MALABAR

MAXWELL UNDERGROUND MINE

Technical Report 2

Groundwater Review

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DATE: 2 April 2026

TO: Malabar Resources Limited
Thomas Mitchell Drive
Muswellbrook NSW 2333

FROM: Dr Noel Merrick

RE: **Maxwell Underground Mine, Revision of Woodlands Hill Seam Extraction Layout**

YOUR REF: PO MV125128

OUR REF: HA2026/3

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1. Introduction

The Maxwell Mine is an underground coal mining operation located in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook. The Maxwell Mine is owned by Maxwell Ventures (Management) Pty Ltd (**Maxwell**), a wholly owned subsidiary of Malabar Resources Limited (**Malabar**).

Development Consent SSD 9526 was modified (Modification 2) on 19 October 2022 to allow for the following:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent (**Modification mine layout)**;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

Modification 2 included a longwall layout in the Woodlands Hill Seam with 150 metres (m) wide longwalls for the first four longwalls (WHLW1 to WHLW4), prior to an increase in width to 300 m for the remaining Woodlands Hill Seam longwalls (and the subsequent deeper seams).

Malabar is considering a staged approach that involves increasing the width of Longwalls WHLW3 and WHLW4 from 150 m to 250 m, prior to increasing to 300 m for future panels There would be no direct overlap of the mining footprints between the Whynot Seam Extraction Plan and the proposed amended Woodlands Hill Extraction Plan.

HydroAlgorithmics undertook groundwater reviews of the Whynot Seam Extraction Plan in March 2024 (HydroAlgorithmics, 2024) and the Woodlands Hill Extraction Plan in February 2025 (HydroAlgorithmics, 2025). The current document has been prepared for the purpose of assessing whether the proposed changes to the widths of Longwalls WHLW3 and WHLW4 from 150 m to 250 m might alter any groundwater-related conclusions reached in the previous Woodlands Hill Extraction Plan Groundwater Review (HydroAlgorithmics, 2025).

Figure 1 shows the amended Woodlands Hill Mine Plan, noting that only panels WHLW1 to WHLW4 are relevant for the current Woodlands Hill Extraction Plan.

Figure 2 shows the amended Woodlands Hill Mine Plan and the overlying Whynot Seam Mine Plan, noting that only Panel 2 to Panel 5 are relevant for the current Whynot Seam Extraction Plan. There is to be no vertical overlap between Panel 2 and WHLW4.

2. Quantities of Interest

The previous Woodlands Hill Extraction Plan Groundwater Review considered matters of relevance to groundwater in Condition C8, Part C of the Development Consent which requires the Extraction Plan to "*…provide updated predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed mining covered by the Extraction Plan, incorporating any relevant information obtained since this consent;…*"

For the amended Woodlands Hill Mine Plan, an opinion will be proffered as to whether the widening of Longwalls WHLW3 and WHLW4 would be likely to cause material changes to the previous predictions of the Quantities of Interest (QoI).

The QoIs are:

1. Water table drawdown.
2. Groundwater drawdown in the Saddlers Creek alluvium.
3. Loss of water held in the Saddlers Creek alluvium.
4. Loss of water from Saddlers Creek.
5. Impacts on riverine ecosystems and potential groundwater dependent ecosystems (GDEs).
6. Impacts on Hunter River and/or Saltwater Creek and/or their alluvia.
7. Impacts on privately owned water supply bores.

Saddlers Creek is proximal to Longwall WHLW1 at a minimum distance of approximately 125 m at the north-western corner of Longwall WHLW1. Saddlers Creek has intermittent flow in response to rainfall events. When flowing, Saddlers Creek generally exhibits losing conditions, where surface water seeps into the underlying alluvium.

The Saddlers Creek alluvium is at least 55 m from Longwall WHLW1. It comprises surficial silts and clays overlying heterogeneous interbedded clays, silts, sands and gravels. Spatially, the alluvium is variably saturated. Where groundwater is present, it occurs at depths of around 3 m to 10 m below surface. Localised perched water tables occur where waterbodies continue to hold water throughout the dry period (e.g. pools along Saddlers Creek). Water quality in the alluvium is generally moderately saline, and is mostly suitable for stock water supply, but is not suitable for irrigation, drinking water or freshwater aquatic ecosystems.

Shallow evapotranspiration is possible from vegetation growing along the bed of Saddlers Creek. A site-specific review of potential GDEs identified Swamp Oak Forest (*Casuarina glauca*) and stygofauna as potential GDEs on Saddlers Creek (HydroSimulations, 2019).

The Hunter River is located at least 4 km to the south and approximately 7 km to the south-west of Longwall WHLW4. The Hunter River alluvium is the most productive aquifer in the region and comprises surficial silt and clays overlying basal sands and gravels up to 20 m deep. As groundwater occurs within the alluvium at depths of around 5 m to 10 m below surface, generally over 2 m below the base of the Hunter River, the river is generally losing water to the groundwater system. Water quality data for the alluvium indicates it can be fresh to brackish, mostly suitable for stock water supply and irrigation, but unsuitable for drinking water or freshwater aquatic ecosystems.

Shallow evapotranspiration is possible from vegetation growing along the riverine corridor of the Hunter River.

Saltwater Creek lies approximately 6 km to the south-east of Longwall WHLW4.

The nearest privately owned bores (e.g. GW029660; GW029648) are more than 5 km to the north-north-west of Longwall WHLW1.

3. Fracture Height

The QoIs could be affected by the amended mine plan if the height of connective fracturing is increased above the Woodlands Hill Seam.

In particular, a widening of the WHLW3 and WHLW4 panels could give rise to potential subsidence impacts to the land and drainages due to single-seam longwall mining, not multi-seam mining, as the proposed mining layout for the Woodlands Hill Seam would not impinge on the previous Whynot Extraction Plan area to the immediate south-east (Panel 2, Panel 3, Panel 4 and Panel 5) (**Figure 2**).

For the Woodlands Hill Seam Extraction Plan layout, the depth of cover to the Woodlands Hill Seam ranged from approximately 130 m (western WHLW1) to 235 m (mid-WHLW4). For the proposed widening of WHLW3 and WHLW4, the minimum depth of cover would not change but the maximum would increase to 255 m (**Figure 3**).

For the Woodlands Hill Seam Extraction Plan layout, the seam thickness of the Woodlands Hill Seam ranged from 2.4 m (western WHLW4) to 2.9 m (eastern WHLW4). For the proposed widening of WHLW3 and WHLW4, the seam thickness would range from 2.3 m to 3.0 m (**Figure 4**).

The mining parameters for the previous and amended layouts are summarised in **Table 1**.

Table 1. Mining parameters

MINING PARAMETER	UNIT	PREVIOUS	AMENDED
Void width (W)	m	150	150 – 255
Depth of cover (H)	m	130 – 235	130 – 255
Mining height (T)	m	2.4 – 2.9	2.3 – 3.0

An estimate of the likely upper limit of fracturing can be calculated using the Ditton and Merrick (2014) formula for longwall mining. The coefficients in this formula were calibrated on a database of observations with the following ranges for key mining parameters, which encompass the ranges for the proposed layout:

- Void width (width [W]): 110 - 355 m
- Depth of cover (height [H]): 75 – 500 m
- Mining height (Thickness [T]): 1.7 – 6.0 m

The Ditton-Merrick algorithm requires another parameter (t') termed "beam thickness" which can be conceptualised as the effective thickness of a spanning stratum in the overburden that could limit the vertical propagation of fracturing. Based on data from other NSW coalfields, this parameter is expected to have a value within the range of 10-40 m, with thinner beams allowing a greater height of fracturing.

Approximately 110-130 m above the Woodlands Hill Seam is a pervasive high-strength sill (Edderton Sill) that is expected to limit fracturing in the overburden, and subsequent land subsidence, induced by longwall mining.

Calculations of expected fracture height are summarised in **Table 2** for the mining parameters in **Table 1**, and for a range of beam thickness values.

Table 2. Predicted heights of fracturing above the Woodlands Hill Seam

FRACTURE HEIGHT	UNIT	BEAM THICKNESS	PREVIOUS	AMENDED
Median (P50)	m	20	69 - 104	68 - 135
Upper (P95)	m	20	87 - 126	85 - 167
Median (P50)	m	30	59 - 88	59 - 115
Upper (P95)	m	30	76 - 111	75 - 147
Median (P50)	m	15	77 - 116	76 - 151
Upper (P95)	m	15	95 - 139	94 - 184

For an Edderton Sill thickness of 20 m, the estimated height of fracturing for the proposed layout is expected to increase, at most, by approximately 30 m (that is, 135 minus 104) at the P50 level of confidence and by approximately 40 m (that is, 167 minus 126) at the P95 level of confidence.

If the Edderton Sill is thinner (e.g. 15 m), fracture heights would be higher and would increase by approximately 45 m as a worst case at the P95 level of confidence (that is, 184 minus 139) for the proposed layout. Conversely, the height of fracturing would be constrained by increasing the sill thickness from 15 m to 30 m; the maximum fracture height would reduce by approximately 35 m as a worst case at the P95 level of confidence (that is, 184 minus 147).

As the Edderton Sill lies approximately 110-130 m above the Woodlands Hill Seam, there is more chance of its being fractured in places with the amended layout than with the previous layout.

To assess the risk of fractures reaching land surface, **Table 3** summarises the expected depths below ground of the upper level of fracturing for the P95 level of confidence, for a range of beam thicknesses.

Table 3. Predicted depths to the top of the fracture zone

DEPTH TO FRACTURE ZONE	UNIT	BEAM THICKNESS	PREVIOUS	AMENDED
Upper (P95)	m	20	43 - 109	45 - 88
Upper (P95)	m	30	54 - 124	55 - 108
Upper (P95)	m	15	35 - 96	36 - 71

In all cases, the fracturing would reach no closer than approximately 35 m below land surface. As there would be no overlap with the depth extent of tensional cracking at land surface, there would be no connected linkage between the surface and the level of mining.

The previous Groundwater Review (HydroAlgorithmics, 2025) reported in Figure 14 an absence of any water table drawdown in excess of 2 m. While it is possible (though unlikely) that this threshold could be exceeded where fracture heights have increased, that would not happen above WHLW1 and WHLW2 as their mining parameters have not changed (QoI 1). As these longwalls are proximal to Saddlers Creek, no incremental effects on Saddlers Creek or Saddlers Creek alluvium can be expected (QoI 2, QoI 3, QoI 4, QoI 5).

4. Groundwater Drawdown Extent

The widening of Longwalls WHLW3 and WHLW4 would have the effect of increasing the drawdown extent in a south-easterly direction (noting these areas would be depressurized by future approved longwalls). There would be no increase in the northerly direction, where Saddlers Creek is located, because Longwalls WHLW1 and WHLW2 are unchanged in width and extent.

In the previous Groundwater Review (HydroAlgorithmics, 2025), Figure 15 presented contours of the predicted maximum incremental drawdown in the Woodlands Hill Seam which is Layer 11 in the numerical groundwater model. As this is the stratum being mined, all other layers would have more limited drawdown extents. This figure is reproduced here as **Figure 5**, with an overlay of the outline of the amended mine plan.

As explained in the previous Groundwater Review (HydroAlgorithmics, 2025), the annual time-stepping of the numerical model meant that results could be output only after half of the original Longwall WHLW4 was mined, or half of the adjacent future longwall (WHLW5) was mined. The latter choice had the effect of overestimating the drawdown extent at the western end of the original Longwall WHLW4. **Figure 5** indicates that the western half of the amended Longwall WHLW4 is almost coincident with the western half of the original simulated Longwall WHLW5. It follows that the drawdown contours in **Figure 5** will be reliable estimates for the amended mine plan for the western half of the amended Longwall WHLW4. As the hydraulic gradients are very steep adjacent to longwall edges, the contour pattern can be reliably inferred along the eastern end of the amended Longwall WHLW4. In my opinion, the 5 m contour should expand marginally (less than 100 m), and there should be negligible expansion of the 2 m contour to the south-east. Any additional drawdown to the south-east of the amended mine plan is inconsequential, as it would not relate to surficial environmental effects.

On the northern side of the amended mine plan, no change would occur to the drawdowns shown on **Figure 5**. The drawdown extent is likely to extend beneath the Saddlers Creek alluvium for a longitudinal distance of approximately 3 km.

5. Conclusion

In terms of the QoIs, the relevant findings for the potential effects of the amended mine plan are as follows:

1. Water table drawdown

The water table drawdown in the Saddlers Creek alluvium has been shown in the previous Groundwater Review (HydroAlgorithmics, 2025) to be minor. The amended mine plan would not alter that finding, as the proximal Longwalls WHLW1 and WHLW2 are unchanged in width and extent .

There could be additional water table drawdown in the regolith above the widened Longwalls WHLW3 and WHLW4 where fracture heights are likely to increase. However, there would be no direct connection between the fractures caused by deep excavation and the transitory tensional cracks at land surface. Any increase in water table drawdown in the regolith above amended Longwalls WHLW3 and WHLW4 would be inconsequential, as it would not relate to surficial environmental effects.

2. Groundwater drawdown in the Saddlers Creek alluvium.

As stated immediately above for QoI 1, the water table drawdown in the Saddlers Creek alluvium would remain minor. The previous Groundwater Review (HydroAlgorithmics, 2025) stated that the drawdown "*is likely to be less than approximately 0.5 m. The maximum predicted at any alluvial monitoring site is about 35 cm at bore MB07*."

3. Loss of water held in the Saddlers Creek alluvium.

Given negligible change to water table drawdown in the Saddlers Creek alluvium, the loss of water from that alluvium would remain small and no different from the approved mine plan. The previous Groundwater Review (HydroAlgorithmics, 2025) reported a predicted loss of approximately 2.0 megalitres per year (0.0055 ML/day) at the end of Longwall WHLW4, which is less than the maximum predicted take from the Saddlers Creek alluvium at full development, reported in the Modification Groundwater Assessment to be approximately 14 ML/year (SLR, 2022).

4. Loss of water from Saddlers Creek.

Given negligible change to water table drawdown in the Saddlers Creek alluvium, the loss of water from Saddlers Creek would remain negligible and no different from the approved mine plan. The previous Groundwater Review (HydroAlgorithmics, 2025) reported a predicted nil loss at the end of Longwall WHLW4.

5. Impacts on riverine ecosystems and potential groundwater dependent ecosystems (GDEs).

As there would be no loss of water from Saddlers Creek, riverine ecosystems associated with Saddlers Creek cannot be affected for the duration of the amended mine plan. Given likely minor changes to depth to water in alluvium and regolith, there would be negligible incremental effect on potential GDEs due to the amended mine plan.

6. Impacts on Hunter River and/or Saltwater Creek and/or their alluvia.

Given that Hunter River and Saltwater Creek are much farther from the amended mine plan than Saddlers Creek, and there are negligible or minor effects at Saddlers Creek and its alluvium, any effects at Hunter River and Saltwater Creek would necessarily be smaller. The previous Groundwater Review (HydroAlgorithmics, 2025) reported a predicted nil loss of water from both watercourses at the end of Longwall WHLW4.

7. Impacts on privately owned water supply bores.

As the nearest privately owned bores are more than 5 km to the north-north-west of the amended mine plan, and the worst-case drawdown extent in that direction is no more than 0.4 km at the 2 m drawdown level (shown in **Figure 5**), there cannot be a material effect on any private groundwater supply for the duration of the amended mine plan.

Based on the above, no change to the currently approved management and monitoring regime would be required as an outcome of the amended layout.

6. References

Ditton, S. and Merrick, N. (2014) *A New Subsurface Fracture Height Prediction Model for Longwall Mines in the NSW Coalfields*. Geological Society of Australia, 2014 Australian Earth Sciences Convention (AESC), Sustainable Australia. Abstract No 03EGE-03 of the 22nd Australian Geological Convention, Newcastle City Hall and Civic Theatre, Newcastle, New South Wales. July 7 - 10. Page 136.

