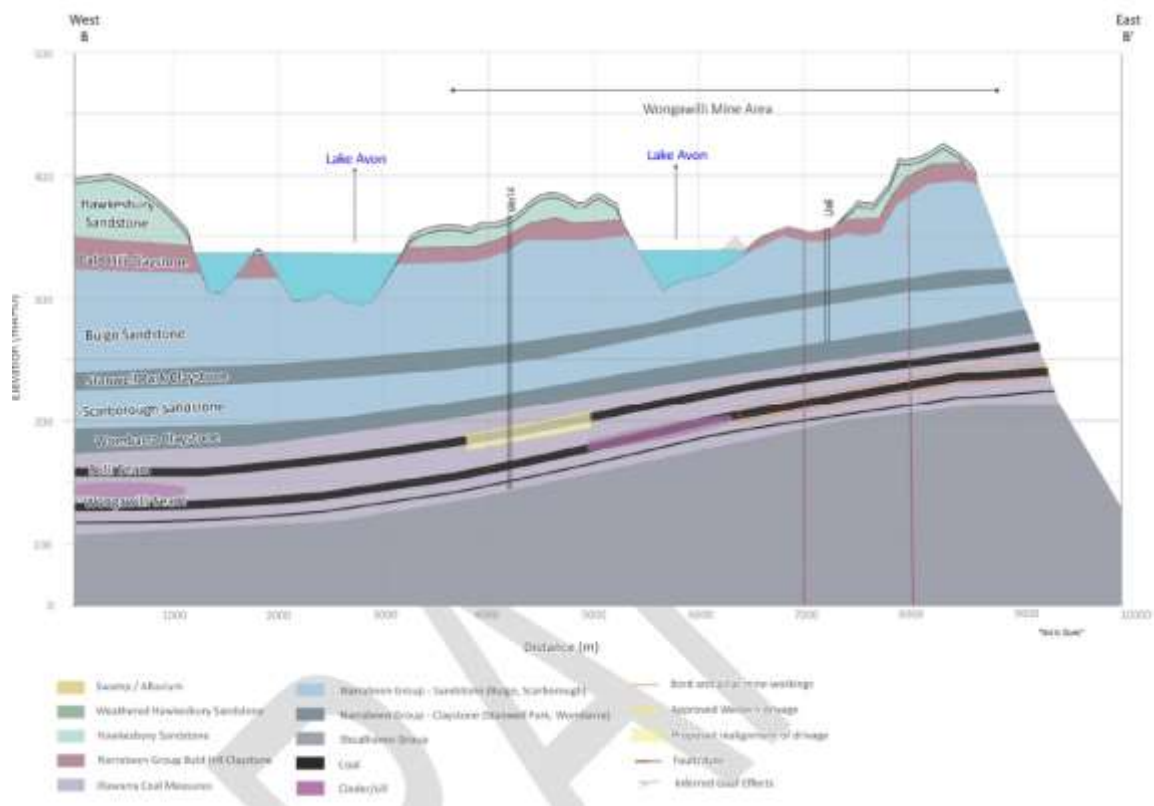
A summary of the geology relevant to the project is provided:

- **Upland swamps:** Small pockets of Quaternary-aged swamp deposits have been mapped across the Southern Coalfield (Moffitt 1999). Coastal upland swamps have also been identified in the area (HydroSimulations 2019), including one swamp area above the proposed NWMD and one above the approved NWMD. Coastal upland swamps are listed as an endangered ecological community (EEC) under the EPBC Act, and the BC Act. Swamp vegetation is highly variable, ranging from open graminoid (grassy) heaths and sedgelands to fernlands and scrubs.
- **Triassic Hawkesbury Sandstone:** predominantly occurs at ground surface and comprises medium to coarse-grained quartz sandstone with minor shale and laminate lenses. The maximum thickness of the Hawkesbury Sandstone within the area of the proposed modification is 154.7 m (WCL 2017). The Hawkesbury Sandstone displays bedding and contains secondary structural features such as joints, fractures and faults.
- **Triassic Narrabeen Group:** This Group underlies the Hawkesbury Sandstone and comprises interbedded quartz-lithic to quartzose sandstone, conglomerate, mudstone, siltstone and rare coal. The proposed modification area includes the Clifton Subgroup, which has Bald Hill Claystone, Bulgo Sandstone, Stanwell Park Claystone, Scarborough Sandstone, Wombarra Claystone and Boal Cliff Sandstone (refer Figure 7.15 and Figure 7.16).



Source: SLR (2020)

Figure 7.15 Geological cross section A-A' – north to south



Source: SLR (2020)

Figure 7.16 Geological section B-B' – west to east

- **Permian Illawarra Coal Measures:** The Illawarra Coal Measures are the primary economic sequence of interest in the Sydney Basin, and consists of interbedded sandstone, shale and coal seams, with a thickness of approximately 200 m to 300 m. The two main coal seams mined in the Southern Coalfield are the uppermost Bulli Seam and the Wongawilli Seam (Holla and Barclay 2000).
 - The Bulli Seam is the uppermost coal member in the Illawarra Coal Measure. Within the area of the proposed modification area, the shallowest depth to the Bulli Seam is approximately 140 m below Lake Avon. In the approved NWMD area, the shallowest depth to Bulli Seam is approximately 85 m beneath the Gallahers Creek arm of Lake Avon. The thickness and position of the Bulli Seam varies within different parts of the proposed NWMD, ranging from 0.9 m to 1.93 m, and is described in greater detail in Section 3 of Appendix I. There are large areas of the Bulli Seam that have been intruded by geological structures such as sills and dykes (discussed further below).
 - The Wongawilli Seam underlies the Bulli Seam. The vertical separation between the Bulli and Wongawilli seams is approximately 22 m on average within the proposed modification area. The Wongawilli Seam is consistent in thickness across the southern part of the Coalfield, ranging from 9 m to 11 m. It has significant deterioration in quality to the north where a basal section has been extensively mined in the past (WCL 2017).
- **Volcanics:** There are several mapped intrusions within the area of the proposed modification and surrounds, consisting of various geological forms such as sills and dykes. The intrusions are referred to as the Nebo Dome, the Dendrobium Nepheline Syenite igneous intrusion, the Cordeaux Crinanite, and the syenitic and doleritic sill intrusions.

b Structural geology

There are regional geological structures that run across the area, including a large syncline fold within the proposed modification area. There are several domed structures in the Wongawilli area which are believed to be due to volcanic intrusions. Previous mining activity in the area involved mining around some of these intrusions.

Most of the faults within the proposed modification area are of short length (less than 1 km), apart from two close to the Nebo Dome that are at least 3 km long and set off offset faults, named Avon Fault, along the Gallahers Creek, which are approximately 5.5 km long. South of the Avon Fault into the previous Avon, Huntley and Avondale Collieries, faulting is not a frequent geological structure. However, small scale faulting has been encountered in the workings of the Avondale and Huntley Collieries but not of a severity to impact significantly on mining. As reported in Tonkin and Timms (2015), there has been no recorded “high level” mine inflows across the Southern Coalfield in the past 25 years. This suggests that faults are typically more barriers than conduits to groundwater flow.

ii Hydrogeology

The major hydrostratigraphic units within the area of the proposed modification include the surficial alluvium (upland swamps), Triassic aged Hawkesbury Sandstone and Narrabeen Group, and the Permian aged Illawarra Coal Measures. Hydrogeological characteristics of each key unit are described in Section 3.6 of Appendix I. However, a summary is provided below.

- **Upland swamps:** There is very little mapped alluvium within the modification area, being limited to river and creek areas. Small pockets of unconsolidated material (upland swamps) are mapped throughout the area and are generally oriented parallel to the direction of surface flow. Recharge to the upland swamps is dominated by direct rainfall and indirectly from runoff, with discharge to the underlying geological units and as river baseflows where there are positive hydraulic gradients towards the creek or rivers. Monitoring at five swamp points between 2009 and 2018 show that groundwater level trends correlate with climate trends. Monitoring suggests that mining in the area has not affected groundwater levels in these shallow features.

- **Cordeaux Crinanite:** The crinanite is not present in the modification area, but is present to the north-east (refer Figure 7.15). The crinanite is an aquitard with very low hydraulic conductivity, experiencing low recharge and discharge, is up to 97.5 m thick (GeoTerra 2010). Feeder dykes from the main intrusion are present in the Bulli, Balgownie and Wongawilli Seams. The dykes are primarily dry and are not considered to provide permeable pathways for groundwater flow in the mining area (GeoTerra 2010). Monitoring of bores installed in the crinanite shows minimal response to rainfall trends and groundwater levels have remained stable despite depressurisation of the Bulli Seam nearby.
- **Hawkesbury Sandstone:** The Hawkesbury Sandstone is regionally extensive across the Sydney Basin and is a productive aquifer. The Hawkesbury Sandstone is characterised as a dual porosity aquifer where groundwater is transmitted by primary (pores in the rock matrix) and secondary porosity (joints and fractures). The PAA lies within the Hawkesbury Sandstone groundwater system that supports the 'Metropolitan and Woronora Special Areas' of Water NSW. Locally, the Hawkesbury Sandstone is present over the modification area except where it has been eroded away exposing the underlying Bald Hill Claystone and upper Bulgo Sandstone within the Gallahers Creek valley (GeoTerra 2010). Recharge to the Hawkesbury Sandstone is from infiltration of rainfall and leakage from water storage dams (ie Lake Avon). Groundwater from the Hawkesbury Sandstone discharges into incised rivers intersecting the Hawkesbury Sandstone such as the Cataract and Nepean Rivers. Regionally, the Hawkesbury Sandstone is used for groundwater supply, however within the area of the proposed modification there are no registered landholder bores due to land use restrictions within the Metropolitan and Woronora Special Areas.
- **Narrabeen Group:** This group is a sequence of interbedded sandstone, claystone, and siltstone of late Permian and early Triassic age that make up a series of aquitards (claystone units) and low yielding aquifers (sandstone units). The Narrabeen Group occurs at the surface in localised areas within the proposed modification area, enabling recharge from Lake Avon and discharge to creeks where hydraulic gradients enable this. Groundwater from this layer can also discharge naturally along the escarpment as springs, where it occurs at ground surface along the coast to the east. There are no registered bores within the area of the proposed modification, but there are bores regionally that use groundwater from the Bulgo Sandstone for irrigation and water supply purposes.
- **Illawarra Coal Measures:** The Permian coal measures consist of interbedded sandstones, shale and coal seams. Groundwater in the coal measures is semi-confined where they sub-crop at surface, becoming confined with depth (including in the proposed modification area). Groundwater recharge is from downward seepage from the overlying Narrabeen Group as well as from infiltration of rainfall where the coal measures occur at the surface along the escarpment. Groundwater discharge occurs naturally as springs along the escarpment or where the coal measures are intersected by creeks. Discharge also occurs via seepage in the mine workings.

a Hydraulic properties

Testing of hydraulic properties of the various key geological units within the area of the proposed modification has been previously conducted, including packer testing at the NWMD within the Hawkesbury Sandstone and Bulgo Sandstone. Extensive packer testing has also been conducted at surrounding mines. The results of these studies are discussed in Appendix I and summarised in Table 7.22. Typically, the hydraulic conductivity within the Hawkesbury Sandstone is more variable and higher than the Bulgo Sandstone. Hydraulic conductivity also tends to reduce with depth, influenced by overburden pressures with fracture apertures decreasing with depth.

Table 7.22 Summary of hydraulic conductivity data

Lithology	Location	Hydraulic conductivity (m/day)			Count	Source
		Average	Min	Max		
Wianamatta Formation	Dendrobium	1.2×10^{-4}	8.6×10^{-6}	5.0×10^{-4}	5	HydroSimulations 2019
	Tahmoor		1.2×10^{-1}		1	SLR 2020
Hawkesbury Sandstone	Appin	-	1.0×10^{-4}	$1.0 \times 10^{+2}$	4+	Heritage Computing 2009
	Dendrobium	2.1×10^{-2}	8.6×10^{-10}	2.4	471	HydroSimulations 2019
	Tahmoor	4.2×10^{-2}	7.6×10^{-5}	4.5×10^{-1}	174	SLR 2020
	NWMD		7.3×10^{-4}	0.1	9	
Narrabeen Group	Appin	-	1.0×10^{-4}	1.0×10^{-2}	4+	Heritage Computing 2009
Bald Hill Claystone	Dendrobium	3.0×10^{-3}	8.6×10^{-7}	2.3×10^{-1}	131	HydroSimulations 2019
	NWMD		9.5×10^{-4}		1	
Bulgo Sandstone	Dendrobium	2.5×10^{-3}	8.6×10^{-7}	3.2×10^{-1}	424	HydroSimulations 2019
	NWMD		1×10^{-4}	5×10^{-4}	8	
Stanwell Park Claystone	Dendrobium	1.5×10^{-2}	8.6×10^{-7}	3.2×10^{-1}	37	HydroSimulations 2019
	Tahmoor	1.1×10^{-4}	8.6×10^{-7}	3.5×10^{-4}	8	SLR 2020
	NWMD		7×10^{-5}		1	
Scarborough Sandstone	Dendrobium	1.4×10^{-2}	8.6×10^{-7}	2.5×10^{-1}	84	HydroSimulations 2019
	Tahmoor	3.4×10^{-4}	4.7×10^{-6}	2.5×10^{-3}	34	SLR 2020
Wombarra Claystone	Dendrobium	4.0×10^{-3}	6.0×10^{-6}	1.2×10^{-1}	80	HydroSimulations 2019
	Tahmoor	1.3×10^{-4}	8.6×10^{-7}	3.5×10^{-4}	9	SLR 2020
Coal Cliff Sandstone	Dendrobium	4.0×10^{-3}	8.6×10^{-10}	1.3×10^{-1}	59	HydroSimulations 2019
Bulli Coal	Dendrobium	6.0×10^{-3}	8.6×10^{-6}	1.1×10^{-1}	19	HydroSimulations 2019
	Tahmoor	7.3×10^{-4}	1.0×10^{-5}	3.9×10^{-3}	30	SLR 2020

There is no site-specific data on storage properties, however some estimates are provided below. Results from the neighbouring Dendrobium Mine and Appin Mine have been used to inform the GWA. Consistent with hydraulic conductivity, storage parameters decrease with depth. Estimates of total porosity range between 0.02% and 0.15%.

Direct test data is not generally available for confined storage, namely the specific storage. The specific storage of Hawkesbury Sandstone has been estimated to be approximately:

- $1 \times 10^{-6} \text{ m}^{-1}$ in the shallower zones where fracture flow is the dominant flow process (Kelly *et al* 2005); and
- $1.5 \times 10^{-6} \text{ m}^{-1}$, for intervals between ground surface and 300 m depth based on pumping tests in Hawkesbury Sandstone from Tammetta and Hawkes (2009).

iii Groundwater monitoring network

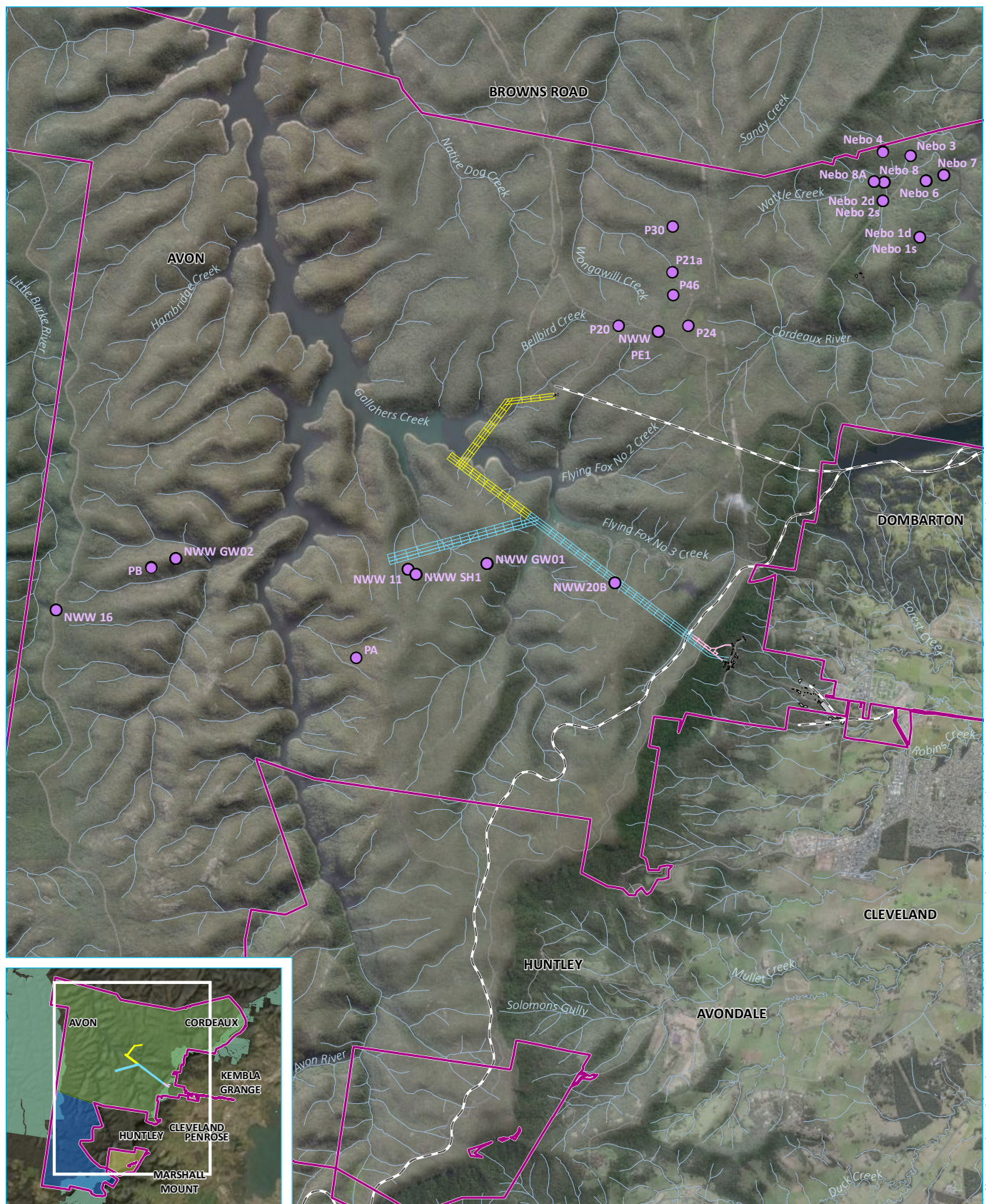
The groundwater monitoring network at the Colliery has been in place since 2009 and includes:

- 6 Nebo open standpipes (Nebo 1 to Nebo 4) within the Hawkesbury Sandstone, Crinanite, Bulli Seam and Wongawilli Seam, with nested bores at Nebo 1 and Nebo 2;
- 7 swamp deposit bores; and
- 11 vibrating wire piezometers (VWP) (Nebo/NWW/NRE) with multiple sensors across various units.

The groundwater monitoring program includes daily readings of pressure head at the VWPs, and manual measurement of water levels at the monitoring bores, as well as water quality sampling and analysis for electrical conductivity (EC), pH, major ions, minor ions and metals.

In addition, a data sharing agreement is in place with South 32, which enables use of extensive site groundwater monitoring data from their network for 149 VWPs with 615 sensors in Areas 3A, 3B and 3C. This network includes 241 sensors positioned within the Hawkesbury Sandstone.

A summary of the groundwater monitoring network is provided in Table 10 of Appendix I and shown below in Figure 7.17.



Source: EMM (2020); Wollongong Coal Limited (2020); DPE (2019); DFSI (2017); SLR (2020)

KEY

- Groundwater monitoring location
 - Project application area
 - Site layout
 - North West Mains Drive completed workings
 - Proposed additional drive
 - Proposed NWMD alignment
 - Rail line
 - Minor road
 - Watercourse/drainage line
- INSET KEY
- NPWS reserve
 - Mining title
 - ML 1565
 - ML 1596
 - CCL 766

Groundwater monitoring network

Wollongong Coal Limited
Modification assessment report
Figure 7.17



iv Water quality

a Surface water

A summary of average water quality, as monitored within the 28 surface water monitoring points within the vicinity of the NWMD, is included in Section 7.6.5. An assessment of EC and TDS indicates that Gallahars Creek has higher salinity than the Avon River. Avon River has a long-term EC average less than 100 $\mu\text{S}/\text{cm}$ and Gallahars Creek EC average exceeds 100 $\mu\text{S}/\text{cm}$. This surface water quality difference is attributed to the Lake Avon catchment having a high percentage of Hawkesbury Sandstone, which has a high quartz content and low salt content which in contrast to the dominant Bald Hill Claystone lithology of the Gallahars Creek catchment, which has a higher salt content.

The water within the Nepean River surface water is generally fresh (median EC 244 $\mu\text{S}/\text{cm}$) and generally has neutral pH (median pH 7.7).

b Groundwater

Groundwater within the soil is fresh (median EC 273 $\mu\text{S}/\text{cm}$) indicating the water is suitable for drinking, irrigation and stock. pH conditions are relatively neutral (median pH 6.5). The water is classified as sodium bi-carbonate type water.

Groundwater within the crinanite is fresh to brackish (median EC 946 $\mu\text{S}/\text{cm}$, maximum EC 2,983 $\mu\text{S}/\text{cm}$) and generally has an alkaline pH (median pH of 9.7). The elevated pH is typical of these alkaline intrusive volcanics. Based on salinity the water is generally suitable for short term irrigation and stock water. The water is classified as calcium/sodium bi-carbonate type water.

Groundwater within the Narrabeen Formation is generally fresh (median EC 724 $\mu\text{S}/\text{cm}$, maximum EC 1,404 $\mu\text{S}/\text{cm}$) indicating, based on salinity, the water is suitable for drinking, irrigation and stock. pH conditions are generally alkaline (median pH 8.4). The water is classified as sodium bi-carbonate type water.

Groundwater within the Bulli Seam is brackish (median TDS 2,375 mg/L) and, based on salinity, is suitable for irrigation and some stock (ie sheep and dairy cattle). The water is classified as sodium bi-carbonate type water.

Groundwater quality within the Permian coal measures is typically moderately saline to saline.

v Groundwater receptors

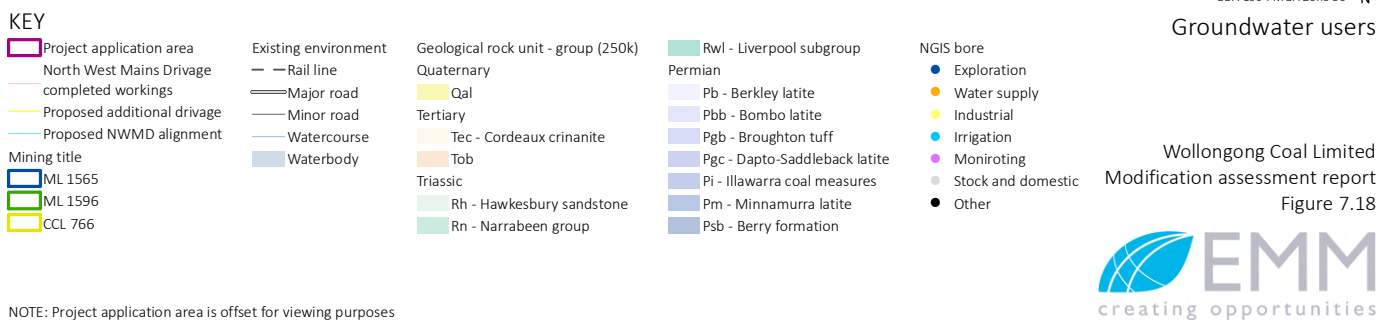
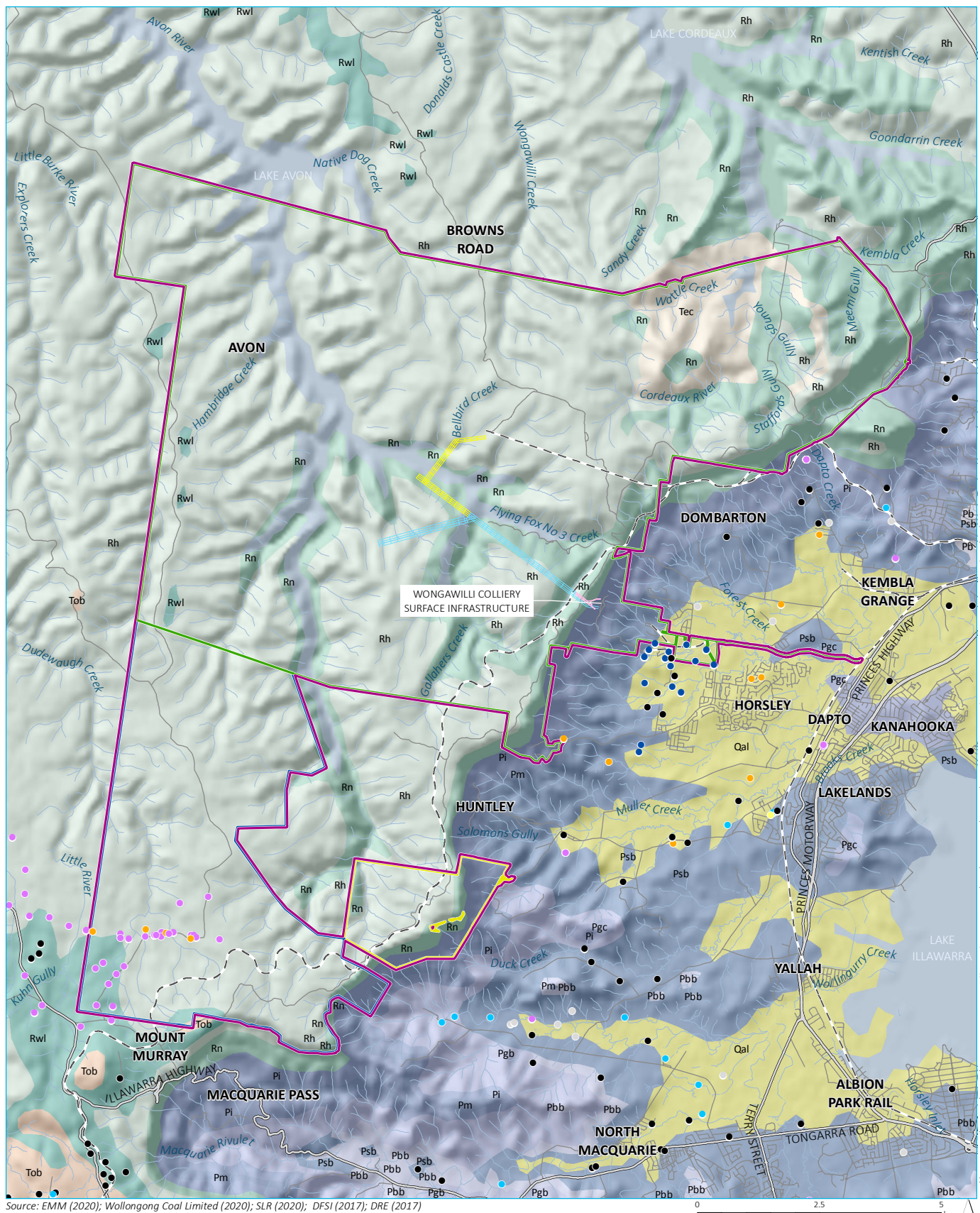
a Third party bores

There are no registered groundwater bores near the proposed modification to the west, south-west and north-west due to lack of population and the areas being reserved as drinking water catchment.

