

METROPOLITAN COAL LONGWALLS 305-307

COAL RESOURCE RECOVERY PLAN



METROPOLITAN COAL

LONGWALLS 305-307

COAL RESOURCE RECOVERY PLAN

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DPIE Approval Date
All	CRRP-R01-A	Original	DPIE, DRG	-
Section 3.3, Attachment 1	CRRP-R01-B	Revised to reflect the shortening of Longwalls 305 and 306	DPIE, DRG	16 March 2020
All	CRRP-R01-C	Updated to reflect 50 m extension to Longwall 307	DPIE	

June 2021

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1 INTRODUCTION

Metropolitan Coal is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) under section 75J of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval is available on the Peabody website (<http://www.peabodyenergy.com>).

The Project comprises the continuation, upgrade and extension of underground coal mining operations (Longwalls 20-27 and Longwalls 301-317) and surface facilities at Metropolitan Coal (Figure 1). Longwalls 305-307 are situated to the west of Longwalls 301-304, and define the next mining sub-domain within the Project underground mining area (Figures 1 to 3). Longwalls 308 on will be subject to future Extraction Plans.

1.1 PURPOSE AND SCOPE

In accordance with Condition 6(e), Schedule 3 of the Project Approval, this Coal Resource Recovery Plan (CRRP) has been prepared as a component of the Metropolitan Coal Longwalls 305-307 Extraction Plan to demonstrate effective recovery of the available resource.

The relationship of this CRRP to the Metropolitan Coal Environmental Management Structure and to the Metropolitan Coal Longwalls 305-307 Extraction Plan is shown on Figure 4.

The following graphical plans (Attachment 1) have been prepared in accordance with Department of Planning and Environment (DP&E) and Division of Resources and Energy (DRE) (2015) *Guidelines for the Preparation of Extraction Plans*:

- Plan 1 Existing, Proposed and Future Workings.
- Plan 2 Longwalls 305-307 Surface Features.
- Plan 3 Geological and Seam Data.
- Plan 5 Mining Titles and Land Ownership.
- Plan 6 Geological Section and Geotechnical Logs.

As there are currently no existing and/or planned future workings in seams above and/or below the proposed workings, Plan 4 referred to in the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans* has not been included in this CRRP. Plan 7 (Subsidence Monitoring Locations) is included in the Metropolitan Coal Longwall 305-307 Subsidence Monitoring Program.

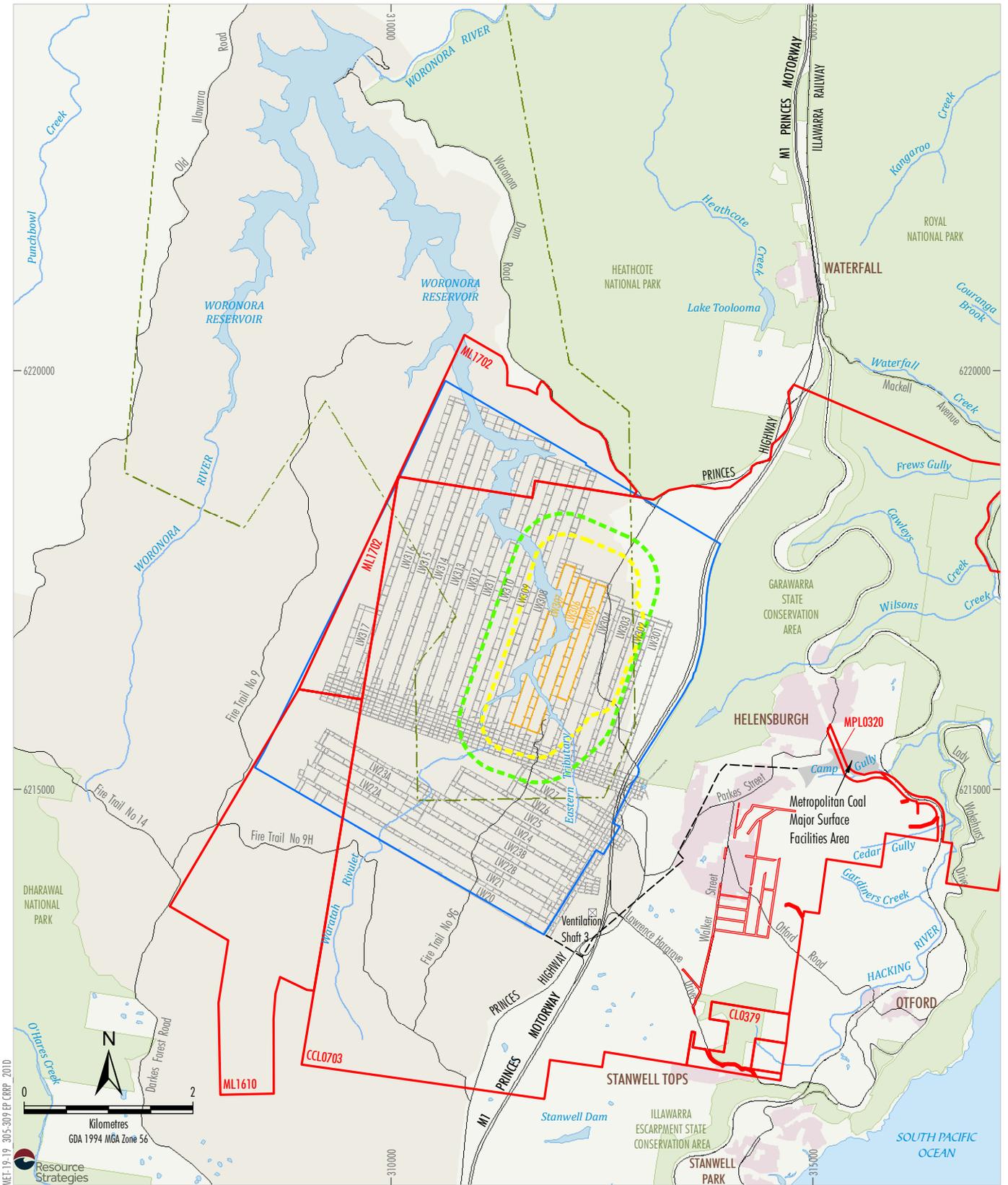
2 COAL RESOURCE RECOVERY PLAN REVIEW AND UPDATE

In accordance with Condition 4, Schedule 7 of the Project Approval, this CRRP will be reviewed within three months of the submission of:

- an audit under Condition 8, Schedule 7;
- an incident report under Condition 6, Schedule 7;
- an annual review under Condition 3, Schedule 7; and

if necessary, revised to the satisfaction of the Director-General (now Secretary) of the DPIE.

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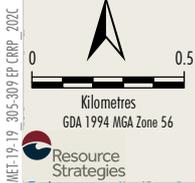
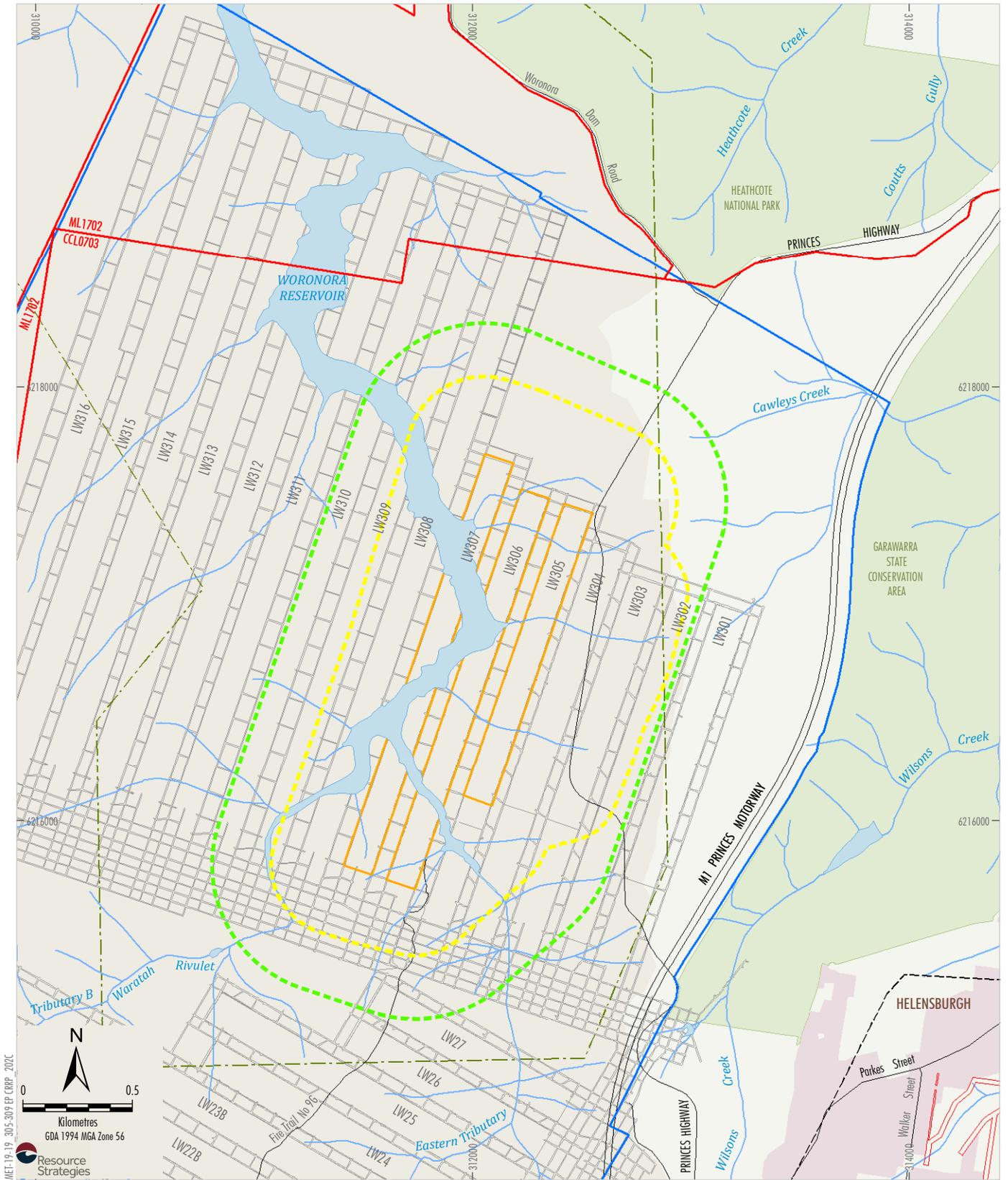
ME1-19-305-309 EP CRPP 2010
Resource Strategies

- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 305-307 Secondary Extraction
 - Longwalls 305-307 35° Angle of Draw and/or
Predicted 20 mm Subsidence Contour
 - 600 m from Longwalls 305-307
Secondary Extraction
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015);
Metropolitan Coal (2019); MSEC (2019)

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METROPOLITAN COAL
Longwalls 305-307 and
Project Underground Mining Area