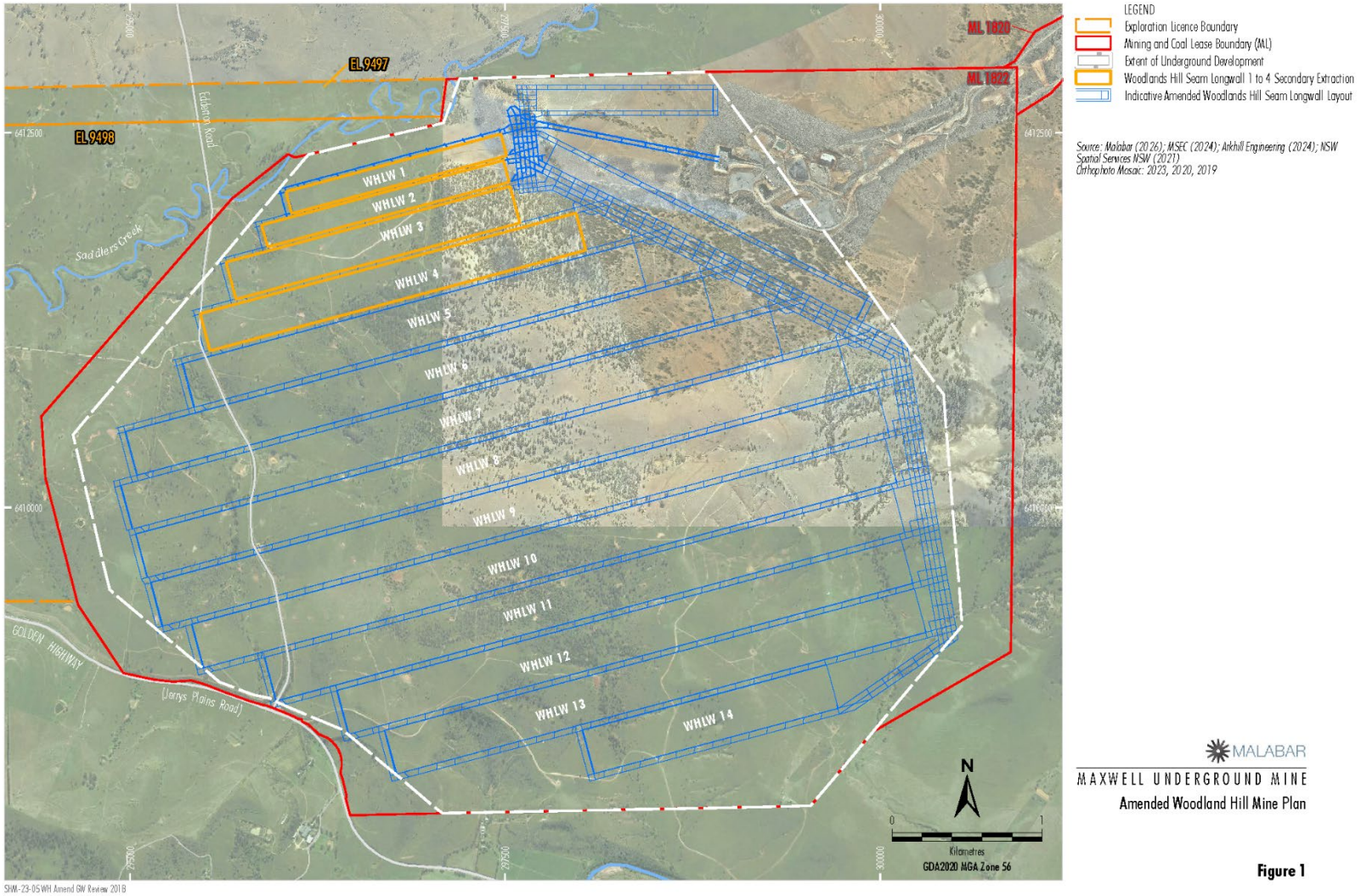
HydroAlgorithmics (2024) *Maxwell Underground Mine, Whynot Seam Extraction Plan - Groundwater Review*. Prepared for Malabar Resources Limited. Report HA2024/3, 3 May 2024.

HydroAlgorithmics (2025) *Maxwell Underground Mine, Woodlands Hill Seam Extraction Plan - Groundwater Review*. Prepared for Malabar Resources Limited. Report HA2025/1, 13 February 2025.

HydroSimulations (2019) *Maxwell Project: Groundwater Assessment*. Prepared for Malabar Coal Limited. Report HS2018/44, 17 July 2019.

SLR Consulting Australia Pty Ltd (SLR) (2022) *Maxwell Underground Mine Project Modification 2 Groundwater Review*. Report 665.10012-R01-v3.0, 14 June 2022.

FIGURES



SHM-23-05 WH Amend GW Review 2018

LEGEND

- Exploration Licence Boundary
- Mining and Coal Lease Boundary (ML)
- Extent of Underground Development
- Woodlands Hill Seam Longwall 1 to 4 Secondary Extraction
- Indicative Amended Woodlands Hill Seam Longwall Layout

Source: Malabar (2026); MSEC (2024); Aikhill Engineering (2024); NSW Spatial Services NSW (2021) Orthophoto Mosaic: 2023, 2020, 2019

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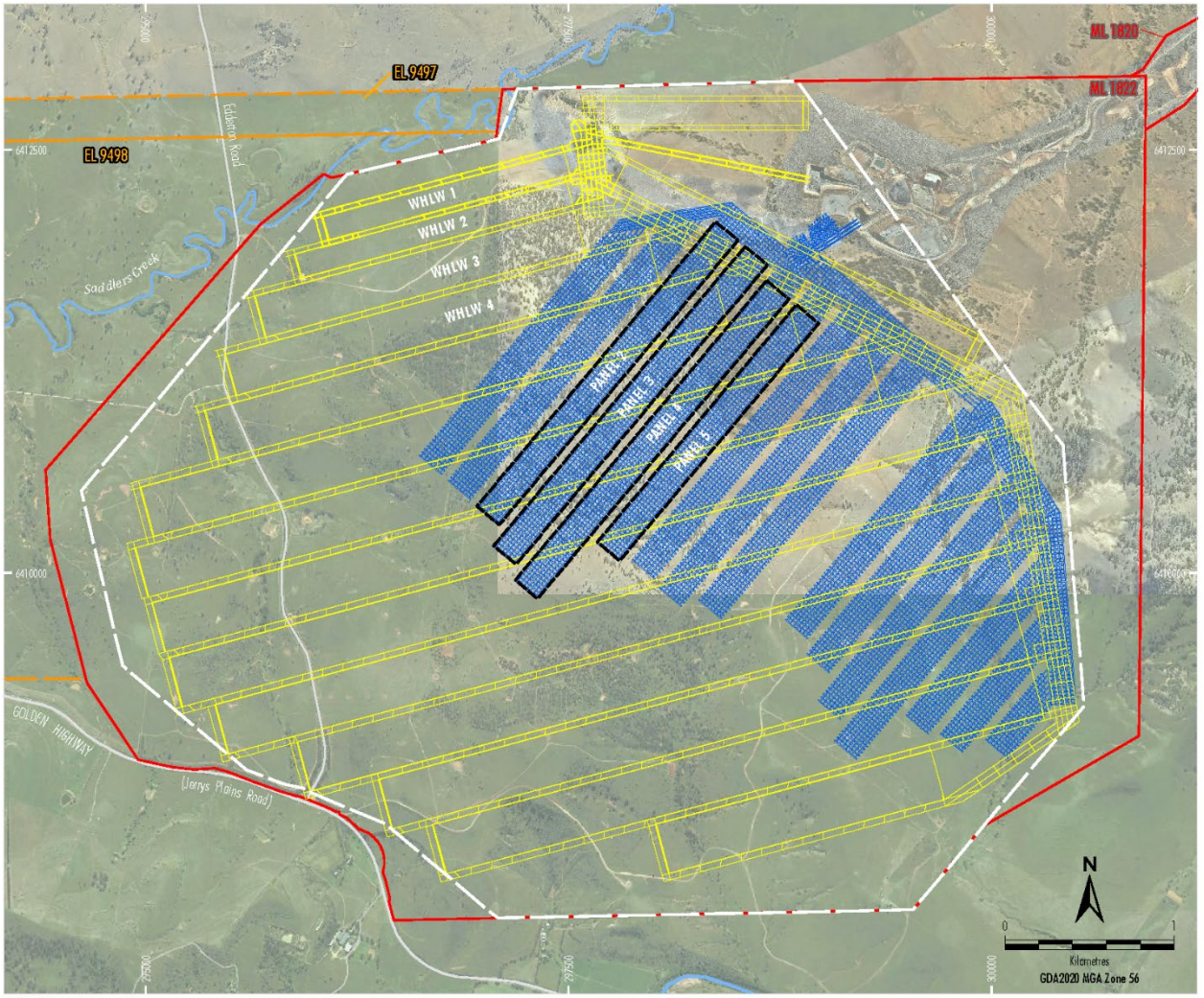
MAXWELL UNDERGROUND MINE

Amended Woodland Hill Mine Plan

Figure 1



LEGEND

- Exploration Licence Boundary
- Mining and Coal Lease Boundary (ML)
- Extent of Underground Development
- Outlines of Whynot Seam Panels 2 to 5
- Indicative Amended Woodlands Hill Seam Longwall Layout
- Indicative Whynot Seam Layout

Source: Malabar (2026); MSEC (2024); Arkhill Engineering (2024); NSW Spatial Services NSW (2021)
Orthophoto Mosaic: 2023, 2020, 2019