Almost 90% of the groundwater usage in the wider area (refer Figure 7.18) of the proposed modification is from the Hawkesbury Sandstone or from surficial alluvium and basalt aquifers far to the west and south of the Colliery. About 10% of the total entitlement is from the Bulgo Sandstone. This is probably due to generally lower bore yields, poorer water quality, and increased drilling costs for accessing deeper units (HydroSimulations 2019c).

Along the coastal plain to the east of the Colliery, most of the bores extract from the outcropping early Permian strata, ie the Cumberland Subgroup and the older Shoalhaven Group.

A search of the BoM's National Groundwater Information System (NGIS) showed that there are 1,006 registered bores within 5 km of the proposed modification area (to the east and south-east of the Colliery). The search indicated that 512 bores are functional, 454 are unknown, 26 are proposed and 14 have been abandoned, non-functional or removed. The data shows that most bores are used for monitoring (379), followed by water supply (377) and irrigation (139) (refer Figure 7.18). Some less common uses include stock and domestic, commercial and industrial, dewatering and exploration.



b Groundwater dependent ecosystems

A review of the WSP for the Greater Metropolitan Regional Groundwater Resources 2011 indicates there are no high priority GDEs within the area of the proposed modification. A review of the BoM GDE Atlas (accessed on 29 August 2020) identified the following potential GDE areas as shown in Figure 7.19:

- Moderate potential for groundwater interaction – localised areas immediately north of the proposed workings and south of the Avon River. Coastal sandstone gully forest, coastal warm temperate rainforest, escarpment foothills wet forest.
- Low potential for groundwater interaction – areas north of the southern extent of the proposed workings including escarpment foothills wet forest, coastal warm temperate rain forest, coastal sandstone gully forest.

Upland swamps have also been mapped within the area, including one swamp area above the proposed NWMD and another one above the approved NWMD (refer Figure 7.19).

The key receptors within the proposed modification area consist of headwater swamps and valley infill swamps, as well as creeks in the vicinity of mining. These swamps are connected to groundwater within valley infill swamps and the sandstone aquifer.

Groundwater modelling has been used to assess impacts to wetlands.

vi Historical mining effects

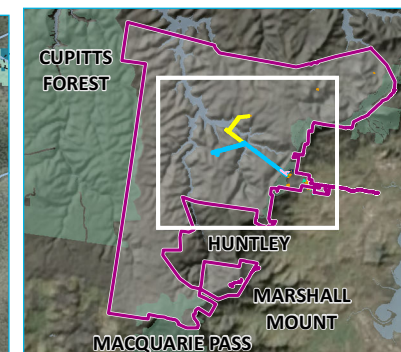
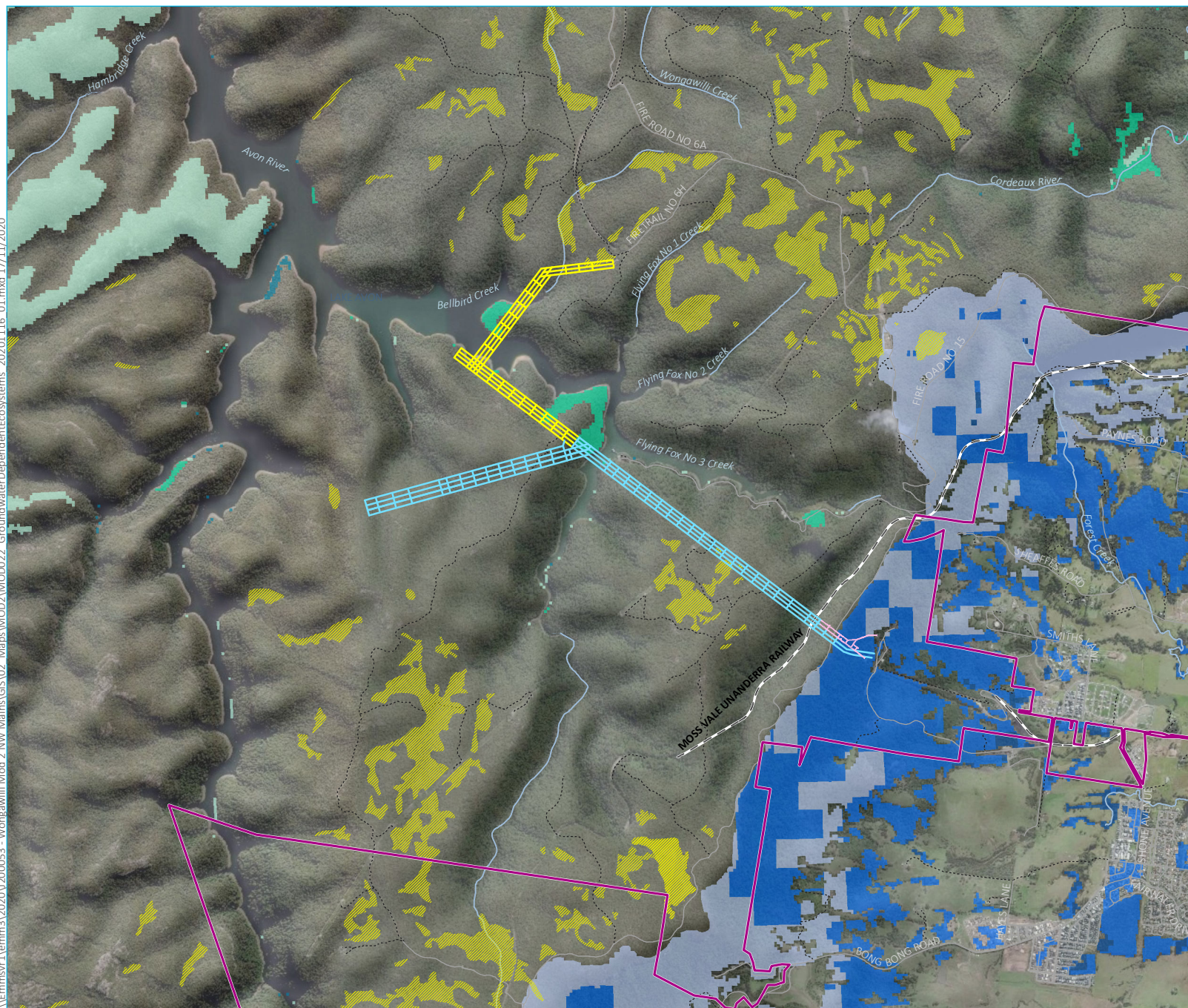
The Southern Coalfields has a long history of mining, including mining in the vicinity of the proposed modification. Blue Panels 2 and 4 were mined approximately 125 m to the north of the proposed NWMD area. Coal was extracted using the bord and pillar method and partial pillar extraction secondary workings has since occurred, which typically results in the partial collapse of the roof structure over the mined void. This has resulted in an increase in void space within the mined areas, as well as increased hydraulic conductivity above the goaf (up to 2-3 orders of magnitude (HGEO 2019) and/or increased cracking.

Furthermore, a number of major dykes have been identified and mapped within the area of the proposed modification. They may provide conduit for groundwater to enter the former workings. It is also possible that inflows can increase where dykes provide a conduit between the workings and aquifer storage.

Longwall mining occurs in the region which can change hydraulic properties of the insitu strata. Subsidence and goaf effect can cause surface cracking, resulting in enhanced vertical conductivity at surface, which varies through natural deposition and infilling, as well as engineered remediation (ie surface grouting).

A subsidence assessment has been conducted for the approved operations and it is predicted that there would be no observable subsidence, strain or tilt, stream bed uplift or bed cracking in Gallahers Creek due to the approved NWMD (MSEC 2010). A subsidence and geotechnical conducted for the proposed NWMD (SCT 2020), supports the 2010 assessment and concluded there is no potential for the main heading development roadway (proposed NWMD) to cause surface ground movement of any consequence.

\\Emmsvr1\emms3\2020\200053 - Wongawilli Mod 2 NW Mains\GIS\02 Maps\MOD2\MOD022 GroundwaterDependentEcosystems 20201116 01.mxd 17/11/2020



KEY

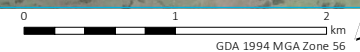
- Project application area
- North West Mains Drivage completed workings
- Proposed additional drivage
- Proposed NWMD alignment
- Swamp
- Terrestrial ecosystem (BoM)
- National assessment
- High potential GDE
- Moderate potential GDE
- Low potential GDE
- Regional studies
- High potential GDE
- Moderate potential GDE
- Low potential GDE
- Existing environment
- Rail line
- Minor road
- Vehicular track
- Named watercourse

Groundwater dependent ecosystems

Wollongong Coal Limited
Modification assessment report
Figure 7.19



Source: EMM (2020); WCL (2020); DFSI (2017); GA (2011); ASGC (2006); BoM (2019)

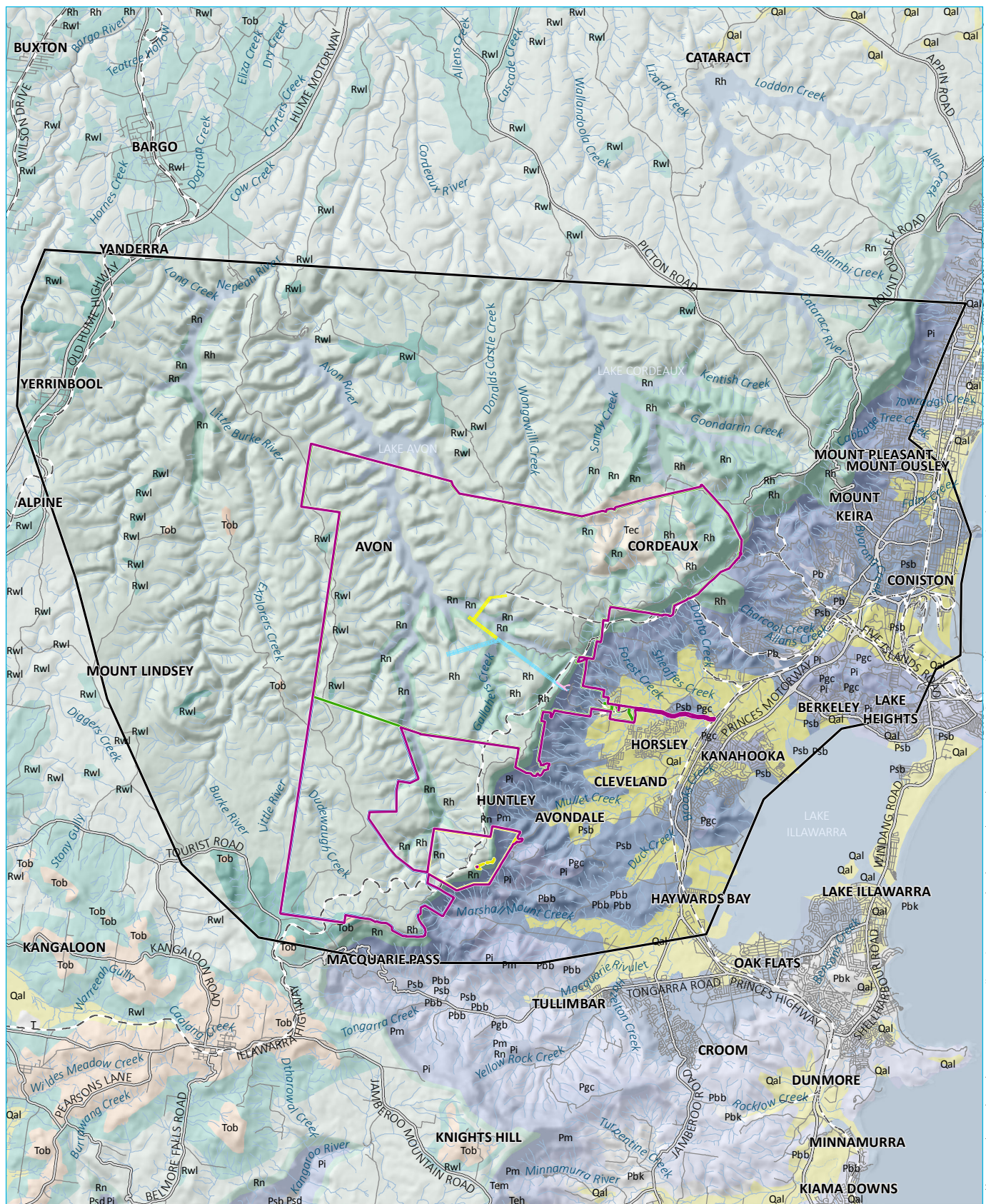


The GWA describes and considers in detail each of the key hydrostratigraphic units present in the proposed NWMD area, including upland swamps, Cordeaux crinanite, Hawkesbury Sandstone, Narrabeen Group and Illawarra Coal Measures. The conceptual groundwater model presented in Figure 7.20 is based on the information presented in Section 7.6.4 and Appendix I.

The main groundwater units in the area are:

- Upland swamps – saturated alluvial/colluvial sediments and organic matter. Recharged from rainfall as well as surface/subsurface water flow.
- The Cordeaux Crinanite – present in the Nebo area of the Colliery and has similar characteristics to dolerite intrusions.
- Hawkesbury Sandstone – main groundwater source and widely accessed for groundwater supply regionally and provides baseflow contributions where incised along major rivers (ie Cataract and Nepean Rivers). Groundwater flow is northward, and locally influenced where intersected by rivers and private abstraction bores. Current monitoring data indicates no depressurisation or drawdown within the Hawkesbury Sandstone in response to mining.
- Narrabeen Group – sandstone interbedded with low permeability claystones that generally act as aquitards. Recharge to the Narrabeen Group is from water storage areas where intersected, infiltration of rainfall along the escarpment and downward seepage from overlying Hawkesbury Sandstone.
- Illawarra Coal Measures – with groundwater occurrence largely associated with the more permeable coal seams, with confined groundwater conditions. Groundwater flow generally northward, and locally depressurised due to current and historical mining. Current monitoring shows depressurisation from historical operations, with recovery in levels in localised areas, potentially influenced by underground water storage.

Pre-mining groundwater flow directions are generally north-westward, down dip along the sandstone and coal beds. There is minimal vertical leakage between the hydrostratigraphic units, with the Stanwell Park Claystone and Wombarra claystone acting as aquitards restricting vertical groundwater movement.



Source: EMM (2020); Wollongong Coal Limited (2020); SLR (2020); DFSI (2017); DRE (2017)

KEY

- Groundwater model domain
- Project application area
- North West Mains Drive completed workings
- Proposed additional drive
- Proposed NWMD alignment
- Mining title
- ML 1565
- ML 1596
- CCL 766

- Existing environment
- Rail line
- Major road
- Minor road
- Watercourse
- Waterbody

- Geological rock unit - group (250k)
- Quaternary
- Tertiary
- Tec - Cordeaux crininite
- Tob
- Triassic
- Rh - Hawksbury sandstone
- Rn - Narrabeen group

- Rwl - Liverpool subgroup
- Permian
- Pb - Berkley latite
- Pbb - Bombo latite
- Pgb - Broughton tuff
- Pgc - Dapto-Saddleback latite
- Pi - Illawarra coal measures
- Pm - Minnamurra latite
- Psb - Berry formation

Groundwater model extent

Wollongong Coal Limited
Modification assessment report
Figure 7.21



NOTE: Project application area is offset for viewing purposes

The proposed modification is likely to result in localised depressurisation within the Bulli Seam and Wongawilli Seam associated with direct interception of groundwater and mine progression. The proposed modification involves first workings along the approved NWMD and the proposed extension to connect to the existing vent shaft at Wongawilli 1. There is negligible subsidence predicted due to extraction associated with the proposed modification, due to the design of the proposed NWMD (SCT 2020). With no subsidence impacts predicted, changes in hydraulic properties of the strata overlying the Bulli Seam is unlikely.

The GWA (Appendix I) presents the conceptual groundwater model before, during and after mining.

During mining, groundwater will be pumped from the active mining areas to maintain dry working conditions. Consequently, the Permian sandstone units overlying the mined seams will become depressurised, lowering the potentiometric head within the Permian sequence to below the Bulli Seam. Above the workings where coal is extracted, cracking will be induced due to subsidence effects caused by the mining void. Similarly, cracking is likely in strata above historic bord and pillar mining where secondary extraction has occurred. The cracking is expected to extend into the Scarborough Sandstone, enhancing vertical leakage into the workings. However, the cracking is not expected to extend into the Bulgo Sandstone or Hawkesbury Sandstone.

Locally, groundwater flow directions are altered where there is greater vertical flow towards the Bulli Seam or towards localised cracked strata that provides a conduit into the mine void. Since cracking associated with the proposed modification is not expected to extend into the Bulgo Sandstone, there will be no leakage from surface water features including the Avon Dam. Higher in the stratigraphic sequence, impacts to the potentiometric surface of the Hawkesbury and Bulgo Sandstone are extremely unlikely due to the thickness of the confining units separating the Bulli Seam from these upper aquifers.

Post mining, extraction of groundwater for mining purposes will cease, allowing the mine voids to become inundated and the recovery of potentiometric heads. Recover to pre-mining conditions is expected to take many years. Induced cracking will remain in the strata overlying the flooded voids and there is the potential for minor mixing of groundwater between the hydrostratigraphic units via these cracks. Potentiometric heads within the Hawkesbury and Bulgo Sandstone are expected to remain unchanged from current conditions.

As outlined above, the proposed modification is predicted to result in negligible subsidence and negligible change to the potentiometric surface of the Hawkesbury and Bulgo Sandstone due to the thickness of the confining units separating the Bulli Seam from these upper aquifers. As such, impacts on surface water features and GDEs associated with the proposed modification is extremely unlikely.

7.6.5 Impact assessment

i Modelling approach

The groundwater model used to assess the potential impacts of the proposed modification is an update to the groundwater model developed to assess the potential impacts of coal mining at nearby Dendrobium (HydroSimulations 2019) and modelling conducted in 2010 to support the initial groundwater impact assessment for the Colliery (GeoTerra 2010). The model was developed in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al 2012), aligns with a Class 2 model with elements of Class 3 and is considered fit for the purpose of assessing potential impacts of the proposed modification of groundwater resources.

The model domain, shown in Figure 7.21, is centred over the proposed modification area, with the model boundaries extending 26.4 km from north to south and 35.4 km from east to west.

The model consists of 18 layers to represent the hydrostratigraphy in the area and to allow simulation of the mine development. Layers vary in thickness from a minimal thickness of 0.1 m to 100 m.

Further details regarding model development, including layer definition, boundary conditions, and model calibration is provided in Appendix I.

Uncertainty analysis was conducted to assess how model predictions vary due to uncertainty within the system. Uncertainty is introduced by error in field measurements, conceptual, spatial and temporal simplifications, and limitations with available data. The uncertainty analysis included the scenarios explored in the sensitivity analysis, scenarios assessing variability in hydraulic conductivity, specific yield, recharge and river conductance (boundary condition). Discussion on this analysis is provided in Appendix I.

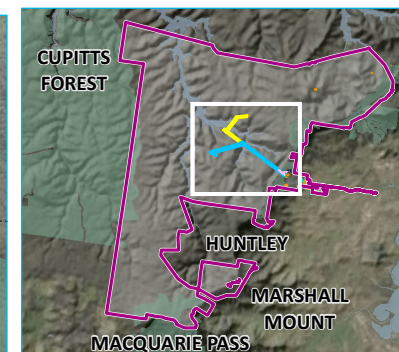
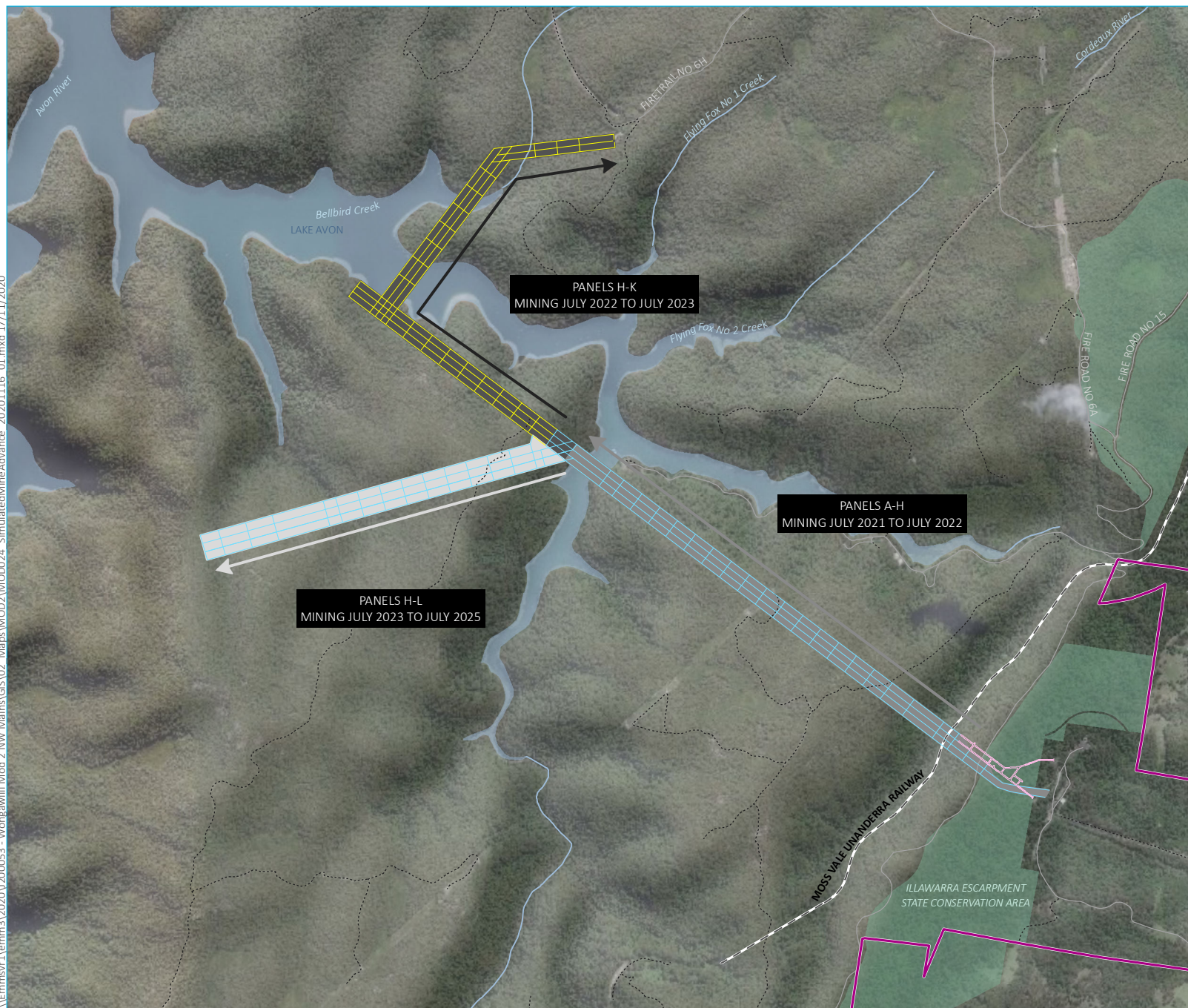


ii Groundwater model results

Transient predictive modelling simulating both the mining relevant to the proposed modification and surrounding mines was undertaken as part of the GWA. The predictive transient simulation of mining ran from 1 January 2021 to 31 December 2049. The post-mining, recovery stage of the groundwater model was run for 500 years out to 2550. Details of the predictive simulations are described in Chapter 7 of Appendix I.

