BHP Mitsubishi Alliance

Appendix K

Supplementary information in response to IESC comment

To:	Hannah Silcox	**From:**	Scott Weeks, Dave Western
Company:	BMA	**SLR Consulting Australia**	
cc:		**Date:**	8 October 2025
		Project No.	620. 040484.00002

RE: Saraji Mine Grevillea Pit Continuation Project – Groundwater Impact Assessment
IESC Advice Response

Introduction

The following memorandum provides responses to relevant comments included in the Independent Expert Scientific Committee (IESC) Advice (dated 16/12/2024) provided to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) in support of their assessment of the Saraji Mine (SRM) Grevillea Pit Continuation Project (the Project). The Project was referred for assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) by BM Alliance Coal Operations Pty Ltd (BMA) in 2023 (EPBC 2023/09757).

The Project's Groundwater Impact Assessment (reference *620.040484.00001-R01-v4.0-20240913*, i.e., SLR 2024a) was developed by SLR in support of the submission to DCCEEW, and included a supporting Groundwater Modelling Technical Report (reference *620.040484.00001-R02-v3.0-20240912_Report*, i.e., SLR, 2024b). The IESC provided formal advice (referred to herein as IESC Advice) in response to this material on 16 December 2024. This memorandum is provided to directly respond to the IESC Advice and should be treated as an addition to the two technical documents (i.e., SLR 2024a; SLR 2024b).

To support responses to the IESC Advice specific to post-mining final void conditions, relevant information from the hydrogeological assessment (which included groundwater modelling) undertaken for a Transitional Progressive Rehabilitation and Closure Plan (PRCP) in 2023 (SLR, 2023) has been incorporated.

Additional geological data for Phillips Creek alluvium has recently become available, and has been used to update this hydrostratigraphic unit in the numerical groundwater model. This included both failed drilling attempts where alluvium was absent and successful installations of alluvium bores that were dry. Simulations using the updated model have been undertaken with results used to provide further insight into potential Project groundwater impacts. Alluvial groundwater behaviour and response to mining activities elsewhere have also been examined to infer behaviour of groundwater in the Phillips Creek alluvium.

This memorandum is structured in terms of each relevant comment within the IESC Advice (presented in **Table 1**). Reponses are presented in the sections following. Note that only responses to comments within the IESC Advice that are directly relevant to SLR's Groundwater Impact Assessment (SLR 2024a) are provided herein.

Table 1 IESC Concerns, Advice and Proposed Approach

IESC Concerns	IESC **[Section]** Advice	See Section
Reduction in alluvial water availability to riparian vegetation communities, especially terrestrial groundwater-dependent ecosystems (tGDEs), arising from open-cut mining through alluvium in the project area	**IESC Memo – Summary – Dot Point 7** Appropriate field data, including surveying and mapping, are needed to characterise the extent, thickness, and hydrogeological characteristics of the Quaternary alluvium along Phillips Creek and within the project area, including potential lateral and vertical hydraulic connectivity within the alluvium, and with the Tertiary sediments and Permian coal seams.	**1.1**
	IESC Memo – Summary – Dot Point 8 Further assessments, including field work, should be completed to improve a local-scale conceptualisation of the alluvial groundwater system, characterise surface water-groundwater interactions and assess whether the model and its predictions are appropriate.	**1.2**
	IESC Memo – Summary – Dot Point 10 Once further data have been collected, an impact pathway diagram should be developed to refine the understanding of how and where the project may impact water resources within and near the project area. This will assist in developing appropriate monitoring programs and management plans.	**1.3**
	IESC Memo – Summary – Dot Point 11 The additional data, revised conceptualisation and the impact pathway diagram may indicate that improved prediction of local groundwater impacts is required, necessitating revised or local-scale modelling.	**1.4**
	IESC Memo – Summary – Dot Point 13 **[Summary]** Given the importance of Phillips Creek and its riparian corridor for regional ecological connectivity, the proponent should demonstrate that the setback's benefits will not be compromised by changes in the alluvial water levels, during and after mining (e.g. legacy impacts of the final void).	**1.5**
	IESC Memo – Context – Paragraph 4 This process may lower alluvial water levels and reduce the availability of water for groundwater-dependent vegetation, potentially diminishing the effectiveness of the proponent's proposed setback of 100–150 m from Phillips Creek (BMA 2024, p. 15) aimed at protecting the high-value riparian corridor.	**1.6**

IESC Concerns	IESC **[Section]** Advice	See Section
	IESC Memo – Response to Questions – Groundwater Item 3 There are presently only two monitoring bores in the Phillips Creek alluvium (SLR 2024a, Table 8, pp. 42–48). These are insufficient to support conclusions presented in the conceptual site model and additional evidence has not been provided. Local-scale studies should be conducted to determine the presence and hydrogeological regime of alluvial aquifers and any surface water-groundwater interactions in and near the project area. Additional studies to improve conceptualisation of shallow groundwaters, especially between Phillips Creek and the location of the final void, should include collection of information and data to: a. establish the depth, extent and hydraulic properties of the alluvium; b. establish the extent, permanence and water level changes of any perched aquifers or saturated lenses of groundwater within the alluvium; c. demonstrate that any groundwater present in the alluvium is hydraulically disconnected from underlying aquifers; d. determine the impact to any alluvial groundwater due to stripping of alluvium within the project area or during proposed mining activities; and e. evaluate whether altered water levels in the alluvium may compromise the intended benefits of the setback.	**1.7**
	IESC Memo – Response to Questions – Groundwater Item 4a The revised conceptualisation (Paragraph 3) should be used to inform whether local-scale groundwater modelling would assist in predicting changes in water levels in the alluvium during and after mining, to improve predictions of impacts to Phillips Creek and tGDEs.	**1.8**
Persistent legacy effects of the final void (NUMA), maintained as a groundwater sink, that may continue to reduce alluvial groundwater availability and, if levees fail or are inadequate, intercept floodwaters that are important in maintaining floodplains and	**IESC Memo – Summary – Dot Point 12** Additional groundwater modelling should estimate and clearly document the long-term impacts of the proposed final void and the increased recharge of spoils.	**2.1**
	IESC Memo – Response to Questions – Groundwater Item 4b It is not clear whether predictive groundwater modelling to date appropriately simulates post-mining conditions, especially the final void. Impacts to groundwater flow, levels and quality should be clearly reported for regional-scale and any local-scale groundwater modelling.	**2.2**

IESC Concerns	IESC **[Section]** Advice	See Section
their ecological assemblages downstream		
Contribution to cumulative impacts to groundwater levels	**IESC Memo – Summary – Dot Point 16** The proponent should clarify how predicted drawdown, altered flow regimes in Phillips Creek, potential releases of MAW and removal of 205 ha of vegetation during the proposed 30-year operations will contribute to cumulative impacts of current and foreseeable mining in the area. Particular focus should be on the likely legacy of cumulative impacts of the final void on, for example, groundwater levels and water quality.	**3.1**
	IESC Memo – Summary – Dot Point 17 Information is needed on the risks of the project to cumulative impacts on landscape connectivity if the setback is too narrow and/or compromised by lowered water levels in the alluvium.	**3.2**
N/A	**IESC Memo – Response to Questions – Groundwater Item 13** As the impact assessment concluded that no project-specific impacts to groundwater resources are likely (SLR 2024b, pp. 129–136), the proponent proposes to adopt the existing Saraji Groundwater Monitoring and Management Plan. Further work is required to provide more robust justification for this conclusion, given the issues with the conceptualisation, limited site-specific groundwater data, and the scale of the model (Paragraphs 3 and 4). For example, there are only two monitoring bores in the alluvium and one hand-augered test hole to evaluate sediment saturation. The results of this further work will indicate whether additional water management measures may be necessary and, if so, what these measures might be and how best to monitor their effectiveness.	**4.1**

1.0 IESC Concern 1

Reduction in alluvial water availability to riparian vegetation communities, especially terrestrial groundwater-dependent ecosystems (tGDEs), arising from open-cut mining through alluvium in the project area.

1.1 IESC Comment

Appropriate field data, including surveying and mapping, are needed to characterise the extent, thickness, and hydrogeological characteristics of the Quaternary alluvium along Phillips Creek and within the project area, including potential lateral and vertical hydraulic connectivity within the alluvium, and with the Tertiary sediments and Permian coal seams.

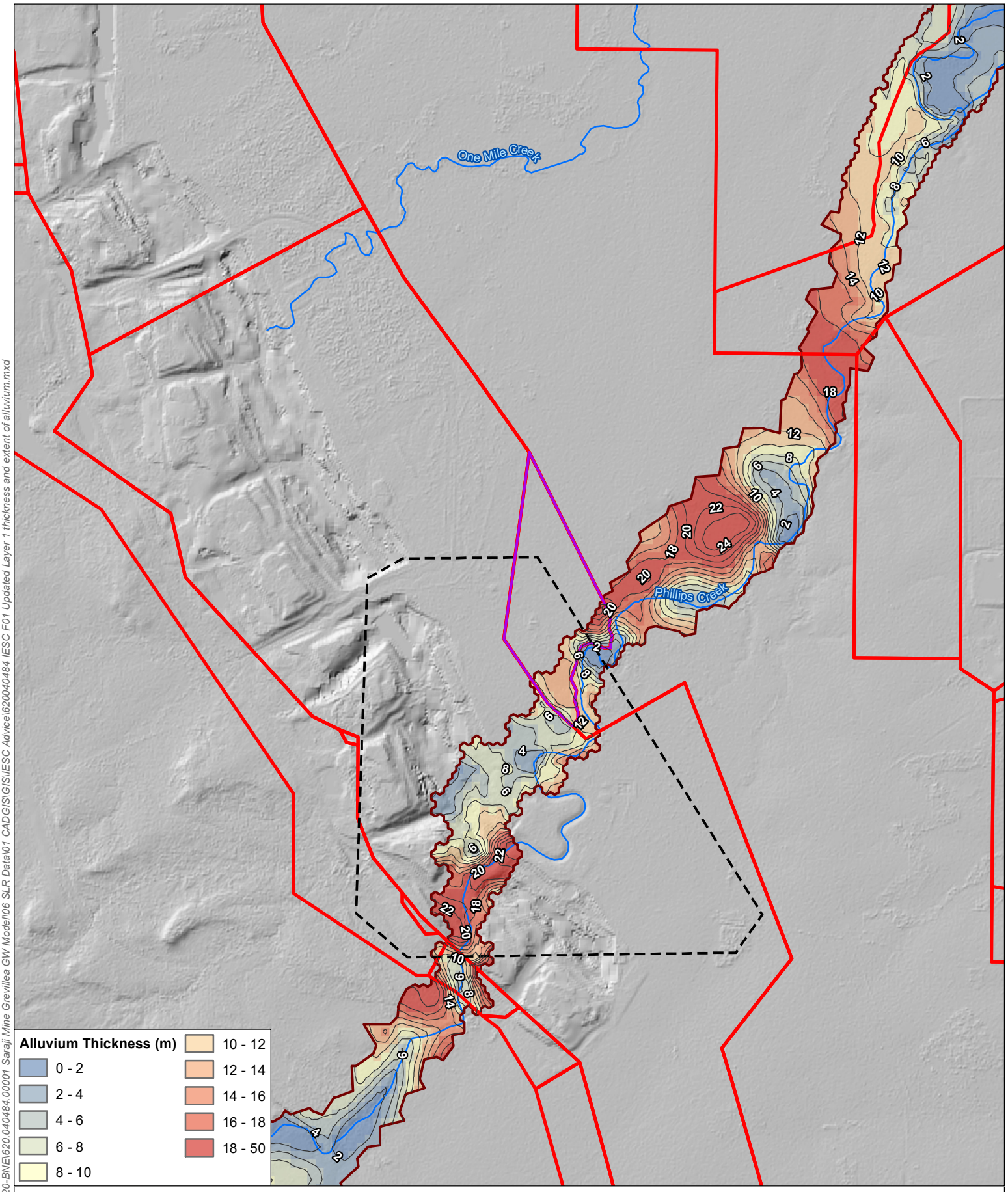
1.1.1 Response

The Phillips Creek alluvium comprises the surficial cover of Quaternary alluvium localised along the creek and aligns with the interpretation of surface geology mapping conducted by the Queensland Department of Resources (now Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development). An examination of 134 drill logs was undertaken to produce an updated interpretation of the extents of the Quaternary alluvium, colluvium, tertiary basalt and tertiary sediments in the vicinity of the Project (Mining Lease (ML) 700021).