Figure 1



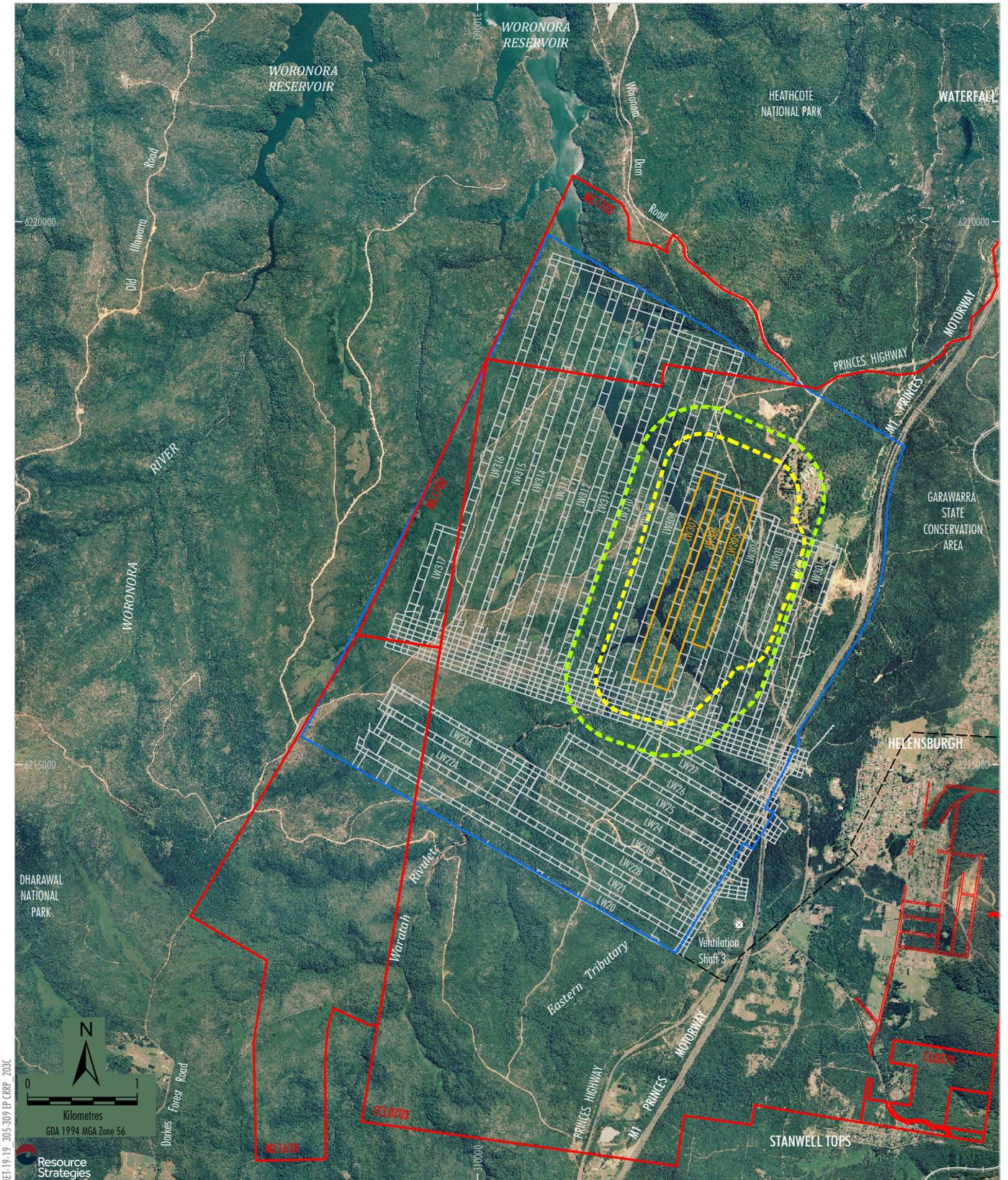
LEGEND

- ▭ Mining Lease Boundary
- ▭ Woronora Special Area
- ▭ Project Underground Mining Area
Longwalls 20-27 and 301-317
- ▭ Longwalls 305-307 Secondary Extraction
- ▭ Longwalls 305-307 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
- ▭ 600 m from Longwalls 305-307 Secondary Extraction
- Existing Underground Access Drive (Main Drift)

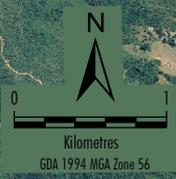
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2019); MSEC (2019)

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 METROPOLITAN COAL
 Longwalls 305-307 Layout

Figure 2



ME1-19-305-309 EP CRPP 2023C



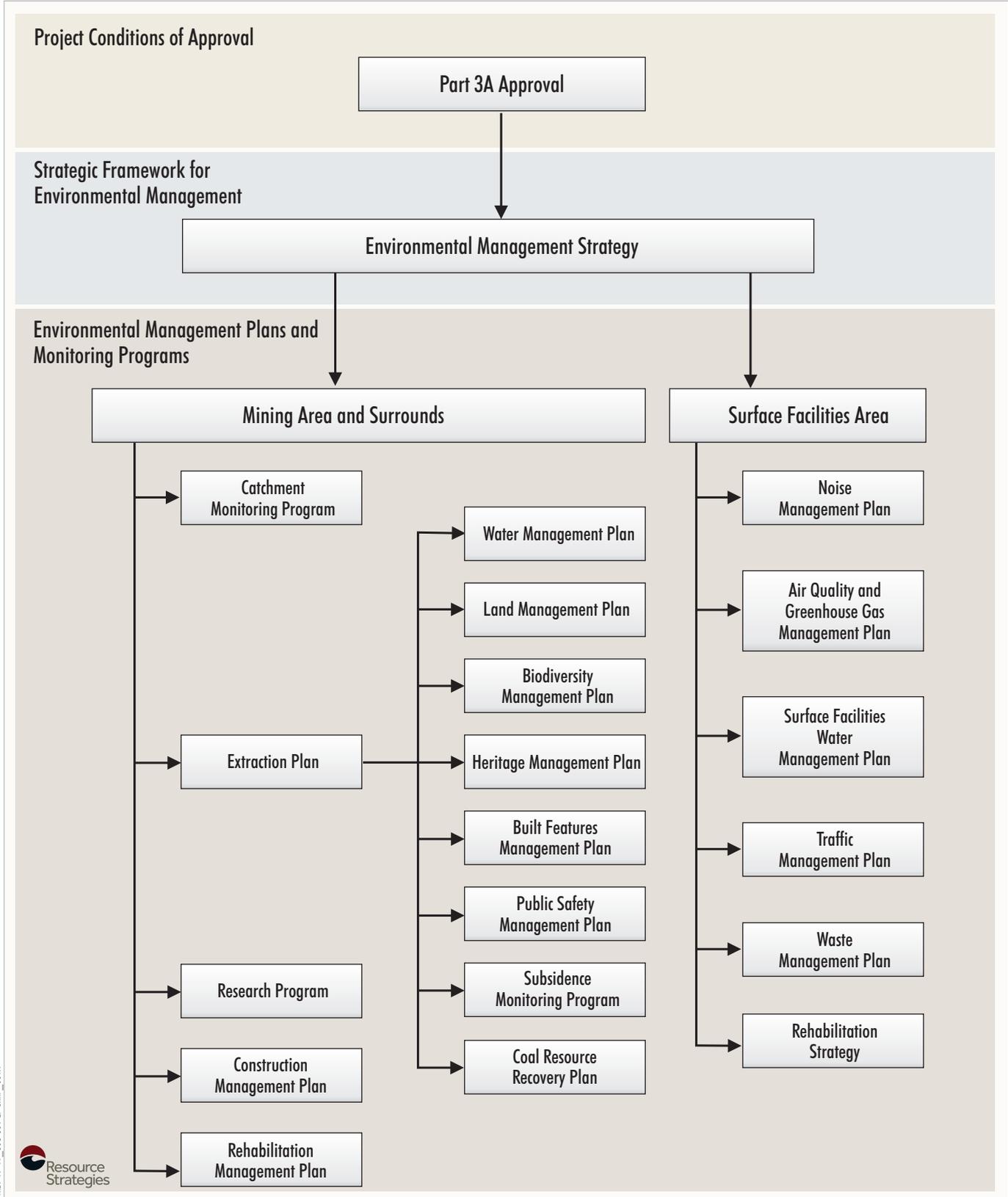
Resource Strategies

- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 305-307 Secondary Extraction
 - Longwalls 305-307 35° Angle of Draw and/or
Predicted 20 mm Subsidence Contour
 - 600 m from Longwalls 305-307
Secondary Extraction
 - Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2019); MSEC (2019)

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METROPOLITAN COAL
Longwalls 305-307 and
Project Underground Mining Area-
Aerial Photograph

Figure 3



The CRRP will also be reviewed within three months of approval of any Project modification and if necessary, revised to the satisfaction of the DPIE.

The revision status of this CRRP is indicated on the title page of each copy. The distribution register for controlled copies of the CRRP is described in Section 2.1.

Revisions to any documents listed within this CRRP will not necessarily constitute a revision of this document.

2.1 DISTRIBUTION REGISTER

In accordance with Condition 10, Schedule 7 of the Project Approval ‘Access to Information’, Metropolitan Coal will make this CRRP publicly available on the Peabody website. A hard copy of the CRRP will also be maintained at the Metropolitan Coal site.

Metropolitan Coal recognises that various regulators have different distribution requirements, both in relation to whom documents should be sent and in what format.

An Environmental Management Plan and Monitoring Program Distribution Register has been established in consultation with the relevant agencies and infrastructure owners that indicates:

- to whom the Metropolitan Coal plans and programs, such as this CRRP, will be distributed;
- the format (i.e. electronic or hard copy) of distribution; and
- the format of revision notification.

Metropolitan Coal will make the Distribution Register publicly available on the Peabody website.

Metropolitan Coal will be responsible for maintaining the Distribution Register and for ensuring that the notification of revisions is sent by email or post as appropriate.

In addition, Metropolitan Coal employees with local computer network access will be able to view the controlled electronic version of this CRRP on the Metropolitan Coal local area network. Metropolitan Coal will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on Metropolitan Coal’s computer system and the Peabody website.

3 DESIGN PRINCIPLES

3.1 APPROVAL CONSIDERATIONS

During the NSW Government’s assessment phase of the Metropolitan Coal Project Environmental Assessment (Project EA) (Helensburgh Coal Pty Ltd [HCPL], 2008), and in recognition of concerns raised by key stakeholders during the formal Planning Assessment Commission (PAC) assessment process, Metropolitan Coal (previously HCPL) considered it appropriate to reduce the proposed extent of the original Project longwall mining area (i.e. Longwalls 20-44).

Metropolitan Coal was granted Project Approval (08_0149) by the Minister for Planning on 22 June 2009. The Project Approval included a layout for Longwalls 301 to 317 referred to as the Preferred Project Layout (as described in the Preferred Project Report [HCPL, 2009]). Longwalls 301-317 included in the Preferred Project Layout (PPL) comprised 163 metres (m) panel widths (void) with 45 m pillars (solid) beyond 500 m from the Woronora Reservoir, and 138 m panel widths (void) with 70 m pillars (solid) within 500 m of the Woronora Reservoir.

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3.2 LAYOUT OPTIMISATION FOR 300 SERIES LONGWALLS

Following further mine planning investigations, Metropolitan Coal identified that significant operational efficiencies and consequently a significant economic benefit would be achieved by rotating the first workings of Longwalls 301-317 to be square with the 300 Mains (a rotation of approximately six degrees). The Secretary of the DP&E approved the revised first workings in accordance with Condition 5, Schedule 3 of the Project Approval in April 2015.

Subsequently, Metropolitan Coal proposed to consolidate the panel and chain pillar widths of Longwalls 301-304 to 163 m (void) panel widths and 45 m wide pillars (solid). Changes to the first workings of Longwalls 301-303 and Longwall 304 were approved by the DP&E in May 2016 and November 2018, respectively.

3.3 LONGWALLS 305-307 EXTENT

3.3.1 Commencing Position – Northern Extent

During the stakeholder consultation phase for the Metropolitan Coal Longwalls 301-303 Extraction Plan, an agreed subsidence parameter was developed with Garrawarra (NSW Health) to keep the active dementia care buildings at or below the 20 millimetres (mm) vertical subsidence contour and minimise the chance of cracking to these health facilities. This design principle has been applied to the Longwalls 305 and 306 northern starting positions. The Longwall 307 starting position has been set based on seam thickness and coal quality considerations.

3.3.2 Finishing Position – Southern Extent

Consistent with the precautionary approach adopted for Longwall 303 and Longwall 304, the finishing end of Longwall 305 (southern end) was shortened to reduce predicted valley closure on the Eastern Tributary.