The modelled mining progression for the proposed modification is shown on Figure 7.22. Mining is proposed to commence in the current approved A-H area, then advance from H-K in the proposed modification area, with mining finishing in the H-L current approved area (Figure 7.22)

\\Emmsvr1\emms3\2020\200053 - Wongawilli Mod 2 NW Mains\GIS\02 Maps\MOD2\MOD024 SimulatedMineAdvance 20201116 01.mxd 17/11/2020



KEY

- Project application area
- North West Mains Drivage completed workings
- Proposed additional drivage
- Proposed NWMD alignment

Mining stage

- H-K July 2020 to July 2023
- A-H July 2021 to July 2022
- H-L July 2023 to January 2025

Existing environment

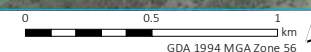
- Rail line
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve

Simulated mine advance

Wollongong Coal Limited
Modification assessment report
Figure 7.22



Source: EMM (2020); WCL (2020); DFSI (2017); GA (2011); ASGC (2006)



In order to assess the potential impact of the proposed modification separately from the current approved mine plan, three model scenarios were performed:

- null run – no mining simulated within the model domain;
- approved project – simulation of the current approved mining area/advance from 2021 with other foreseeable mining in the model domain (eg Dendrobium); and
- modified project – simulation of the current approved mining area, with the proposed modification and other foreseeable mining in the model domain (eg Dendrobium).

a Predicted mine inflows

Predicted inflow to the underground mine is presented on Figure 7.23. The inflow rate is predicted to peak in 2024 at 36.8 ML/year. The predicted inflow for the approved mine plan is predicted to peak at 22.8 ML/year in 2024, and the predicted peak inflow for the proposed modification area is 16.3 ML/year in 2023. The predicted inflow peak in 2024 is greater than the inflows predicted in the EA (9.1 ML/year; GeoTerra 2010) and corresponds to mining progressing into the lower Wongawilli Seam. The predicted inflows can be accounted for within the share entitlements of the current water access licence (WAL) held by Wollongong Coal. This is discussed further in Section 7.6.6 below.

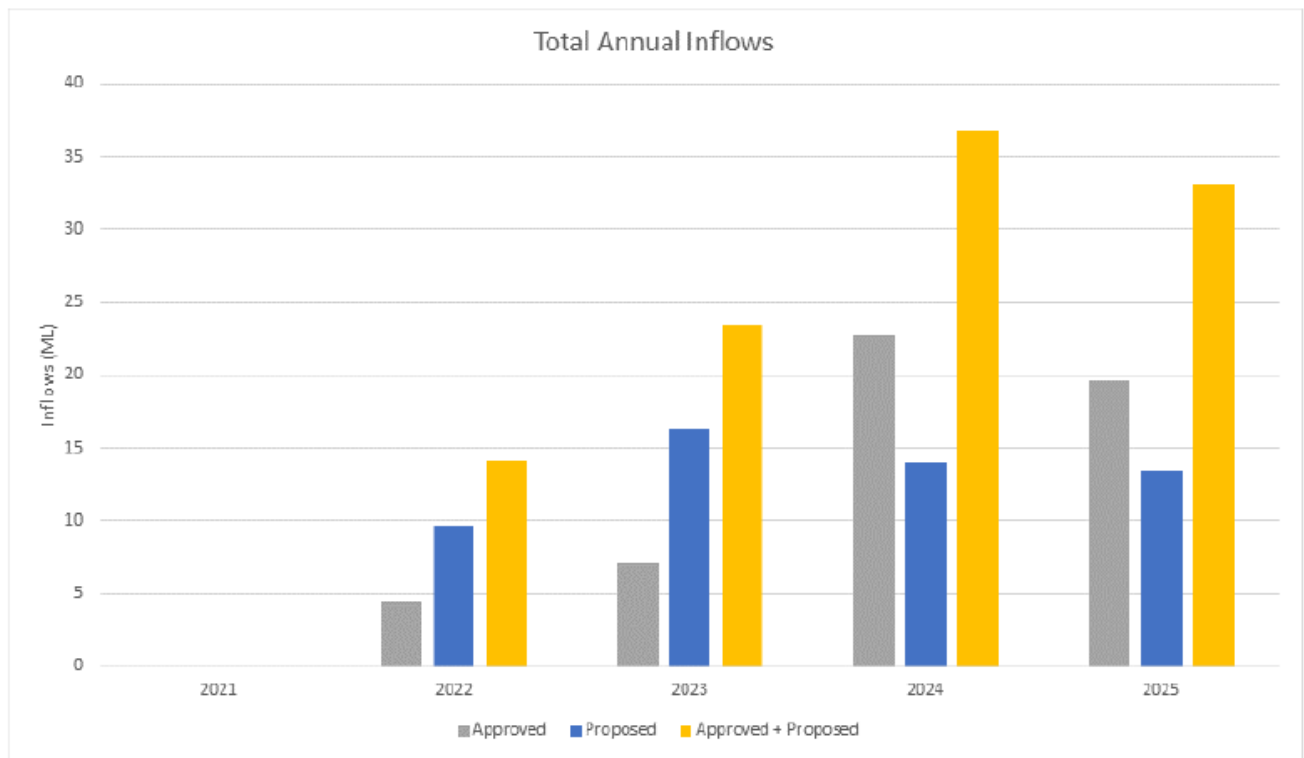


Figure 7.23 Predicted mine inflows

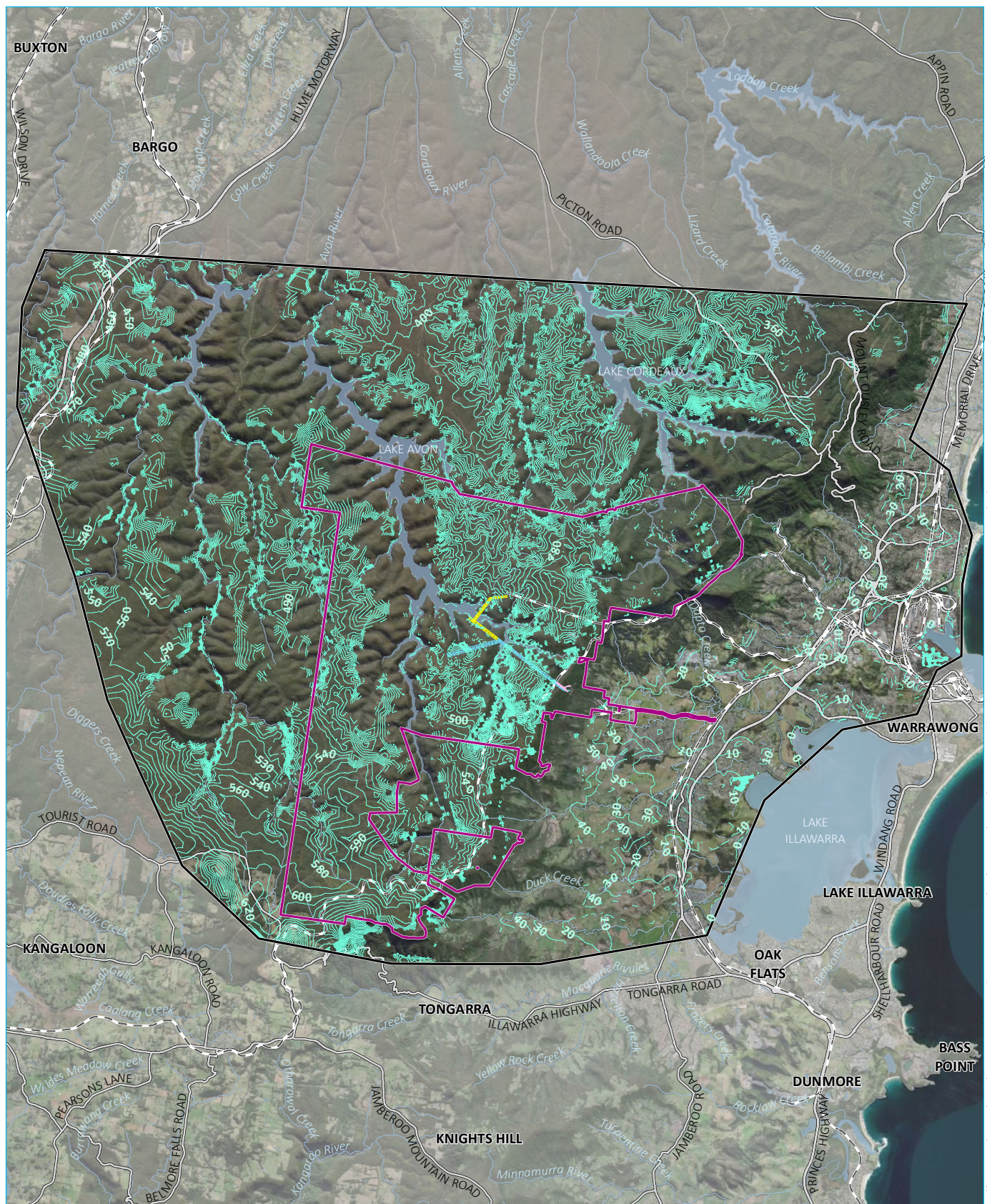
b Predicted groundwater levels

Predicted groundwater levels at the end of mining operations (January 2026) in the alluvium / weathered layer and Bulgo Sandstone for the modified project (approved and proposed) is shown on Figure 7.24 and Figure 7.25. Predicted groundwater level drawdown in the Bulli Seam and Wongawilli Seam at the end of mining (January 2026) is presented in Figure 7.26 and Figure 7.27 respectively.

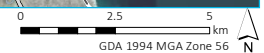
Additional groundwater elevation contour maps and drawdown maps are provided in Appendix I.

The groundwater model predicts:

- negligible groundwater drawdown (>0.5 m) in the Bulgo Sandstone or watertable during active mining, which is consistent with the predictions reported in the EA (GeoTerra 2010);
- no third-party bores are predicted to be impacted, as defined by the 2 m minimal impact considerations;
- groundwater flow direction in the Bulgo Sandstone will be in a north-easterly direction towards Dendrobium and previously mined areas in the Colliery (Figure 7.25);
- groundwater drawdown in the Bulli Seam up to 50 m (Figure 7.26); and
- groundwater drawdown in the Wongawilli Seam up to 50 m, localised around the L panel (Figure 7.27).



Source: EMM (2020); Wollongong Coal Limited (2020); SLR (2020); DFSI (2017); DRE (2017)

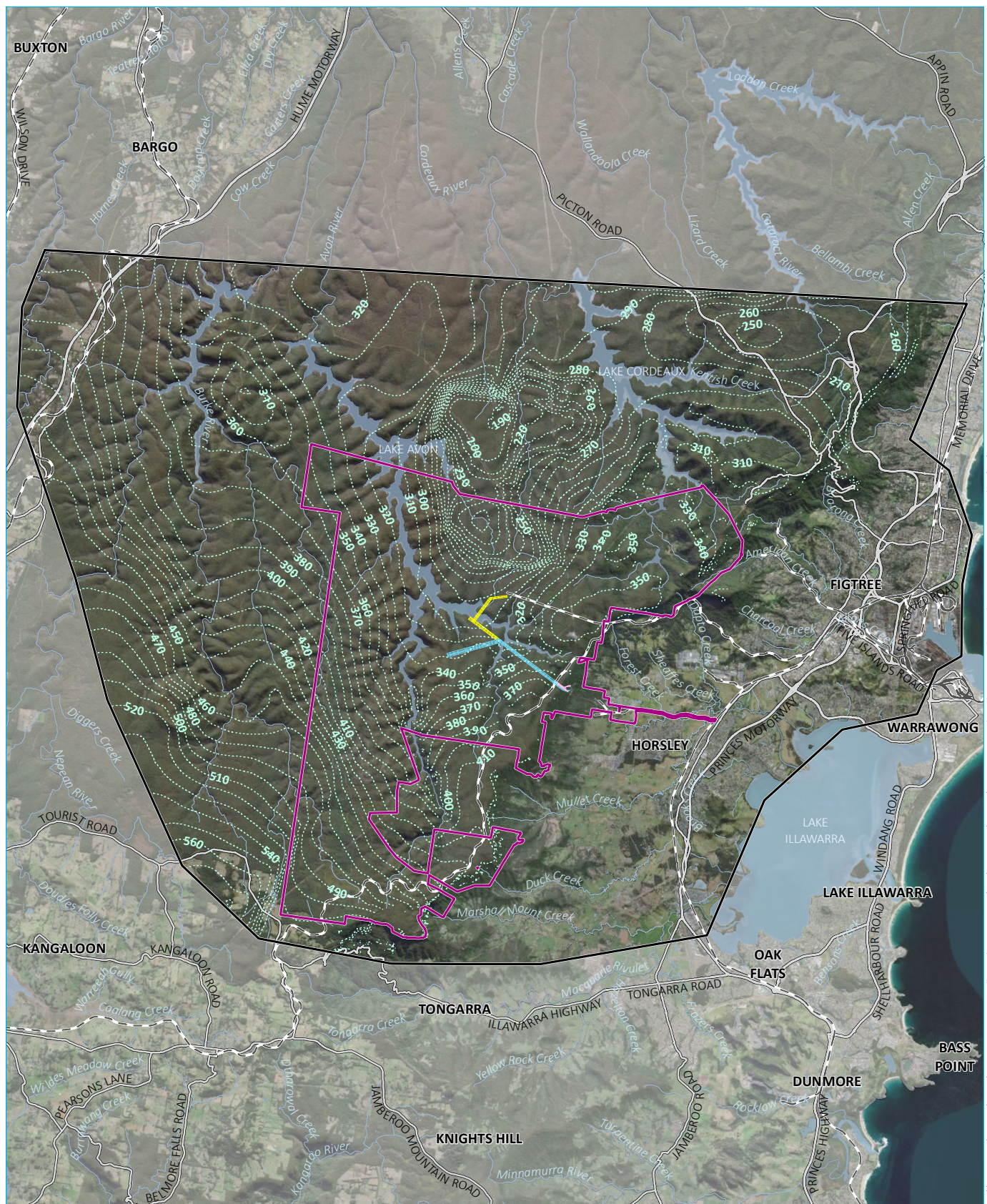


KEY

- | | |
|---|--|
| — Potentiometric surface (m AHD) | — Existing environment |
| Groundwater model domain | — Rail line |
| Project application area | — Major road |
| — North West Mains Drive completed workings | — Named watercourse |
| — Proposed additional drivage | ■ Waterbody |
| — Proposed NWMD alignment | |

Predicted groundwater levels in the alluvium/weathered layer at end of mining

Wollongong Coal Limited
Modification assessment report
Figure 7.24



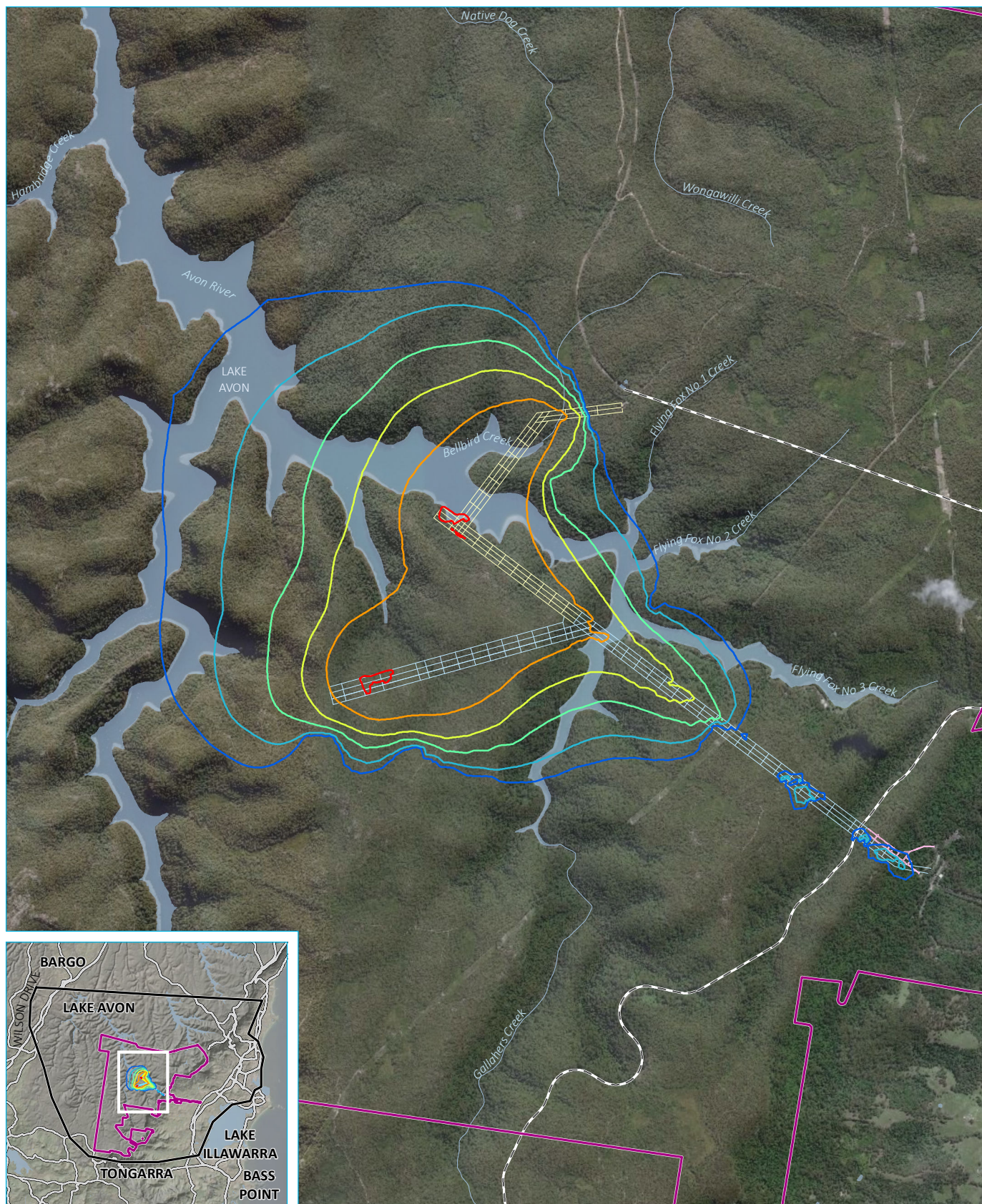
Source: EMM (2020); Wollongong Coal Limited (2020); SLR (2020); DFSI (2017)

KEY

- | | |
|---|----------------------|
| Potentiometric surface (m AHD) | Existing environment |
| Groundwater model domain | Rail line |
| Project application area | Major road |
| North West Mains Drive completed workings | Named watercourse |
| Proposed additional driveway | Waterbody |
| Proposed NWMD alignment | |

Predicted groundwater levels in the Bulgo Sandstone at end of mining

Wollongong Coal Limited
Modification assessment report
Figure 7.25



Source: EMM (2020); Wollongong Coal Limited (2020); SLR (2020); DFSI (2017)

KEY

- Groundwater model domain
- Project application area
- North West Mains Drivage completed workings
- Proposed additional drivage
- Proposed NWMD alignment

- Existing environment
- Rail line
- Named watercourse
- Waterbody

- Drawdown contour
- 1 m
- 2 m
- 5 m
- 10 m
- 20 m
- 50 m

Predicted drawdown in Bulli Seam at end of mining

Wollongong Coal Limited
Modification assessment report
Figure 7.26



Source: EMM (2020); Wollongong Coal Limited (2020); SLR (2020); DFSI (2017)

KEY

Groundwater model domain	Existing environment	Drawdown contour
Project application area	Rail line	1 m
North West Mains Drivage completed workings	Named watercourse	2 m
Proposed additional drivage	Waterbody	5 m
Proposed NWMD alignment		10 m
		20 m
		50 m

Predicted drawdown in Wongawilli Seam at end of mining

Wollongong Coal Limited
Modification assessment report
Figure 7.27

The Independent Expert Panel for Mining in the Catchment Report (IEMPC 2019) recommends that all future mine approvals in the Special Areas should *“include performance measures related to measured changes in groundwater pressure and/or pressure gradients where these have the potential to impact on surface water diversions or losses.”* The results of the groundwater modelling predicts there will be negligible groundwater drawdown (<0.5 m) in the upper units of the alluvium/weathered zone or Hawkesbury Sandstone. As such, the potential for losses or diversion to surface water as a result of the proposed modification are extremely unlikely and performance measures are not required.

Groundwater dependent ecosystems

As the model predicts minimal change to the watertable as a result of the proposed modification (<0.1 m), the potential for impacts on GDEs identified in Section 7.6.4(v) is considered unlikely.

In addition, cracking is unlikely to extend into the Bulgo Sandstone and overlying hydrostratigraphic units (SCT 2020), further limiting the potential for hydraulic connection of shallow groundwater systems and surface water to the deeper Permian units.

c Post mining recovery

The groundwater model was run for 500 years post-mining (to 2550) to predict groundwater level recovery and mine water inflows following cessation of mining. The model predicts the groundwater system will continue to recover for greater than 500 years after mining, likely due to the various other mining activities in the area.

Groundwater inflows to the underground post-mining are predicted to range from approximately 10 to 18 ML/year. Further discussion is provided in Appendix I.

iii Sensitivity and uncertainty analysis

The results of the sensitivity and uncertainty analysis are presented and discussed in Appendix I. In summary, the results show that the predicted zone of depressurisation within the Bulli Seam is sensitive to horizontal hydraulic conductivity of the coal seams, however the predicted drawdown from the sensitivity and uncertainty analysis is similar to the base case predictions.

iv Water quality

No impacts to water quality have been identified in the GWA (Appendix I). Wollongong Coal will continue to implement monitoring in accordance with approved management plans as revised on the basis of MOD2. Monitoring data will be reviewed to ensure no adverse impacts and that existing controls are effective in accordance with Wollongong Coal’s EPL. Results of monitoring undertaken will be reported in the Colliery annual return.

7.6.6 Licensing

i Summary of entitlements held by Wollongong Coal

WC hold WAL 36487 that has 1,500 shares (equivalent to 1,500 ML) of groundwater in the Management Zone 1 of the Sydney Basin Nepean Groundwater Source managed under the WSP for the Greater Metropolitan Region Groundwater Sources 2011.

ii Summary of required entitlements

The volume of groundwater intercepted and required to be accounted for via shares for the project includes water actively extracted during mining operations and groundwater predicted to flow into the underground following completion of mining.

During mining, the total annual mine water inflow is predicted to peak at approximately 37 ML in 2024. Following completion of mining, the annual mine water inflow is predicted to range from 10 to 18 ML.

Wollongong Coal are required to hold adequate WALs for the maximum water take, which is 37 ML. Wollongong Coal have sufficient WAL entitlement to account for the predicted maximum take and the conditions of WAL 36487 remain relevant for the proposed modification for compliance and annual reporting.

7.6.7 Mitigation measures

No changes to the groundwater monitoring program are proposed. All currently approved management plans would continue to be utilised and maintained throughout the continuation of mining with the existing and groundwater monitoring points remaining in use. Monitoring would be carried out to confirm that the water management system is effective, and that the impacts of mining are consistent with the predictions made in the groundwater assessment. Results of water quality monitoring and water flow monitoring would continue to be reported in the Colliery annual return.

7.6.8 Conclusions

The proposed modification is predicted to have little to no impact on groundwater receptors including third party bores, GDEs and surface water. This is based on the following results of the assessment:

- no groundwater drawdown (>0.5 m) in the Bulgo Sandstone or watertable during active mining is predicted to occur;
- no third-party bores are predicted to be impacted, as defined by the 2 m minimal impact considerations; and
- Wollongong Coal having sufficient WAL entitlement to account for the predicted maximum take with the total annual mine water inflow predicted to peak at approximately 37 ML in 2024 with post mining inflow predicted to range from 10 to 18 ML.

7.7 Subsidence

7.7.1 Introduction

A subsidence and geotechnical assessment (SGA) for MOD2 has been prepared by SCT Operations Pty Ltd (SCT 2020) (Appendix K).

7.7.2 Assessment approach

The SGA takes into consideration and assesses the:

- mining geometry of the approved and proposed NWMD in relation to surface features and topography;
- relevant geological structures and whether these aspects have the potential to create any subsidence effects and impacts; pillar stability assessment, and outlines both anticipated effects and impacts of subsidence as was requested by the DPIE in its correspondence dated 9 April 2020, see Appendix K; and
- outlines expected mining conditions and potential for groundwater inflow.

7.7.3 Assessment assumptions

i Mining geometry

The proposed NWMD main heading developments are planned to be mined in the 1-2 m thick Bulli Seam located approximately 20-30 m above the Wongawilli Seam. The main headings are planned to be mined 2.4 m high. The Bulli Seam coal thickness is a maximum of approximately 1.9 m in the areas of the proposed main headings.

In most areas, the mining section would include the full height of the Bulli Seam including any stone bands or intrusions within the seam, as well as whatever roof and floor strata is required to achieve the nominal 2.4 m mining height.

For the purpose the SGA, SCT have divided the NWMD into three main driveages:

- the NW mains, which refers to the driveages below the Illawarra Escarpment;
- the NE mains, which refers to the north-east driveages; and
- the SA mains, which branch to the south-west.

Four headings are proposed in all, apart from a short section in the north where the NE mains are reduced to three headings as they approach the Wongawilli Ventilation Shaft 1. The divided NWMD driveages and headings as described are displayed in Figure 7.28.