In the Phillips Creek alluvium, there has been no material change in the interpreted lateral extent. However, changes in thickness ranging between -6m (i.e., the alluvium is now thinner) and 5m (i.e., the alluvium is now thicker) were identified, with the maximum thickness of the alluvium in the vicinity of the Project being approximately 22m. The revised thickness of the Phillips Creek alluvium therefore ranges from 0.8m to 22m (see **Figure 1**). This range is similar to those of the alluvium aligned along Plumtree and Boomerang Creeks to the north and Downs Creek to the south.

There are two monitoring bores (MB32 and MB38) within the vicinity of the Project. Both MB32 and MB38 are interpreted to be screened within the Phillips Creek alluvium. MB32 is located upstream to the west of SRM and MB38 is located downstream of SRM, northeast of Grevillea Pit. MB38 has consistently been reported as dry since installation in July 2019. Recent monitoring data (i.e. since May 2023) for MB32 shows groundwater levels from around 10.5mbgl to 14mbgl.

Alluvial groundwater levels have also been monitored at 17 locations across SRM (refer **Figure 2)**. The majority of available groundwater monitoring data for the alluvium relates to the area adjacent to Hughes Creek to the west of Bauhinia Pit and near TSF2 and TSF3 (bore IDs prefixed by 2019MP). The majority of alluvium monitoring bores away from Hughes Creek and downstream of SRM are dry, which is consistent with the groundwater conditions encountered at MB38, suggesting the alluvium has already been desaturated from authorised mining activities at SRM. This is in contrast with the alluvium at upstream bore MB32 which is up-hydraulic gradient of current mining areas and is saturated.

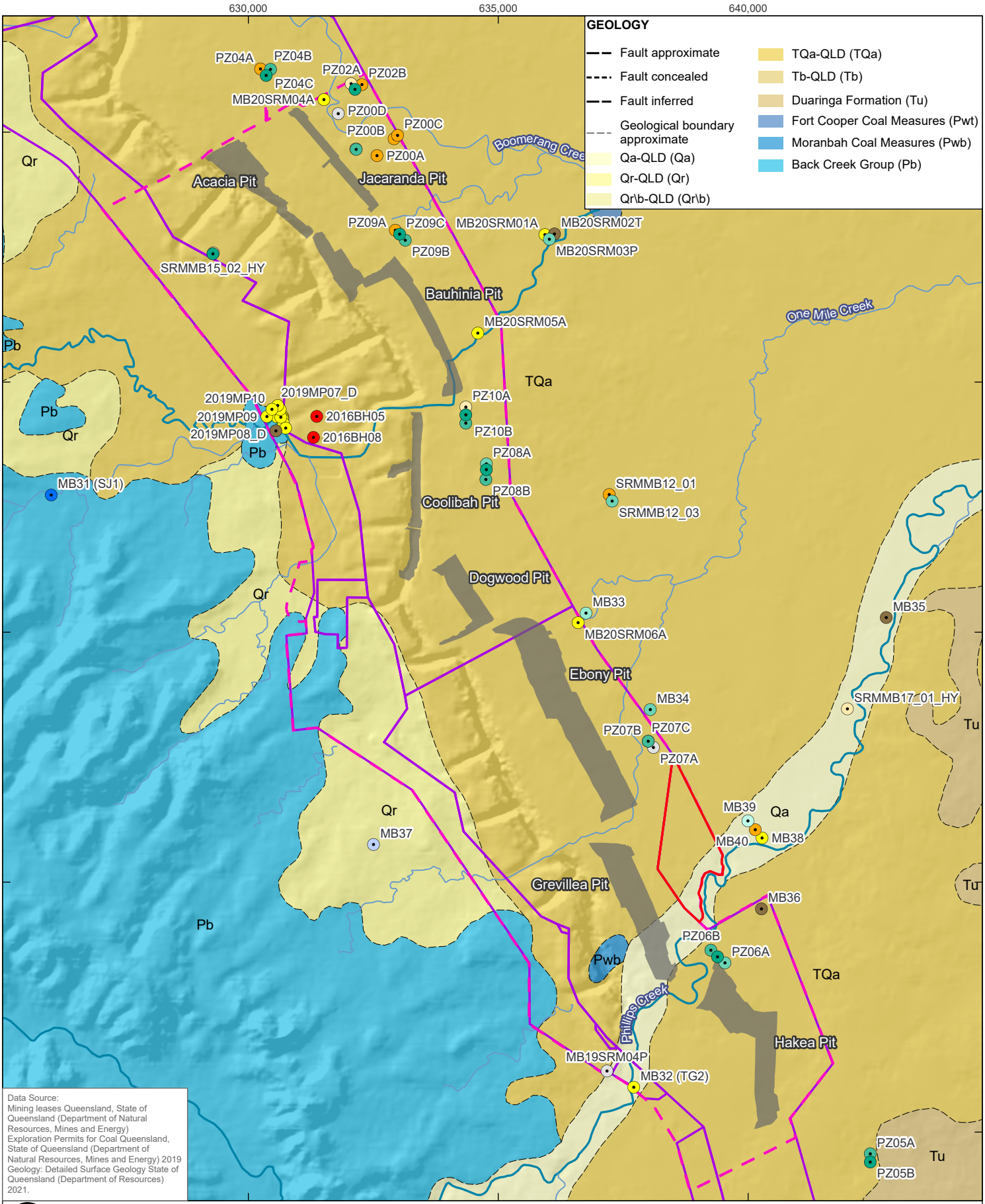


Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:60,000 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

SLR

UPDATED THICKNESS OF THE PHILLIPS CREEK ALLUVIUM

FIGURE 1



Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
Exploration Permits for Coal Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2019
Geology: Detailed Surface Geology State of Queensland (Department of Resources) 2021.

0 1 2 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:100,000 at A4
Project Number:	620.040484.00001
Date Drawn:	12-Sep-2024
Drawn by:	RB

LEGEND

- Major Watercourse
- Minor Watercourse
- Active Pit
- SRM EA Boundary
- SRM Mine Lease
- Project Area

Monitoring Locations - Aquifer Unit

- Alluvium
- Fill
- Tertiary Sediments
- Regolith
- FCCM
- MCM – Interburden
- R Seam Group
- Q Seam Group
- P Seam Group
- H Seam Group
- D Seam Group
- BCG - Interburden
- BCG – Coal Seam

SARAJI MINE GREVILLEA PIT CONTINUATION PROJECT GROUNDWATER ASSESSMENT

SRM GROUNDWATER MONITORING NETWORK

SLR

FIGURE 2

Path: H:\Projects-SLR\620-BNE\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\ArcPro\GW Assessment\GW Assessment.aprx\620040484 F16 GW Monitoring Network

1.2 IESC Comment

Further assessments, including field work, should be completed to improve a local-scale conceptualisation of the alluvial groundwater system, characterise surface water-groundwater interactions and assess whether the model and its predictions are appropriate.

1.2.1 Response

Further field investigations to improve the local-scale conceptualisation of the alluvial groundwater system are not considered necessary. This is because the additional analysis of drill log information, comparison of local and regional groundwater conditions for the alluvium and updated numerical model geometry that has been undertaken to address IESC Advice is considered suitable for characterisation of the Phillips Creek alluvium and assessing the appropriateness of model predictions. Further localised field investigations would be expected to supplement the current conceptualisation of the alluvial groundwater system.

1.3 IESC Comment

Once further data have been collected, an impact pathway diagram should be developed to refine the understanding of how and where the project may impact water resources within and near the project area. This will assist in developing appropriate monitoring programs and management plans.

1.3.1 Response

A review of additional local drill-hole information combined with existing local and regional hydrogeological information on the alluvium supports the Project's Groundwater Impact Assessment that the Phillips Creek alluvium is typically discontinuous, saturated during episodic creek flows and hydraulically disconnected from underlying groundwater units (SLR 2024a). Modelling using updated alluvium extents and depths revealed similar predictions to the modelling used for groundwater impact assessment purposes.

As discussed in **Section 1.1.1**, there has been no change in the understanding of the conceptualisation and by inference the impact pathway. The impact diagram shown in **Figure 3** shows there is a lack of a hydraulic pathway between the Project and the Phillips Creek alluvium (which is dry, shown in yellow) and Phillips Creek, with the potentiometric surface residing in the regolith. Therefore, there is no potential for the Project to impact water resources associated with the alluvium and creek.

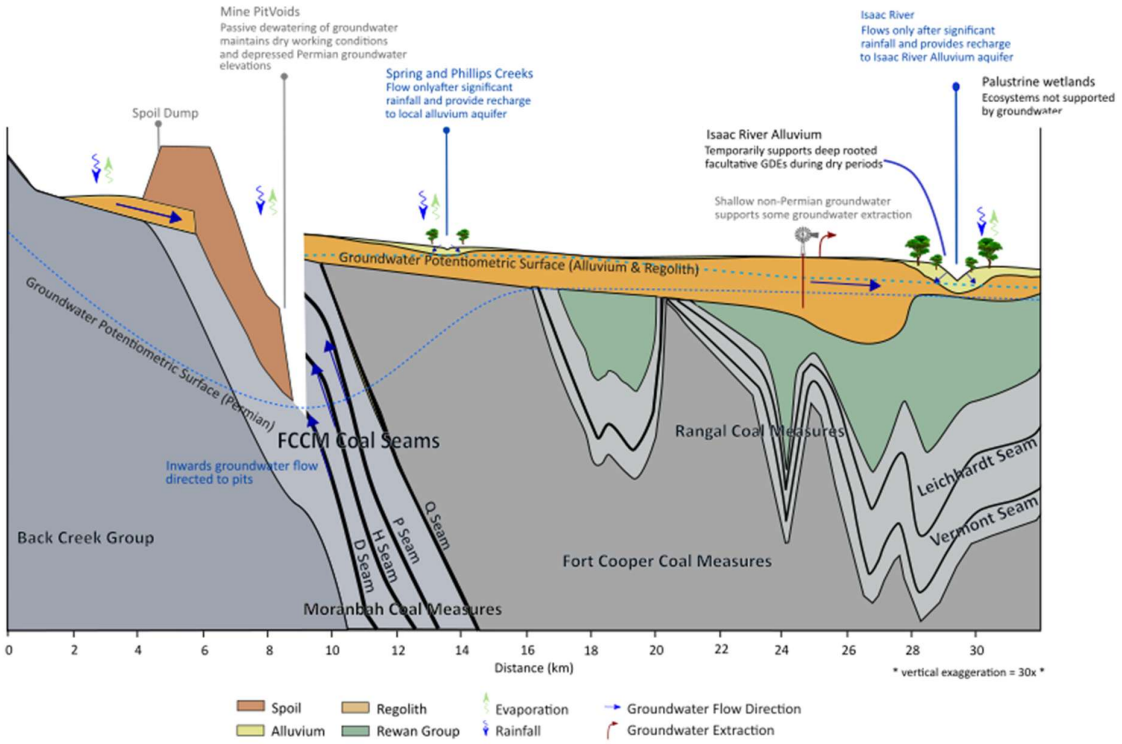


Figure 3 Impact pathway diagram

1.4 IESC Comment

The additional data, revised conceptualisation and the impact pathway diagram may indicate that improved prediction of local groundwater impacts is required, necessitating revised or local-scale modelling.

1.4.1 Response

The conceptualisation of the local hydrogeology in the Project's Groundwater Impact Assessment (SLR, 2024a) is supported by the additional analysis discussed above. Modelling using updated alluvium extents and depths revealed similar predictions to the modelling used for groundwater impact assessment purposes.

1.5 IESC Comment

Given the importance of Phillips Creek and its riparian corridor for regional ecological connectivity, the proponent should demonstrate that the setback's benefits will not be compromised by changes in the alluvial water levels, during and after mining (e.g. legacy impacts of the final void).

1.5.1 Response

As per **Section 1.3** and demonstrated in **Figure 3**, there is a lack of a hydraulic pathway between the Project and the Phillips Creek alluvium. Simulations indicate that the Project will induce no additional impact to the groundwater levels in the Phillips Creek alluvium (see **Section 1.8**) and therefore will not compromise the setback's benefits.

1.6 IESC Comment

This process may lower alluvial water levels and reduce the availability of water for groundwater-dependent vegetation, potentially diminishing the effectiveness of the proponent's proposed setback of 100 –150 m from Phillips Creek (BMA 2024, p. 15) aimed at protecting the high-value riparian corridor.