3.3.3 Longwall Width and Length

Following submission of the Longwalls 305-307 Extraction Plan in October 2019, Metropolitan Coal requested approval from the Secretary of the DPIE for a revision of the Longwalls 305 and 306 first working layout¹. The revised layout includes a reduction to the panel (void) lengths of Longwall 305 (from 1,596 metres [m] to 1,547 m) and Longwall 306 (from 1,956 m to 1,907 m) and associated changes to the cut-through positions for the Longwalls 305 and 306 maingates. The revised layout of Longwalls 305 and 306 did not change the panel widths, pillar widths or panel orientation.

In January 2021, Metropolitan Coal submitted an application to the DPIE requesting a 50 m extension to the panel (void) length of Longwall 307 at the commencing end (from 1,956 m to 2,006 m). This CRRP has been updated to include the revised length of Longwall 307.

Longwall extraction will occur from north to south. A summary of the longwall dimensions for Longwalls 305-307 is provided in Table 1. The Longwall 305 layout includes a 138 m panel width (void), a 45 m tailgate pillar width and a 70 m maingate pillar width. The layout of Longwalls 306 and 307 includes 138 m panel widths (void) and 70 m pillars (solid) consistent with the PPL.

¹ Correspondence to the DPIE (dated 15 January 2020) incorrectly stated that Longwalls 305 and 306 would reduce in length to 1,544 m and 1,904 m, respectively,

Table 1
Summary of Longwall Dimensions for Longwalls 305-307

Longwall	Longwall Length (m)	Total Void Width (m)	Tailgate Chain Pillar Width (m)
LW305	1,547	138	45
LW306	1,907	138	70
LW307	2,006	138	70

m = metres.

The commencing and finishing position changes represent a reduction in longwall extraction meters of 3,703 m, (~2,215 kilotonnes [kt] of coal), from the PPL. A summary of changes by longwall is provided in Table 2.

Table 2
Summary of Longwall Dimension Reductions for Longwalls 305-307

Longwall	Reduction in length from PPL (m)	Reduction in Raw Coal from PPL (kt)	Reduction Reason
LW305	1,460	873	Garrawarra and Eastern Tributary
LW306	1,130	676	Garrawarra
LW307	1,063	636	Geology
Total	3,653	2,185	

m = metres.

kt = kilotonnes.

Plan 1 in Attachment 1 shows existing Metropolitan Coal longwalls located within 500 m of Longwalls 305-307, as well as future longwalls (i.e. Longwalls 308 on).

Longwalls 305-307 and the area of land within 600 m of Longwalls 305-307 secondary extraction is shown on Figures 1 to 3. Plan 2 in Attachment 1 shows the natural and man-made surface features proximal to Longwalls 305-307.

4 GEOLOGICAL DETAILS

4.1 SYDNEY BASIN AT METROPOLITAN COAL

Metropolitan Coal is located within the Southern Coalfield, within the southern part of the Sydney Basin, which is infilled with sedimentary rocks of Permian age (<270 million years ago) and of Triassic age (<225 million years ago) (HCPL, 2008).

Underlying the Sydney Basin sedimentary rocks is the Palaeozoic granite basement rock. A borehole located at Metropolitan Coal by the Australian Oil and Gas (AOG) Corporation in 1963, *AOG Woronora PDH and RDH 1* (Figure 5), intersected the Bulli Coal Seam at 1,710 feet (0.5 kilometres [km]) and the granitic basement rock at 7,470 feet (2.3 km) (AOG Corporation, 1963). At Metropolitan Coal the inter-burden between the Bulli Coal Seam and the basement rock is 1.8 km, and the total depth of Sydney Basin sedimentation is 2.3 km.

Three formally named coal seams of the Illawarra Coal Measures are present in the Southern Coalfield, namely the Bulli, Balgownie and Wongawilli Seams (HCPL, 2008). Thermal Ionisation Mass Spectrometry (TIMS) dating of a tuff from the lower part of the Bulli Coal in the Metropolitan Colliery has yielded an age of 252.60 ± 0.04 million years (Fielding, 2019).

Immediately overlying the Bulli Coal unit of the Illawarra Coal Measures are sandstones and claystones of the Narrabeen Group. The Narrabeen Group contains the Newport Formation (sometimes referred to as the Gosford Formation), the Bald Hill Claystone (also referred to as Chocolate Shale and formed as a result of laterite weathering Gerringong Volcanics), the Bulgo Sandstone, the Stanwell Park Claystone/Shale, the Scarborough Sandstone, the Wombarra Shale and the Coal Cliff Sandstone. At the top of the sequence in the area of interest is the Hawkesbury Sandstone.

4.2 STRATIGRAPHIC SECTION

The sedimentary stratigraphic section at Borehole S225 is shown on Plan 6 in Attachment 1. The location of the borehole is also shown on Plan 6 in Attachment 1. The sandstone and shale units vary in thickness from a few metres to over 160 m. The major sandstone units are interbedded with other rocks and, though shales and claystones are quite extensive in places, the sandstone predominates. A generalised stratigraphic column of the Southern Coalfields is provided in Figure 6 with geological epochs.

4.3 BULLI SEAM

The seam floor within the Longwalls 305-307 35 degree (°) angle of draw and/or 20 mm subsidence contour area generally dips from the south-east to the north-west. The Bulli Seam thickness within the Longwalls 305-307 goaf area varies between approximately 2.6 m to 2.9 m. Longwalls 305-307 will extract the full height of the seam, with localised extraction up to 3.2 m around development headings and longwall install and takeoff points. The seam floor contours and seam thickness contours are shown on Plan 3 in Attachment 1.

4.4 TOPOGRAPHY

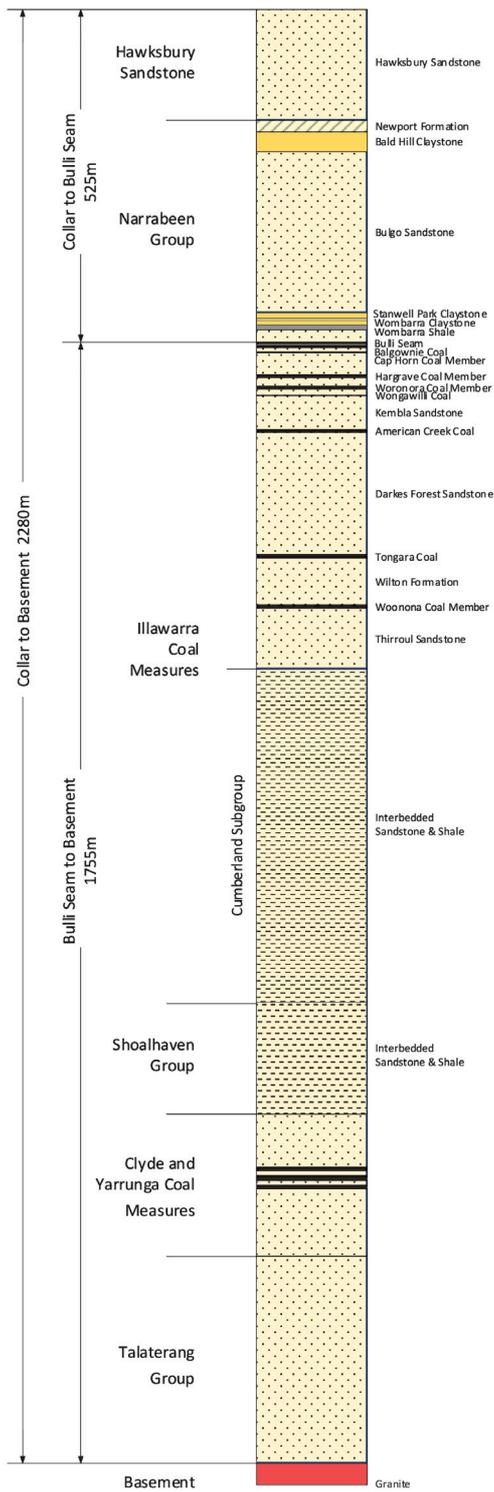
The topography consists of Hawkesbury Sandstone dip slopes falling to the north-west. The southern slopes tend to be more rugged, consisting of joint controlled escarpments of Hawkesbury Sandstone. These plateau areas are deeply incised by the Woronora River, Waratah Rivulet and other unnamed streams.

4.5 DEPTH OF COVER

The surface level contours and depth of cover contours to the Bulli Seam are shown on Plan 3 in Attachment 1. The depth of cover within the Longwalls 305-307 35° angle of draw and/or predicted 20 mm subsidence contour varies between a minimum of 410 m and a maximum of 535 m.

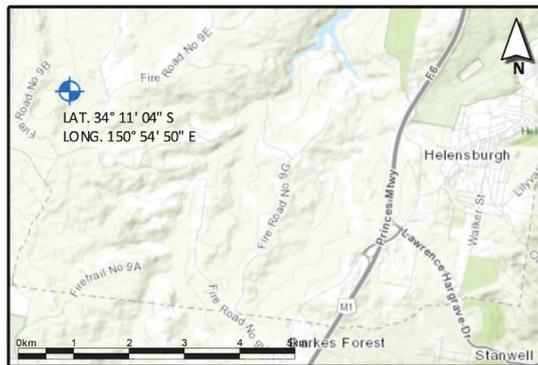
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Metropolitan Colliery – Depth of Basement Rock



County: Cumberland
 Parish: Heathcote
 District: Wollongong
 Hole Name: AOG Woronora PDH & RDH 1
 Collar: R.L. 355.092
 Total Depth: 2315.52m
 Date Commenced: 9-6-1963
 Logged By: A.O.G. Geologists

BORE HOLE LOCATION



ME1-19_305-309 BP CORR_002A

Source: after Australian Oil and Gas Corporation Ltd (1963)

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METROPOLITAN COAL

Depth to Basement
 (2.3 km at Metropolitan Colliery),
 AOG Woronora Hole

Figure 5

AGE	GROUP	SUB-GRP	CODE	FORMATION & MEMBERS		
TRIASSIC	WIANAMATTA GROUP		WMSH	BRINGELLY SHALE MINCHINBURY SANDSTONE ASHFIELD SHALE		
				MITTAGONG FORMATION		
			HBSS	HAWKSBURY SANDSTONE		
	NARRABEEN GROUP	GOSFORD		GRFM	NEWPORT FORMATION GARIE FORMATION	
				BACS	BALD HILL CLAYSTONE	
		CLIFTON		BGSS	BULGO SANDSTONE	
				SPCS	STANWELL PARK CLAYSTONE	
				SBSS	SCARBOROUGH SANDSTONE	
				WBCS	WOMBARRA CLAYSTONE	
				CCSS	COAL CLIFF SANDSTONE	
	PERMIAN	ILLAWARRA COAL MEASURES		BUSM	BULLI COAL	
				UNM1	LODDON SANDSTONE	
				BASM	BALGOWNIE COAL	
LRSS				LAWRENCE SANDSTONE		
				BURRAGORANG CLAYSTONE		
			CHSM		CAPE HORN	
			UNM2		UNNAMED MEMBER 2	
				ECKERSLEY FORMATION	HARGRAVE COAL	
					WORONORA COAL	
					NOVICE SANDSTONE	
				WW01-11	WONGAWILLI COAL	
				KBSS	KEMBLA SANDSTONE	
				ACSM	ALLANS CREEK FORMATION	AMERICAN CK. COAL
				APFM	DARKES FOREST SANDSTONE (APPIN FORMATION)	HUNTLEY CLAYST.
					BARGO CLAYSTONE	AUSTIMER SANDST.
				TGSM	TONGARRA COAL	
				WTFM	WILTON FORMATION	
					WOONONA COAL MEMBER	
					ERINS VALE FORMATION	
		CUMBERLAND		PHEASANTS NEST FORMATION	FIGTREE COAL UNANDERRA COAL BERKELEY LATITE MINNAMURRA LATITE CALDERWOOD LATITE FIVE ISLANDS LATITE	
	SHOALHAVEN GROUP		BROUGHTON FORMATION BERRY SILTSTONE NOWRA SANDSTONE WANDRAWANDIAN SILTSTONE SNAPPER POINT FORMATION PEBBLEY BEACH FORMATION			
	TALATERANG		CLYDE COAL MEASURES			
UNDIFFERENTIATED PALAEOZOIC (DEVONIAN, SILURIAN & ORDOVICIAN)						
ROCKS OF THE BASIN BASEMENT						
Information Sourced From - "Geological Survey Report No. GS1998/277 - R.S. Moffitt"						

ME1-19-305-309 RP CORR_003A

Source: Moffitt, R.S and Geological Survey of New South Wales (1998)

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METROPOLITAN COAL
Generalised Stratigraphic Column of
Southern Coal Field

Figure 6

4.6 LINEARS

Surface lineaments are linear features in the surface landscape, preferentially eroded, that may be the surface expression of an underlying geological structure, fault or dyke or simply a result of surface joint sets. Lineaments are identified from aerial photography, LiDAR and from digital topographic sets. By far the most common linears are features developed on the prevailing joint sets in the surface rock (Doyle and Newland, 2008). Lineament analysis aims to identify features that may be of greater geological significance, recognised by association with known geology or focussed field investigation.

