

29 August 2025

Jessie Evans
Director, Resource Assessments
Department of Planning, Housing and Infrastructure
GPO Box 39
Parramatta NSW 2124

Dear Jessie,

Dendrobium Area 3C – Longwall 21A – SMP Variation

In accordance with requirements of Condition 7 of Schedule 3 of the Dendrobium Underground Coal Mine Development Consent (DA 60-03-2001), Longwall 21A Subsidence Management Plan (SMP) was approved on 9 July 2025.

However, in order to avoid an intrusive sill that was found at the approved commencing end of Longwall 21A, a revised longwall start position 28 m to the east of the approved start position has been developed. As such, Illawarra Coal Holdings Pty Ltd (ICHPL) request that the Department approve a variation to the Longwall 21A SMP Approval to account for this small change.

Please find enclosed the following documentation to support this request:

- Appendix 1: Graphical Plans
- Attachment A: MSEC (2025) Report 1527. Dendrobium Mine Longwall 21A. The effects of the proposed modified commencing end of Longwall 21A on previous subsidence predictions and impact assessments.
- Attachment B: Letter reports from specialist consultants.

The documents have been uploaded to the Major Projects Planning Portal.

The revised assessments provided in Attachments A and B indicate that the assessed levels of potential impact for the natural and built features, based on the revised commencing position, are the same or slightly smaller as those based on the approved SMP Longwall 21A starting position. The assessments and recommended management strategies for these features, therefore, are the same or smaller as those previously provided in Report No. MSEC1290 and the Approved SMP.

The Management Plans required to be submitted in accordance with the SMP Approval for Longwall 21A were submitted on 4 August 2025 and have not yet been approved by the Department.

ICHPL request that the Department grant a variation to the Longwall 21A SMP Approval to account for the change in longwall starting position at your earliest convenience. Further, ICHPL request that the post-SMP Approval management plans are approved as soon as possible to enable the installation equipment and commencement of the monitoring proposed in these management plans. Please note that Longwall 21A is scheduled to commence in December 2025.

If you have any queries, please contact myself or Gary Brassington.

Yours sincerely,



Bruce Blunden

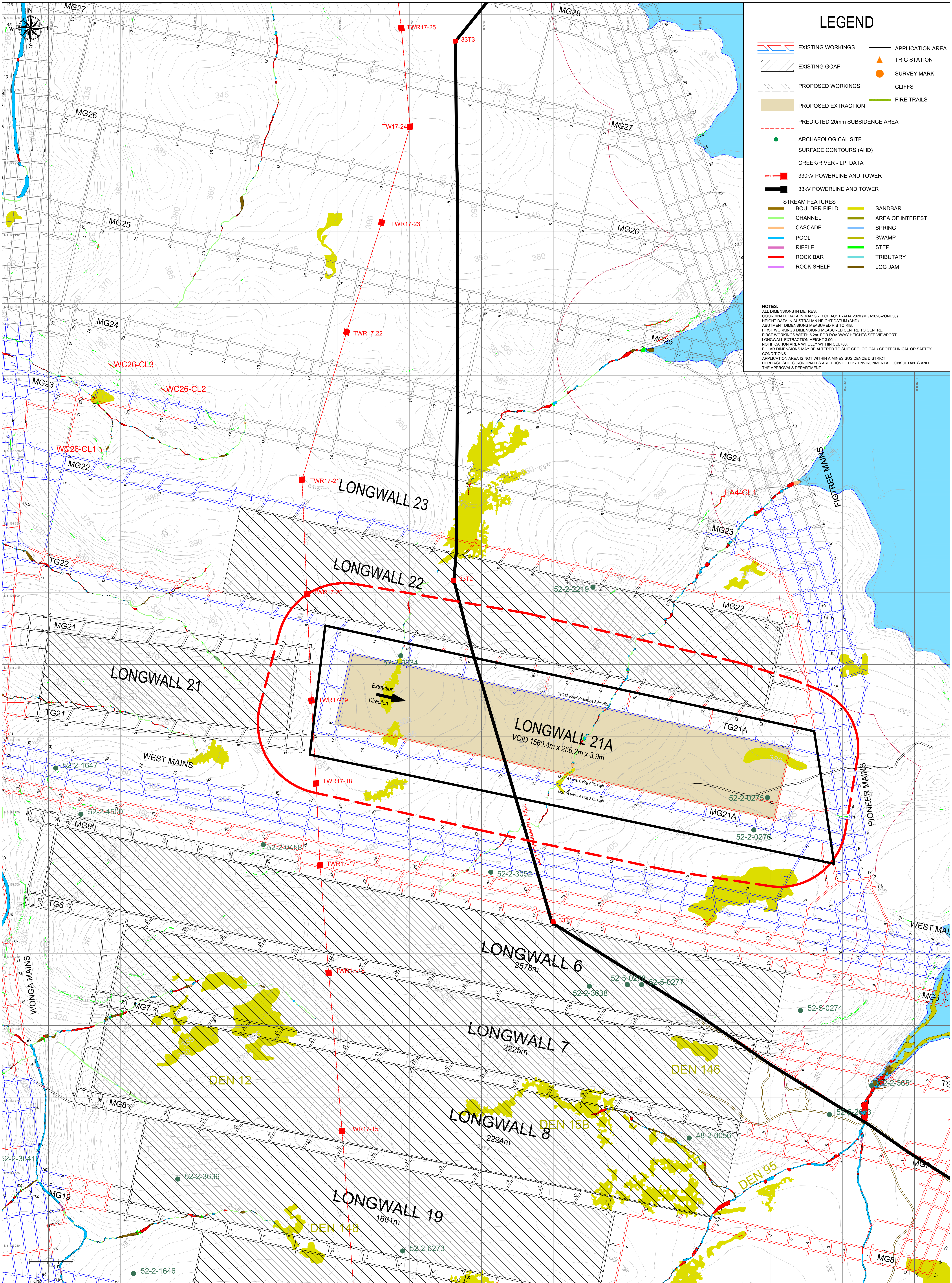
Manger Approvals

Attachments:

- Appendix I: Graphical Plans
- Attachment A: MSEC (2025) Report 1527.
- Attachment B: Letter reports from specialist consultants.

Appendix 1 – Longwall 21A Approved Plans





SIGNED

I hereby accept the information on the plan.

27/08/2025

MINING ENGINEERING MANAGER Date

I hereby certify the accuracy of the plan.

11/08/2025

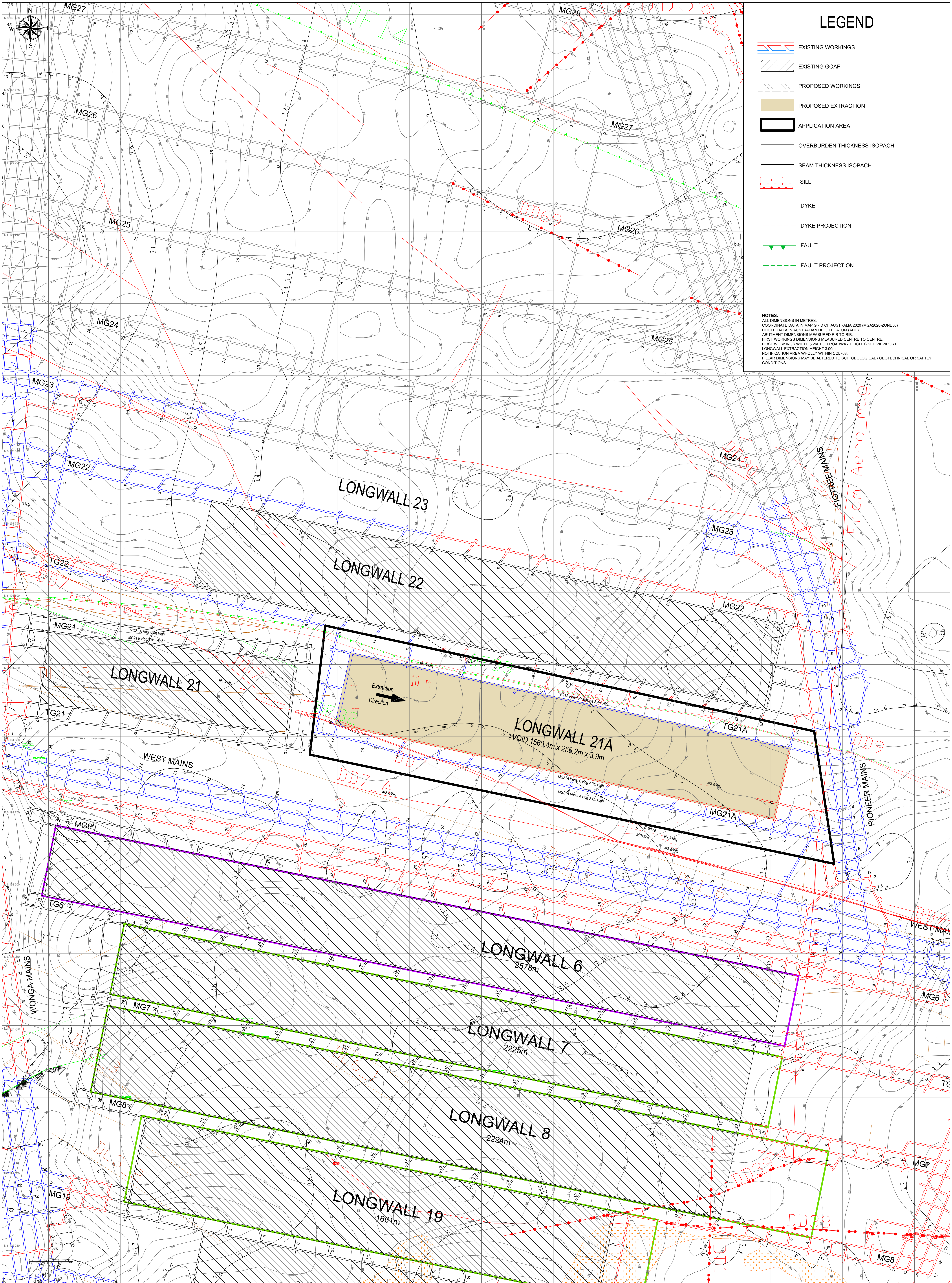
REGISTERED MINING SURVEYOR Date



Dendrobium Mine
ILLAWARRA METALLURGICAL COAL
Cordeaux Road Mount Kembla NSW 2526
ABN 85 098 744 088

Name	Date
DRN ZB	11/08/25
REV	
APP	
SCALE	1:4000 @ A0

Title	Dendrobium Area 3C LW21A Subsidence Management Plan Plan 2 - Surface Features
DRAWING NUMBER	DENSVY1521/2
REV	



SIGNED

I hereby accept the information on the plan.



27/08/2025

Mining Engineering Manager Date

I hereby certify the accuracy of the plan.



11/08/2025

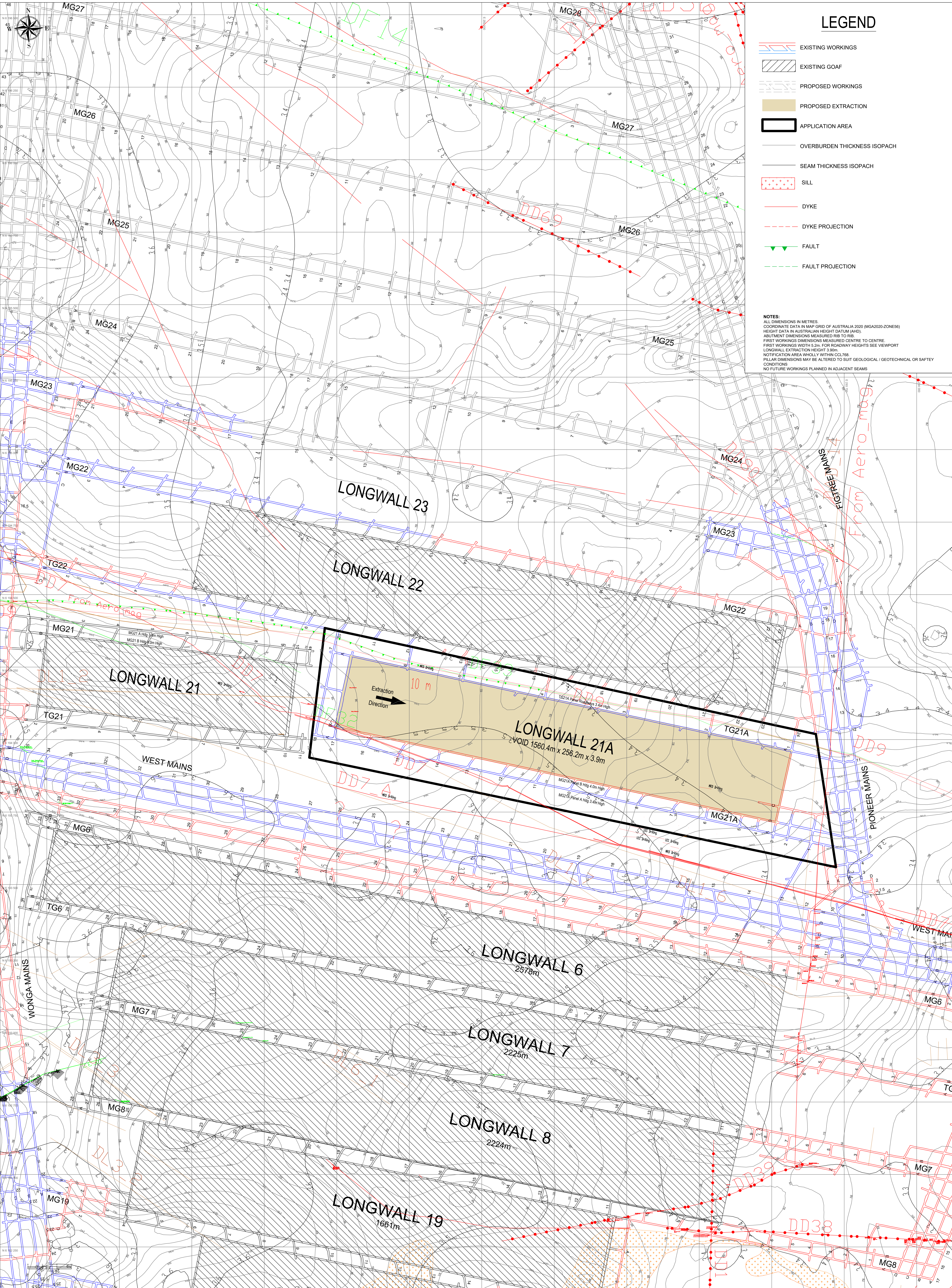
Registered Mining Surveyor Date



Dendrobium Mine
ILLAWARRA METALLURGICAL COAL
Cordeaux Road Mount Kembla NSW 2526
ABN 85 098 744 088

Name	Date
DRN ZB	11/08/25
REV	
APP	
SCALE	1:4000 @ A0

Title	Dendrobium Area 3C LW21A Subsidence Management Plan Plan 3 - Seam Geology
DRAWING NUMBER	DENSVY1521/3
REV	



LEGEND

- EXISTING WORKINGS
- EXISTING GOAF
- PROPOSED WORKINGS
- PROPOSED EXTRACTION
- APPLICATION AREA
- OVERBURDEN THICKNESS ISOPACH
- SEAM THICKNESS ISOPACH
- SILL
- DYKE
- DYKE PROJECTION
- FAULT
- FAULT PROJECTION

NOTES:
ALL DIMENSIONS IN METRES.
COORDINATE DATA IN MAP GRID OF AUSTRALIA 2020 (MGA2020-ZONE56)
HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD)
ABUTMENT DIMENSIONS MEASURED RIB TO RIB.
FIRST WORKINGS DIMENSIONS MEASURED CENTRE TO CENTRE
FIRST WORKINGS WIDTH 5.2m. FOR ROADWAY HEIGHTS SEE VIEWPORT
LONGWALL EXTRACTION HEIGHT 3.90m.
NOTIFICATION AREA WHOLLY WITHIN COL768
PILLAR DIMENSIONS MAY BE ALTERED TO SUIT GEOLOGICAL / GEOTECHNICAL OR SAFETY
CONDITIONS
NO FUTURE WORKINGS PLANNED IN ADJACENT SEAMS

SIGNED

I hereby accept the information on the plan.


27/08/2025
MINING ENGINEERING MANAGER Date

I hereby certify the accuracy of the plan.