1.6.1 Response

See response in **Section 1.5** .

1.7 IESC Comment

There are presently only two monitoring bores in the Phillips Creek alluvium (SLR 2024a, Table 8, pp. 42–48). These are insufficient to support conclusions presented in the conceptual site model and additional evidence has not been provided.

Local-scale studies should be conducted to determine the presence and hydrogeological regime of alluvial aquifers and any surface water-groundwater interactions in and near the project area.

Additional studies to improve conceptualisation of shallow groundwaters, especially between Phillips Creek and the location of the final void, should include collection of information and data to:

a) *establish the depth, extent and hydraulic properties of the alluvium;*
b) *establish the extent, permanence and water level changes of any perched aquifers or saturated lenses of groundwater within the alluvium;*
c) *demonstrate that any groundwater present in the alluvium is hydraulically disconnected from underlying aquifers;*
d) *determine the impact to any alluvial groundwater due to stripping of alluvium within the project area or during proposed mining activities; and*
e) *evaluate whether altered water levels in the alluvium may compromise the intended benefits of the setback.*

1.7.1 Response

See responses in **Sections 1.4** and **1.5**.

1.8 IESC Comment

The revised conceptualisation (Paragraph 3) should be used to inform whether local-scale groundwater modelling would assist in predicting changes in water levels in the alluvium during and after mining, to improve predictions of impacts to Phillips Creek and tGDEs.

1.8.1 Response

Model simulation results from the updated model are consistent with the understanding of the Phillips Creek alluvial groundwater behaviour, i.e., Phillips Creek flows only after significant rainfall events and provides recharge to the local alluvium aquifer.

Numerical simulation has been conducted for three scenarios:

1. No-mining (NM)
2. Approved (includes all approved mining, excludes the Project)
3. Cumulative (includes all approved mining, includes the Project).

The difference between the Approved and Cumulative Cases (scenarios 2 and 3) simulation results shows the additional changes in groundwater behaviours induced just by the Project.

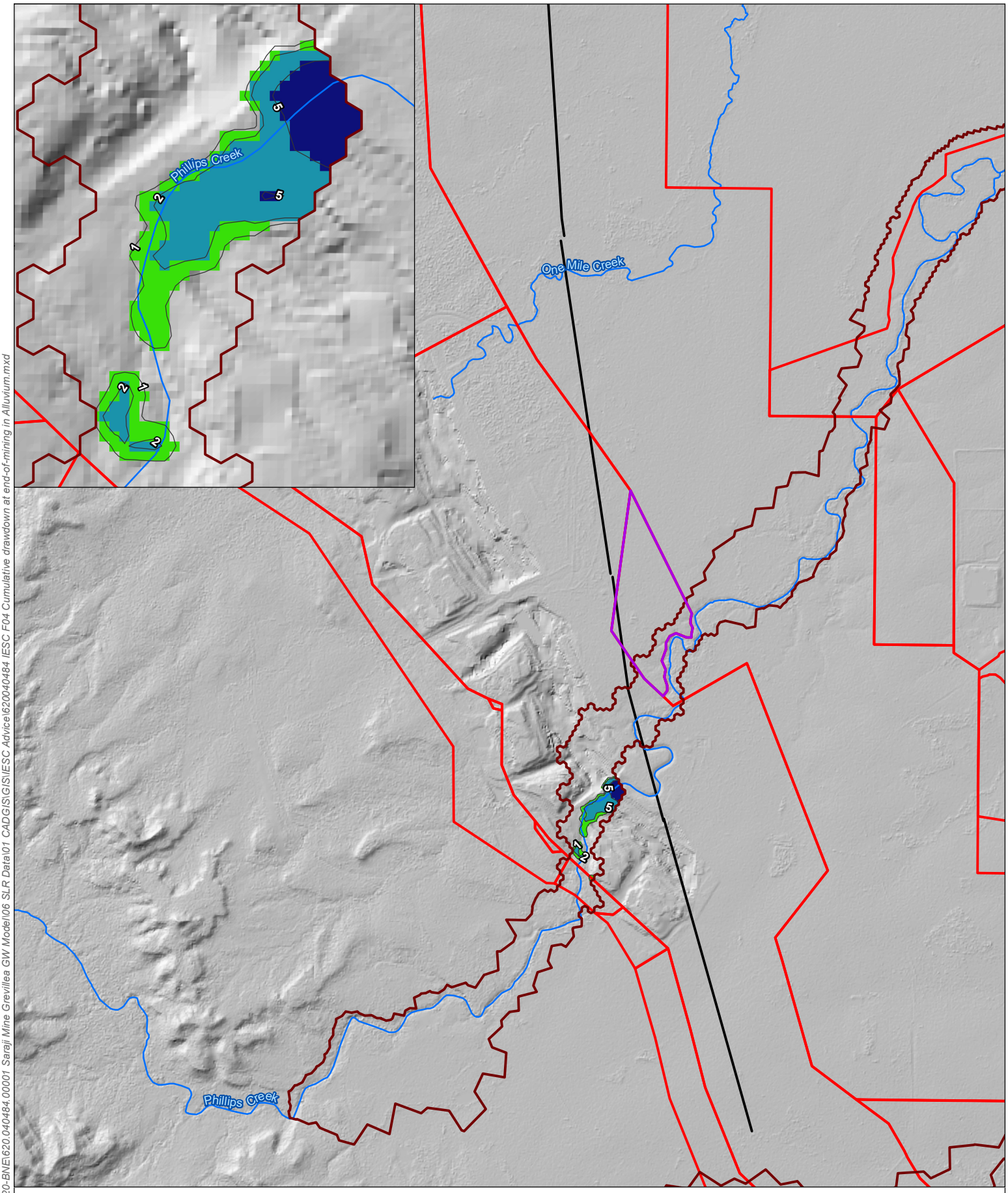
Figure 4 shows the groundwater drawdown in the alluvium at the end of mining for the cumulative scenario (all mining including Project – scenario 3). In the vicinity of the Project, drawdown in the alluvium is restricted to 5m in a small area south of the Project.

Figure 5 shows the maximum (at any time) incremental groundwater drawdown (i.e., the drawdown due to the Project calculated from the difference of scenarios 2 and 3) in the alluvium. There is zero incremental drawdown, indicating that the Project is not causing additional impact to the groundwater in the alluvium.

Figure 6 shows the groundwater drawdown in the regolith at the end of mining for the cumulative scenario (all mining including Project – scenario 3). In the vicinity of the project, drawdown in the regolith is typically less than 5m, with one area experiencing 10m drawdown south of the Project and another area experiencing 20m drawdown south-east of the Project.

Figure 7 shows the maximum (at any time) incremental groundwater drawdown (i.e., the drawdown due to the Project – difference of scenarios 2 and 3) in the regolith. There is Project-related drawdown in the regolith but only to the extent of less than 0.6 m.

Figure 8 shows the depth to groundwater at the end-of-mining for Approved (without the Project) scenario (scenario 2). The minimum depth to water in the alluvium corridor at the boundary of the Project is approximately 60m, indicating that approved activities (without the Project) have already lowered the groundwater to below the base of the alluvium.



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:80,000 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

Drawdown Contour (m)
Major Drainage System
Modelled Fault
Project Area (ML 700021)
Extent of Alluvium
Mining Lease

Drawdown (m)
< 1
1 - 2
2 - 5
5-6

CUMULATIVE DRAWDOWN AT END-OF-MINING IN ALLUVIUM

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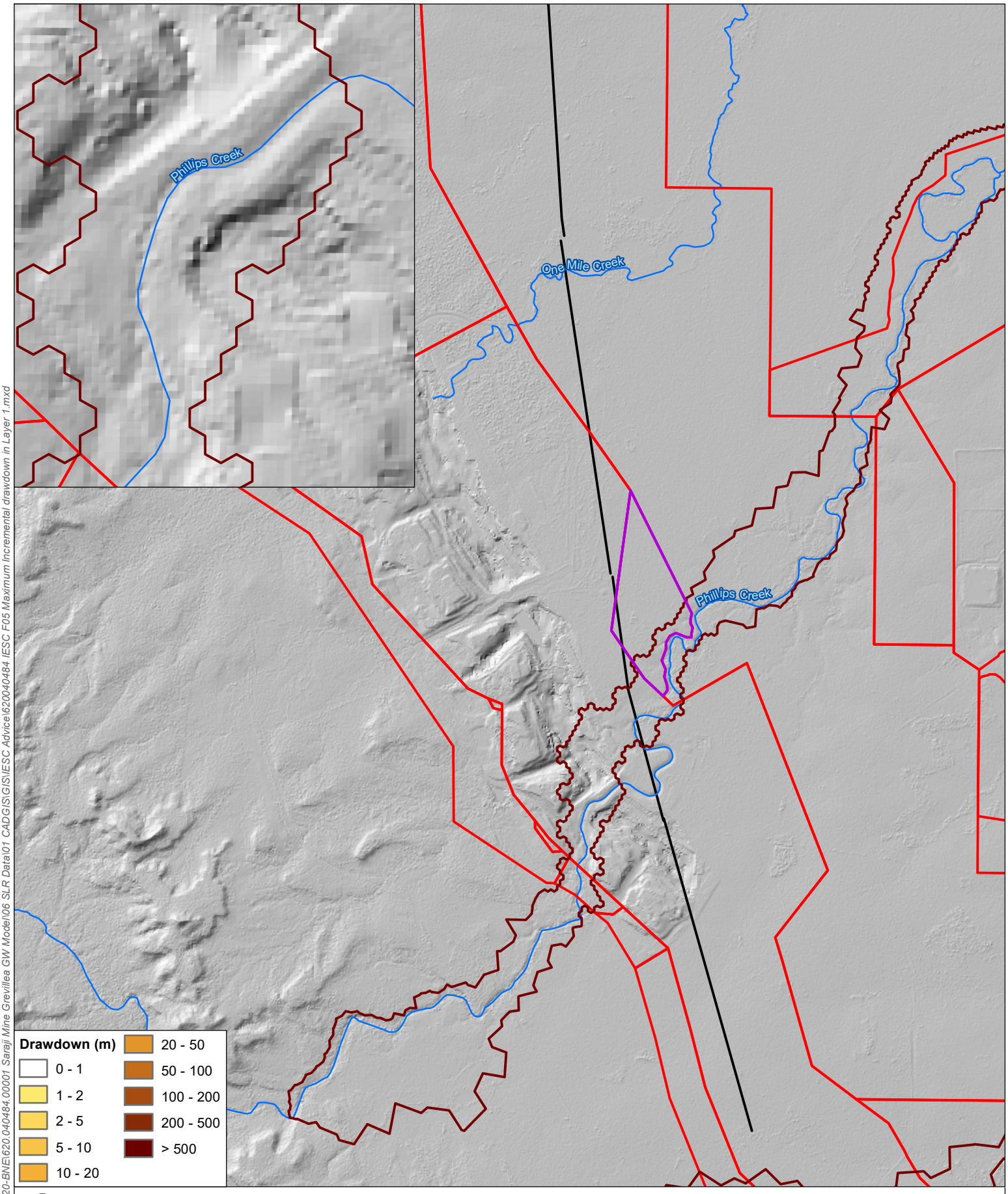
FIGURE 4



0 0.5 1 km

Drawdown Contour (m)
Major Drainage System
Modelled Fault
Project Area (ML 700021)
Extent of Alluvium
Mining Lease