Lineaments mapped by Metropolitan Coal over Longwalls 305-307 and surrounds are shown on Figure 7. The lineament that runs north-south across Longwalls 20-27 extends over Longwall 304. Over Longwalls 20-27 and through Longwall 304, this lineament is associated with an underground fault (F 008). Longwalls 20-27 mined through this fault structure and did not intercept water (i.e. the fault did not act as a conduit at depth).

As described in the Longwall 304 CRRP, a key outcome of the Geological Features Risk Assessment (GFRA) that was undertaken for the Longwall 304 Extraction Plan was the further correlation of updated linear mapping with underground geological mapping (Metropolitan Coal, 2019a). Surface field mapping of lineaments occurred prior to Longwall 304, however little value was achieved in reviewing the lineaments on the ground with mapping of joint sets being the only outcome.

A specific GFRA was completed for Longwalls 305-307 Extraction Plan (Metropolitan Coal, 2019b). The Longwalls 305-307 GFRA considered lineaments as a possible indicator of underlying geological structures and an action arising from the Longwalls 305-307 GFRA was to reanalyse the Longwalls 305-307 study area. A new LiDAR scan of the landscape was commissioned and in August 2019 the landscape was examined for any new lineaments in the Longwalls 305-307 35° angle of draw and/or predicted 20 mm subsidence contour. The 2019 LiDAR review confirmed the existing lineament mapping analysis with additional lineaments added to the dataset. Lineaments were examined for possible correlation to underground geological mapping in the study area of Longwalls 305-307.

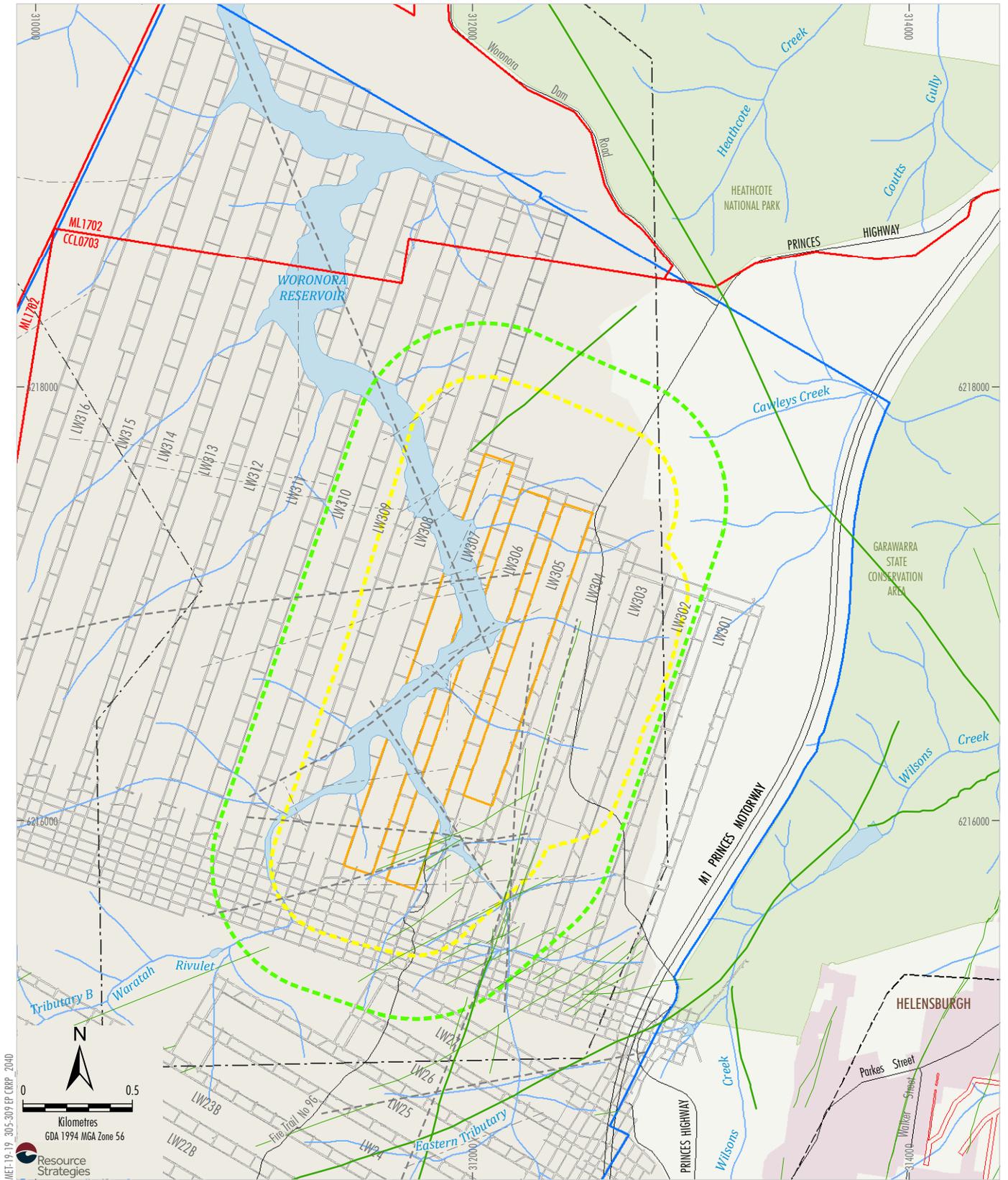
4.7 IGNEOUS INTRUSIONS

The presence of igneous plugs at Metropolitan Coal has not been detected at the surface. Examination of linears and residuals on the topographic surface has failed to identify any such features. Similarly, aeromagnetic surveys made no positive identification of igneous plugs. Aeromagnetic surveys have identified the Maddocks Diatreme to the south of Longwall 1 in 1995 and a possible zone of dykes loosely associated with the Madden Fault zone on the western edge of the Metropolitan Coal lease boundary. A diatreme is an explosive igneous vent that has little or no igneous material associated with the vent. At coal level the diatreme may be represented by an igneous plug, a dyke, sill or induration of the coal by steam and other vapours. No diatremes have been identified in the Metropolitan Coal 300 series longwall area (Doyle and Newland, 2008).

4.8 SYNCLINE/ANTICLINE

The general Bulli Seam structure in the Metropolitan Coal area is a broad syncline trending north to north-west. Geological structures in synclinal areas in the Southern Coalfield are typically more benign than in anticlinal areas (Doyle and Newland, 2008).

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Longwalls 20-27 and 301-317
 - Longwalls 305-307 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Longwalls 305-307
Secondary Extraction
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)
 - Faults and Dykes (vertical displacement > 1m)
 - Faults and Dykes (vertical displacement < 1m)
 - Lineament (prominent)
 - Lineament (minor)

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2019); MSEC (2019); after NPWS (2003), Bangalay Botanical Surveys (2008) and Eco Logical Australia (2015; 2016; 2018)

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 METROPOLITAN COAL
 Mapped Faults and Lineaments over
 Longwalls 305-307 and Surrounds

Figure 7

4.9 FAULTS

The major geological features at seam level are shown on Plan 3 in Attachment 1. For the Longwalls 305-307 Extraction Plan, in seam faults have been further delineated on the plans by highlighting structures with greater than 1km strike length. This delineation is to better highlight what are more persistent structures at seam level and potentially correlate these with surface lineaments. Many faults mapped at seam level are minor in nature and only exist locally about the coal seam.

Longwalls 305-307 are located approximately 900 m south-west of the Metropolitan Fault. The Metropolitan Fault is a normal fault trending with other regional faults in a north-northwest to south-southeast strike. Displacement in the historical workings is 70 to 90 m, downthrow to the east. Seismic investigations have identified a series of reverse faults, 900 m northeast of Longwall 305, projecting in line from the known position of the Metropolitan Fault. Nearby the 300 series longwalls, the displacement at Bulli Seam level has reduced to 18 to 20 m with limited vertical extension and the Bald Hill Claystone is not displaced (Velseis, 2018).

A strike slip fault, F0008, with up to 1.2 m vertical displacement occurs over Longwalls 20-27, and this fault extends partially through Longwall 304. This fault is associated with a surface linear that aligns with the Eastern Tributary and then passes east of the Woronora Reservoir full supply level dissipating into the landscape. Longwall 20 through 27 were extracted through this feature directly under the Eastern Tributary with no moisture evident at seam level and no change in mine water balance during the seven years of extraction in the area. At the time of writing, Longwall 304 extraction had not intercepted F0008 projected extents.

A strike slip fault, F0027, with zero vertical displacement, has been mapped in the gate roads leading into Longwalls 304 and 305 and is projected to be in the extraction area of Longwall 306. The associated surface linear is located approximately 250 m west of the end of the Eastern Tributary arm of Woronora Reservoir full supply level. No moisture has been evident where F-0027 structures intersects the seam.

4.10 RISK ASSESSMENT ON GEOLOGICAL FEATURES WITH POTENTIAL TO AFFECT WATER QUANTITY AVAILABLE TO WORONORA RESERVOIR

The Independent Expert Panel for Mining in the Catchment (IEPMC)² Initial Report recommended that the potential implications for water quantity of faulting, basal shear planes and lineaments be carefully considered, and risk assessed at all mining operations in the Catchment Special Areas (IEPMC, 2018).

In relation to the Metropolitan Coal Mine, the IEPMC Initial Report concluded (pg. 127):

In the case of Metropolitan Mine:

-
- *the potential for water be diverted out of Woronora Reservoir and into other catchments through valley closure shear planes and geological structures including lineaments will require careful assessment in the future because it is planned that most of the remaining longwall panels in the approved mining area will pass beneath the reservoir.*

² The IEPMC was established in November 2017 by the NSW Government to provide expert advice to the DP&E on the impact of mining activities in the Greater Sydney Water Catchment Special Areas, with a particular focus on risks to the quantity of water in the catchment.

A GFRA workshop was held on 19 July 2019 to assess the potential for mining effects from Longwalls 305-307 on geological features to impact on the quantity of water available to the Woronora Reservoir. The workshop participants³ identified and assessed the potential for mining effects on lineaments, joints, faulting, shear planes and dykes to impact on the quantity of water to the Woronora Reservoir, including the potential for water to be diverted out of Woronora Reservoir and into other catchments.

Additional controls arising from the risk assessment workshop included targeted surface mapping above Longwalls 305-307 for further correlation of updated linear mapping with underground geological mapping and a specific underground water monitoring program for F0027 (Metropolitan Coal, 2019).

