



Millennium Mine

Mavis South Underground Project

**Supporting documentation to the  
Environmental Authority EPML00819213  
amendment application – State  
considerations**

for

MetRes Pty Ltd



## QUALITY ASSURANCE

1	15/12/23	231215_MavisUG_FINAL_EAamendment EPML00819213	AOK (SPS)	Colin Moffatt	Colin Moffatt

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## EXECUTIVE SUMMARY

On 7 December 2021, approval was received from Queensland Department of Environment and Science (DES) to commence underground mining within the Mavis area (ML70457) (referred to as Mavis approved). Approval is sought, via this application, for mining activities in an additional area directly to the south and adjacent to the approved Mavis underground operation to access additional economic coal reserves and continued utilisation of existing mining fleet. This area, and the subject of this EA amendment application, is referred to the Mavis South Underground Project (**the Project**).

This supporting documentation accompanies the application for an EA amendment to EPML00819213 for extension of the Mavis approved mine operation providing approximately 854,000 tonnes of Run of Mine (ROM) coal, to be extracted over approximately 12-months.

The action seeking approval is to extend the Mavis approved underground mining operation to the south, to access the additional tonnage, utilising existing mining fleet and infrastructure, with no new or additional surface activities of infrastructure requirements. The surface portal for the Project utilises existing infrastructure and access via the Mavis approved underground operation. No new surface activities are proposed as part of this extension to the Mavis underground operation.

In consideration of concurrent mine operational activities, the proposed extension remains within the approved extraction rate of 5.5 Million tonnes per annum (Mtpa) provided in EA EPML00819213.

The proposed underground extension is currently within a portion of Mine Lease Development (MDL)3046 (Lot3 on SP190266). A mine lease application for the area has been lodged with the Department of Resources (DoR) 19/12/2023. A summary of findings is provided below.

### **EPBC consideration**

A self-assessment was conducted with reference to the Significant Impact Criteria provided in *Significant Impact Guidelines 1.3: Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources 2022* and *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance 2013*.

It was determined that there will be no significant impacts to Matters of National Environmental Significance because of the proposed Mavis South underground extension.



## **Subsidence**

A subsidence assessment was undertaken by Gordon Geotechniques Pty Ltd (GGPL).

The Mavis South Underground area is an extension to the approved Mavis Downs underground area and would use the existing infrastructure to mine the Leichhardt Seam. The key conclusions from this report include:

- The nature of the mining method generating only elastic compression of the strata indicates that sub-surface cracking in the overburden above the proposed Mavis Downs South underground area is not expected.
- Due to the low levels of subsidence and associated strains and tilts, no surface cracking is predicted above the Mavis Downs South underground area. This is consistent at other comparable bord and pillar mines in Queensland and NSW.
- Due to the nature of the bord and pillar mining method, low levels of subsidence, of less than 50 mm, are predicted in the Mavis Downs South area as a result of elastic compression of the strata. This magnitude of subsidence is less than the natural ground movements of up to 50 mm or more that can occur (IESC, 2015). The low levels of subsidence are not anticipated to extend outside the mining lease.
- The formation of significant depressions in the surface topography, where ponding of the surface drainage may occur, are not anticipated in the Mavis Downs South underground area due to the predicted low levels of subsidence. This is also consistent with other comparable bord and pillar mines in Queensland and NSW, where ponding has not been observed.
- Based on mining experience at other bord and pillar mines, the risk of sinkhole subsidence occurring in the Mavis Downs South underground area, where the depth of cover is greater than 60 m, is considered to be without known precedent.

## **Surface Water**

KCB Australia Pty Ltd (2023) was engaged by MetRes to undertake a high-level surface water assessment for the Mavis South Underground Project.

The impact assessment has focused on the potential impacts to surface water with key outcomes are summarised as follows:

- There are no anticipated changes to the configuration and operation of the existing surface water management infrastructure at MCM because of the Mavis South underground extension.
- Minor subsidence is anticipated above the surface of the proposed Mavis South underground extension (< 50 mm), which is not anticipated to impact the existing surface water flow paths.
- The proposed Mavis South underground extension is a continuation of existing mining operations that extend the life of mine but does not inherently change the water balance for the operation, with modelling showing no increased risk of overflow (i.e., capacity within the existing mine-affected water storages to contain the forecasted inventories under all climatic conditions).

## **Groundwater**

SLR Consulting Australia Pty Ltd (SLR) were engaged by MetRes to undertake a Groundwater Impact Assessment (GIA) for the Mavis South Underground Project in support of this EA amendment application.

A regional groundwater model was constructed. The model was then used to quantify the incremental and cumulative impacts of the underground mining at Mavis South on the groundwater environment. From this assessment, the following conclusions were drawn:

- The impact assessment was carried out as incremental (difference between all active and foreseeable mining excluding Mavis South against all active and foreseeable mining including Mavis South) and cumulative (difference between a no mining scenario and all active and foreseeable mining including Mavis South).
- Underground mining at Mavis South has a negligible incremental impact on the shallow groundwater system. No landholder bores or GDEs are impacted by the mining at Mavis South, on top of the cumulative impacts predicted by regional mining.

The Mavis South extension is not adding to the approved Mavis impacts and hence the groundwater monitoring network designed for Mavis approved is deemed adequate. Groundwater reporting requirements will be kept the same as for the Mavis approved.



## **Air quality**

This Air Quality Impact Assessment Technical Report has been prepared by SLR Consulting Australia Pty Ltd (SLR) on behalf of MetRes, to provide supporting information to the EA Amendment Application.

Concurrent operation of the proposed Project and approved open cut mining in A Pit within the Millennium area were considered in this assessment, to assess potential worst case air quality impacts at surrounding sensitive receptors.

Fugitive dust emissions for the proposed and approved mining operations were estimated based on forecasted mine activity data and site layouts, using relevant emission factors sourced from the United States Environmental Protection Agency (US EPA) AP42 Emission Factor Handbook (US EPA 2006 and updates) and National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining published by the Department of Sustainability, Environment, Water, Population and Communities of Australian Government (DSEWPC 2012).

The estimated particulate emissions were then modelled using a combination of the Weather Research and Forecast (WRF) and CALMET meteorological models, and the CALPUFF dispersion model to predict off-site concentrations of total suspended particulate (TSP), particulate matter less than 10 microns (PM10) and particulate matter less than 2.5 microns (PM2.5), as well as dust deposition rates.

Based on the modelling results, the following conclusions have been made.

- The modelling results showed compliance with relevant EPP(Air) criteria for all pollutants at each identified sensitive receptor for the proposed Project.
- The modelling results showed compliance with dust deposition and PM10 criteria listed in condition B4 of the Environmental Authority EPML00819213 at each identified receptor for the proposed Project.

## **Acoustics**

This Noise Impact Assessment Technical Report has been prepared by SLR Consulting Australia Pty Ltd (SLR) on behalf of MetRes to provide supporting information to this EA Amendment Application.

This Assessment has modelled a typical worst-case operational mining scenario for the proposed Project, representing mobile and fixed surface equipment proposed to operate during the planned 12-month Project duration.

Blasting is not proposed for Mavis South UG Project, therefore has been excluded from this Assessment.

Based on the modelling results, the following conclusions have been made.

- The highest predicted noise level from the proposed Project is 17 dBA LAeq at Tarkari (under the adverse weather conditions) which is compliant with the 25-27 dBA LAeq, considered to be equivalent to the EA noise limit of 30 dBA LA10. All other Project noise levels are predicted to be 15 dBA LAeq or below.
- The Project predicted noise level at Tarkari homestead is largely dominated by the haul trucks on the rejects and tailings haul routes, which are the closest Project sources to this receptor. The noise contribution of all fixed plant sources are negligible at Tarkari.
- The highest predicted noise levels from the concurrent mine operations are 26 dBA LAeq (Project plus A-Pit North Strip 1) and 27 dBA LAeq (Project plus A-Pit South Strip 1), both occurring at Tarkari and under adverse weather conditions. These predicted noise levels are within the 25-27 dBA LAeq range, which is considered to be equivalent to the EA noise limit of 30 dBA LA10. For both scenarios, the dominant predicted noise sources at Tarkari are associated with mobile mining equipment working in the A-Pit area, with Project attributable noise levels being 9-10 dBA lower than A-Pit attributable noise levels.
- The concurrent scenarios represent worst case noise predictions and technically may not line up with the mine schedule at the time of operations (ie the Project occurring at the same time as Strip 1 for A-Pit North or Strip 1 for A-Pit South) and therefore the noise predictions would be considered to be conservative.
- All other concurrent mine operations noise levels are predicted to be 24 dBA LAeq or less under adverse weather.
- Regarding cumulative noise, the relevant EA noise limits for each identified adjacent mine have been standardised to an LAeq equivalent night-time noise level. With reference to Tarkari which had the highest Project predicted noise level of 17 dBA LAeq, this is generally 10 dBA or more below the summarised LAeq equivalent night-time noise levels for the adjacent mine. Where a noise source is 10 dBA (or greater) below another noise source, the cumulative noise level of the two (2) sources when logarithmically summed is no greater than the higher noise level. Therefore where noise levels from these surrounding mines and infrastructure are achieving their respective LAeq equivalent night-time noise level, cumulative noise issues with the inclusion of the Project are not expected.

On the basis of this assessment, specific noise mitigation measures are not warranted for the proposed Project and concurrent mine operations at Millennium Mine. Notwithstanding these findings, best practice noise mitigation and management measures should be maintained including record keeping of any noise complaints received during the operations of the Project area and investigate noise management options for verified complaints.

## **Biodiversity**

This Terrestrial Ecology Technical Report has been prepared by Kleinfelder Australia Pty Ltd on behalf of MetRes Pty Ltd (MetRes).

The ecological assessment undertaken of the Queensland database reports and field based assessment determined that:

- The project area is mapped as non-remnant by the Queensland Herbarium regional ecosystem mapping.
- There were no ESAs mapped within the project area.
- There were two threatened plants, one threatened bird, four threatened mammals and one threatened
- reptile recorded within 10 km of project area, but habitat for these species was not mapped in the project area, which was mapped as non-remnant vegetation.
- No Matters of State Environmental Significance (MSES) were listed.
- There were no wetlands in wetland protection areas of High Ecological Value or of General Ecological Value mapped.
- There were not any high risk areas on a Flora Survey Trigger Map for Clearing Protected Plants mapped
- There were no Groundwater Dependent Ecosystems (GDE – Qld).

The conclusions are that the underground mining operations in the Mavis South Underground Project will not cause any significant impacts under the (Qld) *Nature Conservation Act 1992*, (Qld) *Vegetation Management Act 1999* or the (Commonwealth) *Environmental Protection and Biodiversity Conservation Act 1999*.



## **Other environment considerations:**

### *Cultural Heritage*

The traditional owners of the land under consideration is the Barada Barna People. MetRes has a Cultural Heritage Management Plan with the Barada Barna People and it is proposed that the current CHMP will be applied to the MLA, if required.

### *Transport and traffic*

Transport and traffic movement for the Project will be in line with authorised operation.

### *Waste management*

The Project will utilise the existing waste management system in place at the Millennium Mine that has been developed in accordance with all relevant legislation and existing EA conditions.

### *Outcome*

All specialist assessment has determined any potential impact due to amendment area as immaterial and within authorised limits. It has been determined that specific mitigation measures are not warranted and where required, existing management plans and monitoring programs will be updated.

From this self-assessment, the activities relating to the amendment area, as part of this application, are in accordance with the statutory criteria under the *Environmental Protection Act 1994* (Qld) (EP Act) and associated guidelines for a minor amendment application. However as this action is associated with the Mine Lease Application (for a portion of MDL3046), it will be assessed as a **Major amendment**.



## 1. INTRODUCTION

### 1.1 OVERVIEW

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Millennium Coal Mine is within the Bowen Basin, Queensland and is located approximately 20 kilometres (km) south-east of the township of Moranbah, and 174km east of Mackay and within the Isaac Regional Council Local Government Area (LGA) in Queensland (22° 00' 56.68" S, 148° 15' 09.28" E).

On 7 December 2021, approval was received from Queensland Department of Environment and Science (DES) to commence underground mining within the Mavis area (ML70457) (referred to as Mavis approved). Approval is sought, via this application, for mining activities in an additional area directly to the south and adjacent to the approved Mavis underground operation to access additional economic coal reserves and continued utilisation of existing mining fleet. This area, and the subject of this EA amendment application, is referred to the Mavis South Underground Project (the **Project**).

This supporting documentation accompanies the application for an EA amendment to EPML00819213 for extension of the Mavis approved mine operation providing approximately 854,000 tonnes of Run of Mine (ROM) coal, to be extracted over approximately 12-months.

The proposed underground extension is currently within a portion of Mine Lease Development (MDL)3046 (Lot3 on SP190266). A mine lease application for the area has been lodged with the Department of Resources (DoR) 19/12/2023. This supporting documentation accompanies the application for an Environmental Authority (EA) amendment to EPML00819213.

The action seeking approval is to extend the Mavis approved underground mining operation to the south, to access the additional tonnage, utilising existing mining fleet and infrastructure, with no new or additional surface activities of infrastructure requirements. The surface portal for the Project utilises existing infrastructure and access via the Mavis approved underground operation. No new surface activities are proposed as part of this extension to the Mavis underground operation.

In consideration of concurrent mine operational activities, the proposed extension remains within the approved extraction rate of 5.5 Million tonnes per annum (Mtpa) provided in EA EPML00819213.



## 1.2 COMPANY DETAILS

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MetRes Pty Ltd (ACN 621 089 030) is an incorporated joint venture with the following ownership structure:

- Marmilu Pty Ltd (ACN 621 026 373) as trustee for The Marmilu Trust (50.0%); and
- Kerlong Coking Coal Pty Ltd (ACN 142 180 890) (50%), a 100% owned subsidiary of Stanmore Resources Limited (ACN 131 920 968) (50.0%).

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## 1.3 MILLENNIUM MINE

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Millennium Mine is located approximately 160 km southwest of Mackay in Central Queensland, some 15 km southwest of the township of Coppabella and 20 km south east of Moranbah (**Figure 1**). The mine is accessed via an 8 km sealed road that branches from the Peak Downs Highway. The Goonyella Hay Point railway line crosses the mine to the south of the Mavis Downs lease.

Millennium Mine is located near several operating coal mines, BHP's Poitrel and Daunia open cut mines to the south of the mine area and Fitzroy Resources' Carborough Downs underground mine to the north and east. All mines in the region target the Rangal Coal Measures as within this mine.

The area is gently sloping to the east away from a topographical high in the west. A shallow creek "New Chum Creek" drains through Millennium Mine between the two working pits of Millennium and Mavis Downs (**Figure 2**).

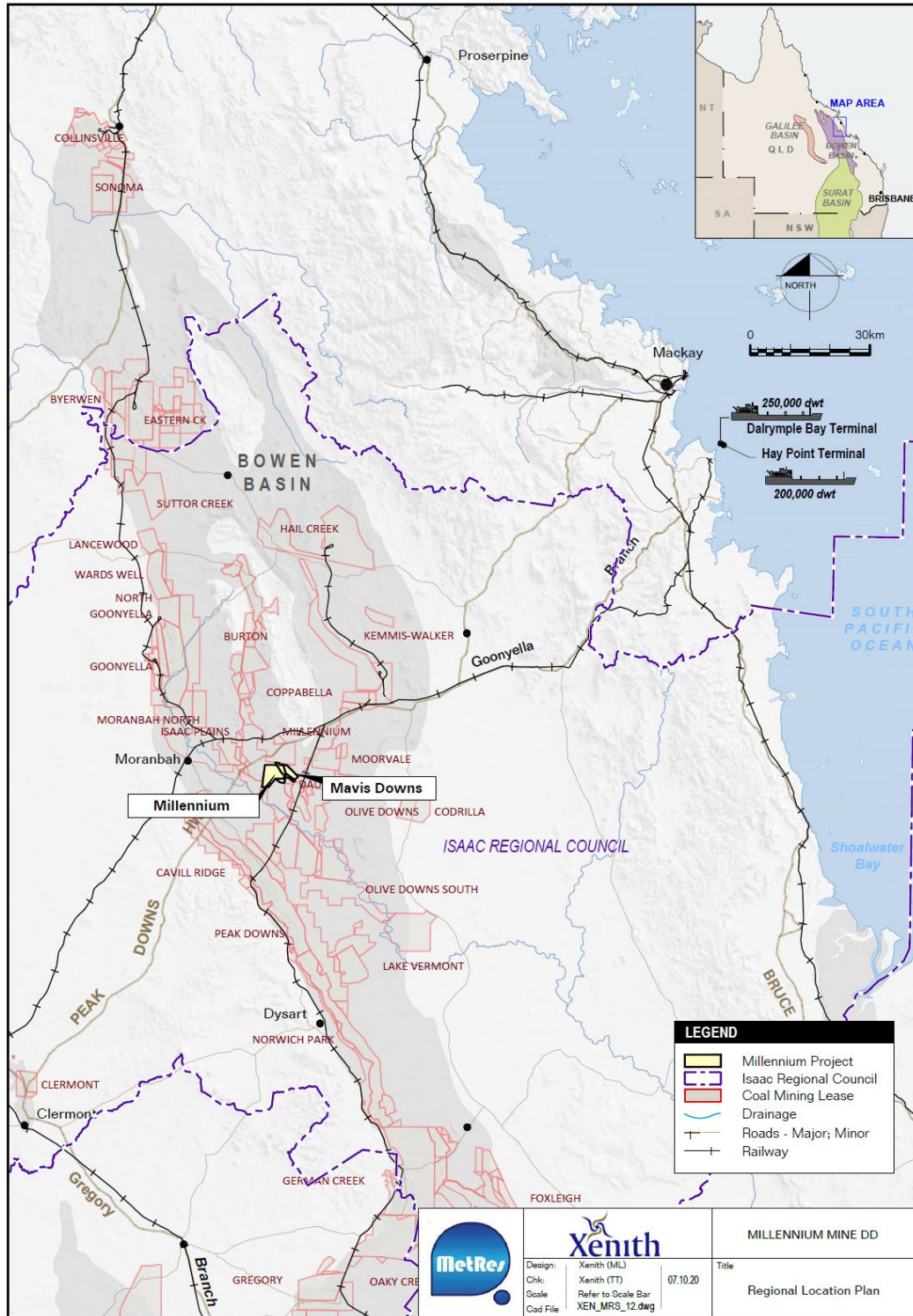


FIGURE 1: MILLENNIUM MINE REGIONAL LOCATION



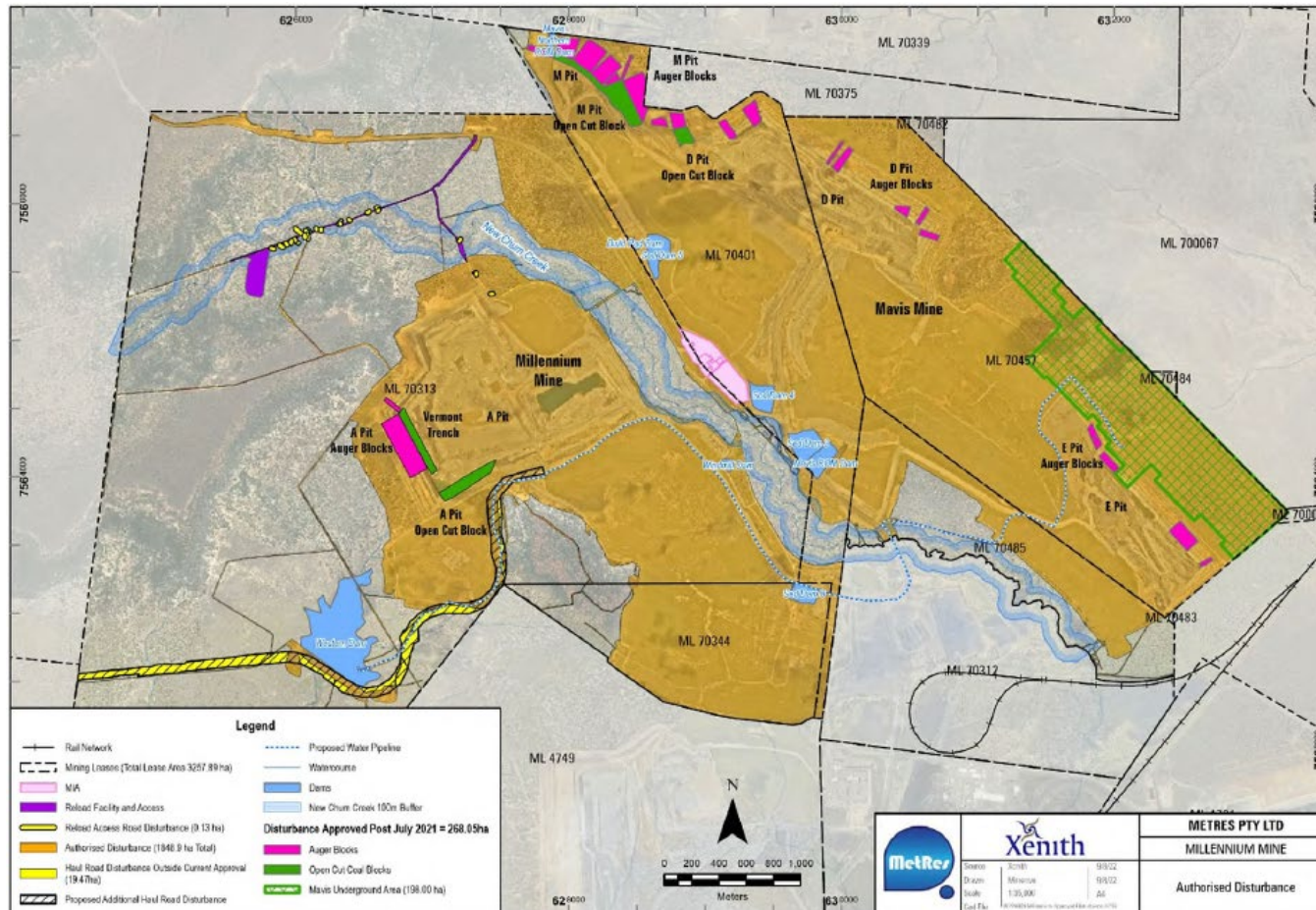


FIGURE 2: MILLENNIUM MINE LAYOUT (FIGURE 3: EPML00819213 DATED JUNE 2023)

## 1.4 PURPOSE OF REPORT

This report supports the EA amendment application for approval to:

- extend the Mavis approved underground mining operation to the south, to access the additional tonnage (ie, approximately 854,000 tonnes of Run of Mine (ROM) coal, to be extracted over approximately 12-months), utilising existing mining fleet and infrastructure, with no new or additional surface activities or infrastructure requirements. The surface portal for the Project utilises existing infrastructure and access via the Mavis approved underground operation.