11/08/2025
REGISTERED MINING SURVEYOR Date



Dendrobium Mine
ILLAWARRA METALLURGICAL COAL
Cordeaux Road Mount Kembla NSW 2526
ABN 85 098 744 088

Name	Date
DRN ZB	11/08/25
REV	
APP	
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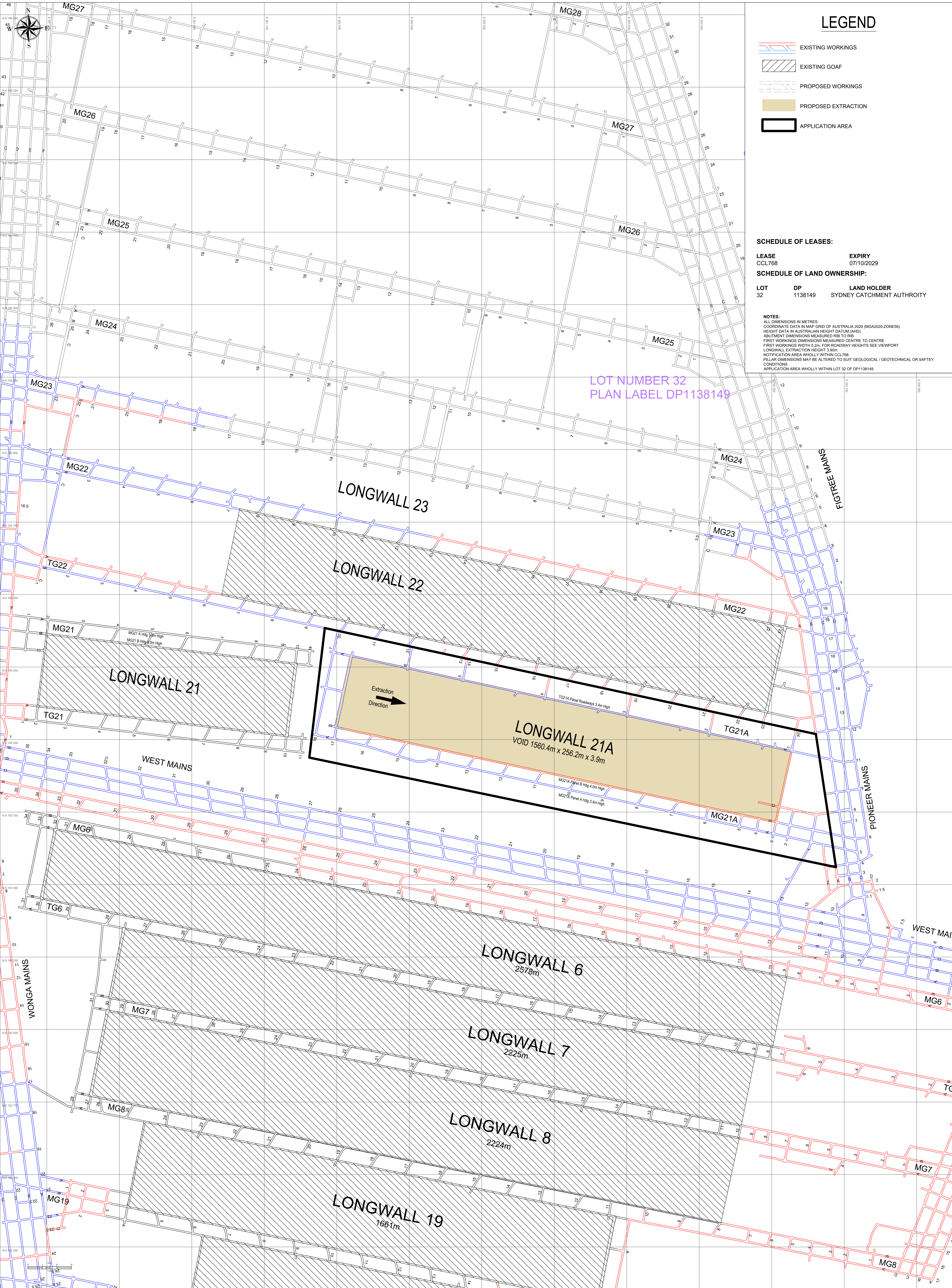
Title

Dendrobium Area 3C LW21A
Subsidence Management Plan
Plan 4 - Seam Geology/Future Worings

DRAWING NUMBER

DENSVY1521/4

REV

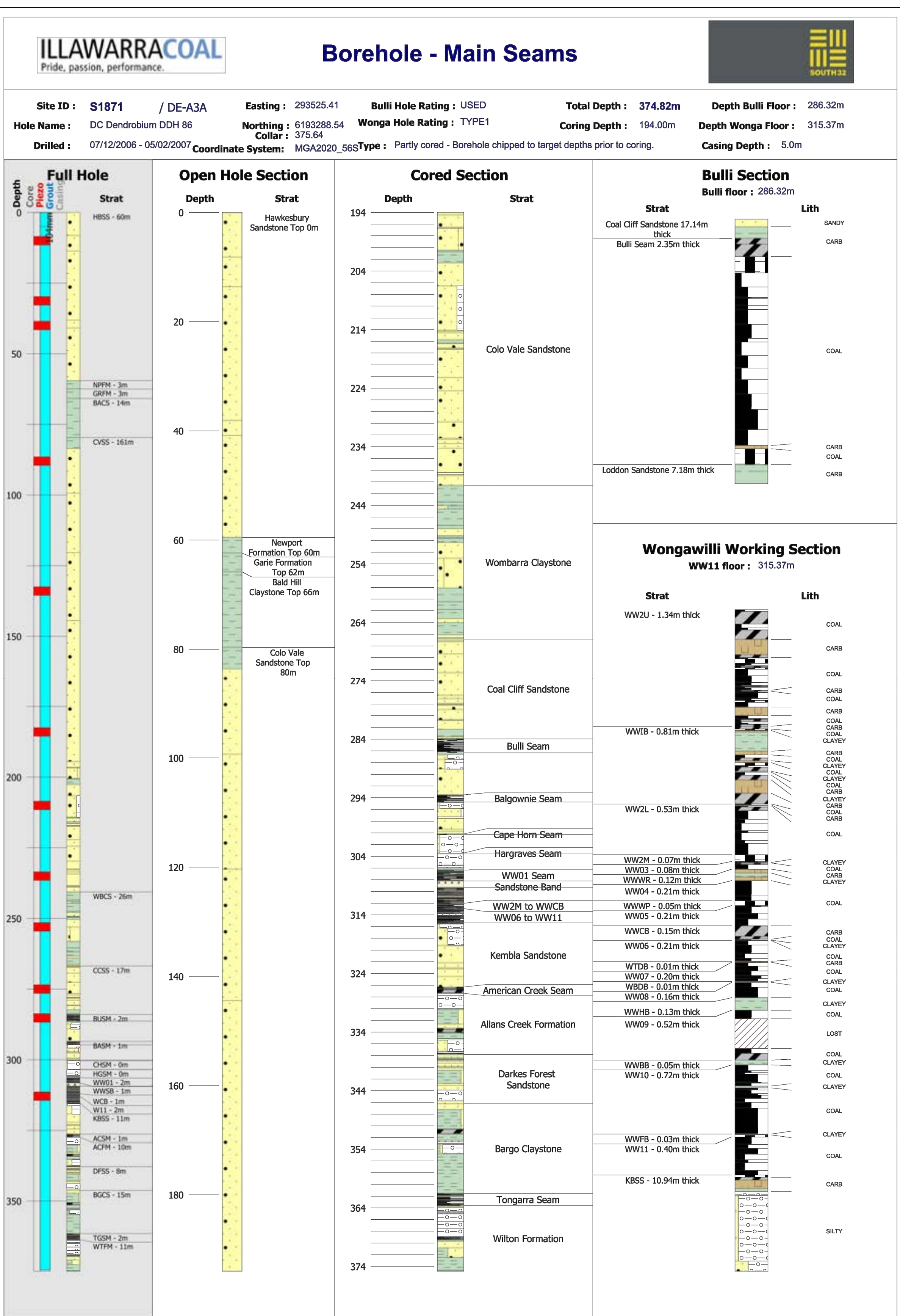


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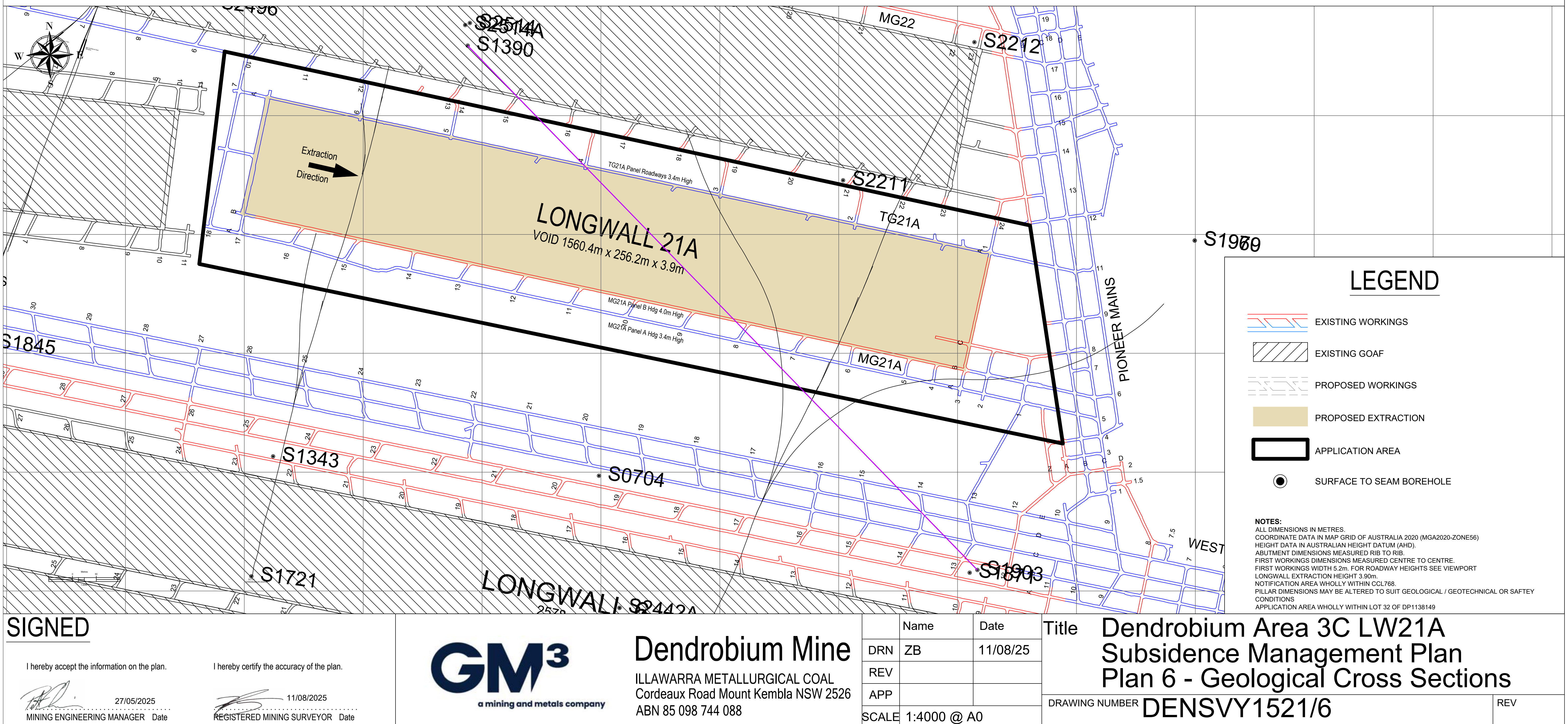
- EXISTING WORKINGS
- EXISTING GOAF
- PROPOSED WORKINGS
- PROPOSED EXTRACTION
- APPLICATION AREA

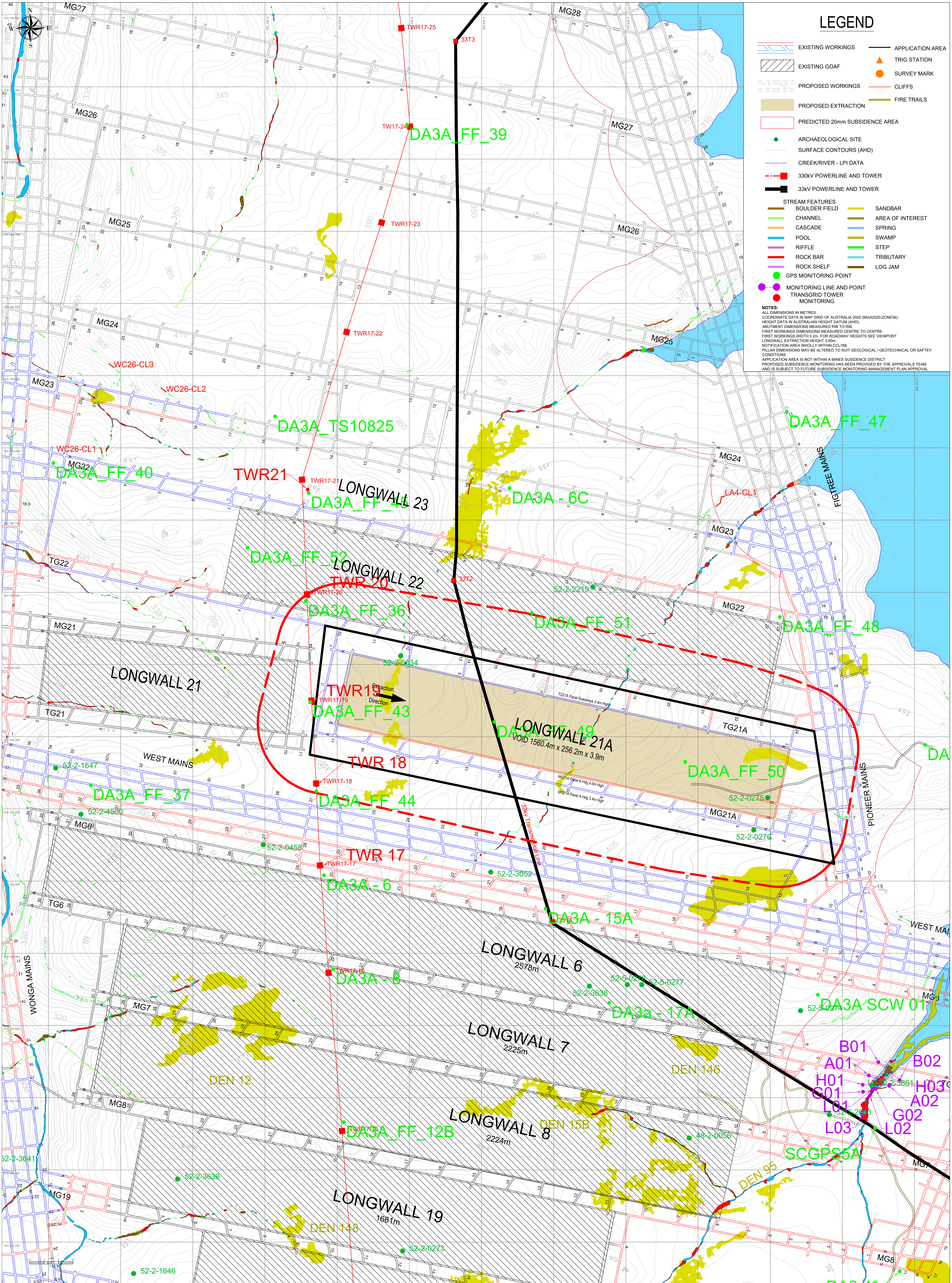
SCHEDULE OF LEASES:
LEASE CCL768 EXPIRY 07/10/2029
SCHEDULE OF LAND OWNERSHIP:
LOT 32 DP 1138149 LAND HOLDER SYDNEY CATCHMENT AUTHORITY
NOTES:
ALL DIMENSIONS IN METRES.
COORDINATE DATA IN MAP GRID OF AUSTRALIA 2020 (MGA2020-ZONE56)
HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD)
ABUTMENT DIMENSIONS MEASURED RIB TO RIB
FIRST WORKINGS DIMENSIONS MEASURED CENTRE TO CENTRE
FIRST WORKINGS WIDTH 5.2m. FOR ROADWAY HEIGHTS SEE VIEWPORT
LONGWALL EXTRACTION HEIGHT 3.90m
NOTIFICATION AREA WHOLLY WITHIN CCL768
PILLAR DIMENSIONS MAY BE ALTERED TO SUIT GEOLOGICAL / GEOTECHNICAL OR SAFETY CONDITIONS
APPLICATION AREA WHOLLY WITHIN LOT 32 OF DP1138149

LOT NUMBER 32
PLAN LABEL DP1138149



BA - COAL - BANDED, 1_coal		CH2 - COAL - BANDED BRIGHT,HEAT AFFECTED, 2_coal_heat		G1 - CONGLOMERATE: granule, SANDY, 6_sandy		AC - CALCITE, 8_other
BB - COAL - BANDED BRIGHT, 1_coal		CH3 - COAL - BANDED,HEAT AFFECTED, 2_coal_heat		G2 - CONGLOMERATE: pebble, SANDY, 6_sandy		AR - CARBONATE, 8_other
BC - COALY BANDS, 1_coal		CH4 - COAL - BANDED DULL,HEAT AFFECTED, 2_coal_heat		G3 - CONGLOMERATE: cobble, SANDY, 6_sandy		AY - CLAY, 8_other
BD - COAL - BANDED DULL, 1_coal		CH5 - COAL - DULL,HEAT AFFECTED, 2_coal_heat		G4 - CONGLOMERATE: boulder, SANDY, 6_sandy		EM - CEMENT, 8_other
BR - COAL - BRIGHT, 1_coal		CI - COAL - CINDERED, 2_coal_heat		GT - CONGLOMERATE, SANDY, 6_sandy		FE - IRONSTONE, 8_other
C1 - COAL - BRIGHT,SIDERITIC, 1_coal		CS1 - CARBONACEOUS SHALE, HEAT AFFECTED, 2_coal_heat		Q5 - QUARTZ SANDSTONE, SANDY, 6_sandy		GR - GRAVEL, 8_other
C2 - COAL - BANDED BRIGHT,SIDERITIC, 1_coal		SC1 - STONEY COAL-HEAT AFFECTED, 2_coal_heat		QZ - QUARTZ, SANDY, 6_sandy		LA - LAMINITE, 8_other
C3 - COAL - BANDED,SIDERITIC, 1_coal		TF - TUFF, 3_clayey		S1 - SANDSTONE: very fine grained, SANDY, 6_sandy		LC - LOST CORE, 8_other
C4 - COAL - BANDED DULL,SIDERITIC, 1_coal		TU - TUFF (PYROCLASTIC), 3_clayey		S2 - SANDSTONE: fine grained, SANDY, 6_sandy		LL - LOST CORE - PROBABLY COAL, 8_other
C5 - COAL - DULL,SIDERITIC, 1_coal		YC - CARBONACEOUS CLAYSTONE, 3_clayey		S3 - SANDSTONE: medium grained, SANDY, 6_sandy		LS - LIMESTONE, 8_other
C6 - COAL - SHALY SIDERITIC, 1_coal		YS - CLAYSTONE, 3_clayey		S4 - SANDSTONE: coarse grained, SANDY, 6_sandy		LT - LATERITE, 8_other
CF - COAL - FUSAINOUS, 1_coal		CM - CARBONACEOUS MUDSTONE, 4_carb		S5 - SANDSTONE: very coarse grained, SANDY, 6_sandy		MY - MYLONITE, 8_other
CO - COAL, 1_coal		CS - CARBONACEOUS SHALE, 4_carb		SA - SAND, SANDY, 6_sandy		NL - NOT LOGGED, 8_other
CR - COAL - SHALY, 1_coal		M1 - SHALE - SIDERITIC, 4_carb		SS - SANDSTONE, SANDY, 6_sandy		PV - PYRITE, 8_other
CJ - COAL, 1_coal		H2 - CARBONACEOUS SHALE - SIDERITIC, 4_carb		SS1 - SANDSTONE -HEAT AFFECTED, SANDY, 6_sandy		RE - BRECCIA, 8_other
DB - COAL - DULL (1-10% br), 1_coal		M1 - MUDSTONE - SIDERITIC, 4_carb		B1 - BASIC IGNEOUS, 7_intrusive		RG - REGOLITH, 8_other
DC - COAL - DULL CONCHOIDAL, 1_coal		MC - MUDSTONE - COALY, 4_carb		BT - BASALT, 7_intrusive		RT - CHERT, 8_other
DD - COAL - Dull, 1_coal		ME - METAMORPHIC ROCK, 4_carb		BV - BASIC VOLCANIC, 7_intrusive		SD - SIDERITE, 8_other
RC - SHALE - COALY, 1_coal		MS - MUDSTONE, 4_carb		DO - dolerite, 7_intrusive		SO - SOIL, 8_other
SC - STONY COAL, 1_coal		OS - OIL SHALE, 4_carb		IG - IGNEOUS INTRUSION, 7_intrusive		WW - UNKNOWN, 8_other
CH - COAL - HEAT AFFECTED, 2_coal_heat		SH - SHALE, 4_carb		NS - NEPHELINE SYENITE, 7_intrusive		SILT
CH1 - COAL - BRIGHT,HEAT AFFECTED, 2_coal_heat		ST - SILTSTONE, 5_silty		VC - VOLCANIC, 7_intrusive		Organic Matter







Attachment A – MSEC1527 – Dendrobium Longwall 21A

ILLAWARRA COAL HOLDINGS:

Dendrobium Mine – Longwall 21A

The effects of the proposed modified commencing end of Longwall 21A
on previous subsidence predictions and impact assessments

DOCUMENT REGISTER

Revision	Description	Author	Checker	Date
01	Draft issue	JB	-	19 Aug 25
A	Final issue	JB	KK	20 Aug 25

Report produced to: support an application for the proposed modification of LW21A to be submitted to the Department of Planning, Housing and Infrastructure.