SKM-23-05 WH Amend GW Review 2028

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MAXWELL UNDERGROUND MINE

Whynot Seam Mine Plan and Amended Woodland Hill Mine Plan

Figure 2

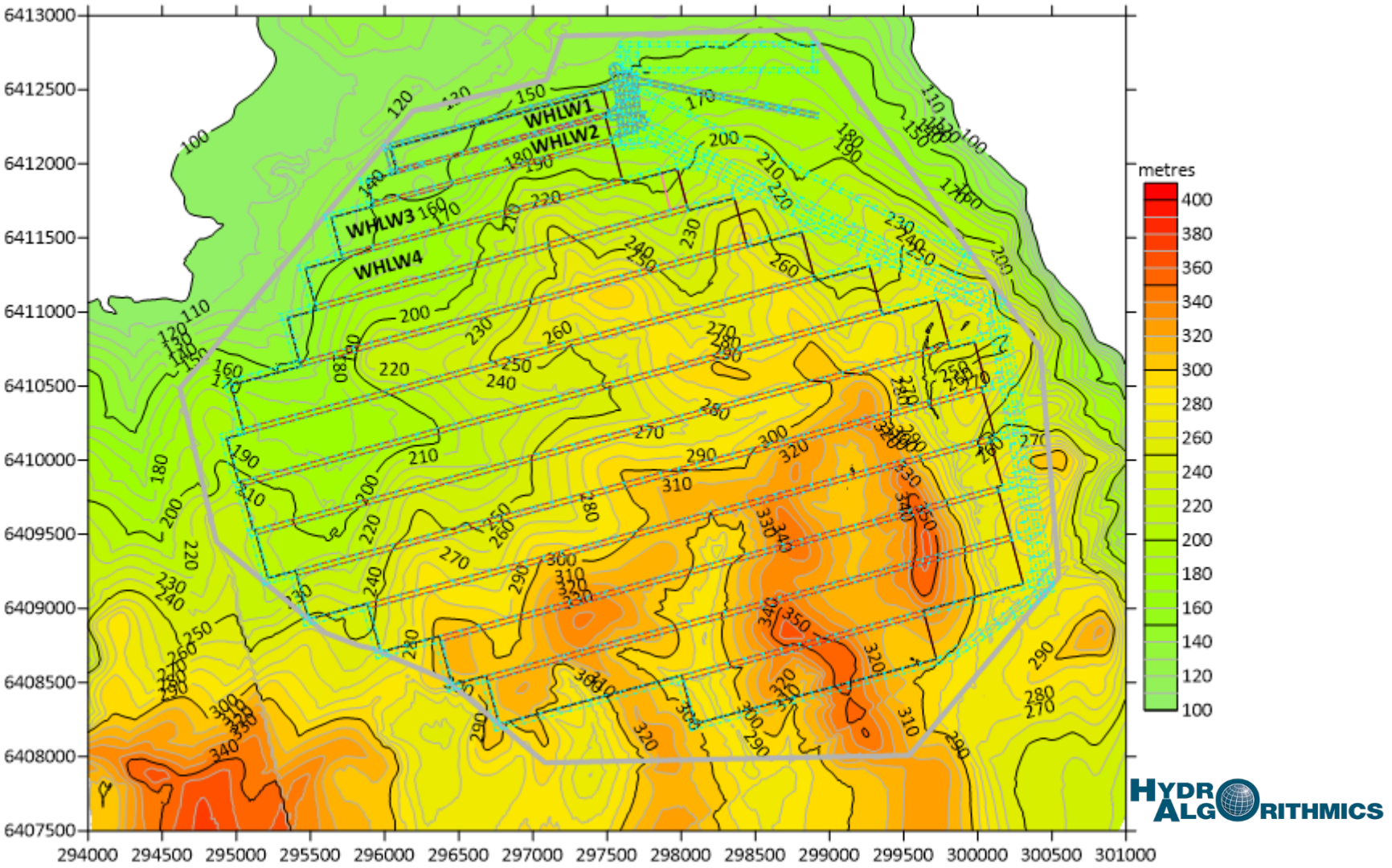


Figure 3. Depth of cover to the Woodlands Hill Seam

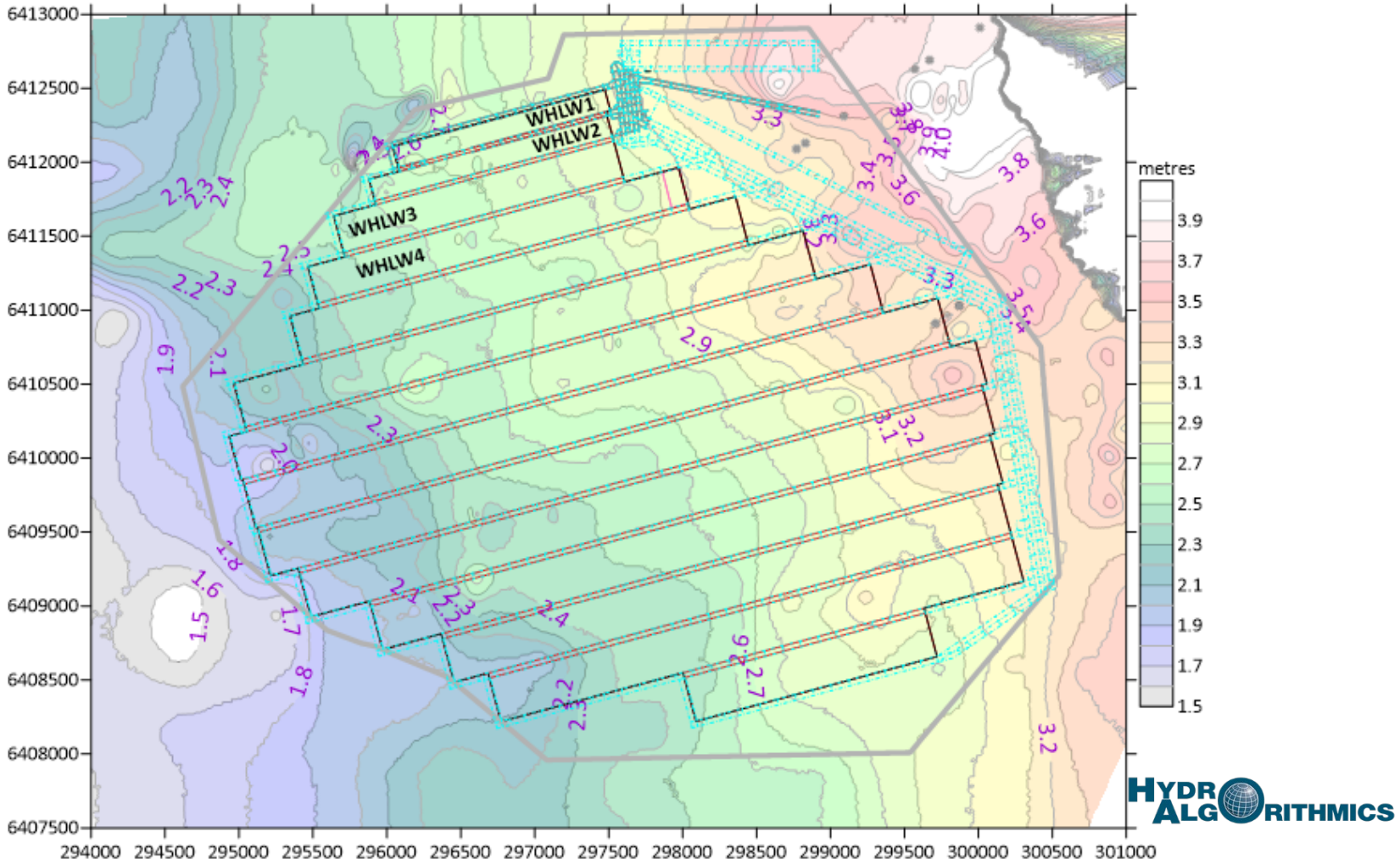
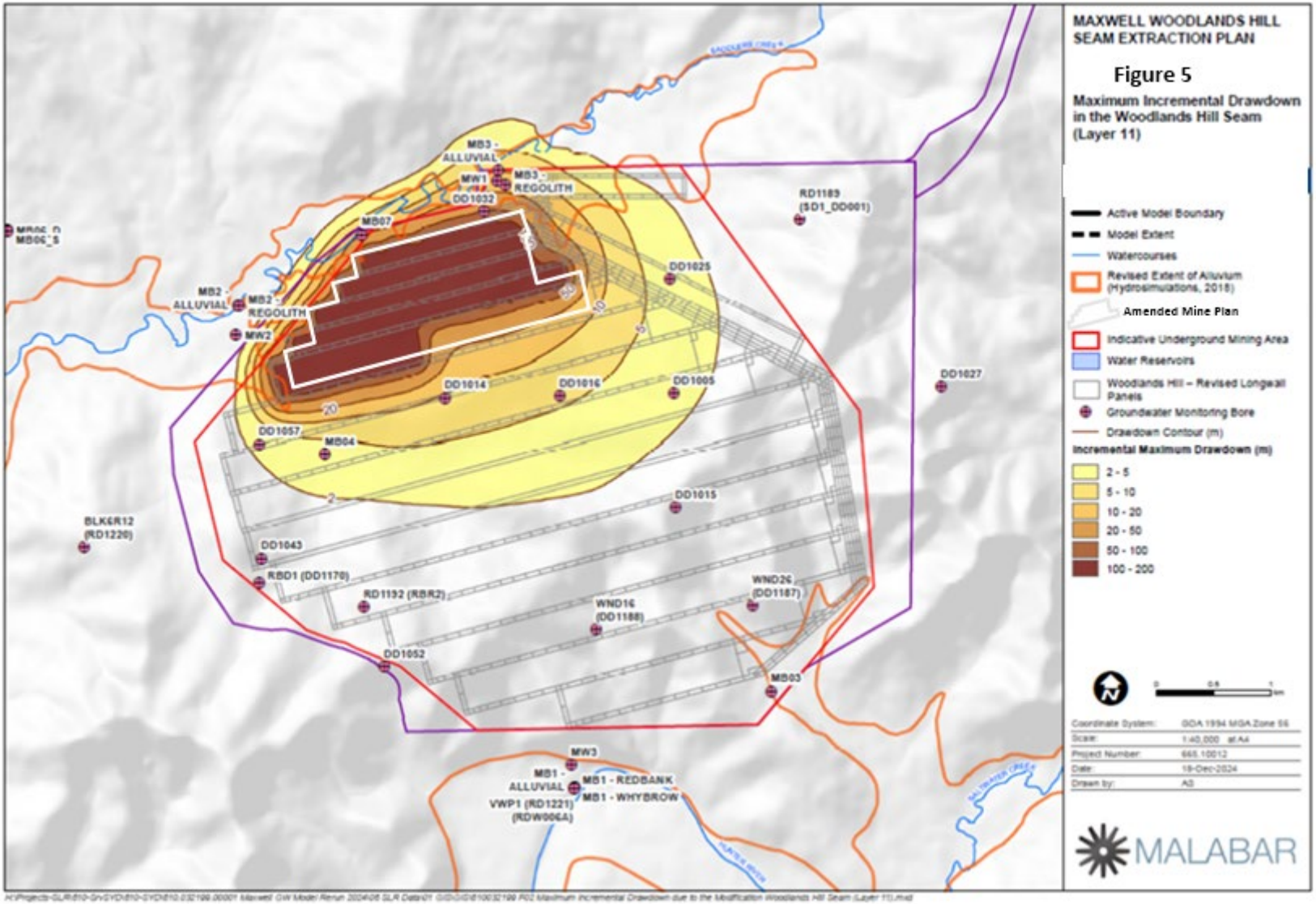


Figure 4. Thickness of the Woodlands Hill Seam


MAXWELL WOODLANDS HILL SEAM EXTRACTION PLAN
Figure 5
Maximum Incremental Drawdown in the Woodlands Hill Seam (Layer 11)
Active Model Boundary
Model Extent
Watercourses
Revised Extent of Alluvium (Hydrosimulations, 2018)
Amended Mine Plan
Indicative Underground Mining Area
Water Reservoirs
Woodlands Hill – Revised Longwall Panels
Groundwater Monitoring Bore
Drawdown Contour (m)
Incremental Maximum Drawdown (m)
2 - 5
5 - 10
10 - 20
20 - 50
50 - 100
100 - 200
MB3 - ALLUVIAL
MB3 - REGOLITH
MW1
DD1032
MB07
MB2 - ALLUVIAL
MB2 - REGOLITH
MW2
DD1025
DD1014
DD1016
DD1005
DD1027
DD1057
MB04
DD1015
BLK6R12 (RD1220)
DD1043
RBD1 (DD1170)
RD1192 (RBR2)
WND16 (DD1188)
WND26 (DD1187)
DD1052
MB03
RD1189 (SD1_DD001)
MW3
MB1 - ALLUVIAL
MB1 - REDBANK
MB1 - WHYBROW
VWP1 (RD1221) (RDW006A)
Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:40,000 at A4
Project Number: 665.10012
Date: 18-Dec-2024
Drawn by: AS
MALABAR

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noel.merrick@hydroalgorithmics.com

DATE: 13 February 2025

TO: Malabar Resources Limited
Thomas Mitchell Drive
Muswellbrook NSW 2333

FROM: Dr Noel Merrick

RE: **Maxwell Underground Mine, Woodlands Hill Seam Extraction Plan – Groundwater Review**

YOUR REF: PO MV112635

OUR REF: HA2025/1

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1. Introduction

This document has been prepared for the purpose of reviewing likely groundwater conditions during the extraction of the first four panels of the Woodlands Hill Seam for the Maxwell Underground Mine (the **Maxwell Mine**). This document has also been prepared to support the Extraction Plan for Panels 1 to 4 (referred to as WHLW1 to WHLW4) in the Woodlands Hill Seam in the Wittingham Coal Measures (the **Extraction Plan**), as shown in **Figure 1**.

The Maxwell Mine is an underground coal mining operation located in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook. The Maxwell Mine is owned by Maxwell Ventures (Management) Pty Ltd (**Maxwell**), a wholly owned subsidiary of Malabar Resources Limited (**Malabar**).

Malabar submitted an Environmental Impact Statement (**EIS**) for the Maxwell Mine in July 2019 (State Significant Development [**SSD**] 9526).

Development Consent SSD 9526 for the Maxwell Mine was granted by the Independent Planning Commission on 22 December 2020. The Maxwell Mine was subsequently approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) on 10 March 2021 (EPBC 2018/8287).

Malabar previously sought to modify Development Consent SSD 9526 under section 4.55(1A) of the NSW *Environmental Planning and Assessment Act 1979* for a minor extension to the mine entry area (Modification 1). Modification 1 was subsequently approved on 19 November 2021 and EPBC 2018/8287 was varied on 14 December 2021.

The Development Consent was further modified (Modification 2) on 19 October 2022 to allow for the following:

- re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent (**Modification mine layout)**;
- reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- repositioning of the upcast ventilation shaft site and associated infrastructure; and
- other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site).

Malabar received approval in January 2025 for the first Extraction Plan for secondary extraction of the Whynot Seam. The Whynot Seam is the first of the four coal seams to be mined under Development Consent SSD 9526. Being the uppermost seam, it is to undergo extraction of coal using a bord and pillar mining method followed by partial coal pillar extraction, so as to reduce the extent of goafing, fracturing and land subsidence. The Whynot Seam Extraction Plan includes the first four panels (Panels 2 to 5) of the current mine plan, with extraction proceeding from north to south (HydroAlgorithmics, 2024). However, there is no overlap of the mining footprints between the Whynot Seam Extraction Plan and the Woodlands Hill Extraction Plan.

This Groundwater Review has relied on the findings of the *Maxwell Underground Mine Project Modification 2 Groundwater Review* (**Modification Groundwater Assessment**) prepared by SLR Consulting Australia Pty Ltd (**SLR**, 2022).

SLR (2022) used a numerical groundwater model developed by HydroSimulations (2019) for the *Maxwell Project: Groundwater Assessment* (**EIS Groundwater Assessment**). The EIS Groundwater Assessment was relied upon for the assessment and approval of the Project under the EPBC Act (EPBC 2018/8287). The EIS Groundwater Assessment was peer reviewed by Kalf and Associates (Dr Frans Kalf) and the peer review report was presented in Attachment 6 of the EIS.

The calibration of the groundwater model was verified by SLR (2022) using updated groundwater monitoring data collected from 2018 to 2021. The verification indicated that the groundwater model continued to calibrate well to the updated data and remained fit for purpose.

2. Objective

The objective of this Groundwater Review is to satisfy matters of relevance to groundwater in Condition C8, Part C of the Development Consent which requires the Extraction Plan to "*…provide updated predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed mining covered by the Extraction Plan, incorporating any relevant information obtained since this consent;…*"

The Modification Groundwater Assessment provides the relevant predictions for the Modification mine layout for the mining of all four seams for the entire Modification mine layout, but does not report the effects of mining the Woodlands Hill Seam on its own. As mining of the Woodlands Hill Seam is to commence before extraction of the first four Whynot Seams is completed, Whynot Seam activity will contribute to simulated effects on groundwater. Accordingly, predicted impacts in this Groundwater Review will be due to the cumulative effects of both Whynot Seam and Woodlands Hill Seam mining.

As predicted effects are documented in the Modification Groundwater Assessment only for the maximum drawdown expected at any time during full mining of the four coal seams, the model has been re-run to allow extraction of detailed results up to the end of complete extraction of WHLW1 to WHLW4 for the Extraction Plan.

3. Hydrogeology Overview

The three main groundwater systems identified in the Project area are:

- alluvium associated with the Hunter River;
- regional regolith and alluvium associated with Saddlers Creek; and
- low permeability Permian strata that host the coal measures.

The Hunter River alluvium is the most productive aquifer in the region and comprises surficial silt and clays overlying basal sands and gravels up to 20 metres (**m**) in depth. As groundwater occurs within the alluvium at depths of around 5 m to 10 m below surface, generally over 2 m below the base of the Hunter River, the river is generally losing water to the groundwater system. Recharge to the Hunter River alluvium is considered to be mostly from regulated stream flow or flood events, with direct infiltration of rainfall where there are no substantial clay barriers in the shallow sub-surface. Shallow evapotranspiration is possible from vegetation growing along the riverine corridor. Water quality data for the alluvium indicates it can be fresh to brackish, mostly suitable for stock water supply and irrigation, but unsuitable for drinking water or freshwater aquatic ecosystems.

Saddlers Creek is proximal to WHLW1 at a minimum distance of approximately 125 m at the north-western corner of WHLW1. The Saddlers Creek alluvium, at least 55 m from WHLW1, comprises surficial silts and clays overlying heterogeneous interbedded clays, silts, sands and gravels. Spatially, the alluvium is variably saturated. Localised perched water tables occur where waterbodies continue to hold water throughout the dry period (e.g. pools along Saddlers Creek). Where groundwater is present, it occurs at depths of around 3 m to 10 m below surface. The alluvium is unconfined and is likely recharged from rainfall and potential stream flow following peak rainfall events. Saddlers Creek has intermittent flow in response to rainfall events. When flowing, Saddlers Creek generally exhibits losing conditions, where surface water seeps into the underlying alluvium. Within the lower reaches of the creek there is also potential upward flow of groundwater from the underlying Permian coal measures. Shallow evapotranspiration is possible from vegetation growing along the creek bed. Water quality in the alluvium along Saddlers Creek is generally moderately saline, and is mostly suitable for stock water supply, but is not suitable for irrigation, drinking water or freshwater aquatic ecosystems.

In areas near Saddlers Creek, water has been detected within the regolith material at depths of around 6 m to 9 m below surface. The presence of water may be locally influenced by land use practices (e.g. water storage areas), and outside of these areas the regolith material is largely unsaturated. Water quality data for the regolith indicates it is generally moderately saline.

A site-specific review of potential Groundwater Dependent Ecosystems (**GDEs**) identified Swamp Oak Forest (*Casuarina glauca*) and stygofauna as potential GDEs on Saddlers Creek (HydroSimulations, 2019).

Three coal measure sequences occur within the Hunter Coalfield. These include the Early to Middle Permian Greta Coal Measures, the Late Permian Wittingham Coal Measures and the overlying Late Permian Newcastle Coal Measures (formerly known as the Wollombi Coal Measures). The target seams for the Project (Whynot, Woodlands Hill, Arrowfield and Bowfield Seams) are within the Jerrys Plains Subgroup (**JPS**), forming part of the upper and middle units of the Wittingham Coal Measures. The coal seams transmit groundwater more readily than the intervening interburden strata. Regionally, groundwater within the Permian coal measures flows in southerly and south-westerly directions. Vertical movement of groundwater (including recharge) is limited by the confining interburden layers, meaning that groundwater flow is primarily horizontal through the seams with recharge primarily occurring at sub-crop. Groundwater within the Wittingham Coal Measures is considered suitable only for some stock, with the type of stock dependent on the salinity range (i.e. beef cattle or sheep).

Minor faults and dykes are mapped within the region. There is no evidence that the faults and dykes act as conduits to groundwater flow, or as barriers restricting lateral groundwater flow. There are two minor structures (F11, F33) mapped across WHLW1 to WHLW3. Between WHLW1 and Saddlers Creek, roughly aligned with Saddlers Creek, is a segmented fault (F16) with low throws of 0 to 6 m, averaging about 2.5 m (Mine Subsidence Engineering Consultants Pty Ltd [**MSEC**], 2025). There are two sills (Whynot Sill, Edderton Sill) overlying the Woodlands Hill Seam that will have the effect of spanning the mined voids and reducing subsidence (MSEC, 2025).

4. Subsidence Overview

The potential subsidence impacts to the land and drainages directly above the Extraction Plan WHLW1 to WHLW4 (**Figure 1**) have been determined from east to west (MSEC, 2025). Single-seam longwall mining is relevant to this Extraction Plan, as the mining layout for the Woodlands Hill Seam does not impinge on the previous Whynot Seam Panels 2 to 5 Extraction Plan area to the immediate south-east. The Woodlands Hill Seam within the mining area has a dip of 3-4 percent (%) from the north-northeast towards the south-southwest.

The nearest off-site watercourse is Saddlers Creek which at its closest point is about 125 m from the north-western corner of WHLW1 where the distance to mapped alluvium is about 55 m. Saddlers Creek and its associated alluvium lie outside the 26.5 degree angle of draw.

The depth of cover to the Woodlands Hill Seam ranges from 130 m (western WHLW1) to 235 m (mid-WHLW4). Approximately 110-130 m above the Woodlands Hill Seam is a pervasive high-strength sill (Edderton Sill) that is expected to limit fracturing in the overburden, and subsequent land subsidence, induced by longwall mining.

The maximum predicted immediate conventional subsidence ranges from 1.0 m over WHLW3 and WHLW4 to 1.1 m over WHLW2. Long-term subsidence is predicted to be no more than 1.1 m above any longwall (MSEC, 2025). This degree of subsidence (and associated tensile strain) is expected to produce surface cracks in the order of 0.7 cm width above and between the longwalls. Based on measurements at other NSW coalfields, far-field horizontal movements (towards the mine) are considered to be “very small and could only be detected by precise surveys” (MSEC, 2025).

The predicted subsidence parameters for the Extraction Plan layout are the same as those predicted for Modification 2 layout, as the Woodlands Hill mine plan has not changed. Saddlers Creek, and more distant watercourses (including the Hunter River), are not expected to experience any measurable tilts, curvatures or strains.