Chapter 5, Part 7, sections 226 and 226A of the *Environment Protection Act 1989* (EP Act) provides an outline of the requirements for EA amendment applications. These requirements and how they are considered as part of the EA amendment application process are provided in **Table 1**.

**TABLE 1: EA AMENDMENT REQUIREMENTS**

EP Act Section	Requirements for amendment application (1)	Mavis South Underground Project
226 (1)(a)	An amendment application must be made to the administering authority	The EA amendment application will be made to DES, as the administering authority.
226 (1)(b)	Application made in the approved form	The amendment application will be made using Form ESR/2015/1733 v20 - Application to amend an environmental authority.
226 (1)(c)	Be accompanied by the fee prescribed by regulation	The prescribed fee will accompany the amendment application.
226 (1)(d)	Describe the proposed amendment	As outlined in Section 1 through to 6.
226 (1)(e)	Describe the land that will be affected by the proposed amendment	As outlined in Section 5 and 7
226 (1)(f)	Include any other document relating to the application prescribed by regulation.	As outlined in Specialist reports presented in Appendix B through to Appendix G
226A (1)	If the amendment application is for the amendment of an environmental authority, the application must also -	
262A (1)(a)	Describe any development permits in effect under the Planning Act for carrying out the relevant activity for the authority.	Development permits under the Planning Act 2016 are not required for the activities the subject of this application.

EP Act Section	Requirements for amendment application (1)	Mavis South Underground Project
226A (1)(b)	State whether each relevant activity will, if the amendment is made, comply with the eligibility criteria for the activity.	The existing EA is not subject to the standard conditions and the proposed activities do not comply with the eligibility criteria in the Eligibility criteria and standard conditions for mining lease activities (ESR/2016/2241). This amendment is for a site specific application as per the original EA application.
226A (1)(c)	If the application states that each relevant activity will, if the amendment is made, comply with the eligibility criteria for the activity—include a declaration that the statement is correct.	Not applicable per above response.
226A (1)(d)	State whether the application seeks to change a condition identified in the authority as a standard condition.	No changes are proposed.
226A (1)(e)	If the application relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit—state whether the applicant seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit.	Not applicable.
226A (1)(f)	Include an assessment of the likely impact of the proposed amendment on the environmental values, including—	
226A (1)(f) (i)	A description of the environmental values likely to be affected by the proposed amendment	
226A (1)(f) (ii)	Details of emissions or releases likely to be generated by the proposed amendment.	
226A (1)(f) (iii)	A description of the risk and likely magnitude of impacts on the environmental values	
262A (1)(f) (iv)	Details of the management practices proposed to be implemented to prevent or minimise adverse impacts	
226A (1)(f) (v)	If a PRCP schedule does not apply for each relevant activity—details of how the land the subject of the application will be rehabilitated after each relevant activity ends.	A Transition Notice for a PRC Plan was received 14 March 2022. A PRC Plan for Millennium Mine is due to the administering authority by December 2023. The PRC Plan submitted will not include the Mavis South project as it's unlikely to be approved prior to the submission date. The PRC Plan will be updated to include





EP Act Section	Requirements for amendment application (1)	Mavis South Underground Project
		the Mavis South project once the EA Amendment is approved.
226A (i)(g)	Include a description of the proposed measures for minimising and managing waste generated by amendments to the relevant activity.	Refer to Section 7.6
226A (i)(h)	Include details of any site management plan or environmental protection order that relates to the land the subject of the application.	Not applicable

(i) This amendment application is not for a condition conversion. Therefore, s. 226 (1) (a) to (f) are applicable. The requirements under s. 226A also apply to this amendment application, to the extent relevant as outlined above.

## 2. EXISTING OPERATION

The following description of existing operation applies to the current approved Millennium Mine operation.

Millennium Mine commenced open cut coal mining operation in 2006, however was placed on care and maintenance by previous owner Peabody Energy Australia Pty Ltd, with the cessation of open-cut mining in 2018 and highwall mining in 2019. With the successful acquisition of Millennium Mine in July 2021, MetRes commenced operation in September 2021 to continue open-cut mine, utilising truck and shovel mining techniques, as well as high wall auger mining to extract the Leichhardt and Vermont seams of the Rangal Coal Measures.

At Millennium Mine, the coal is processed and loaded for transport by rail at the facility of the Red Mountain Infrastructure coal handling and preparation plant (RMI CHPP) operated by Red Mountain Infrastructure Pty Ltd (RMI). MetRes has agreements with RMI and/or BHP Billiton Mitsui Coal Pty for access to the BHP RMI CHPP and associated infrastructure, to process and load Millennium's coal.

Based on the 2021 approval to commence underground operation, the Mavis approved area involves a bord and pillar mining operation accessed from the existing Mavis Downs E Pit highwall in ML70457. The Mavis approved comprises mining operations to extract coal from the Leichhardt Seams within the Rangal Coal Measures. Maximum depth of open cut operations ranges to 100m with the final open cut mining depth determined on economic grounds at the commencement of care and maintenance in 2019. Continuous miner methods have been selected and preferred for the Mavis approved area given the methods flexibility, responsiveness to change in seam conditions, low capital cost and low surface subsidence potential. The resource areas also lend themselves favourably toward Bord and Pillar as opposed to longwall mining methods, given the relatively narrow area widths and irregular mining lease shapes in places.

In line with the current provisions of Environmental Authority EPML00819213, the following activities are currently authorised activities:

- Handling and use of explosives for blasting activities associated with operational mining and testing (signature holes);
- Mine Industrial Area (MIA) – Administration, Mavis Workshop, Warehouse, Sewage Treatment Plan, water tanks, washbay, Emergency Response Team;
- Storage, handling and use of chemicals and flammable or combustible liquids;

- Potable water supply – treated water from the Isaac Regional Council's standpipe supplied to site; and
- Both coarse and fine (tailings) rejects will be disposed of in Mavis Pit waste dumps.
- Maintenance of existing power lines and associated fire breaks;
- Maintenance of hardstand/laydown areas, access tracks and roads that may utilise coarse reject material from the RMI CHPP;
- Waste management – Onsite disposal of tyres;
- Dust suppression;
- Storage of explosives at explosives magazine on ML70313;
- Maintenance of water management infrastructure including sediment and erosion control dams; stormwater runoff drainage; dewatering infrastructure network (pipelines and pumps) and the levee;
- Reshaping of spoil dumps, replacement of topsoil and revegetation of the mined out and backfilled areas;
- Review designs and conditions of various water drains;
- Construction of drains in rehabilitated areas;
- Maintaining a nature conservation corridor – New Chum Creek buffer;
- Rehabilitation of exploration boreholes;
- Ongoing monitoring required for dust, water storage, mine affected water releases, saline drainage, groundwater, receiving environment, rehabilitation and other such as noise, odour, airblast on request from the administering authority;
- Land management activities, including but not limited to, fire breaks, weed and feral animal control;
- Rehabilitation maintenance activities such as weed management and erosion control;
- Maintenance of existing groundwater monitoring bores and all other monitoring infrastructure and equipment; and
- Ongoing stakeholder engagement with the landowner's Property Manager, landowner and State Government regarding rehabilitation and future transition to a Progressive Rehabilitation Closure Plan.

In relation to off lease activities, the following is currently authorised:

- Management and monitoring activities associated with the Wotonga Offset Area;
- Waste management – off lease disposal of general and regulated waste through a licensed waste management company;
- Processing of Run off Mine (ROM) coal through the RMI CHPP to produce coking coal and a PCI (Pulverised Coal Injection) coal; and



- Transporting the product coal by rail to the Dalrymple Bay Coal terminal for export

## 3. REGULATORY REQUIREMENTS

### 3.1 COMMONWEALTH CONSIDERATIONS

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In March 2009 Millennium Coal Pty Ltd (Peabody) referred the Millennium Extension Project for assessment and approval pursuant to the Environment *Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Millennium Extension Project resulted in unavoidable impacts to a ‘matter of national environmental significance’ (MNES) which was listed under the EPBC Act (Brigalow – Acacia harpophylla dominant and co-dominant). An EIS process was undertaken (to address both EPBC Act and EP Act requirements) and on 3 November 2011 approval was granted under the EPBC Act for the Millennium Expansion Project – EPBC No 2009/4821, subject to a number of conditions.

Under Condition 1 of the EPBC 2009/4821, Peabody was required to secure a minimum of 112.5 ha of Brigalow as an offset. Peabody provided an offset area for the Millennium Mine, namely the Wotonga Offset Area on the Peabody related body corporate-owned property of Wotonga Pastoral Holding (Lot 13 SP178466) for the listed threatened species and communities as part of the requirement for the Millennium Extension Project. On 20 June 2014, in response to the Department of Natural Resources and Mines (now Department of Resources) declared area offer, Peabody requested that a voluntary declaration under the *Vegetation Management Act 1999* be made in respect of Lot 13 on SP 178466. The vegetation notice has been declared on the title of the property on 24 August 2015.

Condition 2 of the EPBC 2009/4821 approval requires an offset management plan to be approved by the Minister, which have been obtained on 12 February 2014 for the Wotonga Offset Area Management Plan – Millennium Expansion Project (dated 28 November 2013). Under Condition 3 of the approval, a copy of the Threatened Flora and Fauna Species and Ecological Communities Management Plan has been provided to the Minister on 13 May 2014 and the plan has been implemented during the removal of any EPBC listed ecological communities or species.

On 22 July 2021, the Commonwealth Department of Agriculture, Water and Environment (now Department of Climate Change, Energy, the Environment and Water) approved transfer of EPBC 2009/4821 approval under the *Environmental Protection and Biodiversity Act 1999* (Cth) (EPBA Act) to MetRes.

For the proposed Mavis South Underground Project. a self-assessment was conducted with reference to the Significant Impact Criteria provided in *Significant Impact Guidelines 1.3: Coal Seam Gas and Large Coal Mining Developments* –



*Impacts on Water Resources 2022 and Significant Impact Guidelines 1.1 – Matters of National Environmental Significance 2013.*

The self-assessment was undertaken for the following matters:

- Terrestrial Ecology (Kleinfelder 2023)
- Water Resources
  - Surface Water (KCB, 2023)
  - Groundwater (SLR, 2023).

Summary of guideline assessment:

- EPBC Act listed threatened communities do not occur with the Project area.
- The Mavis South underground extension does not impact any wetlands of international importance.
- The Mavis South underground extension does not impact any Commonwealth marine environments.
- The proposed Mavis South underground extension does not impact any world heritage properties.
- The proposed Mavis South underground extension does not impact any national heritage properties.
- The proposed Mavis South underground extension does not involve nuclear actions.
- The changes to the proposed extension will have no impact on flows entering the Great Barrier Reef Marine Park.

Protection of water resources from coal seam gas development and large coal mining, development, refer to Table 2 (Groundwater assessment).



TABLE 2: EPBC ACT CONSIDERATIONS (GROUNDWATER ASSESSMENT)

<b>Guideline Section 5.3 An impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:</b>	<b>Assessment</b>
<p>a) Change in water quantity, including the timing of variations</p>	<p>The Project does not directly intercept groundwater of the Quaternary alluvium (Isaac Connors Groundwater Unit 1 under the Water Plan (Fitzroy Basin) 2011), and no changes are predicted to the hydrology of the Isaac River.</p> <p>All direct groundwater take by the underground mine for the Project is likely to be from Isaac Connors Groundwater Unit 2 (sub-artesian aquifers of the Rangal Coal Measures) only.</p>
<p>b) Changes in the integrity of hydrological or hydrogeological connections, including substantial structural damage (e.g. large-scale subsidence)</p>	<p>Due to the nature of the proposed mining method (bord and pillar), no large-scale subsidence is predicted.</p>
<p>c) Changes in the area or extent of a water resource</p>	<p>No change in groundwater quantity (levels) are predicted for the Quaternary alluvium or Tertiary regolith as a result of the Project. No change to Isaac River as a result of the Project.</p> <p>No groundwater users are likely to be located within the predicted incremental drawdown extent of the Project.</p>
<p>a) There is a risk that the ability to achieve relevant local and regional water quality objectives would be materially compromised.</p>	<p>The Project does not include any additional open voids or spoil emplacements, which could potentially impact the groundwater quality beyond the effects of approved mining. The Project is exclusively underground bord and pillar mining, leaving the excavated and dewatered underground voids in the coal body to recharge naturally over time. The inflowing water will have the same quality than the water previously stored in the coal.</p> <ul style="list-style-type: none"> <li>- The Project does not directly intercept groundwater of the Quaternary alluvium and therefore will not alter water levels or quality in this unit or the Isaac River.</li> </ul>

Guideline Section 5.3 An impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:	Assessment
b) There is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives.	Not applicable. The water quality is not superior to local or regional water quality objectives due to the following: <ul style="list-style-type: none"> <li>- The Project does not affect the Quaternary alluvium.</li> <li>- The Tertiary formations, Rangal Coal Measures, and Fort Cooper Coal Measures show a high salinity and sodium/ chloride concentration.</li> </ul>
c) High quality water is released into an ecosystem which is adapted to a lower quality of water	Not applicable. Water release to the environment is not foreseen, water will be managed and contained within the mine water management system.

In addition to the above groundwater summary, further consideration of potential impacts against the Significant Impact Criteria 1.3, Changes to Hydrological Characteristics 2022 (KCB, 2023) is presented in **Table 3** (Surface Water assessment).

**TABLE 3: EPBC ACT CONSIDERATIONS (SURFACE WATER ASSESSMENT)**

Parameter	Comments (KCB, 2023)
Flow regime (volume, timing, duration, and frequency of surface water flows)	Flow regime of New Chum Creek and its tributaries (volume, timing and frequency) is not expected to change due to the extension of the underground works within the Mavis Pit. <ul style="list-style-type: none"> <li>- Mine-affected water from the underground extension will be captured, pumped into existing mine-affected water storages at MCM, and re-used or released to New Chum Creek in accordance with current EA controlled release criteria.</li> <li>- Controlled releases will be monitored in accordance with relevant EA conditions which prescribe the minimum flow in the receiving waters for release to occur along with water quality release limits. In accordance with the EA, a cumulative maximum release of 20% of flow in receiving waters is allowed.</li> <li>- Minimal surface subsidence is expected. As such, catchments and overland flow paths are not expected to change.</li> </ul>

	<ul style="list-style-type: none"> <li>- No change to erosion or sediment control measures is expected as a result of the proposed extension.</li> </ul>
Groundwater / surface water interactions River / floodplain connectivity	<p>Water required for the Mavis South underground extension will be sourced from existing raw water storage at MCM (i.e., Western Dam). The overall raw water requirements for the extension of the underground are not expected to be greater than currently approved.</p> <p>Mine-affected water from the underground extension will be captured, pumped into existing mine-affected water storages at MCM, and re-used or released to New Chum Creek in accordance with EA controlled release criteria.</p> <p>Mine-affected water storages and any controlled releases will be monitored in accordance with relevant EA conditions.</p> <ul style="list-style-type: none"> <li>- New Chum Creek and its tributaries are not considered to be baseflow-fed creeks.</li> <li>- Therefore, potential impacts to surface water interactions because of the underground extension are not anticipated; and will not result in any changes to river and/or floodplain connectivity.</li> </ul>
Coastal processes	<p>Mavis South underground extension is in central Queensland. Given the distance to the coast and no potential impacts to surface water from the underground extension, changes to coastal processes are not expected to occur.</p>

It was determined that there will be no significant impacts to Matters of National Environmental Significance because of the proposed Mavis South underground extension.

## 3.2 STATE OF QUEENSLAND

### 3.2.1 Environmental Authority Amendment Process

Approval to continue and expand operation within the Millennium Mine is sought under the EA amendment provisions prescribed in Chapter 5, Part 7 of the EP Act – Amendment of environmental authorities by application.

This supporting documentation has been developed in consideration of the requirements listed under the following DES Guidelines:

- Application requirements for activities with impacts to air (ESR2015/1840, version 5.0) (DES, 2023a);
- Application requirements for activities with impacts to land (ESR/2015/1839, version 4.03) (DES, 2021a);
- Application requirements for activities with impacts to water (ESR2015/1837, version 4.04) (DES, 2021b);

- Application requirements for activities with noise impacts (ESR2015/1838, version 3.06) (DES, 2022a);
- Application requirements for activities with waste impacts (ESR2015/1836, version 5.03) (DES,2023b); and
- Requirements for site-specific and amendment applications – underground water rights (ESR/2016/3275, version 1.03) (DES, 2021c).

### **3.2.2 EA Amendment Assessment Level Decision**

Under s.228 of the EP Act, the administering authority DES must decide whether the proposed amendment is a minor or a major amendment. While it is acknowledged that the final assessment level decision is not made until the EA amendment application is lodged, in preparation of this supporting documentation, a consideration for the EA criteria have been self-assessed by MetRes and are presented below in **Table 4** and **Table 5**.

The types of activities that are considered to be a 'significant increase' to constitute a major EA amendment are listed under Section 3.3 of the DES Guideline '*Major and minor amendments*' (ESR/2015/1684 Version 10.01 (DES, May 2022b)).



TABLE 4: MINOR AMENDMENT (THRESHOLD) CONSIDERATIONS (DES, 2022)

Minor amendment (threshold) considerations (as listed in ESR/2015/1684 Version 10.01, May 2022)	Relevance to Mavis South Underground Project
<i>(a) is not a change to a standard condition identified in the EA as a standard condition, other than a condition conversion or replacing a standard condition with a standard condition for the ERA; and</i>	<b>No</b>
<i>(b) does not significantly increase the level of environmental harm caused by the relevant activity; and</i>	<b>No</b>
<i>(c) does not change any rehabilitation objectives in the EA in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the EA; and</i>	<b>No</b> Rehabilitation objectives remain unchanged.
<i>(d) does not significantly increase the scale or intensity of the relevant activity; and</i>	<b>No.</b> All mine activity proposed for the Mavis South Underground Project demonstrates <b>lower</b> environmental risk than previously assessed.
<i>(e) does not relate to a new relevant resource tenure for the EA that is—</i>	<b>No</b>
<i>(i) a new mining lease; or</i>	<b>YES</b>
<i>(ii) a new petroleum lease; or</i>	<b>No</b>
<i>(iii) a new geothermal lease under the Geothermal Energy Act 2010; or</i>	N/A
<i>(iv) a new greenhouse gas injection and storage lease under the Greenhouse Gas Storage Act 2009; and</i>	N/A
<i>(f) increases the existing surface area for the relevant activity by 10% or less; and</i>	<b>No</b>
<i>(g) for an EA for a petroleum activity.</i>	N/A



<b>Minor amendment (threshold) considerations (as listed in ESR/ 2015/1684 Version 10.01, May 2022)</b>	<b>Relevance to Mavis South Underground Project</b>
<i>(i) involves constructing a new pipeline that does not exceed 150km in length; and</i>	N/A
<i>(ii) involves extending an existing pipeline by no more than 10% of the existing length of the pipeline; and</i>	N/A
<i>(h) if the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or greenhouse gas permit– the amendment application seeks an EA that is subject to the standard conditions for the relevant activity, to the extent it relates to the permit</i>	N/A

Consideration of threshold values in relation to environmental harm or change align with **the statutory criteria for a minor amendment application**. However, as this proposed development is linked to a new mine lease (conversion of a portion of MDL 3046), from this self-assessment, the activities relating to the Amendment will trigger a **Major Amendment**.

Additional analysis is provided below in relation to considerations for a major amendment application and public notification requirements as set out in DES' guidelines. Both **Table 4** and **Table 5** demonstrate that in isolation (ie, without the MLA) the Amendment area **does not** trigger either requirement.