Previous reports: MSEC1290 (Rev. B) – Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Extraction of the Proposed Longwall 21A in Area 3C at Dendrobium Mine (October 2023).

Background reports available at www.minesubsidence.com:-

Introduction to Longwall Mining and Subsidence (Revision A)

General Discussion of Mine Subsidence Ground Movements (Revision A)

Mine Subsidence Damage to Building Structures (Revision A)

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Fig. A.03	Predicted profiles of incremental vertical subsidence, tilt and curvature along Fire Road No. 6F due to mining of LW21A only	App. A
Fig. A.04	Predicted profiles of incremental vertical subsidence, tilt along and tilt across the 330 kV transmission line due to the mining of LW21A only	App. A

Drawings

Drawings referred to in this report are included in Appendix B at the end of this report.

Drawing No.	Description	Rev.
MSEC1527-01	General layout of longwalls in Area 3C	A
MSEC1527-02	Surface level contours	A
MSEC1527-03	Wongawilli Seam Floor Contours	A
MSEC1527-04	Wongawilli Seam Thickness Contours for Basal Section	A
MSEC1527-05	Wongawilli Seam Depth of Cover Contours	A
MSEC1527-06	Natural features	A
MSEC1527-07	Built features	A
MSEC1527-08	Predicted incremental subsidence contours due to LW21A	A
MSEC1527-09	Predicted total subsidence contours after LW21 to LW23	A

1.1. Background

Illawarra Coal Holdings Pty Limited (ICHPL), a wholly owned subsidiary of Gear M Illawarra Met Coal Pty Ltd (trading as GM³), operates Dendrobium Mine (the Mine), which is located in the Southern Coalfield of New South Wales (NSW). The Mine is located west of Wollongong and the Illawarra Escarpment and east of the township of Bargo.

ICHPL has completed the mining of Longwalls 6 to 8, 19 and 19A (LW6 to LW8, LW19 and LW19A) in Area 3A, Longwalls 9 to 18 (LW9 to LW18) in Area 3B and Longwall 21 (LW21) in Area 3C. At the time of this report, ICHPL was mining Longwall 22 (LW22) and has approval for the mining of the future Longwalls 21A and 23 (LW21A and LW23) in Area 3C.

Mine Subsidence Engineering Consultants (MSEC) was previously commissioned by ICHPL to prepare subsidence predictions and impact assessments for LW21A in Area 3C at Dendrobium Mine. Report No. MSEC1290 (Rev. B) was issued in October 2023 in support of the Subsidence Management Plan Application for this longwall.

The Department of Planning, Housing and Infrastructure (DPHI) granted ICHPL approval for the mining of LW21A on 9 July 2025. The longwall layout in Area 3C adopted in the SMP Application and Report No. MSEC1290 is referred to as the *Previous Layout* in this report.

ICHPL now proposes to shorten the commencing (i.e. western) end of LW21A by 28 m from that adopted in the SMP Application and Report No. MSEC1290. The purpose of the modification is to avoid a sill in the barrier pillar between LW21 and LW21A.

The longwall layout in Area 3C that includes the modified commencing (i.e. western) end of LW21A is referred to as the *Modified Layout* in this report. This subsidence report has been prepared to support the proposed modification of LW21A which will be submitted to the DPHI.

1.2. Mining geometry

The locations of the longwalls in Area 3C are shown in Drawing No. MSEC1527-01 in Appendix B. The layout of LW21A based on the Previous Layout and Modified Layout are shown by the orange outline and magenta outline, respectively, in this drawing.

LW21A is located east of the existing LW21 and south of the currently active LW22. The mining sequence in Area 3C is LW21, LW22, LW21A and then LW23.

A summary of the dimensions for LW21A based on the Previous Layout and Modified Layout is provided in Table 1.1.

Table 1.1 Dimensions of LW21A based the Previous Layout and Modified Layout

Layout (Report No.)	Overall void length including installation heading (m)	Overall void width including first workings (m)	Overall tailgate chain pillar width (m)
Previous Layout (MSEC1290)	1588	256	70
Modified Layout (MSEC1527)	1560	256	70

The overall void length of LW21A is proposed to be shortened by 28 m at the commencing (i.e. western) end of this longwall. The length of longwall extraction excluding the installation heading is approximately 9 m less than shown in Table 1.1 and is approximately 1579 m based on the Previous Layout and 1551 m based on the Modified layout.

The longwall face width for LW21A excluding the first workings (i.e. secondary extraction) is 246 m based on both the Previous Layout and Modified Layout. The solid chain pillar between LW21A and LW22 is 70 m based on both layouts. That is, the longwall void width and solid chain pillar width are not proposed to be modified.

LW21A will be mined within the Wongawilli Seam from the west towards the east, i.e. retreat mining towards the Figtree main headings.

1.3. Surface and seam

The surface and seam levels along the centreline of LW21A are shown in Fig. 1.1. The definition of the Study Area is provided in Section 3.1.

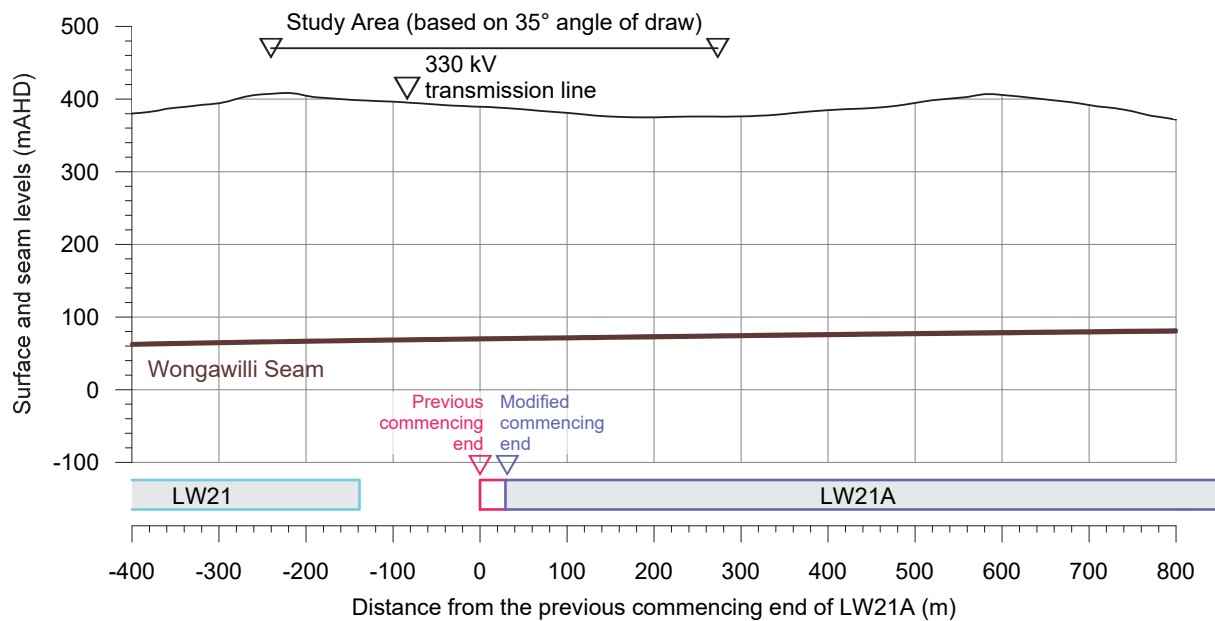


Fig. 1.1 Surface and seam levels along the centreline of LW21A

The surface level contours are shown in Drawing No. MSEC1527-02 in Appendix B. LW21A is located to the south of LW22 and to the east of LW21. Two ridgelines are located above the middle and eastern end of LW21A. The natural surface above the longwall falls towards several drainage lines that drain into Lake Cordeaux.

The seam floor contours, seam thickness contours and depth of cover contours for the Wongawilli Seam are shown in Drawing Nos. MSEC1527-03, MSEC1527-04 and MSEC1527-05, respectively. The contours are based on the information presented in Report No. MSEC1290 and the SMP Application.

The depths of cover to the Wongawilli Seam above the commencing (i.e. western) end of LW21A vary between 335 m on the northern side and 350 m on the southern side.

The Wongawilli Seam is nominally 10 m thick and contains numerous bands of non-coal material. The economic section of the Wongawilli Seam is the basal 3 m to 5 m. ICHPL has reviewed the nature of the banding in Area 3C and propose to extract a height of 3.9 m using conventional longwall mining techniques.

2.1. Maximum predicted conventional subsidence effects

The Incremental Profile Method (IPM) was previously used to predict the conventional subsidence effects due to the mining of LW21A based on the Previous Layout and these are presented in Report No. MSEC1290. The IPM has now been used to predict the conventional subsidence effects for this longwall based on the Modified Layout.

The predicted incremental subsidence contours due to the mining of LW21A, based on the Modified Layout, are shown in Drawing No. MSEC1527-08 in Appendix B. The predicted incremental 20 mm subsidence contour, based on the Previous Layout, is also shown in this drawing for comparison.

The extent of vertical subsidence decreases due to the proposed shortened commencing (i.e. western) end of LW21A. The surface area located within the predicted incremental 20 mm subsidence contour for this longwall is 87 hectares (ha) based on the Previous Layout reducing to 86 ha based on the Modified Layout.

A summary of the maximum predicted values of incremental vertical subsidence, tilt and curvatures due to the mining of LW21A, based on the Previous and Modified Layouts, is provided in Table 2.1. The predicted strains directly above the longwall are discussed in Section 2.2.

Table 2.1 Maximum predicted incremental conventional vertical subsidence, tilt and curvatures due to the mining of LW21A based on the Previous and Modified Layouts

Layout (Report No.)	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt (mm/m)	Maximum predicted incremental hogging curvature (km ⁻¹)	Maximum predicted incremental sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	2400	35	0.90	0.90
Modified Layout (MSEC1527)	2400	35	0.90	0.90

The maximum predicted incremental subsidence effects for LW21A, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout. That is, the shortened commencing (i.e. western) end of LW21A does not affect the maximum predicted incremental values. The reason is that the maximum predicted incremental effects occur near the mid-length and eastern end of LW21A where the depths of cover are shallower.

The predicted total subsidence contours due to the mining of LW21, LW22, LW21A and LW23, based on the Modified Layout, are shown in Drawing No. MSEC1527-09 in Appendix B. The predicted total 20 mm subsidence contour, based on the Previous Layout, is also shown in this drawing for comparison.

A summary of the maximum predicted values of total vertical subsidence, tilt and curvatures due to the mining of LW21, LW22, LW21A and LW23, based on the Previous and Modified Layouts, is provided in Table 2.2. The values are the maximum predicted subsidence effects anywhere above the mining area.

Table 2.2 Maximum predicted total conventional vertical subsidence, tilt and curvatures in Area 3C based on the Previous and Modified Layouts

Layout (Report No.)	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	2900	35	1.0	1.0
Modified Layout (MSEC1527)	2900	35	1.0	1.0

The maximum predicted total subsidence effects within the mining area, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout. That is, the shortened commencing (i.e. western) end of LW21A not affect the maximum predicted total values. The reason is that the maximum predicted total effects occur near the middle of the mining area (i.e. away from the LW21A commencing end) where the depths of cover are shallower.

While the maximum predicted subsidence effects do not change, the locations of the maximum predicted longitudinal tilt and curvatures at the commencing (i.e. western) end of LW21A move towards the east due to the proposed modification.

This is illustrated along Prediction Line 1 taken along the centreline of LW21A. The location of this prediction line is shown in Drawing Nos. MSEC1527-08 and MSEC1527-09 in Appendix B. The predicted profiles of total vertical subsidence, tilt and curvature along Prediction Line 1 are illustrated in Fig. A.01 in Appendix A. The predicted profiles after the existing and approved LW21 and LW22 are shown by the cyan lines. The predicted total profiles after LW21A and LW23 based on the Previous and Modified Layouts are shown by the red lines and blue lines, respectively.

The locations of the maximum predicted longitudinal tilt and curvatures move approximately 28 m towards the east due to the proposed shortened commencing (i.e. western) end of LW21A. It is noted that these longitudinal effects are less than the maximum predicted values that occur transverse to the longwalls.

2.2. Predicted strains

The prediction of strain is more difficult than the predictions of subsidence, tilt and curvature. The reason for this is that strain is affected by many factors, including ground curvature and horizontal movement, as well as local variations in the near surface geology, the locations of pre-existing natural joints at bedrock, and the depth of bedrock. Survey tolerance can also represent a substantial portion of the measured strain, in cases where the strains are of a low order of magnitude. The profiles of observed strain, therefore, can be irregular even when the profiles of observed subsidence, tilt and curvature are relatively smooth.

The predicted strains for LW21A have been derived using a statistical analysis of ground monitoring data from the NSW coalfields. The method of prediction for strain is described in Section 4.4 of Report No. MSEC1290.

The maximum predicted strains for LW21A, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout. The reason is the shortened commencing (i.e. western) end has little to no effect on the predicted subsidence effects in this location. Also, the maximum strains occur near the mid-length and eastern end of LW21A where the depths of cover are shallower.

The maximum predicted total strains for LW21A are 8 mm/m tensile and compressive based on the 95 % confidence levels, and 17 mm/m tensile and compressive based on the 99 % confidence levels.

2.3. Predicted valley-related effects

The predicted valley-related effects along the streams at the Mine have been determined using the methods outlined in ACARP Research Project No. C9067, which were published in the handbook entitled "*Management Information Handbook on the Undermining of Cliffs, Gorges and River Systems*", issued in September 2002. Details on the ACARP 2002 Prediction Method are provided in the background report entitled "*General Discussion on Mine Subsidence Ground Movements*" which can be obtained from www.minesubsidence.com.

The predicted upsidence and closure effects along the streams have been determined from the empirical database based on their lateral and longitudinal distances from the extracted longwalls, the depths of the valleys and the maximum predicted incremental subsidence resulting from the extraction of each longwall.

There are no streams located directly above the commencing (i.e. western) end of LW21A based on both the Previous Layout and Modified Layout. There are tributaries to Wongawilli Creek located west of the longwall commencing end and tributaries to Lake Cordeaux located east of the commencing end.

The predicted valley-related effects for the streams, based on the Modified Layout, are therefore similar to or slightly less than those based on the Previous Layout. Further discussions are provided in Chapter 3.

3.1. The Study Area

The *Study Area* has been defined as the surface area where the predicted subsidence effects, based on the Modified Layout, are different to those predicted based on the Previous Layout. The Study Area has been based on the following:

- 35° angle of draw line around the commencing (i.e. western) end of LW21A based on both the Previous Layout and Modified Layout; and
- the limit where the change in the predicted incremental vertical subsidence, due to the modified commencing (i.e. western) end of LW21A, is greater than 20 mm.

The depths of cover contours for the Wongawilli Seam are shown in Drawing No. MSEC1527-05. The depths of cover above the commencing (i.e. western) end of LW21A vary between 335 m and 350 m. The 35° angle of draw, therefore, has been determined by drawing a line that is a horizontal distance varying between 235 m and 245 m around the extents of secondary extraction for the longwall.

The predicted limit of vertical subsidence, taken as the predicted incremental 20 mm subsidence contour for LW21A, has been determined using the Incremental Profile Method (IPM). This method is described in Report No. MSEC1290 which supported the SMP Application. The predicted 20 mm change in vertical subsidence contour is wholly located inside of the 35° angle of draw.

The Study Area is therefore only defined by the 35° angle of draw and it is shown in Drawing Nos. MSEC1527-01 to MSEC1527-07 in Appendix B. The Study Area is referred to as the “*Study Area based on the 35° degree angle of draw*” in this report for simplicity.

Surface features that are located within 600 m of the commencing (i.e. western) end of LW21A may experience valley-related effects and could be sensitive to these effects. These features have therefore also been included in the assessments provided in this report.

The Study Area based on the 600 m boundary is also shown in Drawing Nos. MSEC1527-01 to MSEC1527-07 in Appendix B.

The natural and built features that are located within or adjacent to the Study Areas based on the 35° degree angle of draw and based on the 600 m boundary are shown in Drawing Nos. MSEC1527-06 and MSEC1527-07.

The surface features that have been included in the assessments provided in this report are:

- first and second order tributaries;
- steep slopes;
- swamps;
- unsealed tracks;
- 330 kV transmission line;
- Aboriginal heritage sites; and
- survey control marks.

The effects of the proposed modified commencing (i.e. western) end of LW21A on the subsidence predictions and impact assessments for these features are provided in the following sections.

3.2. Wongawilli Creek

Wongawilli Creek is shown in Drawing No. MSEC1527-06.

Wongawilli Creek is located more than 1.1 km from the commencing (i.e. western) end of LW21A at its closest point. At this distance, the creek is not predicted to experience measurable subsidence effects due to the mining of LW21A.

It is unlikely, therefore that Wongawilli Creek would experience adverse physical impacts due to the mining of LW21A, even if the predictions were exceeded by a factor of two times.

3.3. First and second order tributaries

The tributaries are shown in Drawing No. MSEC1527-06.

LC5 is a first order tributary to Lake Cordeaux and the upper reaches cross LW21A. The tributary is located east of the longwall commencing end at a minimum distance of 165 m based on the Previous Layout and 135 m based on the Modified Layout.

WC20, WC24 and WC24A are first and second order tributaries to Wongawilli Creek that are located west of LW21A. The distances of these creeks from the longwall increase by up to 30 m due to the proposed modified commencing end.

The predicted profiles of total vertical subsidence, upsidence and closure along LC5 are illustrated in Fig. A.02 in Appendix A. The predicted profiles after the existing and approved LW21 and LW22 are shown by the cyan lines. The predicted total profiles after LW21A and LW23 based on the Previous and Modified Layouts are shown by the red lines and blue lines, respectively.

The predicted vertical subsidence, upsidence and closure above LW21A, based on the Modified Layout, are less than the predicted values based on the Predicted Layout. The slight reductions are due to the changed end effects caused by the proximity of the commencing (i.e. western) end of LW21A due to the proposed modification. However, the maximum predicted vertical subsidence, upsidence and closure above LW22 and LW23 do not change.