An estimate of the likely upper limit of fracturing can be calculated using the Ditton and Merrick (2014) formula for longwall mining. The coefficients in this formula were calibrated on a database of observations with the following ranges for key mining parameters:

- Void width (width [W]): 110 - 355 m
- Depth of cover (height [H]): 75 – 500 m
- Mining height (Thickness [T]): 1.7 – 6.0 m

The corresponding Extraction Plan parameters are:

- Void width (W) – longwall extraction: 150 m
- Depth of cover (H): 130 – 235 m
- Mining height (T): 2.4 – 2.9 m

The Ditton-Merrick algorithm requires another parameter (t') termed "beam thickness" which can be conceptualised as the effective thickness of a spanning stratum in the overburden that could limit the vertical propagation of fracturing. Based on data from other NSW coalfields, this parameter is expected to have a value within the range of 10-40 m, with thinner beams allowing a greater height of fracturing. For the Edderton Sill thickness of 20 m, and the values listed above for W, H and T, the estimated median height of fracturing is 69-104 m, or 87-126 m at the 95% confidence level. For a broader beam thickness range of 15-30 m, the estimated median height of fracturing is 59-116 m, or 76-139 m at the 95% confidence level. As the estimated maximum heights of fracturing are similar to the position of the Edderton Sill, it is likely that this stratum will be effective in limiting the vertical propagation of fracturing and preventing fractures from reaching land surface (as distinct from tensional cracking at land surface).

5. Groundwater Data Analysis

Groundwater Level

The condition of the groundwater system is monitored routinely for groundwater level and water quality by means of a network of monitoring bores. The bore locations are shown in **Figure 2**. Key monitoring bores for this report that are relevant to this Extraction Plan are highlighted in **Figure 2** and listed in **Table 1**.

All key monitoring bores have dataloggers installed, except for Bore DD1015, with water levels recorded automatically each 12 hours. Water depths are checked manually each time a data logger is downloaded. In addition, water levels are measured routinely (by dipping) in all key bores at quarterly intervals.

Hydrographs of groundwater levels are displayed in **Figure 3** for key monitoring bores in alluvium and regolith, and in **Figure 4** for deeper key Permian monitoring bores.

Table 1. Details of relevant groundwater monitoring network bores

Bore ID	Stratum	Easting^ (m)	Northing^ (m)	Ground (mAHD)	Screen (m)
MW1	Saddlers Creek alluvium	297254	6412760	136.53	6-9
MW2	Saddlers Creek alluvium	294977	6411419	119.36	4-9.5
MB2-Alluvial	Saddlers Creek alluvium	294998	6411669	115.34	5-7
MB3-Alluvial	Saddlers Creek alluvium (upslope)	297269	6412850	132.72	8.5-14.5
MB2-Regolith	Regolith	295004	6411675	115.43	20-29
MB3-Regolith	Regolith	297328	6412729	137.34	27-30
MB07	Saddlers Creek alluvium	296076	6412292		3.0-5.5
DD1005	JPS – Blakefield overburden	298799	6410901	225.02	138.6
DD1014	JPS – Blakefield overburden	296799	6410864	183.4	90.5
DD1015	JPS – Blakefield overburden	298815	6409900	212.65	162.5
DD1016*	JPS – Blakefield overburden	297801	6410882	201.15	126.4
DD1025*	JPS – Blakefield overburden	298764	6411901	169.81	44.6
DD1032	JPS – Piercefield overburden	297143	6412495	140.25	276.5
DD1057	JPS – Arrowfield overburden	295181	6410458	146.93	164-188

mAHD = metres Australian Height Datum; mbgl = metres below ground level

^ GDA 94/MGA 56

* Bore has been decommissioned and rehabilitated; last data on 13/4/2023 (DD1016) and 23/11/2022 (DD1025)

The hydrographs are compared with Cumulative Rainfall Deviation[1] (**CRD**) which tracks the difference between long-term monthly average rainfall and actual monthly rainfall. Positive gradients on the CRD curve confirm wetter conditions than normal, while negative gradients indicate dry conditions. Normal rainfall conditions are inferred during periods of fairly stable residual mass. The CRD graph shows that the area experienced a period of above average rainfall from 2007 to 2016, followed by a dry period until 2020 when a wet period commenced. Following a brief drying period in 2023, wetter conditions resumed in 2024.

If rainfall recharge is a significant source of water, the temporal variability in recorded groundwater levels can be expected to mimic the pattern of the CRD curve. Lack of correlation between groundwater level fluctuations and the CRD curve indicates that rainfall recharge is not a significant source of water, or that another stress (such as mining) is more substantial in affecting groundwater levels.

As all alluvial and regolith hydrographs are well correlated with the CRD curve since 2019, the shallow groundwater system is responsive to rainfall recharge. There is no evidence of any mining effect due to active mining[2] to the north of Saddlers Creek.

The Permian hydrographs, for which there is a longer period of record, show an overall declining trend influenced by far-field mining, with occasional small increases in water levels. As there is no correlation with the wet period commencing in 2007, and only partial response at some bores after 2020, rainfall recharge is no more than a minor contributor to deeper groundwater levels.

Groundwater Salinity

The electrical conductivity (**EC**) of a water sample is a convenient surrogate for salinity, and is a high-level indicator of general water quality. EC groundwater hydrographs are displayed in **Figure 5** for key monitoring bores in alluvium and regolith, and in **Figure 6** for deeper key Permian monitoring bores.

For the alluvial and regolith bores, EC has a wide range from about 4,000 microSiemens per centimetre (**µS/cm**) (moderately saline) to about 10,000 µS/cm (saline). There is a general inverse relationship with CRD during the wet period commencing in 2020 as fresh rainfall infiltrates to the water table.

For the Permian bores, the groundwater salinity is marginally higher, generally in the range from about 5,000 µS/cm (moderately saline) to about 14,000 µS/cm (saline). There is a mild inverse correlation with CRD, with rising EC during the dry period prior to 2020, and falling EC during the wet period commencing in 2020. This suggests downwards leakage of water from the overlying regolith.

Groundwater Acidity

Acidity, as measured by pH, fluctuates across a small range of 6.5 to 8.5 in the alluvial and regolith bores (**Figure 7**) and 6.5 to 8.0 in the Permian bores (**Figure 8**). Most of the time, and at most bores, groundwater is on the alkaline side (pH > 7) of neutrality (pH = 7).

In general, pH values are stable within individual bores, with a natural variation of about 0.5. A correlation with CRD is not conclusive, as some bores show a direct correlation while others show an inverse correlation.

[1] Also known as cumulative departure from mean (CDM) or residual mass (RM).
[2] Mt Arthur Coal Mine.

Groundwater Sulphate

Sulphate [SO4] is generally higher in alluvial and regolith bores than in Permian bores. It fluctuates across a moderate range of about 100 to 800 mg/L in the alluvial and regolith bores (**Figure 9**) but is quite stable within individual Permian bores, ranging from about 50 to 500 mg/L overall (**Figure 10**).

6. Groundwater Model Overview

The EIS Groundwater Assessment by HydroSimulations (2019) included numerical modelling (using MODFLOW-USG software) to assess the potential cumulative impacts on groundwater resources of underground mining in four coal seams as well as surrounding mining operations. This model allowed description of any expected/predicted change to potential environmental consequences for groundwater resources, surface water/groundwater interaction, and GDEs.

In order to assess the cumulative effects of other mines, the model extent was very large: 50 km from west to east and 35 km from south to north. The model domain was discretised into a little less than 1 million Voronoi-shaped (polygonal) cells extending through 24 model layers representing the stratigraphy of the coal measures and overlying shallow material. The minimum cell dimension was 50 m. Separate layers were assigned to the following coal seams:

- Whynot Seam [Layer 5]
- Blakefield Seam [Layer 7]
- Glen Munro Seam [Layer 9]
- Woodlands Hill Seam [Layer 11]
- Arrowfield Seam [Layer 13]
- Bowfield Seam [Layer 15]
- Piercefield Seam [Layer 17]
- Edderton Seam [Layer 19]
- Ramrod Creek Seam [Layer 21]

Interburden layers were inserted between layers of coal. Above the Whynot Seam were two layers of overburden [Layers 3 and 4], a layer of regolith, and a layer of alluvium where it exists in association with watercourses. Mapped geological sills were included in layers 5, 6, 13 and 15. Faults were honoured in terms of the minor geometrical changes they cause to seam floors, but were not modelled as distinct barriers, conduits or mixed barrier-conduit systems. This means that coal seams were assumed to have continuity across fault and dyke planes; this assumption acts conservatively to propagate drawdown effects farther than would occur if a fault were to cause compartmentalisation of the groundwater system.

For the EIS, transient calibration against groundwater levels was carried out for the period January 2001 to June 2018. The achieved calibration performance measures were 4.3% Scaled Root Mean Square (**SRMS**) and 7.0 m Root Mean Square (**RMS**). The performance of the groundwater model was verified by SLR (2022) in the Modification Groundwater Assessment using updated groundwater monitoring data collected from 2018 to August 2021. The verification indicated that the groundwater model continued to calibrate well, with performance statistics of 5.5% SRMS and 9.6 m RMS.

7. Groundwater Modelling Results

The updated groundwater model has been interrogated to provide the following quantified effects by the end of mining of the first four Woodlands Hill Seam longwalls, assuming concurrent bord and pillar extraction of four Whynot Seam panels to the immediate south-east:

- Groundwater inflow to the Woodlands Hill Seam [Layer 11].
- Groundwater take from the Saddlers Creek alluvium [Layer 1].
- Surface water take from Saddlers Creek [Layer 1].
- Groundwater level hydrographs at monitoring bores in Saddlers Creek alluvium [Layer 1].
- Groundwater drawdown graphs at key alluvial and Permian monitoring bores [Layers 1, 6, 12 and 16].
- Drawdown maps for unconsolidated sediments [Layer 1] and Woodlands Hill Seam [Layer 11].
- Drawdown map for the water table [highest saturated layer].

Attention is focused on Saddlers Creek and Saddlers Creek alluvium, rather than more distant Hunter River and Saltwater Creek (and their alluvia), as any effect from Extraction Plan mining would be maximised there.

Groundwater Inflow

As shown in **Figure 11**, the groundwater inflow to the Woodlands Hill Seam is predicted to rise slowly to a maximum rate of approximately 0.10 megalitres per day (**ML/day**) at the end of the Extraction Plan (WHLW4).

Groundwater Take

Figure 12 indicates that the take from the Saddlers Creek alluvium, due to mining of both the Woodlands Hill Seam and the Whynot Seam for the duration of the Extraction Plan, is predicted to climb linearly to a rate of approximately 2.0 megalitres per year (0.0055 ML/day). As expected, this is less than the maximum predicted take from the Saddlers Creek alluvium reported in the Modification Groundwater Assessment of approximately 14 ML/year (SLR, 2022).

Surface Water Take

The surface water take from Hunter River, Saddlers Creek and Saltwater Creek, in the form of leakage from the river or creek, was found to be zero at all times for the duration of the Extraction Plan. Accordingly, no graphs have been provided.

Groundwater Drawdown Graphs

The predicted groundwater drawdowns at key alluvial and Permian monitoring bores are illustrated in **Figure 13 [a, b, c]**

Figure 13a shows a predicted drawdown of less than 5 centimetres (**cm**) at all alluvial bores[3] other than MB07, which has a predicted drawdown of approximately 35 cm at the end of mining the Extraction Plan. Bore MB07 lies close to the western end of longwall WHLW1. No deleterious impact on the alluvium would occur by mining the Woodlands Hill Seam.

[3] The response at bore MW2 is not shown as it has zero predicted drawdown.

Table 1 notes that most Permian monitoring bores are in the shallow Blakefield interburden [model Layer 6] immediately below the Whynot Seam [Layer 5] and well above the Woodlands Hill Seam [Layer 11]. The drawdowns in this layer are variable according to distance from the longwalls to be mined in the Woodlands Hill Extraction Plan as well as concurrent Whynot Seam mining. The maximum drawdown (about 30 m) is predicted to occur at bore DD1016 which lies directly beneath Whynot Seam Panel 2. Bores DD1005, DD1014 and DD1025, which have a predicted drawdown of approximately 10 m at the end of mining the Extraction Plan, are likely to be affected more by concurrent Whynot Seam mining than by Woodlands Hill Seam mining. Bore DD1015, having a maximum drawdown of about 1 m, is least affected because it is situated well to the south of both Whynot panels and Woodlands Hill longwalls.

Figure 13c shows the predicted drawdown response at Permian bores extending deeper than the Woodlands Hill Seam. Although bore DD1057 is in the Arrowfield overburden [Layer 12] directly beneath the Woodlands Hill Seam, it has a predicted maximum drawdown of less than 2 m due to its being about 800 m from the western end of WHLW4. Bore DD1032, though much deeper [Layer 16], has more predicted drawdown (~20 m) because it lies close to the eastern end of WHLW1.

Groundwater Drawdown Maps

Figure 14 is set up to show drawdowns in excess of 2 m in Layer 1 of the model (alluvium and regolith). The map is blank because that threshold level is predicted to not occur anywhere in the alluvium of Saddlers Creek, or in the broader expanse of the regolith. This map confirms the conclusion based on **Figure 13a**, that no impact in the form of groundwater drawdown would be likely to occur in the Saddlers Creek alluvium.

As a general principle, mining results in depressurisation of coal seams and fractured overburden/interburden within the immediate area of mining activities. At the level of the Woodlands Hill Seam [Layer 11], there is likely to be drawdown[4] in response to dewatering the Woodlands Hill Seam down to the floor of the seam. As shown in **Figure 15**, drawdown is maximised where the floor of the seam is at its lowest elevation. Due to the depth of cover being from 130 m (western WHLW1) to 235 m (mid-WHLW4), drawdowns in excess of 100 m are evident over all four longwalls covered by the Extraction Plan. **Figure 15** also shows strong drawdown over the western half of WHLW5 which is not included in the Extraction Plan. This is a modelling artefact that results from the adopted time scale for longwall progression in the model. In predictive mode, the model progresses in annual time intervals ("stress periods"), and one of those annual periods covers the whole of WHLW4 and half of WHLW5. The drawdown pattern in **Figure 15**, therefore, is exaggerated near the western end of WHLW4, and the southern drawdown contours extend farther in **Figure 15** than would occur at the end of the Extraction Plan. On the northern side, the drawdown extent would be reliable and is likely to extend beneath the Saddlers Creek alluvium for a longitudinal distance of approximately 3 km.

[4] The difference between potentiometric surfaces before and after mining.

Figure 16 shows the effect on the water table, which is the highest level of saturation regardless of the layer in which it occurs. The dominant feature on **Figure 16** is an expanse of drawdown, mostly 5-10 m in range, associated with concurrent Whynot Seam mining. This drawdown is a cumulative effect of mining two seams at the same time. There is another modelling artefact on **Figure 16** due to simulation in the model of the mining of two Whynot Seam panels to the north of the panels included in the Whynot Seam Extraction Plan; they are active in the Modification mine plan and hence in the current version of the numerical model, but they will not be mined in practice. There are two small pockets in excess of 2 m near the western end of WHLW2 and the western end of WHLW4; the latter is probably exacerbated by unintended mining of the western half of WHLW5 in the model, which is not part of the Extraction Plan. There is no obvious reason for these isolated occurrences. One thing they have in common is that the Whynot Seam has zero thickness there. Elsewhere, the water table is not significantly affected by drawdown at the level of the Woodlands Hill Seam.

8. Conclusion

The key findings of this Groundwater Review are:

1. Mining of the Woodlands Hill Seam for the duration of the Extraction Plan is expected to cause a maximum drawdown in excess of 100 m at the level of the seam, corresponding to the magnitude of the depth of cover.
2. This depressurisation would not cause any significant drawdown of the water table over the Extraction Plan footprint, apart from two isolated occurrences at the western ends of WHLW2 and WHLW4.
3. Groundwater drawdown in the Saddlers Creek alluvium is likely to be less than approximately 0.5 m. The maximum predicted at any alluvial monitoring site is about 35 cm at bore MB07.
4. Consequently, a small volume of “take” is expected from the Saddlers Creek alluvium, at a rate of approximately 0.0055 ML/day at the end of the Extraction Plan mining.
5. The take from the Saddlers Creek alluvium would be a small component (about 5%) of the groundwater inflow to the Woodlands Hill mine void, which is expected to reach approximately 0.10 ML/day at the end of Extraction Plan mining.
6. No additional leakage, due to mining, is expected from the water in Saddlers Creek.
7. As there are predicted to be negligible effects on Saddlers Creek and only minor effects on its alluvium, there would be negligible impact on riverine ecosystems (including potential GDEs identified in the EIS Groundwater Assessment).
8. Given a greater distance from mining, negligible effects are predicted for Hunter River and Saltwater Creek, and their alluvia, as effects on these systems must be less than those assessed for Saddlers Creek and its alluvium.
9. At the level of the Woodlands Hill Seam, the 5 m drawdown contour is expected to extend no more than about 200 m northwards of the mining lease boundary. Consequently, there can be no impact on privately owned water supply bores during the period of the Extraction Plan.
10. Groundwater-related effects from the extraction of the first four longwalls in the Woodlands Hill Seam would be less than those approved for the Maxwell Mine.