The participants considered the risk control measures and procedures to be reasonable to manage the identified risks.

The outcomes of the risk assessment are provided in Attachment 2.

5 RESOURCE RECOVERY

5.1 MINING METHOD

Longwalls 305-307 will be extracted using retreating longwall mining methods for secondary extraction of a panel with a 138 m void width. The longwall panel will be formed by driving two sets of gate roads (the tailgate and maingate roads). Each gate road requires two roadways (headings) to be driven parallel to each other. The two roadways will be used for ventilation purposes, with one of the roadways utilised as a transport road and the other roadway used to convey the coal that will be mined back to the main conveyors. Construction of development main headings and gate roads are mined using continuous miners.

The dimensions of the headings will be approximately 5.2 m wide and 3.2 m in height. The headings are connected approximately every 120 m by driving a cut-through from one heading to another which forms pillars of coal along the length of the gate road. The tailgate and maingate roads are separated by the 133 m wide longwall panel (measured between roadway centrelines). The maingate roads and tailgate roads are then linked together by driving an installation road and bleeder road at the top end of the longwall panels. Run-of-mine (ROM) coal will be conveyed by the maingate conveyor to the main conveyor which will carry coal to the surface of the mine.

5.2 MINE PLAN

5.2.1 Justification

As described in Section 3.2, the seam thickness within the Longwalls 305-307 goaf area varies from approximately 2.6 m to 2.9 m. Longwalls 305-307 will extract the full height of the seam. Using the proposed mining method, the recovery of ROM coal from the Bulli Seam in Longwalls 305-307 is estimated to be 55 percent. The total amount of ROM coal anticipated to be extracted is estimated to be approximately 3.4 million tonnes (Mt).

³ Participants included Dr Noel Merrick (SLR Consultants, Groundwater), Mr Peter DeBono (Mine Subsidence Engineering Consultants, Subsidence), Mr Ian Stone (Polaris), Mr Shane Kornek (Metropolitan Coal, Senior Geotechnical Engineer), Mr Jon Degotardi (Metropolitan Coal, Technical Services Manager), and Mr Stephen Love (Metropolitan Coal, Environment and Community Superintendent). The risk assessment was facilitated by Mr Mick Allen (Peabody, Safety Superintendent).

Metropolitan Coal considers the layout of Longwalls 305-307 to provide the most efficient resource recovery given the constraints.

5.2.2 Mining Schedule

Metropolitan Coal operates seven days a week, 24 hours a day on a rotating shift basis. The extraction of Longwalls 1 to 303 is complete, with extraction of Longwall 304 underway.

The provisional extraction schedule for Longwalls 305-307 is provided in Table 2.

**Table 2
Provisional Extraction Schedule**

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 305	April 2020	8 Months	November 2020
Longwall 306	June 2021	11 Months	April 2022
Longwall 307	May 2022	8 Months	December 2022

5.2.3 Future Mine Plans

The current layout of Longwalls 308-317 is shown on Figures 1 and 3, on Plan 1 in Attachment 1 and includes narrow longwalls (138 m wide) beneath and within 500 m of the Woronora Reservoir.

The layouts of Longwalls 308-317 will however be subject to further review for future Extraction Plans in consideration of potential subsidence impacts and environmental consequences.

5.2.4 Effects on Future Resource Recovery

The Bulli Seam is the upper seam of the Illawarra Coal Measures of the Southern Coalfields. The interburden thickness between the base of the Bulli Seam and the top of the seam below (Balgownie Seam) varies between 7.9 m and 13.9 m. The planned mining of Longwalls 305-307 is not expected to impede on any future mining of the lower seams. Currently there are no plans for mining of these seams within the Longwalls 305-307 mining area.

6 REFERENCES

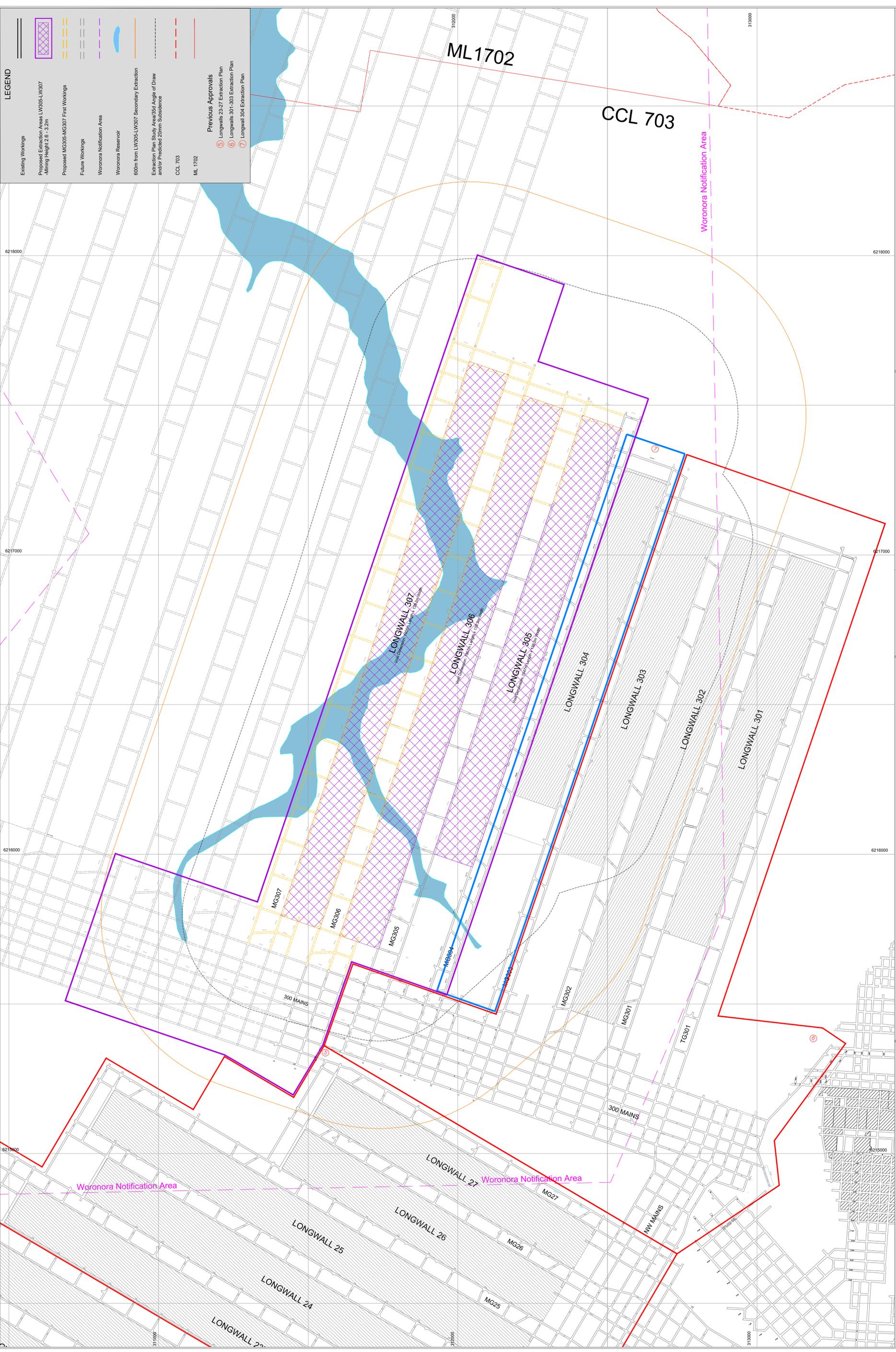
- Australian Oil and Gas Corporation Ltd (1963) *Woronora PDH & RDH 1 Lithological Log*. AOG Geologist.
- Doyle, J. and Newland, A. (2008) *A compilation of surface geological features in the western portion of Metropolitan Colliery*. Geosensing Solutions, May 2008.
- Fielding, C. R. (2019) *Age and pattern of the southern high-latitude continental end-Permian extinction constrained by multiproxy analysis*. Nature Communications, vol. 10, article 385.
- Helensburgh Coal Pty Ltd (2008) *Metropolitan Coal Project Environmental Assessment*.
- Helensburgh Coal Pty Ltd (2009) *Metropolitan Coal Project Preferred Project Report*.
- Independent Expert Panel for Mining in the Catchment (2018) *Initial Report on Specific Mining Activities at the Metropolitan and Dendrobium Coal Mines*. 12 November 2018.
- Metropolitan Coal (2019a) *ME-ENV-RISK-0333 Longwall 304 Risk Assessment – Potential for geological features in study area to affect water quantity available to Woronora Reservoir*. 20 February 2019.
- Metropolitan Coal (2019b) *ME-ENV-RISK-0364 Potential geological features that may be affected by LW 305 – LW 307 mining and affect water quantity available to Woronora Reservoir*. 19 July 2019.
- Moffitt, R.S. and Geological Survey of New South Wales (1998) *A compilation of the geology of the southern coal field: notes to accompany the 1:100 000 Southern coal field geological map*. GS1998/277.
- Velseis (2018) *Metropolitan 2D repro. Processing and Interpretation report*.

Metropolitan Coal – Coal Resource Recovery Plan		
Revision No. CRRP-R01-C		Page 17
Document ID: Coal Resource Recovery Plan		

ATTACHMENT 1

PLANS 1, 2, 3, 5 AND 6 IN ACCORDANCE WITH THE
DEPARTMENT OF PLANNING AND ENVIRONMENT AND
DIVISION OF RESOURCES AND ENERGY (2015)
GUIDELINES FOR THE PREPARATION OF EXTRACTION PLANS

Metropolitan Coal – Coal Resource Recovery Plan		
Revision No. CRRP-R01-C		
Document ID: Coal Resource Recovery Plan		



METROPOLITAN MINE
 Longwalls 305-307 Extraction Plan:
 Plan 1 - Existing, Proposed and Future Workings