A summary of the maximum predicted values of total vertical subsidence, upsidence and closure along Stream LC5, based on the Previous and Modified Layouts, is provided in Table 3.1. The values are the maximum predicted subsidence effects anywhere along the stream due to the mining of LW21, LW22, LW21A and LW23.

Table 3.1 Maximum predicted total vertical subsidence, upsidence and closure along Stream LC5 due to mining of LW21 to LW23

Layout (Report No.)	Maximum predicted total vertical subsidence (mm)	Maximum predicted total upsidence (mm)	Maximum predicted total closure (mm)
Previous Layout (MSEC1290)	3100	375	475
Modified Layout (MSEC1527)	3100	375	475

The maximum predicted subsidence effects for WC20, WC24 and WC24A, based on the Modified Layout, are similar to but slightly less than the maximum predicted subsidence effects based on the Previous Layout. The reason is that these tributaries are located outside the mining area and their distances from LW21A increase due to the proposed modification.

The assessed levels of potential impact for the first and second order tributaries, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for the tributaries, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.4. Cliffs

The cliffs are shown in Drawing No. MSEC1527-06.

There are no cliffs identified within the Study Area based on the 600 m boundary. The cliffs are located more than 900 m from the commencing (i.e. western) end of LW21A. At these distances, the cliffs are unlikely to experience measurable subsidence effects.

It is unlikely, therefore that the cliffs would experience adverse physical impacts due to the mining of LW21A, even if the predictions were exceeded by a factor of two times.

3.5. Steep slopes

The steep slopes are shown in Drawing No. MSEC1527-06.

Steep slopes are located on the western side of LW21A. The predicted subsidence effects for these steep slopes, based on the Modified Layout, are similar to but slightly less than the maximum predicted values based on the Previous Layout. The reason is the minimum distance of these steep slopes from LW21A increases due to the proposed modifications.

There are also steep slopes located above the mid-length of LW21A, south of LW21A above solid coal and above LW22 and LW23. The predicted subsidence effects for these steep slopes do not change due to their distances from the commencing (i.e. western) end of LW21A.

The assessed levels of potential impact for the steep slopes, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for the steep slopes, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.6. Swamps

The swamps are shown in Drawing No. MSEC1527-06.

Swamp 9 is located above the western end of LW21A. Swamp 7 is located above the active LW22 and future LW23 to the north of LW21A. Swamps 144 and 145 are located outside the mining area to the south and south-west of LW21A.

A summary of the maximum predicted values of total vertical subsidence, tilt and curvatures for the swamps, based on the Previous and Modified Layouts, is provided in Table 3.2. The values are the maximum predicted subsidence effects within 20 m of the mapped extents of the swamps due to the mining of LW21, LW22, LW21A and LW23.

Table 3.2 Maximum predicted total vertical subsidence, tilt and curvatures for the swamps due to mining of LW21 to LW23

Layout (Report No.)	Swamp	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	Swamp 7	2650	35	0.90	0.70
	Swamp 9	2250	30	0.50	0.70
	Swamp 144	< 20	< 0.5	< 0.01	< 0.01
	Swamp 145	< 20	< 0.5	< 0.01	< 0.01
Modified Layout (MSEC1527)	Swamp 7	2650	35	0.90	0.70
	Swamp 9	2150	30	0.50	0.70
	Swamp 144	< 20	< 0.5	< 0.01	< 0.01
	Swamp 145	< 20	< 0.5	< 0.01	< 0.01

The maximum predicted vertical subsidence for Swamp 9, based on the Modified Layout, is slightly less than the maximum predicted value based on the Previous Layout. The slight reduction is due to the changed end effects caused by the proximity of the commencing (i.e. western) end of LW21A due to the proposed modification. However, the maximum predicted tilt and curvatures for Swamp 9 do not change.

The maximum predicted subsidence effects for Swamp 7, Swamp 144 and Swamp 145, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout. The predictions for these swamps do not change due to their distances from the commencing (i.e. western) end of LW21A.

The assessed levels of potential impact for the swamps, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for the swamps, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.7. Tracks

The unsealed roads and tracks are shown in Drawing No. MSEC1527-07.

Fire Road No. 6F is located on the western side of LW21A. The unsealed road is located partially above the commencing (i.e. western) end of LW21A based on the Previous Layout but is located outside of LW21A based on the Modified Layout.

The predicted profiles of incremental vertical subsidence, tilt and curvature along Fire Road No. 6F are illustrated in Fig. A.03 in Appendix A. The profiles based on the Previous Layout and Modified Layout are shown by the red lines and blue lines, respectively, in this figure.

A summary of the maximum predicted values of incremental vertical subsidence, tilt and curvature along Fire Road No. 6F, based on the Previous and Modified Layouts, is provided in Table 3.3. The values are the maximum predicted subsidence effects anywhere along the fire road due to the mining of LW21A only.

Table 3.3 Maximum predicted incremental vertical subsidence, tilt and curvature along Fire Road No. 6F due to mining of LW21A only

Layout (Report No.)	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt (mm/m)	Maximum predicted incremental hogging curvature (km ⁻¹)	Maximum predicted incremental sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	40	0.5	0.01	< 0.01
Modified Layout (MSEC1527)	30	0.5	0.01	< 0.01

Fire Road No. 6F is predicted to experience low level subsidence effects due to the mining of LW21A. The predicted subsidence effects for the road, based on the Modified Layout, are similar to or slightly less than the maximum predicted values based on the Previous Layout. This is due to the distance of the road from LW21A increasing by the proposed modification.

The assessed levels of potential impact for Fire Road No. 6F, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for the fire roads, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.8. 330 kV transmission line

The 330 kV transmission line is shown in Drawing No. MSEC1527-07.

The Avon-to-Macarthur 330 kV transmission line (Line 17) owned by Transgrid is located between LW21 and LW21A and crosses directly above LW22 and LW23 in Area 3C. The centreline of Tower TWR17-19 is situated approximately 60 m east of the existing LW21.

Tower TWR17-19 is also located west of the future LW21A at a distance of 65 m based on the Previous Layout and 95 m based on the Modified Layout. That is, the distance of this tower from LW21A increases by approximately 30 m due to the proposed modification.

The predicted profiles of incremental vertical subsidence, tilt along and tilt across the 330 kV powerline due to the mining of LW21A only are illustrated in Fig. A.04 in Appendix A. The profiles based on the Previous Layout and Modified Layout are shown by the red lines and blue lines, respectively, in this figure.

A summary of the maximum predicted values of incremental vertical subsidence, tilt along and tilt across the alignment of the 330 kV transmission, based on the Previous and Modified Layouts, is provided in Table 3.4. The values are the maximum predicted subsidence effects anywhere along the transmission line due to the mining of LW21A only.

Table 3.4 Maximum predicted incremental vertical subsidence, tilt along and tilt across the alignment of the 330 kV transmission due to mining of LW21A only

Layout (Report No.)	Maximum predicted incremental vertical subsidence (mm)	Maximum predicted incremental tilt along alignment (mm/m)	Maximum predicted incremental tilt across alignment (mm/m)
Previous Layout (MSEC1290)	20	< 0.5	0.5
Modified Layout (MSEC1527)	< 20	< 0.5	< 0.5

The 330 kV transmission line is predicted to experience very low level movements due to the mining of LW21A. The reason is that it is located outside the extents of this longwall. The predicted subsidence effects also slightly reduce due to the proposed shortened commencing (i.e. western) end of LW21A.

A summary of the maximum predicted values of total vertical subsidence, tilt and curvatures for Tower TWR17-19, based on the Previous and Modified Layouts, is provided in Table 3.5. The values are the maximum predicted subsidence accumulated effects due to the mining of LW21, LW22, LW21A and LW23 in Area 3C.

Table 3.5 Maximum predicted total vertical subsidence, tilt and curvatures for Tower TWR17-19 due to the mining of LW21, LW22, LW21A and LW23 in Area 3C

Layout (Report No.)	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	100	0.5	< 0.01	< 0.01
Modified Layout (MSEC1527)	100	0.5	< 0.01	< 0.01

Tower TWR17-19 is predicted to experience total vertical subsidence of 100 mm based on both the Previous Layout and Modified Layout. The subsidence at this tower is due to the mining of the existing LW21 and the predicted additional subsidence due to the mining of LW22, LW21A and LW23 is negligible.

Only low level tilt and curvatures are predicted at Tower TWR7-19 due to the mining of the existing LW21. Similarly, the predicted additional tilt and curvatures at this tower due to the mining of LW22, LW21A and LW23 are negligible.

Preventive measures have been installed at Tower TWR17-19 including the construction of a raft slab base, installation of diaphragm bracing and belt bracings and installation of roller blocks on the earthwire and conductor attachments.

The preventive measures were designed based on the predicted subsidence effects at Tower TWR17-19 based on the Previous Layout. The required preventive measures do not change at this tower, based on the Modified Layout, as the predicted subsidence effects are similar to but slightly less than those predicted based on the Previous Layout.

The predicted subsidence effects at the remaining towers, based on the Modified Layout, are the same as the predicted values based on the Previous Layout. Preventive measures have also been installed at Towers TWR17-20 and TWR17-21 and were not deemed required for Tower TWR17-18. The required preventive measures do not change at these towers as the predicted subsidence effects do not change.

The assessed levels of potential impact for the 330 kV transmission line, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for the transmission line, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.9. Aboriginal heritage sites

The Aboriginal heritage sites are shown in Drawing No. MSEC1527-07.

Site 52-2-5034 (grinding grooves) is located approximately 25 m north of LW21A and 80 m south of the currently active LW22. This site is east of the commencing (i.e. western) end of LW21A at a distance of 200 m based on the Previous Layout and 175 m based on the Modified Layout.

A summary of the maximum predicted values of total vertical subsidence, tilt and curvatures for Site 52-2-5034, based on the Previous and Modified Layouts, is provided in Table 3.6. The values are the maximum predicted subsidence accumulated effects within 20 m of the site due to the mining of LW21, LW22, LW21A and LW23 in Area 3C.

Table 3.6 Maximum predicted total vertical subsidence, tilt and curvatures for Site 52-2-5034 due to the mining of LW21, LW22, LW21A and LW23 in Area 3C

Layout (Report No.)	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
Previous Layout (MSEC1290)	1000	4.5	0.07	0.11
Modified Layout (MSEC1527)	950	4.5	0.07	0.11

The maximum predicted vertical subsidence at Site 52-2-5034, based on the Modified Layout, is slightly less than the maximum predicted value based on the Previous Layout. The slight reduction is due to the changed end effects caused by the proximity of the commencing (i.e. western) end of LW21A due to the proposed modification. However, the maximum predicted tilt and curvatures for this site do not change.

Site 52-2-0458 (shelter with art) is located south-west of LW21A at a distance of approximately 475 m based on the Previous Layout and 485 m based on the Modified Layout. This site is not predicted to experience measurable subsidence effects due to the mining of LW21A based on both the Previous Layout and Modified Layout.

The assessed levels of potential impact for the Aboriginal heritage sites, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for these sites, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.10. Survey control marks

The survey control marks are shown in Drawing No. MSEC1527-07.

SS66043 is located on the western side of LW21A, and S1343 and SS60972 are located near the 600 m boundary. The predicted subsidence effects for the survey control marks, based on the Modified Layout are similar to or slightly less than those predicted based on the Previous Layout.

The assessed levels of potential impact for the survey control marks, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout. The assessments and recommended management strategies for these marks, therefore, are the same as those previously provided in Report No. MSEC1290 and the SMP Application.

3.11. Summary

The maximum predicted subsidence effects for LW21A, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout, as they occur near the mid-length and eastern end of the longwall where the depths of cover are shallower. However, the extent of subsidence slightly reduces at the western end of LW21A due to the proposed modification.

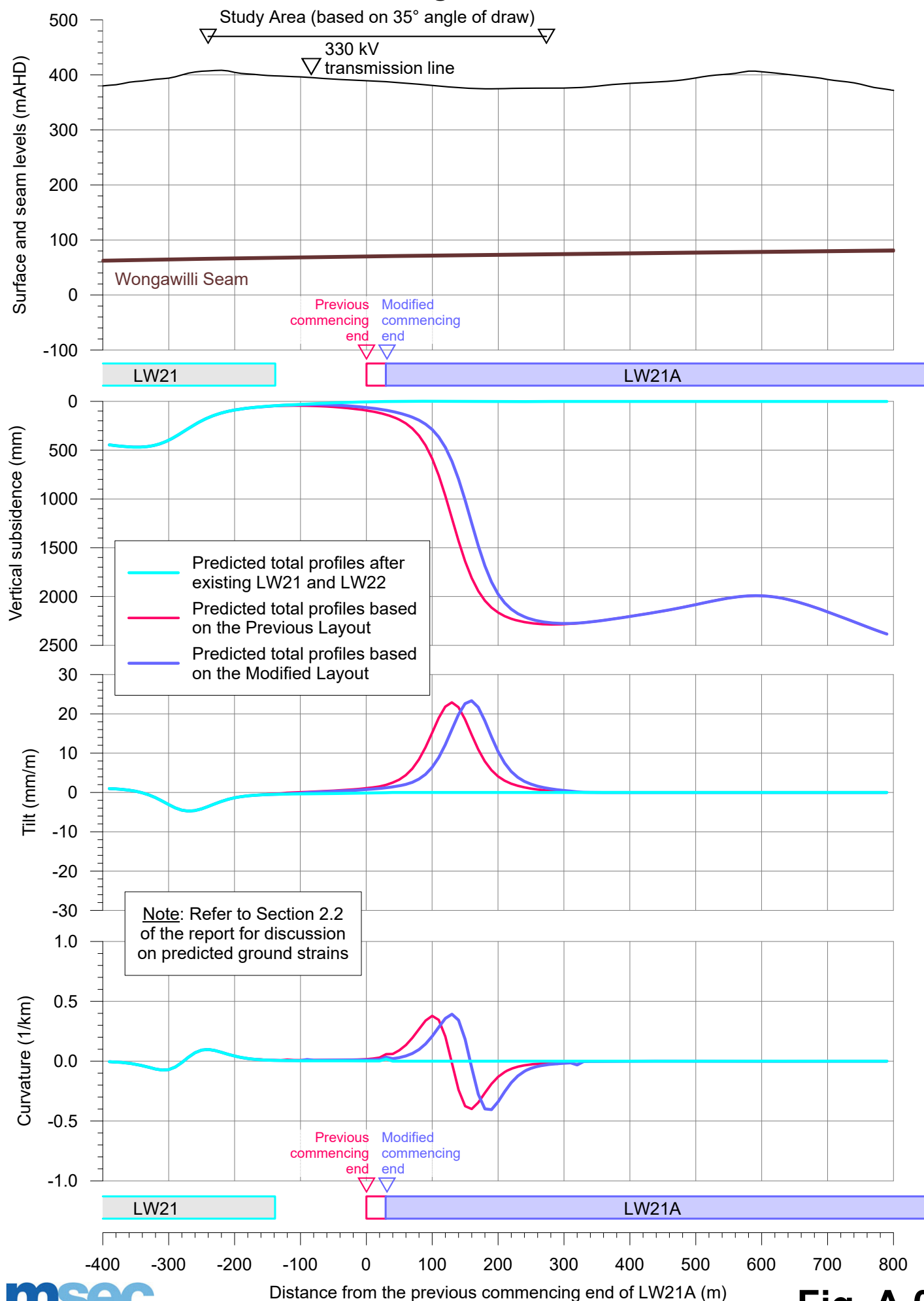
The locations of the maximum predicted longitudinal tilt and curvatures at the commencing (i.e. western) end of LW21A move approximately 28 m towards the east due to the proposed modification. However, these longitudinal effects are less than the maximum predicted values that occur transverse to the longwall.

The maximum predicted subsidence effects for the natural and built features within the Study Area, based on the Modified Layout, are the same or slightly less than the maximum predicted values based on the Previous Layout.

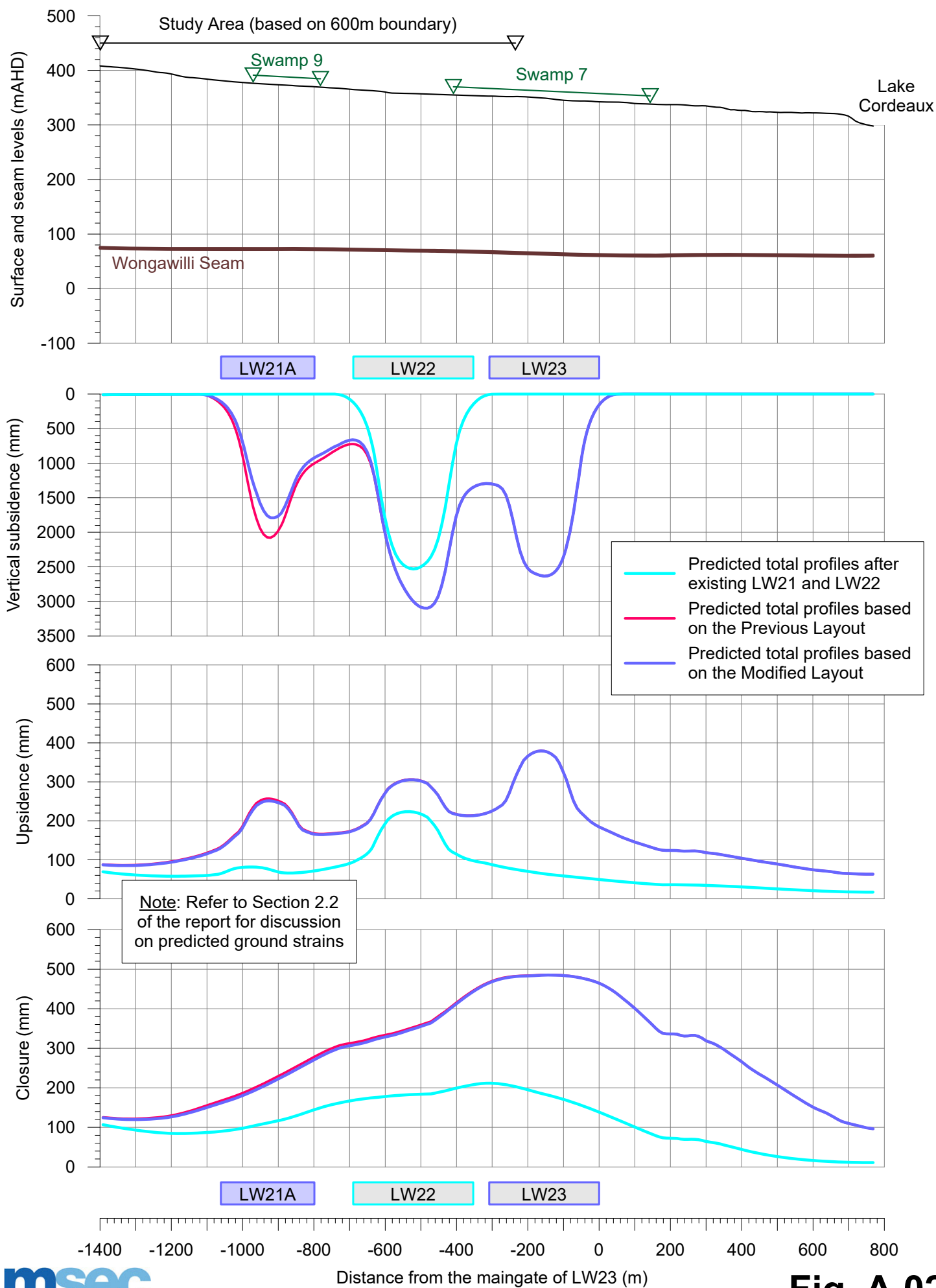
The assessed levels of potential impact for the natural and built features, based on the Modified Layout, are the same as those based on the Previous Layout. The assessments and recommended management strategies for these features, therefore, are the same as those previously provided in Report No. MSEC1290 and the Extraction Plan Application.