TABLE 5: MAJOR AMENDMENT CONSIDERATIONS (DES, 2022)

The following matters will usually be significant, and therefore be assessed as major amendments	Relevance to Mavis South Underground Project
<i>Increasing impacts to Category A or B environmentally sensitive areas (ESA)</i>	No. No impact on mapped sensitive areas. No impact to MSES or MNES matters result.
<i>Increasing impacts to waters with limited assimilative capacity measured against environmental values and management objectives as prescribed in the Environmental Protection (Water) Policy 2019 (e.g. a discharge to a river which is already not meeting the required water quality objectives prescribed in the Environmental Protection (Water and Wetland Biodiversity) Policy 2019).</i>	No. As demonstrated in Groundwater impact assessment Section 8.2 and <b>Appendix D</b>
<i>Increasing impacts to air quality such that the air quality objectives in the Environmental Protection (Air) Policy 2019 may not, or will not be achieved</i>	No. As demonstrated in Air Quality assessment Section 8.3 and <b>Appendix E</b>
<i>Increasing noise emissions such that the acoustic quality objectives in the Environmental Protection (Noise) Policy 2019 may not, or will not be achieved</i>	No. As demonstrated in Noise assessment Section 8.4 and <b>Appendix G</b>
<i>Increasing scale and nature of disturbances by a prescribed activity that will, or are likely to, result in a significant residual impact on a prescribed environmental matter (Note - these changes may trigger a requirement for an offset under the Environmental Offsets Act 2014.</i>	No. The Mavis South underground extension has a total surface area footprint of 45.521 ha/ 0.697km <sup>2</sup> , of which 0.2km <sup>2</sup> drains towards New Chum Creek. Proposed tonnage to access the additional underground area is within approved ROM tonnage. No impact to MSES or MNES matters result.
<i>Diverting a natural watercourse</i>	No
<i>Changing fuel type being used (i.e. from gas to coal or coal to waste)</i>	No.



<b>The following matters will usually be significant, and therefore be assessed as major amendments</b>	<b>Relevance to Mavis South Underground Project</b>
<i>Discharging contaminants directly to groundwater</i>	No.
<i>Deeper extraction that intersects groundwater or where the depth of groundwater is not known</i>	No.
<i>Increasing the height or area of a mine tailings dam by more than 10% of the existing height or area of that dam</i>	No.
<i>Constructing and/or operating a new coal seam gas brine dam</i>	N/A
<i>Using emerging technologies (e.g. a new type of mining)</i>	No.
<i>Changes to the final landform design that compromise landform stability and increase erosion potential (e.g. increasing the gradient of final slopes)</i>	No.
<i>Changes which are part of staged development</i>	No.
<i>A 5% volume increase of waste production with potentially acid forming or neutral mine drainage properties</i>	No.
<i>A change in the type of minerals being mined</i>	No.
<i>A change of a post-mining land use for an area</i>	No.
<i>The addition of a mining lease to an EA, due to the increase in the risk of environmental harm</i>	No.
<i>The following proposed amendments may be significant (and therefore major amendments), or may not be significant, depending on the nature of the amendment:</i>	
<i>discharging contaminants which differ to those authorised in the existing EA</i>	No.
<i>increasing emissions to the environment either by substantial volume or concentration or load</i>	No.
<i>changing the final rehabilitation acceptance criteria for an activity to a lower standard such that proposed rehabilitated land has a</i>	No.





<b>The following matters will usually be significant, and therefore be assessed as major amendments</b>	<b>Relevance to Mavis South Underground Project</b>
<i>lower environmental value than that originally authorised in the existing EA</i>	
<i>moving a contaminant release location to a place with different environmental values</i>	No.
<i>using different industrial processes which will result in different emissions and impacts which are not authorised by the EA</i>	No.
<i>changing the design of an engineered capping layer to be installed over a waste rock dump</i>	No.
<i>increasing annual throughput for the relevant activity beyond that authorised in the existing EA</i>	No.
<i>increasing the quantity of chemicals, hazardous materials or wastes stored on the site beyond that authorised in the existing EA</i>	No.
<i>increasing operating hours into evening hours and Sundays where not previously authorised in the existing EA and the site of the activity(ies) is within close proximity to sensitive receptors.</i>	No.

Further consideration has also been applied in this self-assessment as to whether public notification may be required. Based on DES guideline, **Table 6** provides a summary of considerations relating to Mavis South Underground Project area.



TABLE 6: PUBLIC NOTICE CONSIDERATIONS (DES, 2022)

In relation to consideration of what may trigger public notification if the amendment is for a resource activity and the administering authority decides that	Relevance to Mavis South Underground area
– the amendment is likely to lead to a substantial increase in the risk of environmental harm under the amended EA; and	No
– the risk is the result of a substantial change in:	--
the quantity or quality of contaminant permitted to be released to the environment; or	No
the results of the release of a quantity or quality of contaminant permitted to be released into the environment.	No
<b>Also, the notification stage will apply to an application if any part of the application is for a mining activity relating to a new mining lease.</b>	<b>YES</b>
Public notification applies to applications for a major amendment of a PRCP schedule, except to the extent that the proposed change to the PRCP schedule:	PRCP schedule will be developed and proposed under the transitional arrangements (due December 2023).
– reduces the area of a non-use management area under the schedule; or	Not applicable (but note this exception would be relevant here if a PRCP were already in place because the remaining void and associated impacts will be reduced).
– is likely to reduce, or cause no change to, the impacts on environmental values raised by the activities the subject of the schedule.	Not applicable (per response above).



### 3.3 OTHER REGULATORY CONSIDERATIONS

A review of other regulatory considerations is provided in **Table 7**.

TABLE 7: CONSIDERATION OF ASSOCIATED APPROVALS RELEVANT TO THE MAVIS SOUTH UNDERGROUND AREA

Legislation	Administering authority	Relevance to Mavis South Underground area
<b>COMMONWEALTH</b>		
<i>Environmental Protection and Biodiversity Protection Act 1999</i>	Department of Climate Change, Energy, the Environment and Water	Millennium Mine operates under conditions relating to EPBC 2009/4821.  No impact to MNES arise from the Project.
<i>National Greenhouse and Energy Report Act 2007</i>	The Clean Energy Regulator	Assessment and reporting required for controlling corporations registered under section 12 of the NGER Act. Annual reporting will continue in line with current operation.
<i>Native Title Act 1994</i>	Department of Resources	Native title has been extinguished over the underlying tenure to the mining lease application relating to MDL3046.
<b>STATE OF QUEENSLAND</b>		



Legislation	Administering authority	Relevance to Mavis South Underground area
<i>Environmental Protection Act 1994</i>	Department of Environment and Science	Approval to access addition bord and pillar workings for the Project is the subject of this EA amendment application. MetRes will apply for a new Estimated Rehabilitation Cost (ERC) Decision for the resource activity following the amendment of the EA.
<i>Mineral Resources Act 1999</i>	Department of Resources	A mine lease application has been lodge to convert a portion of MDL3046 and approval requirements will run concurrently with this EA amendment application.
<i>Mineral and Energy Resources (Financial Provisioning) Act 2018</i>	Queensland Treasury	Financial Provision Scheme and contribution Holder must give increased surety under the financial provisioning scheme within 12 months after the allocation decision for the authority if the ERC for the authority increases.
<i>Aboriginal Cultural Heritage Act 2003 (Qld)</i>	Department of Aboriginal and Torres Strait Islander Partnerships	Any activity undertaken by any person that may harm Aboriginal cultural heritage. 2 August 2011: Cultural Heritage Management Plan (CHMP) Barada Barna People and Millennium Mine. 9 September 2011: Letter of approval by the Director of the Cultural Heritage Coordination Unit. 13 July 2021 Deed of Assignment and Assumption – CHMP. Transfer of all rights and obligations under the CHMP to MetRes. The Project will continue to operate under the approved CHMP, and any consultation requirements of that CHMP will be complied with.
<i>Biosecurity Act 2014</i>	Department of Agriculture and Fisheries	Any activity undertaken by any person that may spread biosecurity pests, diseases and contaminants. Weed hygiene and weed awareness and Weed and pest management plans will continue under approved procedures. The Project will continue to operate under approved management plans.
<i>Coal Mining Safety and Health Act 1999</i>	Resources Safety & Health	The Project will continue to operate under an approved Management Structure and Safety and Health Management System as required under the Act.



Legislation	Administering authority	Relevance to Mavis South Underground area
	Queensland (RSHQ),	
<i>Nature Conservation Act 1992</i>	DES	Activities that affect protected plants are regulated under the subordinate Nature Conservation (Plants) Regulation 2020 (Qld) (NC Plants Regulation). This regulation requires that a flora survey be carried out where areas of clearing are to occur within 'high risk areas' that are shown on the 'Flora Survey Trigger Map' unless general exemptions apply.
<i>Planning Act 2016</i>	Queensland Treasury	Applies when assessable development is proposed, however is not applicable to the activities proposed for the Project and not considered further.
<i>Queensland Heritage Act 1992</i>	DES	Requires a person to notify the DES chief executive of an archaeological artefact that is an important source of information about an aspect of Queensland's history.
<i>Regional Planning Interests Act 2014</i>	Queensland Treasury	Required when a resource or regulated activity is proposed in an area of regional interest, however Millennium Mine is not within a trigger mapped area and not considered further for this EA amendment application. Millennium Mine area will continue to operate under approved procedures.
<i>Stock Route Management Act 2002</i>	Department of Resources and Isaac Regional Council	Applies when altering or using stock routes. Not relevant to the Project. Millennium Mine will continue to operate under approved procedures.
<i>Strong and Sustainable Resource Communities Act 2017</i>	Coordinator-General and Anti-Discrimination Commission Queensland	Applies when large resource projects require an environmental impact statement or hold a site-specific environmental authority and have 100 or more workers. Millennium Mine is currently on the Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) list of large resource projects but this is not considered further in this EA amendment application.
<i>Transport Infrastructure Act 1994</i>	Department of Transport and Main Roads (DTMR)	Applies when works require alteration of access and traffic routes. No change to authorised transport operation is proposed for Project and therefore not considered further.



Legislation	Administering authority	Relevance to Mavis South Underground area
<i>Transport Operations (Road Use Management) Act 1995</i>	DTMR	Applies when transporting oversized or over dimension loads. No change to authorised transport operation is proposed the Project and therefore not considered further.
<i>Vegetation Management Act 1999</i>	Department of Resources	Applies to clearing or interference with native vegetation for activities that are not within a ML. <b>Section 6.7</b> and <b>Appendix G</b> assesses impacts to vegetation. N/A
<i>Waste Reduction and Recycling Act 2011</i>	DES	Manages planned waste generated by Millennium Mine. No change to authorised transport operation is proposed for the Project and therefore not considered further.
<i>Water Act 2000</i>	Department of Regional Development, Manufacturing and Water	Management of impacts on underground water caused by the exercise of underground water rights by resource tenure holders. <b>Appendix C</b> provides further consideration of this Act. Water Act includes criteria for determining water courses that require authorisation to interfere with the flow of water and drainage features that may require authorisation to interfere with overland flow. As defined by the Water Act: <ul style="list-style-type: none"> <li>- there are no declared water courses or drainage features in the MCM MLs;</li> <li>- Isaac River and downstream extents of New Chum Creek (both to the south of MCM) are declared water course;</li> <li>- North Creek (to the east of MCM) is a declared drainage feature</li> </ul>

## 4. CONSULTATION

Stakeholder engagement has occurred for both the proposed Mine Lease application and this EA amendment lodgement. Engagement undertaken to-date is summarised in **Table 8**

TABLE 8: INTERESTED PARTIES

Stakeholder		Method of engagement undertaken to-date (up to November 2023)
Landholder	Direct and adjoining	Face to Face as required
Regulatory engagement	Department of Resources Department of Environment and Science	Prelodgement meeting (via TEAMS)
Local Council	Isaac Regional Council	Face to Face as required
Representatives of the Barada Barna People		Face to Face as required
Interested parties	Overlapping tenure holders Aurizon Network Pty Ltd Department of Transport and Main Roads Stanmore SMC Pty Ltd Millennium Coal Pty Ltd	Phone and email correspondence where required

Consultation material (refer to **Appendix H**) has been distributed to interested parties.

It is proposed that a Combined Public Notification for both this EA amendment application and the Mine Lease application will be issued post lodgement of this supporting documentation. Final format of the Public Notification will be directed by DES.



## 5. EXISTING ENVIRONMENT

### 5.1 TENURE

The Millennium Coal Mine is comprised of the following tenements as detailed in **Table 9**.

- Mining Lease 70313
- Mining Lease 70401
- Mining Lease 70344
- Mining Lease 70457
- Mining Lease 70483
- Mining Lease 70485.

The leases adjoin a landscape dominated by large scale coal mines, and low-density cattle grazing stations.

**TABLE 9: MILLENNIUM MINE TENURES AND LAND OWNERS**

Tenure	Tenement Holder	Name	Lodge Date	Granted Date	Expiry Date	Area (Ha)
ML 70313	Metres Pty Ltd	Millennium West	19/03/2003	16/12/2004	31/12/2034	1,953
ML 70401	MetRes Pty Ltd	North Poitrel	28/07/2008	16/09/2011	31/12/2034	402.6
ML70344	MetRes Pty Ltd	Mountain Pit	19/05/2005	03/11/2005	30/11/2035	164.1
ML 70457	MetRes Pty Ltd	Mavis Downs	01/07/2011	09/12/2011	31/12/2034	574.4
ML 70485	MetRes Pty Ltd	New Chum Creek	11/10/2012	15/07/2013	31/12/2034	163.4
ML70483	MetRes Pty Ltd	Mavis Downs Southern Triangle Extension	11/10/2012	15/07/2013	31/12/2034	0.4

As part of this EA amendment process, a mine lease application has been lodged with the Department of Resources in accordance with requirements under the *Mineral Resources Act 1989* (MR Act).

## 5.2 CLIMATE AND METEOROLOGY

The nearest meteorological monitoring station to the Project site operated by the Bureau of Meteorology (BoM) is the Moranbah Water Treatment Plant (WTP), located approximately 24 km to the west (Station ID 03403). This station was commissioned in 1986 and has long-term (1986–2012) meteorological data for the following parameters:

- Temperature (°C)
- Rainfall (mm)
- Solar radiation (MJ/m<sup>2</sup>)
- Relative humidity (%)
- Wind speed (m/s) and wind direction (degrees).
- A review of the long-term data collected is provided in the following sections.

### Temperature

Long-term temperature statistics are summarised in **Figure 3**. Mean maximum temperatures range from 23.7°C in winter to 34°C in summer, while mean minimum temperatures range from 9.9 °C in winter to 21.9°C in summer. Maximum temperatures up to 45°C and minimum temperatures less than 1°C have been recorded.

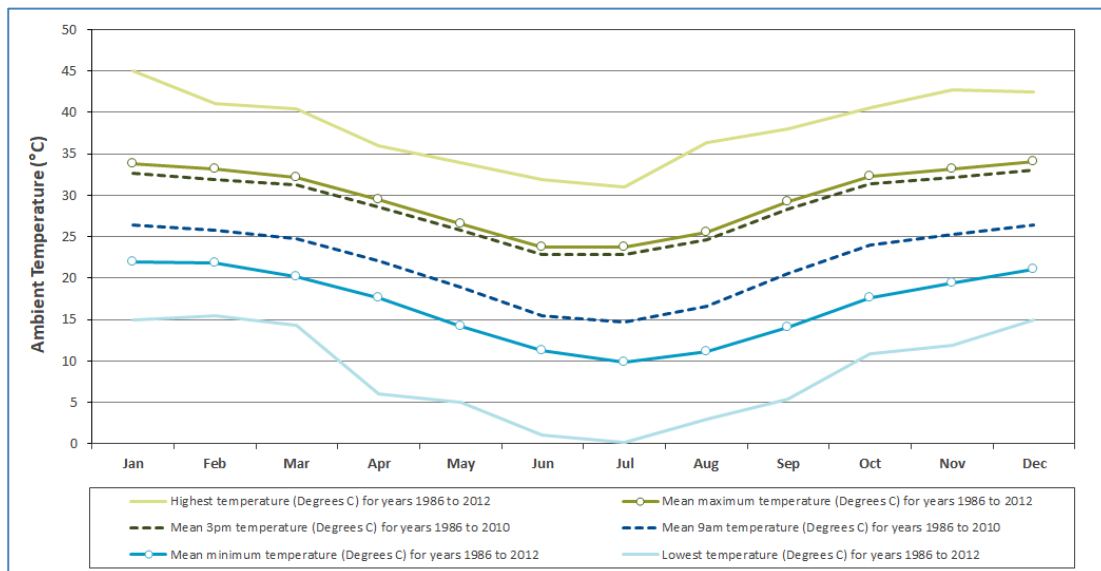


FIGURE 3: LONG TERM TEMPERATURE DATA – MORANBAH (SLR, 2023)

TABLE 11: OPERATIONAL BOM WEATHER STATIONS NEAR THE MILLENNIUM MINE (SLR, 2023)

Name	Site Number	Date Commenced	Easting*	Northing*	Elevation (mAHD*)	Operational Status	Distance from Millennium Mine
Moranbah Airport	34035	2012	610999	7559653	232	Open	20 km south-west
Iffley	34100	1998	647356	7539801	173	Open	30 km south-east
Carfax	34016	1962	673063	7515595	128	Open	62 km south-east
*mAHD = metres Australian Height Datum +GD 94, Zone 55							

### 5.3 TOPOGRAPHY

The topography of the Millennium Mine extent is relatively flat with gentle undulation and average elevations with an overall gradient to the south-west, towards the Isaac River. Regionally the Millennium Mine sits within on the Isaac River valley slope, with elevations at mine between approximately 280 mAHD along the eastern boundary of Mavis Pit to 250 mAHD in the west. Higher elevation points are common surrounding the mine with two observed adjacent to the southern boundary of the mine, reaching elevations of 320 mAHD.

The mine is located in the upper catchments of New Chum Creek and West Creek, both tributaries of the Isaac River. All of the drainage lines, including the Isaac River, are ephemeral.

### 5.4 GEOLOGY

As per the State (Queensland Government) Detailed Surface Geology (SDSG) mapping, the geology surrounding the A-Pit area is typically Quaternary deposits overlying Tertiary, Permian, and Triassic Age sedimentary and igneous bedrock (SLR, 2023a).

### 5.5 REGIONAL GEOLOGY

The Millennium Mine is located in the Bowen Basin, a basin spanning an extent of approximately 200,000 km<sup>2</sup> and one of five major foreland sedimentary basins

formed along the eastern side of Australia during the Permian Period. The Bowen Basin extends in a north to south direction from Townsville, Queensland at its northern extent to Moree, New South Wales at its southern extent.

In the southern parts, the extent of the Bowen Basin and the Great Artesian Basin (GAB) overlap. The Bowen Basin has two north trending depocentres, the eastern Taroom Trough and western Denison Trough (Geoscience Australia, 2021). The Millennium Mine lies within the Collinsville Shelf, north of the Taroom Trough depocentre.

Basin geology within the Collinsville Shelf includes the basal Permian aged Back Creek Group, which is comprised of generally fine-grained clastic sedimentary rocks deposited in a fluvial to shallow marine environment. The Back Creek Group is conformably overlain by the Blackwater Group, which includes the Rangal Coal Measures, Fort Cooper Coal Measures, and Moranbah Coal Measures. The economic seams of the Millennium Mine are contained in the Late Permian Rangal Coal Measures. The Permian strata occur at outcrop on the eastern and western edges of the Basin and are unconformably overlain by the Triassic aged terrestrial sedimentary rocks of the Rewan Group. While not present at the mine, isolated pockets of remnant quartzose sandstones of the Middle Triassic Clematis Group are mapped.

The Permian and Triassic units are covered by a thin layer of unconsolidated to semi-consolidated Cainozoic sediments (Tertiary to Quaternary alluvium and colluvium). The alluvial sediments are localised along rivers and creeks (Isaac River). Volcanic intrusions and extrusions are also present within the region.

The major lithological units found in the vicinity of the Millennium Mine are shown in **Table 12**.



TABLE 12: GENERAL STRATIGRAPHIC SEQUENCE (SLR, 2023A)

Period	Stratigraphic Unit	Map code	Lithological Description	Thickness (m) (MatrixPlus,2010; SLR, 2021a)	Location to Millennium Mine
Quaternary	Isaac River Alluvium	Qa	Clay, silt, sand and gravel; flood-plain alluvium	0 to 20	Surficial cover localised along Isaac River and North Creek.
	Colluvial deposits	Qr	Clay, silt, sand, gravel and soil; colluvial and residual deposits	0 to 20	Surficial cover localised along Isaac River and downstream portions of New Chum Creek where it joins the Isaac River.
Quaternary / Tertiary	Regolith - alluvium, colluvium and other sediments in floodplains, alluvial fans, and high terraces	TQa	Locally red-brown mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits (generally related to present stream valleys but commonly dissected)	0 to 20	Proximal to the mine as isolated deposits occurring along New Chum Creek.
Tertiary	Suttor Formation	Tu	Quartz sandstone, clayey sandstone, mudstone and conglomerate; fluvial and lacustrine sediments; minor interbedded basalt.	0 to 50	Crops out to the north-west of the mine, associated with the high topography areas. Small outcrops to west and north of the Project.
	Duaranga Formation	Tb	Mudstone, sandstone, conglomerate, siltstone, oil shale, lignite & basalt	0 to 50	No outcrop in proximity to the Project.
Cretaceous	Undifferentiated igneous intrusives	Ki	Gabbro, leuco-diorite, quartz hornblende diorite, biotite-hornblende granodiorite, microgranite, rhyolite, trachyte	Unknown	To the south of the Project.