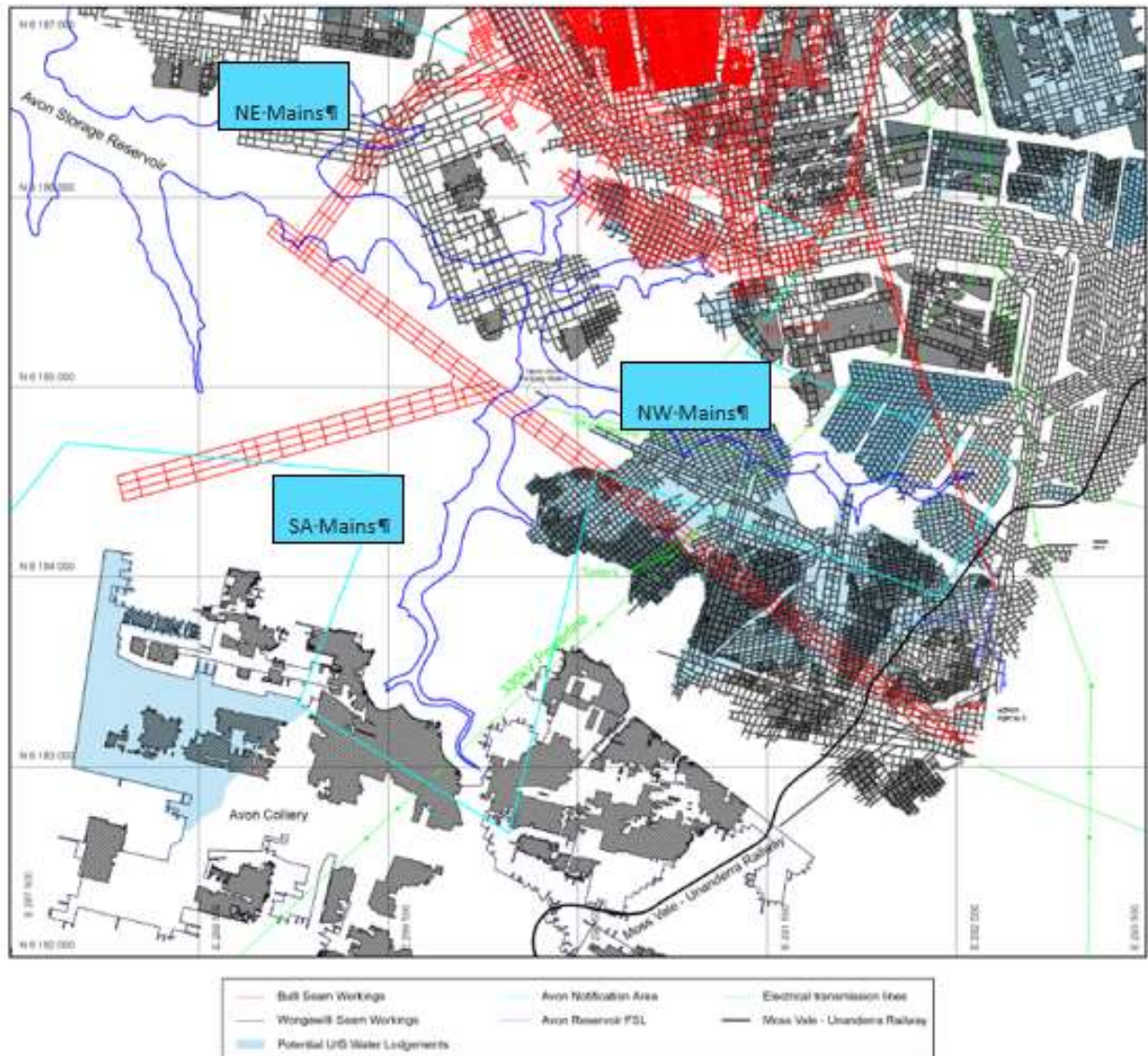


Figure 7.28 NWMD mains driveages

7.7.4 Existing environment

i Surface features

The NWMD is located almost entirely below the Sydney's drinking water catchment (Metropolitan Special Area) of Avon Storage Reservoir, with a small area in the east located below the IECA. Surface features above the NWM include:

- five fire roads numbered 15A, 15H, 15J and 15G, and 6H;
- the Moss Vale to Unanderra Railway Line;
- Transgrid's Avon to Marulan 330 kilovolt (kV) power transmission line;
- Avon Reservoir;
- Upper Avon Pumping Station; and
- Wongawilli Ventilation Shaft 1.

No other significant surface or sub-surface features have been identified, which could be vulnerable to potential subsidence impacts from MOD2.

ii Surface topography

Figure 7.29 shows the surface topography along the NW and NE mains, which is further described in Section 3.3 of Appendix K.

The main headings are planned to pass 90 m beneath the Moss Vale – Unanderra Railway, 215 m below a 330 kV powerline, twice below Gallagher's Creek (an arm of Avon Storage Reservoir) and once more below the Bellbird Creek arm of the reservoir.

The depth of the headings below the base of the reservoir is 60 m at the first approved NWMD crossing point, 113 m at the proposed second crossing point and 134 m at the third proposed crossing point.

The surface topography rises to a high of RL445 m at the Wongawilli Ventilation Shaft 1 and an overburden depth of approximately 360 m to the proposed mining horizon.

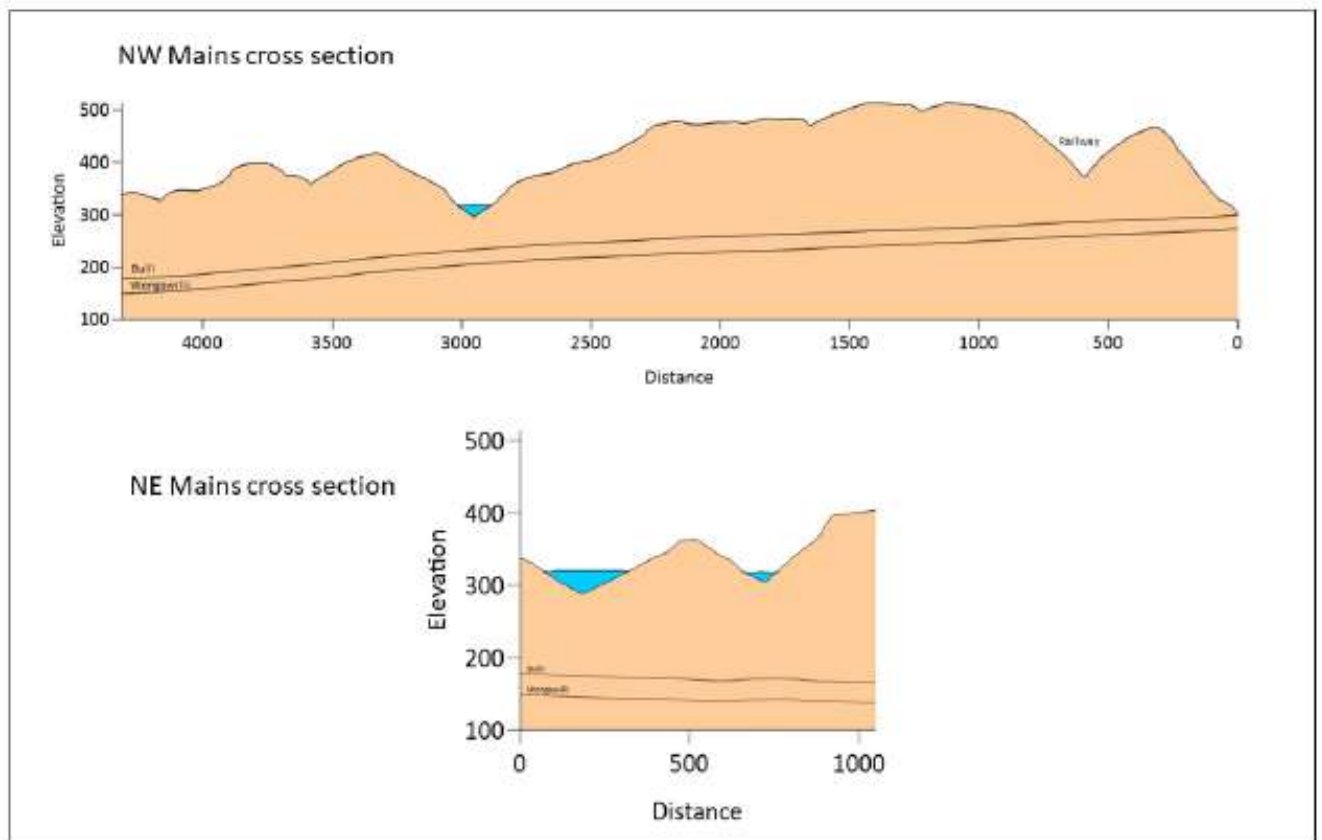


Figure 7.29 Cross sections of NW mains and NE mains

iii Geological structure

The geological structure used for the SGA was mapped during previous mining in the Wongawilli Seam and is shown in Figure 5 of Appendix K.

iv Major geological faults

There are two major geological fault structures in the vicinity of the proposed main heading developments.

The first major fault is located to the north of the proposed NW mains headings, while a second parallel fault is located approximately 750 m to the south of the NW mains between Wongawilli and Avon Collieries.

The SGA notes that Doyle (2017) found, in a review of experience of mining through geological structures in the Dendrobium area of the Southern Coalfields, that geological fault structures are not hydraulically conductive.

v Dykes, sills and seam splits

Dykes are thin vertical ‘intrusions’ that cut across any layers in the rock they intrude. Dykes tend to be laterally extensive and vertical, and in the Southern Coalfields are generally less than a few metres wide. A sill, on the other hand, moves horizontally between rock layers. Sills commonly develop in coal seams more easily than in the surrounding strata.

Coal quality is degraded by intrusion of hot material (both dykes and sills would have been formed by hot volcanic material), and the harder sill material makes mining more difficult. Thus, areas of silling tend not to be mined.

The extent of mining in the Wongawilli Seam below the NW mains is largely determined by the extent of silling. The NW mains are expected to cross five dykes that have been intersected by previous mining in the Wongawilli Seam. Their position, thickness and difficulty to mine can be determined from the records of previous mining and is outlined in Section 3.4.2 of Appendix K.

The estimated extent of silling within the proposed area is well defined where intersected by underground mining. Elsewhere, the extent is estimated from borehole intersections and is therefore subject to interpretation.

The NW mains are not expected to encounter silling in the Bulli Seam but will encounter up to about 1 m of shale (siltstone/claystone) material associated with a seam split within approximately 1,500 m of the existing portals. Mining the shale and upper coal is expected to give better roof conditions because of the Coalcliff Sandstone located above these units.

7.7.5 Impact assessment

The SGA concluded that there is no potential for the proposed NWMD roadways to cause any significant surface ground movement. Any surface subsidence is expected to be so small as to be imperceptible. Any potential impacts to natural and built features are expected to be imperceptible. A summary of the key findings is outlined below.

i Subsidence effects

A previous subsidence assessment undertaken for the Part 3A application for the Nebo Area Project 09_0161 (MSEC 2010) concluded that *“No subsidence is expected as a result of the proposed Western Driveages and, hence, no subsidence predictions have been undertaken for these Western Driveages”*.

SCT’s findings for MOD2 are consistent with MSEC’s findings. The development of four roadways in the Bulli Seam at 35 m centres in overburden depths ranging from 60 m to 250 m are not expected to cause any perceptible surface subsidence.

The only potential for first workings to cause surface subsidence would be if there was a potential for widespread pillar instability. This potential is assessed as low (refer Section 1.1.5(ii)).

ii Pillar stability assessment

The roadways in the NWMD are proposed to be formed at 35 m centres. The pillars are therefore nominally 29.5 m wide (measured rib to rib). The thickness of the Bulli Seam is expected to range 1–2 m but the mining height is planned to be 2.4 m. A pillar height of 2.4 m and width to height ratio of 12 is used for stability assessment purposes.

The factor of safety calculations used to determine pillar stability, which are outlined in Section 4.2 of Appendix K imply long-term stability. In areas where there has been secondary extraction of pillars in the Wongawilli Seam, vertical loading in the Bulli Seam has the potential to increase. However, the calculations for the pillar stability under such conditions is also expected to be long-term stable.

The SGA concluded that any effects from mining first workings roadways in the Bulli Seam are expected to be generally limited to a few metres around the proposed roadways and not expected to significantly impact workings in the Wongawilli Seam.

Therefore, the long-term stability of the main headings pillars is found to be long-term stable.

iii Subsidence impacts

SGA conducted an assessment of subsidence impacts for specific surface infrastructure within the vicinity of the NWMD. A subsidence assessment of this kind was not undertaken for the Nebo Area Project, as no subsidence was predicted at the time.

a Moss Vale – Unanderra railway line

The Moss Vale – Unanderra Railway Line passes directly above the proposed NW mains. Given that mining has historically taken place within the vicinity of the railway line, a barrier of unworked pillars was left underneath to protect the railway and associated infrastructure from subsidence impacts.

The barrier is generally greater than 80 m wide on each side of the railway centreline, with a total width of more than 160 m. The barrier has been effective in providing protection to the railway line from subsidence impacts.

The SGA considered the dimensions of the coal pillars located in the Wongawilli Seam within the railway barrier, some of which are directly below the railway line. The SGA concluded that mining of the NW mains in the Bulli Seam, approximately 25 m above the barrier pillars left in the Wongawilli Seam, is not expected to cause any significant change in loading conditions at the Wongawilli Seam mining horizon or result in any perceptible impacts to the railway and associated infrastructure.

b Powerlines

Two electricity transmission lines traverse the surface above or adjacent to the NW mains.

The Avon to Marulan 330 kV powerline owned by TransGrid crosses the alignment of the NW mains in a north-south alignment. Two towers on this powerline are located above or adjacent to the NW mains. The northern tower is approximately 210 m and 240 m above the Bulli and Wongawilli Seams respectively. The southern tower is approximately 235 m and 265 m above the Bulli and Wongawilli Seams respectively.

Proposed mining of the NW mains is not expected to cause any perceptible subsidence effects or impacts at the location of the north and the south towers.

A 33 kV powerline, owned by Integral Energy, that supplies the Avon Pumping Station and other water supply infrastructure crosses the Flying Fox No 3 Creek from the north and runs along the edge of the reservoir adjacent to and almost parallel to the direction of the NW mains. The NWMD would not mine below any section of this power line or associated substations/switch yards, and thus MOD2 is not expected to have any perceptible subsidence effects or impacts on these powerlines and associated infrastructure.

No perceptible subsidence effects at, or impacts to, powerline infrastructure are expected as a result of the NWMD.

c Water intake structure

The NW mains are located in proximity to the Avon Water Intake Structure near where the headings pass under the Avon Reservoir. The structure is protected by a barrier and the proposed mining does not extend into this barrier.

The SGA concluded that the proposed four headings have no potential to cause ground movements at the surface that would impact on this structure.

iv Mining conditions

The SGA considers the mining conditions in relation to areas above first workings in the Wongawilli Seam, in areas above secondary extraction in the Wongawilli Seam, dykes, flooded workings, gas and Wongawilli Ventilation Shaft 1. The key findings are summarised as below:

- In areas above first workings in the Wongawilli Seam, where there has been no secondary extraction, mining conditions are expected to be similar to conditions that would be typical of mining in the Bulli Seam at overburden depths of 250 m. The low seam thickness of the 1-2 m thick Bulli Seam, a seam split in the middle, and possible silling west of the Avon Reservoir are expected to make mining more difficult than would be typical. Non-coal material in the roof and floor and within the seam are likely to be harder to cut than coal. These materials are also likely to dilute the coal product significantly. For this reason, fit-for-purpose machinery such as a suitably designed road-header is likely to be required to manage the variable mining conditions and achieve a satisfactory level of productivity.
- The Bulli Seam strata is likely to be significantly disturbed above areas of secondary pillar extraction in the Wongawilli Seam. The SGA found that rib deterioration, open fractures and elevated horizontal stresses may occur in some areas. However, these are expected to be managed with meshing and additional rib support, as well as a program of monitoring and response to match the support requirements to the strata and stress conditions. SCT also recommended drill ahead strategies to confirm the presence of coal on the other side of dykes, and to manage the vertical alignment of the belt road through these areas.
- Difficult mining conditions are expected where dykes cross the NW mains. A fit-for-purpose miner capable of mining Bulli Seam roof and floor material is likely to be able to penetrate the dyke material more effectively than standard continuous miners, but provision should be made in case there is a need to drill and blast through this section of the proposed driveages.
- Historical findings indicate that gas is generally very low within typical contents of around 1 m³/t, with the composition of the gas consisting of a high percentage of methane (CH₄). While gas is not expected to be a significant issue for the mining of the NW mains, the risk of gas migrating from areas of the Wongawilli Seam workings into the Bulli Seam above needs to be considered. The SGA concludes that this may be an issue for the NW mains where any potential gas accumulation has not been displaced by water in the flooded workings.

- The three main headings that are planned to intersect the Wongawilli Ventilation Shaft 1 are planned to cross the Wongawilli Fault (refer Figure 6 of Appendix K). SCT recommends staying above the existing Bulli Seam workings in this area to avoid all the legacy issues associated with mining through old workings. The roadway conditions surrounding the Wongawilli Ventilation Shaft 1 are described in detail in Section 5.6 of Appendix K and conclude that avoiding the existing Bulli Seam roadways in favour of newly constructed roadways/drifts is recommended. Remaining above the Bulli Seam level provides an opportunity to seal the old workings to prevent gas and water related issues from below. This also removes the requirements of inspections and maintenance of old roadways.

v Potential for inflow

The SGA reviews the potential for inflows to occur where the main headings cross below Avon Reservoir, as well as strategies to identify and manage this potential.

Dam Safety NSW prohibit mining below stored waters at a depth of less than 60 m. Given that the proposed NW mains below the base of Avon Reservoir are close to this minimum, the modification will be referred to the Dams Safety NSW by DPIE for consideration.

The base of the reservoir is interpreted to be RL496 m. The roof of the Bulli Seam is estimated to be RL436 m. Boreholes are located all around the site, with the nearest being 230 m away.

The assessment considered the hydraulic conductivity in various places within the NW workings. The proposed four roadways of the NW mains are planned to pass 60 m below the floor of the Avon Reservoir in the vicinity of a vertical dyke structure that extends through to the surface. Based on SCT's experience in the nearby Blue Panels, the inflow rates expected are estimated to be less than 0.2 ML/day and therefore likely to be acceptable based on Dams Safety NSW guidelines for tolerable loss.

Even though significant inflows are not expected, SCT has recommended a precautionary approach to manage the potential for inflows from the reservoir into these roadways. The full supply level (FSL) of Avon Reservoir is at RL320.2 m, while the existing NW mains portals are at approximately RL260 m. This equates to a 60 m head difference that would need to be managed in the event of any high inflows. The SGA recommends managing the potential for inflows by drilling ahead in the Bulli Seam through the dyke and below the base of Avon Reservoir from the underground roadways once they have been developed (refer Section 6 of Appendix K). This approach would confirm there are no zones of increased hydraulic conductivity that would lead to high potential inflows into the underground roadways from the reservoir.

7.7.6 Management and mitigation measures

Recommended mitigation measures are summarised throughout Appendix K are summarised below:

- Fit-for-purpose machinery such as a suitably designed road-header is likely to be required to manage the variable mining conditions and achieve a satisfactory level of productivity within areas above first workings in the Wongawilli Seam.
- Some areas above secondary extraction in the Wongawilli Seam will likely require meshing and additional rib support to control roadway width. A program of monitoring and response is recommended to match the support requirements to the strata and stress conditions.
- Given that difficult mining conditions are expected where dykes cross the NW mains, a fit-for-purpose miner capable of mining Bulli Seam roof and floor material is likely to be able to penetrate the dyke material more effectively than standard continuous miners. Provision should be made in case there is a need to drill and blast through this section of the proposed driveages.

- The water level in the Wongawilli Seam lodgement, below the proposed NW mains, will need to be drawn down by a minimum of 10 m to avoid water entering the inbye Bulli Seam workings of the NW mains. Additional drawdown is recommended to accommodate inflows into the lodgement after heavy rainfall, for the life of the main headings.
- Staying above the existing Bulli Seam workings in the area close to the Wongawilli Ventilation Shaft 1, to avoid all the legacy issues associated with mining through old workings. This approach will ensure that:
 - there would be no need to intersect the existing Bulli Seam workings which are old, low height and relatively poorly supported;
 - the shaft could be back filled to above the Bulli Seam and sealed to prevent circulation loss into existing workings in the Bulli Seam and Wongawilli Seam; and
 - waste rock material from the stone driveages could be disposed of into the shaft.
- Mining below the Avon Reservoir should be done in a way to manage the potential for inflows, ie being able to drill ahead in the Bulli Seam through the dyke and below the base of Avon Reservoir. This approach would confirm there are no zones of increased hydraulic conductivity that would lead to high potential inflows into the underground roadways from the reservoir.

7.7.7 Conclusion

The SGA concludes that there is no potential for the proposed NWMD roadways to cause any significant surface ground movement. Any surface subsidence is expected to be so small as to be imperceptible. Any potential impacts to natural and built features are expected to be imperceptible.

The main headings are expected to pass at acceptable distances below any significant surface infrastructure identified in the assessment.

Wollongong Coal will implement the proposed mitigation and management measures identified within the SGA to ensure a conservative approach is taken to the mining of the NWMD and reduce the already low potential for subsidence impacts.

7.8 Biodiversity

7.8.1 Introduction

A Biodiversity Development Assessment Report (BDAR) was prepared by Biosis Pty Ltd (Biosis 2020) to address the biodiversity impacts of MOD2 (Appendix L).

7.8.2 Assessment approach

i Overview

The BDAR was prepared in accordance with the *Biodiversity Assessment Method* (BAM; OEH 2017a) and key biodiversity legislation and government policy listed below. The BDAR assess the potential impacts of the proposed modification on biodiversity values. It addresses the BAM and the Biodiversity Offsets Scheme (BOS), and identifies how the proponent proposes to avoid and minimise impacts to biodiversity.

More precisely, the BDAR addresses only the proposed modification components that fall outside of the previously approved footprint, consisting of 28.7 hectares overlying the proposed underground roadways (ie the proposed extension of the NWMD), the proposed coal conveyor and existing mine tunnel entrance at the Wongawilli Pit Top. As direct impacts to native vegetation are only proposed at the Wongawilli Pit Top, this area has been designated the subject land, and makes up 0.03 hectares of native vegetation proposed to impact by MOD2.

Section 1.5 of Appendix L provides a list of key sources of information used for the BDAR, including relevant databases, spatial data, literature and previous site reports.

Numerous field investigations were carried out to undertake flora and fauna assessments across the study area. Field surveys were undertaken on 17, 21, 24 and 29 July, and 4 and 24 August 2020 with methods and results outlined in Section 3.1 and Section 3.2 of Appendix L respectively.

ii Legislation

The proposed modification has been assessed against key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999;*
- *Environmental Planning and Assessment Act 1979;*
- *Biodiversity Conservation Act 2016;*
- *Fisheries Management Act 1994;*
- *Biosecurity Act 2015;*
- State Environmental Planning Policy Koala Habitat Protection 2019 (Koala SEPP); and
- *Wollongong City Council LEP 2009.*

iii Assessment terminology

For the purpose of the assessment, the following terminology is used throughout the BDAR and this section:

- 'subject land' defines the total area of proposed disturbance and encompasses the proposed works footprint and all areas that could be disturbed during construction (ie the footprint of the proposed conveyer works, the conveyor belts, drive heads and any buffer zones to account for further vegetation removal); and
- 'study area' encompasses the subject land and includes areas outside of the subject land that could be indirectly impacted by the proposal, including adjacent areas downslope.

7.8.3 Existing environment

i Bioregions, landscape and soils

The study area occurs within the Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, and both the Illawarra and Sydney Cataract IBRA subregions. The Sydney Basin Bioregion extends from just north of Batemans Bay to Nelson Bay on the Central Coast, and almost as far west as Mudgee. It is one of the most species diverse bioregions in Australia, as a result of the variety of rock types, topography and climates (OEH 2016).

The study area occurs within the Bulli Coast Escarpment Mitchell Landscape, with varied soils types. The high rainfall, averaging approximately at 2,200 mm per year, and high elevation encourage mesophilic vegetation on rich soils with cool temperate rainforest elements.

No vegetated or cleared parts of the study area are mapped as being Acid Sulphate Soils under the Wollongong LEP.

ii Waterways and wetlands

The study area is located within the Hawkesbury Nepean catchment, within the WaterNSW Metropolitan Special Area. The waterways above the proposed extension of the NWMD can be categorised into two broad groups, the large waterbody of Gallaghers Creek (within the upper influence of Lake Avon reservoir), and first and second order tributaries of Lake Avon, shown in Figure 7.12.

Lake Avon occurs within the Lake Avon dam and has a catchment area of 124 square kilometres (km²) (WaterNSW 2020). The study area intersects with Gallaghers Creek, passing below the lake from the south western to north eastern bank, with the upper extent of Lake Avon dam. The crossing and study area is located downstream of the confluence of the major tributaries of Flying Fox No 1 Creek, Flying Fox No 2 Creek and Flying Fox No 3 Creek with Gallaghers Creek, and upstream of the Bellbird Creek tributary.

Lake Avon, within the study area, is included in the Coarse Key Fish Habitat mapping by NSW Department of Primary Industries (DPI) (DPI 2007). It is also considered TYPE 1 highly sensitive key fish habitat and CLASS 1 major key fish habitat, according to the classification provided in DPIE (2013).