DRAWING No M200131 PA

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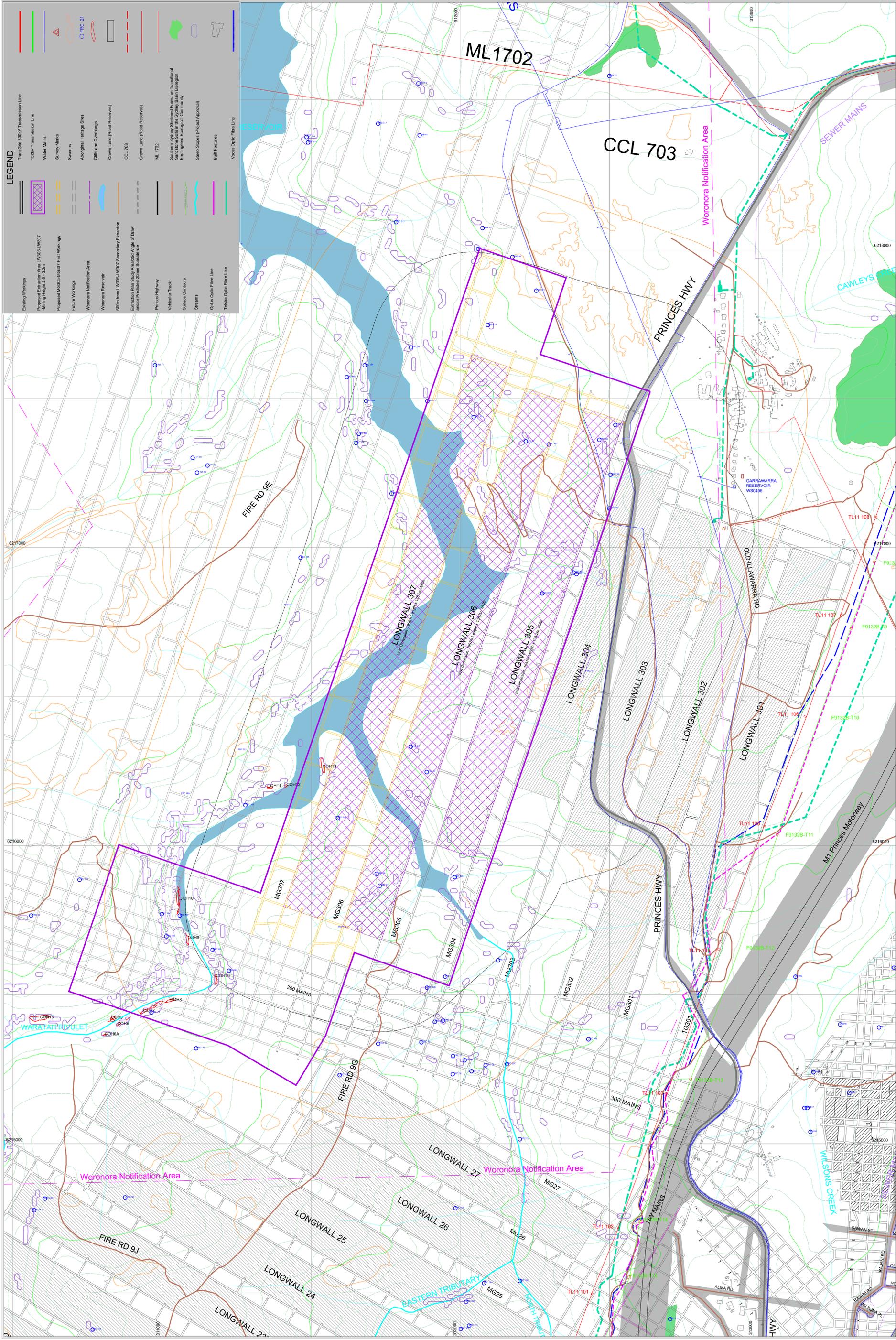
CLIENT/PROJECT: METROPOLITAN COAL PTY LTD
 METROPOLITAN MINE
 PO BOX 402
 HILARYBURGH 2588

CHECKED: AUTHORIZED:

SURV/D/DES/GD

Registered Mine Surveyor Date
 Mining Engineering Manager Date

MCA

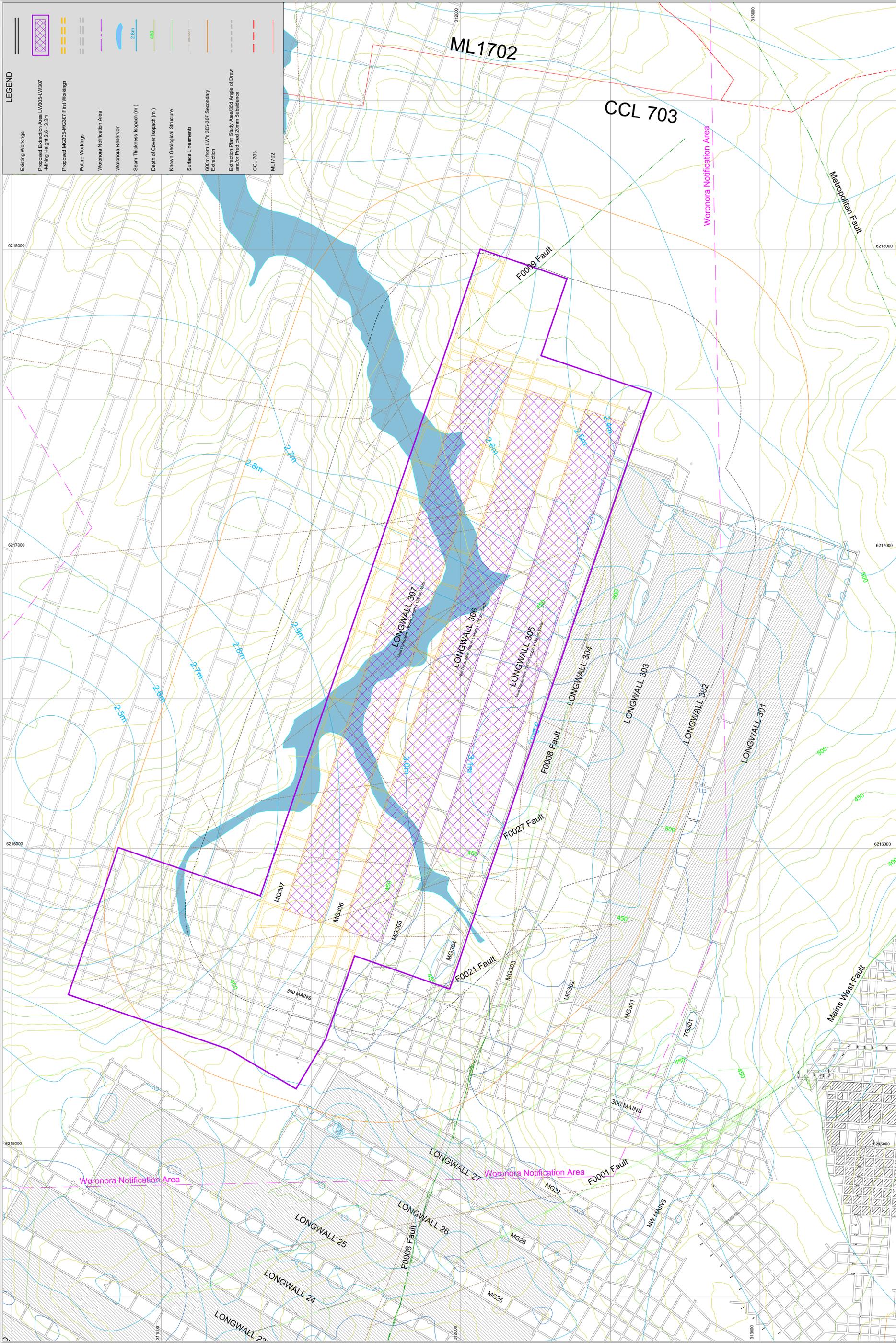


METROPOLITAN MINE
Longwalls 305-307 Extraction Plan:
Plan 2 - Surface Features

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 DRAWN: Survey Dept.
 SHEET: 1 OF 1
 SCALE: 1:4000

Peabody
 CLIENT/PROJECT: METROPOLITAN COAL PTY LTD
 METROPOLITAN MINE
 SURV/D/DES/GD: 2588
 CHECKED: AUTHORIZED

Registered Mine Surveyor Date
 Mining Engineering Manager Date
 MCA



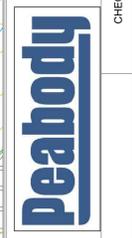
LEGEND

- Existing Workings
- Proposed Extraction Area LW305-LW307 Mining Height 2.0 - 3.2m
- Proposed MG305-MG307 First Workings
- Future Workings
- Woronora Notification Area
- Woronora Reservoir
- Seam Thickness (isopach (m))
- Depth of Cover (isopach (m))
- Known Geological Structure
- Surface Lineaments
- 600m from LW's 305-307 Secondary Extraction
- Extraction Plan Study Area (55m Angle of Draw and/or Precipitator 20mm Subsidence)
- CCL 703
- ML 1702

METROPOLITAN MINE
Longwalls 305-307 Extraction Plan:
Plan 3 - Geological and Seam Data

DRAWING No	M200131 P3
DATE	31/01/2020
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SHEET	1
OF	1
SCALE	1:4000

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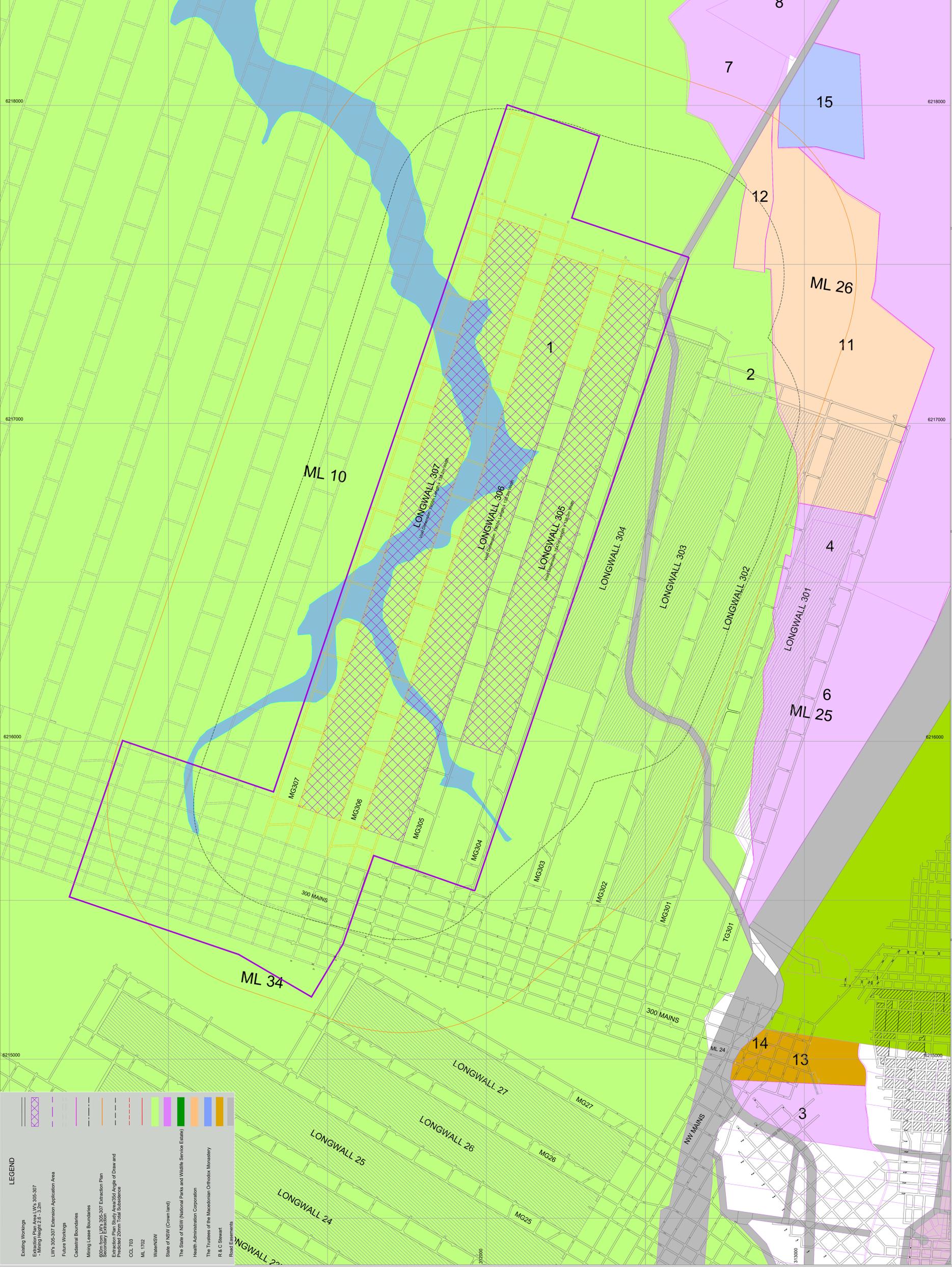
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 SURV/D/DES/GD

Registered Mine Surveyor
 Date

Mining Engineering Manager
 Date



Reference No	Lot	DP
1	1	830604
2	1	219640
3	878	752033
4	4	840501
5	3	840501
6	7332	1160004
7	1003	822247
8	1002	822247
9	142	1201515
10	143	1201539
11	2	840501
12	4	851304
13	713	752033
14	911	752033
15	991	723636
16	1	1174560
17	1001	822247