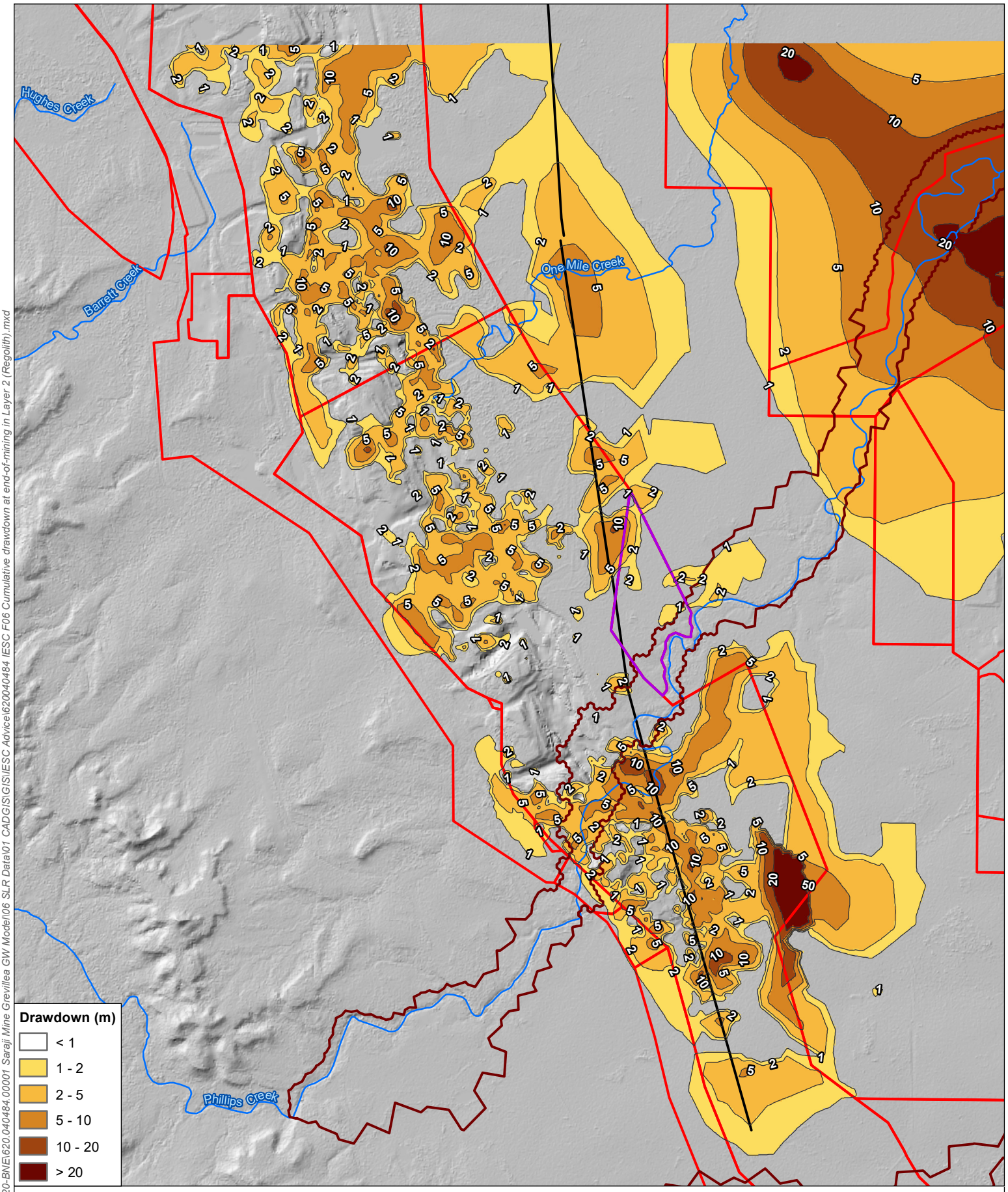
Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:80,000 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

MAXIMUM INCREMENTAL DRAWDOWN IN LAYER 1

SLR

FIGURE 5

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\IESC Advice\620040484 IESC F05 Maximum Incremental drawdown in Layer 1.mxd



Drawdown (m)

- < 1
- 1 - 2
- 2 - 5
- 5 - 10
- 10 - 20
- > 20

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:80,000 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

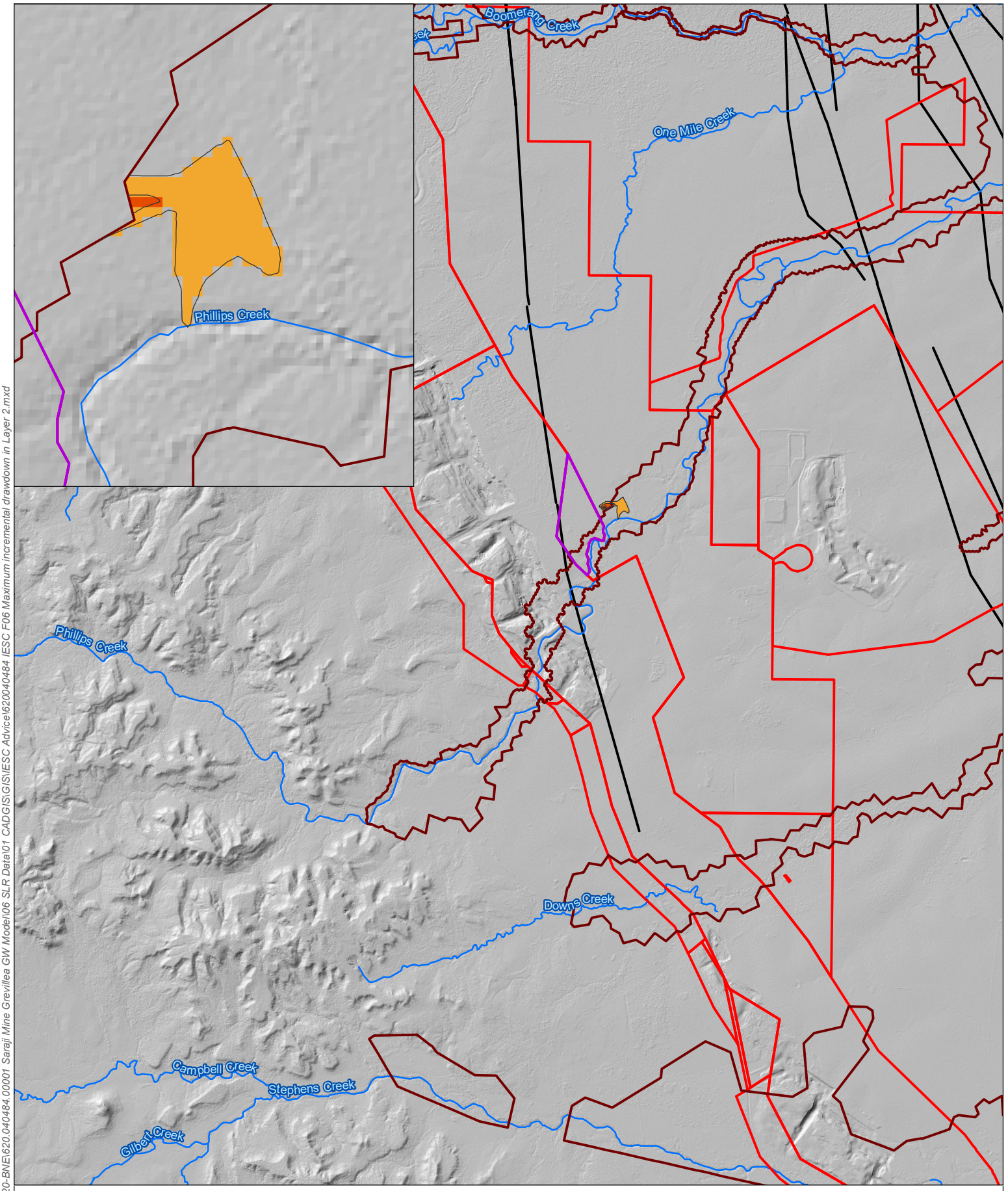
- Drawdown Contour (m)
- Major Drainage System
- Modelled Fault
- Project Area (ML 700021)
- Extent of Alluvium
- Mining Lease

CUMULATIVE DRAWDOWN AT END-OF-MINING IN REGOLITH

SLR

FIGURE 6

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\ESC Advice\620040484 IESC F06 Cumulative drawdown at end-of-mining in Layer 2 (Regolith).mxd



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:135,541 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

Drawdown Contour (m)
Major Drainage System
Modelled Fault
Project Area (ML 700021)
Extent of Alluvium
Mining Lease

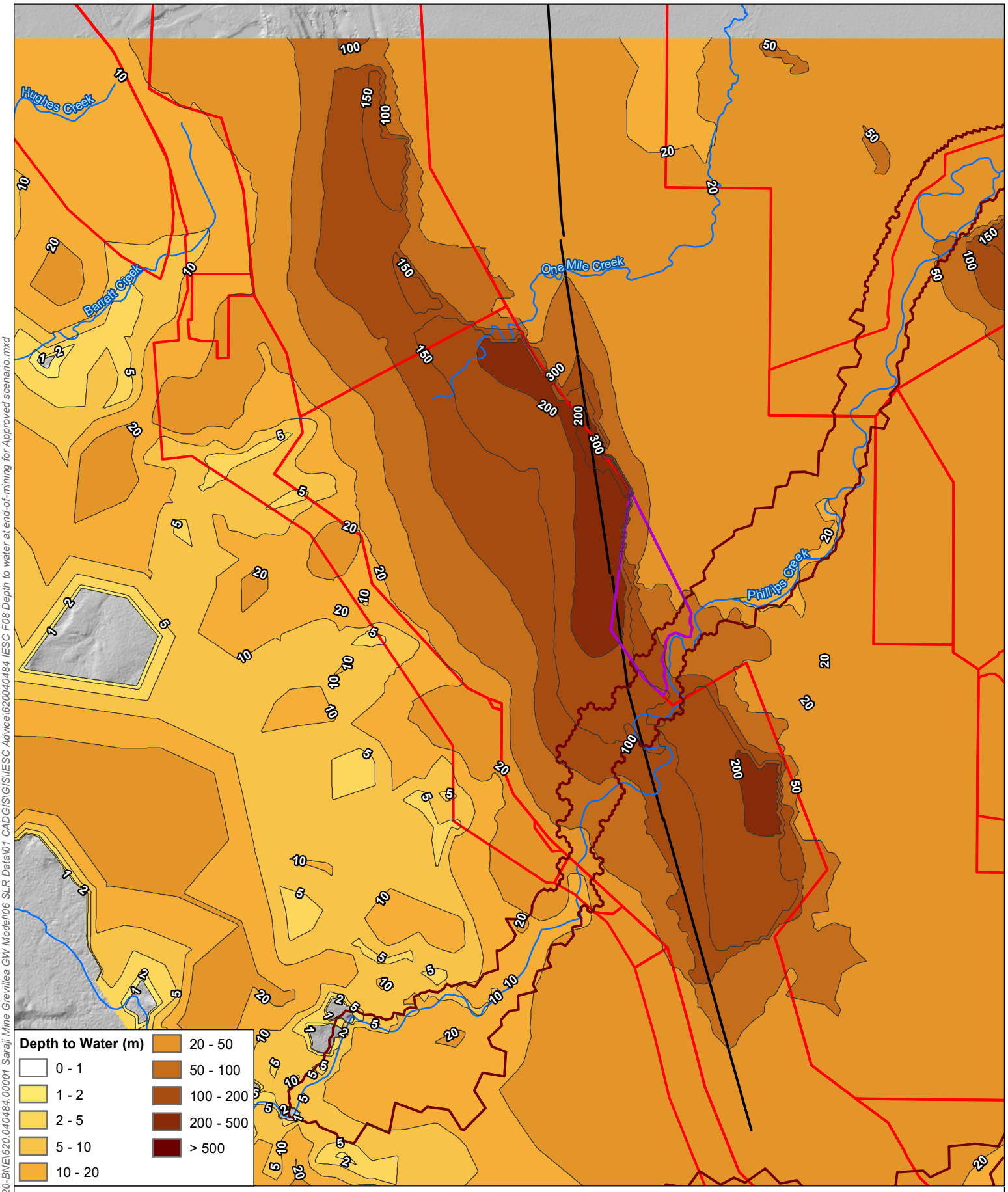
Drawdown (m)
< 0.3
0.3 - 0.4
0.4 - 0.53

MAXIMUM INCREMENTAL DRAWDOWN IN REGOLITH

SLR

FIGURE 7

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADG\SIG\SI\ESC Advice\620040484 IESC F06 Maximum incremental drawdown in Layer 2.mxd



0 0.5 1 km

Drawdown Contour (m)
Major Drainage System
Modelled Fault
Project Area (ML 700021)
Extent of Alluvium
Mining Lease

Coordinate System:	GDA 1994 MGA Zone 55
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Drawn by:	JG