Period	Stratigraphic Unit		Map code	Lithological Description	Thickness (m) (MatrixPlus,2010; SLR, 2021a)	Location to Millennium Mine
<b>Triassic</b>	Mimosa Group	Clematis Group	Re	Cross-bedded quartz sandstone, some quartz conglomerate and minor red-brown mudstone.		No outcrop in proximity to the Project.
		Rewan Group	Rr	Lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate (at base). Sandstone mudstone & minor conglomerate (at base).	5 to 70 >600 m regionally	Crops out at surface at the Project location.
<b>Permian</b>	Blackwater Group	Rangal Coal Measures	Pwj	Calcareous sandstone, calcareous shale, mudstone, and concretionary limestone including the following coal seams: <ul style="list-style-type: none"> <li>• Leichardt;</li> <li>• Millennium; and</li> <li>• Vermont.</li> </ul>	20 to 70 Leichardt (4 to 10) Millennium (1) Vermont (4 to 10)	At depth at the mine location, underlying the Rewan Group.
		Fort Cooper Coal Measures	Pwt	Lithic sandstone, conglomerate, mudstone, carbonaceous shale, coal, tuff, tuffaceous (cherty) mudstone.	30 to 60	At depth at the mine location, underlying the Rangal Coal Measures.
		Moranbah Coal Measures	Pwb	Labile sandstone, siltstone, mudstone, coal, conglomerate in the east		At depth at the mine, crops out to the east.
	Back Creek Group	Pb	Quartzose to lithic sandstone, siltstone, carbonaceous shale, minor coal and sandy coquinite		At depth at the mine, crops out to the west.	

## 5.6 LOCAL GEOLOGY

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The bedrock stratigraphy at Millennium Mine typically comprises of Triassic aged deposits, namely the Rewan Formation, which unconformably overlies Permian Coal Measures, inclusive of the Rangal Coal Measures and Fort Cooper Coal Measures. Proposed operations at the A-Pit extension area will extract down to the Vermont coal seam in the Rangal Coal Measures Formation.

Superficial deposits include alluvial and weathered colluvial bedrock, formed during the Tertiary and Quaternary Periods. The Quaternary alluvial deposits are localised along creeks and rivers; in the area surrounding the Millennium Mine these are associated with the Isaac River to the south and south-west. The Tertiary aged alluvium is more widespread across the area and is likely associated with historical palaeo-watercourses.

## 5.7 LAND USE

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Land use information specific to Millennium Mine and the proposed Mavis South underground extension area was sourced from the Queensland Government Department of Science, Information Technology, and Innovation (Queensland Government 2017) and as reported in KCB (2023).

The dataset classifies land use type using the Australian Land Use and Management (ALUM) classification system which provides a nationally consistent method to collect and present land use information in Australia. This classification system categorises 32 land use classes and subclasses. There are six primary classes used in the ALUM classification system and these are further divided into secondary and tertiary classes. Descriptions of the primary classes (ABARES 2010) are detailed below:

- Conservation and natural environments: land is used primarily for conservation purposes, based on the maintenance of essentially natural ecosystems already present.
- Intensive uses: land is subject to substantial modification, generally in association with closer residential settlement, commercial or industrial uses.
- Production from dryland agriculture and plantations: land is used mainly for primary production, based on dryland farming systems.

Production from irrigated agriculture and plantations: land is used mainly for primary production, based on irrigated farming.





- Production from relatively natural environments: land is used mainly for primary production based on limited change to the native vegetation.
- Water: although primarily land cover types, water features are regarded as essential to the classification. **Figure 4** presents the land use categories across MCM and the proposed Mavis South underground extension area.

The land use category for the surface footprint for the proposed Mavis South underground extension is conservation and natural environments. Other land use categories present are intensive uses for mining, water for dams and production from relatively natural environments for grazing native vegetation.

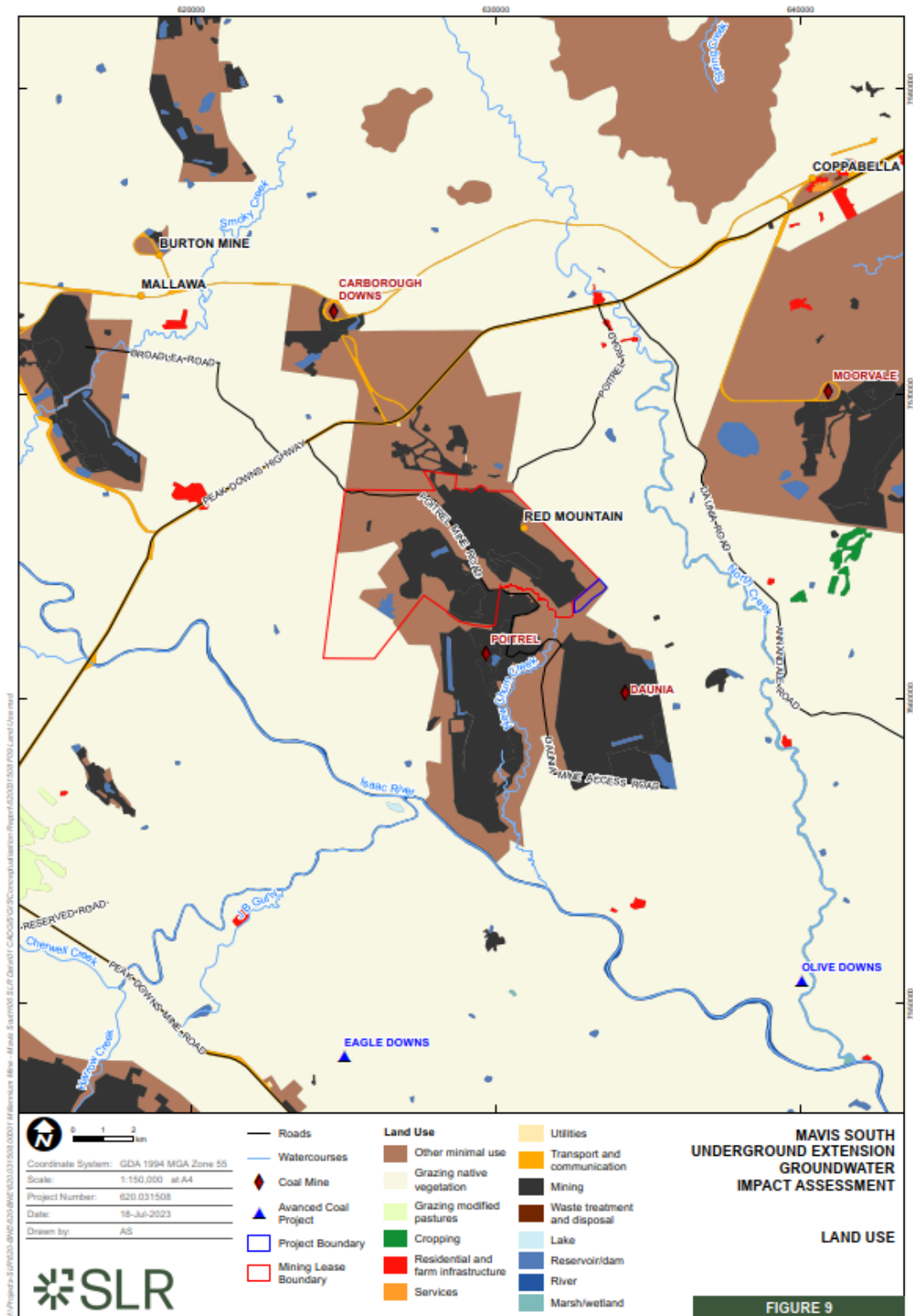


FIGURE 4: LAND USE SUMMARY (SLR, 2023A)

## 5.8 LAND CONTAMINATION

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A number of activities associated with the existing Millennium Mine are classified as notifiable activities. Notifiable activities are listed in Schedule 3 of the EP Act. Under the EP Act, MetRes has a duty to notify DES should potentially contaminating activities be carried out on site. Land that has been or is being used for notifiable activities may be recorded on the Environmental Management Register (EMR), which is maintained by DES.

The notifiable activities that are currently undertaken at the existing Millennium Mine, associated with mine waste and petroleum fuel storage, will also be undertaken for the Project.

A search was conducted on the Queensland EMR and the Contaminated Land Register (CLR) to determine if any lots that were covered by the Project area (MDL3046) were registered. No sites on the properties relating to this new MLA are included in the EMR or the CLR.

## 5.9 OVERBURDEN AND COAL REJECTS CHARACTERISATION

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An overburden and coal rejects assessment was detailed in the 2011 EIS. The materials assessed as part of the 2011 detailed study, apply to the same lithology and area relevant to the Mavis South Underground area.

The pH of all samples from the five holes analysed in the 2011 EIS, fall within the range 7.5–9.9. These samples are slightly to moderately alkaline and are within the general range of Australian soils (3–10 pH units) and in the upper range of Australian agricultural soils (4.5–9 pH units).

The salinity of the samples tested ranged between 130 and 850  $\mu\text{S}/\text{cm}$  for EC1:5 Soil water extract. This range of soil salinity is low to moderate and, in conjunction with the pH results above, will not be a limiting factor to the use of this material in final landform development.

## 5.10 VISUAL AMENITY

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The Millennium Mine is located wholly within the boundary of the previous Nebo Shire Council (2011), now under the Isaac Regional Council. Under the plan as assessed for the 2011 EIS, the Millennium Mine area was classified as Rural land, which includes the specific provision for mining operations.



The current Isaac Regional Planning Scheme 2021 came into effect on 1 April 2021. Under the new planning scheme, the Millennium Mine remains classified as Rural zone.

Lake Elphinstone and Mt Britton are the only rural locations in the region mentioned as having visual amenity significance. They are both distant from the Millennium Mine and will not be impacted by the Mavis South Underground Project.

Based on the 2011 EIS detailed assessment, the landscape within the vicinity of the Millennium Mine is considered to have a low sensitivity to landscape changes, given that the local region primarily supports rural and mining activities, including the relevant mining infrastructure for the Millennium Mine e.g. CHPP, train load-out, offices and workshops, that are already in place at the existing Millennium Mine.

As all activities associated with the Project will be underground, no discernible impact on visual amenity is expected.



## 6. MAVIS SOUTH UNDERGROUND PROJECT – MINE LEASE APPLICATION

The proposed Mavis South underground extension is currently within a portion of Mine Lease Development (MDL)3046 (Lot3 on SP190266). A mine lease application for the area has been lodged with the Department of Resources (DoR) 19/12/2023.

The underlying tenure of the Project area is:

- Fitzroy (CQ) Pty Ltd. Holder of mineral development licence (MDL3046) over subject land; and
- Millennium Coal Pty Ltd. Owner of subject land and adjoining land (Lot 3, SP190266).

## 7. MAVIS SOUTH UNDERGROUND PROJECT

### 7.1 OVERVIEW

On 7 December 2021, approval was received from Queensland Department of Environment and Science (DES) to commence underground mining within the Mavis area (ML70457) (referred to as Mavis approved). Approval is sought, via this application, for mining activities in an additional area directly to the south and adjacent to the approved Mavis underground operation to access additional economic coal reserves and continued utilisation of existing mining fleet. This area, and the subject of this EA amendment application, is referred to the Mavis South Underground Project (the Project).

This supporting documentation accompanies the application for an EA amendment to EPML00819213 for extension of the Mavis approved mine operation providing approximately 854,000 tonnes of Run of Mine (ROM) coal, to be extracted over approximately 12-months.

### 7.2 DESCRIPTION OF MINING ACTIVITIES FOR THE MAVIS SOUTH UNDERGROUND AREA

The mining activity for the proposed Project is (**Table 13**):

- Underground Bord and Pillar mining and
- Extension of approved underground operation providing approximately 854,000 t of ROM over approximately 12 month period.

**TABLE 13: PROPOSED DEVELOPMENT**

Parameter	Description
Pit	Mavis
ROM	Within authorised ROM of 5.5mtpa Proposed 853,565 tonnes ROM (total) over approximate 12-month period
Mine method	Underground Bord & Pillar
Deepest seam mined	Leichardt Seam
Fleet requirement	Within existing mine fleet demand. Utilisation of E-Pit/Mavis UG (as approved) Transport of coal to processing (Red Mountain Infrastructure (RMI) area) will be via truck via existing road network to RMI.
Water demand	Within current authorised volume
Power demand	Within current authorised volume
FTE change	No anticipated change
Mine waste disposal	In line with existing operation



The proposed Project is based on the following actions:

- Proposed ROM extraction rate is approximately up to 854,000 tonnes over a period of approximately 12 months. The additional extraction rate remains within the approved ROM of 5.5 Million tonnes per annum (Mtpa) in accordance with EA Condition A2.
- Mine operation is a continuation of the current underground bord and pillar mining method, to extract the Leichhardt seams of the Rangal Coal Measures.
- No additional surface infrastructure is required (ie, road network, communications)
- All management plans that may be affected by the proposed extension will be updated as required.

The Project is required to maximise ongoing opportunity to access available resource while ensuring continuation of production.

### **7.2.1 Coal processing**

Coal processing for the Mavis South Underground area will be in line with authorised operation.

The coal will be processed and loaded for transport by rail at the facility of the Red Mountain Infrastructure coal handling and preparation plant (RMI CHPP) operated by Red Mountain Infrastructure Pty Ltd (RMI).

Millennium has agreements with RMI and/or BHP Billiton Mitsui Coal Pty for access to the BHP RMI CHPP and associated infrastructure, to process and load Millennium's coal at the required rates of production and dispatch.

MetRes intends to continue these arrangements through a combination of novation/assignment of the existing arrangements and entering into a new coal tolling agreement with RMI.

### **7.2.2 Mine Equipment**

All mine equipment required to access the Mavis South Underground area is currently being utilised on site.



## 7.2.3 Mine Rehabilitation and Final Landform

### Post Mining Land Uses

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The existing land use across the proposed Mavis South area is grazing native vegetation. The area will be returned to the same use post-mining. The EA currently includes Table F1: Final Land Use and Rehabilitation Approval Schedule which outlines the post-mining land uses for approved disturbance at Millennium Mine. The Mavis Underground subsidence area is currently approved to be returned to grazing and therefore the proposed post mining land use for Mavis South will be consistent with the existing EA.

Stakeholder consultation will be undertaken as part of the public notification requirements for the EA Amendment application. The proposed post-mining land use is consistent with the surrounding area and with existing approvals and therefore it's unlikely that there will be public objection.

### Rehabilitation Objectives

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The proposed underground extension will not result in a change to the Millennium Mine's four general rehabilitation goals and associated objectives, listed below, for areas disturbed by mining:

- Safe: All rehabilitation to be safe to all humans, livestock and wildlife.
- Non-Polluting: All potential contaminants to be contained on site.
- Stable: Landform design and construction to minimise the potential for erosion.
- Sustainable: Completion of rehabilitation to meet landform design criteria.

### Rehabilitation Methodology

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Given the nature of the proposed mining operation there will be negligible impact from subsidence to the surface; therefore, rehabilitation activities are minimal. The surface area will be monitored for potential impacts to land but overall, no active rehabilitation activities will be undertaken at the surface.

When mining has ceased, contaminated material/machinery will be removed from the underground workings, the portal will be sealed and the underground workings will be able to fill. A specific portal decommissioning strategy will be developed prior to underground mining ceasing in the area.

There is significant existing rehabilitation already in place at Millennium Mine. The majority of the waste rock dumps have been successfully rehabilitated to a grazing native vegetation land use.

At the end of mine life, power and other services will be disconnected, and all infrastructure will be removed. Final earthworks and shaping will then occur to blend with the existing landform. There will be no change as a result of the proposed Mavis South Underground area.

### **Progressive Rehabilitation**

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As stated above there will be very little rehabilitation required for the Mavis South underground due to the proposed method of mining. The rehabilitation that does need to occur for the removal of underground infrastructure and sealing of the portal can only occur once mining has ceased. The surface area will be monitored for any subsidence impacts, although unlikely to occur, and rehabilitation actions will be taken where required.

### **Interaction with PRCP**

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A Transition Notice for a PRC Plan was received 14 March 2022. A PRC Plan for Millennium Mine is due to the administering authority by December 2023. The PRC Plan submitted will not include the Mavis South project as it's unlikely to be approved prior to the submission date. The PRC Plan will be updated to include the Mavis South project once the EA Amendment is approved.

#### **7.2.4 Environmental relevant activities**

No new ERAs will be introduced with the Project area.

**Table 14** outlines prescribed environmental relevant activities (ERAs), as identified in Schedule 2 of the Environmental Protection Regulation 2019, along with associated thresholds which are also undertaken at Millennium Mine as ancillary activities.

**TABLE 2: PRESCRIBED ERAS AUTHORISED UNDER EA EPML00819213**

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<b>Prescribed ERA</b>	<b>Description</b>
Schedule 3.13	Mining black coal
Schedule 3 09:	A mining activity involving drilling, costeaning, pitting or carrying out geological surveys causing significant disturbance

Prescribed ERA	Description
Ancillary 07 Chemical manufacturing	Manufacturing, in a year, a total of 200t or more of any of the following (d) explosives
Ancillary 08 Chemical storage 3	Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)
Ancillary 60 Waste disposal	Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(b) (d) more than 10,000t but not more than 20,000t
Ancillary 63 Sewage treatment	Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (a-ii) 21 to 100EP otherwise

### 7.2.5 Notifiable activities

No new notifiable activities will be introduced with the inclusion of the Mavis South Underground mining operation.

### 7.2.6 Workforce

The Millennium Mine current operation, including the proposed Project, has approximately 139 Full Time Equivalent (FTE) employees/ contractors for operation. No additional personnel is proposed for the Mavis South Underground Project.

Millennium Mine employees include 33% site-based employees living in the local community, while 44% live in the region and drive in and out (DIDO) of Moranbah and a further 22% live elsewhere in Queensland and fly in and out (FIFO).

Local and regional communities are also supported through using contractors and suppliers based in the region. The proposed Mavis South Underground Project will enable continuation of local and regional economic growth through local and regional employment and procurement.

### 7.3 SUBSIDENCE

A subsidence assessment was undertaken by Gordon Geotechniques Pty Ltd (GGPL) and is presented in **Appendix B**.

The Mavis South Underground area is an extension to the approved Mavis Downs underground area and would use the existing infrastructure to mine the Leichhardt Seam (**Figure 5**). GGPL previously completed a subsidence assessment for the Mavis Downs underground in 2021 and this assessment was also peer reviewed by Byrnes Geotechnical (2021). The same assessment methodology has been applied to the Mavis South underground area.

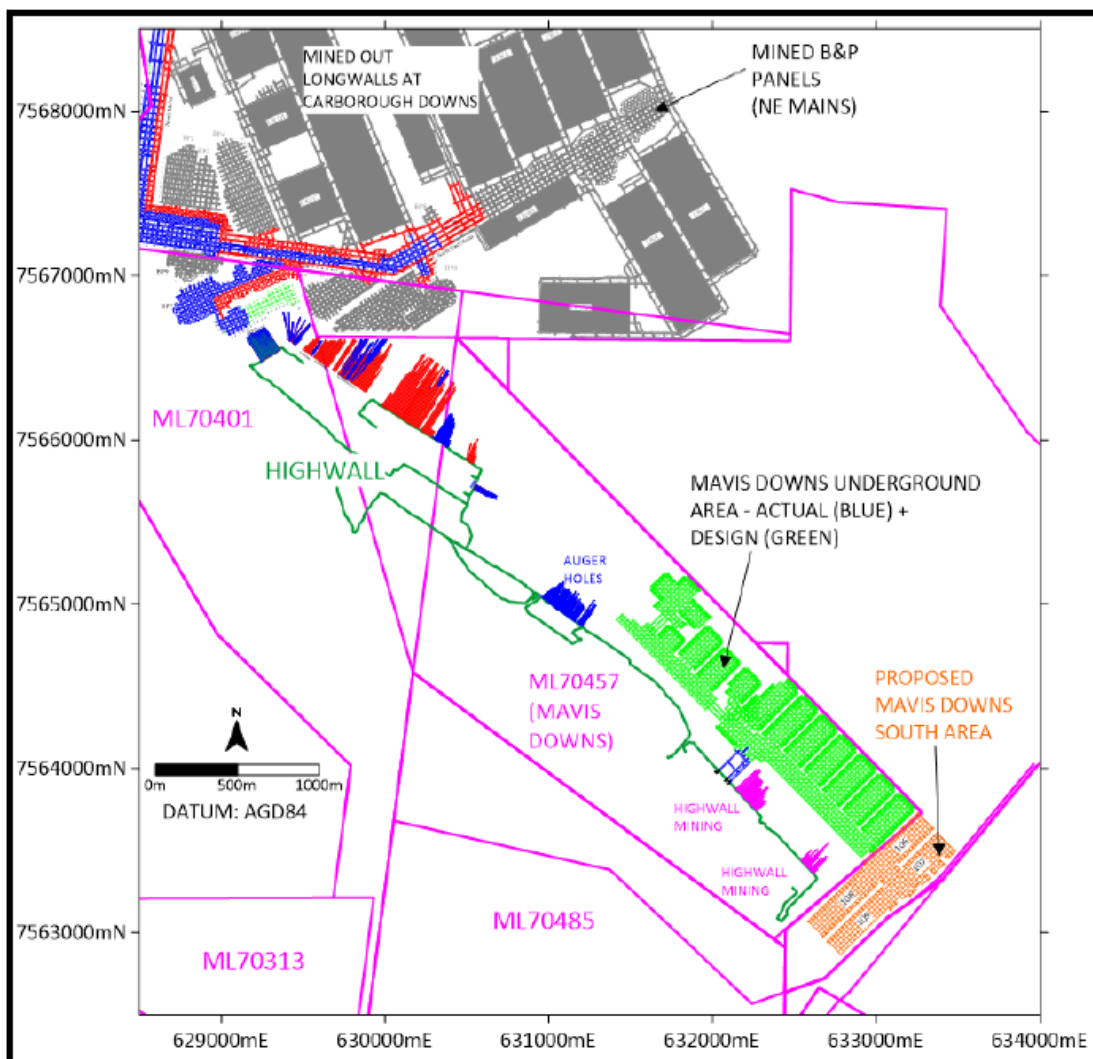


FIGURE 5: LOCATION PLAN (GGPL 2023)

The GGPL assessment included prediction of the subsidence and an assessment of the subsidence effects for the proposed Project bord and pillar area.