9. References

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FIGURES

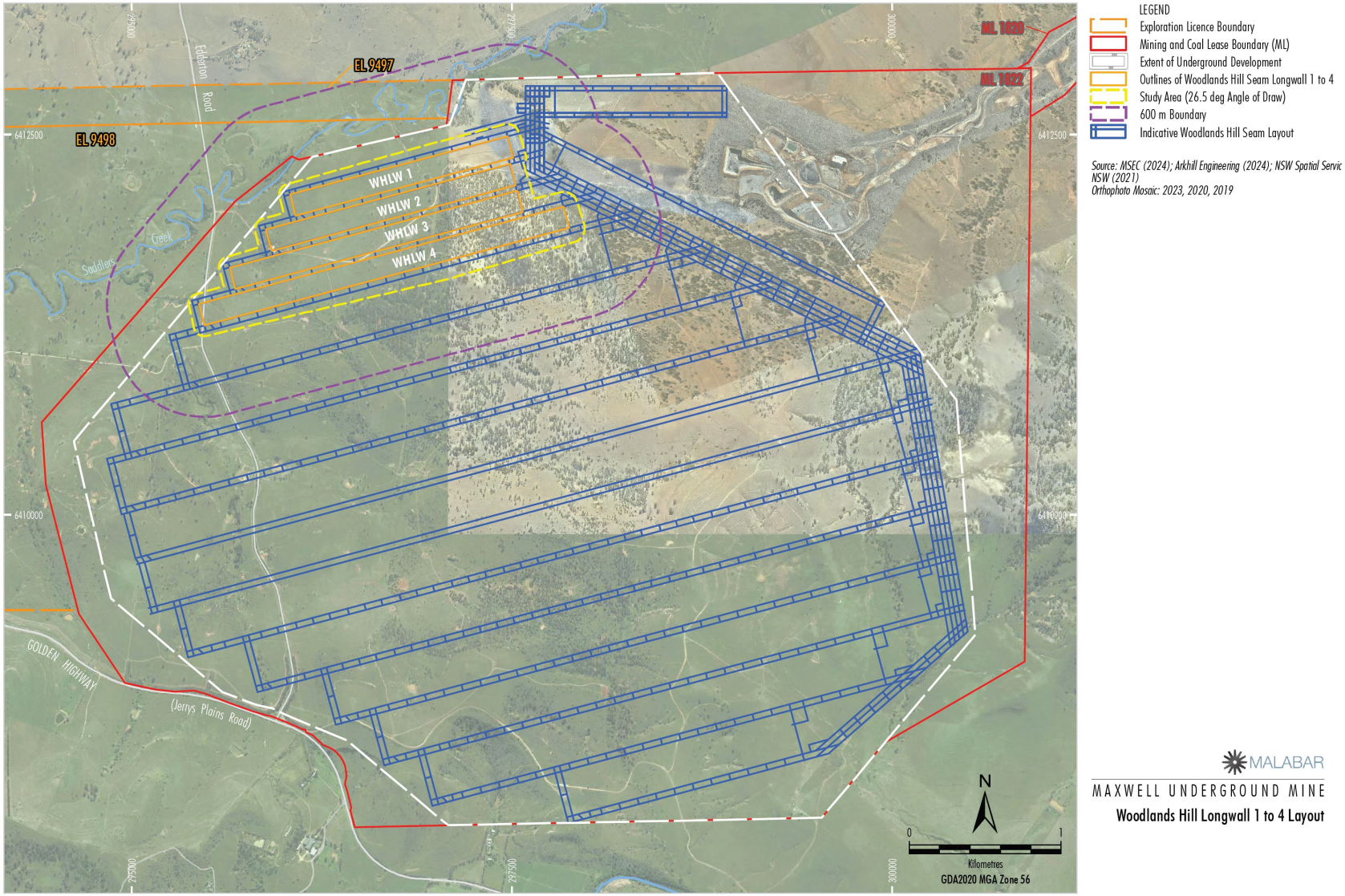
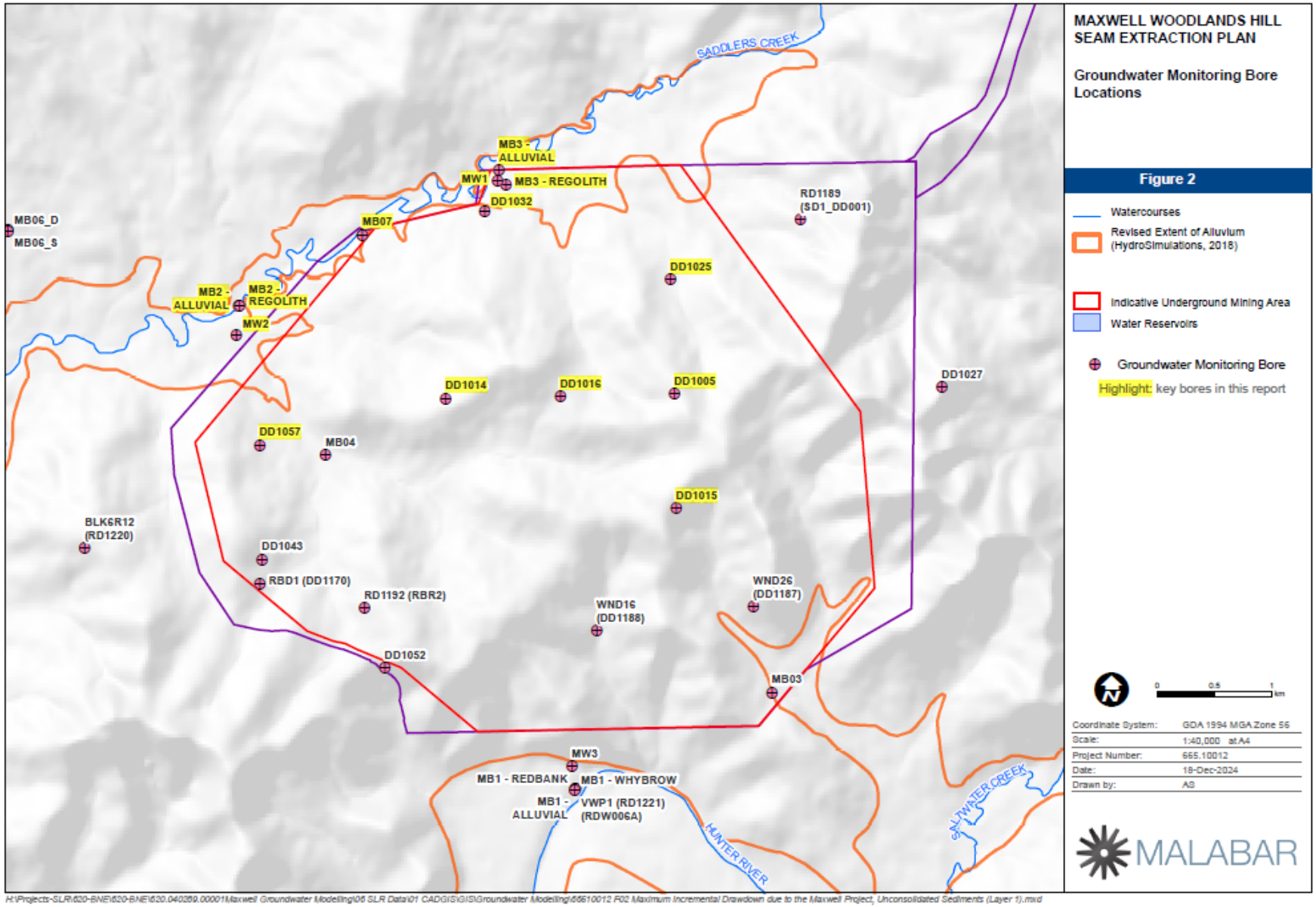


Figure 1. Woodlands Hill Seam Extraction Plan longwalls WHLW1 to WHLW4


MAXWELL WOODLANDS HILL SEAM EXTRACTION PLAN
Groundwater Monitoring Bore Locations
Figure 2
Watercourses
Revised Extent of Alluvium (HydroSimulations, 2018)
Indicative Underground Mining Area
Water Reservoirs
Groundwater Monitoring Bore
Highlight: key bores in this report
Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:40,000 at A4
Project Number: 665.10012
Date: 18-Dec-2024
Drawn by: AB
MALABAR
SADDLERS CREEK
MB3 - ALLUVIAL
MW1
MB3 - REGOLITH
DD1032
MB07
RD1189 (SD1_DD001)
MB06_D
MB06_S
DD1025
MB2 - ALLUVIAL
MB2 - REGOLITH
MW2
DD1014
DD1016
DD1005
DD1027
DD1057
MB04
DD1015
BLK6R12 (RD1220)
DD1043
RBD1 (DD1170)
RD1192 (RBR2)
WND16 (DD1188)
WND26 (DD1187)
DD1052
MB03
MW3
MB1 - REDBANK
MB1 - WHYBROW
MB1 - ALLUVIAL
VWP1 (RD1221) (RDW006A)
HUNTER RIVER
SALTWATER CREEK
H:\Projects-SLR\620-BNE\620-BNE\620.040359.00001\Maxwell Groundwater Modelling\06 SLR Data\01 CAD\GIS\GIS\Groundwater Modelling\665610012 F02 Maximum Incremental Drawdown due to the Maxwell Project, Unconsolidated Sediments (Layer 1).mxd