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DEPTH TO WATER AT END-OF-MINING FOR APPROVED SCENARIO

FIGURE 8

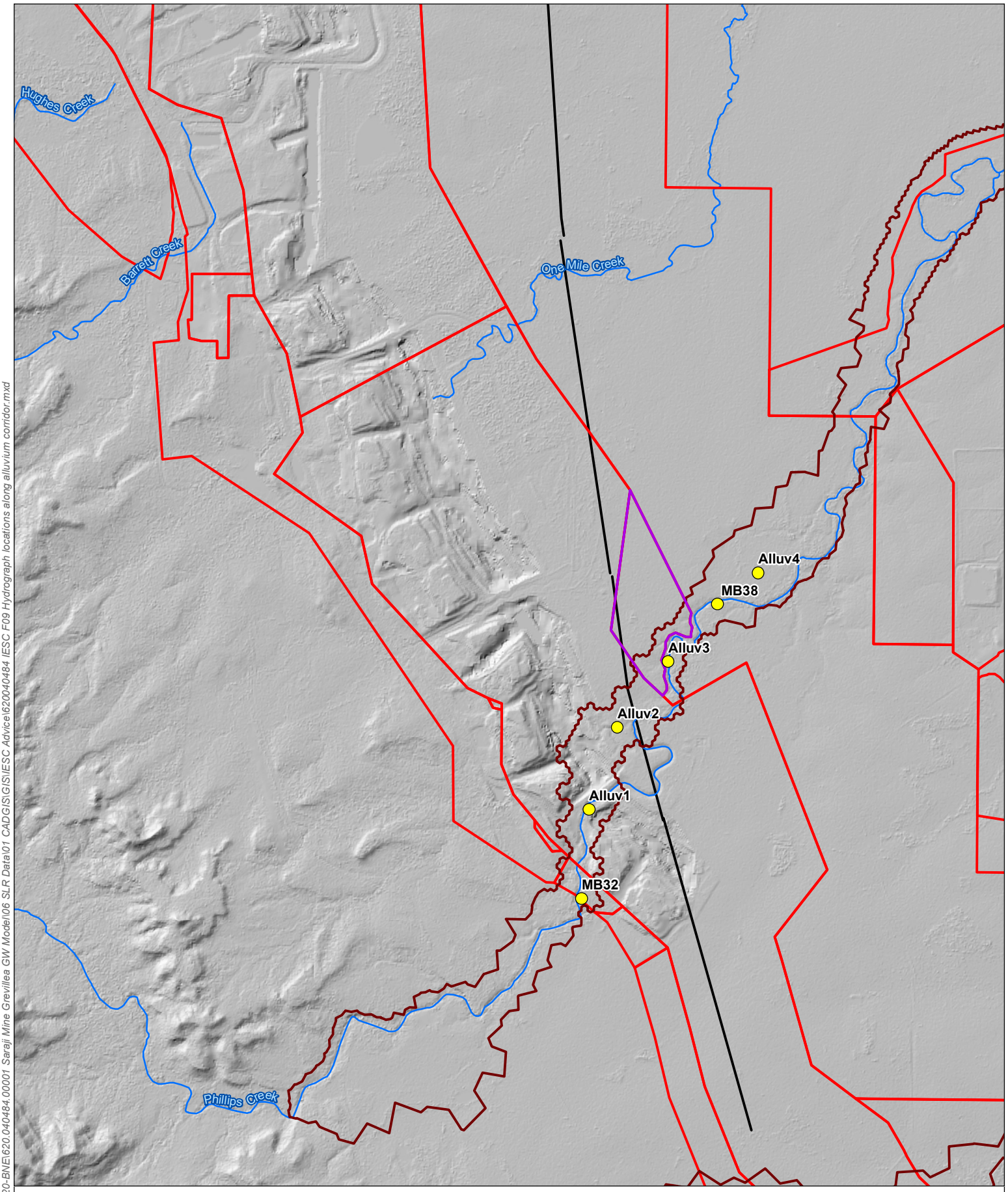
Hydrographs have been generated at monitoring bore locations (shown in **Figure 2**) and for additional locations along the Phillips Creek alluvium (**Figure 9**).

The hydrographs shown in **Figure 10** to **Figure 15** present the simulation results for the no-mining (nm), approved (app) and cumulative (cum) scenarios from 2026 to end-of mining. Also shown are the elevation of the base of the alluvium (Bot_L1) and regolith (Bot_L2).

In the hydrographs, the following observations can be made:

- From 2026 onwards, the groundwater levels for the approved scenario are below the base of the alluvium, as are the groundwater levels for the cumulative scenario, indicating the alluvium has been desaturated prior to commencement of the Project.
- The difference in groundwater levels between the approved and cumulative scenarios are indistinguishable except for Alluv3 (**Figure 13**) which is closest to the Project area. At this location, the effects of the Project can be seen from 2032 onwards with more drawdown occurring at depth.

Figure 16 presents the simulated flux from the Phillips Creek alluvium into the surrounding groundwater. The difference between the approved (without Project) and the cumulative (with Project) scenarios becomes distinguishable in approximately 2044. The effects of the Project on the flux from the Phillips Creek alluvium can be seen as an increase of less than 3%, from 0.057 ML/d in the approved (without Project) scenario to 0.059 ML/d for the cumulative (with the Project) scenario.



0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:80,000 at A4
Project Number:	620.040484.00002
Date:	01-Oct-2025
Drawn by:	JG

- Alluvium Hydrograph Locations
- Major Drainage System
- Modelled Fault
- Project Area (ML 700021)
- Extent of Alluvium
- Mining Lease

HYDROGRAPH LOCATIONS ALONG ALLUVIUM CORRIDOR

SLR

FIGURE 9

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CADGIS\GIS\ESC Advice\620040484 IESC F09 Hydrograph locations along alluvium corridor.mxd