### 7.3.1 Method

A subsidence assessment using a compression analysis of the roof, floor and coal for the proposed bord and pillar mine layout (106-109 Panels and 100 Mains) and mining method (**Figure 5**).

- Comparison of the mining methodology and geology in the Mavis Downs South area to other bord and pillar mines.
- Review of the geological model to identify any very weak units in the floor that may lead to bearing capacity failure below the coal pillars.
- Detailed description of the subsidence prediction methodology and any associated limitations and limits of accuracy.
- Discussion on the surface and subsurface subsidence effects based on the assumption that there will be no significant surface subsidence and no surface/subsurface cracking.
- Review of the potential for the formation of sinkholes

### 7.3.2 Results

GGPL's assessment findings is shown in **Appendix B**, which presents the following key conclusions:

- The nature of the mining method generating only elastic compression of the strata indicates that sub-surface cracking in the overburden above the proposed Mavis Downs South underground area is not expected.
- Due to the low levels of subsidence and associated strains and tilts, no surface cracking is predicted above the Mavis Downs South underground area. This is consistent at other comparable bord and pillar mines in Queensland and NSW.
- Due to the nature of the bord and pillar mining method, low levels of subsidence, of less than 50 mm, are predicted in the Mavis Downs South area as a result of elastic compression of the strata. This magnitude of subsidence is less than the natural ground movements of up to 50 mm or more that can occur (IESC, 2015). The low levels of subsidence are not anticipated to extend outside the mining lease.
- The formation of significant depressions in the surface topography, where ponding of the surface drainage may occur, are not anticipated in the Mavis Downs South underground area due to the predicted low levels of subsidence. This is also consistent with other comparable bord and pillar mines in Queensland and NSW, where ponding has not been observed.
- Based on mining experience at other bord and pillar mines, the risk of sinkhole subsidence occurring in the Mavis Downs South underground area,



where the depth of cover is greater than 60 m, is considered to be without known precedent.

## 8. ASSESSMENT OF ENVIRONMENTAL VALUES

Specialist environmental impact assessment was undertaken by the following consultants and are provided in full in the following appendices:

- **Appendix C: Surface water** – KCB Australia. This included technical reports on both State and Commonwealth impact assessment guidelines.
- **Appendix D: Groundwater** – SLR Consulting. This included technical reports on both State and Commonwealth impact assessment guidelines. In addition, an Underground Water Impact Report was developed for the Project.
- **Appendix E: Air Quality** – SLR Consulting. A Greenhouse Gas Assessment – SLR Consulting was also undertaken.
- **Appendix F: Acoustics** – SLR Consulting.
- **Appendix G: Terrestrial Ecology**. This included technical reports on both State and Commonwealth impact assessment guidelines.

To assess concurrent operations at Millennium Mine, as a worst-case assessment approach, inclusion of approved Millennium open cut A-Pit North and A-Pit South (2023) has been assessed. It is noted that technically these scenarios may not line up with the mine schedule at the time of operations, however it provides a worst case model/assessment approach and the predictions should be considered to be conservative.

## 8.1 SURFACE WATER

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KCB Australia Pt Ltd (KCB) was engaged by MetRes Pty Ltd (MetRes) to conduct a review of potential changes to the water resource environment as a result of the proposed Project.

Refer to the **Appendix C** for full detail of the surface water resource assessment.

### 8.1.1 Drainage network

Millennium Mine is in the Upper Isaac River catchment (part of the Isaac and Connors River catchment) within the Fitzroy River basin. There is relatively little water resources development in the Isaac River Basin. The only significant water retaining structure in the catchment is Burton Gorge Dam, which is on the Isaac River approximately 45 km to the north of the Millennium Mine.

The Fitzroy River Basin is the second largest externally drained basin in Australia and the largest on the east coast. Covering an area of 150,000 km<sup>2</sup>, the basin contains several significant tributaries, including the Nogoa, Comet, Mackenzie, and Dawson Rivers. The basin discharges into the Coral Sea east of Rockhampton.

Key watercourses (as shown in **Figure 6**) within the vicinity of Millennium Mine include New Chum Creek, North Creek and West Creek.

Most of Millennium Mine lies in the headwaters of New Chum Creek (stream order 2), a south-flowing tributary of the Isaac River (stream order 6). New Chum Creek has a catchment area of approximately 51 km<sup>2</sup> at the Isaac River confluence.

The north-eastern portion of Millennium Mine drains into headwater tributaries of North Creek, a major south-flowing tributary which joins the Isaac River approximately 15 km downstream of New Chum Creek. North Creek has a total catchment area of approximately 338 km<sup>2</sup> at the Isaac River confluence.

The Mavis South underground extension has a total surface area footprint of 0.697km<sup>2</sup>, of which 0.2km<sup>2</sup> drains towards New Chum Creek. The balance of area flows towards North Creek, which eventually joins New Chum Creek downstream of the site. The portion of the underground extension which drains towards New Chum Creek is 0.4% of the total catchment area. The portion of the surface footprint for the underground extension which drains towards North Creek is 0.2% of the total catchment area.



The Directory of Important Wetlands in Australia (Department of Climate Change, Energy, the Environment and Water 2021) has no nationally important wetlands near MCM and the Mavis South underground extension area.

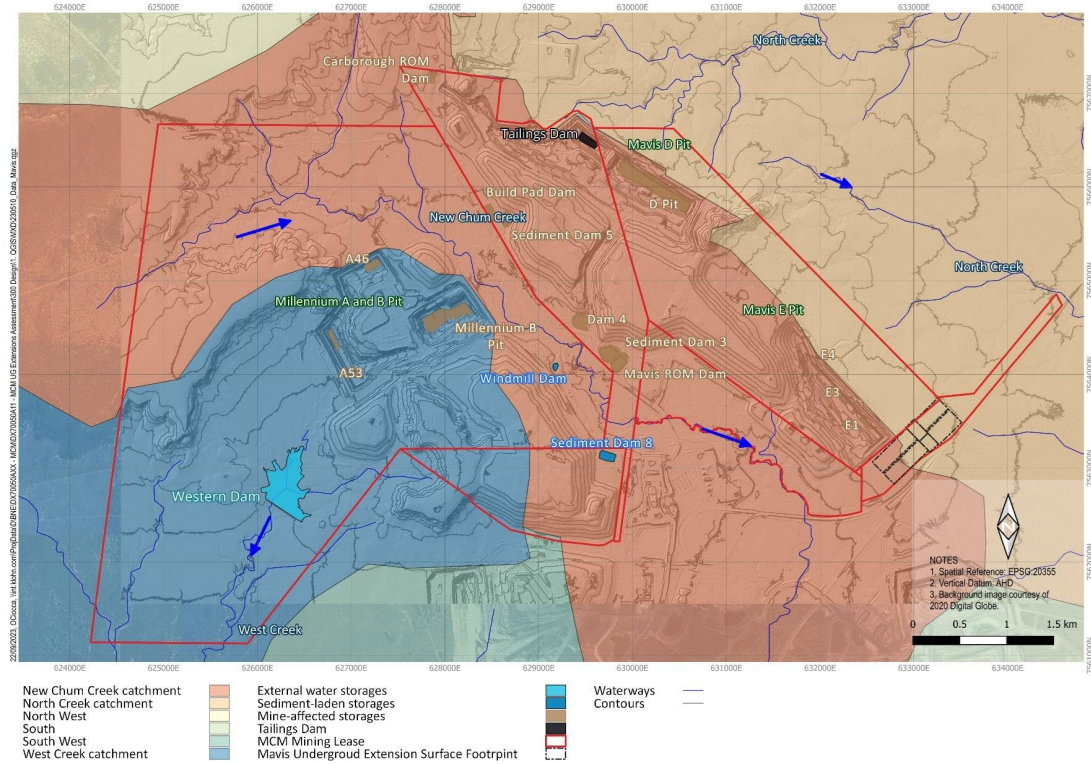


FIGURE 6 MILLENNIUM MINE SURFACE CATCHMENT DELINEATION (KCB, 2023)

### 8.1.2 Flow

Surface water flow can be classified into three regimes: permanent, semi-permanent, and ephemeral based on Kennard et al. (2010):

- **Permanent:** stream discharge persists during both high rainfall (typically summer wet season) and low rainfall (typically winter dry season) periods. During drought years, some cease to flow periods may occur, however non-flowing, connected pools will persist throughout the waterway channel.
- **Semi-permanent:** watercourse that contains water for more than 70% of the time on average. These watercourses experience high discharges during heavy rainfall periods (i.e., summer wet season), however are typically reduced to a series of disconnected, non-flowing series of pools during the dry season.
- **Ephemeral:** these watercourses will typically only experience surface water flow during or immediately after heavy or sustained rainfall events (i.e., summer wet season). Following periods of flow surface water will persist in

the form of non-flowing, disconnected pools separated by dry / exposed stream bed. Surface water (flowing or non-flowing) is only present for a small part of the hydrological cycle.

Watercourses within the vicinity of Millennium Mine and the proposed Mavis South underground extension area (i.e., New Chum Creek, North Creek, and West Creek) are ephemeral. This is likely a consequence of the catchments being in the upper most reaches with limited runoff area;

- the non-uniform rainfall during the year; and
- that there doesn't appear to be any springs which feed the creeks.

There are no Queensland Government surface water flow gauges within the vicinity of Millennium Mine and the proposed Mavis South underground extension area, with the closest open gauge located on Isaac River at Deverill (13041A). However, site owned and operated gauging stations are located on New Chum Creek upstream and downstream of Millennium Mine. For the period of record available (i.e., January 2012 to July 2022), the maximum instantaneous discharge recorded at the gauges were:

- New Chum Creek upstream: 29 m<sup>3</sup>/s in February 2016; and
- New Chum Creek downstream: 46 m<sup>3</sup>/s also in February 2016.

The flow duration relationship at the New Chum Creek upstream and downstream gauging stations from January 2012 to July 2022 is presented in **Figure 7**.

Review of **Figure 7** confirms that flow in the creek is ephemeral at both gauging stations, with New Chum Creek only flowing around 3% to 7% of the time.

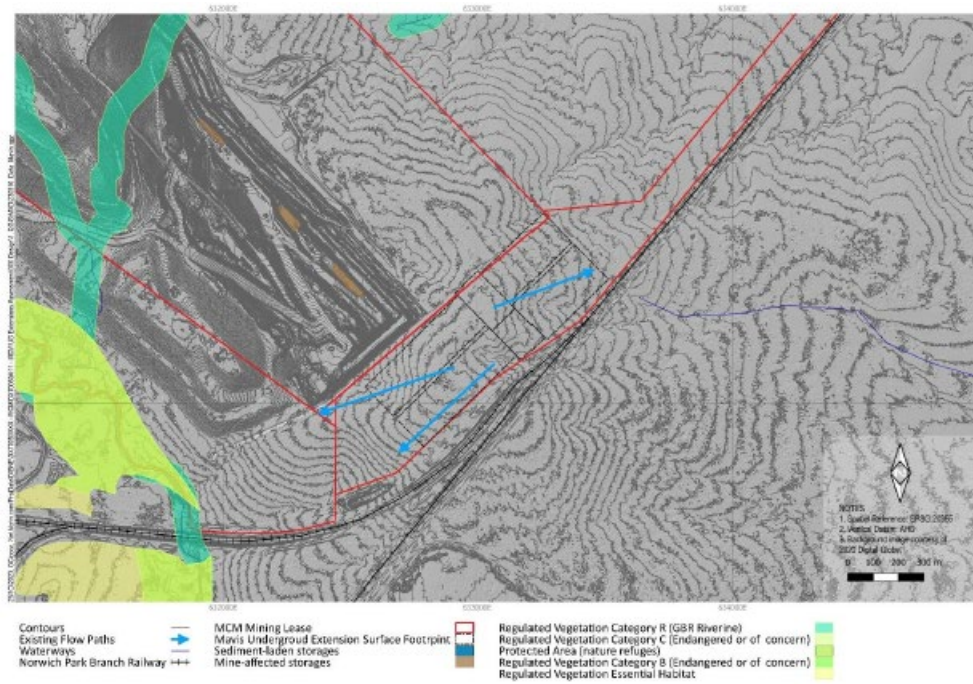


FIGURE 7: FLOW DURATION (KCB, 2023)

### 8.1.3 Geomorphology

New Chum Creek is characterised by a sandy bed channel incised within a wide floodplain. The main channel typically has a base width of approximately 3m, a depth of 2m, and bank slopes of approximately 1V:2H. The channel has capacity to convey flows up to the 50% annual exceedance probability (AEP) before significant overbank flow occurs. The banks appear stable and are well covered by trees and grass. The bed material is coarse sand. Some waterholes persist in the channel for several weeks following rainfall, however, the stream is ephemeral, and there is little aquatic vegetation.

The floodplain area is vegetated by scattered trees. The floodplain also contains several remnant channels of similar dimensions to the main channel.

### 8.1.4 Flood regime

Floodplain mapping is presented in **Figure 8** with the Queensland Floodplain Assessment Overlay (QFAO) identifying areas potentially at threat of inundation by flooding for a 1% AEP.

Flood modelling mapping are available through Queensland Globe (State of Queensland 2021a) and indicate that flooding does not occur near Millennium Mine and the proposed Mavis South underground extension.



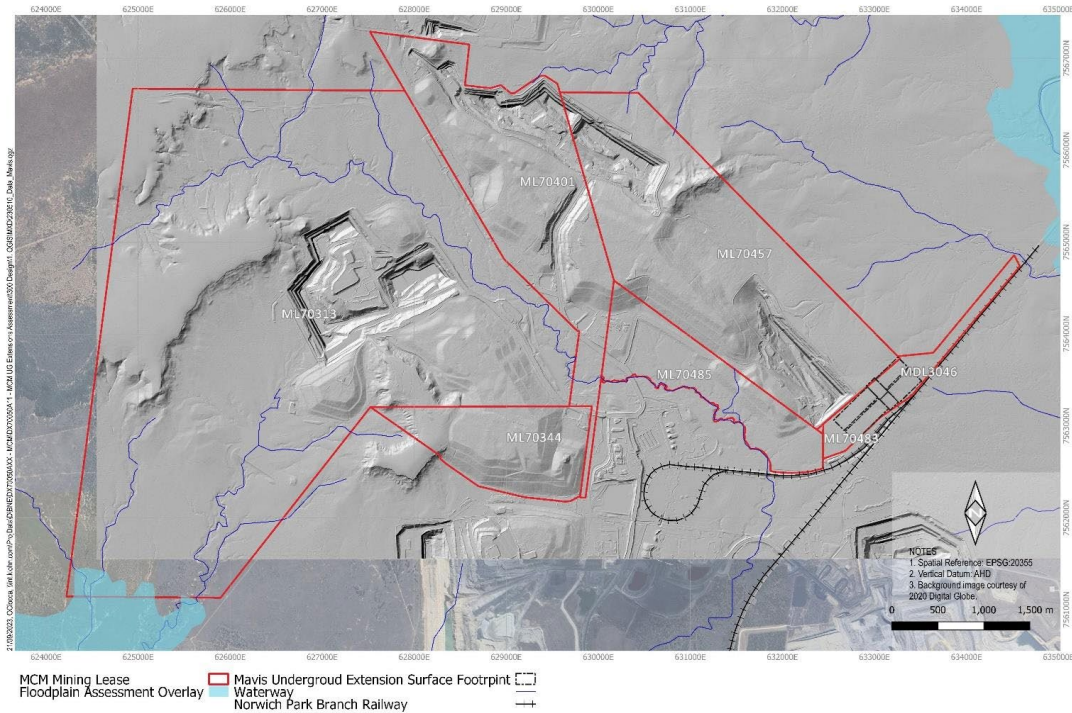


FIGURE 8: EXTENT OF FLOODPLAIN AREAS (KCB, 2023)

### 8.1.5 Water users

Under the Fitzroy Basin ROP (State of Queensland 2015), creeks within the vicinity of Millennium Mine and the proposed Mavis South underground extension area are within the Isaac and Connors River catchment area on the Fitzroy Basin. The site is not within a water management area or water allocation ground. There are no resource operations licence holders in the vicinity of the proposed Mavis South underground extension.

The downstream receiving waters do not include potable or irrigation water supply systems or National or State Parks within 100 km of MCM and the proposed Mavis South underground extension. The downstream users of the waterways that flow through MCM are predominantly graziers and other mining operations.

### Water Management

Millennium Mine has an established water management system operated in accordance with the site’s water management plan (WMP) and manages the five types of water generated at Millennium Mine, including external water, mine-affected water, groundwater, sediment-laden water, and unimpacted water.

As detailed in Section 2, the Mavis South underground extension builds upon the existing Mavis underground mining operations within the Mavis E Pit and focusses on the management and impact of the extension on surface water, including mine-affected, sediment-laden and unimpacted water.

In accordance with the Millennium WMP, the general principles to manage surface water at Millennium Mine are:

1. The separation of mine-affected water, sediment-laden water and unimpacted water.
2. Collect and contain on site potential mine-affected water in dedicated mine-affected water storages with mine-affected water storages used as the primary water source for coal processing at Red Mountain Infrastructure (RMI) CHPP and for dust suppression.
3. Collect and treat surface water runoff in a manner in accordance with the site ESCP.
4. Use onsite water to reduce the need for importing external water.

### **8.1.6 Existing surface water drainage conditions**

#### *Unimpacted and sediment-laden water management*

Unimpacted water to the north of the Mavis E Pit highwall is captured by a drain which discharged north to north creek. Unimpacted water to the east of the Mavis E Pit highwall (i.e., surface above the proposed Mavis South underground extension) is either captured by a drain along the eastern highwall and discharged to New Chum Creek or flows overland to North Creek.

#### *Mine-affected water management*

Mine-affected water from the existing Mavis E Pit underground operations is currently pumped to E1, E3 and E4 sumps located in the Mavis E Pit. These sumps also pick up rainfall/runoff from within the in-pit area. From here, mine-affected water is pumped directly to Mavis ROM Dam and onto Millennium B Pit, which is MCM's primary mine-affected water storage. In accordance with water management system principles, from Millennium B Pit this mine-affected water is used for:

- dust suppression;
- coal processing water; and
- supply of third-party water transfer agreements between MCM and Moorvale South, Daunia, and Isaac Downs.

This existing mine-affected water management system will be used to capture and manage mine-affected water from the proposed Mavis South underground extension.

### 8.1.7 Impact assessment

#### *Total site water*

In the WBM (KCB, 2023), the total site water inventory is defined as the volume of water in the following storages and mining pits:

- mine-affected water storages: Millennium B Pit, D Pit, Mavis ROM Dam, Carborough ROM Dam, Build Pad Dam, Sediment Dams 3 and 5, Dam 4, and Mavis E Pit sumps (E1, E3 and E4);
- sediment-laden water storages: Sediment Dam 8;
- external water storages: Western Dam; and
- mining pits: Millennium A Pit (A46 and A53).

The proposed Mavis South underground extension is not expected to require augmentation of the water management system because of the proposed Mavis South underground extension (i.e., total site inventory expected to be captured and managed within the existing water management system infrastructure).

The expected performance of the current water management system up to the end of May 2025 (i.e., no proposed Mavis South underground extension) has also been assessed by review of the modelled site water inventory and containment of this inventory within the existing water management system infrastructure. Modelled site water inventory is presented in **Appendix C** (KCB, 2023), with the performance of the total site inventory expected to remain within the targeted and normal operating zone and be contained within existing mine-affected water storages under all climate conditions modelled.

In comparison with the total site water inventory profiles developed including the proposed Mavis South underground extension, there is minimal difference in the expected wet, average, and dry climatic inventories. This is consistent with the minimal change expected to the water management system because of the proposed Mavis South underground extension (i.e., continuation of the existing underground operation and associated raw water demands and mine-affected water returns).

The ability to model trends and responses of the MCM water management system is a function of the WBM configuration, input parameters and background assumptions. Definition and documentation of the WBM is important to allow

interpretation and use of the model in line with the purpose for which it has been developed. Given the dynamic nature of mining at Millennium Mine, it is recommended that the MCM WBM be reviewed and updated to take into consideration the changes to the water management system proposed for the future expansions (i.e., A Pit south and north and the proposed Mavis South underground extension) as needed.

### **8.1.8 Conclusions**

The existing water management system at Millennium Mine is designed to manage surface water and is operated in accordance with the site's EA. Based on KCB's review of the proposed Mavis South underground extension layout and water balance modelling for the extension, the proposed extension is not expected to impact the existing water management system or downstream environment. Key outcomes of the high-level surface water impact assessment are:

Mavis South underground extension:

- Proposed Mavis South underground extension area is outside of the EA approved disturbance area (i.e., Condition A2).
- Additional ROM coal extracted from the A Pit south and north extension areas, combined with the proposed Mavis underground operation, is expected to be within the EA approved 5.5 Mtpa extraction (i.e., Condition A2).

Surface water management (above Mavis South underground extension):

- Based on current subsidence monitoring of the surface above the approved Mavis underground extension (< 50 mm), minor subsidence may be expected in the surface above the proposed Mavis South underground extension. This minor subsidence is not anticipated to impact the existing surface water flow paths on the surface above the proposed Mavis South underground extension. Continued subsidence monitoring during the underground operations is recommended (with key areas of interest along the eastern highwall drain and MDL3046 boundary in the railway corridor).
- There are no other changes planned for the surface footprint for the Mavis South underground, so no other impacts to surface runoff from this area is expected.