APPENDIX A. FIGURES

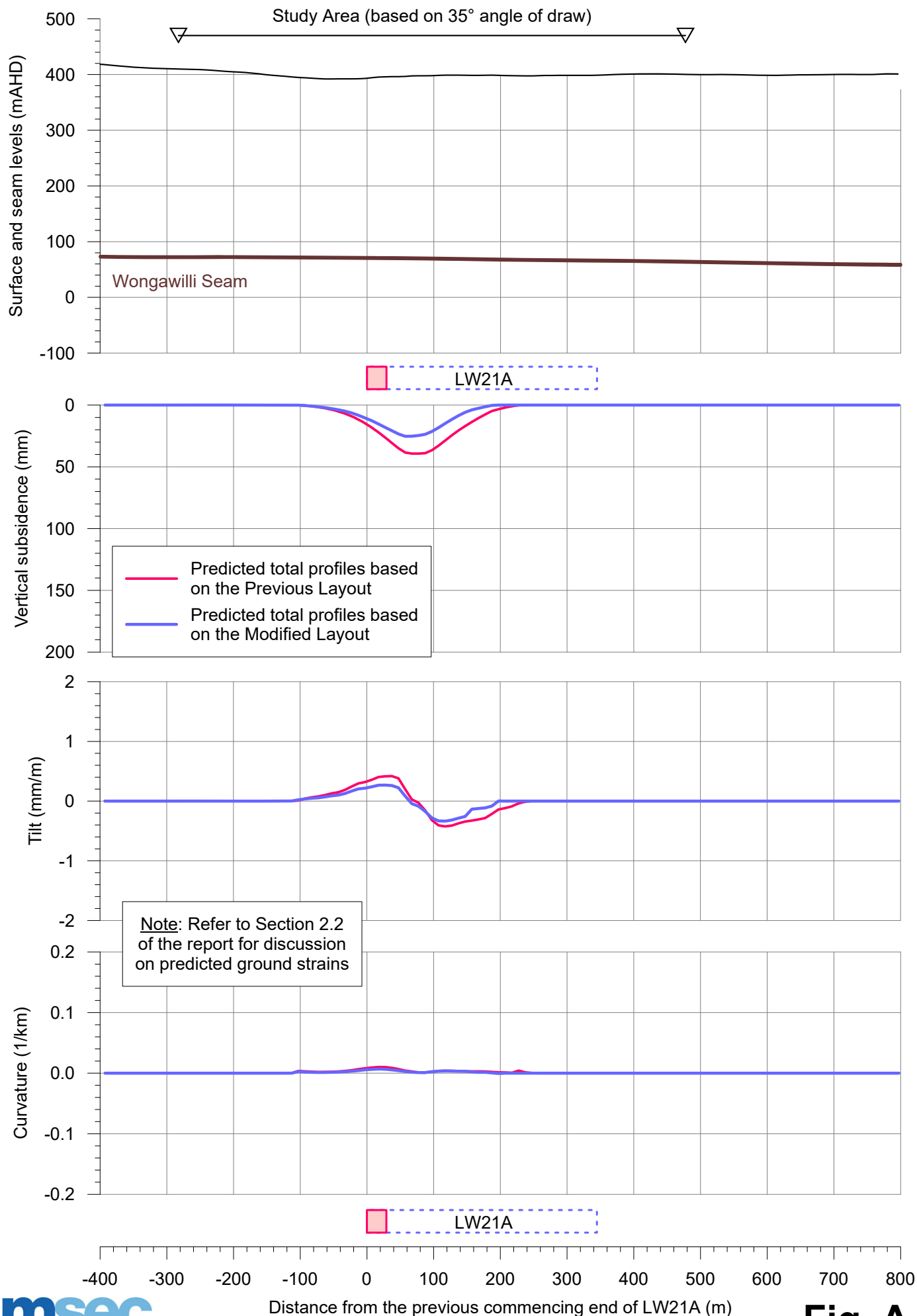
Predicted profiles of total vertical subsidence, tilt and curvature along Prediction Line 1 due to mining of LW21, LW22, LW21A and LW23



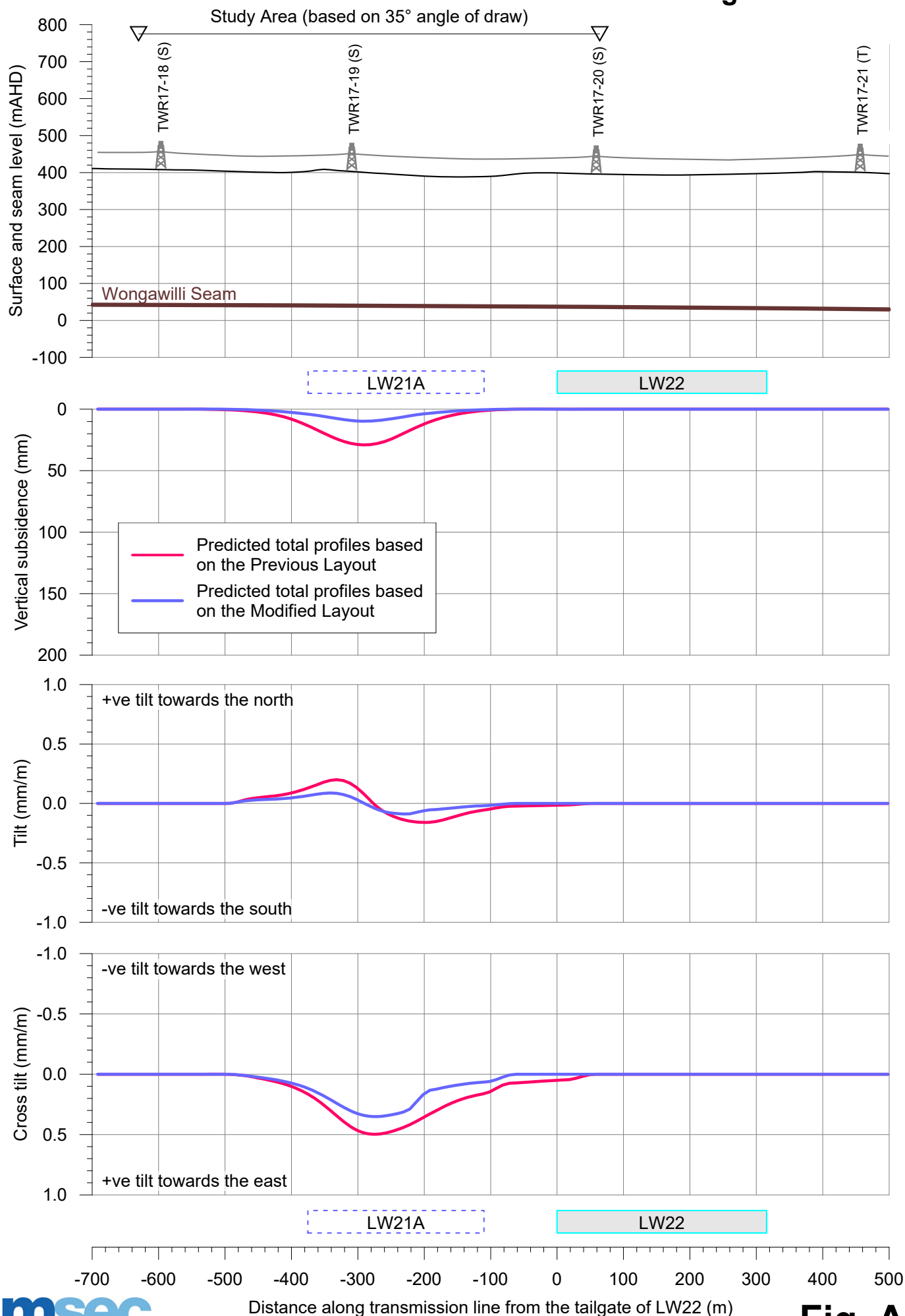
Predicted profiles of total vertical subsidence, upsidence and closure along Stream LC5 due to mining of LW21, LW22, LW21A and LW23



Predicted profiles of incremental vertical subsidence, tilt and curvature along Fire Road No. 6F due to mining of LW21A only



Predicted profiles of incremental vertical subsidence, tilt along and tilt across the 330 kV transmission line due to mining of LW21A only



APPENDIX B. DRAWINGS

- LEGEND**
- MODIFIED LAYOUT
 - PREVIOUS LAYOUT

AREA 3C

0m 250m 500m
SCALE

msec
mine subsidence
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ILLAWARRA COAL HOLDINGS
DENDROBIUM MINE- AREA 3C
LONGWALL LW21A MODIFICATION
GENERAL LAYOUT OF
LONGWALLS IN AREA 3C

DATE:
20 Aug 2025

SCALE:
as shown

DRAWING No:
MSEC1527-01

Rev No
A

Lake Cordeaux

AREA 3A

Wongawilli Creek



LW21

Study Area based on
600m Boundary

Study Area based on
35° Angle of Draw

TWR 17-20

TWR 17-19

TWR 17-18

28 m

Fire Road No 6C

TWR 17-17

TWR 17-16

LW6

33 kV Powerline

Fire Road No 6C

LW21A

LW22

Unsealed

LEGEND

— MODIFIED LAYOUT

— PREVIOUS LAYOUT

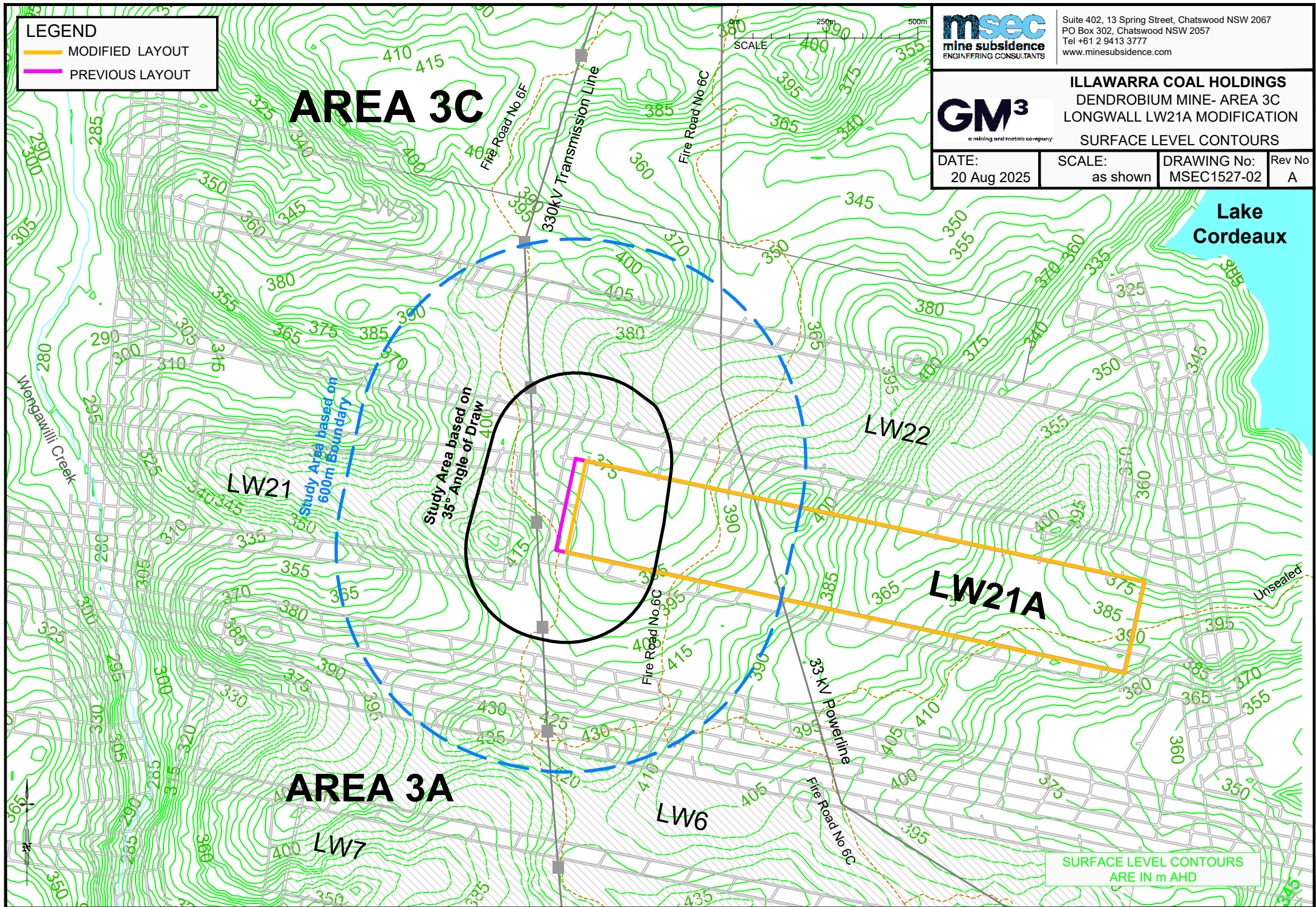
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LONGWALL LW21A MODIFICATION
SURFACE LEVEL CONTOURS

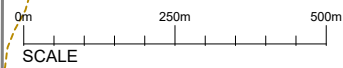
DATE: 20 Aug 2025	SCALE: as shown	DRAWING No: MSEC1527-02	Rev No A
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LEGEND

— MODIFIED LAYOUT

— PREVIOUS LAYOUT

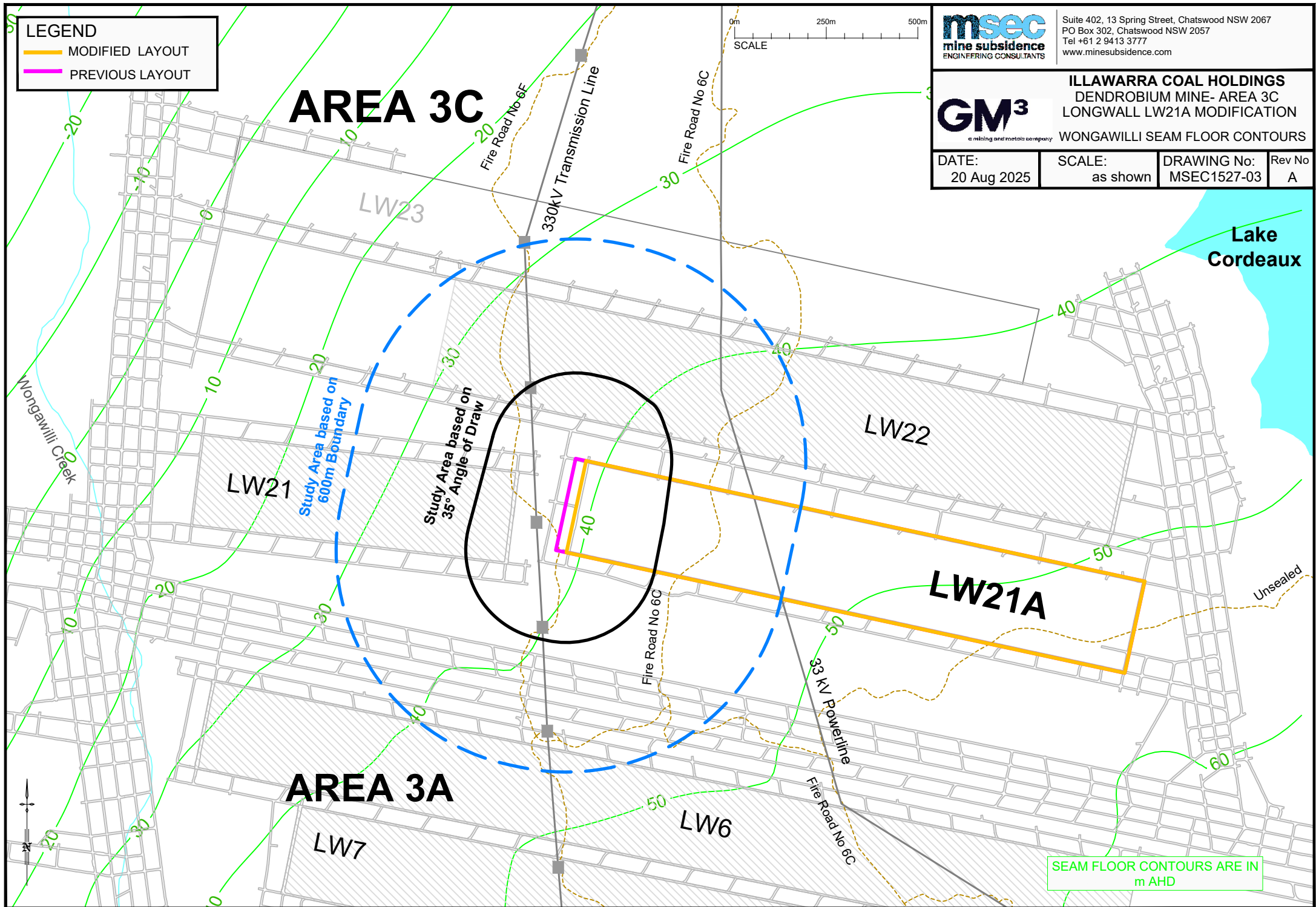


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LONGWALL LW21A MODIFICATION
WONGAWILLI SEAM FLOOR CONTOURS

DATE: 20 Aug 2025	SCALE: as shown	DRAWING No: MSEC1527-03	Rev No A
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SEAM FLOOR CONTOURS ARE IN
m AHD