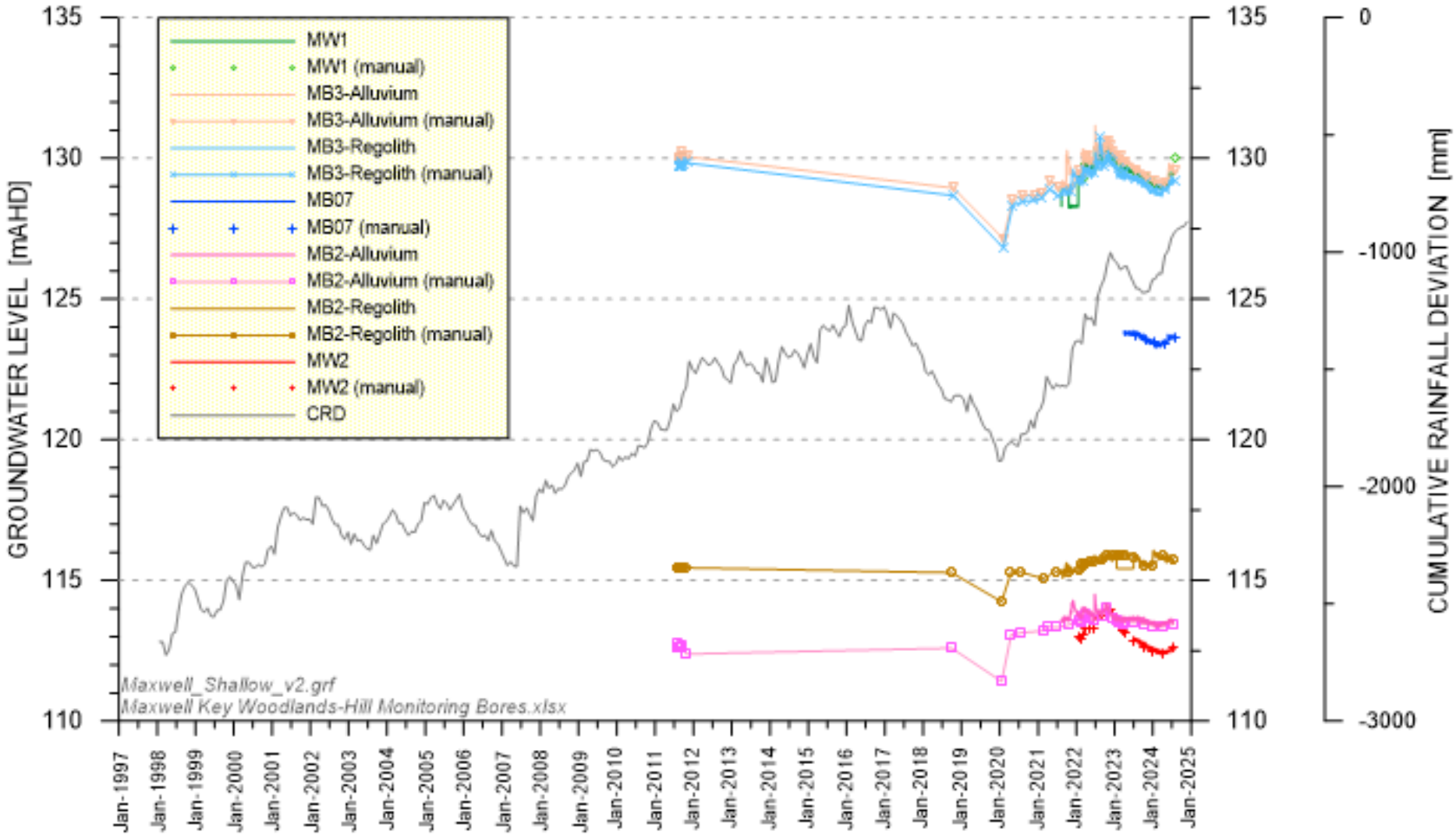


Figure 3. Groundwater hydrographs for key shallow monitoring bores

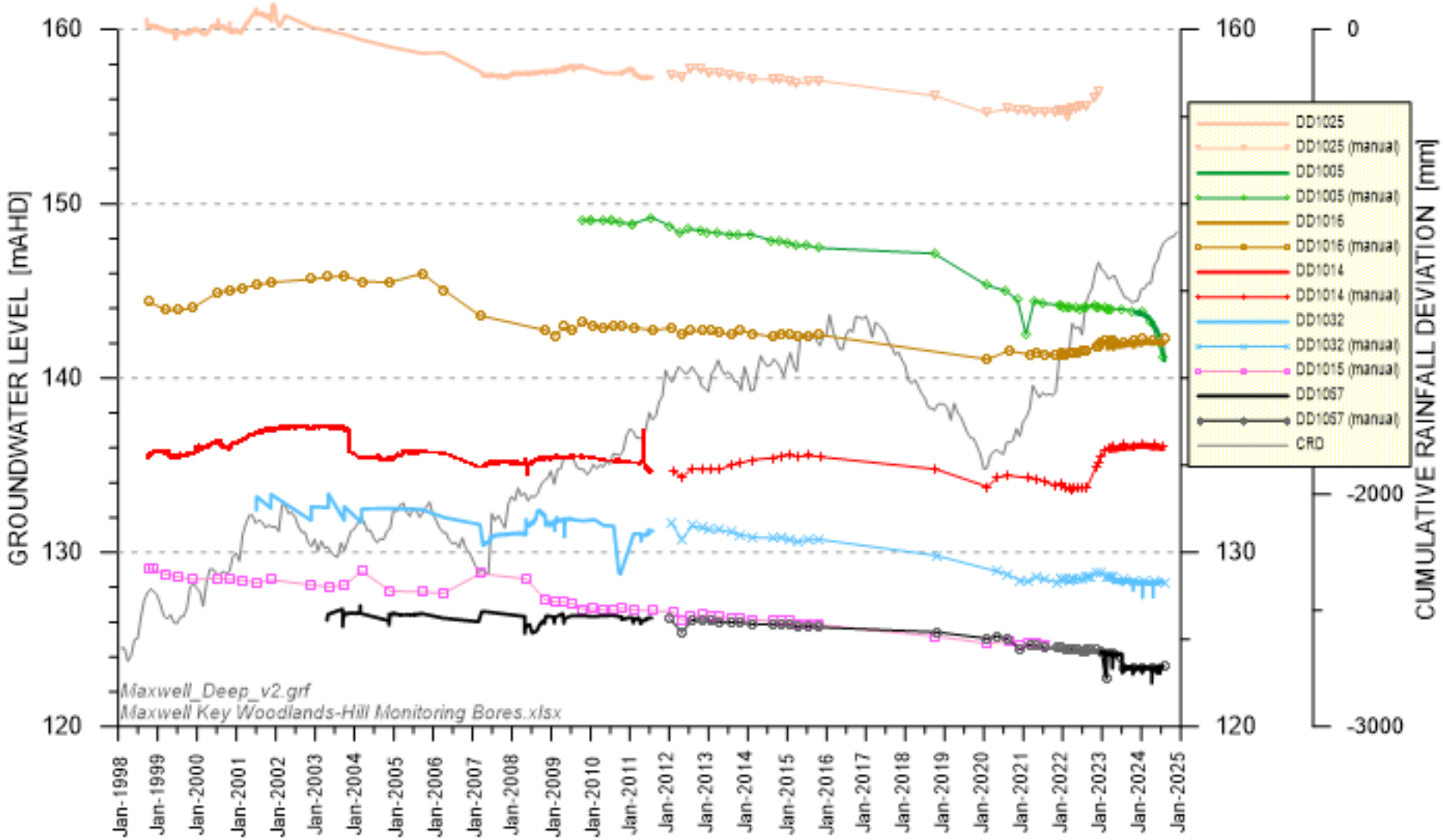


Figure 4. Groundwater hydrographs for key deep monitoring bores

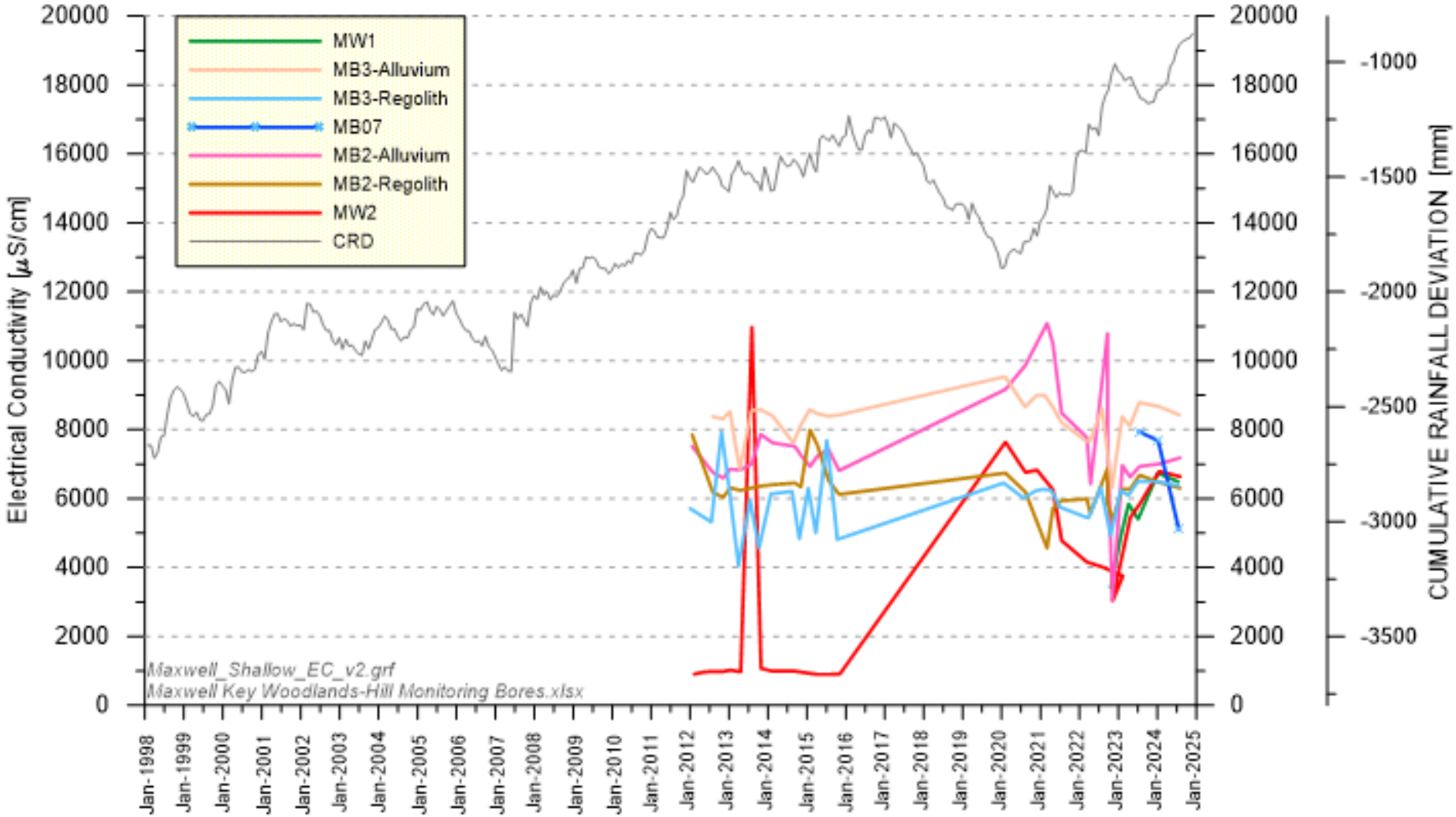


Figure 5. Groundwater EC variations for key shallow monitoring bores

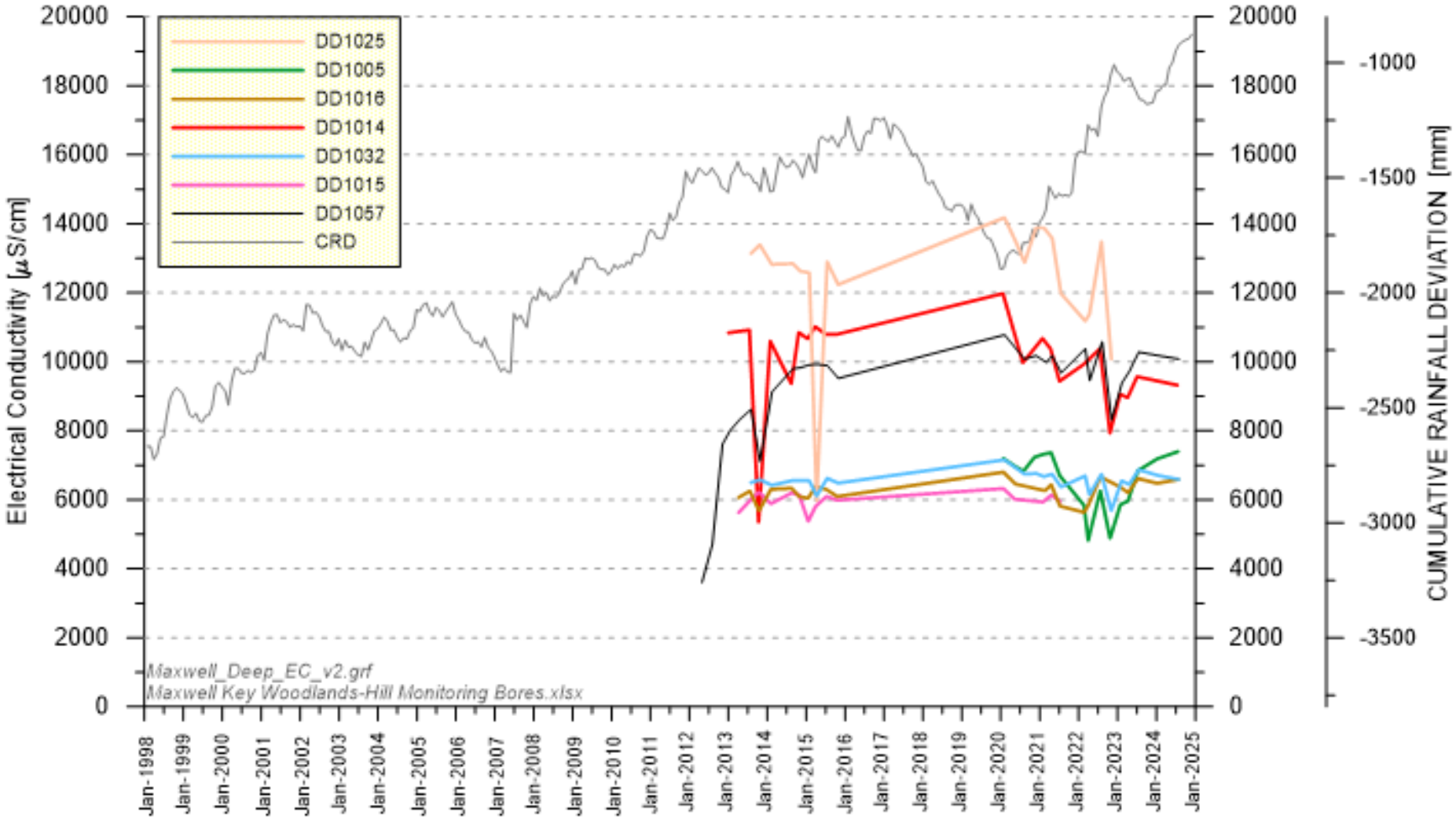


Figure 6. Groundwater EC variations for key deep monitoring bores

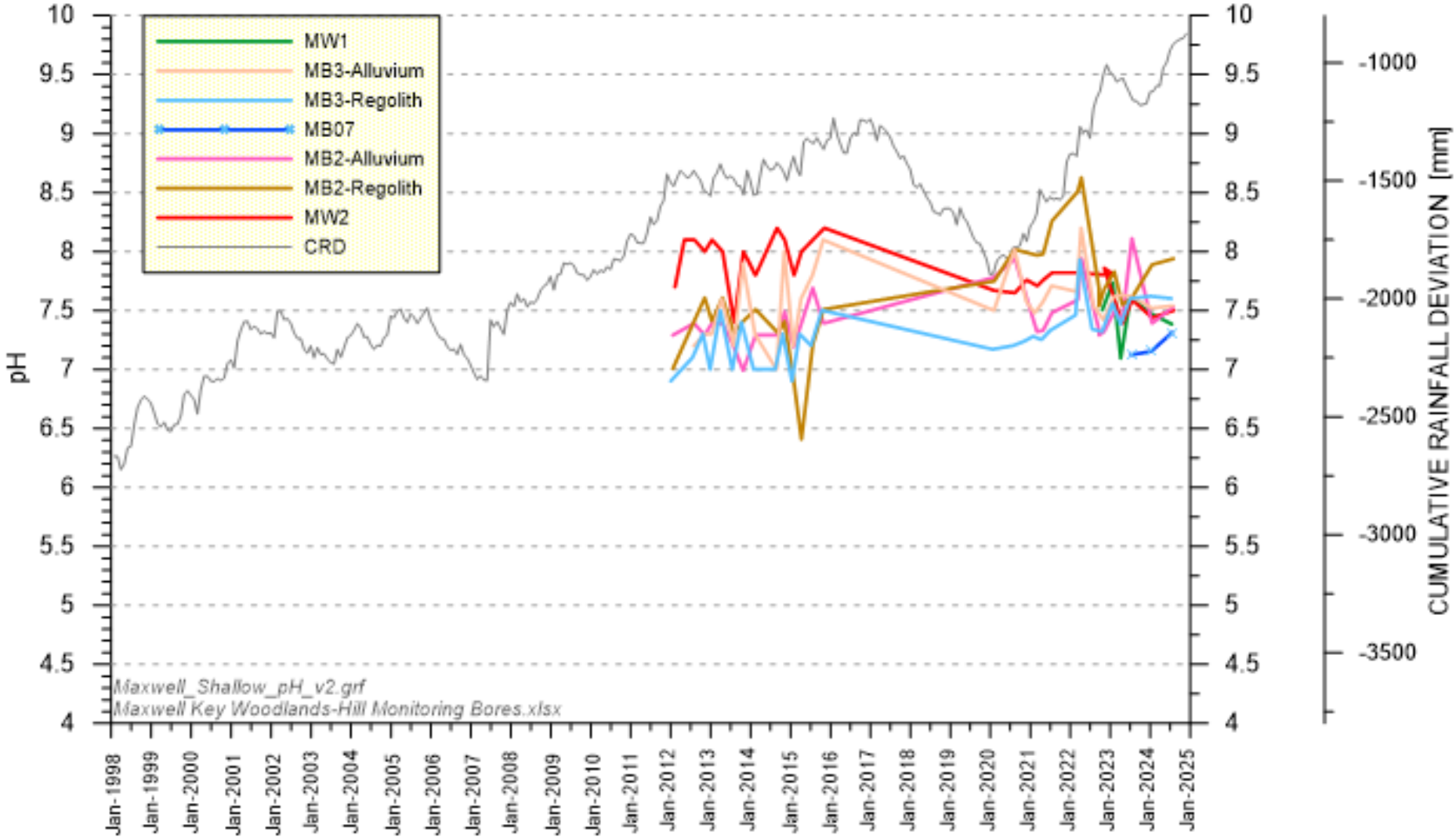


Figure 7. Groundwater pH variations for key shallow monitoring bores

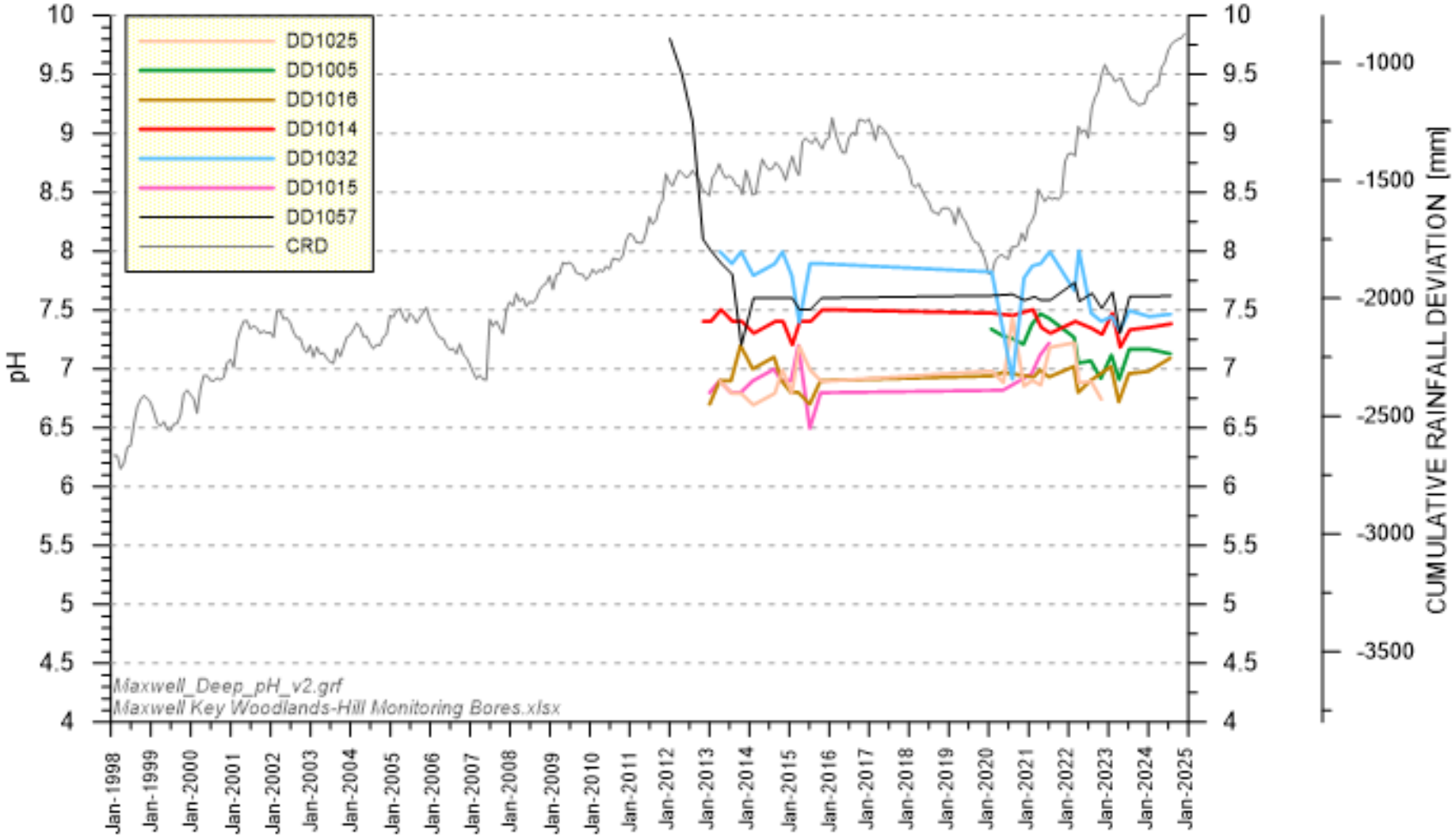


Figure 8. Groundwater pH variations for key deep monitoring bores

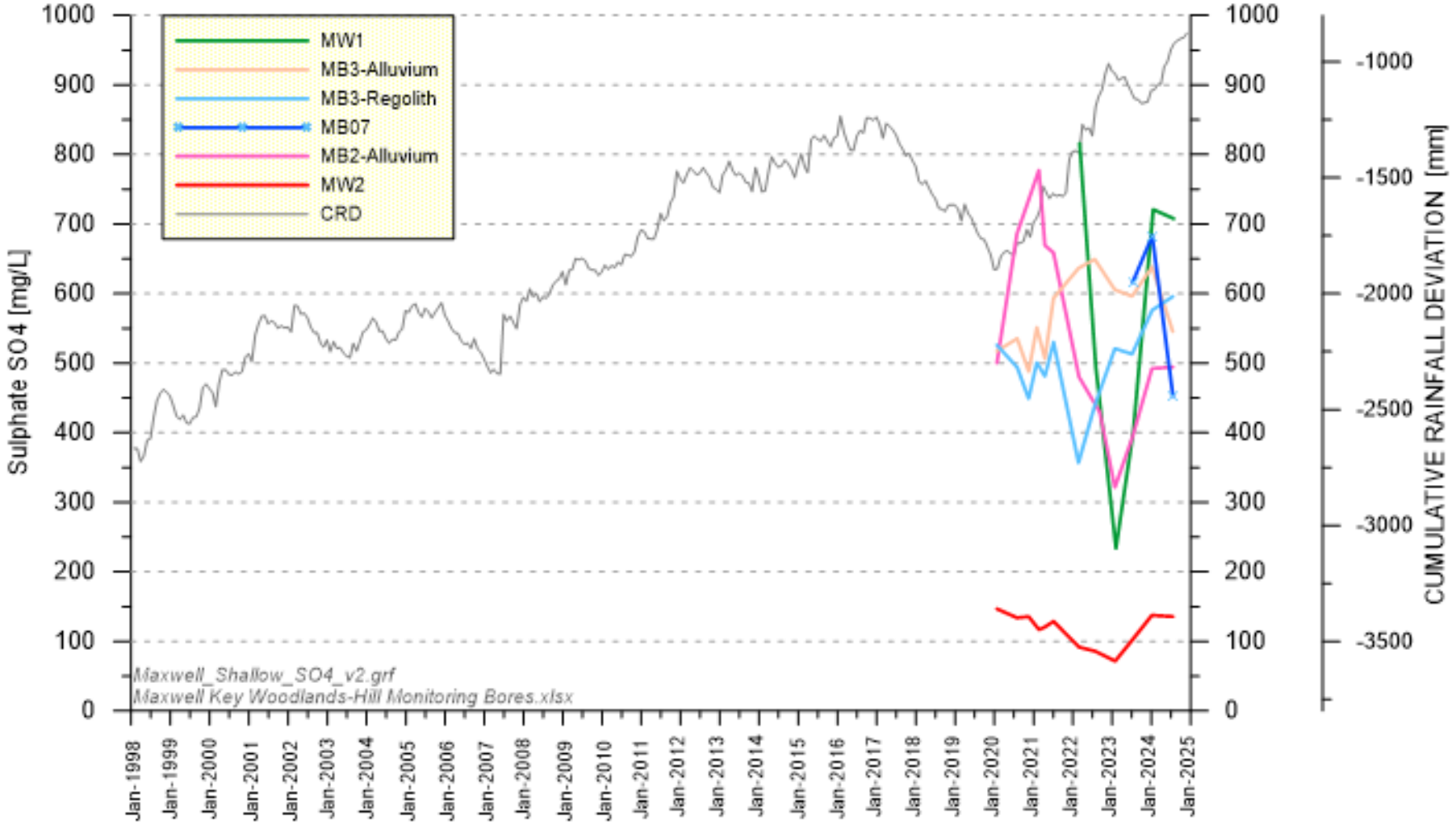


Figure 9. Groundwater SO4 variations for key shallow monitoring bores

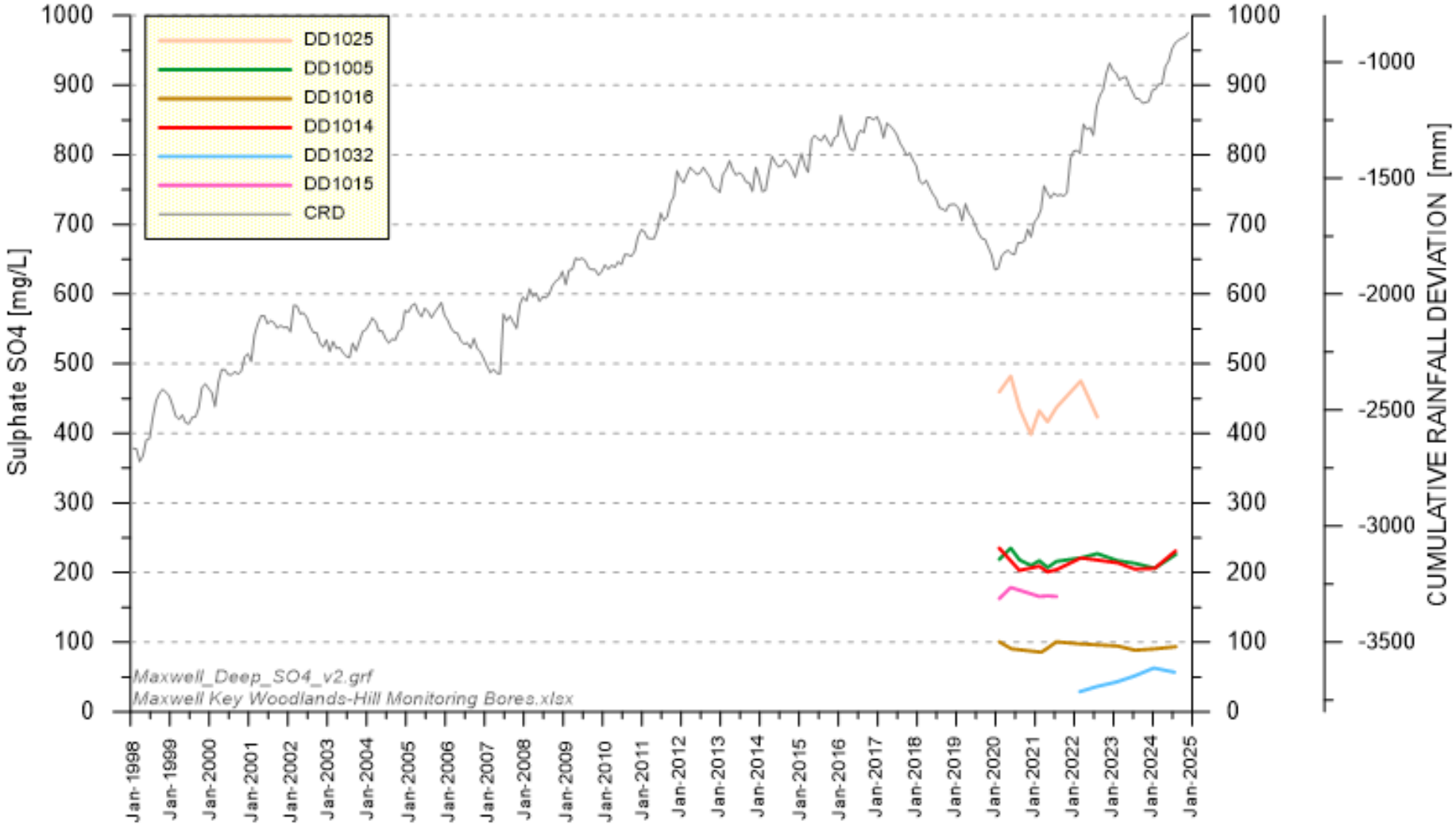


Figure 10. Groundwater SO4 variations for key deep monitoring bores

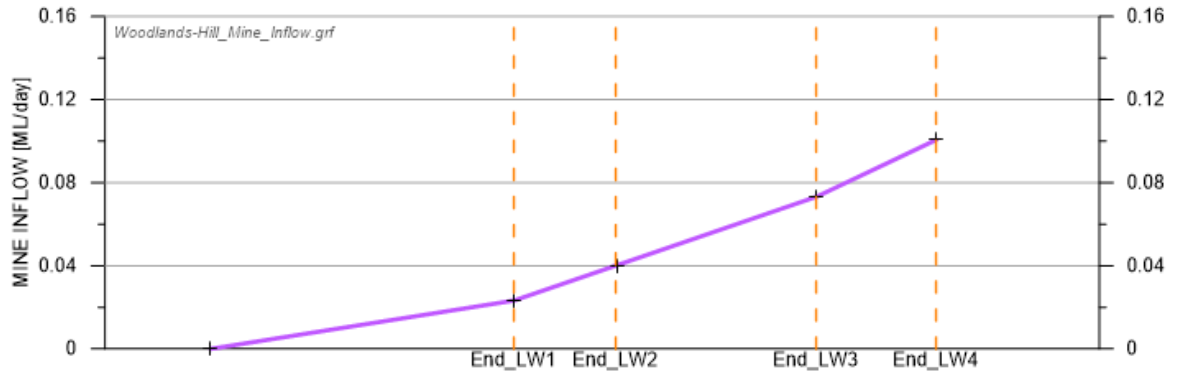


Figure 11. Groundwater inflow to the Woodlands Hill Seam

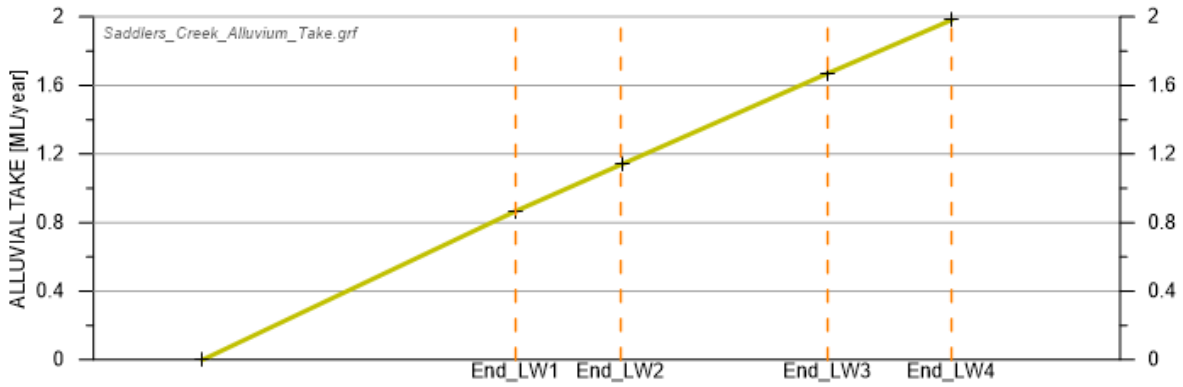


Figure 12. Groundwater take from Saddlers Creek alluvium

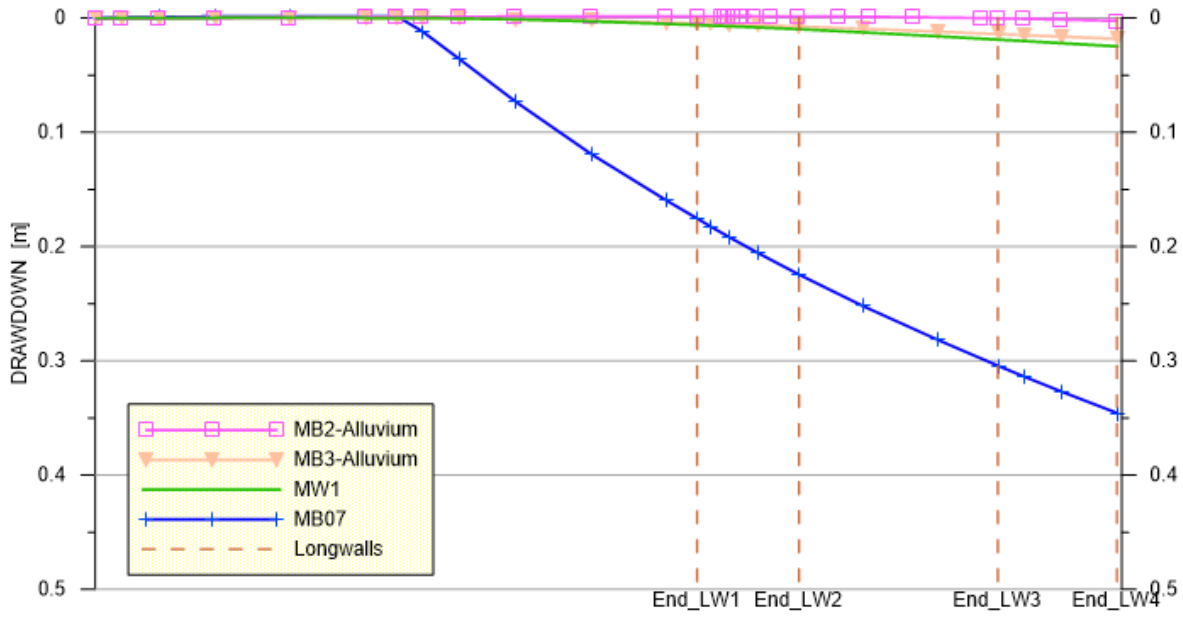


Figure 13a. Simulated groundwater drawdown in Saddlers Creek alluvium