LEGEND

- Existing Workings
- Extraction Plan Area LW's 305-307
- Mining Height 2.5 - 3.2m
- LW's 305-307 Extension Application Area
- Future Workings
- Cadastral Boundaries
- Mining Lease Boundaries
- 600m from LW's 305-307 Extraction Plan
- Secondary Extraction
- Extraction Plan Study Areas 50m Angle of Draw and
Predicted 30m Total Subsidence
- CCL 703
- ML 1702
- WaterNSW
- State of NSW (Crown Land)
- The State of NSW (National Parks and Wildlife Service Estate)
- Health Administration Corporation
- The Trustees of the Macdonellan Children's Monastery
- R & C Stewart
- Road Easements

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DATE: 31/01/2020
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METROPOLITAN MINE
Longwalls 305-307 Extraction Plan:
Plan 5 - Mining Titles and Land Ownership

peabody

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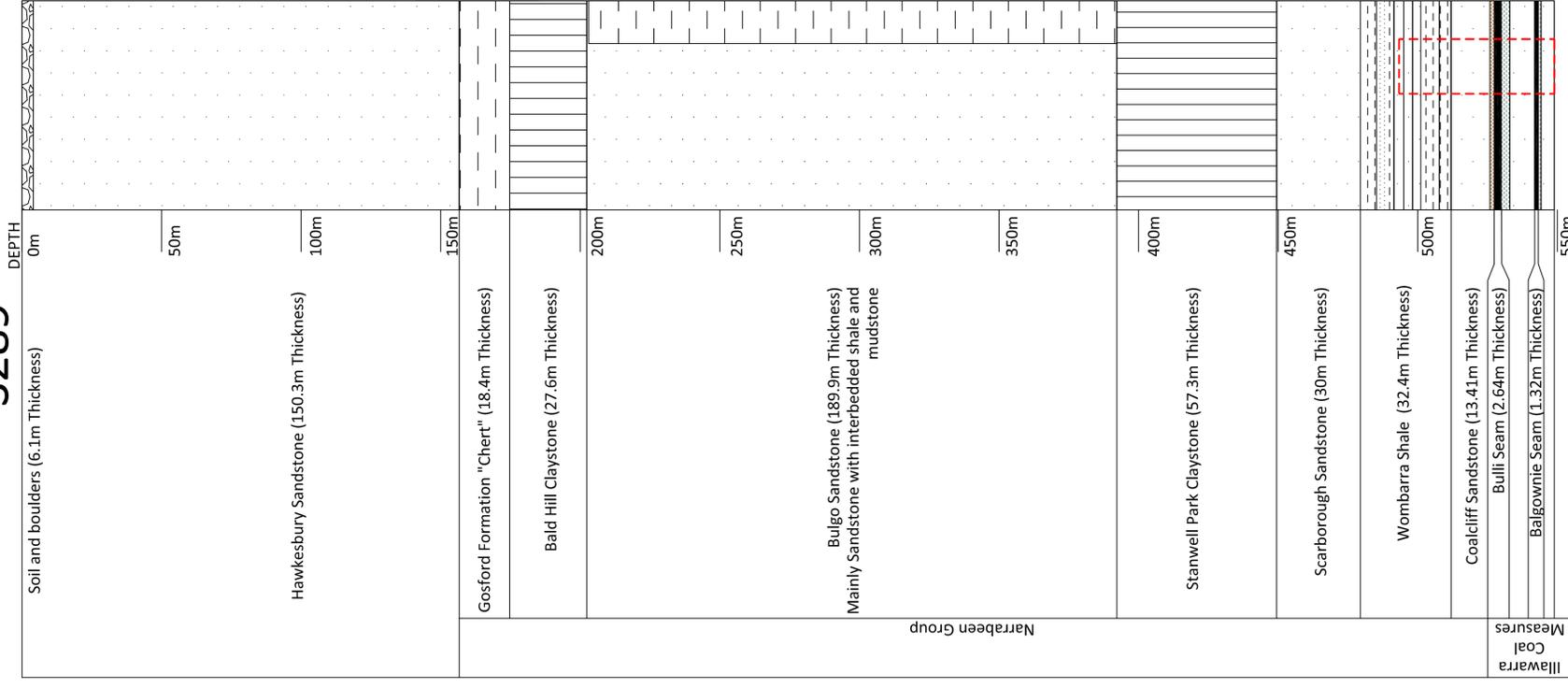
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SURV/D/DES/GD: _____

Mining Engineering Manager Date: _____
Registered Mine Surveyor Date: _____

MCA

Vertical Log of Bore S289

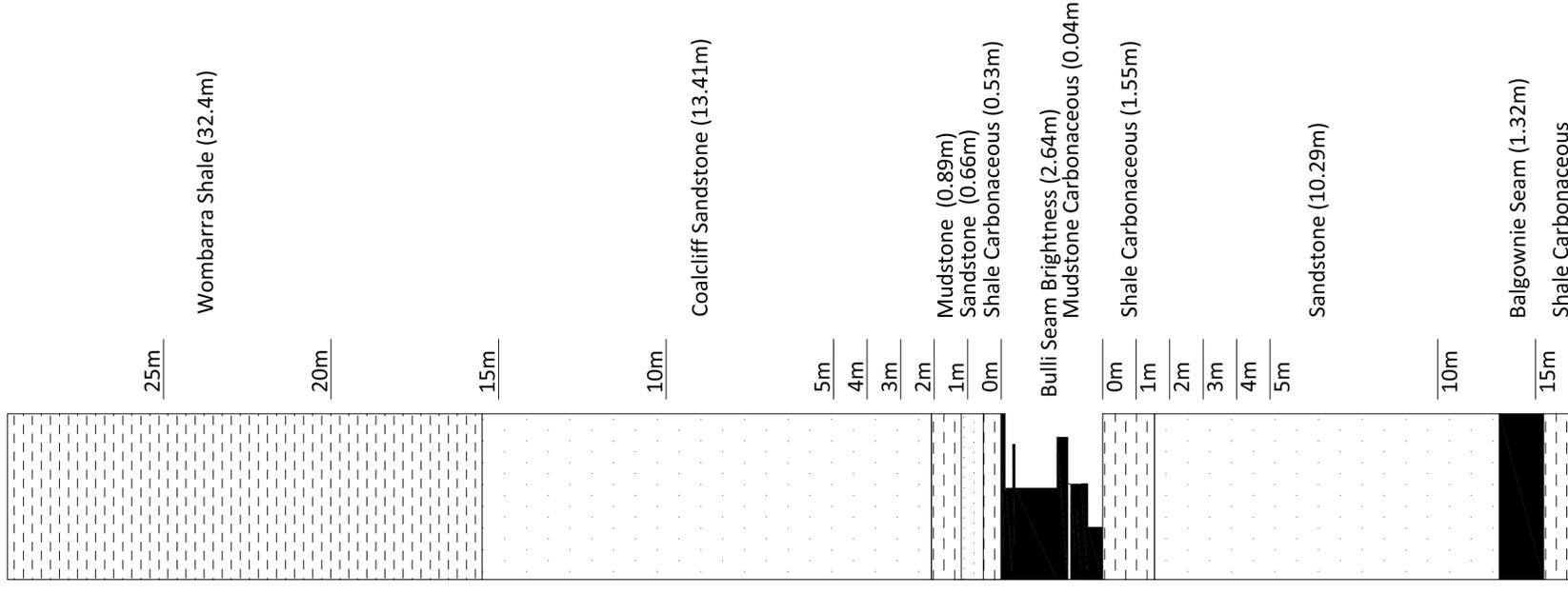
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Inset 1

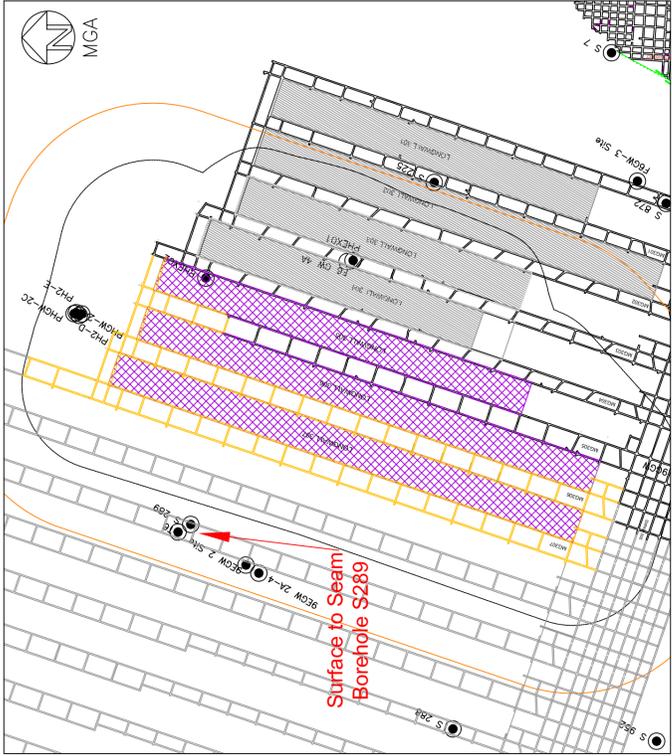
Inset of Vertical Log Bore S289

S289

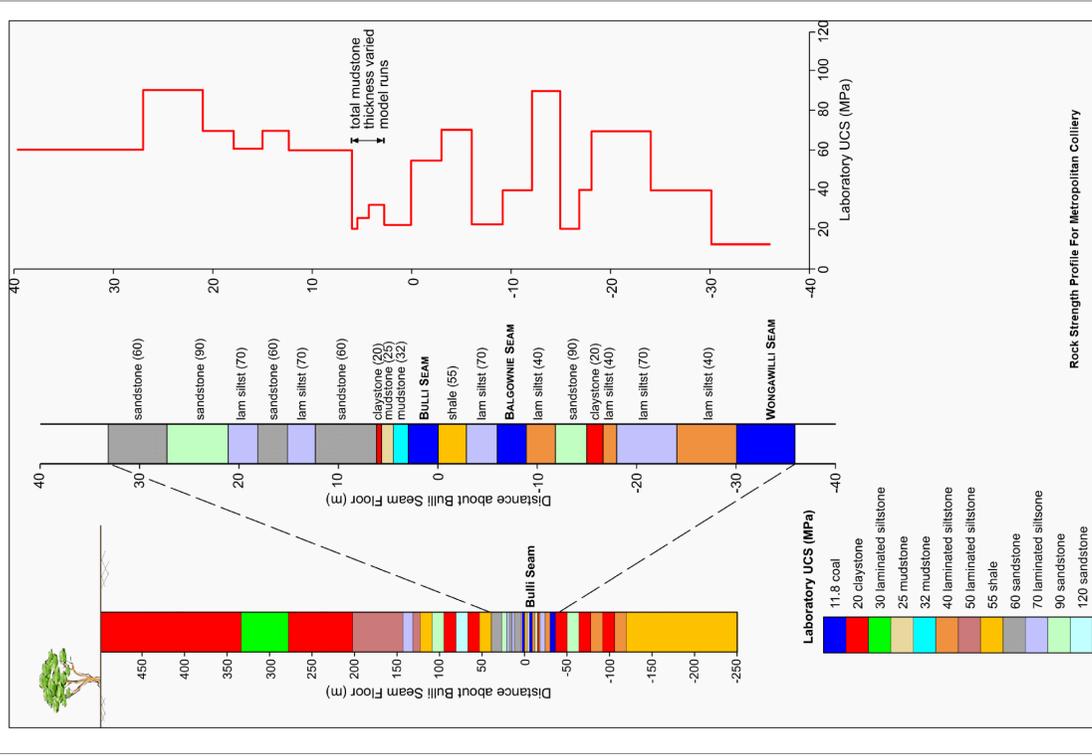


Inset

Location Plan



Geotechnical Log



METROPOLITAN MINE
Longwalls 305-307 Extraction Plan:
Plan 6 - Geological Section and Geotechnical Logs