The study area also intersects with five mapped first and second order high slope streams on the south western and north eastern banks of Lake Avon (refer Figure 7.12) The field surveys undertaken as part of the BDAR identified that the stream network on the north eastern bank appears to be more complex than mapped, with a number of additional small waterways and drainage lines identified and shown in photographs taken during field surveys.

There are no wetlands mapped within the study area. Lake Avon is mapped as a reservoir on the NSW Wetlands database (DPIE 2020c).

iii Plant community types

The following plant community types (PCTs) were identified within the study area above the proposed extension of the NWMD, and are shown in Figure 7.30:

- PCT 1804 – Needlebush – Banksia wet heath swamps on coastal sandstone plateaus of the Sydney basin (high condition);
- PCT 1292 – Water Gum – Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion (high condition);
- PCT 1250 – Sydney Peppermint – Smooth-barked Apple – Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (high condition);
- PCT 1127 – Sandstone cliff-face soak of the Sydney Basin Bioregion (high condition);
- PCT 1083 – Red Bloodwood – scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion (high condition); and
- PCT 878 Gully Gum – Sydney Peppermint – Yellow Stringybark moist open forest of coastal escarpments, southern Sydney Basin Bioregion (high condition).

The following PCTs were identified within the study area (and the subject land) at the Wongawilli Pit Top, and are described in detail in Table 2 and Table 3 of Appendix L, and shown in Figure 7.30:

- PCT 906 – Lilly Pilly – Sassafras – Stinging Tree subtropical/warm temperate rainforest on moist fertile lowlands, southern Sydney Basin Bioregion (moderate condition); and
- PCT 1245 – Sydney Blue Gum x Bangalay – Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion (low condition).

Two of the PCTs within the overall study area have been identified as either threatened or endangered ecological communities (refer Section 7.9.3vii(b) below).

iv Biodiversity values map

There are no areas of outstanding biodiversity or biodiversity values mapped within the subject land at the Wongawilli Pit Top. There are, however, areas of outstanding biodiversity value mapped within the proposed extension of the NWMD, encompassing riparian vegetation along Lake Avon and its tributaries.

v Areas of geological significance

There are no recorded karst, caves, crevices, cliffs or other areas of geological significance within the subject land at the Wongawilli Pit Top. However, the subject land occurs on a flat bench on the lower slopes of the IECA. The escarpment rises to the west of the subject land and is composed of cliff areas often exceeding 10 m in height.

Within the proposed extension of the NWMD, the study area contains two cliff lines recorded during field investigations. Both cliffs occur above Lake Avon, with steep slopes leading down to the water body. The surrounding landscape also contains several cliff lines. No karsts or caves were recorded within the study area, however rocky areas and rock crevices are abundant throughout.

vi Vegetation description

The majority of the habitat for flora and fauna mapped within the subject land at the Wongawilli Pit Top consists of rainforest and wet sclerophyll forest. Given that the subject land is located adjacent to the IESC and the Metropolitan Special Area, habitat extends far into the surrounding landscape beyond 100 ha. Native vegetation within the subject land is connected to further vegetation to the west, north and south.

The subject land at the Wongawilli upper pit top supports 0.03 ha of native vegetation with varying levels of disturbance. The results of the field investigations within the subject land identified that the condition of the native vegetation across the study area is varied, with areas of heavy weed infestation and other areas of predominantly native vegetation. Figure 7.30 shows the extent of Lantana infestation at the Wongawilli Pit Top.

Areas adjacent to the vehicle track in the north-west of the study area are primarily underscrubbed and lack native understorey, however they maintain a canopy cover from White Topped Box. Areas with no native cover storey or mid storey cover, and less than 50% cover of native groundcover, met the definition of cleared land and were not mapped as native vegetation. These areas are not considered to provide habitat for threatened species.

vii Threatened species

a Fauna habitat

A fauna habitat assessment was undertaken to determine whether the vegetation to be impacted by the proposed works contains habitats suitable to support threatened fauna species identified in the assessment. The field investigation, however, identified only one hollow-bearing tree within the subject land. The hollow was of medium size.

The field investigations confirmed the following findings:

- the subject land lacked large hollows that would be suitable habitat for roosting owls or larger mammals;
- no aquatic habitat was recorded within the subject land, and thus presence of threatened frog species was considered unlikely; and
- no banksias, bottlebrushes or other high quality feed species were recorded within the subject land that might provide foraging habitat for mammals.

Nevertheless, a few threatened species were assumed to exist within the study area, and are discussed in the following sections. A detailed assessment of the likelihood of occurrence of each potential species credit species is provided in Appendix 2 of Appendix L.

b Threatened and endangered ecological communities

PCT 1804 recorded within the proposed extension of the NWMD meets the listing for the threatened ecological community (TEC) Coastal Upland Swamp in the Sydney Basin Bioregion, which is listed as endangered under both the BC Act and the EPBC Act.

PCT 906, identified in the Wongawilli Pit Top study area and subject land, currently meets the listing for Illawarra Subtropical Rainforest in the Sydney Basin Bioregion, which is an endangered ecological community (EEC) under the BC Act, in accordance with the final determination (NSW Scientific Committee 2008) for Illawarra subtropical rainforest in the Sydney Basin Bioregion – endangered ecological community listing.

The extent of threatened and endangered ecological communities are shown in Figure 7.31.

c Candidate species

A number of ecosystem credit species and species credit species were predicted to occur within the habitat present within the subject land and were assessed using the BAM method (OEH 2017a). The presence or absence of these species in the subject land was determined in accordance with Section 6.4 of the BAM (OEH 2017a). A list of the species is provided in Table 6 and Table 7 of Appendix L respectively.

No threatened fauna species were recorded during the field survey, and no threatened fauna were considered likely to occur within the subject land. However, a number of species were assumed to be present, including the Pink Robin, Large-eared Pied Bat, Large Bent-winged Bat and Little Bent-winged Bat. Thus, no targeted threatened fauna surveys were required. Figure 7.32 shows the threatened microbat breeding habitat, within the study area at the Wongawilli Pit Top.

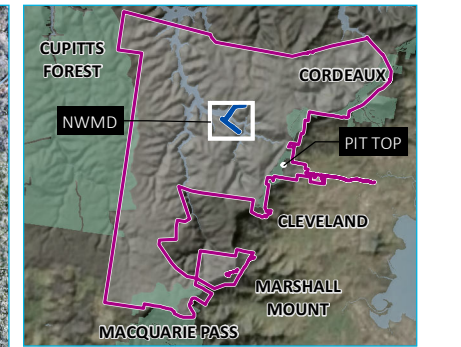
Targeted species surveys for species that have a likelihood of occurring within the subject land were undertaken, as described in Section 4.3.1 of Appendix L. No threatened flora species were recorded during the field survey, as detailed in Chapter 4 of Appendix L.

d Aquatic species

The BDAR considered the likelihood of occurrence of threatened aquatic species within the proposed extension of the NWMD. The Fish Community status within the study area of Gallaghers Creek has been classified by NSW DPI as very poor (DPIE 2020d). Macquarie Perch have the potential to occur within the study area along Gallaghers Creek, given the level of connectivity with Lake Avon which has been mapped as the habitat of the fish (DPIE 2020d). Furthermore, several threatened fish species populations are known to occur within Lake Cataract which is located north of Lake Avon. The presence of these species of fish within the study area is possible, but unknown.

No fish community status mapping or indicative threatened fish species mapping is located along the mapped tributaries of Lake Avon within the proposed extension of NWMD study area. These streams are not considered to support suitable habitats for the threatened species listed above given their high slope, small size and more limited connectivity. These tributaries do, however, support habitats for non-threatened aquatic species.

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KEY

- BAM plot
- Hollow bearing tree
- Study area
- Subject land
- Survey transect
- Lantana camara* - Lantana

Plant community type - condition (Biosis, 2020)

- PCT 878 | Gully Gum - Sydney Peppermint - Yellow Stringybark moist open forest of coastal escarpments, southern Sydney Basin Bioregion - High
- PCT 906 | Lilly Pilly - Sassafras - Stinging Tree subtropical/warm temperature rainforest on moist fertile lowlands, southern Sydney Basin Bioregion - Moderate
- PCT 1083 | Red Bloodwood - scribbly gum healthy woodland on sandstone plateau of the Sydney Basin Bioregion - High
- PCT 1127 | Sandstone cliff-face soak of the Sydney Basin Bioregion - High
- PCT 1245 | Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin Bioregion - Low
- PCT 1250 | Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion - High
- PCT 1292 | Water Gum - Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion - High
- PCT 1804 | Needlebush - Banksia wet heath swamps on coastal sandstone plateaus of the Sydney Basin Bioregion - High

Existing

- Minor road
- Vehicular track
- Named watercourse

INSET KEY

- Project application area
- NPS reserve

Plant community types within the study area

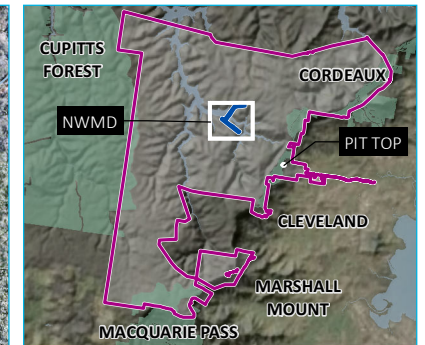
Wollongong Coal Limited
Modification assessment report
Figure 7.30



Source: EMM (2020); WCL (2020); Biosis (2020); DFSI (2017); GA (2011); ASGC (2006)

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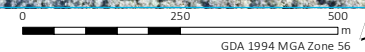
- KEY**
- Study area
 - Subject land
 - Minor road
 - Vehicular track
 - Named watercourse
- Threatened ecological**
- Coastal Upland Swamp in the Sydney Basin Bioregion (Endangered, BC Act and EPBC Act)
 - Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (Endangered, BC Act, Critically Endangered, EPBC Act)
- INSET**
- Project application area
 - NPWS reserve

Threatened ecological communities in the study area

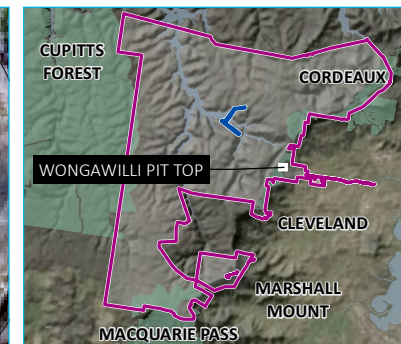
Wollongong Coal Limited
Modification assessment report
Figure 7.31



Source: EMM (2020); WCL (2020); Biosis (2020); DFSI (2017); GA (2011); ASGC (2006)



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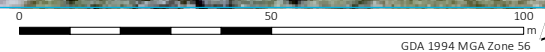
- KEY**
- Study area
 - Subject land
 - Microbat breeding habitat (100 m)
 - Project application area (refer to inset)
 - Threatened microbat breeding habitat (Large-eared Pied Bat, Large Bent-winged Bat, Little Bent-winged Bat)
 - Existing mine tunnel
 - Old gantry and tumbler
 - Existing
 - Minor road
 - Vehicular track
 - NPWS reserve

Threatened microbat
breeding habitat

Wollongong Coal Limited
Modification assessment report
Figure 7.32



Source: EMM (2020); WCL (2020); Biosis (2020); DFSI (2017); GA (2011); ASGC (2006)



7.8.4 Impact assessment

i Direct impacts

a Wongawilli Pit Top

The BDAR identified that areas of dense understorey rainforest vegetation within the subject land at the Wongawilli Pit Top could provide potential foraging habitat for Pink Robin, which is listed vulnerable under the BC Act. In addition, two human-made structures at the Wongawilli Pit Top could provide potential roosting or breeding habitat for threatened microbat species, which were recorded within 100 m of the proposed works. These are the old gantry and tumble house, and the existing mine tunnel entrance. Neither structure is currently in use by WCL. Several microbat species have previously been recorded utilising these structures including the threatened Large Bent-winged Bat (vulnerable, BC Act), Large-eared Pied Bat (Vulnerable, BC Act and EPBC Act) and the Little Bent-winged Bat (vulnerable, BC Act). Therefore, these four species have been assumed present within the subject land.

Direct impacts arising from the proposed modification within the subject land at the Wongawilli Pit Top include:

- removal of 0.01 ha of modern condition PCT 906 Illawarra Escarpment subtropical rainforest consistent with the TEC Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (Endangered, BC Act, Critically Endangered, EPBC Act);
- removal of 0.02 ha of low condition PCT 1245 Illawarra Escarpment Blue Gum wet forest;
- removal of 0.03 ha of vegetation considered to be foraging and breeding habitat for three threatened microbat species. Large-eared Pied Bat, Large Bent-winged Bat and Little Bent-winged Bat; and
- removal of 0.03 ha of vegetation considered to be foraging habitat for Pink Robin.

These impacts will be permanent. Mitigation measures outlined in Section 7.8.5 will help to minimise the potential impacts to biodiversity values that remain present within the study area.

b NWMD

No direct impacts to biodiversity values will occur as a result of the proposed works within the proposed extension of NWMD.

ii Indirect impacts

A number of indirect impacts have been identified and assessed in the BDAR, and are outlined in Table 13 of Appendix L. Potential indirect impacts are outlined below.

- Inadvertent impacts on adjacent habitat or vegetation, including reduced viability of habitat and loss of breeding habitat:
 - Vegetation within the Wongawilli Pit Top is disturbed, and does not provide high quality fauna habitat. The subject land lacks large hollows that would be suitable habitat for roosting owls such as Powerful Owl or large mammals such as Spotted-tailed Quoll. No aquatic habitat was recorded within the subject land, and thus presence of threatened frog species such as Littlejohn's Tree Frog or Red-crowned Toadlet was considered unlikely. Furthermore, no banksias, bottlebrushes or other high quality feeding species were recorded within the subject land that might provide foraging habitat for mammals such as Eastern Pygmy Possum. A comprehensive assessment of the likelihood of occurrence of each potential species credit species is provided in Appendix L.

- Nevertheless, inadvertent impacts on adjacent habitat or vegetation at the Wongawilli Pit Top may occur as a result of the proposed works, including increases in noise, dust, vibration, light and human traffic during construction and operation.
- The removal of vegetation and construction of a coal conveyer within a larger patch of retained vegetation has the potential to result in reduced viability of habitat in this area. Impacts will be in the form of noise, dust or light spill associated with both the construction and continued operation of the proposed conveyer, impacting habitat quality for resident fauna such as birds, bats and small mammals.
- As the proposed conveyer will be installed adjacent to the old gantry and tumbler house, which provides potential threatened microbat roosting and breeding habitat, there is potential for reduced viability of this habitat due to noise or light spill, both during construction and operation of the proposed conveyer.
- Appropriate mitigation measures are provided in Section 7.8.5. While mitigation measures during construction are detailed in Section 7.8.5, ongoing measures will be required in order to protect the viability of the habitat for the threatened microbat population. Impacts are expected to be minimised through the implementation of a CEMP and an Operation Environmental Management Plan (OEMP) detailing best practice environmental protection measures. Mitigation measures undertaken to reduce some of the impacts will include the installation of noise barriers during conveyer construction, as well as the measures outlined in Table 7.25 and Table 7.26.
- No impacts on habitat or vegetation are predicted as a result of works within the proposed extension of NWMD.
- Reduced viability of adjacent habitat due to edge effects:
 - Vegetation within the Wongawilli Pit Top footprint is disturbed, and contains several weed species including Crofton Weed, Cape Ivy, Lantana, Pellitory and Madeira Winter Cherry. Edge effects can be seen at the eastern and western edge of the study area through presence of Lantana and absence of canopy species (refer Figure 7.31). Due to the removal of 0.03 ha of vegetation in a strip running from the eastern to western edge of the study area, there is potential for reduced viability of the surrounding vegetation due to further edge effects, including weed encroachment and spread. Mitigation measures, such as continued weed treatment and monitoring, have been provided in Section 7.8.5.
 - No vegetation is proposed to be removed from the study area within the proposed extension of NWMD and thus no edge effects are likely.
- Transport of weeds and pathogens from the site to adjacent vegetation:
 - As already noted, there are a number of weed species present within the subject site. As the vegetation to be retained is in similar condition, increased transport of pathogens and weeds is unlikely to occur. Regardless, measures to ensure adequate control of weeds and pathogens will be detailed and managed by biosecurity measures outlined in the CEMP and OEMP.
 - No transport of weeds is predicted as a result of works within the proposed extension of NWMD.

- Increase in pest animal populations:
 - The study area and surrounds likely support several pest animal species including the Red Fox and Feral cats and several species of deer. The OEMP will detail monitoring and management measures to ensure that the presence of such species does not increase due to the ongoing operation of the proposed conveyor. However, overall the removal of 0.03 ha of vegetation within a patch greater than 100 ha at Wongawilli Pit Top is unlikely to increase the presence of pest animal populations within the locality.
- Increased risk of fire:
 - Removal of 0.03 ha of vegetation within the subject land will involve the use of machinery within vegetation. While the risk of fire is considered unlikely, it could be catastrophic if it spread to surrounding bushland. This risk will be managed by implementing appropriate mitigation measures such as spark dampers, water spraying, or the close proximity of fire-fighting gear such as extinguishers.
 - Ongoing operation of the proposed conveyor within the study area after construction may also pose a small fire risk to surrounding bushland if a mechanical issue was to cause a spark. Fire-fighting equipment such as extinguishers will remain in close proximity to the proposed conveyor permanently. This will substantially reduce the fire risk that the proposed works might pose to the study area and surrounds.

iii Prescribed impacts

An assessment of prescribed impacts was undertaken for both the Wongawilli Pit Top and the proposed extension of NWMD. The assessment considered potential impacts to karsts, caves, crevices and cliffs, rocky areas, human-made structures, non-native vegetation, connectivity, movement of threatened species, water quality, water bodies and hydrological processes, wind turbine strikes and vehicle strikes.

Overall, the assessment concluded that other than already identified impacts (refer Section 7.9.4i and Section 7.9.4ii) no other impacts are anticipated from the proposed modification.

iv Impacts to groundwater dependent ecosystems

The study area at the Wongawilli upper Pit Top is partially mapped as supporting Groundwater Dependent Ecosystems (GDEs) on the Groundwater Dependent Ecosystem Atlas (GDEA) (BOM 2019) due to the presence of Subtropical Complex Rainforests (recorded as PCT 906 during the field investigation). However, no changes to groundwater are predicted as a result of the proposed works at the Wongawilli upper Pit Top.

Likewise, the study area within the proposed extension of the NWMD is partially mapped as supporting GDEs on the GDEA due to the predicted presence of PCT 1250 within the vegetated peninsula in the centre of the study area (BOM 2019). However, the field investigation undertaken by Biosis confirmed that the vegetation in this area was not Coastal Sandstone Gully Forest but was instead PCT 1083 - *Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion* and PCT 878 - *Gully Gum - Sydney Peppermint - Yellow Stringybark moist open forest of coastal escarpments, southern Sydney Basin Bioregion*.

Due to the inconsistency between GDEA mapping and the vegetation mapped during the field investigation, the presence of GDEs was instead determined using the *Risk assessment guidelines for groundwater dependent ecosystems – Appendix 4: inferring groundwater dependency* (DPI 2012). Using this document, it was determined that all PCTs mapped as present within the Additional Driveage are groundwater dependent, with the exception of PCT 1083.

In particular, in the north east portion of the Additional Driveage, PCT 1804 - *Needlebush - Banksia wet heath swamps on coastal sandstone plateaus of the Sydney basin* was recorded, and is consistent with the TEC *Coastal Upland Swamp in the Sydney Basin Bioregion* (Endangered, BC Act and EPBC Act). This PCT is considered to be particularly groundwater dependent.

The project groundwater assessment concluded that there is no potential for any surface water or groundwater impacts as a result of the proposed Additional Driveage (SLR 2020), while the project geotechnical report similarly concluded that there is no potential for any perceptible surface subsidence impacts as a result of the proposed Additional Driveage (SCT 2020). It also concluded that inflows from Lake Avon into the proposed underground roadways is unlikely. As such no impacts to GDEs are expected to occur as a result of MOD2.

Four serious and irreversible impacts (SAILs) have been identified as having potential to occur as a result of the proposed works. These are:

- removal of 0.01 hectares of *Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* (Endangered, BC Act, Critically Endangered EPBC Act);
- removal of 0.03 hectares of breeding habitat for Large-eared Pied Bat;
- removal of 0.03 hectares of breeding habitat for Large Bent-winged Bat; and
- removal of 0.03 hectares of breeding habitat for Little Bent-winged Bat.

SAIL assessments have been prepared for each of these entities, and are provided Appendix 6 of Appendix L.

v Impacts to native vegetation (ecosystem credits)

The offset requirement for the proposal was calculated using the BAM calculator. Table 7.23 provides a summary of the ecosystem credit offsets required for impacts from proposed works at the subject land.

Table 7.23 Offsets required for the proposed works (ecosystem credits)

Vegetation zone	Vegetation	Area (ha)	Impact	Vegetation integrity score	Offset required?	Credit Requirement
VZ1	PCT 906 - moderate	0.01	Clearance	64.8	Yes	1
VZ2	PCT 1245 - low	0.02	Clearance	40.2	Yes	1

vi Impacts to threatened species (species credits)

The offset requirement for the proposal was calculated using the BAM Calculator. Table 7.24 provide a summary of the species credit offsets required for impacts from proposed works at the subject land.

Table 7.24 Offsets required for the proposed works (species credits)

Vegetation zone	Species	Habitat condition (vegetation integrity score) loss	Area (ha)	Biodiversity risk weighting	Credit requirements
VZ1	Large-eared Pied Bat	64.8	0.01	3	0
	Large Bent-winged Bat	64.8	0.01	3	0
	Little Bent-winged Bat	64.8	0.01	3	0
	Pink Robin	64.8	0.01	2	0
VZ2	Large-eared Pied Bat	40.2	0.02	3	1
	Large Bent-winged Bat	40.2	0.02	3	1
	Little Bent-winged Bat	40.2	0.02	3	1
	Pink Robin	40.2	0.02	2	0

vii Assessment against biodiversity legislation

The BDAR assessed the impacts of the proposed works in accordance with the EPBC Act, and other relevant legislation (refer Chapter 10 of Appendix L).

In accordance with the EPBC Act, it was concluded that Matters of National Environmental Significance (MNES) are not likely to be significantly impacted by the proposed works and as such, a referral of the project to the Commonwealth is not required.

7.8.5 Mitigation measures

i Wongawilli Pit Top

The BDAR recommends reducing impacts on biodiversity values within the study area by avoiding and/or minimising the removal of native vegetation and fauna habitat. Steps undertaken to avoid and minimise impacts to biodiversity are broken down into site selection and planning, construction and operation phases of the proposed modification.

a Site selection and planning

The location of the proposed conveyor to be installed is necessary to connect the conveyor portal to the existing infrastructure at the Wongawilli Colliery. The reutilisation of infrastructure at the Wongawilli Colliery minimises impacts to native vegetation and flora and fauna habitats present within the broader study area, by avoiding construction of completely new infrastructure.

b Construction

Mitigation measures recommended to avoid and minimise further indirect impacts to vegetation and habitat during the construction phase of the proposed works include:

- installation of appropriate exclusion fencing around trees and vegetation to be retained in the study area;
- installation of appropriate signage such as 'No Go Zone' or 'Environmental Protection Area';
- identification of the location of any 'No Go Zones' in site inductions and a Construction Environmental Management Plan (CEMP);

- all material stockpiles, vehicle parking and machinery storage will be located within cleared areas or areas proposed for clearing, and not in areas of native vegetation that are to be retained;
- proposed hollow-bearing tree to be removed should be placed in the area of retained vegetation to provide additional fauna habitat;
- removal of the hollow-bearing tree should be supervised by a qualified ecologist;
- where appropriate native vegetation cleared from the subject land should be mulched for re-use on the site, to stabilise bare ground;
- wet down areas to reduce dust generation during construction;
- implementation of temporary stormwater controls during construction and to ensure that discharges to the drainage channels are consistent with existing conditions; and
- sediment and erosion control measures should be implemented prior to construction works commencing (eg silt fences, sediment traps), to protect current drainage channels. These should conform to relevant guidelines, should be maintained throughout the construction period and should be carefully removed following the completion of works.

Table 11 and Table 12 of Appendix L outline detailed mitigation measures to be undertaken by WCL in order to minimise any impacts to potential threatened microbats utilising the old gantry and tumbler house or the existing mine tunnel entrance, as a result of works associated with the proposed modification. Some of the management measures are outlined below.

The following measures are recommended for impacts associated with the construction of coal conveyor adjacent to a potential roosting and breeding structures for threatened microbats.