LEGEND

- MODIFIED LAYOUT
— PREVIOUS LAYOUT

0m 250m 500m
SCALE

msec
mine subsidence
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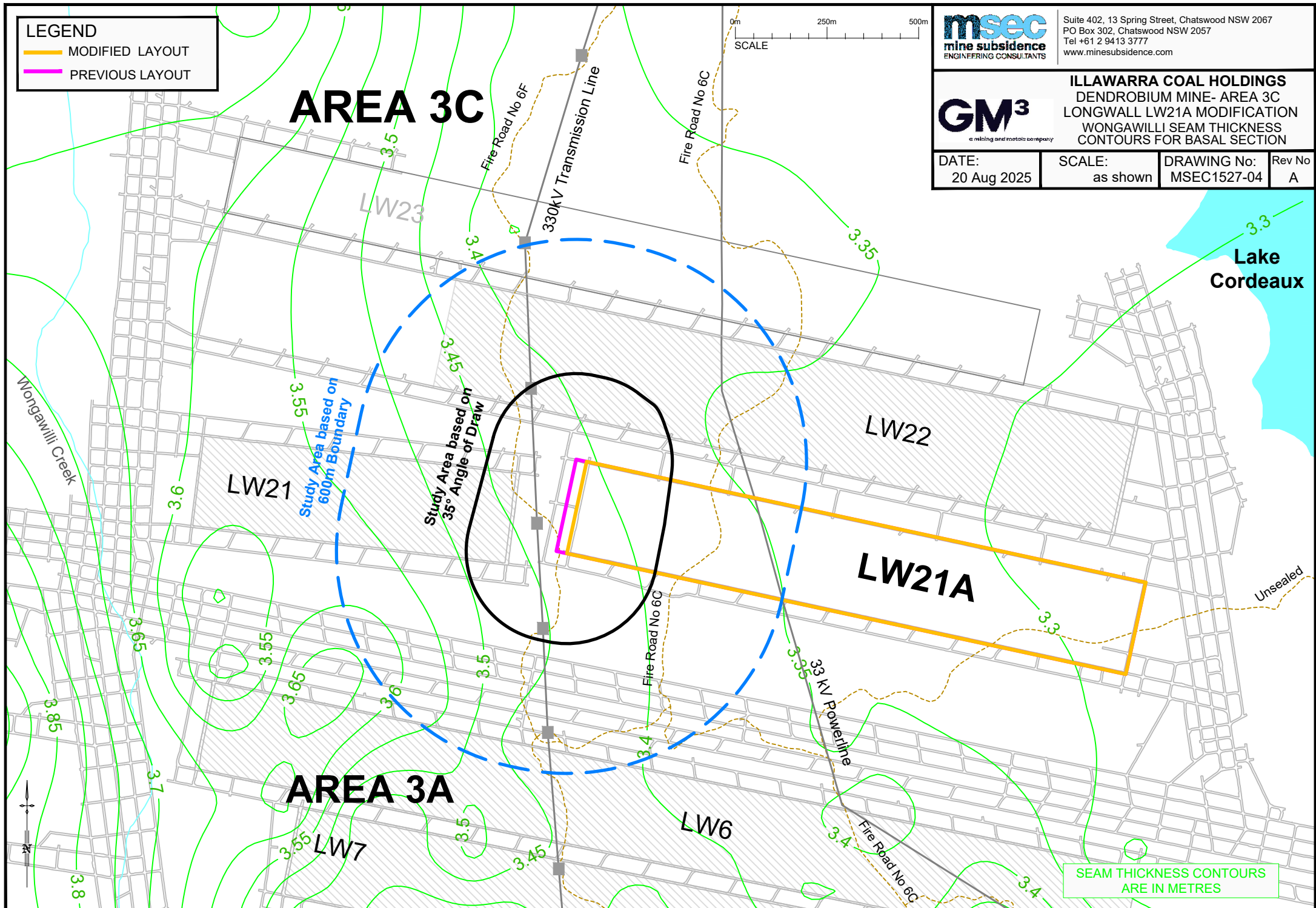
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LONGWALL LW21A MODIFICATION
WONGAWILLI SEAM THICKNESS
CONTOURS FOR BASAL SECTION

DATE:
20 Aug 2025

SCALE:
as shown

DRAWING No:
MSEC1527-04

Rev No
A



SEAM THICKNESS CONTOURS
ARE IN METRES

LEGEND

- MODIFIED LAYOUT
— PREVIOUS LAYOUT

AREA 3C

msec
mine subsidence
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LONGWALL LW21A MODIFICATION
WONGAWILLI SEAM
DEPTH OF COVER CONTOURS

DATE:
20 Aug 2025

SCALE:
as shown

DRAWING No:
MSEC1527-05

Rev No
A

**Lake
Cordeaux**

LW21

LW22

LW21A

LW6

LW7

AREA 3AStudy Area based on
600m boundaryStudy Area based on
35° Angle of Draw

DEPTH OF COVER CONTOURS
ARE IN METRES

LEGEND

— MODIFIED LAYOUT

— PREVIOUS LAYOUT

— STREAMS

— SWAMPS

— CLIFFS

— MINOR CLIFFS

STEEP SLOPES AT-

1:3 to 1:2

1:2 to 1:1.5

1:1.5 to 1:1

GREATER THAN 1:1

— 5m SURFACE LEVEL CONTOURS

AREA 3C**AREA 3A**

LW21

Swamp 9

Swamp 145

Swamp 144

Swamp 12

Swamp 153

Swamp 158

Swamp 7

Swamp 154

Swamp 155

Swamp 156

Swamp 157

Swamp 16

Rock Platform

LW22

LW21A

LW6

WC26-CL3

WC26-CL2

LC5-CL1

LC6-CL3

LC6-CL2

LC6-CL1

LA9-CL1

Lake
CordeauxSCALE
0m 250m 500m**msec**
mine subsidence
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LONGWALL LW21A MODIFICATION

NATURAL FEATURES

DATE:

20 Aug 2025

SCALE:

as shown

DRAWING No:

MSEC1527-06

Rev No

A

LEGEND

- MODIFIED LAYOUT
- PREVIOUS LAYOUT
- 330kV TRANSMISSION LINE & TOWERS
- 33kV POWERLINE & POLES
- SURVEY MARKS
- ABORIGINAL HERITAGE SITES
- - - FIRE ROADS & TRACKS

AREA 3C

LW23

LW21

LW22

LW21A**AREA 3A**

LW7

LW6

Lake Cordeaux

0m 250m 500m
SCALE

msec
mine subsidence
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LONGWALL LW21A MODIFICATION

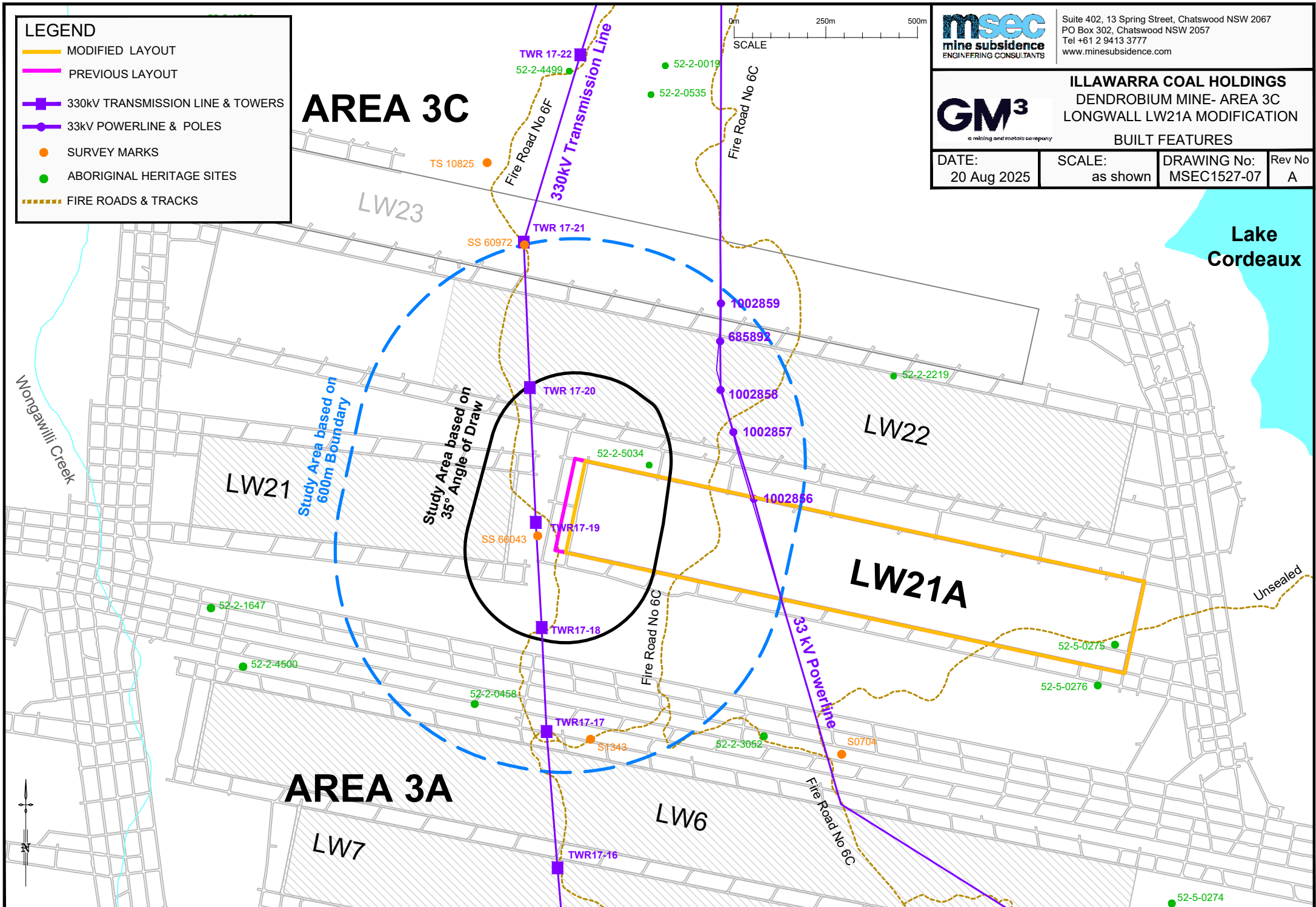
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DATE:
20 Aug 2025

SCALE:
as shown

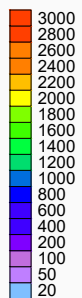
DRAWING No:
MSEC1527-07

Rev No
A



LEGEND

- MODIFIED LAYOUT
 - - - PREVIOUS LAYOUT

LEGENDSUBSIDENCE CONTOUR
COLOUR SCALE (mm)**NOTE:**

The value of the Subsidence Contours, from the outside to the inside of the panels, are 20mm, 50mm, 100mm, 200mm, and so forth, in 100mm increments.



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GM³
 a mining and metals company

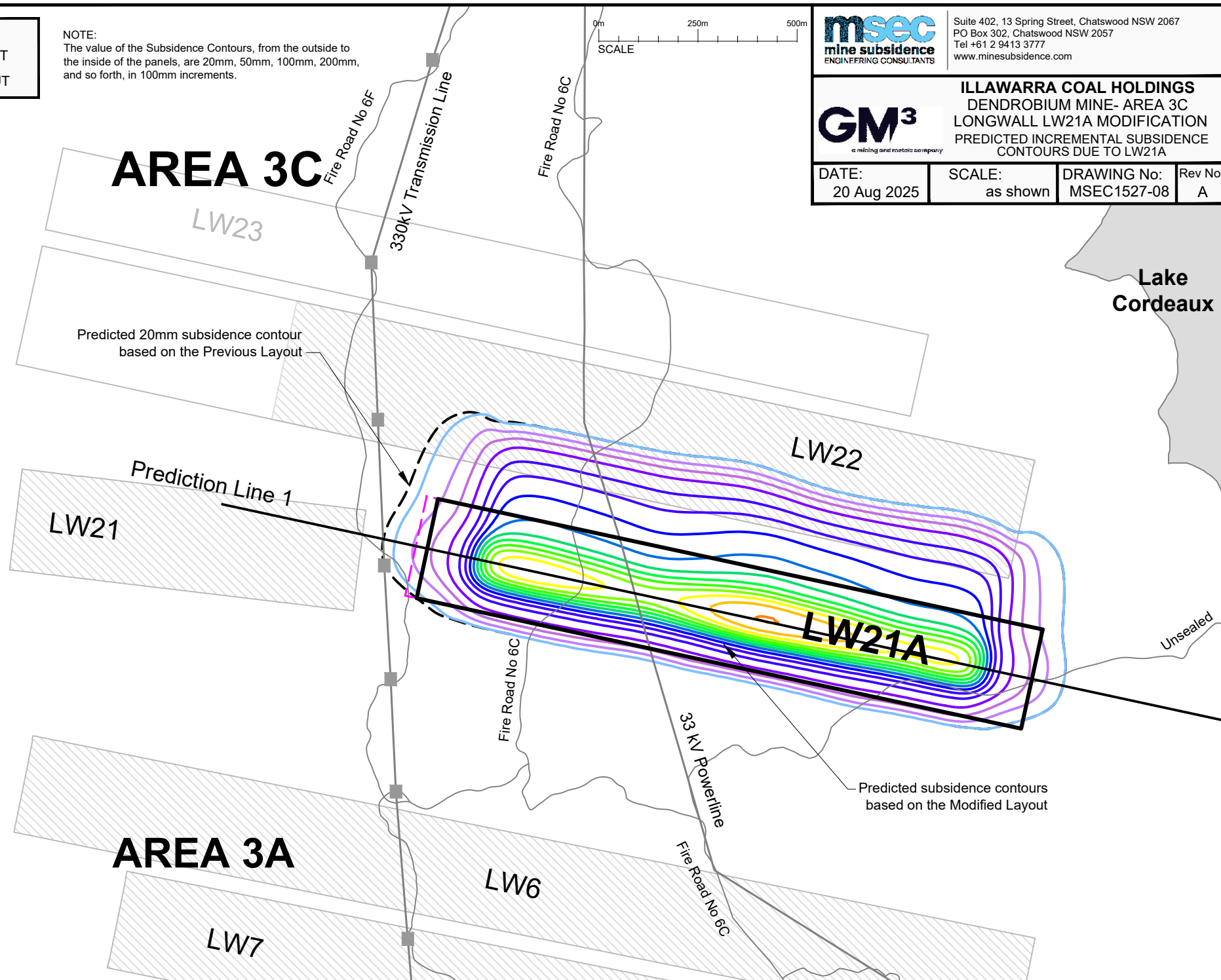
ILLAWARRA COAL HOLDINGS
 DENDROBIUM MINE- AREA 3C
 LONGWALL LW21A MODIFICATION
 PREDICTED INCREMENTAL SUBSIDENCE
 CONTOURS DUE TO LW21A

DATE:
20 Aug 2025

SCALE:
as shown

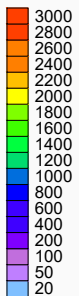
DRAWING No:
MSEC1527-08

Rev No
A



LEGEND

- MODIFIED LAYOUT
 - - - PREVIOUS LAYOUT

LEGENDSUBSIDENCE CONTOUR
COLOUR SCALE (mm)**NOTE:**

The value of the Subsidence Contours, from the outside to the inside of the panels, are 20mm, 50mm, 100mm, 200mm, and so forth, in 100mm increments.



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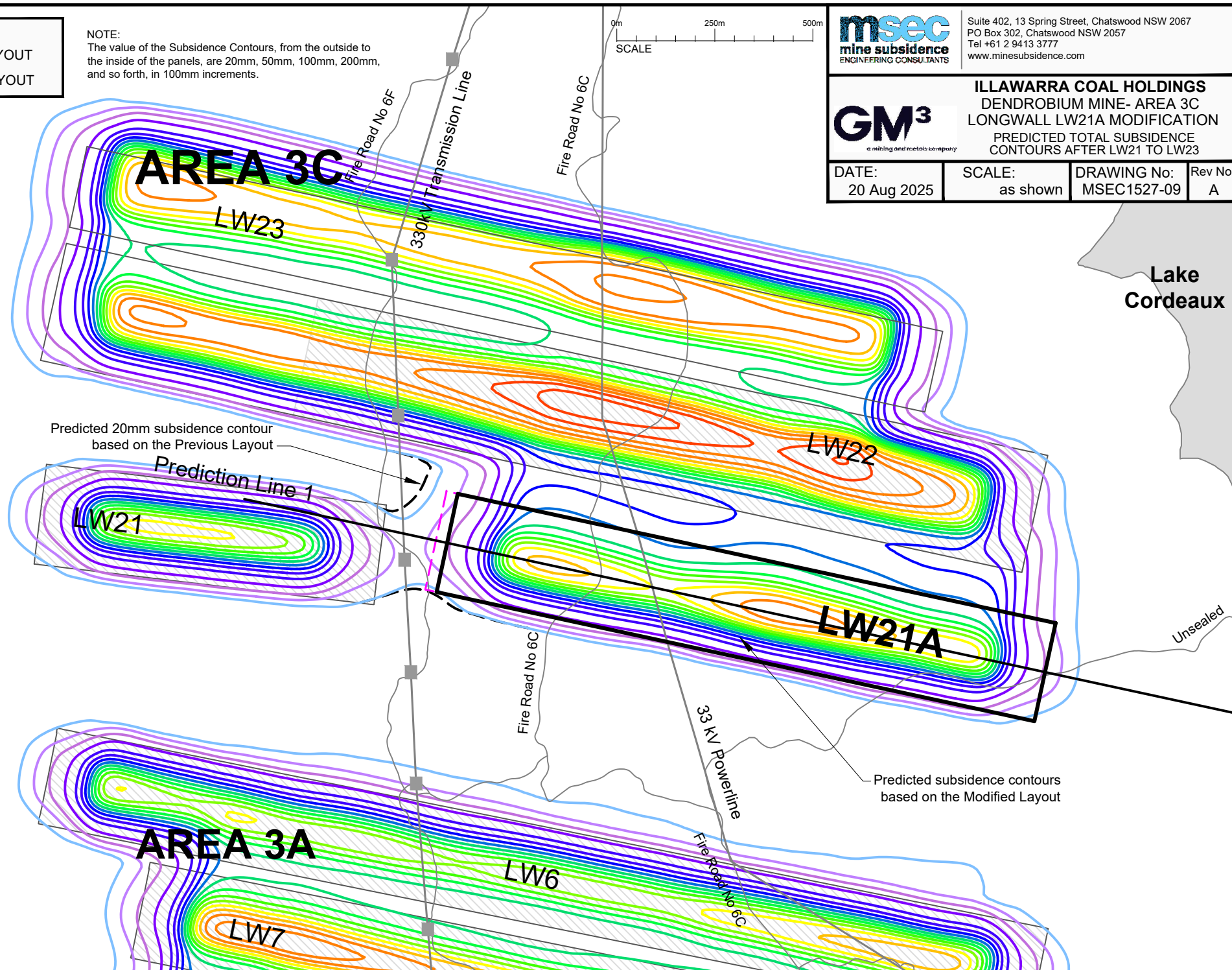
ILLAWARRA COAL HOLDINGS
 DENDROBIUM MINE- AREA 3C
 LONGWALL LW21A MODIFICATION
 PREDICTED TOTAL SUBSIDENCE
 CONTOURS AFTER LW21 TO LW23

DATE:
20 Aug 2025

SCALE:
as shown

DRAWING No:
MSEC1527-09

Rev No
A



Attachment B – Technical Specialist Reports:
Dendrobium Longwall 21A

22 Aug 2025

Watershed HydroGeo

ABN: 95 615 827 499

81 North St, Nowra N.S.W.

AUSTRALIA 2541

will.minchin@watershedhg.com

To: Bruce Blunden
Manager Approvals
GM3

cc:

From: Will Minchin

Dendrobium Mine: Longwall 21A SMP variation – groundwater matters

Your Ref: IC request 12/08/2025

Our Ref: IMC116–M071b

1 Introduction

In 2023 Illawarra Coal Holdings Pty Ltd (ICHPL) submitted a Subsidence Management Plan (SMP) for Area 3C Longwall 21A. A Groundwater Assessment to inform the Subsidence Management Plan (SMP) was carried out by Watershed HydroGeo (2023). The Longwall 21A SMP was approved by NSW Department of Planning, Housing and Infrastructure (DPHI) on 9 July 2025.