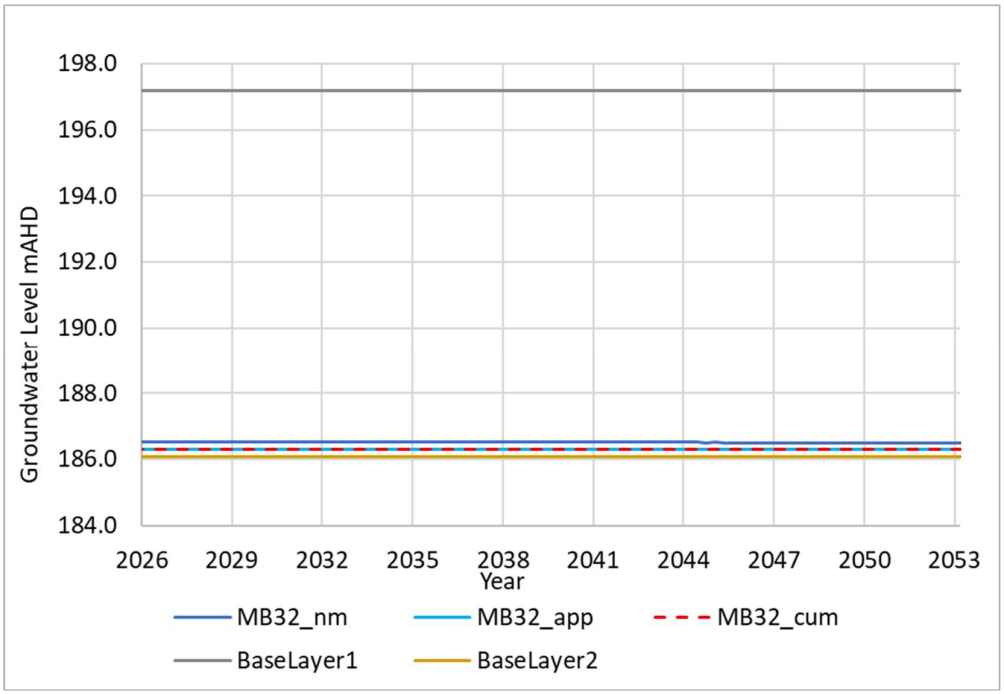


Figure 10 Hydrograph at MB32 location

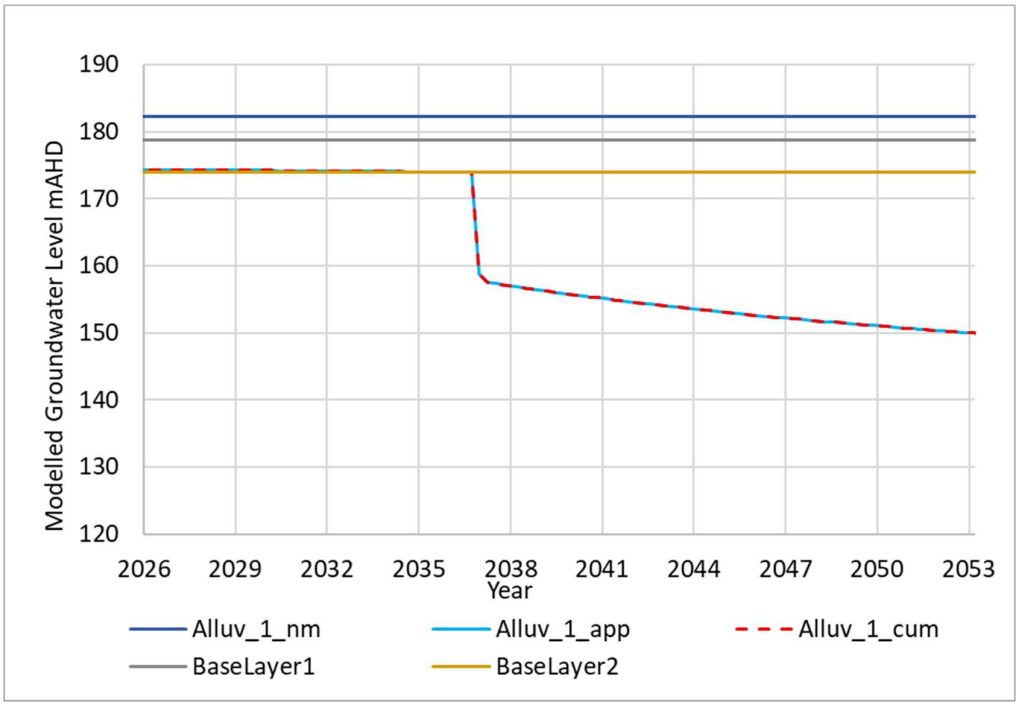


Figure 11 Hydrograph at Alluv1 location

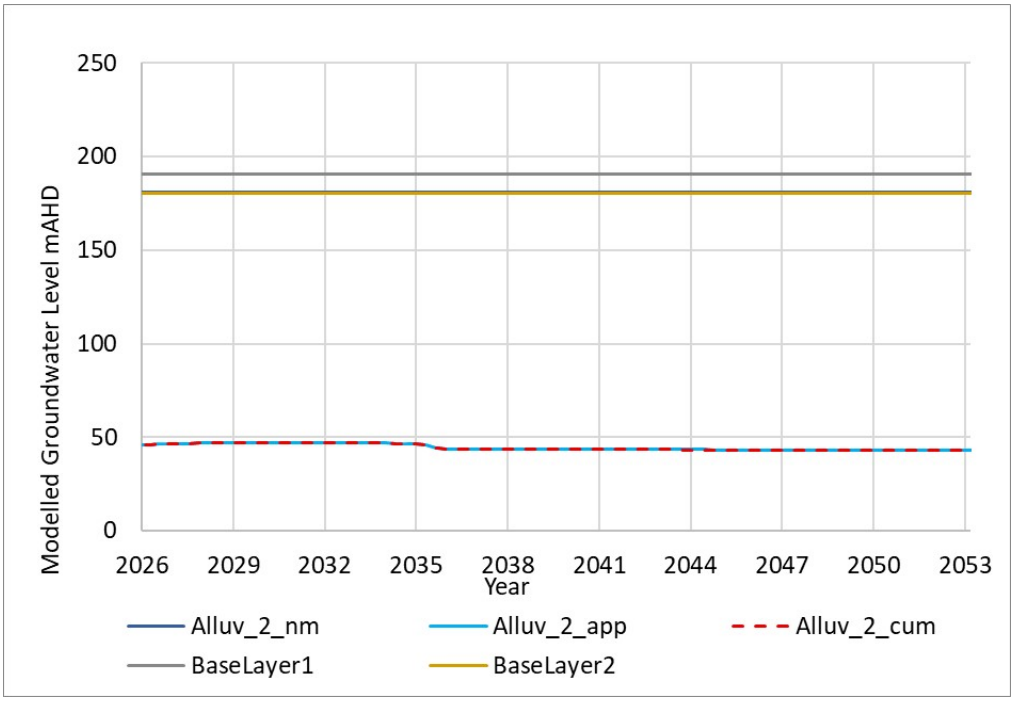


Figure 12 Hydrograph at Alluv2 location

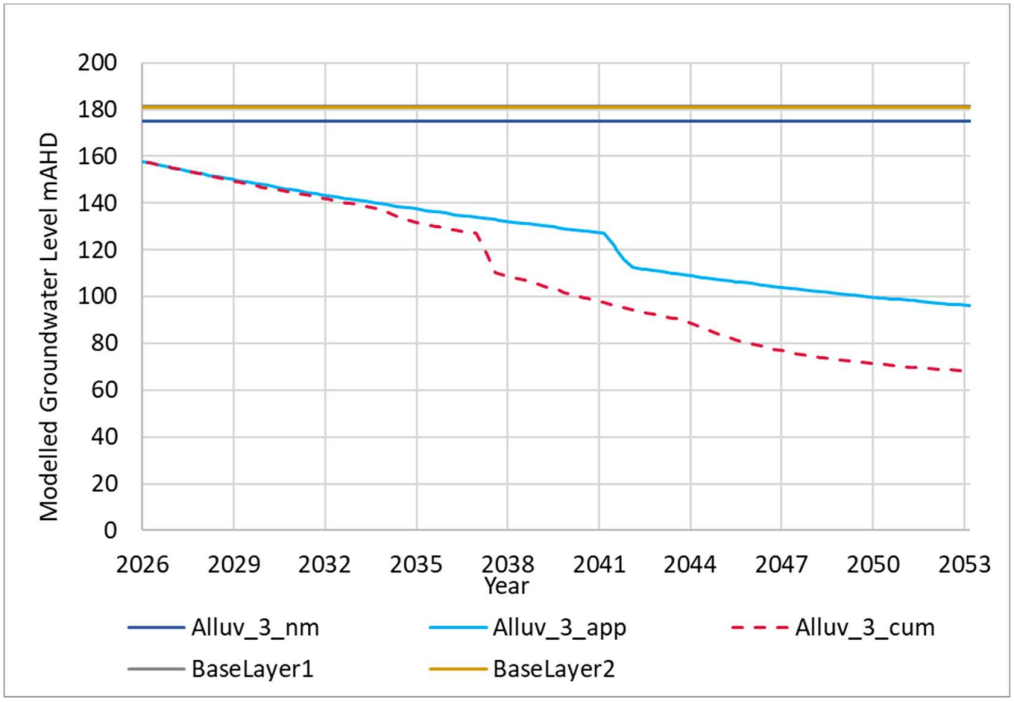


Figure 13 Hydrograph at Alluv3 location

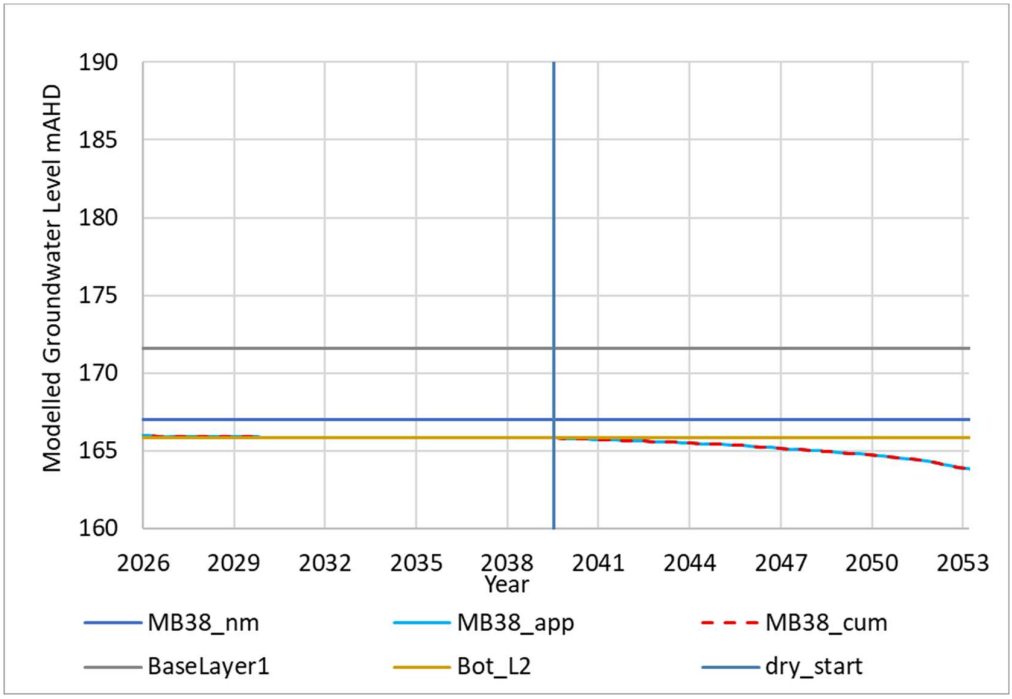


Figure 14 Hydrograph at MB38 location

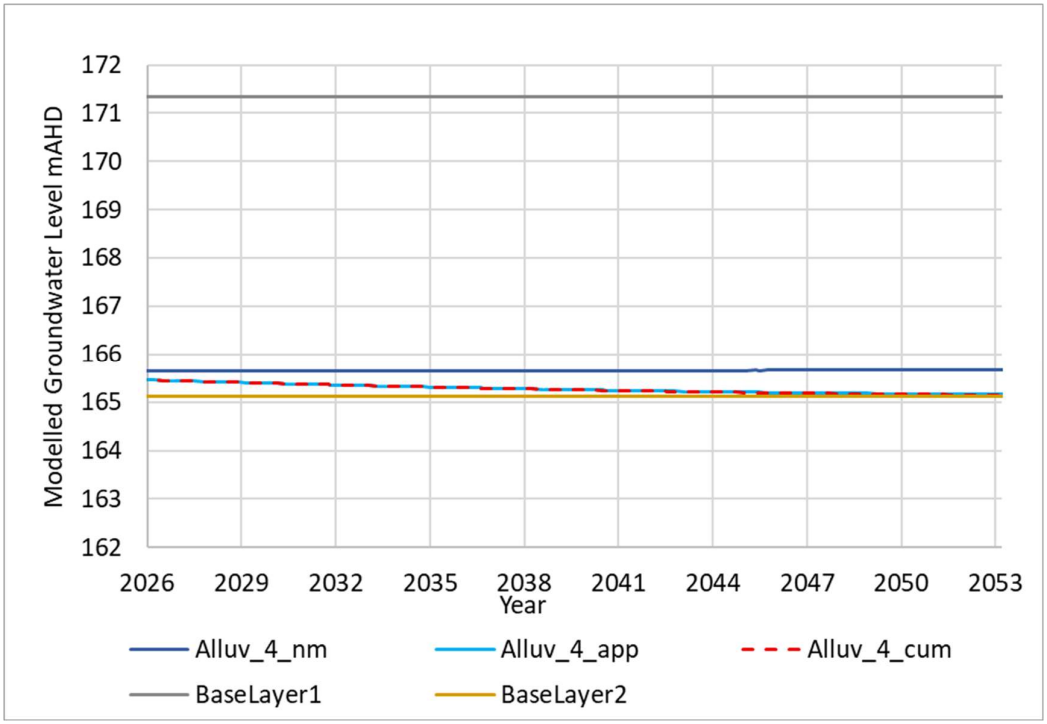


Figure 15 Hydrograph at Alluv4 location

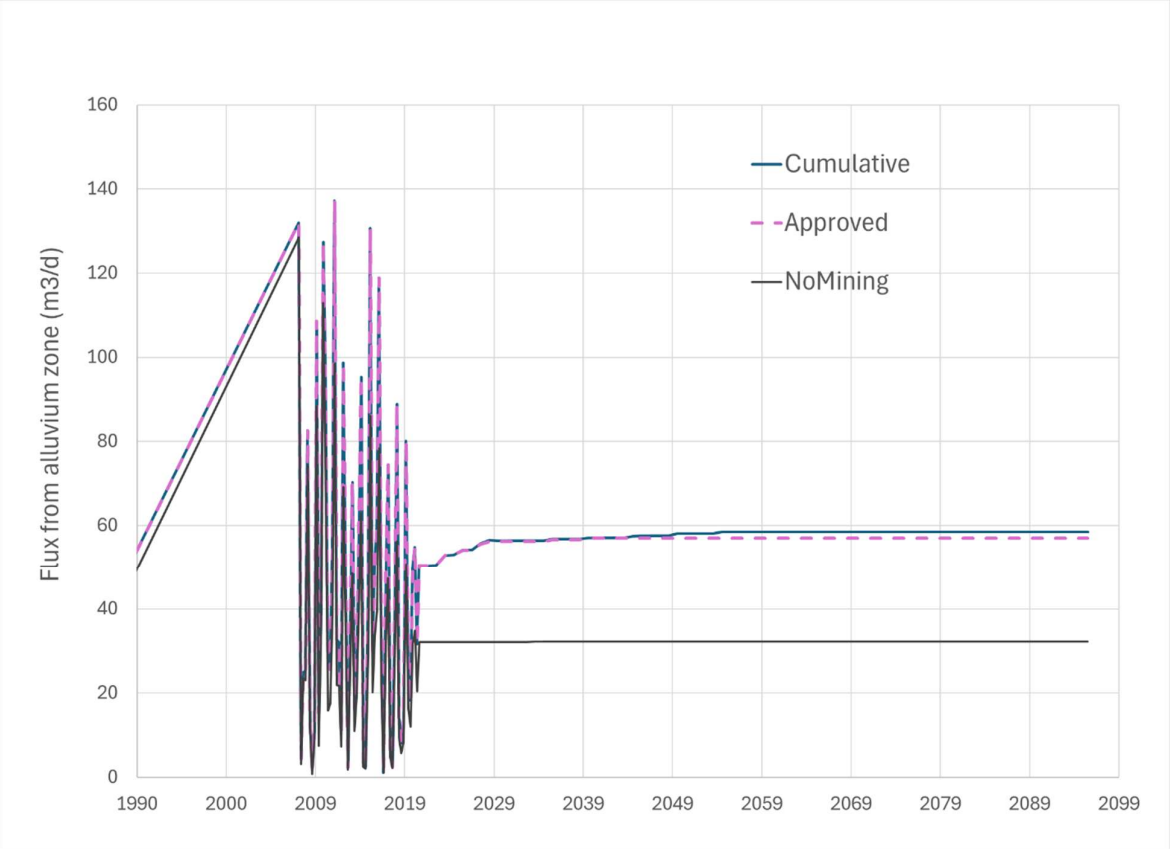


Figure 16 Simulated flux from the Phillips Creek alluvium to groundwater

2.0 IESC Concern 2

Persistent legacy effects of the final void (NUMA), maintained as a groundwater sink, that may continue to reduce alluvial groundwater availability and, if levees fail or are inadequate, intercept floodwaters that are important in maintaining floodplains and their ecological assemblages downstream.

2.1 IESC Comment

Additional groundwater modelling should estimate and clearly document the long-term impacts of the proposed final void and the increased recharge of spoils.