Table 7.25 **Impact management and mitigation strategies for the old gantry and tumbler house structures**

Impact	Environmental management measures	Timing	Responsibility
Construction of coal conveyor adjacent to a potential roosting and breeding structures for threatened microbats	A microbat survey is to be undertaken during the day prior to the commencement of construction of the proposed conveyor. All potential habitat is to be inspected to confirm if microbats are present.	Pre-construction	Project Ecologist, Environmental Manager
	A detailed schedule of management, monitoring and mitigation measures specific to the construction phase of the project will be implemented in the CEMP.	Pre-construction	Project Ecologist, Environmental Manager
	Appropriate noise barriers are to be installed between the proposed conveyor and the old gantry and tumbler house before the start of construction, ensuring not to impede movement of microbats in and out of the structure.	Pre-construction	Environmental Manager, Contractors
	It will be ensured that any staff that are required to undertake works within the vicinity of the structure are briefed on the importance of minimising disturbance to the structure and any potential resident microbats.	Pre-construction	Environmental Manager, Site Foreman, Contractors
	Any necessary lighting required for the proposed works will be directed away from the structures, and designed such that light spill does not occur within retained vegetation.	Construction	Environmental Manager, Contractors

Table 7.25 **Impact management and mitigation strategies for the old gantry and tumbler house structures**

Impact	Environmental management measures	Timing	Responsibility
	WCL will maintain appropriate exclusion zones around the structures, and manage any night works by ensuring noise and light pollution is kept to a minimum, particularly through the breeding and lactation period (October and March) in the vicinity of the identified microbat habitat.	Construction, operation	Environmental Manager, Contractors
	If it is identified that bats are present in torpor within the structure, fortnightly winter monitoring should be conducted during any upgrades or maintenance works to ensure that over-wintering roosting colonies are not being adversely impacted.	Construction, operation	Project Ecologist
	Unexpected finds and stop works procedures are to be implemented if microbats are observed exiting the structure during construction.	Construction	Environmental Manager and Site Foreman
	Any permanent lighting required for operation of the proposed conveyor will be designed to be directed away from, and avoid light spill into, the structure and any retained vegetation.	Operation	Environmental Manager
	Permanent noise barriers will be constructed between the conveyor and the microbat structure, to minimise noise or vibration disturbance to resident microbats.	Operation	Environmental Manager
	The structure will be designated as a permanent no-go-zone to avoid disturbance to microbats from increased foot traffic in the vicinity.	Operation	Environmental Manager

Table 7.26 **Impact management and mitigation strategies for the existing mine tunnel entrance**

Impact	Environmental management measure	Timing	Responsibility
Reutilisation of the existing mine tunnel entrance that provides potential roosting and breeding habitat for threatened microbats	A pre-clearance survey is to be undertaken during the day in September or October, when individuals from all microbat species concerned would have returned to their breeding habitat prior to the breeding season. All areas with the potential to support microbat habitat within the existing mine tunnel entrance will be inspected.	Pre-construction	Project Ecologist, Environmental Manager
If threatened microbats are not located during pre-clearance			
	<p>All potential habitat found not to support microbats during pre-clearance surveys and considered likely to be impacted by the proposed works is to have temporary exclusion measures installed to prevent microbats from moving in before works begin.</p> <p>These measures are to be installed immediately following the pre-clearance survey, to ensure microbats do not move into the habitat overnight.</p> <p>Exclusion measures may include:</p> <ul style="list-style-type: none"> • thick tape (such as bitumen tape) or plywood installed over habitat; • expanding foam to remove cracks and gaps that may be utilised by microbats; and • sealing of all side entrances that connect the existing tunnel to other inactive sections of the adit system, including the old gantry and tumbler house. Sealing off these entrances will ensure that microbats are able to continue utilising inactive adit structures, without exposure to works within the exiting tunnel entrance. <p>Exclusion measures are to be confirmed sufficient and effective by a qualified ecologist prior to works beginning.</p> <p>Any habitat not considered likely to be impacted by the works, for example permanently unused sections within the adit system are to remain available to any displaced microbats. This will include the installation of bat-friendly gates at any entrances to the system available to microbats.</p> <p>A detailed schedule of management, monitoring and mitigation measures specific to the construction phase of the project will be implemented in the CEMP.</p>	Pre-construction	Project Ecologist, Environmental Manager

Table 7.26 Impact management and mitigation strategies for the existing mine tunnel entrance

Impact	Environmental management measure	Timing	Responsibility
	If non-breeding threatened microbats are located during pre-clearance		
	<p>If microbats are found to be present in the existing tunnel entrance during the pre-clearance inspection, but are not likely to be utilising the structure as a maternity roost (ie no evidence of pregnant or lactating females), then temporary exclusion measures are to be installed overnight once the bats have left the roost to forage.</p> <p>Planned roost exclusion can only be conducted outside the breeding season (October – March) and over wintering time (mid-May to August) under the supervision of a qualified ecologist to ensure all microbats have vacated the roost. The following safeguards must be considered to minimise potential impacts to displaced bats:</p> <ul style="list-style-type: none"> • ensure that this procedure is not conducted during an extensive dry period (drought) as this could be detrimental and lead to mortality, if there is no nearby suitable habitat; and • avoid conducting this procedure during windy, full-moon, cold or rainy nights (ie >20 mm in 24 hours), as there is a low likelihood of roost exodus. <p>The most beneficial timing for planned roost exclusion is in autumn (mid-April – early May) and the start of spring (September). This would avoid both the breeding and overwintering period for microbats.</p> <p>If works and exclusion of roosting bats are required during the overwintering months (mid-May to August), when many culvert roosting bats enter torpor (hibernation state), the following additional safeguards must be adhered to:</p> <ul style="list-style-type: none"> • nocturnal monitoring of roost activity is to be undertaken by a qualified ecologist, and bats must be confirmed as leaving the roost to forage on at least two separate occasions prior to installation of exclusion measures; • if bats are not confirmed as leaving the roost to forage (ie in winter torpor) additional monitoring is to be undertaken until regular foraging has resumed; and • works are not to impact upon the tunnel with bats present in winter torpor. <p>Additional safeguards that must be considered when exclusion devices are installed include:</p> <ul style="list-style-type: none"> • all roost exclusion should be done after dusk, once individuals have emerged to feed and an ecologist is satisfied no microbat individuals remain within the roost; and • roosting habitat that has been sealed must be regularly monitored to ensure the sealing mechanism remains intact and no microbats are able to utilise the habitat. If it is suspected that the exclusion mechanism has failed then an ecologist must re-inspect the habitat before the seal is reapplied. <p>Alternative roosting habitat should be made or left available wherever possible when undertaking passive roost exclusion.</p>		

Table 7.26 Impact management and mitigation strategies for the existing mine tunnel entrance

Impact	Environmental management measure	Timing	Responsibility
If breeding threatened microbats are located during pre-clearance			
	Although unlikely, if threatened microbats are found to be present in the existing tunnel entrance during the pre-clearance survey, and appear to be in breeding condition (ie pregnant or lactating females, presence of young), any use of the tunnel will be immediately postponed and appropriately qualified ecologists will be consulted to determine the most appropriate steps to be taken. Appropriate approval authorities will also be notified. Maternity roosts are considered habitat critical to the survival of these species.		
	Reports are to be provided outlining the findings of pre-clearance assessments and detailing the exclusion measures installed and procedure (if required).	All works	Project Ecologist
	Unexpected finds and stop works procedure are to be implemented if microbats are observed within the existing tunnel during works.	Construction, operation	Site Foreman, Environmental Manager and Project Ecologist

c Operation

The following recommendations are made to avoid impacts resulting from 'operation' of the proposed works:

- Any lighting required around the facility should point towards the development and not into surrounding vegetated areas.
- On-going treatment of exotic species from within retained vegetation should be undertaken to assist vegetation resilience and quality.

7.8.6 Conclusion

Avoidance of impacts to native vegetation, threatened ecological communities and fauna habitat have been undertaken to restrict proposed direct impacts associated with the project to the removal of 0.01 hectares of PCT 906 (*Illawarra Subtropical Rainforest in the Sydney Basin Bioregion* (Endangered, BC Act, Critically Endangered, EPBC Act)) and 0.02 hectares of PCT 1245, and the habitat it supports on the subject land.

A total of two ecosystem credits are required to offset impacts to the two vegetation zones identified within the subject land.

No threatened fauna species were recorded at the subject land, however this assessment assumes the presence of four species credit species identified by the BAM calculator (Appendix 2 of Appendix L). These are the Pink Robin, Large-eared Pied Bat, Large Bent-winged Bat and Little Bent-winged Bat. Based on the impact area and biodiversity risk weighting (Section 7.8.4) attributed to these species, four species credits are required to offset impacts to fauna habitat. Mitigation measures to avoid direct impacts and mitigate potential indirect impacts to native fauna are provided in Section 7.8.5 of this report.

There were no threatened flora species recorded or assumed to be present within the subject land.

Matters of National Environmental Significance are not likely to be significantly impacted by the proposed works and as such, a referral of the project to the Commonwealth is not required.

If the mitigation measures provided in this report are implemented, there should be no further impacts to biodiversity values as a result of the proposed works, and the project can proceed as planned.

7.9 Historic heritage

7.9.1 Introduction

Biosis Pty Ltd (Biosis) prepared a heritage assessment and statement of heritage impact (SoHI) for MOD2.

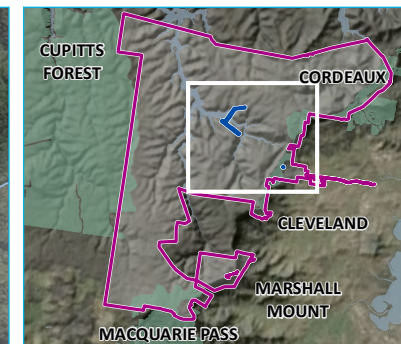
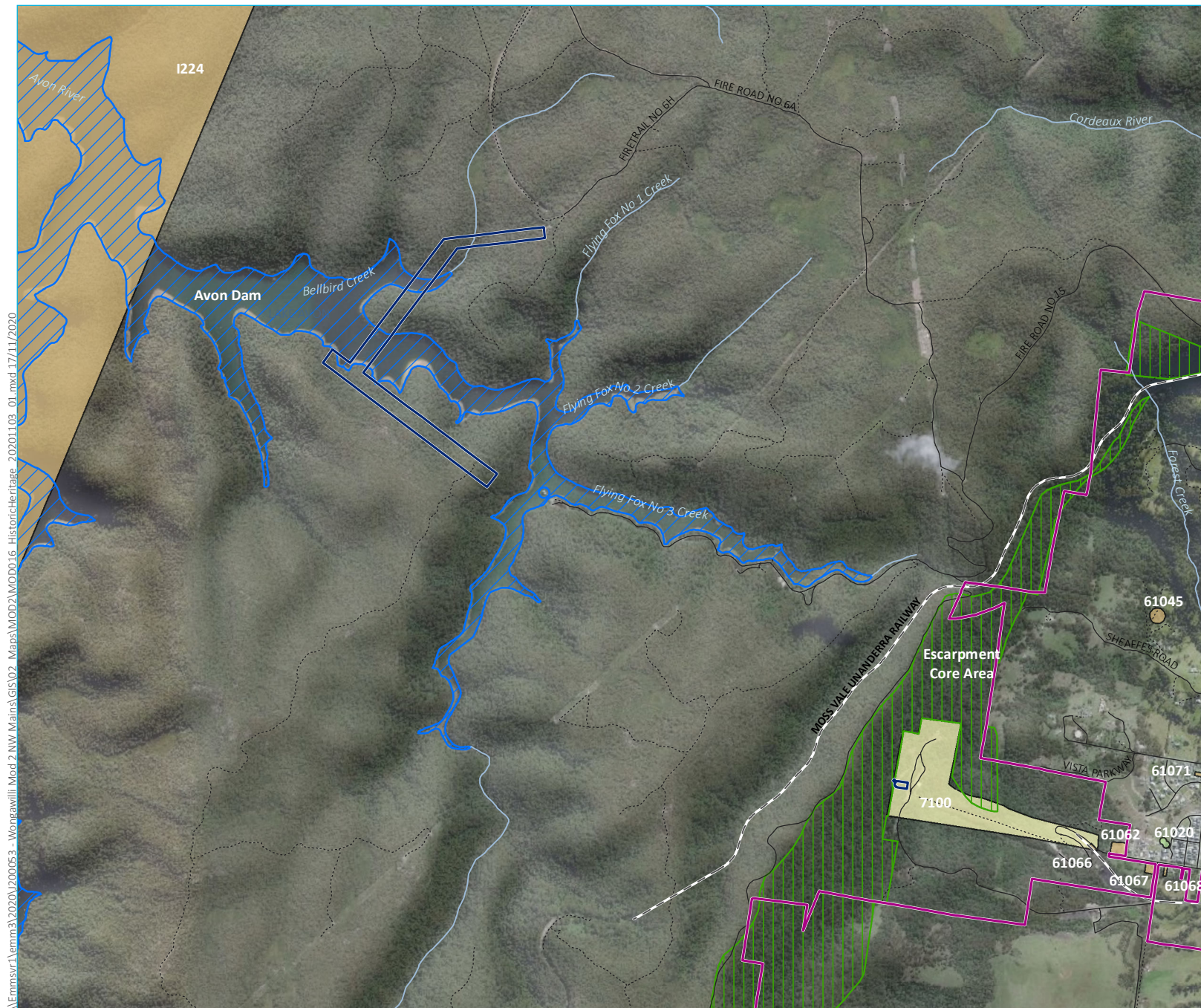
The report (Appendix M) was prepared in accordance with current heritage guidelines including *Assessing Heritage Significance*, *Assessing Significance for Historical Archaeological Sites and 'Relics'* and the *Burra Charter*.

7.9.2 Historical context

The region is identified as having a long history of mining, in particular coal mining, which was first discovered in 1797 and increasing to ten or more collieries by World War I. Wongawilli township is identified as a company town which was established to service the Wongawilli Colliery in 1916.

Buildings and portals associated with the Colliery's pre 1960s mining operations are identified as the historic core of the site and includes the range of buildings at the southern end from the Dumper House (carpenter shop, old offices, bathrooms, lamp room, old fan room), the old workshops and blacksmith (now loco charging station and storage), garden beds, stone retaining walls, the man haulage, and the fire station.

Figure 7.33 depicts the heritage items identified at Wongawilli Colliery and their proximity to MOD2 works.



- KEY**
- Project application area
 - Study area
 - State heritage item
 - Local heritage item
 - Item - Landscape
 - Item - General
 - Item - Archaeological
 - Conservation area - Landscape
 - Existing environment
 - Rail line
 - Minor road
 - Vehicular track
 - Named watercourse
 - INSET KEY**
 - NPWS reserve

Historic heritage items

Wollongong Coal Limited
Modification assessment report
Figure 7.33

7.9.3 Significance assessment

i Assessment approach

An assessment of heritage significance encompasses a range of heritage criteria and values. The heritage values of a site or place are broadly defined as the 'aesthetic, historic, scientific or social values for past, present or future generations'. This means a place can have different levels of heritage value and significance to different groups of people.

Heritage value and significance varies according to the value placed on a site by different groups. *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS 2013) (the Burra Charter) characterises the heritage values in accordance with the following four significance values:

- Historical significance (evolution and association).
- Aesthetic significance (scenic/architectural qualities and creative accomplishment).
- Scientific significance (archaeological, industrial, educational, research potential and scientific significance values).
- Social significance (contemporary community esteem).

These values are used for heritage assessment by all state and Commonwealth agencies and were utilised by the NSW Heritage Office to identify the places of heritage significance located within the study area for MOD2.

ii Assessment

The heritage assessment and SoHI undertaken by Biosis did not identify any further historical or archaeological information which alters the existing identified significance of the Colliery, Avon Dam or the Illawarra Escarpment Landscape Conservation Area.

Table 7.27, below, provides a summary of the statement of significance for the listed heritage items. The full statements are provided in Table 5 of Appendix M, which lists the statements of significance for these sites as they appear in the State Heritage Inventory.

Table 7.27 Statements of significance for listed heritage items within the study area

Site number	Site name	Listings	Significance	Summarised statement of significance
7100	Wongawilli Colliery	Wollongong LEP 2009	Local	The Wongawilli Colliery is significant for its association with Wongawilli "Bank Book" Hill and Wongawilli Road residential areas, as evidence of the evolving relationships between mines, mining companies and their workers, and of the joint ownership of the mine and the associated steel industry.

Table 7.27 **Statements of significance for listed heritage items within the study area**

Site number	Site name	Listings	Significance	Summarised statement of significance
1358	Avon Dam	State Heritage Register, WaterNSW, Wingecarribee LEP 2010	State	Significant for its size and structure being still the second largest of all NSW storage dams in terms of capacity. Represents design qualities by Australia's leading water supply engineer of the time and includes 'strong Egyptian style architectural character'. Additional buildings and grounds, respectively, provide fine examples of interwar architecture and considerable aesthetic and social value.
-	Illawarra Escarpment Landscape Area	Wollongong LEP 2009	Local	

Biosis assessed what impacts MOD2 will have on heritage items listed within the study area, including buildings and infrastructure within Wongawilli Colliery, and adjacent the study area. Table 7.28 provides a summary of the Biosis assessment of the impacts of the proposed development on identified heritage items as assessed against the Heritage Manual guideline Statements of Heritage Impact (Heritage Office & DUAP 1996).

Table 7.28 **Assessment of impacts to heritage items within or adjacent to the study area**

Heritage item	Significance	Discussion	Assessment	Mitigation measures
Wongawilli Colliery	Local	The proposed works will involve the installation of an additional conveyor to connect the conveyor portal of the existing infrastructure. This will consist of two 5 x 7 m driveheads and a 2 x 63 m conveyor belt held up by pillars. The pillars will be located on a steep slope between the NWMD portal and the existing conveyor. The existing conveyor is part of a large complex of structures identified as B9 (Breaker Building and Transfer Bunker) in the CMP, which includes the belt conveyor that extends into the underground workings, the drive house, breaker building, transfer bunker, and associated structures. These were installed in 1959 along with the Decline Conveyor but altered in subsequent decades. B9 has little significance but associative archaeological significance. The CMP policy states that buildings and structures of associative significance need only be retained and conserved where required. No removal or demolition of the existing conveyor will occur; however, there will be some alternation to the fabric of B9, where the new conveyor connects to the existing conveyor. Furthermore, the proposed works are also in close proximity the Dumper House (B4), which has high significance and primary archaeological significance. Direct impacts may occur to this building due to the use and movement of machinery that could inadvertently damage the building.	Direct - partial	Archival recording Protection of Dumper House (B4) Unexpected finds procedure

Table 7.28 Assessment of impacts to heritage items within or adjacent to the study area

Heritage item	Significance	Discussion	Assessment	Mitigation measures
Avon Dam	State	The Additional Driveage part of the study area crosses the curtilage of the Avon Dam. As the driveage is being developed using the first workings mining method, no impacts are expected to the ground surface. Natural or seasonal variations in surface levels due to wetting and drying of soils are approximately 20 mm, and thus subsidence less than this can be considered no more than the variations occurring from natural processes, and should have negligible impacts on both natural and man-made surface infrastructure (CoA 2014, MSEC 2007, Hume Coal 2017). A geotechnical report provided by SCT Operations Pty Ltd (2020) confirmed this, with the geotechnical assessment concluding that there is no potential for any perceptible surface subsidence impacts as a result of the proposed Additional Driveage.	No impact	Unexpected finds procedure
Illawarra Escarpment Landscape Area	Local	The Wongawilli pit top part of the study area is adjacent to the curtilage of the Illawarra Escarpment Landscape Area; however, no works will occur within the curtilage. Temporary visual and noise impacts will occur during the proposed works but this will be resolved upon completion of the project and not result in any lasting impacts to the heritage item.	No impact	Unexpected finds procedure

Only the proposed minor changes to replace a portion of the Wongawilli upper pit top conveyor network has been assessed as having a direct - partial impact on heritage items. A partial impact represents a loss or reduction of heritage significance and are generally identified as minor impacts to a small proportion of a curtilage of an item or works occurring within the curtilage of a heritage item which may impact on its setting.

The existing conveyor is part of a large complex of structures identified as B9 in the Conservation Management Plan (CMP) and having associative archaeological significance. The CMP policy states that buildings and structures of associative significance need only be retained and conserved where required. As described in Section 3.2, minor section of conveyor will be removed and coal handling infrastructure relocated as such there will be some alternation to the fabric of B9 where the new conveyor connects to the existing conveyor.

In addition, the proposed works are also in close proximity the Dumper House (B4), which has high significance and primary archaeological significance. Direct impacts may occur to this building if construction works are not appropriately managed due to the use and movement of machinery that could inadvertently damage the building.

The Illawarra Escarpment Landscape Area is located adjacent to the Wongawilli pit top however any visual and noise impacts will be temporary in nature during construction and will not result in any lasting impacts.

Therefore, if the appropriate mitigation measures are employed, it is considered that the works associated with the NWMD modification are acceptable from a heritage perspective, and that any loss of heritage significance through the proposed works will be appropriately managed if the recommendations are followed.

7.9.4 Mitigation measures

The following mitigation measures will be implemented to minimise potential impacts to historic heritage sites associated with MOD2.

i Archival recording

A digital photographic archival recording of the Wongawilli Pit Top part of the study area will be undertaken prior to any works occurring. This is in accordance with Policy 12 of the CMP.

The archival recording will comply with the NSW Heritage Council guidelines *How to Prepare Archival Records of Heritage Items* and *Photographic Recording of Heritage Items Using Film or Digital Capture 2006*.

ii Protection of Dumper House (B4)

The existing fencing surrounding the Dumper House will be marked with high visibility bunting to further protect it from any possible damage during the construction of the new conveyor. This is in accordance with Policy 5 of the CMP.

iii Unexpected finds procedure

Any relics discovered during the construction will trigger the implementation of Wollongong Coals unexpected find procedure. Work in the vicinity of any unanticipated relic should cease and an archaeologist will be contacted to make a preliminary assessment of the find, including notification to the Heritage Council, if required.

7.9.5 Conclusion

The modification proposes no removal or demolition of local or State historic heritage sites however it will result in a 'direct – partial' impact against one heritage item identified by the NSW Heritage Council, being some alteration to the fabric of the Breaker Building and Transfer Bunker.

Mitigation measures will ensure that proposed works to and around identified local heritage sites, comprising minor alterations to the fabric of the Breaker Building and the Transfer Bunker or inadvertent damage to the Dumper House caused by use and movement of machinery is appropriately managed during construction.

MOD2 will have no impacts to the heritage value of the Avon Dam and Illawarra Escarpment Landscape Area.

7.10 Aboriginal heritage

7.10.1 Introduction

An Aboriginal Cultural Heritage Assessment (ACHA) was prepared by Biosis Pty Ltd for the proposed modification at Wongawilli Colliery (Appendix N).

The ACHA takes into consideration the proposed extensions to the NWMD and proposed disturbance at the Wongawilli Upper Pit Top, which is referred to as the study area and shown in Figure 7.34

7.10.2 Assessment Approach

The Colliery has previously been assessed for Aboriginal heritage as part of the application for the original consent. As there is a potential for the proposed modification to disturb areas that are not currently disturbed by mining activities, an ACHA was undertaken to determine if Aboriginal objects will be harmed by the proposed modification and determine appropriate mitigation and measures should they be required.

The ACHA and Archaeological Report (AR) contained within, document the findings of the archaeological investigations and consultation conducted. As required under Section 2.3 of The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code), the AR annexed to the ACHA provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations. The ACHA consists of:

- consideration of the environmental context of the site and surrounds to assess the likelihood of Aboriginal objects or places being present;
- consideration of existing regional and local Aboriginal cultural heritage studies;
- a search of Aboriginal Heritage Information System (AHIMS) database to identify whether registered Aboriginal sites are present within the site;
- a site inspection by a Biosis archaeologist accompanied by RAP representatives to identify if any Aboriginal objects or areas of potential archaeological deposit (PAD) are present or likely to occur within the site;
- a record of consultation undertaken with Registered Aboriginal Parties (RAPs) and relevant agencies;
- an assessment of Aboriginal cultural and archaeological significant of the study area; and
- determination of whether further heritage investigation and impact assessment are required.

7.10.3 Existing Environment

i Land use history

Early European land use in the vicinity of the Colliery consisted of forestry and extractive industries. Forestry along the escarpment commenced in the early 1800's, with coal mining commencing in the region from 1849. Coal mining in the area resulted in significant industrial development in the Illawarra region. Since this time large portions of land surrounding the Colliery have been declared a state catchment area. The catchment area was subject of a large state infrastructure project known as the Upper Nepean Scheme (Water NSW 2015). This scheme sought to increase the State's water supply during the 1920s. Following the catchment are being declared no further forestry was undertaken in the catchment, whilst underground mining has continued.

Since 1916 the Colliery has continued to be operated as underground coal mine, supply largely metallurgical coal to a number of markets over time.

ii Ethnohistory

The Illawarra region is the traditional land of the Wodi Wodi, a group of people who spoke a variant of the Dharawal language (Wesson 2009). The area occupied by this group extended from Botany Bay down the coast to around Nowra. To the north of the Wodi Wodi, the Darug are identified, to the west are the Gundangurra, and in the south the Thoorga (Dhauga) are identified (Tindale 1974). The areas inhabited by each of the groups are considered to be indicative only and would have changed through time and may have been dependent on certain circumstances (ie availability and distribution of resources). Interactions between different types of social groupings would have varied with seasons and resource availability. Traditional stories tell of the arrival of the Wodi Wodi to Lake Illawarra, bringing with them the Dharawal or cabbage tree palm from which their language is named (Wesson 2009, p.5). Analysis of middens in the region has provided dates of occupation dating back 6000 to 7000 years on the coast and at Lake Illawarra, and it is accepted that Aboriginal occupation of the south coast dates to around 20,000 years ago (AMBS 2006).

The Illawarra escarpment, named Merrigong, has great symbolic and historical importance for local Aboriginal people and has a number of named mountains. These include Wonga (Wongawilly), meaning native pigeon, Djera (Keira), meaning wild turkey, and Kembla derives from either Jum-bulla, meaning wild game abundant or plenty of game, or from Djembla, meaning wallaby (Wesson & OEH 2005). Aboriginal creation stories express the deep cultural and physical connections between the people and their environment. High places are generally culturally important and were an important area for ceremonial practices and a rich source of food, medicine and other resources (NPWS 2018).