This current memo documents ICHPL's notification to move the commencing end of Longwall 21A by 28 m in-by, and based on a review of the Subsidence Assessment (MSEC, 2025) outlines the likely groundwater-related effects that this variation to the longwall would have on the environment.

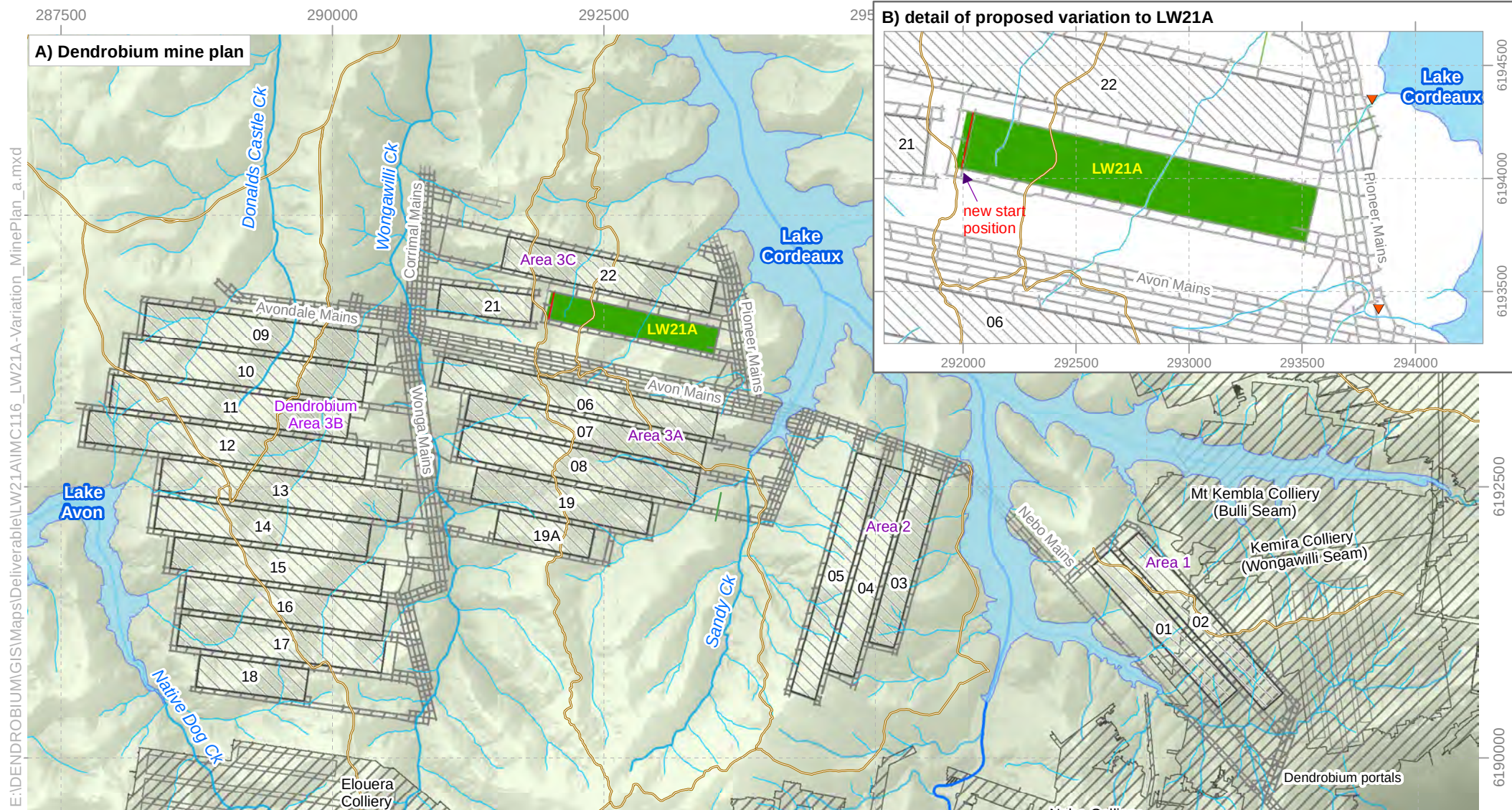
1.1 Change to Longwall 21A

A summary of the proposed variation, which is restricted to a small change in the starting position of Longwall 21A, is shown in **Table 1-1**. As shown here, other geometric parameters are unchanged.

Table 1-1 Approved and varied/proposed geometry of Longwall 21A

Aspect	Approved	Varied / proposed
Void length (m)	1588	1560
Position of commencing end	Easting 291,991	28 m in-by (to the east) of approved
Position of completing end	Easting 293,546	unchanged
Void width (m)	256.2	unchanged
Cutting height (m)	3.9	unchanged
Depth of cover (m)	335-350	essentially unchanged (MSEC, 2025)
Likely duration of extraction	200 days	196 days

Given the small change (moving the starting position 28 m in-by, or reducing it by <2% of the total length), this memo documents the likely changes based on the conceptualisation. Running the numerical model to make updated forecasts of effects is not warranted, and for such a small change, the model results of the approved and varied mine plan are likely indistinguishable.



Dendrobium and Longwall 21A mine plan including proposed variation **Figure 1-1**

2 Conceptual description of likely effects

From a groundwater perspective, longwall extraction has the following effects:

- A longwall requires dewatering to maintain a safe working environment – mine inflow is quantified at Dendrobium via the mine water balance.
- Dewatering and subsidence fracturing or goafing leads to groundwater drawdown above and adjacent to the longwall;
- Surface cracking, as a result of subsidence, can directly affect surface features, such as watercourses and Upland Swamps;
- Drawdown and subsidence effects can reduce baseflow to and/or increase leakage from watercourses and reservoirs.

The likely effect of the variation on each of these is described below.

2.1 Mine inflow (dewatering rate)

Due to the slightly shorter void, smaller footprint that is fractured/goafed, and the likely shorter duration of extraction, the varied mine plan for Longwall 21A should result in slightly less inflow. The best estimate of this is that total inflow to this longwall might decline by approximately 2% (based on the change in length and similar reduction in extraction duration). Peak inflow rate would likely be negligibly different between the two mine plans.

2.2 Groundwater drawdown

The height of connected fracturing and height of disconnected fracturing above that are chiefly influenced by longwall void width and cutting height. These are proposed to be unchanged from the approved mine plan. It is therefore expected that groundwater drawdown within the overlying strata would be effectively the same, other than the westerly edge of the drawdown cone would move slightly to the east (consistent with the movement of the starting position). In reality, it is unlikely that this change in drawdown would be measurable from field data.

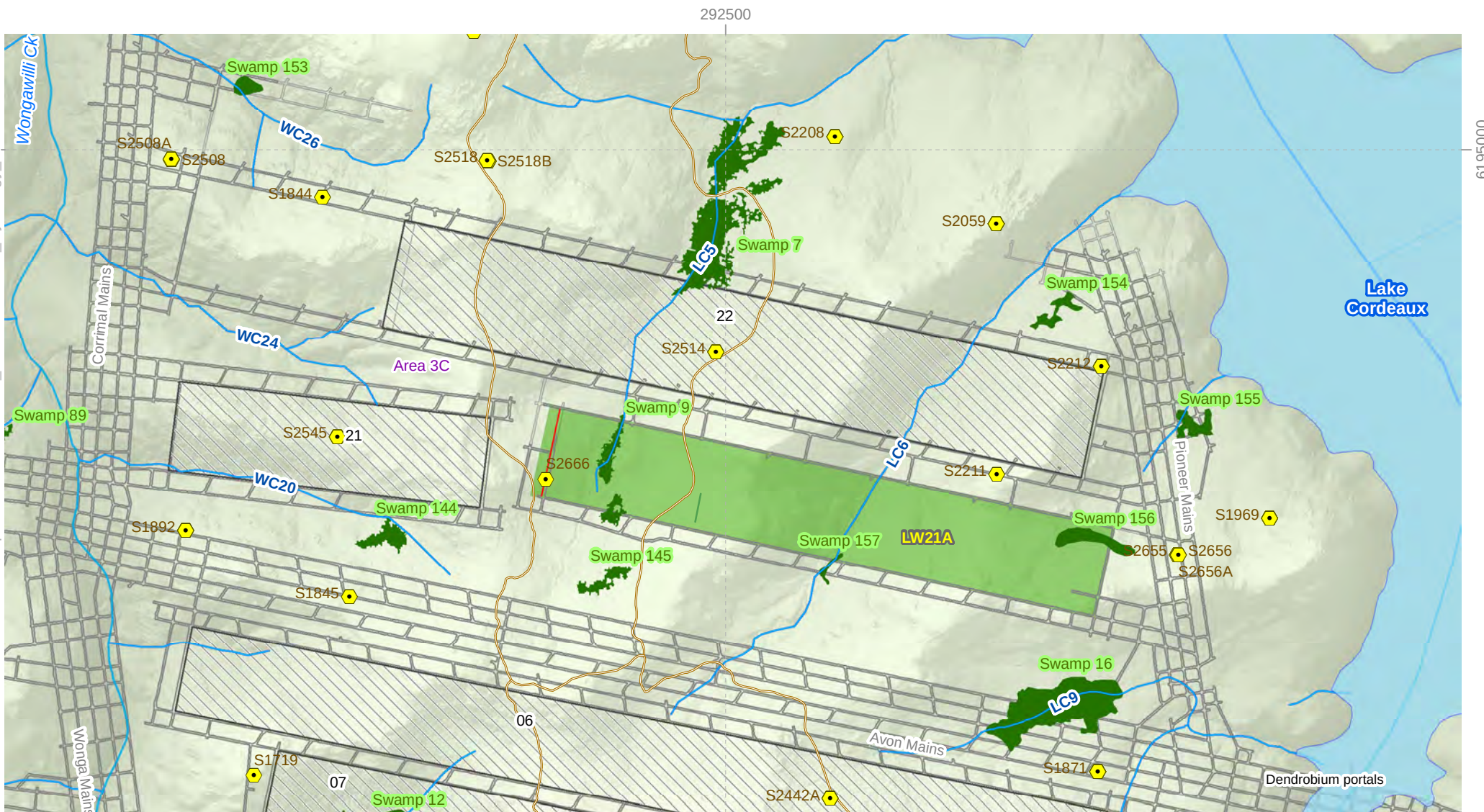
We expect that drawdown will be significant, probably to the point of desaturation in the Illawarra Coal Measures and lower Narrabeen Formation strata, up into the Bulgo Sandstone. The Hawkesbury Sandstone may experience such drawdown initially, but groundwater recovery is expected in the upper Bulgo Sandstone and Hawkesbury Sandstone a few years post-extraction.

2.3 Effects on environmental features above the footprint

Upland Swamps near to Longwall 21A are shown on **Figure 2-1** labelled in green). Those around Longwall 21A are all mapped as High Priority GDEs in the Water Sharing Plan.

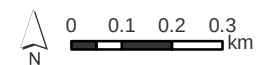
Figure 2-1 shows that none of the swamps are close to the starting end of the panel, and so none will be affected by the change in position (i.e. no change to the effects at these swamps, including Swamp 9 which is closest to the starting position). Swamps within the footprint, and outside the footprint to approximately 120 m are expected to show rapid change to water table behaviour once mine under.

Figure 2-1 indicates that two tributaries flow over the footprint of Longwall 21A: LC6 (in the middle of the longwall), and LC5 commences at Swamp 9 near the western end of the panel. LC5 is still 135 m inside the proposed starting end (compared to approximately 160 m for the approved mine plan). As such, there might be some very minor reduction in surface cracking effects, but in reality, no change to the occurrence of surface cracking at LC5 (or LC6) is expected as a result of the variation to the mine plan.



Created by: WMinchin | Version: A | Date: 22/08/2025

- GW monitoring bore
- River
- Creek
- Lake
- Upland Swamp (IMC / OEH)
- Fire Road
- ▨ Mined area
- Dendrobium workings: existing
- ▨ Extracted panels (Aug 2025)
- LW21A void (approved)
- LW21A: revised starting position



Scale: 15,000 @A4
GDA2020 MGA Zone 56



GM3-IC | Dendrobium Mine

Longwall 21A mine plan,
hydrological features and
groundwater monitoring

Figure 2-1

2.4 Baseflow effects at water features away from the footprint

2.4.1 Watercourses

Figure 2-1 shows watercourse and tributaries around Longwall 21A. As noted above, the variation to the mine plan only marginally changes the distance from the edge of the panel to LC5, and the same length of LC5 remains above the footprint of Longwall 21A. As such, no changes to baseflow losses (or increased leakage) are expected.

Similarly, the effects on LC6 will be unchanged from the approved mine plan.

To the west, tributaries of Wongawilli Creek (WC20 and WC24) are approximately 400-500 m away from Longwall 21A at their closest, and the additional 28 m (approximately) in distance could mean some marginal benefit in terms of flow losses. However given that these tributaries are already closer to Longwalls 21 and 22, any changes would not be detectable in field data (i.e. negligible).

Similarly, no change is expected to any effects directly on Wongawilli Creek.

2.4.2 Water supply reservoirs

Cordeaux Reservoir is the nearest reservoir to Longwall 21A (**Figure 2-1**). At its nearest point (north-eastern corner), the approved mine plan for Longwall 21A is 500 m SSW of Cordeaux Reservoir FSL, and 680 m from the south-eastern corner. The change to the starting end does not alter these distances. As such, there would be no change the effects of the approved mine plan.

Avon Reservoir is 4 km from Longwall 21A and would not be affected by either the approved or varied mine plan for this longwall.

3 Conclusion and recommendations for management

The proposed variation to the mine plan is very small, as described above. If anything it would result in marginal reductions in environmental effects, however essentially the view is that there would no material change to the effects described in the approved SMP.

As a result, the groundwater monitoring network (**Figure 2-1**) remains appropriate. No changes to monitoring or modelling are warranted as part of this variation to the SMP.

Please contact me if any clarification required.

Your sincerely,

Will Minchin

will.minchin@watershedhg.com

4 References

MSEC, 2025. Dendrobium Mine – Longwall 21A: The effects of the proposed modified commencing end of Longwall 21A on previous subsidence predictions and impact assessments. Report MSEC1527, Rev01.

Watershed HydroGeo, 2023. Dendrobium Area 3C: Longwall 21A Groundwater assessment. Report R044c.

To:	Bruce Blunden (ICHPL)	cc:
From:	Stuart Brown	
Subject:	Dendrobium Longwall 21A Variation: Surface water and shallow groundwater effects	
Date:	27 August 2025	Ref: D25297

1. Introduction

Illawarra Coal Holdings Pty Ltd (ICHPL) was granted approval to mine Longwall 21A at Dendrobium Mine Area 3C by the Department of Planning and Environment on 9 July 2025. The approved Subsidence Management Plan (SMP) for Longwall 21A included predicted effects on surface water and shallow groundwater prepared by HGEO (HGEO 2023).

ICHPL intends to modify the layout of Longwall 21A by shortening the length of the longwall void by 28 m. This would be achieved by moving longwall start position east of the approved starting position by 28 m. The longwall end position and void width (256.2 m) remain unchanged.

This memo describes the predicted impacts to surface water and shallow groundwater as a result of the modified layout compared with those of the previous layout. It is intended to form an Addendum to the existing Longwall 21A Surface Water Assessment (HGEO 2023). The findings of this report rely on estimates of ground subsidence provided by MSEC (2025), and estimates of groundwater drawdown and surface water losses provided by Watershed Hydrogeo (2023, 2025).

1.1 Findings

The modified layout of Longwall 21A results in a 1.8% reduction in longwall area compared with the approved layout, and proportional reductions in the buffer areas used to assess surface water and swamp impacts. Note that the changes in longwall area and associated buffer zones overlap with the study areas of previously extracted Longwalls 21 and 22. A map showing the proposed Longwall 21A layout variation compared with the approved longwall layout is shown in Figure 1.

The modified longwall layout will not result in a change in the maximum predicted vertical subsidence, surface tilt or curvature compared with the approved layout (MSEC 2025), although the location of maximum tilt and curvature at the western end of the longwall would be shifted to the east by 28 m.

An assessment of groundwater effects by Watershed (2025) finds that the modified layout will result in a very minor to negligible decrease in drawdown at the western end of the proposed longwall, compared with the approved layout. The difference would likely be undetectable from field measurements.

Changes to the predicted effects on surface water courses and shallow groundwater within swamps are expected to be very minor to negligible, as assessed below:

1.2 Surface water flow and quality

The proposed modification to Longwall 21A results in no change in the length of tributaries LC5 and LC6 that directly overlie the longwall footprint. Therefore, the estimated potential impacts to those watercourses in terms of surface fracturing and flow diversions is unchanged.

Similarly, potential water quality effects of surface fracturing in watercourses that directly cross the longwall footprint (LC5 and LC6) remains unchanged from the initial assessment. Those watercourses may experience transient changes in water quality, including iron staining, as has been observed in Areas 3A and 3B.

The distance of tributaries LC7 and LC9 from Longwall 21A is unchanged under the modified layout. Those watercourses pass within 400 m of the longwall footprint, and it is possible that fracturing and flow diversion could occur along those minor tributaries. That assessment is unchanged.

The main channel of Wongawilli Creek is 1.2 km from Longwall 21A at its closest point and is unlikely to be directly influenced by the modified Longwall 21A.

1.3 Swamps

The modified layout for Longwall 21A results in no change in terms of the potential impacts to Swamps 7, 9, 16, 145, 155, 156, and 157, as previously assessed. The proportions of those swamps that lie within 120 m and 400 m of the proposed longwall remain unchanged with little or no change in the predicted surface subsidence effects (MSEC 2025).