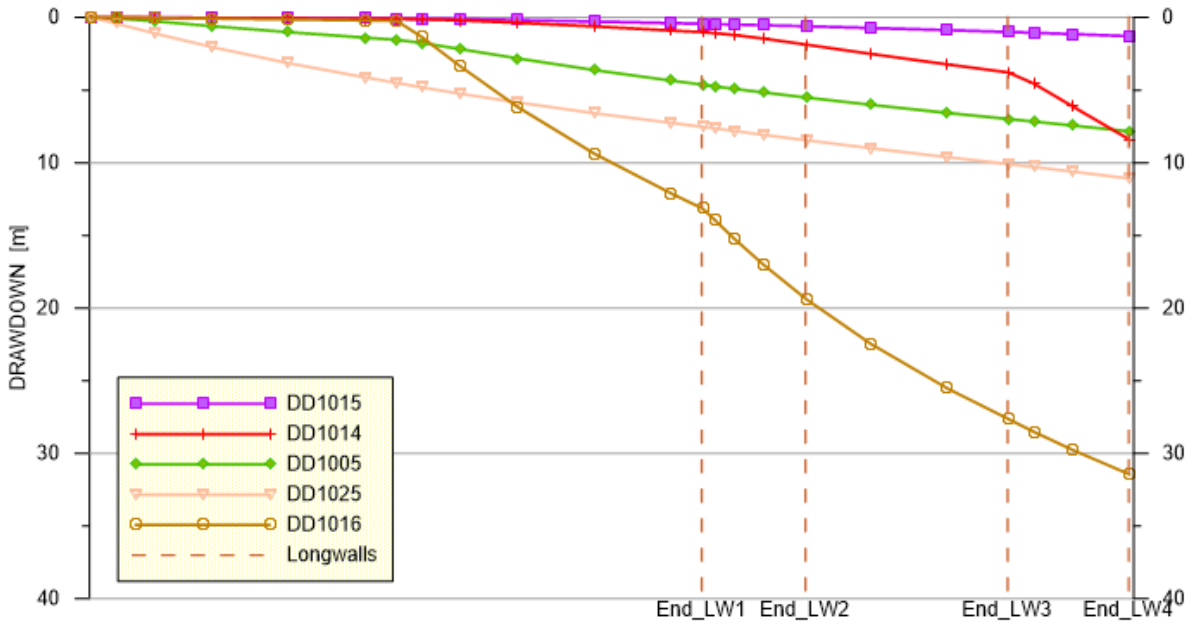


Figure 13b. Simulated groundwater drawdown in shallow Permian overburden

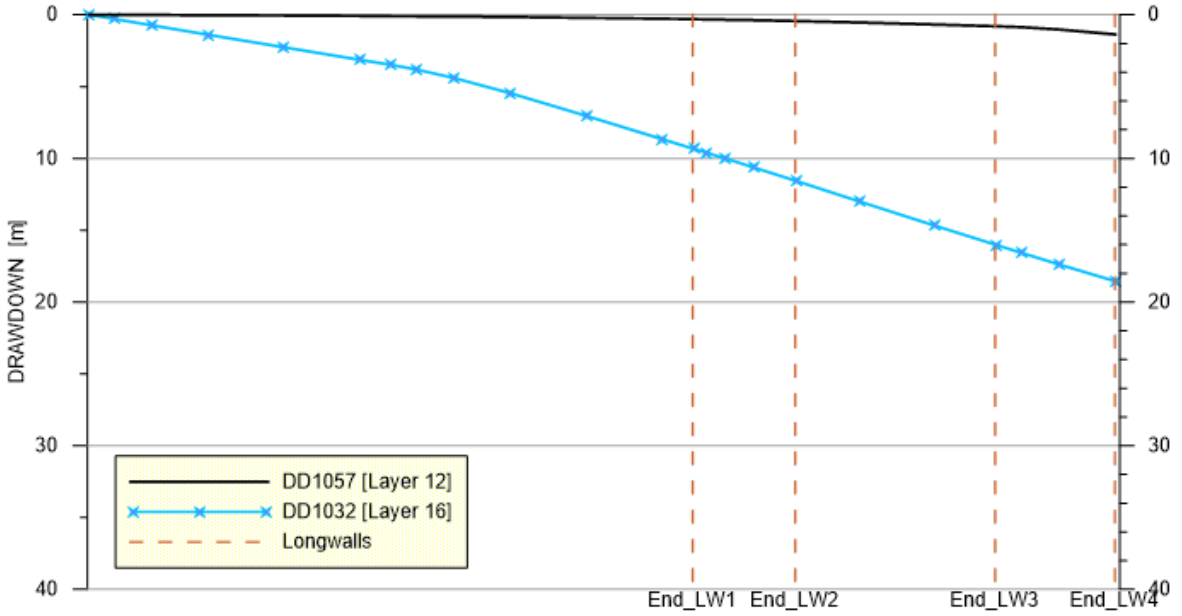
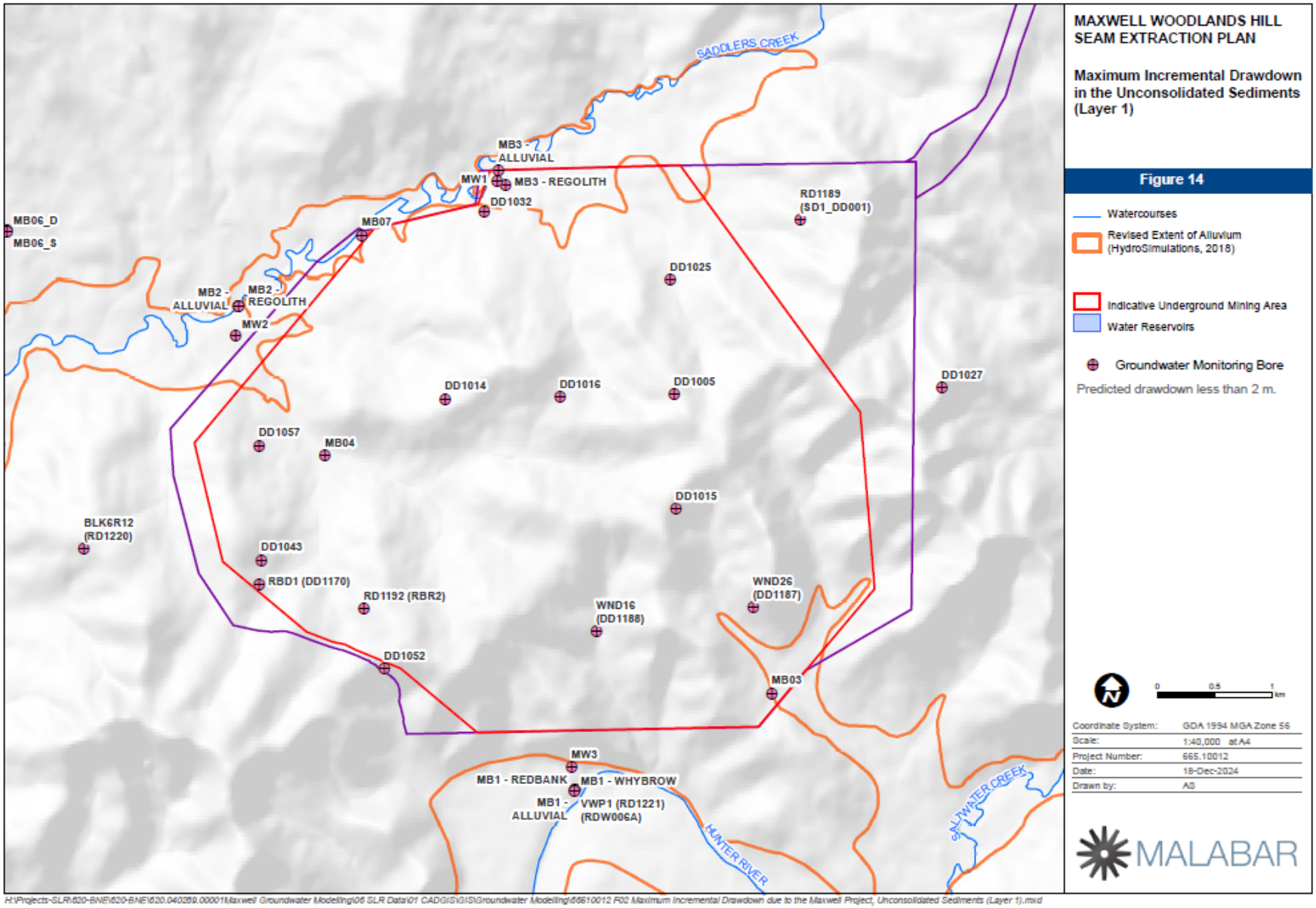
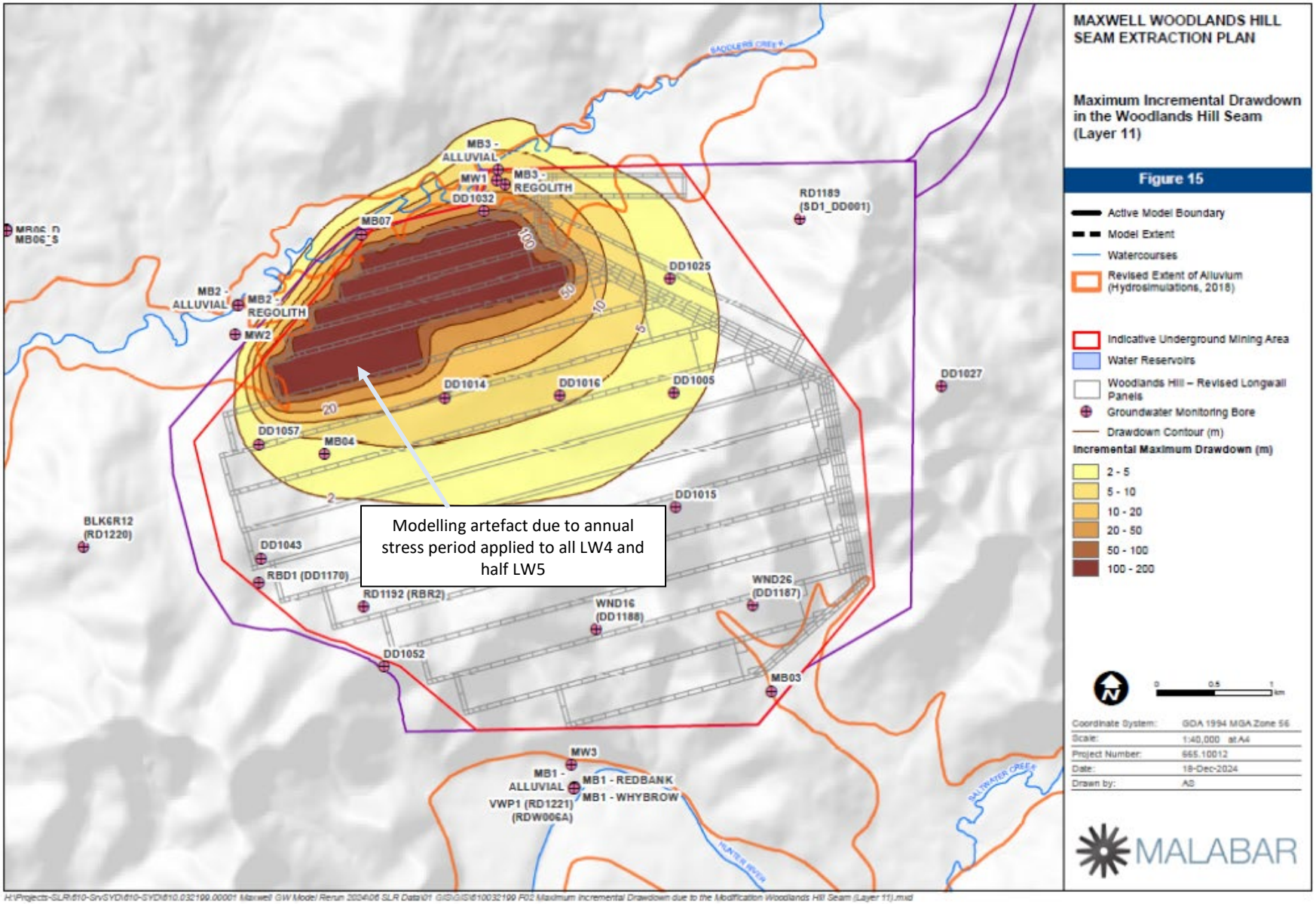
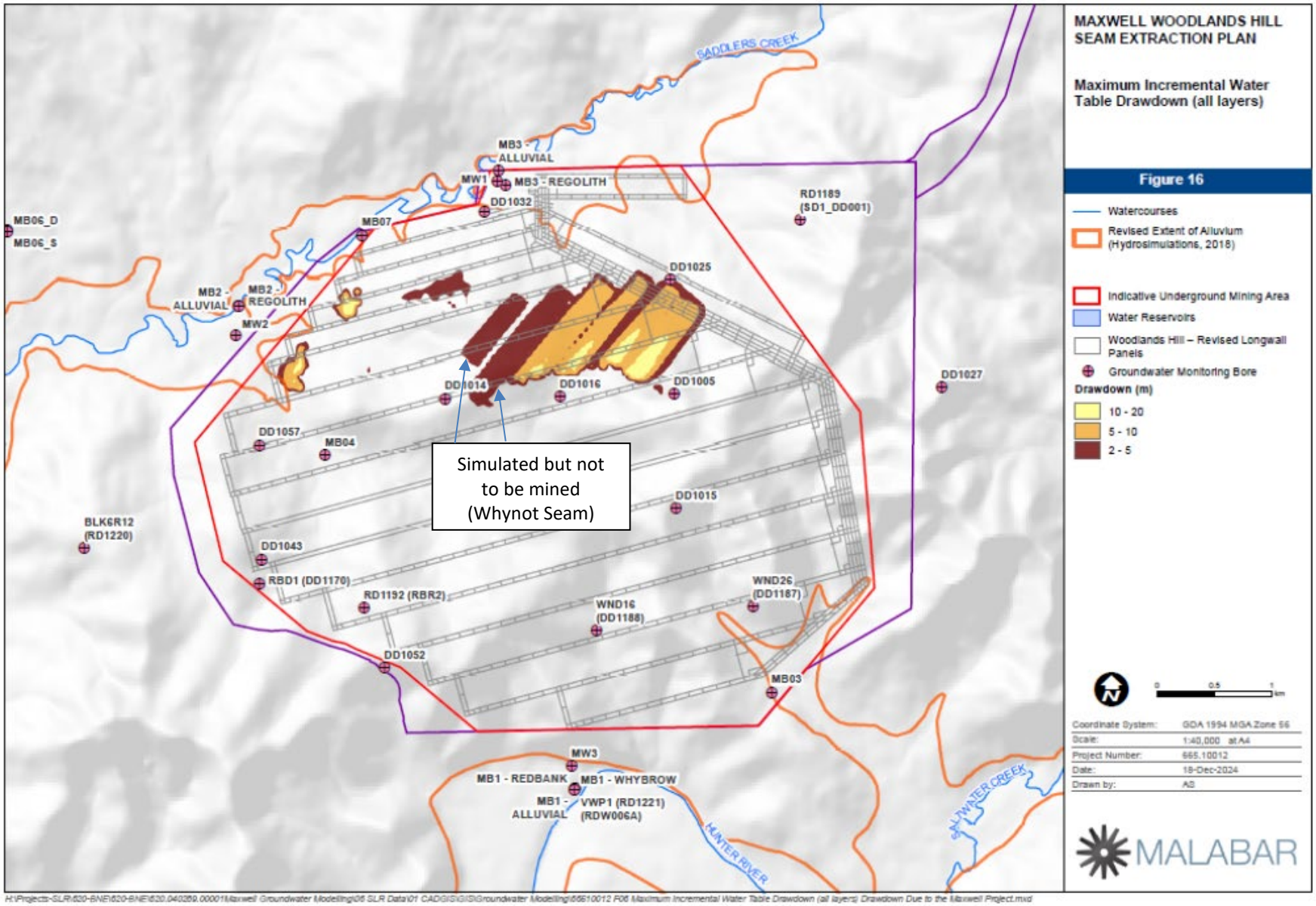


Figure 13c. Simulated groundwater drawdown in deep Permian overburden


MAXWELL WOODLANDS HILL SEAM EXTRACTION PLAN
Maximum Incremental Drawdown in the Unconsolidated Sediments (Layer 1)
Figure 14
Watercourses
Revised Extent of Alluvium (HydroSimulations, 2018)
Indicative Underground Mining Area
Water Reservoirs
Groundwater Monitoring Bore
Predicted drawdown less than 2 m.
Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:40,000 at A4
Project Number: 665.10012
Date: 18-Dec-2024
Drawn by: AB
MALABAR
SADDLERS CREEK
MB3 - ALLUVIAL
MB3 - REGOLITH
MW1
DD1032
MB07
MB06_D
MB06_S
MB2 - ALLUVIAL
MB2 - REGOLITH
MW2
RD1189 (SD1_DD001)
DD1025
DD1014
DD1016
DD1005
DD1027
DD1057
MB04
DD1015
BLK6R12 (RD1220)
DD1043
RBD1 (DD1170)
RD1192 (RBR2)
WND16 (DD1188)
WND26 (DD1187)
DD1052
MB03
MW3
MB1 - REDBANK
MB1 - WHYBROW
MB1 - ALLUVIAL
VWP1 (RD1221) (RDW006A)
HUNTER RIVER
SALTWATER CREEK