Mine-affected water management:

- The proposed Mavis South underground extension is a continuation of existing mining operations that extend the life of mine but does not



inherently change the water balance for the operation, with modelling showing no increased risk of overflow (i.e., capacity within the existing mine-affected water storages to contain the forecasted inventories under all climatic conditions).



## 8.2 GROUNDWATER

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SLR Consulting Australia Pty Ltd (SLR) was engaged by MetRes Pty Ltd (MetRes) to conduct a review of potential changes to the groundwater environment as a result of the proposed Project.

Refer to the **Appendix D** for full detail of the Groundwater Impact Assessment (GIA).

### 8.2.1 Previous groundwater assessment

The main sources of information were the Groundwater Impact Assessment (MatrixPlus, 2010) prepared for the Millennium Expansion Project (MEP) EIS (Peabody, 2010) as well as the Groundwater Impact Assessment for the Millennium Mine Mavis Underground operation (SLR, 2021).

The conceptualisation of the groundwater system has used the work done by SLR (2021) and has been updated with newly available data acquired at the Project since the time of that report.

In addition to publicly available and Project specific information and data, this groundwater assessment has been prepared utilising information and data collected and collated as part of recent groundwater assessments for the nearby Winchester South Project (SLR, 2020), Moorvale South Project (SLR, 2019a), Eagle Downs Mine (SLR, 2019b), and Olive Downs Project (HydroSimulations, 2018). MetRes has established groundwater data sharing agreements with the owners of each of these projects/mines, which allows for the sharing of groundwater data, models, and documentation. Under these agreements, data utilised as part of each mine's groundwater assessment has been incorporated into this groundwater assessment where relevant.

### 8.2.2 Conceptual Groundwater Model

A conceptual model of the groundwater regime has been developed based on review of the available hydrogeological data for the Millennium and Mavis area and surrounds.

Geologically the Millennium Mine is in the Collinsville Shelf, part of the wider Bowen Basin, a foreland sedimentary basin formed along the eastern side of Australia during the Permian Period. The geology is comprised of Permian-aged Rewan Group overlying Rangal Coal Measures. Both formations are comprised of interbedded sequences of siltstone, sandstone, shale, and coal. Younger Cretaceous intrusive volcanics are also locally mapped in the region. The Project

will target the economic seams in the Rangal Coal Measures as do the majority of coal exploration in the area.

A schematic of the conceptual groundwater model is provided in **Figure 9**.

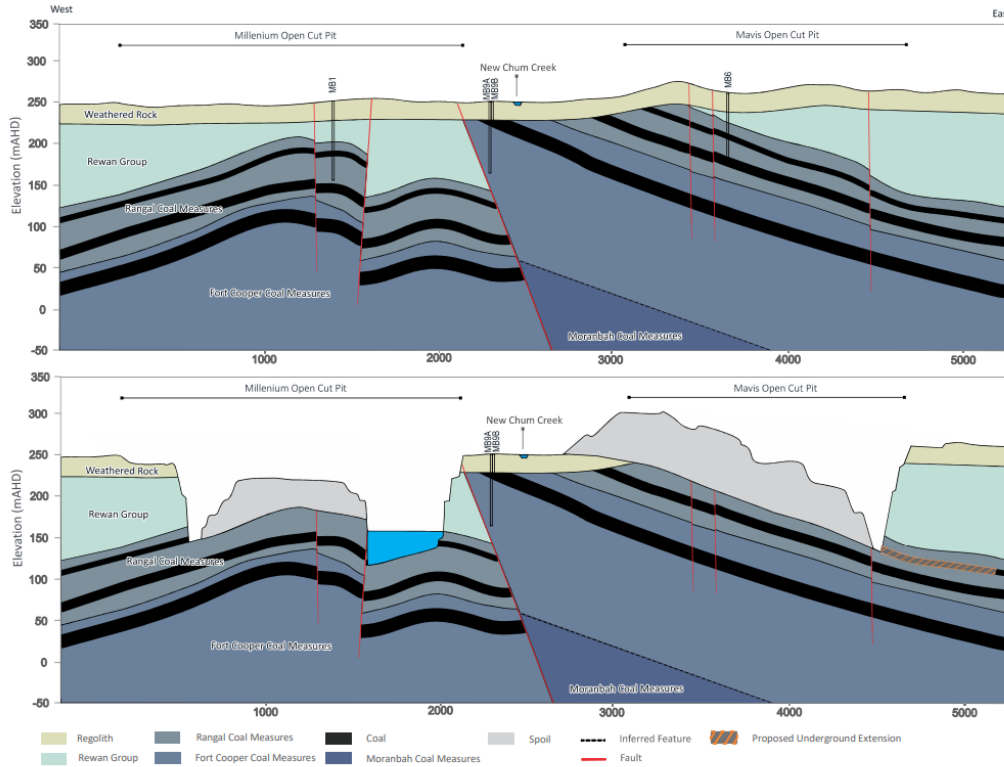


FIGURE 9: CONCEPTUAL MODEL OF THE MILLENNIUM MINE (SLR, 2021)

The main hydrostratigraphic units in the vicinity of the Project are:

- The Quaternary alluvial sand of the Isaac River Alluvium, located along Isaac River and New Chum Creek. These are predominantly recharged by rainfall and stream flow infiltration during high streamflow events. Typically, they are high-yielding aquifers (albeit of limited areal extent and depth).
- Quaternary/ Tertiary alluvial and colluvial sediments, an unconfined perched aquifer that is predominantly recharged by rainfall.
- Permian Rangal Coal Measures (RCM) – a semi-confined to confined aquifer with most groundwater flow occurring through the higher permeability coal seam layers. Predominantly recharged through rainfall where the deposit outcrops at surface, or by leakage from alluvium. The siltstones and sandstones that make up the majority of the interburden are considered to act as confining layers, due to their low permeabilities. This unit is historically

mined and will continue to be mined as part of the proposed underground mine.

### **8.2.3 Groundwater Occurrence and Flow**

#### *Isaac River Alluvium*

The Quaternary Isaac River Alluvium consists of a heterogeneous distribution of fine to coarse grained sand, interspersed with clay and gravel lenses. These Quaternary sediments are not present over the Project extent, but instead are associated with Isaac River, 4 km to the south-west and North Creek tributary, 2.5 km to the west.

Limited information is available in terms of the unconsolidated, surficial aquifers in the region surrounding the Project. Currently no monitoring bores are installed directly into the Quaternary Alluvium at Millennium Mine. Based on work done by SLR (2019) for the Moorvale South Project, groundwater elevations along the Isaac River to the south-west of the Project, range between 162 mAHD and 167 mAHD, equating to around 10 to 17 mbgl and follow the south-easterly flow direction of the Isaac River. Higher groundwater elevations are recorded in bores positioned closest to the surface watercourses of Isaac River and New Chum Creek, indicating a losing river system.

It is noted in SLR (2019a), that there is a general lack of response of groundwater levels to rainfall trends in the Quaternary Alluvium, which may either relate to the presence of surficial clays restricting groundwater recharge, or that the amount of rainfall is generally not sufficient to wet the unsaturated zone as well as providing vertical groundwater flow towards the water table. Groundwater monitoring also suggests limited rainfall recharge to the alluvium, with groundwater levels only responding slightly to the above average rainfall conditions in 2021. In comparison, water levels monitored for the Caval Ridge Mine Horse Pit Extension (SLR, 2021) and Winchester South (SLR, 2020) groundwater assessments suggest that the alluvial levels show a stronger correlation to rainfall; this may indicate the absence or reduction of clay in the shallow subsurface at these downgradient locations.

The alluvium is considered to behave as an unconfined aquifer, with recharge to the alluvial sediments predominantly occurring from leakage from the ephemeral Isaac River and New Chum Creeks during high rainfall and streamflow events. Direct rainfall recharge is likely to be heterogeneous over the areal extent of the alluvium, with limited recharge occurring where low permeability clay sediments are found at surface.

Geological logs indicate the alluvium is underlain by low hydraulic conductivity stratigraphy (i.e., claystone, siltstone, and sandstone), which likely restricts the rate

of downward leakage to underlying formations. Localised perched water tables within the alluvium are evident where waterbodies continue to hold water throughout the dry period (pools in the Isaac River and floodplain wetlands) occurring where clay layers slow the percolation of surface water. Where the Isaac River Alluvium is in direct contact with coal seams of the underlying Rangal Coal Measures, a level of hydraulic connection is expected between the two aquifers, with the alluvium likely discharging to the bedrock.

Although limited, available bore yield data suggest flows are highly variable within the alluvial deposits with maximum yields of 4 L/sec observed (MatrixPlus, 2010). However, the Isaac River Alluvium is not laterally or vertically extensive, and therefore, although high yielding, does not form a regionally significant aquifer in the area surrounding the Project. Prolonged, intensive groundwater extraction from this aquifer is unlikely to be sustainable, and excessive pumping is likely to impact significantly on groundwater drawdown across the aquifer.

#### *Other alluvial and colluvial deposits*

Quaternary/ Tertiary Alluvium is present close to the Project extent, associated with watercourses. No MetRes monitoring bores are installed directly into the Quaternary/ Tertiary alluvium. One third-party registered number (RN) bore 162550, is registered as monitoring “Quaternary Sediments” of a clayey silt to clayey sand composition and has time series water level data dating back to early 2016. This registered bore is located to the south of New Chum Creek and is approximately 40 m south of MetRes monitoring bores MB10A and MB10B (RN 162248 and RN 162249 respectively). The groundwater level in RN 162550 is approximately 10 mbgl.

The geological map associates RN 162550 with an isolated Tertiary/ Quaternary alluvial deposit, though it is currently unknown if this bore is screening true alluvium or weathered bedrock colluvium (of the underlying Fort Cooper Coal Measures). Either way, the bore indicates the presence of persistent groundwater in the shallow geology within the vicinity of the Project.

MB10A and MB10B both screen the Fort Cooper Coal Measures at depths of between 27 to 35 mbgl and 64 to 76 mbgl respectively. Given the apparent lack of impact from mining operations the groundwater occurrence in RN 162550 is likely a localised, perched system that is not in hydraulic connection with the deeper Fort Cooper Coal Measures aquifer. These deposits are not expected to form a significant aquifer in relation to the Project.

This Quaternary/ Tertiary Alluvium material comprises low hydraulic conductivity strata, which restricts rainfall recharge. This is shown by the general lack of response to climatic conditions in RN 162550. This is consistent with observations within

colluvial monitoring bores in the nearby Moorvale South and Winchester South project areas, where groundwater levels have remained relatively stable between June 2017 and February 2019, despite above average rainfall (although not substantial) from October to December 2017 and over February 2018. Like the Quaternary Alluvium, the lack of response in monitoring bores may also be due to rainfall being insufficient to wet the unsaturated zone above the water table as well as providing vertical groundwater flow towards the water table.

Groundwater discharge occurs primarily through evapotranspiration whilst vertical seepage through the regolith is limited by the underlying low hydraulic conductivity Rewan Group and interburden of the Permian Coal Measures.

#### *Tertiary Suttor and Duinga Formations*

The Suttor Formation and the Duinga Formation form the local Tertiary sediments, occurring to the north of the Project. These Formations are associated with the topographic high points to the north of the Project, reaching elevations of up to 350 mAHD. Small outcrops of this deposit are encountered to the west and adjacent north of the Project. Rainfall infiltration is expected through this deposit where there are no substantial clay/ claystone barriers in the subsurface.

Five monitoring bores are in this Formation. All five bores ceased monitoring at the end of 2017 with the sale and transfer of the Red Mountain Infrastructure mining lease to BHP. They show a variety of groundwater levels and responses. In the bores monitored since 2011 (MB3A, MB3B, and MB4) an increase in level is observed over the monitoring period with a weak correlation to the CRD and antecedent rainfall conditions, suggesting a level of confinement to this unit.

There are a limited number of registered bores within this hydrostratigraphic unit and therefore it is expected to be low yielding. Where bores exist, they are associated with the upper weathered zone where unconsolidated deposits are present at surface.

#### *Triassic Rewan Group*

The Rewan Group unit typically has a low permeability due to the abundance of mudstone and is likely to act as confining layer to the underlying Permian Coal Measures, though permeability may increase in areas where sandstone and conglomerate dominate the lithology. Due to the dominance of siltstone and sandstone in the vicinity of the Project, the permeability of the sediment may allow some recharge through the substrate.

MB8A is located within this unit, this bore has shown as historically dry and therefore the hydrogeology of this unit at the Project is unknown. From monitoring of this unit

at the nearby Olive Downs Project (8.5 km south of the Project), groundwater elevations in this Group are shown to be relatively stable with increases observed after heavy antecedent rainfall conditions (HydroSimulations, 2018). Groundwater elevations within the Rewan Group are above those recorded within the deeper Permian Coal Measures, indicating a downward hydraulic gradient from the Rewan Group, possibly a result of the depressurisation in the lower unit. The alluvial/colluvial groundwater levels are above the groundwater levels in the Rewan Group, indicating downward migration of groundwater, restricted by the local permeability of the Rewan Group.

#### *Permian Rangal Coal Measures*

The coal seams within the Rangal Coal Measures are typically considered the main aquifer units and may be significantly more permeable than the interburden material of interbedded mudstone, siltstone, and sandstone. Groundwater within these coal measures is considered confined and sub-artesian. The Permian coal seams are classified as a dual-porosity, dual-permeability medium with water stored and transmitted through both the primary matrix porosity and secondary fracture porosity. The hydraulic gradient within the Permian coal measures is primarily downward, however this gradient might reverse with increased depth of cover and pressure, coinciding with the observed decrease in hydraulic conductivity with depth. When groundwater levels are locally reduced in the coal seams due to mining, these interburden units will provide a source of water by vertical leakage into the depressurised coal seams.

Due to folding and faulting in the vicinity of the Project, the Rangal Coal Measures are found either cropping out at surface, at subcrop beneath alluvial deposits, or confined at depth by the Rewan Group. Recharge to these deposits will predominantly occur where the coal seams outcrop or subcrop, in the form of direct rainfall infiltration during high rainfall events when adequate saturation can occur (MatrixPlus, 2010). Additional recharge may occur to the alluvial deposits south of the Project, via leakage from the overlying Isaac River Alluvium and Tertiary deposits where it is in hydraulic connection with the Rangal Coal Measures. Discharge from this unit is dominated by evaporation and groundwater extraction from mining activities.

Groundwater monitoring is currently taking place within this unit at MB1, MB2, MB7, MB8B, and CS\_MB2. Since commencement of the water level record in 2011, a decline in water level is apparent in both MB2 and MB8B bores, attributable to local mining activity within the Rangal Coal Measures. The decline in MB1, located in the Millennium Pit, is not observed to the same extent in MB2, which lies outside of the

open cut pit. CS\_MB2 has observed a gradual rise and fall in water level from mid 2020 to mid 2023.

Based on regional studies, regional groundwater flow is to the east down-dip along coal bedding planes, consistent with local topography and western outcrop of coal seams between faults. Differences in piezometric heads within the confined coal seam aquifers of the Moranbah Coal Measures drive groundwater flow eastwards across the Bowen Basin, from the slightly more elevated subcrop areas on the western flank of the Basin to the less elevated subcrop areas on the eastern flank (GHD, 2017). The flow regime in the Rangal Coal Measures across the Project has been intercepted by mining, causing local flow towards the open cut pits.

The surrounding Permian overburden and interburden sequences typically comprise of low permeability claystones, mudstones, siltstones, and shales that are often confining in nature. Regionally, within the Bowen Basin the overburden/interburden is considered essentially impervious and acts as an aquitard, with exceptions occurring where significant faulting or jointing has occurred and are acting as conduits to flow (AGE, 2014). These lithologies can often provide localised supplies of variable, but typically low yielding and poor-quality, groundwater.

#### *Permian Fort Cooper Coal Measures*

Recharge to the Fort Cooper Coal Measures is predominantly through permeation of direct rainfall and stream flow infiltration from the ephemeral New Chum Creek during periods of high rainfall events where it outcrops at surface to the west of the Project.

Water levels in all bores, except MB9B, are showing slight long-term decline post 2018, which is likely commensurate with below average annual rainfall (downward sloping CRD trend) and in response to active mining and associated dewatering. This is followed by a rise corresponding to an upward trend in CRD from late 2022. This geology is not currently, or will be, dewatered, though depressurisation of the above coal seams in the Rangal Coal Measures may influence some loss of water from this unit. In contrast to other bores, MB9B shows a unique water level trend with an overall steady rise in water level over time. Bore MB9B shows a groundwater level recovery since observations started, including over the last five years, with the rate of increase slowing down over the last three years, and tending towards a plateau around 221 mAHD. A mining impact is likely; however, it relates to water level recovery rather than water level drawdown (SLR, 2023b).



#### **8.2.4 Groundwater- surface water interaction**

In central Queensland, highly seasonal rainfall results in intermittent stream flow, limited groundwater recharge, and deep groundwater tables. In this environment, the most appropriate way to assess surface water and groundwater interaction is by comparing stream stage elevation data to the underlying groundwater elevation in a nearby monitoring bore.

At Millennium Mine, the key surface water drainage feature is New Chum Creek. Limited alluvial sediments are associated with New Chum Creek; where these do exist, they form small, isolated pockets of deposit. A shallow groundwater table is observed within these deposits of approximately 10 mbgl, far below the base of the channel indicating limited hydraulic connection between groundwater and surface water of the New Chum Creek. In peak rainfall events when the channel flows some leakage of water to the underlying sediments to the water table is expected. In addition, scenario modelling completed by JBT Consulting (2015) to investigate changes in groundwater level beneath New Chum Creek due to changes in water level in the Southern Void, found that no scenario modelled resulted in interaction between the mine and New Chum Creek.

The Isaac River is the predominant surface water feature regionally; however, it is not considered local to the Project. Studies conducted on the Isaac River indicate that it functions as a losing system, with stream-stage above that of the local groundwater. Occasional periods of baseflow to the Isaac River from the underlying alluvium may occur after prolonged rainfall events or following flood events. Under these conditions, recharged alluvial sediments will drain to the Isaac River as the hydraulic gradient reverses and sustains streamflow for a short period after the rainfall event.

#### **8.2.5 Groundwater quality**

#### **8.2.6 Beneficial groundwater use**

The Project falls within Isaac Connors Groundwater Management Area (GMA – Zone 34) of the Fitzroy Basin under the Water Plan (Fitzroy Basin) 2011. Groundwater at the Project includes alluvial groundwater under GMA Groundwater Unit 1 and water within the hard rock aquifers in GMA Groundwater Unit 2 (sub-artesian aquifers). The management objective of the Water Plan (Fitzroy Basin) 2011 is to maintain the 20th, 50th, and 80th percentile water quality results in order to preserve or enhance groundwater quality for its recognised uses. In the case of Isaac groundwaters, these values include aquatic ecosystems, irrigation, farm supply/use, stock



watering, primary recreation, drinking water as well as being of cultural and spiritual value.

In order to understand the groundwater resources within the Study Area, available water quality data has been compared to the:

- Fitzroy Basin Zone 34 groundwater quality objectives for deep water;
- Australian Drinking Water Guidelines (ADWG) (NHMRC, 2011); and
- ANZECC (2000) guidelines for aquatic ecosystems, irrigation (long term and short term) and stock water supply.

Although groundwater in the vicinity of the Project Area may have some cultural and spiritual values, none were identified in the literature reviewed. In addition, primary recreation Environmental Values (EV) apply to water reservoirs and connected waterbodies. The lack of connectivity between groundwater and surface water within the study area means that the primary recreation EV is not relevant to groundwater for the Project. Consequently, the environmental values pertinent to groundwater in the vicinity of the Project are:

- ecosystems;
- irrigation; and
- stock water supply.

Applicable triggers for these environmental values are presented in further detail in SLR (2021). The following sections describe the main findings of the SLR (2021) assessment of on-site water quality against beneficial groundwater guideline values.

### **8.2.7 Groundwater Users**

#### *Groundwater Dependent Ecosystems*

Ecosystems that rely on groundwater to maintain their structure and function are classified as Groundwater Dependent Ecosystems (GDEs). The GDE Atlas developed BoM provides high level mapping for surface and sub-surface GDEs, based on national-scale analysis and regional studies. The Atlas contains information about three types of ecosystems:

Terrestrial GDEs are ecosystems dependent on the sub-surface presence of groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their vegetation communities.

Aquatic GDEs are ecosystems that rely on the surface expression of groundwater. This includes surface water ecosystems which may have a groundwater

component, such as rivers, wetlands, and springs. Marine and estuarine ecosystems can also be groundwater dependent, however these are not mapped in the BoM Atlas.

Subterranean ecosystems, includes cave and aquifer ecosystems (stygo fauna).

The first two categories may overlap in riparian zones where vegetation may access groundwater in the subsurface but also via its surface expression during overbank flooding of streamflow sourced from baseflow.

A review of the Atlas has been undertaken and the findings relevant to the Project described in the following sections.

#### *Terrestrial GDEs*

Potential terrestrial GDE's have been identified both regionally and locally to the Project from national assessment, as shown on **Figure 10**. This data is not based on focused studies in the region and consequently comes with an inherent level of uncertainty.