Swamp 144 which is located to the west of Longwall 21A will be 28 m further from the modified longwall starting point. However, given that the swamp remains just within 400 m of the longwall, the prediction of “unlikely but possible” shallow groundwater effect remains unchanged. Note that Swamp 144 is located 113 m from Longwall 21, extracted in 2023, and was likely affected previously by subsidence effects of that longwall (Watershed HydroGeo 2024).

2. References

HGEO. 2023. *Assessment of Surface Water Flow and Shallow Groundwater Effects of Proposed Dendrobium Longwall 21A*. **D23203** Report by HGEO Pty Ltd for Illawarra Coal Holdings Pty Ltd.

MSEC. 2025. *The Effects of the Proposed Modified Commencing End of Longwall 21A on Previous Subsidence Predictions and Impact Assessments*. **MSEC1527**.

Watershed HydroGeo. 2023. *Dendrobium Area 3C: Longwall 21A Groundwater Assessment*. **R044d** Report for South32 Illawarra Metallurgical Coal.

Watershed HydroGeo. 2024. *Update to Geographic Review of Mining Effects on Upland Swamps at Dendrobium Mine (Data to January 2024)*. **R058b**.

Watershed HydroGeo. 2025. *Dendrobium Mine: Longwall 21A SMP Variation - Groundwater Matters*. **IMC116-M071b** Report for South32 Illawarra Coal Holdings Pty Ltd.

26 August 2025

Bruce Blunden
Manager Approvals
GM³

bruce.blunden1@gm3.au

Dear Bruce,

Re: Dendrobium Mine Longwall 21A Modification – ecological update (Niche ref: #9351)

Illawarra Coal Holdings Pty Limited (ICHPL), operating as Gear M Illawarra Met Coal Pty Ltd (trading as GM³), has proposed the modification of Longwall 21A (The Project) within Area 3C of the Dendrobium Mine. This letter has been prepared to provide an addendum to the Terrestrial Ecological Assessment Report prepared for Longwall 21A Dendrobium Colliery Area 3C (Niche 2023). It is noted that, that study was an accompanying document to the Subsidence Management Plan (SMP) for Longwall 21A.

ICHPL now proposes to shorten the commencing (i.e. western) end of LW21A by 28 metres from that adopted in the SMP Application and Report No. MSEC1290. The purpose of the modification is to avoid a sill in the barrier pillar between LW21 and LW21A. The proposed modification to LW23 is hereafter referred to as the 'Modified Layout'.

A desktop review of the potential ecological constraints within the Modified Layout was completed to determine whether the Modified Layout is likely to increase the level of impact to threatened biodiversity identified in part of the Terrestrial Ecological Assessment (Niche 2023). The desktop review included a review of:

- Changes to the layout of Longwall 23 at Dendrobium Mine
- LW21A Terrestrial Ecological Assessment (SMP) (Niche 2023)
- Revised MSEC report (referenced MSEC 1527, dated 20 August 2025), to determine the predicted impacts to ecological values resulting from the Modified Layout.

The following has been summarised from MSEC (2025):

- The maximum predicted incremental conventional vertical subsidence, tilt and curvatures, based on the Modified Layout, are the same as the maximum predicted values for the previous layout.
- The maximum predicted total subsidence effects within the mining area, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout.
- The maximum predicted strains for LW21A, based on the Modified Layout, are the same as the maximum predicted values based on the Previous Layout.
- The predicted valley-related effects for the streams, based on the Modified Layout, are therefore similar to or slightly less than those based on the Previous Layout.
- The assessed levels of potential impact for waterbodies and swamps, cliffs and steep slopes, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout.

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Therefore, as a result of the Modified Layout, the assessed levels of potential ecological impacts are typically the same or less than those based on the Previous Layout, that were assessed as part of the SMP for LW21A (Niche 2023).

Please contact me on **0458 000 560** or **sbloomfield@niche-eh.com** should you require any further information.

Yours sincerely,

Stephen Bloomfield

Ecology Principal

Niche

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T - 0458 000 560



References

Mine Subsidence Engineer Consultants (2025). Dendrobium Mine - LW 21A (MSEC1527). Unpublished report for GM3-Illawarra Metallurgical Coal.

Niche Environment and Heritage (2023). Terrestrial Ecological Assessment - Longwalls 21A Dendrobium Colliery Area 3C. Prepared for South32 (now GM3)-Illawarra Metallurgical Coal.



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Our expertise



Natural capital
and offsetting



Ecology



Heritage
management



Spatial Services

Our Ref: 3004500131_LW21A-SMP-AEAUpdate_Rev0: DP
Contact: Dan Pygas

28 August 2025

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Attention: Bruce Blunden

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Dear Bruce,

LONGWALL 21A SMP MODIFICATION – AQUATIC FLORA AND FAUNA ASSESSMENT UPDATE

Introduction

Illawarra Coal Holdings Pty Ltd (ICHPL), a subsidiary of Gear M Illawarra Met Coal Pty Ltd (operating as GM3), plans to extract coal from Longwall 21A in Dendrobium Area 3C (Area 3C). Longwall 21A is located between Wongawilli Creek and Lake Cordeaux and to the north of Dendrobium Area 3A (Area 3A). Stantec (formerly Cardno) previously prepared the Aquatic Flora and Fauna Assessment (AFFA) to support the Subsidence Management Plan (SMP) for Longwall 21A (Stantec 2023). The overall objective of the SMP is to manage any impacts to watercourses, other natural features and built features associated with mine-induced subsidence. Stantec (2023) included:

- > A review and synthesis of existing information on the aquatic flora and fauna of the Wongawilli Creek and Lake Cordeaux catchments in the Study Area (area within 600 metres (m) of Longwall 21A).
- > Assessment of the potential impacts on aquatic flora and fauna (including threatened species) arising directly and indirectly from the proposed mining.
- > Recommendations on impact mitigation measures and monitoring for inclusion within the SMP.

This was supported by predictions of subsidence induced impacts to aquatic habitat (MSEC 2022) and associated changes to surface water and groundwater availability and quality in the surface water (Hgeo 2023) and groundwater (WHG 2023) specialist studies. The Department of Planning, Housing and Infrastructure (DPHI) granted ICHPL approval for the mining of Longwall 21A on 9 July 2025.

ICHPL propose to modify Longwall 21A by shortening the commencing (i.e., western) end of LW21A by 28 m (the modified layout) from that adopted in the SMP Application and Stantec (2023) (the previous layout). The purpose of the modification is to avoid a sill in the barrier pillar between Longwall 21 and Longwall 21A.

Further detail and updated subsidence predictions are provided in MSEC (2025), alongside updated changes to surface water (Hgeo 2025) and groundwater (WHG 2025) availability and quality. ICHPL requested Stantec update the previous AFFA, where required, to support a SMP variation application.

The updated AFFA (this document) includes:

- > Summary of the existing environment and findings of the AFFA (Stantec 2023) undertaken for the previous Longwall 21A layout.
- > Review of the updated subsidence predictions and specialist studies and update of the previous AFFA impact assessment made in Stantec 2023.
- > If required, update of recommendations made in Stantec (2023) related to mitigating potential impacts to aquatic flora and fauna and the requisite monitoring program.

Existing Environment

Longwall 21A is located within the Metropolitan Catchment Area, which is a special declared area controlled by WaterNSW (previously the Sydney Catchment Authority - SCA). The Study Area for the AFFA is the surface environment directly above and within 600 m of the longwall footprint consistent with Condition 8d of Schedule 3 of the Dendrobium Mine Consent, which requires the identification and assessment of the significance of all natural features located within 600 m of longwalls. For the AFFA, natural features within the 600 m Study Area include several tributaries draining eastward into Wongawilli Creek and westward

draining tributaries of Lake Cordeaux and a small area of Lake Cordeaux. The main channel of Wongawilli Creek and Sandy Creek are located at least 1 km from Longwall 21A and are unlikely to experience direct physical impacts due to coal extraction (MSEC 2022).

Three tributaries of Wongawilli Creek (WC20, WC24 and WC24A) and six tributaries of Lake Cordeaux (LC5, LC6, LC7, LC8, LC9 and LC9A) are located in the Study Area. Of these, WC20, LC5, LC6, LC7, LC9 and LC9A are located partly within the 400 m boundary and sections of two (LC5 and LC6) are partly located directly above Longwall 21A.

The lower section of LC6 provides 'moderate' aquatic habitat including some semi-permanent pools from just downstream of Longwall 21A footprint to its confluence with Lake Cordeaux including a section within the 400 m boundary and 600 m Study Area. The Section of LC5 from approximately 300 m downstream of the Study Area to its confluence with Lake Cordeaux provides 'moderate' aquatic habitat. The remaining upper section LC6 and WC20 provide 'minimal' aquatic habitat such as small semi-permanent refuge pools which are unlikely to persist through prolonged drought. The remaining sections of tributaries within the Study Area provide 'unlikely' aquatic habitat consisting of ephemeral aquatic habitat that only contain flow during and immediately after significant rainfall. This includes the section of LC5 within the Study Area. Several investigations indicate that the aquatic ecology in sections of tributaries in the Study Area are comparable with that present throughout the larger catchment area.

The listed threatened Macquarie perch (*Macquaria australasica*) is likely to be present in Wongawilli Creek downstream of the Study Area. However, presence of natural barriers and its apparent absence in several surveys farther upstream and within the Study Area suggests it is very unlikely to occur in Wongawilli Creek in the Study Area. Tributaries in the Study Area also do not provide suitable habitat for Macquarie perch. Other threatened species, Australian grayling (*Prototroctes maraena*), Adam's emerald dragonfly (*Archaeophya adamsi*) and Sydney hawk dragonfly (*Austrocordulia leonardi*) do not, or are highly unlikely to, occur in the Study Area.

Previous and Updated Impact Assessment

The maximum predicted subsidence effects for modified Longwall 21A layout are the same as the maximum predicted values based on the previous layout (MSEC 2025). The extent of subsidence slightly reduces at the western end of Longwall 21A due to the proposed modification. The locations of the maximum predicted longitudinal tilt and curvatures at the commencing (i.e., western) end of LW21A move approximately 28 m towards the east due to the proposed modification. These longitudinal effects are less than the maximum predicted values that occur transverse to the longwall. The modified Longwall 21A layout would also result in very minor to negligible decrease in predicted groundwater drawdown at the western end of Longwall 21A and very minor to negligible change in predicted water quality effects to watercourses (WHG 2025, Hgeo 2025).

Associated impacts to aquatic habitat, biota and threatened species (if present) in tributaries due to the modified Longwall 21A layout are therefore expected to be comparable and potentially reduced in magnitude and extent compared to the previous layout (**Table 1**). The reduction in longwall length to the west would also result in a reduction in length of WC20, WC24 and WC24 within the 600 m boundary and reduction in length of WC20 within the 400 m boundary by approximately 28 m (these tributaries provide 'unlikely' aquatic habitat). This would reduce the potential for physical impacts (such as fracturing and flow diversions) to occur in these tributaries and reduce the potential for any reductions in availability of aquatic habitat to occur.

Impacts to Type 1 KFH in Wongawilli Creek, Sandy Creek and Lake Cordeaux was not expected due to their distance from Longwall 21A. There are also no flow controlling rockbars in Wongawilli Creek and Sandy Creek within 400 m that would otherwise be susceptible to fracturing and associated flow diversions. The modified layout does not represent any additional impact to Key Fish Habitat (KFH) present in Wongawilli Creek and Lake Cordeaux relative to the previous layout.

Conclusion and Recommendations

The modified Longwall 21A layout would result in comparable subsidence and ground movements and result in very minor to negligible changes to predicted effects on surface water quality and availability. Thus, there would be no change to associated predicted impacts to aquatic habitat and biota. The reduction in longwall length represents and potential for reduced subsidence effects in the western extend of the Study Area represents improved outcomes for aquatic habitat and biota in some western flowing tributaries compared to the previous layout. Impacts are not expected to occur to KFH or threatened species in the Dendrobium Mine Area. Changes to associated management plans are therefore not considered necessary or recommended.

Table 1. Summary of Potential Impacts to Aquatic Habitat and Biota Associated with the Previous (Stantec 2023) and Modified Longwall Layout.

Attribute	Previous Longwall 21A Layout	Modified Longwall 21A Layout
Wongawilli Creek, Sandy Creek and Lake Cordeaux		
Aquatic Habitat, Aquatic Biota and Threatened Species	Wongawilli Creek and Sandy Creek are unlikely to experience adverse physical impacts due to extraction of Longwall 21A (MSEC 2022). It is also unlikely that fracturing would occur in the bedrock beneath Lake Cordeaux due to its distance (500 m) from the proposed Longwall 21A. In the unlikely case that minor and isolated fracturing did occur, it is unlikely that it would be visible in the bed of the reservoir due to the alluvial deposits (MSEC 2022).	No change to potential impacts
Tributaries		
Aquatic Habitat	It is expected that fracturing of the bedrock would occur along the sections of the tributaries that are located directly above Longwall 21A impacting a total of approximately 520 m of first order tributaries. These tributaries would be most at risk of flow diversions and reductions in aquatic habitat area and quality. Fracturing can also occur outside the extents of the proposed longwalls, with minor and isolated fracturing previously observed at distances up to approximately 400 m. An additional ~2,500 m of first / second order drainage line habitat is located within 400 m of Longwall 21A. This represents a very small proportion of the total watercourse length in the upper Avon and Cordeaux River catchments (< 1 %) Due to the generally limited aquatic habitat supported by these tributaries and the abundance of ephemeral drainage line habitat in the wider catchment, potential consequences to aquatic ecology whilst significant at the scale of individual pools and tributaries, would be minor at the wider catchment scale. It is noted that the lower sections of LC5 and LC6 that provide the most substantial aquatic habitat in these tributaries are not located directly above the longwalls and so should not experience the most severe fracturing and loss of flow.	Maximum predicted ground movements, surface water loss and potential impacts to water quality due to the modified Longwall 21A layout are no greater than that predicted for the previous layout and the overall length of drainage line habitat expected to be impacted by mining is slightly less under the modified Longwall 21A layout. The reduction in total length of potentially impacted habitat in WC20, WC24 and WC24 represent improved outcomes for these watercourses associated with the modified Longwall 21A layout. As for the previous longwall layout, impacts to aquatic habitat in tributaries would likely be significant at the extent of individual tributaries and pools, however, represent relatively minor impacts to overall drainage line habitat in the Avon River and Cordeaux River catchments.
Aquatic Biota	Drainage of pools and loss of aquatic habitat following fracturing leading to flow diversion in tributaries is likely to have localised, significant impact on aquatic biota, particularly on aquatic plants and sessile animals. At the scale of the upper Avon and Cordeaux River catchments, impacts to the population size of affected aquatic biota associated with tributaries associated with extraction of Longwalls 21A would be minor	While the loss of associated aquatic biota represents a significant impact to aquatic biota at the scale of individual pools, at the scale of the upper Avon and Cordeaux River catchments, impacts to the population size of affected aquatic biota associated with tributaries associated with extraction of the modified Longwall 21A would be minor. There would be no change to potential impacts to water quality, and thus associated impacts to aquatic biota, under the modified layout.
Threatened Species	Tributaries in the study area do not provide habitat for threatened species. Large waterfalls where LC5 and LC6 join Lake Cordeaux also prevent Macquarie perch from access these watercourses.	No impacts to threatened species expected.

Yours sincerely,



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for Stantec

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References

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28 August 2025

Bruce Blunden
Manager Approvals
GM³
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bruce.blunden1@gm3.au

Dear Bruce

Re: Dendrobium LW21A Modified Layout to Starting Position – Aboriginal Cultural Heritage Assessment Update (Niche ref: #9343)

Illawarra Coal Holdings Pty Limited (ICHPL), trading as GM³, has proposed a minor variation of Longwall 21A (the 'Modified Layout') in the Dendrobium Area 3C mining area. This letter presents the results of an assessment of the proposed Modified Layout on Aboriginal cultural heritage sites.

The Modified Layout of Longwall 21A

The commencing end of Longwall 21A is proposed to be shortened by 28 m from the layout presented in the following assessments and management plans:

- MSEC 2023. Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Extraction of the Proposed Longwall 21A in Area 3C at Dendrobium Mine.
- Niche 2025. Dendrobium Area 3C Aboriginal Cultural Heritage Assessment.
- Niche 2025. Aboriginal Cultural Heritage Management Plan Longwall 21A Dendrobium Area 3C.

Revised subsidence assessment based on the Modified Layout to Longwall 21A

One Aboriginal cultural heritage site, Dendrobium 3C Grinding Groove 1 (AHIMS ID# 52-2-5034), a sandstone platform with axe grinding grooves of moderate archaeological significance is within the zone of influence due to the Modified Layout to the commencing end of Longwall 21A.

Updated and revised subsidence predictions for this site and a revised subsidence assessment are presented in the following report:

- MSEC 2025. Dendrobium Mine – Longwall 21A The effects of the proposed modified commencing end of Longwall 21A on previous subsidence predictions and impact assessments.

Site Dendrobium 3C Grinding Groove 1 (AHIMS ID#52-2-5034) was located 200 m east of the original commencing end of Longwall 21A but is located 175 m from the commencing end of the Modified Layout. MSEC present revised subsidence predictions based on the varied commencing end in which vertical subsidence is 50 mm less than what was originally assessed. MSEC report that:

The maximum predicted vertical subsidence at Site 52-2-5034, based on the Modified Layout, is slightly less than the maximum predicted value based on the Previous Layout. The slight reduction is due to the changed end effects caused by the proximity of the commencing (i.e. western) end of

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LW21A due to the proposed modification. However, the maximum predicted tilt and curvatures for this site do not change.

The assessed levels of potential impact for the Aboriginal heritage sites, based on the Modified Layout, are similar to or slightly less than those based on the Previous Layout.

Revised heritage impact assessment based on the Modified Layout to Longwall 21A

Based on the revised subsidence assessment, and its conclusion that potential impact to Dendrobium 3C Grinding Groove 1 (AHIMS ID# 52-2-5034) is similar to or slightly less than previously assessed, the potential impact to the Aboriginal cultural heritage values of the site is also similar or slightly less than that reported in Niche 2025 *Dendrobium Area 3C Aboriginal Cultural Heritage Assessment*. Therefore, it is unlikely (less than 10%) that subsidence effects from Longwall 21A will have adverse impacts on the heritage values of site Dendrobium 3C Grinding Groove 1 (AHIMS ID# 52-2-5034). The site is located on a larger rock bar which may experience fracturing and reduction in pool water levels, but this does not affect the assessment of unlikely impact to the cultural heritage features present on the rock bar.

Conclusion

Considering the above, the proposed management actions documented in Niche 2025 *Aboriginal Cultural Heritage Management Plan Longwall 21A Dendrobium Area 3C* do not need to be changed because of the Modified Layout of Longwall 21A.

Yours sincerely,

Jamie Reeves

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