The first recorded contact between Aboriginal and European peoples occurred in 1770, when Captain Cook sailed down the east coast of Australia in the Endeavour and observed cook fires and Aboriginal people carrying canoes along the coast (Organ 1990). The next recorded contact occurred in 1796, when Flinders and Bass travelled along the coast in the Tom Thumb. Organ (1993) also notes an expedition from Jervis Bay by George William Evans, in which the expedition met several groups of Aboriginal people on the way through the Wollongong area in 1812.

iii Desktop assessment

A large number of cultural heritage surface (surveys) and sub-surface (excavations) archaeological assessments have been conducted within the regional and local area surrounding the Colliery. Archaeological assessments are summarised in Section 3.2 of the ACHA (refer Appendix N).

Regional and local archaeological studies have shown extensive use of the Woronora Plateau and Illawarra escarpment. A variety of archaeological evidence such as stone artefacts, grinding grooves, modified trees rock shelters with art and deposit as well as stone arrangements show complex social systems and use of the region. Regional and local archaeological studies have shown extensive use of the Woronora Plateau and Illawarra escarpment.

iv AHIMS site analysis

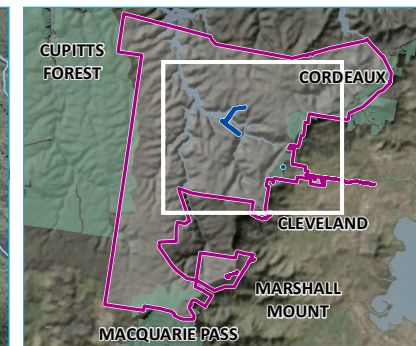
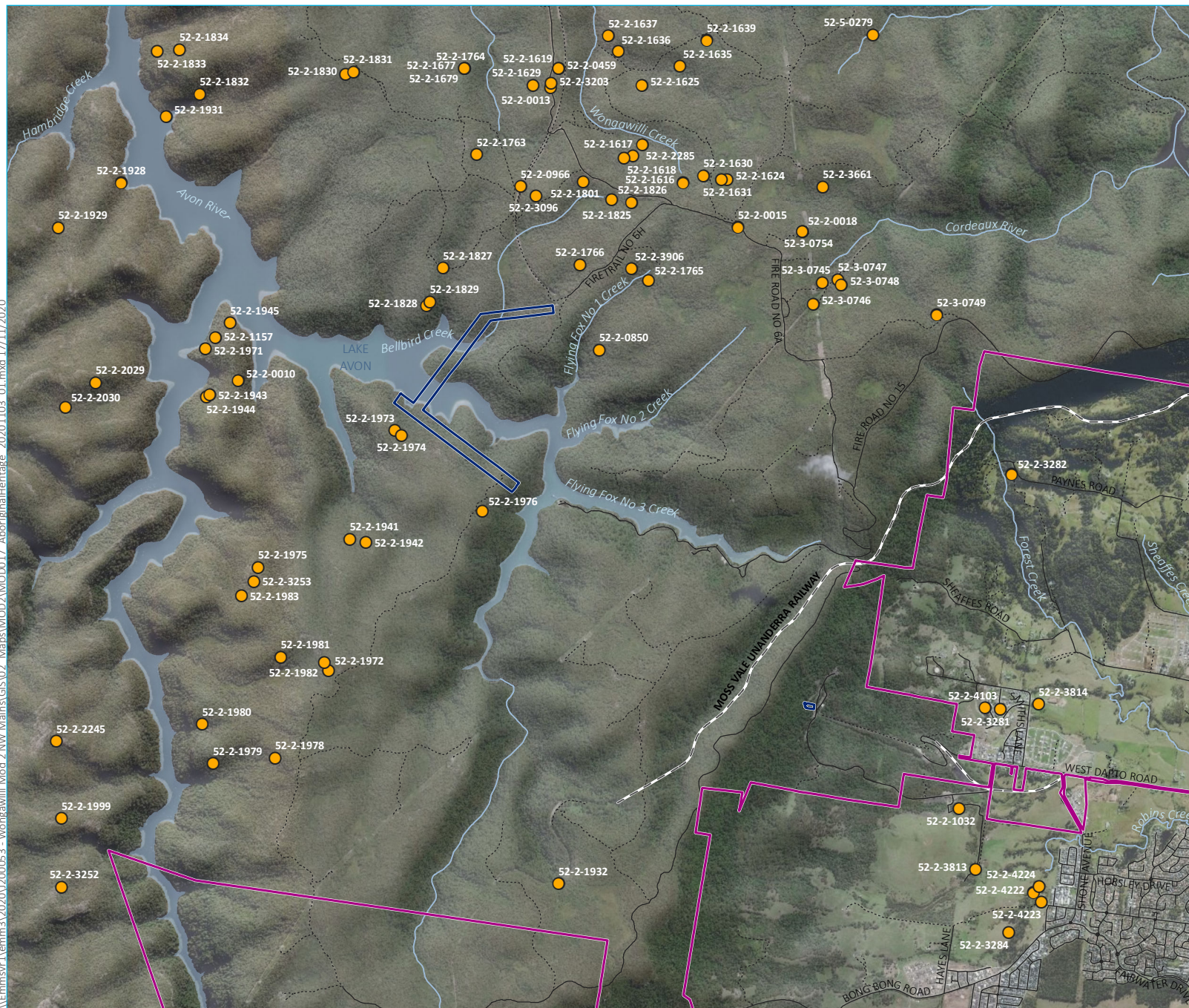
A search of the AHIMS database (Client Service ID: 511747) identified 87 Aboriginal archaeological sites within a 2 by 2 kilometre search area, centred on the study area. None of these registered sites are located within the study area (see Figure 7.34). AHIMS search results are included within Appendix N.

Table 7.29 provides the frequencies of Aboriginal site types in the vicinity of the study area. Some recorded sites consist of more than one element, for example art and potential archaeological deposit (PAD); however, for the purposes of this breakdown and the predictive modelling, all individual site types will be studied and compared. This explains why there are 104 results presented here, compared to the 87 sites identified in AHIMS.

Table 7.29 **AHIMS results**

Site Type	Number of Occurrences	Frequency (%)
Art (pigment or engraved)	47	45.19
Artefact	25	24.04
Grinding groove	15	14.42
PAD	14	13.46
Stone arrangement	3	2.88
Total	104	100

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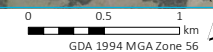
- KEY**
- AHIMS record
 - Project application area
 - Study area
 - Existing environment
 - Rail line
 - Minor road
 - Vehicular track
 - Named watercourse
 - Named waterbody
 - INSET KEY**
 - NPWS reserve

AHIMS sites in the vicinity of the study area

Wollongong Coal Limited
Modification assessment report
Figure 7.34



Source: EMM (2020); WCL (2020); Biosis (2020); DFSI (2017); DPE (2017); GA (2011)



7.10.4 Consultation

The Aboriginal community was consulted regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the DECCW document, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (consultation requirements). The appropriate government bodies were notified, and advertisements placed in the *Illawarra Mercury Newspaper* (16 June 2020), which resulted in 12 Aboriginal organisations registering their interest.

A search conducted by the Office of the Registrar, *Aboriginal Land Rights Act 1983* (NSW) listed no Aboriginal Owners with land within the study area. A search conducted by the NNTT listed no Registered Native Title Claims, Unregistered Claimant Applications or Registered Indigenous Land Use Agreements within the study area. There was one unregistered Claimant Application within the study area, South Coast Peoples (NC2017/008).

Upon registration, the Aboriginal parties were invited to provide their knowledge on the study area and on the proposal provided in methodology documents.

Site officers from elected RAPs participated in the field investigation and provided comment on the study area with regard to the proposal. A record of consultation undertaken is provided in Section 4 of Appendix N.

7.10.5 Archaeological Investigation

A field survey of the study area was undertaken between 31 August and 2 September 2020 by Samantha Keats (Consultant Archaeologist), Matthew Tetlaw (Research Assistant), Byron Dale (Field Assistant), James Davis (Wodi Wodi Traditional Owner), and Paul Cummins and Kayla Williamson (Woronora Plateau Gundangara Elders Council).

i Sampling strategy

The sampling strategy was informed by previous archaeological work within the region, the survey methodology involved targeted survey of known landforms of archaeological sensitivity in order to re-locate previously recorded Aboriginal archaeological sites and to systematically survey the study area for new Aboriginal sites.

ii Survey methods

The archaeological survey was conducted on foot via means of a meandering foot transect with a field team of four members, identified in Section 7.10.4. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information that recorded during the survey included:

- Aboriginal objects or sites present in the study area during the survey;
- survey coverage;
- any resources that may have potentially been exploited by Aboriginal people;
- landform;
- photographs of the site indicating landform;
- evidence of disturbance; and
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

iii Archaeological survey results

The survey was conducted across two landforms, steep hills and steep low hills. These landforms were targeted on the basis of dense vegetation across most of the study area and limited access to some cliff lines. Poor ground visibility obscured the ability to identify potential artefact scatters, however, shelters and rock platforms were easily detectable.

The field team did not detect any Aboriginal sites or PADs within the study area and determined the archaeological potential of the entire study area to be low. Archaeological field surveys results are further defined in Appendix N.

7.10.6 Statement of significance

Site significance was assessed in accordance to:

- requirements of the Code;
- the Burra Charter; and
- the Guide to Investigating and Reporting Aboriginal Heritage.

The combined use of these guidelines is widely considered to represent the best practice for assessments of Aboriginal cultural heritage. The identification and assessment of cultural heritage values includes the four values of the Burra Charter: social, historical, scientific and aesthetic values. The resultant statement of significance has been constructed for the study area based on the significance ranking criteria assessed in Table 7.30.

Table 7.30 Significance assessment criteria

Site name	Criteria	Ranking
Wongawilli pit top	Cultural – discussions with the local Aboriginal communities reflect that the site is high in value	High
	Historical – the site is not connected to any historical event of personage	Low
	Scientific – the site possesses limited archaeological values	Low
	Aesthetic – the site has sustained significant disturbances associated with construction of the pit top and vent shaft	Moderate
Additional driveage	Cultural – discussions with the local Aboriginal communities reflect that the site is high in value	High
	Historical – the site is not connected to any historical event of personage	Low
	Scientific – the site possesses limited archaeological values	Low
	Aesthetic – the study area is relatively undisturbed and is a typical example of the Woronora Plateau in its natural context	High

7.10.7 Impacts and mitigation

As identified in Figure 7.34 there are no recorded Aboriginal sites within the study area to be impacted by the proposed modification. However, all RAPs noted the high cultural value of the Illawarra escarpment.

As Biosis has identified in Appendix N, the study area has been assessed as being of low potential for identification of any Aboriginal archaeological sites; however, have recommended in the unlikely event an item or items of Aboriginal historical significance should be discovered during the course of development the following protocols be followed:

- Recommendation 1: No further archaeological assessment is required - No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential.
- Recommendation 2: Discovery of unanticipated Aboriginal objects - All Aboriginal objects and Places are protected under the *National Parks and Wildlife Act 1974* (NPW Act). It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Heritage NSW, Department of Premier and Cabinet (Heritage NSW). Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying Heritage NSW and Aboriginal stakeholders.
- Recommendation 3: Discovery of Aboriginal ancestral remains - Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:
 1. Immediately cease all work at that location and not further move or disturb the remains.
 2. Notify the NSW Police and Heritage NSW's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
 3. Not recommence work at that location unless authorised in writing by Heritage NSW.
- Recommendation 4: The proponent should continue to consult with RAPs about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project.

7.10.8 Conclusion

Biosis has undertaken background research and a survey of the study area as part of the ACHA to identify and characterise any potential Aboriginal heritage constraints within the study area, see Appendix N. No Aboriginal sites or areas of potential archaeological deposit were identified within the study area during the survey. As a result, the study area has been assessed with low archaeological potential to contain Aboriginal sites. No further archaeological investigation has been recommended. Wollongong Coal propose to implement the recommendations as outlined within the ACHA and noted above.

7.11 Social

7.11.1 Introduction

A social impact assessment (SIA) was prepared by EMM for MOD2 to identify the potential social impacts and opportunities, as well as appropriate measures for managing adverse impacts and enhancing potential benefits.

The report (Appendix O) was prepared in accordance with the *Social Impact Assessment Guidelines for State Significant Mining, Petroleum and Industry Development* (DPE 2017) (the SIA guidelines).

7.11.2 Assessment approach

i Overview

The SIA was informed by data collected as part of the social baseline, community consultation and engagement findings, findings from technical studies, previous SIA reports from the same regional area, academic research and relevant government and agency reports.

The local community was informed of the project via the establishment of a community information session, project website, a community survey, SIA email account, regular newsletters distributed by mailbox drop to the local area and via download from the project website, and CCC meetings. These forums provided updates to the community on the proposed project, environmental assessments and the planning and approvals process.

The engagement and consultation undertaken as part of MOD2 is outlined in Chapter 6 of Appendix O.

ii Methodology

The scope of the SIA has been developed in accordance with the social characteristics and community values of the Council, the Wollongong community and the SIA Guidelines. The SIA adopted the approach and principles supported by international and NSW best practice guidance documents. The key components of the SIA are:

- determining the area of social influence;
- compiling demographic and socio-economic characteristics of affected communities;
- review of literature and strategic planning context;
- consultation with local communities and key stakeholders (see agencies identified in Section 6.4);
- analysis of social impacts and evaluation of their significance; and
- development of mitigation and enhancement strategy to address impacts and opportunities.

The following data and information have been used to identify potential impacts and their associated risks:

- data collected as part of the social baseline;
- limited findings from the stakeholder engagement activities;
- findings from technical reports;
- previous SIA reports from the same regional area;

- academic research; and
- relevant government and agency reports.

7.11.3 Social baseline

i Area of social influence

The SIA identified two key areas of social influence, including:

- the local area, which is the primary area of social influence for MOD2 and is known as the Horsley – Kembla Grange Statistical Area 2 (SA2), encompassing the suburbs of Dombarton, Wongawilli, Huntley, Horsley, and Kembla Grange; and
- the regional area, which is the Illawarra Statistical Area (SA4) and includes potentially impacted communities such as Dapto, Wollongong (nearest major city), and Port Kembla.

The communities identified in the local and regional areas have the potential to experience change during the establishment and operation of the project.

ii Key findings

The social baseline analysis included the following key findings for communities within the area that could be influenced by MOD2.

According to the 2016 Census, the local area has a total population of 8,659 people (ABS 2016) and a 2019 estimated resident population of 10,154 (ABS 2020), an increase of 7.2%. From 2011-2016, the population of the local area increased by 16.7%. Overall, the local area experienced a much greater population percentage increase than the regional area (6.3%) and NSW (8.1%).

The median age of persons in the local area is 35, compared to 39 in the regional area and 38 in NSW.

Overall, the regional and local areas depend on the following three industries as the main industries of employment:

- health care and social assistance (15.3% in the local, and 14.7% in the regional area);
- retail trade (12.2% in the local and 10.1% in the regional area); and
- construction (8.9% in the local and 9.5% in the regional area).

While the regional and local industries do not differ greatly, the education and training industry is more prominent in the regional area (10.9%) and in NSW (8.4%) (refer Table A.32 of Appendix O). Mining accounts for 2.3% in the local area, 2.0% in the regional area and 0.9% of the NSW total.

In 2019, there were 377 registered businesses in the local area, none of which employed more than 200 employees. Of these registered businesses, 98.8% were classed as small businesses employing fewer than 20 people (ABS 2016). Most of the businesses in the local area were non-employing or employed 1–19 employees of which 15 businesses turned over \$2M or more in 2019 compared to 927 in the Wollongong LGA.

Four major health risk factors that can be used as an indicator of physical population health are alcohol consumption, smoking, obesity, and asthma. The regional area population had a slightly higher percentage of the population who consumed alcohol at levels considered to be a high risk to health than NSW, at 16.2% and 15.5% respectively (PHIDU 2020). The percentage of the population in 2019 who smoke was above the state average. The percentage of people who are suffering from asthma is above the NSW average. There is also a higher rate of obesity among the regional population compared to NSW.

The number of properties for sale and rent in the local area indicate that the housing market in the area is tight, with minimal available properties to buy and very few to rent. Housing prices in the regional area have been steadily increasing from 2011-2017, with a dip in the market between 2017-2019, rising again in 2020. There has been an undersupply of rental housing in the local area.

The local area is not well serviced in terms of social infrastructure and services; however, most are accessible with minimal travel in the regional area. Residents within the local area have access to numerous childcare services, primary and secondary schools, and tertiary education institutions within the regional area.

The local area and regional area are located within the Illawarra Shoalhaven Local Health District. The closest public hospital service to the local area, offering the most comprehensive services, is Wollongong Hospital, with more than 500 beds.

Community services located in the regional area service the local area. These services are mainly concentrated in the suburbs of Wollongong.

The only emergency service within the local area is the Dapto Rural Fire Brigade in Wongawilli. The next closest emergency services are two additional Rural Fire stations and one NSW Ambulance station situated in Dapto, within the regional area.

The closest police station is also in Dapto and the closest State Emergency Service (SES) is in situated in Coniston, a 20-minute drive from Wongawilli.

As evidenced from the above social baseline (see full study in Appendix A of Appendix O), key vulnerabilities in the local area community relate to a high percentage of low-skilled workers, poor health indicators and lack of capacity in the housing and rental markets. Opportunities to remedy these vulnerabilities for the project may include improving upon or providing job training opportunities.

7.11.4 Summary of consultation

The Project attracted significant stakeholder and community interest as shown in the number of visits and visitors to the website (as detailed in Appendix O). In addition, interest was promoted by the multiple number of engagement activities described above (Section 7.11.2). However, the low number of responses to the online community survey and comparatively limited attendance to the CID mean the results of consultation are not representative of the community, who may or may not be in support of the Project. Those community members who attended the CID expressed support for the Project and those who raised concerns were against coal mining in general (voiced by members of Protector our Water Alliance) or based on misinformation about the Project and minimised upon further discussion with the Project team. A comparatively small number of community members that expressed concerns over the Project provided their feedback via the website and survey, as outlined in Appendix O. Impact assessment

The SIA conducted a social impacts and benefits assessment, by assessing the proposed change and likely consequences of MOD2 to the current social conditions experienced by the community, as well as the effectiveness of the proposed mitigation and management strategies.

A risk-based framework was adopted for the SIA, taking into consideration the findings from technical reports prepared for MOD2, as well as the perceptions of stakeholders identified from the Russell Vale Colliery.

The SIA acknowledges that assessment of social impacts is complex and as such requires the balancing of a range of factors and often competing interests. The SIA is reflective of this and has:

- assessed some aspects of MOD2 as both negative and positive as they relate to different groups of people;
- identified potential negative impacts and mitigation strategies on the local community while documenting the benefits to the broader region;
- considered the impacts on vulnerable groups and provided management strategies to ensure that any existing disadvantages are not exacerbated; and
- considered each community's access to critical resources, such as housing and health care, and how this affects their resilience.

The social impacts outlined in Table 7.31 have been assessed on a worst-case scenario initially and then the residual effect is assessed on the basis that mitigation and management strategies are successfully implemented.

A summary of assessment, using the social risk framework provided in Appendix B of Appendix O, is provided in Table 7.31.

Table 7.31 Summary of social risks attributed to MOD2

Impact	Description of social risk without mitigation	Affected parties	Duration	Extent	Unmitigated	Mitigated
Traffic and transport	Road delays due to increased traffic	Residents of the local area (particularly in housing estates off Wongawilli Road)	Construction and operation	Local area	Low – 6	Negligible -3
	Public safety from increased traffic	Residents in the local area	Construction and operation	Local area	Medium – 10	Low - 7
Groundwater	Access to groundwater	Groundwater users	Construction and operation	Local and regional area	Negligible- -1	Negligible – 1
	Impacts on livelihood from groundwater depressurisation	Groundwater users	Operation and post-operation	Local and regional area	Negligible – 1	Negligible - 1
Historic heritage	Loss of historic heritage	Residents of the local area	Construction, operation and past closure	Local area	Low – 6	Negligible – 5
Noise	Health impacts from noise	Neighbouring residents	Construction and operation	Immediate local area	High – 12	Low - 6
Noise	Amenity impacts from noise and vibration	Residents in the local area	Construction and operation	Local area	Medium – 8	Low – 6
Air quality	Health impacts from expelled dust	Neighbouring residents	Construction and operation	Immediate local area	Medium – 8	Negligible -2

Table 7.31 Summary of social risks attributed to MOD2

Impact	Description of social risk without mitigation	Affected parties	Duration	Extent	Unmitigated	Mitigated
	Health impacts from GHG emissions	Neighbouring residents	Construction and operation	Local area	Low – 6	Low – 6
Biodiversity	Loss of native species' habitats	Residents in the regional area/ potentially any environmentally concerned persons	Construction and operation	0.03 ha in the local area	Low – 6	Negligible -3

In addition to the above, the SIA also considered the cumulative impacts of MOD2. There are several concurrent development projects operating or intended to operate in and around the local area, including:

- Kembla Grange Resource Recovery Facility, which will involve the development of a waste collection, treatment and disposal centre; and
- the West Dapto (Horsley) Water Infrastructure project, which will involve the development of a sewerage collection, treatment and disposal infrastructure.

7.11.5 Mitigation measures

The proposed mitigation and management strategies for potential social impacts identified in Table 7.31 and outlined in Table 7.32.

Table 7.32 Summary of mitigation and management strategies for identified social risks

Impact	Description of social risk	Proposed mitigation and management strategies	Responsibility
Traffic and transport	Road delays due to increased traffic	Reduced hours of production on weekends and out of hours	Wollongong Coal
	Public safety from increased traffic	Council upgrades to Wongawilli Road (previously owned by the Colliery)	Wollongong City Council
Groundwater	Access to groundwater	No impact or mitigation required	-
	Impacts on livelihood from groundwater depressurisation	No impact or mitigation required	-
Historic heritage	Loss of historic heritage	Archival recording, high visibility bunting, and unexpected finds procedure	Wollongong Coal
Air quality	Health impacts from expelled dust	Dust suppression measures outlined in AQIA	Wollongong Coal
	Health impacts from GHG emissions	No impact or mitigation measures	Wollongong Coal

Table 7.32 **Summary of mitigation and management strategies for identified social risks**

Impact	Description of social risk	Proposed mitigation and management strategies	Responsibility
Biodiversity	Loss of native species' habitats	Actions to avoid or minimise impacts and offsetting one vegetation zone through the transfer and retirement of biodiversity credits or by paying into the BCT Offset Fund	Wollongong Coal
Noise	Amenity impacts from noise and vibration	Reduced out of hours operation and mitigation measures outlined in noise assessment	Wollongong Coal

It is proposed that a monitoring and management framework be developed to ensure that the identified social impacts are monitored over time to measure the effectiveness or otherwise of the proposed mitigation and management measures, including changing conditions and trends in the local and regional areas over the same period.

It is proposed that the monitoring and management framework identifies the following key aspects:

- track progress of mitigation and management strategies;
- assess actual project impacts against predicted impacts;
- identify how information will be captured for reporting to impacted stakeholders including landholders, communities and government on progress and achievements;
- key performance indicators, targets, and outcomes;
- identify responsible parties; and
- mechanisms for ongoing adaption of management measures when and if required.

To ensure the effectiveness of the management measures, it is recommended that a continuous improvement approach be adopted allowing for the review and adaption of impacts, management measure and outcomes.

7.11.6 Conclusion

The SIA concludes that the initiatives built into the project design, and the mitigation and management measures proposed to address increased traffic, historic heritage, impacts from noise, expelled dust, amenity and loss of native species' habitat, will minimise potential impacts to the local and regional communities.

7.12 Economic

7.12.1 Introduction

An economic assessment for MOD2 has been prepared by Gillespie Economics (Gillespie Economics 2020). The full report is included in Appendix P.

The economic assessment considers both:

- the efficiency of the project – ie the economic costs and benefits; and
- the impacts of the project – ie the effects that the project will have on local economy.

7.12.2 Assessment method

The economic assessment was carried out in accordance with relevant standards and guidelines as follows:

- *Guideline for the economic assessment of mining and coal seam gas proposals* (the Guidelines) (NSW Government 2015); and
- *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government 2018).

Consistent with the above guidelines, two types of analysis were prepared in the economic assessment including:

- a cost benefit analysis (CBA), which assists with evaluating the net benefits of projects and policies, provides economic justification for a project and addresses the public interest; and
- a local effects analysis (LEA) to assess the impacts of MOD2 in the locality, specifically:
 - effects relating to local employment;
 - effects relating to non-labour project expenditure; and
 - environmental and social impacts on the local economy.

The economic assessment was based on financial, technical and environmental advice provided by Wollongong Coal and EMM and was evaluated using two different scenarios, comprising MOD2 as a project of its own and an evaluation of MOD2 as a subcomponent of a larger future potential mining project (ie mining within the North West Domain, for which Wollongong Coal propose to seek future approval).

The NSW Treasury (2007, p33) notes

A project may consist of a series of component parts. In such circumstances it is the evaluation of the larger project which is critical and it is essential that this be provided, not just an evaluation of the individual component part.

Consequently, MOD2 will provide access to the North West Domain and ensure continuity of mining operations, assuming that the North West Domain Project will require a 3-5-year period for application preparation, submission and determination.