For vegetation to access groundwater in the subsurface, the roots must be able to reach the capillary zone above the water table at some time during the plant's life cycle. A widely adopted rule of thumb is that vegetation use of groundwater is likely where depth-to-water (DTW) is 0 to 10 mbgl, possible at depths of 10 to 20 mbgl, and unlikely at depths of >20 mbgl (Doody, 2019). However, vegetation use of groundwater from greater depths should not be ruled out. Vegetation communities that are solely reliant on shallow soil moisture are not terrestrial GDEs. Those that access perched groundwater are terrestrial GDEs but may not be priority terrestrial GDEs for the purpose of this method if the perched groundwater is not connected to groundwater in the target formation(s).

Due to the combination of the saline nature and depth to groundwater in the local aquifers (Rangal Coal Measures and Fort Cooper Coal Measures) it is not thought likely that these aquifers are valuable resources for GDEs. Temporary perched aquifers present after high rainfall events (i.e., when flow is observed in the ephemeral waterways) in the surficial sediments may be responsible for servicing the water needs of terrestrial vegetation communities over a short period of time, consequently rendering them GDEs. However, given the lack of connection between these perched temporary groundwater systems and mining operations it is unlikely that any impact to GDEs would be incurred because of mining.

### *Aquatic Ecosystems*

Potential aquatic GDEs based on the BoM GDE Atlas are presented in Figure 10. High potential aquatic GDEs are associated with higher order streams, such as the Isaac River to the south-west of the Project. Given the disconnect between the Projects mining activities and these larger watercourses, the regional potential aquatic GDEs are not considered dependent on or related to mining activities.

Wetlands of high ecological significance within a 50 km radius of the Project. Minor wetlands are evident to the south-east of the Project (Figure 10).

### *Subterranean GDEs*

GDE aquifers have the potential to support subterranean fauna (stygo fauna). It is expected that the potential for aquifers in the Project Area to support high stygo fauna diversity are low. This is due to salinity levels in the vicinity of the Project being high, shown by elevated EC values above 5,000  $\mu\text{S}/\text{cm}$ . According to Hancock and Boulton (2008), most stygo fauna collected from alluvial aquifers in New South Wales and Queensland prefer salinities less than 5,000  $\mu\text{S}/\text{cm}$ . Hose et al. (2015) reported that the salinity range for aquifers in the Bowen Basin that yielded stygo fauna was 342  $\mu\text{S}/\text{cm}$  to 9,975  $\mu\text{S}/\text{cm}$  (Hose et al., 2015). The GDE atlas indicates no occurrence of potential subterranean GDEs in or around the Project site.

### *Springs*

A spring vent is a point where there is a surface expression of groundwater, with groundwater flow occurring intermittently or continuously. The Queensland Government maintains an inventory of identified springs in the Queensland Springs Database (DES, 2019). No springs have been identified within the Project area within a 50 km radius of the Project.

A search of the EPBC Act 'Protected Matters' database (DEE, 2019) found that there are no Internationally or Nationally Important Wetlands within the Project area. The closest wetlands of international importance are located approximately 190 km south-east of the Project and include those of the Shoalwater and Corio Bays Area. Lake Elphinstone is the closest nationally important wetland, located 50 km north (upstream) of the Project. Due to their distance from site, no internationally and nationally important wetlands will be impacted by the Project.

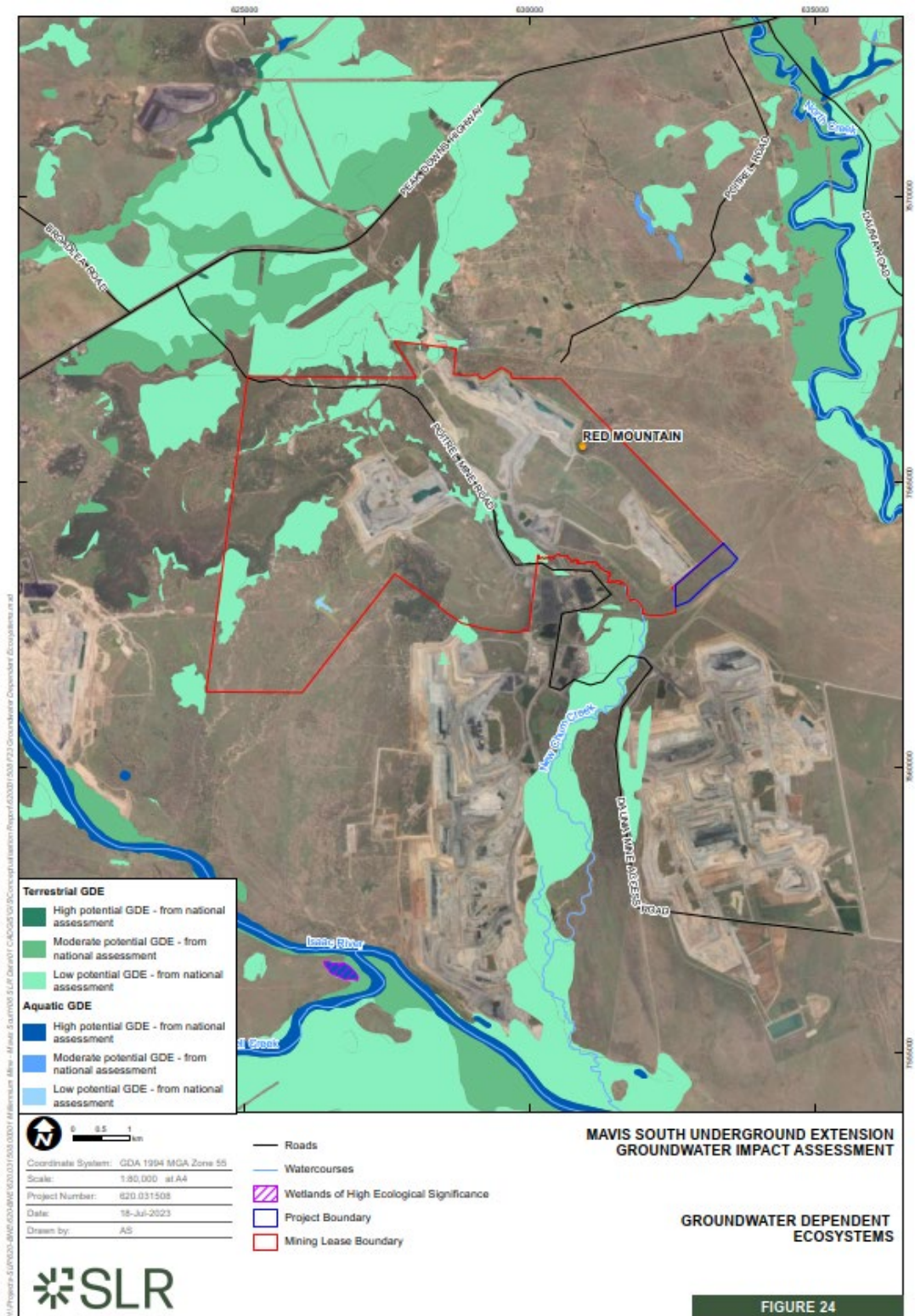


FIGURE 10: GROUNDWATER DEPENDENT ECOSYSTEMS

### 8.2.8 Groundwater Monitoring Program

A detailed outline of the current monitoring program is provided in **Appendix D** (SLR 2023a, Section 5).

The groundwater monitoring program at the Millennium Mine focuses on the adjacent Tertiary and Permian lithologies to identify changes and potential impacts from mining activity to these aquifers. Groundwater monitoring at the site commenced in 2011 with the installation of the initial suite of monitoring bores, which was extended in 2014 with further monitoring sites appended to the program.

A summary of historical and current monitoring bores is provided in **Table 15**, including provision of the monitoring data captured.

The groundwater monitoring bore network as per the current EA EPML00819213 allows for the compilation of groundwater monitoring data from the Rangal Coal Measures and Fort Cooper Coal Measures for the currently approved operations at Millennium. **Table 15** lists the groundwater monitoring bores specified in this EA with their location, depth, and monitored horizon.

One additional bore, CS-MB2 was agreed with DES to monitor drawdown impacts at Mavis Approved; this is located to the east of the Mavis Approved footprint. Therefore, with the addition of this bore to the monitoring network, it is envisaged that this existing monitoring network at Millennium Mine is sufficient to monitor impacts from the Project. This is due to the Project being a small extension of Mavis Approved and of only one-year in length. Therefore, no additional bores are recommended. It is recommended that groundwater monitoring according to the current EA EPML00819213 should continue for the duration of the Project.

**TABLE 3: MONITORING BORE NETWORK (SLR, 2023)**

Bore Name		Aquifer	Depth	Screen	WL data from:	WL Data to:	WQ data from:	WQ Data to:	Notes	Inclusion GW Monitoring Plan
			mBGL							
EA Monitoring Bore Network	MB2	Permian Rangal	90	72 - 90	Jan-11	Oct-20	Jan-11	Oct-20	Limited data prior 2013, SWL only after 2013	Quarterly SWL
	MB8A	FCCM - Sandstone	30	22 - 28	Jan-14	Oct-20	Jan-14	Oct-20	Bore dry, no data	Quarterly SWL & Quality





Bore Name	Aquifer	Depth	Screen	WL data from:	WL Data to:	WQ data from:	WQ Data to:	Notes	Inclusion GW Monitoring Plan	
		mBGL								
Historical Monitoring Bore Network	MB8B	FCCM - Coal	80	62 - 74	Jan-14	Oct-20	Jan-14	Oct-20	WQ 10/2020 only includes pH, EC, Temp, Desc	Quarterly SWL & Quality
	MB9A	FCCM - Coal	30	22 - 30	Jan-14	Oct-20	Jan-14	Oct-20	WQ 10/2020 only includes pH, EC, Temp, Desc	Quarterly SWL & Quality
	MB9B	FCCM - Sandstone	80	60 - 74	Jan-14	Oct-20	Jan-14	Oct-20	WQ 10/2020 only includes pH, EC, Temp, Desc	Quarterly SWL & Quality
	MB10A	FCCM - Coal	35	27 - 35	Jan-14	Oct-20	Jan-14	Oct-20	WQ 10/2020 only includes pH, EC, Temp, Desc	Quarterly SWL & Quality
	MB10B	FCCM - Sandstone	80	64 - 76	Jan-14	Oct-20	Jan-11	May-20	WQ 10/2020 only includes pH, EC, Temp, Desc	Quarterly SWL & Quality
	CS_MB2	RCM (coal)	170	161-164	May 2020	May 2023	N/A	N/A	No water quality measurements required	Quarterly SWL
Historical Monitoring Bore Network	MB1	Permian Rangal	96	78 - 96	Jan-11	May-20	Jan-11	May-20	Lost to mining end 2014	
	MB3A	Tertiary Sandstone	0	30 - 35	Jan-11	Nov-17	Jan-11	Nov-17	Monitoring ceased in 2017 with the sale of the RMI mining lease	
	MB3B	Tertiary Sandstone	0		Jan-11	Nov-17	Jan-11	Nov-17	Monitoring ceased in 2017	
	MB4	Tertiary Sandstone	0	30 - 35	Jan-11	Nov-17	Jan-11	Nov-17	Monitoring ceased in 2017	
	MB5		0		Jan-11	Nov-17	Jan-11	Nov-17	No monitoring bore infrastructure installed	
	MB6	Permian Rangal	78	66 - 78	NA	NA	NA	NA	Only one data point 04/2011	
	MB7		0		Jan-11	May-20	Jan-11	May-20	3 data points only, 2011 & 2014	



Bore Name	Aquifer	Depth	Screen	WL data from:	WL Data to:	WQ data from:	WQ Data to:	Notes	Inclusion GW Monitoring Plan
		mBGL							
MB11A	Tertiary Sandstone	0	30 - 35	Jan-14	Nov-17	Jan-11	Nov-17	None	
MB11B	Tertiary Sandstone	0		Jan-14	Nov-17	Jan-11	Nov-17	None	

### 8.2.9 Landholder bores

All registered bores in the vicinity of the Project are shown in Figure 11.

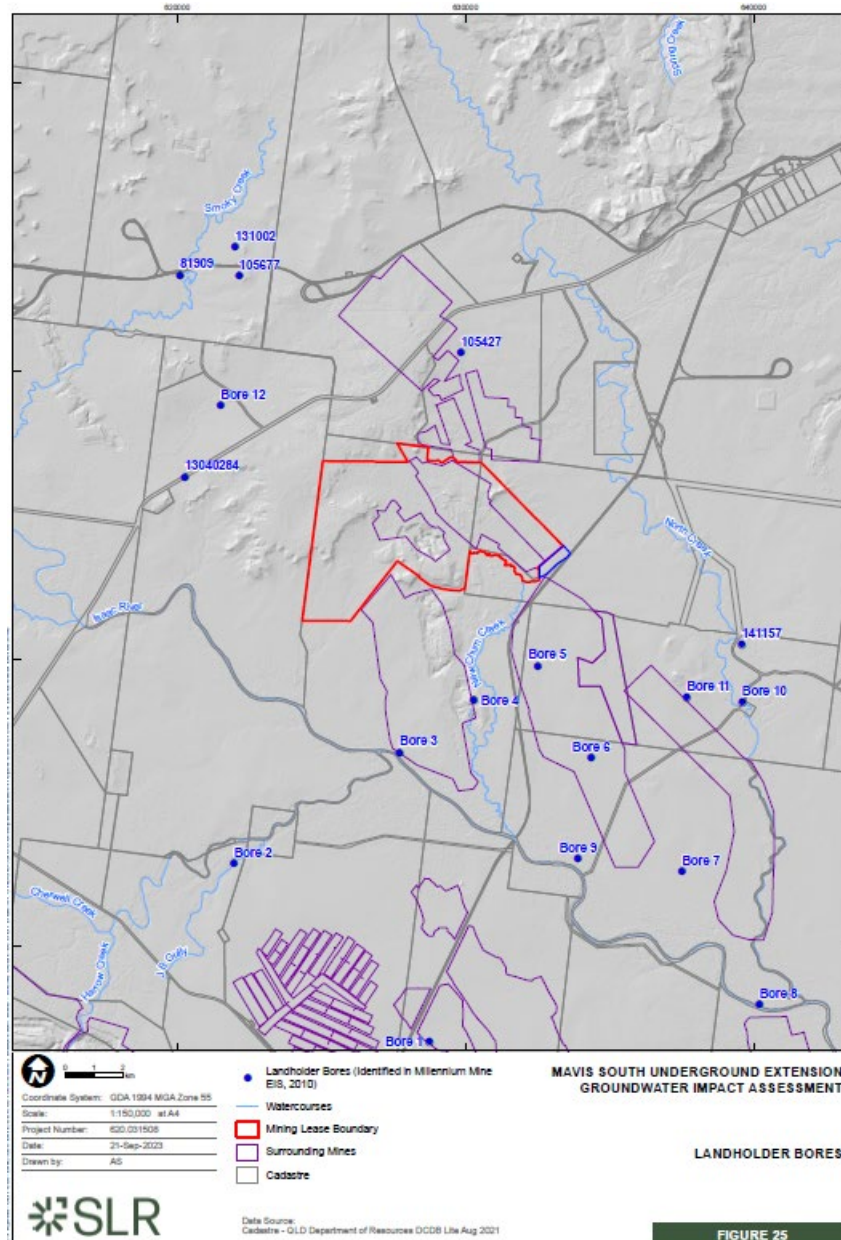


FIGURE 11: LANDHOLDER BORES

A survey of landholder bores has previously been undertaken as part of the Millennium Mine EIS (MatrixPlus, 2010) and included data from the public database run by the Department of Regional Development, Manufacturing and Water (DRDMW) as well as unregistered landholder bores in the vicinity of Millennium Mine, identified in the bore census undertaken for the Poitrel EIS (EPA, 2005). Details on bore construction and lithologies is limited for the unregistered landholder bores identified in the Poitrel EIS (EPA, 2005) bore census. Many of the landholder bores identified in the Millennium Mine EIS (MatrixPlus, 2010) have since been destroyed as a result of mining activity or are no longer utilised for water supply.



A summary of private bores identified in the Millennium Mine EIS (Matrix Plus, 2010) and their updated use status (as of 2023) is provided in **Table 16**. The updated landholder bore data suggests there is minimal use of groundwater surrounding the Project.

**TABLE 4: LANDHOLDER BORES (SLR, 2023)**

<b>RN</b>	<b>Drill Date</b>	<b>mE (GDA94)</b>	<b>mN (GDA94)</b>	<b>Depth (m)</b>	<b>Screened Aquifer</b>	<b>Use Status</b>
<b>81909</b>	17/12/1994	620090	7573318	60	Rewan Group	In use
<b>105427</b>	22/04/2004	629841	7570637	100	Rewan Group	In use
<b>13040284</b>	02/09/2004	620264	7566309	19	Rangal Coal Measures	Unknown
<b>105677</b>	13/06/2005	622136	7573306	67.7	Tertiary Basalt	In-use (CD)
<b>131002</b>	18/11/2005	621997	7574302	63	Tertiary Basalt	Unknown
<b>141157</b>	27/04/2007	639587	7560479	66	Rangal Coal Measures	No longer used
<b>Bore 1</b>	Unknown	628740	7546688	Unknown	Rangal Coal Measures	Unknown
<b>Bore 2</b>	Unknown	621970	7552907	Unknown	Rangal Coal Measures	No longer used
<b>Bore 3</b>	Unknown	627714	7556752	Unknown	Quaternary Alluvium	No longer used
<b>Bore 4</b>	Unknown	630297	7558574	Unknown	Rangal Coal Measures	No longer used
<b>Bore 5</b>	Unknown	632495	7559750	Unknown	Rangal Coal Measures	No longer used
<b>Bore 6</b>	Unknown	634350	7556563	Unknown	Rangal Coal Measures	No longer used
<b>Bore 7</b>	Unknown	637519	7552624	Unknown	Rangal Coal Measures	No longer used
<b>Bore 8</b>	Unknown	640189	7547989	Unknown	Quaternary Alluvium	Unknown
<b>Bore 9</b>	Unknown	633898	7553055	Unknown	Quaternary Alluvium	No longer used

RN	Drill Date	mE (GDA94)	mN (GDA94)	Depth (m)	Screened Aquifer	Use Status
<b>Bore 10</b>	Unknown	639594	7558477	Unknown	Rangal Coal Measures	No longer used
<b>Bore 11</b>	Unknown	637684	7558650	Unknown	Fort Cooper Coal Measures	No longer used
<b>Bore 12</b>	Unknown	621511	7568791	Unknown	Rangal Coal Measures	No longer used

### 8.2.10 Groundwater Numerical Model

#### *Model Objectives*

Numerical modelling was undertaken to assess the impact of the Project on the groundwater regime. The key objectives of the predictive modelling were to:

- estimate the groundwater inflow to the mine workings as a function of mine position and timing.
- simulate and predict the extent and area of influence of dewatering and the level and rate of drawdown at specific locations (groundwater users, Section 5.6).
- identify areas, where groundwater impact mitigation / control measures may be necessary.

For the purposes of the EA amendment, this assessment has predicted the impacts for the proposed extension to underground mining at Mavis South Underground operation.

#### *Modelling Code*

MODFLOW-USG Transport was used as the model code (Panday et al. 2013). MODFLOW-USG is the latest version of the industry standard MODFLOW code and was identified to be the most suitable modelling code for accomplishing the model objectives. To allow stable numerical modelling of the large spatial area of the model domain, an unstructured grid with varying Voronoi cell sizes was designed using Algomesh (HydroAlgorithmics, 2014). Fortran code and a MODFLOW-USG edition of the Groundwater Data Utilities (Watermark Numerical Computing) were used to construct the MODFLOW-USG input files.

All results are presented in **Appendix D** of this report.

## 8.2.11 Assessment of Impacts

The predicted impacts presented will include:

- Incremental – impacts due to underground (UG) mining at Mavis South only, obtained by comparing the difference between the cumulative project and approved basecase scenarios.
- Cumulative – impacts due to all approved mining plus UG mining at Mavis South Pit, obtained by comparing the difference between the Cumulative and Null Run scenarios.

### *Maximum Predicted Drawdown Impacts*

Maximum predicted drawdowns have been calculated for the Quaternary alluvium, regolith, Rewan Group, and Leichardt Seam as described in Section 6.6.1. The maximum drawdown represents the maximum drawdown values recorded at each model cell at any time over the model duration.

### *Maximum Predicted Incremental Drawdown*

There is no predicted incremental drawdown in the Quaternary Alluvium and in the regolith for the Mavis South UG scenario.

The predicted incremental drawdown in the Rewan Group extends 400 m to the south-east of the Mavis South mining scenario.

The Leichardt Seam is the target coal seam at the Project and maximum predicted drawdown reaches to 200 m in this layer. It is predicted that the drawdown surrounding the Mavis South underground operation is predominantly from north-east to the south-west direction with the maximum extent of approximately 950 m towards the southeastern part of the Mavis South project boundary

### *Predicted Mine Inflows*

Mine inflow volumes for Millennium Mine have been calculated as time weighted averages of the outflow reported by ZoneBudget software for Millennium drain cells.

For the scenario representing all approved and foreseeable mining at Millennium, including approved underground mining at Mavis and proposed mining at Mavis South, future inflows to the open cut mining are predicted to decrease from year 2023 to 2027. The maximum amount of 236.6 ML/year is predicted in 2023, which reduces to 0.0 ML/year by 2030.

There are no predicted inflows to the Mavis South underground pit during years 2023 and 2024. The inflow to the Mavis South is predicted to happen in 2025 with the amount of 59.9 ML/year which rises to 71.5 ML/year in 2026 and declines to no inflow

again by 2027. The inflow to the Approved case of Mavis underground fluctuates throughout these years with an overall increase from 32.9 ML/year in 2023 to 131.4 ML/year in 2027.