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 NO. BOX 403
 HILLSBOROUGH 2588

AUTHORISED

Peabody

CHECKED

SURV/DRESGD

CLIENT/PROJECT: METROPOLITAN COAL PTY LTD
 METROPOLITAN MINE
 NO. BOX 403
 HILLSBOROUGH 2588

Mining Engineering Manager Date

ATTACHMENT 2

RISK ASSESSMENT ON GEOLOGICAL FEATURES WITH POTENTIAL TO AFFECT WATER
QUANTITY AVAILABLE TO WORNORA RESERVOIR

Metropolitan Coal – Coal Resource Recovery Plan		
Revision No. CRRP-R01-C		
Document ID: Coal Resource Recovery Plan		

WORKPLACE RISK ASSESSMENT AND CONTROL (WRAC)

Title / ID number	ME-ENV-RSK-0364 Potential geological features that may be effected by LW 305 - LW 307 mining and affect water quantity available to Woronora Reservoir.		
Site	Metropolitan Coal	Date	19th July 2019
Purpose and objectives	Assess the risks and hazards of potential geological features that may be effected by mining in LW305 - LW307 and affect water quantity available to Woronora Reservoir or loss of ground water from the catchment		
Scope / context	This risk assessment is a recommendation arising from Independent Expert Panel into Mining in Catchments, IEPMC, that all future Extraction Plan applications be accompanied by a Risk Assessment considering potential outcomes from geological features.		
Activity	This risk Assessment was carried out in the offices at Metropolitan Colliery and via (Web dial in)		
Assumptions	<p>The following assumptions and limitations were applied to this risk assessment:</p> <ul style="list-style-type: none"> - Current mine plan for LW305 - LW307 - Existing natural ground water system pathways in place. - SharePoint Document Kiosk is available and provides access to site documentation and procedures - Supervision Arrangements are in place for all activities carried out at the operation - All existing Management Plans, Systems and Procedures are available and understood - Pre-shift and toolbox talks are completed at the start of every shift - Job Hazard Analysis are performed for all tasks where procedures are not available or when changes to the task occur - SLAM process is utilised for tasks - Incident and Hazard Reporting Procedure exist - Defect Management System is used for all defect reporting - Cardinal Rules have been developed and are communicated to the workforce and contractors - All personnel performing tasks have completed all relevant inductions - All personnel performing tasks are trained and competent in their field of expertise - All monitoring equipment is maintained to acceptable levels as determined by the mine site and the OEM - Personal Protective Equipment (PPE) is available and is worn as required - Housekeeping standards exist and are followed 		
Reference / related documents <i>(including Change Management number reference if applicable)</i>	<p>IEPMC panel report Metropolitan Geological Plan as of 18/7/19 [ME-ENV-RSK-0333] Geological features effected by mining LW304 regarding Woronora reservoir [ME-TSE-HMP-0011] Subsidence [ME-MIN-HMP-0006] Inundation or inrush of a substance PHMP [ME-TSE-HMP-0031] Ground or Strata Failure [ME-TSE-MNP-0002] Survey and drafting arrangements [ME-MIN-HMP-0013] Outburst Prevention [ME-MIN-HMP-0063] Contingency Mine Water Sealing MDG1010 - Risk Management Handbook for the Mining Industry. Dated. May 1997 MDG1014 - Guide to Reviewing a Risk Assessment of Mine Equipment and Operations Dated. July 1997 AS NZS ISO 31000-2009 - Risk management - Principles and guidelines Work Health and Safety Act 2011 Work Health and Safety Regulation 2017 New South Wales - Work Health and Safety (Mines and Petroleum Sites) Act 2013 New South Wales - Work Health and Safety (Mines and Petroleum Sites) Regulation 2014</p>		

Approved by: Name		Signature		Date	
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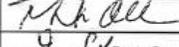
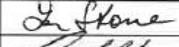
Participants - ME-ENV-RSK-0364

Name	Title	Company	Experience (years / detail)	Consensus (Qtd)	Signature and date
Peter DeBono	Subsidence Engineer	MSEC	13		19/7/19
Noel Merrick	DR (Hydrogeologist)	Hydrosimulations	45 (G'water)		19/7/19
Jon Degotardi	Technical Services Manager	Peabody	18		19/7/19
Mick Allen	Facilitator / Safety Superintendent	Peabody	25		19/7/19
Ian Stone	Geologist	Palaris	43 (Geology & Geotech)		19/7/19
Richard Shipe	Vacation student	Peabody	1		19/7/19

Workplace risk assessment and control (WRAC)

Document number: PA-SAH-TMP-0008 Version: 12 June 2018

Participants - ME-ENV-RSK-0333

Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Subsidence Engineer	MSEC	13		 19/07/19
Noel Merrick	DR (Hydrogeologist)	Hydrosimulations	45 (Gwater)		 19/7/19
Jon Degotardi	Technical Services Manager	Peabody	18		 17/7/19
Mick Allen	Facilitator / Safety Superintendent	Peabody	25		 19/7/19
Ian Stone	GEOLOGIST	PARASIS	45 (geology & geotech)		 19.07.19
Richard Shiper	Vis Student	Peabody	5 months		 19/7/19

Ref ID	Risk / threat	Work area or exposure group	Consequence category (use a separate row if multiple reasonable consequences of the same threat as shown in example)	Impact	Act, Object or System Current controls in place	Erosion Factor - Monitoring and Support to Address (Relevant specification documents, inspection and monitoring, training, systems or procedures, etc.)	Risk evaluation (with current control measures)			Act, Object or System Proposed additional controls (if required)	Ownership (Position / role of person(s) accountable for the risk)	Peabody Notification level	Action to address (SAP EHSM action number)
							Maximum reasonable consequence	Likelihood	Risk score				
1. LINEAMENTS													
1.1	Mining effects geological feature - known LINEAMENTS and affects water quantity available to the Woronora reservoir and / or ground water. LINEAMENTS - Definition Linear feature in the surface landscape that may be the surface expression of an underlying geological structure - (faults, joints, dyke)	Water NSW and Dam Safety Committee for all	Compliance / regulatory Considered other consequence categories - Financial, Reputation, Strategic, Environmental	Breach of approval	System - Water management plan includes ground water monitoring and assessment Act - Lineament analysis prior to mine design Act - Correlation of surface lineaments with potential underground structures (inseam drilling , mapping) Act - Seismic surveying to assess continuity and extent of structure System - Mine water balance - monitoring System - Regular review and update of MP's System - [ME-TSE-HMP-0031] Ground or Strata Failure arrangements System - [ME-TSE-MNP-0002] Survey and drafting arrangements System - [ME-TSE-HMP-0011] Subsidence System - [ME-MIN-HMP-0006] Inundation or inrush of a substance PHMP System - Mining approvals System - Geometry, Narrow Extraction / depth of cover ratios System - Wide pillars System - End of panel subsidence monitoring programme - LIDAR plus aerial photography	Limited coverage of all survey and monitoring techniques Inadequate application of MP Inaccuracies in water balance model	4 Significant	1 Rare	10	Act - Potential for LW step around Act - Potential for LW standoff - environmental pillar Object - Potential for additional or replacement ground water monitoring sites Act - Targeted surface mapping above LW305 - LW307	JD SK	Crew/Team	Targeted surface mapping above LW305 - LW307
1.2	Mining effects geological feature - Unknown LINEAMENTS and affects water quantity available to the Woronora reservoir and / or ground water. LINEAMENTS - Definition Linear feature in the surface landscape that may be the surface expression of an underlying geological structure - (faults, joints, dyke)	Water NSW	Compliance / regulatory Considered other consequence categories - Financial, Reputation, Strategic, Environmental	Breach of approval	System - Water management plan includes ground water monitoring and assessment System - Mine water balance - monitoring System - Regular review and update of MP's System - [ME-TSE-HMP-0031] Ground or Strata Failure arrangements System - [ME-TSE-MNP-0002] Survey and drafting arrangements System - [ME-TSE-HMP-0011] Subsidence System - [ME-MIN-HMP-0006] Inundation or inrush of a substance PHMP System - Mining approvals System - Narrow Extraction / depth of cover ratios System - End of panel subsidence monitoring programme - LIDAR plus aerial photography	Limited coverage of all survey and monitoring techniques Inadequate application of Management Plans Inaccuracies in water balance model	4 Significant	1 Rare	10	Act - Potential for LW step around Act - Potential for LW standoff - environmental pillar Object - Potential for add ground water monitoring sites Act - Targeted surface mapping above LW305 - LW307 Act - Correlation of underground structures (inseam drilling , mapping) with surface lineaments Act - Seismic surveying to assess continuity and extent of structure Act - Review in seam drilling Object - Recent 2019 LIDAR	JD SK JD JD	Crew/Team	Correlation of surface lineaments with potential underground structures (inseam drilling , mapping)
2. JOINTS													
2.1	Mining effects geological feature - JOINTS and affects water quantity available to the Woronora reservoir and / or ground water. <i>Not assessed due to being covered under lineaments. Joints may contribute to the formation of a lineament but are not vertically extensive and are limited to near surface extents.</i>												
3. FAULTING													
3.1	Mining effects geological feature - FAULTING and affects water quantity available to the Woronora reservoir and / or ground water.	Water NSW	Compliance / regulatory Considered other consequence categories - Financial, Reputation, Strategic, Environmental	Breach of approval	System - Water management plan includes ground water monitoring and assessment Act - Lineament analysis prior to mine design Act - Correlation of surface lineaments with potential underground structures (inseam drilling , mapping) Act - Seismic surveying to assess continuity and extent of structure System - Mine water balance - monitoring System - Regular review and update of MP's System - [ME-TSE-HMP-0031] Ground or Strata Failure arrangements System - [ME-TSE-MNP-0002] Survey and drafting arrangements System - [ME-TSE-HMP-0011] Subsidence System - [ME-MIN-HMP-0006] Inundation or inrush of a substance PHMP System - Mining approvals Act - Ground water modeling to predict ground water flow behaviour System - Conceptual model - ground water and geotechnical, faults not necessarily contiguous System - Narrow Extraction / depth of cover ratios + geometry System - End of panel subsidence monitoring programme - LIDAR plus aerial photography	Limited coverage of all survey and monitoring techniques Inadequate application of MP Inaccuracies in water balance model	4 Significant	2 Unlikely	20	Act - Potential for LW step around Act - Potential for LW standoff - environmental pillar Object - Potential for additional ground water monitoring sites Act - Targeted surface mapping above LW305 - LW307 Act - Potential for additional surface drilling to characterise a faulting feature Act - Underground water make monitoring specific to F0027 during mining, and further delineation with roadway advancement and inseam drilling.	JD SK JD JD	Supervisor	Underground water make monitoring specific to F0027 during mining, and further delineation with roadway advancement and inseam drilling.

WORKPLACE RISK ASSESSMENT AND CONTROL (WRAC)



Site	Metropolitan Coal
Date	19th July 2019
Title	ME-ENV-RSK-0364 Potential geological features that may be effected by LW 305 - LW 307 mining and affect water quantity available to Woronora Reservoir.

Treatment plan					
Ref ID	Additional controls	Action to address	SAP action no:	Responsible person	Due date
1	Targeted surface mapping above LW305 - LW307	Targeted surface mapping above LW305 - LW307	2000000033329	SK	Mar-20
2	Correlation of surface lineaments with potential underground structures (inseam drilling , mapping)	Correlation of surface lineaments with potential underground structures (inseam drilling , mapping)	2000000033331	JD	Mar-20
3	Underground water make monitoring specific to F0027 during mining, and further delineation with roadway advancement and inseam drilling.	Underground water make monitoring specific to F0027 during mining, and further delineation with roadway advancement and inseam drilling.	2000000033333	JD	Dec-21
4					
5					
6					