H:\Projects-SLR\620-BNE\620-BNE\620.040359.00001\Maxwell Groundwater Modelling\06 SLR Data\01 CAD\GIS\GIS\Groundwater Modelling\665I0012 F02 Maximum Incremental Drawdown due to the Maxwell Project, Unconsolidated Sediments (Layer 1).mxd


MAXWELL WOODLANDS HILL SEAM EXTRACTION PLAN
Maximum Incremental Drawdown in the Woodlands Hill Seam (Layer 11)
Figure 15
Active Model Boundary
Model Extent
Watercourses
Revised Extent of Alluvium (Hydrosimulations, 2018)
Indicative Underground Mining Area
Water Reservoirs
Woodlands Hill – Revised Longwall Panels
Groundwater Monitoring Bore
Drawdown Contour (m)
Incremental Maximum Drawdown (m)
2 - 5
5 - 10
10 - 20
20 - 50
50 - 100
100 - 200
Modelling artefact due to annual stress period applied to all LW4 and half LW5
MB3 - ALLUVIAL
MB3 - REGOLITH
MW1
DD1032
MB07
RD1189 (SD1_DD001)
DD1025
MB2 - ALLUVIAL
MB2 - REGOLITH
MW2
DD1027
DD1014
DD1016
DD1005
DD1057
MB04
DD1015
BLK6R12 (RD1220)
DD1043
RBD1 (DD1170)
RD1192 (RBR2)
WND26 (DD1187)
WND16 (DD1188)
DD1052
MB03
MW3
MB1 - ALLUVIAL
MB1 - REDBANK
MB1 - WHYBROW
VWP1 (RD1221) (RDW006A)
Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:40,000 at A4
Project Number: 665.10012
Date: 18-Dec-2024
Drawn by: AS
MALABAR



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