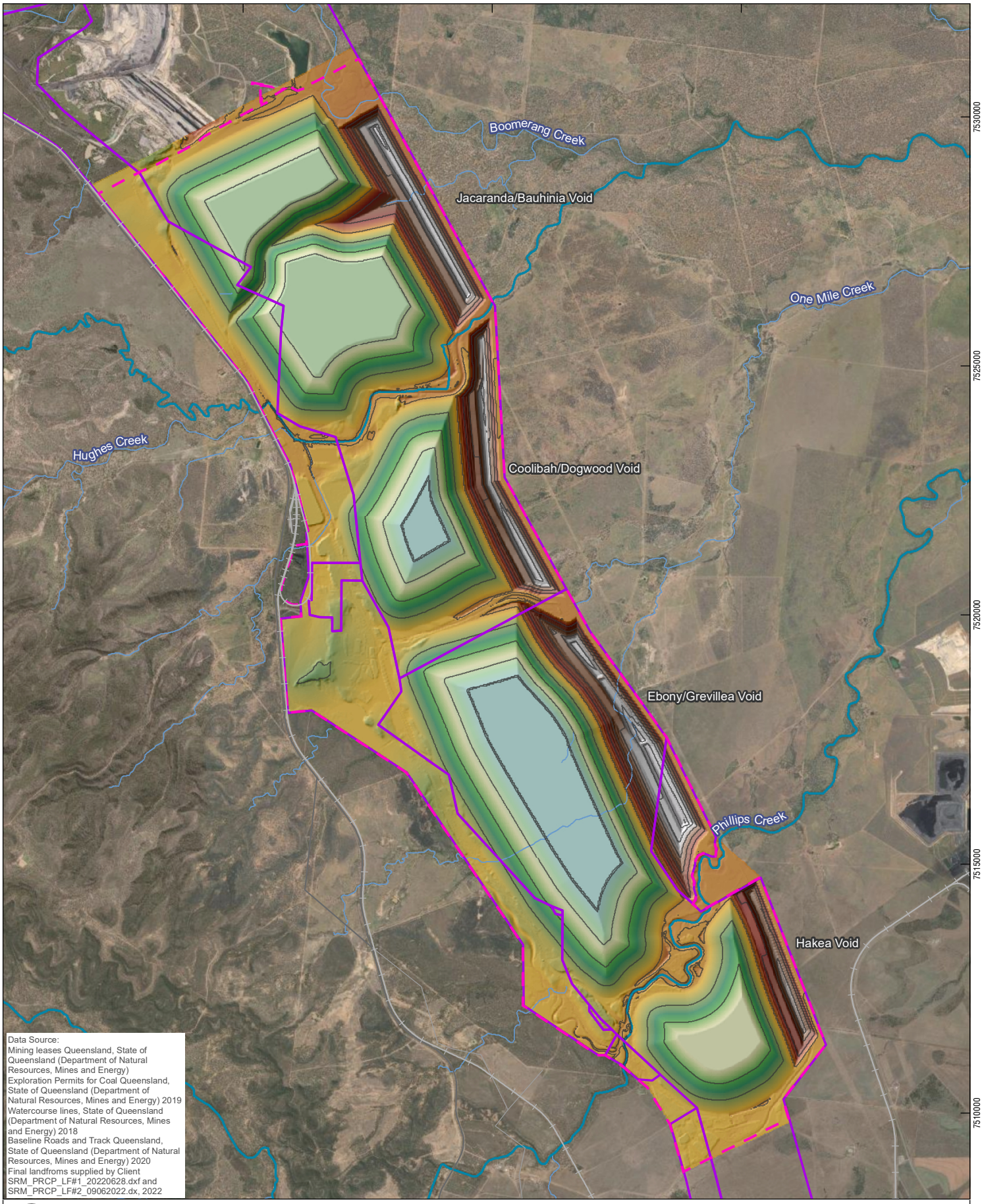
2.1.1 Response

The post-mining final landform contains four residual final voids: Jacaranda/Bauhinia Void, Coolibah/Dogwood Void, Ebony/Grevillea Void, and Hakea Void (Acacia Pit will be backfilled with spoil) as shown in **Figure 17**.

The proposed final landform was replicated in a groundwater recovery model, including areas of spoil emplacement within mined out pits and the four proposed final voids. The distribution of modelled spoil emplacement is shown in **Figure 18** noting that modelled spoil emplacement occurs throughout the four residual void areas (i.e. beneath the residual void floor and above natural geology). The modelling of spoil emplacement within the residual voids themselves is an artefact of the modelling code and the automated process by which

the final landform design is imported into the model. In reality, the final landform design does not include spoil emplaced at the lowest point of the residual void floors and the natural geology remains exposed at the base of the void lakes. This modelling nuance would not affect the predicted total groundwater inflows, just the proportion of inflows between the spoil and natural rock. Predicted residual void lake levels would also not be affected since total groundwater inflows would not be affected.

The groundwater recovery model was designed according to the conceptual understanding shown on **Figure 19** and used to predict the fluxes to the residual voids from groundwater.



Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
Exploration Permits for Coal Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2019
Watercourse lines, State of Queensland (Department of Natural Resources, Mines and Energy) 2018
Baseline Roads and Track Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2020
Final landfroms supplied by Client SRM_PRCP_LF#1_20220628.dxf and SRM_PRCP_LF#2_09062022.dx, 2022

0 1 2 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:100,000 at A4
Project Number:	620.30984
Date:	20-Sep-2022
Drawn by:	NT

LEGEND

- Major Watercourse
- Minor Watercourse
- Rail
- Road
- Track
- SRM EA Boundary
- Mine Lease

LANDFORM

Elevation (mAHD)

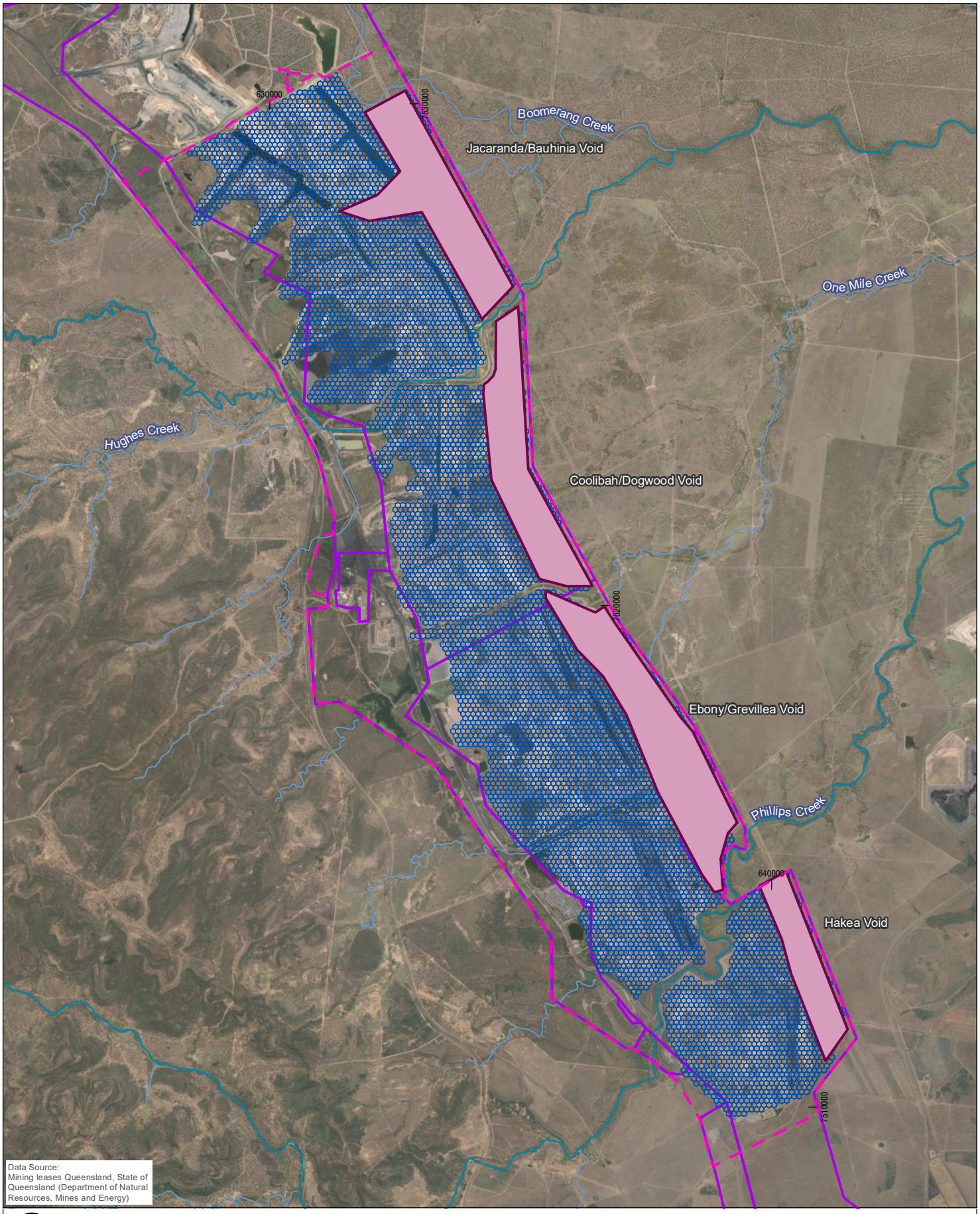
450

-199.721

POST MINING LANDFORM

FIGURE 17

H:\Projects-SLR\620-BNE\620.30984.00000 DNM & SRM PRCPs Groundwater\03 SLR Data\01 CAD\GIS\GIS\SRM\62030984 F01_3 Post Mining Landform.mxd



Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)

0 1 2 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:100,000 at A4
Project Number:	620.040484
Date:	01-Oct-2025
Drawn by:	AS

SLR

LEGEND

- Major Watercourse
- Minor Watercourse
- Void Extent
- SRM EA Boundary
- Mine Lease
- Spoil Emplacement

MODELLED SPOIL EMPLACEMENT

FIGURE 18

\\au.slr.local\Corporate\Projects-SLR\620-BNE\620-BNE\620.040484.00001 Saraji Mine Grevillea GW Model\06 SLR Data\01 CAD\GIS\GIS\ESC Advice\620040484 IESC F18 Modelled Spoil.mxd

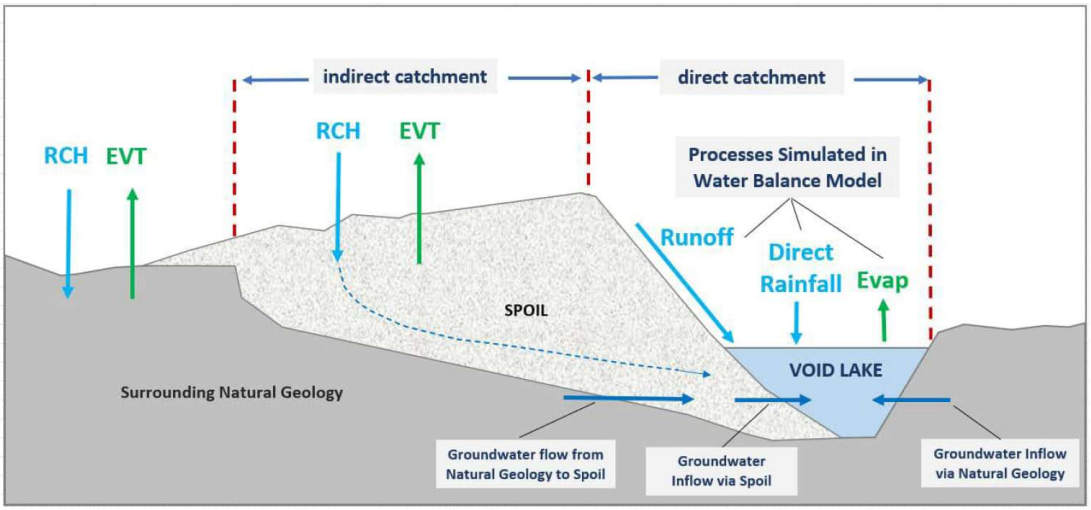


Figure 7-2 Residual Void Recovery Model Conceptual Diagram

Figure 19 Residual void recovery model conceptual diagram

The groundwater recovery model predicted that the water table will remain depressed east of the SRM area by up to 2 km from the edge of the ML for the Coolibah/Dogwood, Ebony/Grevillea and Hakea residual voids, but less than 0.5 km off lease for the Jacaranda/Bauhinia Void due to the ongoing groundwater discharge to the residual void lakes and governed by the lake elevations themselves. That is, long term groundwater flow gradients towards the voids are maintained post-mining.

Predicted groundwater levels for the Q, P, H and D Seams of the Permian Coal Measures indicate again that groundwater levels in the Permian sequence are predicted to remain depressed, driven by the ongoing groundwater discharge to the residual void lakes and governed by the lake elevations themselves. Additionally, dominant flow gradients towards the southern end of the Ebony/Grevillea void are apparent within the Q seam east of the SRM area. The P Seam is predicted to remain unsaturated across much of the SRM area, however remains saturated in the small area along Phillips Creek between Ebony/Grevillea and Hakea voids where a south to north flow gradient towards Ebony/Grevillea void is apparent. Predicted H Seam groundwater levels show similar patterns to the P Seam, and levels are similar between the two units in the south of the SRM area. However, levels are approximately up to 60 m lower in the H Seam than the P Seam in the northern part of the SRM area and therefore head gradients are significantly steeper there. D Seam levels and head gradients are similar to the H Seam, and the depression of D Seam groundwater levels extends significantly east of the SRM area.

The vast majority of groundwater level drawdown in the Permian Coal Measures occurs during mining operations, with post-closure groundwater levels in the deeper coal seams rebounding following cessation of mining. Furthermore, there is very little effect on groundwater levels from the residual void inflow flux variability in the early post-closure period.