7.12.3 Assessment criteria

Consistent with the NSW Government (2015), the quantification/valuation of benefits and costs was undertaken:

- in 2020 real values;
- with discounting at 7% and sensitivity testing at 4% and 10%; and
- with an analysis period in 7 years, comprising one year per MOD2, the MOD2 life and one year post MOD2.

Where competitive market prices are available, they have generally been used as an indicator of economic values. Environmental, cultural and social impacts have initially been left unquantified and interpreted using the threshold value method.

An attempt has also been made to estimate environmental, cultural and social impacts using market data and benefit transfer and incorporate them into an estimate of the net social benefit of MOD2.

7.12.4 Cost benefit analysis

i Overview

CBA is the method used to consider the economic efficiency of projects by providing a comparison of the present value of aggregate benefits to society, as a result of a project, with the present value of aggregate costs (ie the net benefit). Provided the present value of benefits to society exceed the present value of the costs, a development is considered to improve the well-being of society and hence is desirable from an economic efficiency perspective.

CBA involves the following steps:

- identification of the base case (ie 'with' or the 'without the project' scenario), which for MOD2, the 'without the project' scenario would limit the Colliery operations to December 2020 and the Colliery would remain in care and maintenance, with required rehabilitation and decommissioning occurring thereafter;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates using discounting to account for temporal differences;
- application of decision criteria;
- sensitivity testing;
- consideration of non-quantified benefits and costs; and
- consideration of the distribution of costs and benefits.

ii Identification of benefits and costs

The CBA of mining projects involves a trade off between:

- the net production benefit of a project to society, including royalties, company tax and net producer surplus and any economic benefits to existing landholders, employees and suppliers; and
- the environment, social and cultural impacts of the project, including net public infrastructure costs.

Relative to the base case, or “without” MOD2 scenario, MOD2 itself is associated with a number of production costs, such as opportunity costs, development costs and operating costs, that Wollongong Coal is willing to incur to establish access to the North West Domain and have continuity of future potential mining operations. These production costs are partially offset by the value of coal extracted, deferred rehabilitation and decommissioning requirements at the mine site, and the residual value of land and capital at the cessation of MOD2. In addition, there may potentially be some environmental, social and cultural impacts as a result of MOD2.

Furthermore, when MOD2 is considered as part of a larger project involving mining the North West Domain then net production benefits are likely to be positive, with royalties and company tax benefits accruing to Australia and NSW and net producer surplus benefits accruing to Wollongong Coal. These net production benefits also need to be considered in relation to the environmental, social and cultural impacts of the larger project.

The potential costs and benefits of the project are summarised in Table 7.33. However, it should be noted that if the potential externality impacts listed in the table are mitigated to the extent where community wellbeing is significantly affected, then no external economic costs arise.

Table 7.33 Potential and alternative economic benefits and costs of the project

Costs	Benefits
Potential incremental economic benefits and costs of MOD2	
Opportunity costs of land and capital	Deferred rehabilitation and decommissioning
Development costs	Sale value of coal
Operating costs, including administration, mining, processing, transportation, mitigation measures and offsets (but excluding royalties)	Residual value of land and capital at the cessation of MOD2
Environmental, social and cultural impacts	
Alternative frame of potential economic benefits and costs of MOD2	
Direct costs	Direct benefits
Nil	Net production benefits: <ul style="list-style-type: none"> • royalties; • company tax; • net producer surplus;
Indirect costs	
Environmental, social and cultural impacts	

The estimated costs of the project are described in detail in the economic assessment (refer Appendix P), and include:

- the opportunity cost of capital and land;
- capital cost of MOD2; and
- annual operating costs.

The production benefits of MOD2 (including estimated value of coal, royalties, deferred decommissioning and rehabilitation and residual value), and the environmental, social and cultural costs and benefits have also been quantified and are described in detail in Appendix P. The environmental, social and cultural costs and benefits accounted for include:

- the cost of obtaining surface and groundwater licences;
- costs related to GHG emissions;
- biodiversity offset related costs (estimated at \$20,000); and
- groundwater WALs (assumed to be \$2,000/ML ie \$0.06M).

The economic assessment that there would be no net infrastructure costs to government, and no loss of surplus to other industries. Economic benefits to existing landholders and to suppliers are not included in the calculations.

MOD2 will provide additional employment for the regional and NSW economy. There are potentially wage benefits for these workers if wages received are in excess of their reservation wage. However, for the purpose of the economic assessment it is assumed that there are no wage benefits to workers.

Environmental, social and cultural impacts of MOD2 have been minimised through project design and mitigation, offset and compensation measures. Where mitigation measures have been identified, these have been included in the capital costs for MOD2, as indicated in the result of the CBA presented in Appendix P.

iii Results

MOD2 is estimated to have global net production benefit of \$43.8M (present value at 7% discount rate). Wongawilli Colliery is 100% foreign owned, and therefore the components of the net production benefits that accrue to Australia are government royalties and company tax (assuming a 30% company tax rate). On this basis, the net production benefits of MOD2 that accrue to Australia are estimated at \$11.1M (present value at 7% discount rate), comprising royalties of \$2.9 M (present value at 7% discount rate) and a company tax deduction of - \$14M, that can only be realised if there is positive taxable income from which it can be deducted. If it cannot be realised then the net production benefit to Australia is \$2.9 M (present value at 7% discount rate).

These net production benefits can be further apportioned to NSW by assuming that company tax benefits/costs accrue to NSW based on its population share and that all government royalties accrue to NSW. On this basis, the net production benefits of MOD2, which accrue to NSW, are estimated at - \$1.6M to \$2.9M (present value at 7% discount rate) comprising royalties of \$2.9M (present value at 7% discount rate) and a company tax deduction of - \$4.5M, that can only be realised if there is positive taxable income from which it can be deducted. If it cannot be realised then the net production benefit to NSW is \$2.9M (present value at 7% discount rate).

From Table 7.34 it can be seen that the main potential environmental, social and cultural impacts of MOD2 are immaterial from biophysical perspective and hence immaterial from an economic efficiency perspective. The externalities that were quantified, ie GHG emissions, opportunity cost of holding the required groundwater WALs, and biodiversity offset costs are also minor.

Table 7.34 Global costs and benefits (present value, 7% discount rate)

	Costs	\$M	Benefits	\$M
Production	Opportunity cost of land	\$6.2	Deferred rehabilitation and decommissioning	\$9
	Opportunity cost of land	\$43.7	Revenue	\$42.3
	Capital costs	\$29.8	Residual value of land	\$5.1
	Operating costs (ex royalties)	\$56.2	Residual value of capital	\$35.6
	Sub-total	\$135.8	Sub-total	\$92

Table 7.34 Global costs and benefits (present value, 7% discount rate)

Costs		\$M	Benefits	\$M
			<i>Global net production benefits</i>	- \$43.8
			<i>Australian net production benefits</i>	-\$11.1 to \$2.9
			<i>NSW net production benefits</i>	-\$1.6 to \$2.9
Externalities	Greenhouse gas emissions (Scope 1 and 2)	\$0.02	Wage benefits to employment	Not quantified
	Operational noise	No material impact	Economic benefits to existing landholders	\$0
	Road transport	No material impact	Economic benefits to suppliers	\$0
	Air quality	No material impact		
	Groundwater	\$0.06		
	Surface water	No material impact		
	Subsidence	No material impact		
	Biodiversity	\$0.02		
	Aboriginal heritage	No material impact		
	Historic heritage	No material impact		
	Net public infrastructure costs	No material impact		

iv NSW cost and benefits

The economic assessment combined the results of Table 7.34 with Table 2.7 in Appendix P, to show the net social benefits of MOD2, by itself, to NSW. This indicates that MOD2 will have net social benefits to NSW of between - \$1.7M and \$2.8M (present value at 7% discount rate), depending on whether Wollongong Coal can realise the tax deduction that arises from MOD2.

v Consideration of the larger project

MOD2 is the first stage of a larger potential mining project involving mining in the North West Domain. For the purpose of the economic assessment, it was estimated that 375 Mt of in situ coal resource is potentially available to the Wongawilli Colliery (Clark 2017).

It is recognised that any subsequent stages would require a separate approval and that there is uncertainty in regard to obtaining approval. Notwithstanding, some indication of potential net production benefits to NSW of the overall project can be gained from making the following assumptions:

- ROM production of 2.1 Mtpa for 28 years commencing in five years' time;
- product coal recovery following washing of 80%;
- 100% hard coking coal;

- KPMG long term benchmark price for hard coking coal – USD137.2/t;
- KPMG long term AUD:USD exchange rate – 0.73; and
- various probabilities of project approval ranging from 30% to 100%.

Taking the above into consideration, potential expected value of royalty benefits from the larger project range between \$57M and \$191M (present value at 7% discount rate), depending on the assumed probability of obtaining project approval. This is a minimum benefit of the larger project as it does not include potential company tax benefits and wage benefits. Any residual environmental, social and cultural impacts of this larger project after mitigation, compensation and offset, would also need to be compared against the estimated production benefits and would be the subject of a future economic assessment.

vi Risk and sensitivity analysis

A sensitivity analysis of the various assumptions used in the CBA was undertaken for NSW by applying 4%, 7% and 10% discount rates for the following:

- opportunity cost of land;
- opportunity cost of capital;
- operating costs;
- capital costs;
- deferred rehabilitation and decommissioning costs;
- revenue;
- residual value of land;
- residual value of capital;
- greenhouse gas costs;
- groundwater costs; and
- surface water costs.

DPIE has previously identified that the financial viability of projects is a risk assumed by the project owners. Wollongong Coal is willing to incur a financial loss associated with MOD2 to facilitate access to the North West Domain and ensure continuity of mining operations. Any risk that MOD2 may commence and then cease operation for financial reasons leaving unmet rehabilitation liabilities is mitigated by the fact that Wollongong Coal is required to pay a rehabilitation security deposit to DPIE as the holder of a mining authority under the Mining Act. This security deposit is held by DPIE-DRE to ensure that the legal obligations in relation to rehabilitation and safety of the site can be met following mine closure. If rehabilitation obligations are not met to the satisfaction of the Minister, then the security funds would be used by DPIE-DRE to meet the relevant requirements.

The provision of biodiversity offsets can be associated with a number of risks, which are mitigated through offset ratio requirements in the provision of offsets and commitment to pay into the Biodiversity Conservation Trust Fund, whereby the offsets will be obtained and managed via the Biodiversity Conservation Trust.

This analysis indicates that CBA is most sensitive to changes in revenue (reflecting production levels, the value of coal in USD and the USD/AUD exchange rate) and to a lesser extent operating costs and capital costs. This is because changes in revenue directly impact royalties which is the main component of net production benefits to NSW. Changes in revenue also impact tax estimates.

However, sensitivity analysis indicated that the CBA results are not sensitive to changes in GHG costs, groundwater costs or biodiversity offset costs.

Under all scenarios examined, the net social benefits to NSW range from slightly negative to slightly positive depending on whether tax losses can be realised. This reflects the nature of MOD2 as an initial investment as a component of a larger future potential project.

7.12.5 Local effects analysis

Local Effects Analysis (LEA) compliments the CBA by translating effects identified at the NSW level to the potential impacts on the communities located near the MOD2 area.

For the LEA, the locality is defined as the Illawarra SA4, which includes the LGAs of Wollongong, Shellharbour and Kiama. This area is considered to be the main source of labour and non-labour inputs for MOD2.

MOD2 will employ up to 150 people on site at any one time, including direct employees and contractors. On an average annual basis, direct employment (ie employees, is estimated at 56). Based on historic employment data, 97% of these workers are expected to be sourced from the local area. The effects of MOD2 on regional activity were quantified with consideration of other wage impacts, housing impacts, and environmental and social impacts.

A summary of the local effects is outlined in Table 7.35.

Table 7.35 Summary of local effects

Item	Project direct	Project direct local	Net direct effect (with multiplier)
Local effects			
Average annual direct employment EFT	56	54	26
Net income (\$M)			2.5
Non-labour expenditure in the Local Area	7.5		
Regional impacts			
	Direct	Flow-on	Total
Output (\$M)	23	20	43
Value-added (\$M)	9	11	19
Income (\$M)	6	5	11
Employment	56	62	118
Other local economic impacts			
Contraction in other sectors	No material impact*		
Displaced activities	No material impact*		
Wage rise impacts	No material impact*		
Housing impacts	No material impact*		

Table 7.35 Summary of local effects

Item	Project direct	Project direct local	Net direct effect (with multiplier)
Local Environmental Impacts			
Greenhouse gas emissions (Scope 1 and 2)		\$0.00	
Operational noise		No material impact*	
Road transport		No material impact*	
Air quality		No material impact*	
Groundwater		No material impact* - cost borne by Wollongong Coal	
Surface water		No material impact	
Subsidence		No material impact*	
Biodiversity		No material impact* cost borne by Wollongong Coal	
Aboriginal heritage		No material impact*	
Historic heritage		No material impact	
Net public infrastructure costs		No material impact	

* The Illawarra SA4 Local Area population is a small fraction of the NSW population. NSW GHG impact have been apportioned accordingly.

7.12.6 Conclusion

A CBA of MOD2, indicates net production benefits to NSW at -\$1.6M to \$2.9M (present value at 7% discount rate) comprising royalties of \$2.9M (present value at 7% discount rate) and a company tax deduction of -\$4.5M, that can only be realised if there is positive taxable income from which it can be deducted. If it cannot be realised then the net production benefit to NSW is \$2.9M (present value at 7% discount rate). There will also be some additional externality costs (\$0.1M, present value at 7% discount rate) associated with GHGs, biodiversity offsets and the opportunity cost of holding groundwater licences. Overall MOD2 is estimated to have net social benefits to NSW of between -\$1.7M and \$2.8M (present value at 7% discount rate).

However, from an economic perspective, MOD2 is part of a larger project involving mining in the North West Domain. The expected value of royalty benefits from mining in the North West Domain range from \$57M and \$191M (present value at 7% discount rate), depending on the assumed probability of obtaining project approval. This is a minimum benefit of mining in the North West Domain as it does not include potential company tax benefits and wage benefits. Any residual environmental, social and cultural impacts of this larger project after mitigation, compensation and offset, would need to be compared against the estimated production benefits. This will be the subject of a future economic assessment.

MOD2 will provide direct economic activity, including jobs, to the local area of Illawarra SA4, and indirect economic activity to the local area via both wage and non-wage expenditure. Environmental, social and cultural impacts of MOD2 to the local community are not expected to be material from an aggregate economic efficiency perspective.

8 Evaluation of merits

8.1 Introduction

A description of the need and justification for MOD2 is provided below with regard to biophysical, social and economic factors; the principles of ecologically sustainable development (ESD); and the consistency of MOD2 with the objects of the EP&A Act.

8.2 MOD2 impacts

This modification report assesses the potential impacts that may result from the MOD2. The assessment of environmental issues has been multi-disciplinary and involved consultation with DPIE and key stakeholders as outlined in Chapter 6 of this report.

MOD2 will not result in significant biophysical, social or economic impacts and MOD2 report has identified that any residual impacts can be appropriately managed.

8.3 MOD2 benefits

MOD2 will extend the life of the Colliery by five years, enable completion of the NWMD and prevent the sterilisation of a high-quality coal resource within Wollongong Coals mining tenements whilst utilising existing site infrastructure.

The first workings mining method proposed by the modification leaves pillars intact and the overlying strata fully supported. Ensuring no potential for the main heading development roadways (ie the approved NWMD and Additional Driveage) to cause perceptible surface ground movement or additional groundwater and surface water impacts to that currently approved.

This modification report has assessed and determined MOD2 will not results in any new significant biophysical, social and economic impacts. As such, the residual impacts can continue to be managed in accordance with the modified consent, updated mitigation measures and management plans which will be revised as part of MOD2.

MOD2 aligns with the strategic policies for the region, including the NSW Strategic Statement on Coal Exploration and Mining in NSW (DPIE - Division of Resources and Geoscience, 2020), and would assist the state to continue to meet predicted growing coal demand, particularly from Asian markets with the majority of coal production to be sold to JSPL's for steel and power generation.

The modification would allow for existing social and economic benefits of the Colliery to continue as a result of the extended mine life. Enable the employment of up to 150 FTE employees, while supporting local and regional suppliers. The modification would also provide stability and certainty to local and regional communities, contributing to negating possible social and economic impacts during a period financial hardship caused by COVID-19. Economic benefits would extend to state and national levels with ongoing royalty payments and export sales.

In addition, the modification will enable the continuation of a brownfield site in a long-established coal mining precinct. Minimal or no changes are proposed to a number of key aspects of the existing operations at the Colliery; in particular, there is no proposed increase in annual coal extraction volumes or water requirements, nor is perceptible subsidence predicted. Potential environmental impacts of the project, such as impacts in relation to traffic, air quality and noise are therefore expected to be much the same as that of the existing operations. Or as is the case with noise and traffic related impacts, reduced given mitigation and management measures documented within this report.

8.4 Ecological sustainable development

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future. Wollongong Coal are committed to the principles of ESD and understand that biophysical, social and economic objectives are interdependent.

Wollongong Coal acknowledge that well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation. With two coal mines in operations, up to date EPA licensing, Wollongong Coal understands the importance of maintaining ESD objectives on site and has extensive experience implementing ESD principles in all its development projects and assets.

The principles of ESD, for the purposes of the EP&A Act, are provided in Clause 7(A) of Schedule 2 of the EP&A Regulation. The four principles of ESD are:

- precautionary principle – the precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- inter-generational equity – the principle of inter-generational equity is that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- conservation of biological diversity and maintenance of ecological integrity – the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and
- improved valuation and pricing of environmental resources – improved valuation, pricing and incentive mechanisms should be promoted.

MOD2 has been designed to reduce impacts to a level which is as low as is reasonably practicable and which are generally in accordance with the impacts of the approved Colliery. Each of the four principles of ESD are considered further below.

8.4.1 Precautionary principle

This modification report has assessed the potential biophysical, social and economic impacts of MOD2, including detailed technical assessments of the key potential issues. The assessments have found that MOD2 will not result in any new significant biophysical, social or economic impacts and the residual impacts can continue to be managed in accordance with the modified consent, updated mitigation measures and management plans which will be revised as part of MOD2.

Wollongong Coal will continue environmental monitoring and to confirm that the impacts of MOD2 are in accordance with the predicted impacts. Environmental management measures will be reviewed and, where required, updated if any impacts are greater than assessed.

8.4.2 Inter-generational equity

Wollongong Coal will continue to undertake ongoing environmental monitoring with mitigation measures to provide effective environmental management across its operation. This management is provided through planning, communication, documentation, review and feedback. These environmental management measures ensure that the health, diversity and productivity of the environment is maintained or enhanced for future generations.

As described above the first workings mining method proposed by modification leaves pillars intact and the overlying strata fully supported resulting in perceptible ground movement. As a result, the modification would not obstruct future potential land uses, environmental outcomes or economic opportunities within the vicinity of the proposed mining activities.

Under the current conditions of its PA, the Colliery is approved to undertake mining operations until 31 December 2020, therefore in the absence of MOD2, it is likely that the approved NWMD and any future underground mining in the North West Domain (subject to a future separate planning process and full merit assessment) would not proceed. The mine would likely be rehabilitated in accordance with conditions under the PA. Should this occur, the economic and social benefits of the NWMD would not be realised, nor that of future potential mining activities. Restricting the ability for both current and future generations to benefit from the Colliery.

8.4.3 Conservation of biological diversity and maintenance of ecological integrity

The potential environmental impacts of MOD2 are detailed in this modification report. MOD2 is not expected to cause direct impacts to threatened species or endangered ecological communities. A BDAR has been undertaken with potential ecological impacts, mitigation measures and offset requirements summarised in Section 7.8 and attached in Appendix L.

8.4.4 Improved valuation and pricing of environmental resources

MOD2 will support the ongoing, efficient operation and supply of coal production from the Colliery and provide an economically viable pathway for Wollongong Coal to continue development of the approved NWMD. Furthermore, MOD2 allows for further assessment into the North West Domain which demonstrates an economically viable resource which would not be accessible without the proposed NWMD.

8.5 Conclusion

MOD2 has been designed to avoid and minimise adverse biophysical, social and economic impacts. MOD2 is anticipated to result in minimal environmental impacts beyond those previously assessed and approved under the consent. The residual impacts have been identified and assessed.

All aspects relating to environmental management will continue in accordance with the PA 19_0161 (as modified), EPL 1087, revised site management plans, and the mitigation measures consolidated in Appendix D.

MOD2 and 5 year extension to the operation of the Colliery will provide immediate and long-term benefits to the local community, region and State.

As the potential environmental impacts can be managed and mitigated with few residual impacts and there are a range of immediate economic benefits from extending the life of the mine through MOD2, Wollongong Coal are confident that MOD2 is in the public interest. MOD2 allows the best use of the approved Colliery and the site and presents an opportunity to meet ongoing coal demand without establishing a greenfield site. Rather, MOD2 will enable production from a brownfield site in a well-established coal mining region.

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Abbreviations

Abbreviation	Definition
μS/cm	Microsiemens per centimetre
mAHD	Australian Height Datum
AAQ NEPM	<i>National Environment Protection (Ambient Air Quality) Measure</i>
ABS	Australian Bureau of Statistics
AERMOD	Atmospheric dispersion modelling system
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal heritage impact permit
AQGHGMP	Air Quality and Greenhouse Gas Management Plan
AQIA	Air quality impact assessment
AQMS	Air quality monitoring station
BAM	Biodiversity Assessment Method
BC Act	<i>NSW Biodiversity Conservation Act 2016</i>
BCD	Biodiversity and Conservation Division
BDAR	Biodiversity development assessment report
BoM	Bureau of Meteorology
CBA	Cost benefit analysis
CCL	Consolidated coal lease
CHL	Commonwealth Heritage List
CMP	Conservation management plan
Colliery	Wongawilli Colliery
Council	Wollongong City Council
COVID-19	Coronavirus disease
DA	Development approval
DAWE	Commonwealth Department of Agriculture, Water and the Environment
Db	Dust deposition gauges
DDGs	Dust deposition gauges
DoEE	Australian Government Department of the Environment and Energy (DoEE)
DoI	Department of Industry
DPE	NSW Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EA	Environmental assessment
EC	Electrical conductivity
ESD	Ecologically Sustainable Development
EMM	EMM Consulting Pty Limited

EIS	Environmental Impact Statement
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPA	NSW Environment Protection Authority
EPI	Environmental planning instruments
EPL	Environmental Protection Licence
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2000
ESD	Ecologically sustainable development
FEL	Front end loader
FTE	Full time equivalent
GHG	Greenhouse gas
Gujarat NRE	Gujarat NRE Coking Coal Limited
Ha	Hectares
ICNG	<i>Interim Construction Noise Guideline</i>
IEA	International Energy Agency
IECA	Illawarra Escarpment Conservation Area
INP	<i>NSW Industrial Noise Policy</i>
IPC	Independent Planning Commission
JSPL	Jindal Steel and Power Limited
IS Regional Plan	Illawarra Shoalhaven Regional Plan 2036
Km	Kilometres
Kg	Kilograms
kL	Kilolitres
kV	Kilovolt
LEA	Local effect analysis
LEP	Local Environmental Plan
LGA	Local government area
LOS	Level of Service
Mg/l	Milligrams per litre
ML	Mining leases
MNES	Matters of national environmental significance
Mining Act	NSW <i>Mining Act 1992</i>
Mining SEPP	<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
Mm	Millimetres
MOD1	Modification approved in December 2015
MOD2	The proposed modification (subject of this modification report)
Mt	Million tonnes

Mtpa	Million tonnes per annum
MOP	Mining Operations Plan
NEMP	National Environment Protection Measure
NGAF	National Greenhouse Accounts Factors
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
NHL	National Heritage List
NMP	Noise Management Plan
NorBE	Neutral or beneficial effect
NPfi	<i>Noise Policy for Industry</i>
NPI	National Pollution Inventory
NSW	New South Wales
NVIA	Noise and vibration impact assessment
NWMD	North West Mains Development
OEH	Office of Environment and Heritage
Oz	Ounces
PA	Project approval
PAA	Project application area
PAC	Planning Assessment Commission
PCTs	Plant community types
PM _{2.5}	Particulate matter less than 2.5 µm in aerodynamic diameter
PM ₁₀	Particulate matter less than 10 micrometres (µm) in aerodynamic diameter
POEO Act	<i>NSW Protection of the Environment Operations Act 1997</i>
POEO Regulation	Protection of the Environment Operations (Clean Air) Regulation 2010
RAPs	Registered Aboriginal Parties
RBL	Rating background level
RING	<i>Rail Infrastructure Noise Guideline</i>
RMS	Roads and Maritime Services (RMS)
RNP	<i>NSW Road Noise Policy</i>
ROM	Run-of-mine (coal)
SES	State Emergency Services
SEPP	State environmental planning policy
SEPP 33	<i>State Environmental Planning Policy No 33 – Hazardous and Offensive Development</i>
SGA	Subsidence and geotechnical assessment
SHI	State Heritage Inventory
SHR	State Heritage Register
SIA	Social impact assessment
SIDRA	Signalised & unsignalised intersection design and research aid

SoHI	Statement of heritage impact
SSD	State significant development
SWA	Surface water assessment
TECs	Threatened ecological communities
TfNSW	Transport for NSW
TIA	Traffic impact assessment
TDS	Total dissolved solids
TIA	Traffic impact assessment
TMP	Traffic Management Plan
TSP	Total suspended particles
WAL	Water access licence
WCSP 2028	Wollongong 2028 Community Strategic Plan
WNSW Act	<i>WaterNSW Act 2014</i>
Wollongong Coal	Wollongong Coal Pty Ltd