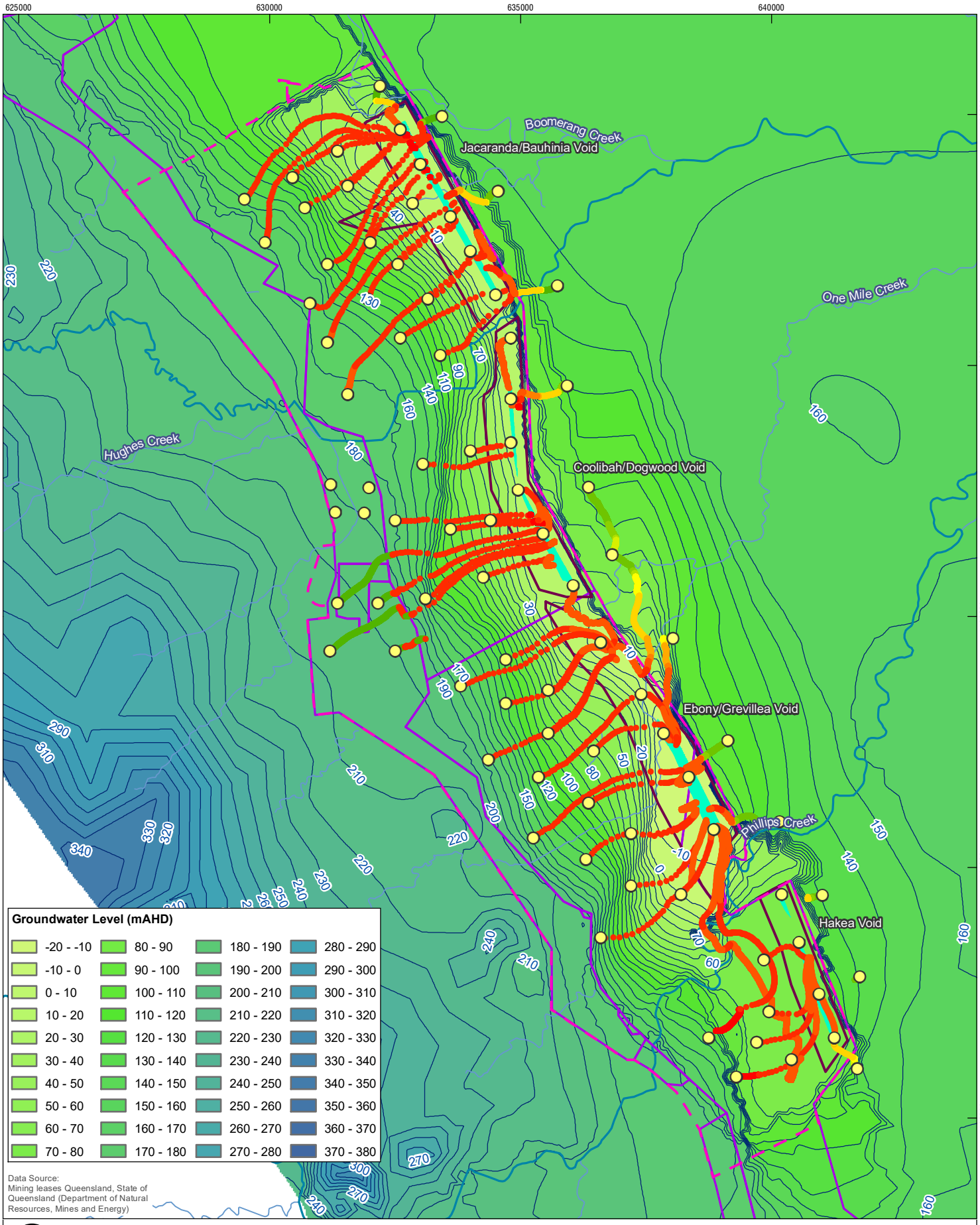
For the Ebony/Grevillea residual void, lake levels are predicted to recover to approximately 15.7 m below the predicted H Seam groundwater elevation just outside the void and approximately 7.6 m of the predicted D Seam groundwater elevation just outside the void. The Q Seam is predicted to remain dry with its base more than 91 m above the void lake level, and P Seam groundwater levels are predicted to remain approximately 39.8 m above the void lake level.

Although model predictions indicate groundwater flow towards all residual voids in the long term, the differences in predicted void lake levels and the predicted groundwater levels in the H and D Seams immediately adjacent the voids are relatively small, which may result in pit waters discharging to the seams. It should be noted that there is a distinct lack of groundwater environmental receptors identified in the H and D Seams and therefore there is little environmental risk posed by any void outflow to those seams. Additionally, net flux over the post-mining simulation remains towards for each void, i.e. any outwards flux in the first few years post-mining is recaptured by the voids in the long-term post-mining.

Particle tracking simulations were undertaken to assess the fate and transport of water through the groundwater system post-mining. **Figure 20** shows the predicted movement of water particles in the 2249 year recovery simulation.

The colour changes along the paths on **Figure 20** indicate that particles situated within the shallower saturated layers at the beginning of the post-mining simulation generally move progressively toward deeper layers representing the Permian coal measures (or backfilled spoil where the coal measures has been mined out). The flow path analysis indicates the particles generally move toward the void lakes, with many of the particles captured in the voids. Some particles starting in the area of the void lakes themselves initially move outwards from the lakes before turning to flow inwards back into the lakes, with the flow path terminating in the lakes themselves, i.e. these particles are re-captured by the voids. Some particles located just east of the SRM area are shown to initially move marginally outwards by less than 500 m in shallow layers before turning to flow back inwards towards the SRM area in deeper layers. Given these particles starting locations are east of the SRM area away from any SRM related potential contamination source, and head gradients remain towards the voids as shown in **Figure 20**, these results do not indicate any potential for increased environmental risk. No particles are shown to move significantly away from the SRM area to the broader receiving environment.

Overall, the particle movement simulation indicates that groundwater at SRM, including that flowing through spoil of the final landform would remain within the final landform (e.g. backfilled spoil and voids) in the long-term with no groundwater predicted to flow to the receiving environment, i.e. the voids would remain groundwater sinks and groundwater would not flow from the residual voids off-site. Void water quality simulations predict TDS (Total Dissolved Solids) to increase following closure (due to groundwater inflow and evapoconcentration) and pH to decrease to below the upper EA range (SLR, 2023).


625000
630000
635000
640000
7530000
7525000
7520000
7515000
7510000
Boomerang Creek
Jacaranda/Bauhinia Void
One Mile Creek
Hughes Creek
Coolibah/Dogwood Void
Ebony/Grevillea Void
Phillips Creek
Hakea Void
Groundwater Level (mAHD)
-20 - -10
-10 - 0
0 - 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100
100 - 110
110 - 120
120 - 130
130 - 140
140 - 150
150 - 160
160 - 170
170 - 180
180 - 190
190 - 200
200 - 210
210 - 220
220 - 230
230 - 240
240 - 250
250 - 260
260 - 270
270 - 280
280 - 290
290 - 300
300 - 310
310 - 320
320 - 330
330 - 340
340 - 350
350 - 360
360 - 370
370 - 380
Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
0
1
2
km
LEGEND
Starting Location of Particle Simulation
Major Watercourse
Minor Watercourse
Groundwater Contour (mAHD)
Void Extent
Void Lake
Mine Lease
SRM EA Boundary
Model Layer Traversed
1
2
9
10
11
12
13
14
15
16
17
18
19
Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:100,000 at A4
Project Number: 620.30984
Date: 31-Oct-2023
Drawn by: AS
SLR
PREDICTED MOVEMENT OF PARTICLES
FIGURE 20
H:\Projects-SLR\620-BNE\620.30984.00000 DNM & SRM PRCPs Groundwater\03 SLR Data\01 CADGIS\GIS\SRM\62030984 F07_25 Predicted Movement of Particles.mxd

2.2 IESC Comment

It is not clear whether predictive groundwater modelling to date appropriately simulates post-mining conditions, especially the final void. Impacts to groundwater flow, levels and quality should be clearly reported for regional-scale and any local-scale groundwater modelling.

2.2.1 Response

See responses in **Sections 1.2**, **1.3, 1.4 and 2.1**.

3.0 IESC Concern 3

Contribution to cumulative impacts to groundwater levels.

3.1 IESC Comment

The proponent should clarify how predicted drawdown, altered flow regimes in Phillips Creek, potential releases of MAW and removal of 205 ha of vegetation during the proposed 30-year operations will contribute to cumulative impacts of current and foreseeable mining in the area.

Particular focus should be on the likely legacy of cumulative impacts of the final void on, for example, groundwater levels and water quality.

3.1.1 Response

Section 4.5.3 of the Project's Groundwater Impact Assessment (SLR, 2024a) presents predicted cumulative drawdown. In summary, there are:

- Small amounts of cumulative drawdown impacts (not Project related) predicted for the Quaternary alluvium within or around the Grevillea Project.
- Interaction of project-related drawdown with drawdown from Peak Downs Mine (PDM) and SRM open cuts within the regolith and the Q, P, H and D seams in the Moranbah Coal Measures.
- No drawdown interaction between the Grevillea area and the neighbouring mines for the Leichhardt and Vermont coal seams of the Rangal Coal Measures as these seams are not present in the Grevillea area.

It should be noted that the vast majority of these predicted cumulative drawdowns are not related to the Project but result from existing authorised mining activities represented in the model. Indeed, where cumulative drawdowns are predicted to exceed the *Water Act 2000* trigger exceedances at third party bores in the regolith (MB4 and MB5), these drawdowns are from neighbouring and approved operations and not due to the Project.

Cumulative drawdowns are also predicted to exceed the *Water Act 2000* trigger exceedances at third party bore in the Moranbah Coal Measure seams (57747).

There was no simulation of changes to Phillips Creek flows due to the Project and neighbouring operations as part of the groundwater modelling for the Project's Groundwater Impact Assessment (SLR, 2024a). Cumulative impacts from altered flow regimes in Phillips Creek are highly unlikely given there was no predicted change to the estimated net flow for Phillips Creek due to the Project.

SLR is not aware of foreseeable mining operations in the area.

Although the model used for groundwater recovery predictions is regional in nature, designed primarily to predict regional scale mining impacts in a cumulative impact framework, spatial discretisation in the areas of interest (i.e., in the vicinity of the final voids)

is at a higher resolution, permitting more detailed examination of modelled groundwater flow in that area.

Void water quality simulations predict Total Dissolved Solids (TDS) to increase following closure (due to groundwater inflow and evapoconcentration) and pH to decrease to below the upper EA range (SLR, 2023).

3.2 IESC Comment

Information is needed on the risks of the project to cumulative impacts on landscape connectivity if the setback is too narrow and/or compromised by lowered water levels in the alluvium.

3.2.1 Response

See **Section 1.5**.

4.0 IESC Concern 4

4.1 IESC Comment

As the impact assessment concluded that no project-specific impacts to groundwater resources are likely (SLR 2024b, pp. 129–136), the proponent proposes to adopt the existing Saraji Groundwater Monitoring and Management Plan. Further work is required to provide more robust justification for this conclusion, given the issues with the conceptualisation, limited site-specific groundwater data, and the scale of the model (Paragraphs 3 and 4). For example, there are only two monitoring bores in the alluvium and one hand-augered test hole to evaluate sediment saturation. The results of this further work will indicate whether additional water management measures may be necessary and, if so, what these measures might be and how best to monitor their effectiveness.

4.1.1 Response

The outcomes of the additional data analysis and modelling undertaken as part of addressing the IESC's comments reaffirm that that no project-specific impacts to groundwater resources are likely. The existing Saraji Groundwater Monitoring and Management Plan remains appropriate for monitoring and managing impacts as a result of the Project.

5.0 References

AGE, 2023. Ironbark No.1 Mine Underground Water Impact Report. Prepared for Hansen Environmental Consulting on behalf of Fitzroy (CQ) Pty Ltd by Australasian Groundwater and Environmental Consultants Pty Ltd.

SLR, 2022. Site Specific Environmental Authority Application - Sapphire (PL1034), Central (PL1038), Lancewood (PL1045) Supporting Information. Prepared for:

SLR, 2023 Saraji Mine Transitional PRC Plan – Hydrogeology, December 2023. Prepared for BMA.

SLR, 2024a Saraji Mine Grevillea Pit Continuation Project Groundwater Impact Assessment. Prepared for Engeny on behalf of BMA.

SLR, 2024b Saraji Mine Grevillea Pit Continuation Project Groundwater Modelling Technical Report. Prepared for Engeny on behalf of BMA.