#### *Predicted Impacts on GDEs and Landholder Bores*

Low potential GDEs 1.5 km south-west of the Project are predicted to be impacted by up to 2 m of drawdown in the regolith.

As the incremental drawdowns associated with underground mining at Mavis South have predicted extents less than 1 km from the pit, the cumulative drawdowns predicted to impact the low potential GDEs, are likely a result of simulated surrounding and historical mining

Two landholder bores were identified to be within the predicted water table drawdown extent. Cumulative (all mining) drawdowns at bore 105427, screened in the Rewan Group, and at Bore 8, screened in the Quaternary Alluvium, are predicted to be 11.13 and 7.59 m, respectively.

There is no predicted incremental from the Project (Mavis South UG) water table drawdown at bore 105427 or Bore 8, as the maximum predicted incremental water table drawdown extends only 1 km from Mavis South Pit. As bore 105427 is located within the Carborough Downs Mine area, predicted cumulative drawdown impacts at this location are likely to be caused by simulated mining at Carborough Downs Mine. The water table drawdown predicted in the cumulative (Mavis South UG) scenario at Bore 8 is likely to be associated with simulated surrounding or historical mining.

#### **8.2.12 Monitoring Program**

The current monitoring requirements as presented in EA EPML00819213 for approved mining at Millennium Mine were reviewed to assess the suitability for future monitoring of impacts due to the proposed UG mining at the Project.

#### *Monitoring Locations and Aquifers*

The groundwater monitoring bore network as per the current EA EPML00819213 allows for the compilation of groundwater monitoring data from the Rangal Coal Measures and Fort Cooper Coal Measures for the currently approved operations at Millennium.

It is envisaged that this existing monitoring network at Millennium Mine is sufficient to monitor impacts from the Mavis South UG. Therefore, no additional bores are recommended. It is recommended that groundwater monitoring according to the current EA EPML00819213 should continue for the duration of the Project.

### 8.2.13 Other Important Considerations

#### *Cumulative impacts*

The Significant Impact Guidelines 1.3 – Coal seam gas and large coal mining developments – impacts on water resources require the action to be “considered with other developments, whether past, present or reasonably foreseeable developments”.

The predictive numerical groundwater model for the region evaluated the potential incremental and cumulative impacts of the Project on the local groundwater regime (SLR, 2021). Cumulative impacts associated with approved and foreseeable open cut and underground coal mines surrounding the Project were modelled by SLR, 2021. Results of the simulated cumulative impacts are as follows:

- The closest predicted cumulative impact to Millennium in the Quaternary Alluvium is a small region of up to 5 m of drawdown 7 km to the south, most likely associated with Poitrel Mine.
- Cumulative drawdown in the regolith is up to 10 m, whilst cumulative drawdown in the Rewan Group is up to 50 m. Drawdown in the Leichardt Seam is up to 100 m at the coal face. Cumulative drawdown impacts in the regolith, Rewan Group, and Rangal Coal Measures do not pose a significant risk to water resources. This is due to there being a very unlikely likelihood of impacts to current anthropogenic or environmental water users.

Based on modelling of underground operations at the neighbouring Mavis Underground (SLR, 2021), the Mavis South Underground will not add to the cumulative impacts on water resources.

### 8.2.14 Conclusions

The groundwater assessment undertaken for the EA amendment for continued underground mining at Mavis South has shown:

- The regional land use is dominated by mining and grazing.
- Surface water in the area is ephemeral and does not have a significant groundwater baseflow component.
- The water quality in the coal measures is generally saline and not widely used.
- The impact assessment was carried out as incremental (difference between all active and foreseeable mining excluding Mavis South against all active and foreseeable mining including Mavis South) and cumulative (difference

between a no mining scenario and all active and foreseeable mining including Mavis South).

- Underground mining at Mavis South has a negligible incremental impact on the shallow groundwater system. No landholder bores or GDEs are impacted by the mining at Mavis South, on top of the cumulative impacts predicted by regional mining.

The Mavis South extension is not adding to the approved Mavis impacts and hence the network designed for Mavis approved is deemed adequate. Reporting requirements will be kept the same as for the Mavis approved.

One additional bore, CS-MB2 was agreed with DES to monitor drawdown impacts at Mavis Approved; this is located to the east of the Mavis Approved footprint. Therefore, with the addition of this bore to the monitoring network, it is envisaged that this existing monitoring network at Millennium Mine is sufficient to monitor impacts from the Project. This is due to the Project being a small extension of Mavis Approved and of only one-year in length.

Therefore, no additional bores are recommended. It is recommended that groundwater monitoring according to the current EA EPML00819213 should continue for the duration of the Project

### **8.2.15 Underground Water Impact Report assessment**

SLR Consulting Australia Pty Ltd (SLR) has been engaged by MetRes to undertake an Underground Water Impact Report (UWIR) for the Mavis South Underground extension area.

The main purpose of the UWIR is to describe the impacts and monitoring strategies from exercising underground water rights within the Project over a three-year period (the UWIR period). As the Project is one year of length, this UWIR addresses this year from the commencement of operational activities (July 2024).

The UWIR structure is based on the framework of the *Water Act 2000* (Section 376). The structure is detailed in the Guideline (*Water Act 2000*) Underground Water Impact Reports and Final Reports (DES, 2021).

Predictive groundwater modelling completed by SLR in 2023 (Appendix A) provides an estimate of groundwater inflows over the life of the mine, including the first three years after the consultation date. The Project intercepts Groundwater Unit 2 (sub-artesian aquifers) under the Water Plan (Fitzroy Basin) 2011.

Given that the Project will utilise the existing Millennium Mine water management system, it is impractical to distinguish the underground mine inflows between the existing approved operations and the Project, and hence the combined inflows for the existing operations (Mavis Approved) and the Project (Mavis South) are listed.

Potential impacts were assessed through a numerical groundwater model (described in Section 6 of the Project Groundwater Impact Assessment report in **Appendix D**). As defined in Section 387 of the Water Act, the model was used to identify impacts by predicting:

Section 362 of the Water Act defines a bore trigger threshold for an aquifer as a decline in water levels of:

- As prescribed by regulation; or
- Five metres for consolidated aquifers; and
- Two metres for unconsolidated aquifers.

#### *Immediately affected area*

The extent of the IAA is defined in the Water Act as drawdown exceeding 2 m in unconsolidated aquifers and 5 m in consolidated aquifers after three years from commencement date (July 2024). For this Project, the predicted incremental drawdowns have been modelled for the Quaternary Alluvium (Layer 1), which is an unconsolidated aquifer, the Rewan Group (Layer 3), and the Leichardt Seam (Layer 5), both of which are classed as a consolidated aquifer.

No incremental drawdown is predicted in the three years of mining of this IAA UWIR reporting period within the unconsolidated aquifer of the Quaternary alluvium, due to the Project.

#### *Long Term Affected Area*

Due to the Life of Mine till end of 2027, there is no long-term affected area beyond that of the IAA.

Therefore, as mentioned above in Section 5.2.1 no incremental drawdown is predicted in the long-term within the unconsolidated aquifer of the Quaternary alluvium, due to the Project.

#### *Bores within the immediately affect area*

Due to the radius of drawdown of the Project being minimal, no bores are within the immediately affected area.

### *Review of Maps Produced*

The Groundwater Management and Monitoring Program (GMMP) has recently been updated, consistent with the EA Condition D1.1.

During the life of Millennium Mine, data collected through the GMMP will be used to review and if deemed necessary update and refine the Millennium Mine groundwater model and its impact predictions, to reflect the actual activities undertaken on site (e.g. mine development) and the results of regular groundwater monitoring.

With the current Life of Mine of Millennium Mine for a total of 4 years (latest approval included mining up to 2027), a review of the model and model predictions is not likely to be required.

### *Impact on Aquatic and Terrestrial Ecosystems*

The UWIR must consider the potential for groundwater to interact with surface water (e.g., baseflow to rivers and creeks) and GDEs (including any aquifers, caves, lakes, palustrine wetlands, lacustrine wetlands, rivers, and vegetation).

There is no predicted incremental drawdown to the unconsolidated deposits of the Quaternary alluvium or Tertiary regolith because of Mavis South operations. Therefore, for completeness the extent of predicted cumulative drawdown impacts (from all mining in the area) in the regolith and identified GDEs in the model domain are shown in Figure 6. The low potential GDEs that are 1.5 km south-west of the Project are predicted to be impacted by up to 2 m of drawdown in the regolith from cumulative mining in the area.

### *Impact on Private Bores – Irrigation, Farm Supply / Use and Stock Water*

There is no predicted incremental drawdown in the Quaternary Alluvium and in the regolith for the Mavis South Underground scenario. No landholder bore is predicted to have an incremental impact as a result of mining at Mavis South Underground.

### *Impact on Alluvium*

There is no predicted incremental drawdown in either the Quaternary Alluvium or the regolith as a result of the Mavis South UG project. Therefore, no significant impacts to the alluvium are anticipated from the Project.

### *Impact on Baseflow*

As part of the conceptual model the surface watercourses in the vicinity of the Project are considered disconnected from the underlying aquifer systems. Therefore, no significant impacts are expected to surface watercourses, including Isaac River and New Chum Creek.





### *Management of Springs*

The Project incremental maximum drawdown does not intersect any active springs, and as such the Project will have no impacts on springs. Therefore, it is concluded that there is no requirement for a Spring Management Strategy for the Project

### *Groundwater Level Monitoring Program*

The groundwater monitoring bore network established under the current EA EPML00819213 allows for the compilation of groundwater data from the Rewan Group, Rangal Coal Measures, and Fort Cooper Coal Measures around the Project. This network is deemed suitable to assess the impacts of the Project.

The current monitoring schedule (monitoring on a quarterly basis or as defined in the EA) will be maintained for the Project as detailed in the current EA.

## 8.3 AIR QUALITY

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SLR Consulting Australia Pty Ltd (SLR) was engaged by MetRes Pty Ltd (MetRes) to conduct a review of potential changes to the air quality environment as a result of the proposed Mavis South Underground Project.

Refer to the **Appendix E** for full detail of the air quality assessment.

The SLR Air Quality Impact Assessment report has been prepared in line with the requirements contained in the following documents:

- *Queensland Environmental Protection Act 1994* (QLD Gov 1994)
- *Queensland Environmental Protection (Air) Policy* (Qld Gov 2019)
- *Queensland DES Guideline: Application requirements for activities with impacts to air* (DES 2017)

The key air emissions resulting from the Project are fugitive emissions of particulate matter associated with the mining activities, including particulate matter less than 2.5 µm (PM<sub>2.5</sub>), particulate matter less than 10 µm (PM<sub>10</sub>) and total suspended particulate (TSP). Emissions of TSP also have the potential to result in increased rates of dust deposition in the surrounding area.

Appropriate ambient air quality criteria have been established for the Project based on state and national policies and regulations and are presented in detail in **Appendix E**, Section 2.6.

Background air quality was estimated based on ambient air quality monitoring data collected by the DES AQMSs located in Moranbah township and by the Winchester Down AQMS operated as part of the ambient air quality monitoring network for the adjacent Poitrel Coal Mine. Further information on the selection of representative background air quality data is provided in **Appendix E**, Section 3.4.

Published emission factors were used to estimate potential emissions of TSP, PM<sub>10</sub> and PM<sub>2.5</sub> from the Project, as described in **Appendix E**, Section 4.0. The downwind dispersion of these emissions was then modelled using the CALPUFF dispersion model and one year of site-representative three-dimensional meteorological data generated using a combination of the Weather Research and Forecast (WRF) and CALMET models, to provide estimates of maximum particulate concentrations and dust deposition rates at surrounding receptors. Details of the modelling methodology are presented in **Appendix E**, Section 5.0.

Potential air quality impacts associated with the Project were then assessed by comparing the predicted off-site levels against relevant ambient air quality criteria, as presented in **Appendix E**, Section 6.0.

### 8.3.1 Data review

Refer to the **Appendix E**, Section 6 for full detail of the air quality assessment.

### 8.3.2 Surrounding Sensitive Receptors

Sensitive receptors surrounding the Project site have been identified based on a desktop review that included a review of historical information and analysis of available aerial imagery. The locations of these receptors have been confirmed by MetRes and are presented in **Table 17** and **Figure 12**.

TABLE 57: ASSESSED SENSITIVE RECEPTORS

	Receptor	Distance and direction from Project
R1	Annadale Homestead	9.1 km, north
R2	Moorvale Homestead	8.3 km, north
R3	Moorvale Workers Accommodation	7.6 km, north
R4	Mavis Downs	6.9 km, east
R5	Daunia	9.3 km, southeast
R6	Olive Downs	11.2 km, south-southeast
R7	Winchester Downs	15.6 km, southwest
R8	Wotonga	12.2 km, west-northwest
R9	Tarkari	7.4 km, northwest

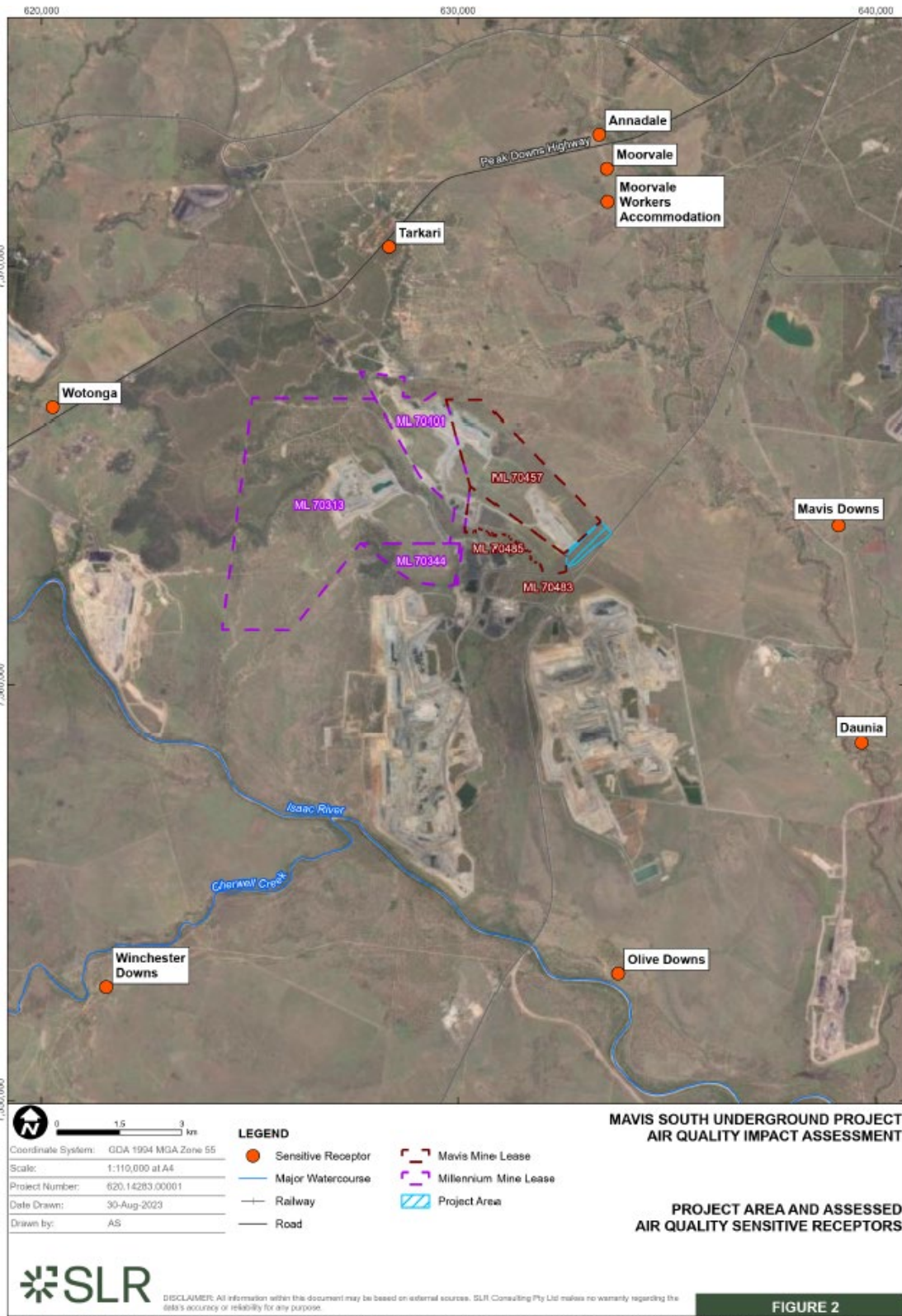


Figure 12: Assessed Receptors (SLR, 2023b)

### 8.3.4 Air quality impact assessment

A full description of the methodology undertaken for the Air Quality assessment is presented in **Appendix E**.

#### *Dispersion Model Configuration*

Dispersion modelling was conducted using the CALPUFF dispersion model and three-dimensional meteorological data output from CALMET. Emissions from the mining and processing activities were represented by a series of volume sources, while wind erosion from exposed areas was represented by area sources.

The estimated particulate emissions were modelled as:

- Fine Particulates (FP < 2.5 µm)
- Course Matter (2.5 µm < CM < 10 µm)
- Remainder (RE > 10 µm).

These parameters were then grouped within the CALPUFF model to predict PM<sub>2.5</sub>, PM<sub>10</sub> and TSP concentrations at surrounding receptor locations. This approach provides the most realistic treatment of the differing size fractions, with the lighter, finer particulate matter being dispersed further than the heavier size fraction that settles out of the air more rapidly.

Based on the sensitivity of each activity to wind speed and variation in monthly production rates, hourly varying emission files representing hourly FP, CM and RE emissions for each source were generated for each model scenario.

### 8.3.5 Air Quality Impact Assessment

The incremental and cumulative impacts predicted by the modelling at each identified receptor surrounding the Project site are presented in **Table 18** (maximum 24-hour and annual average PM<sub>2.5</sub> concentrations), **Table 19** (maximum 24-hour and annual average PM<sub>10</sub> concentrations) and **Table 20** (annual average TSP concentrations and maximum monthly dust deposition rates). The estimated background concentrations derived in **Appendix E**, Section 3.5 were used to calculate the cumulative impacts at each identified surrounding receptor.

The modelling results show that the predicted cumulative maximum 24-hour and annual average PM<sub>2.5</sub> and PM<sub>10</sub> concentrations, annual average TSP concentrations, and maximum monthly dust deposition rates comply with the relevant criterion at each of the surrounding sensitive receptors.

TABLE 6 PREDICTED INCREMENTAL AND CUMULATIVE PM2.5 CONCENTRATIONS

Receptor	24 Hour Average ( $\mu\text{g}/\text{m}^3$ )				Annual Average ( $\mu\text{g}/\text{m}^3$ )			
	Increment		Cumulative <sup>1</sup>		Increment		Cumulative <sup>2</sup>	
	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit
R1	0.1	0.2	6.6	6.7	<0.1	<0.1	<5.7	<5.7
R2	0.1	0.3	6.6	6.8	<0.1	<0.1	<5.7	<5.7
R3	0.2	0.3	6.7	6.8	<0.1	<0.1	<5.7	<5.7
R4	<0.1	0.2	<6.6	6.7	<0.1	<0.1	<5.7	<5.7
R5	<0.1	<0.1	<6.6	<6.6	<0.1	<0.1	<5.7	<5.7
R6	<0.1	0.1	<6.6	6.6	<0.1	<0.1	<5.7	<5.7
R7	<0.1	0.2	<6.6	6.7	<0.1	<0.1	<5.7	<5.7
R8	0.1	0.6	6.6	7.1	<0.1	<0.1	<5.7	<5.7
R9	0.2	0.4	6.7	6.9	<0.1	<0.1	<5.7	<5.7
<b>Criteria</b>	-		<b>25</b>		-		<b>8</b>	
<sup>1</sup> Includes estimated background concentration of $6.5 \mu\text{g}/\text{m}^3$								
<sup>2</sup> Includes estimated background concentration of $5.6 \mu\text{g}/\text{m}^3$								

TABLE 7 PREDICTED INCREMENTAL AND CUMULATIVE PM10 CONCENTRATIONS

Receptor	Maximum 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )				Annual Average ( $\mu\text{g}/\text{m}^3$ )			
	Increment		Cumulative <sup>1</sup>		Increment		Cumulative <sup>2</sup>	
	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit
R1	0.2	1.0	28.0	28.8	<0.1	<0.1	<22.8	<22.8
R2	0.2	1.3	28.0	29.1	<0.1	<0.1	<22.8	<22.8
R3	0.3	1.5	28.1	29.3	<0.1	<0.1	<22.8	<22.8
R4	0.2	0.8	28.0	28.6	<0.1	<0.1	<22.8	<22.8
R5	<0.1	0.4	<27.9	28.2	<0.1	<0.1	<22.8	<22.8
R6	0.1	0.5	27.9	28.3	<0.1	<0.1	<22.8	<22.8
R7	<0.1	0.5	<27.9	28.3	<0.1	<0.1	<22.8	<22.8
R8	0.3	2.7	28.1	30.5	<0.1	0.4	<22.8	23.1
R9	0.6	2.3	28.4	30.1	<0.1	0.2	<22.8	22.9
<b>Criteria</b>	-		<b>50</b>		-		<b>25</b>	

Receptor	Maximum 24-Hour Average ( $\mu\text{g}/\text{m}^3$ )				Annual Average ( $\mu\text{g}/\text{m}^3$ )			
	Increment		Cumulative <sup>1</sup>		Increment		Cumulative <sup>2</sup>	
	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit
<sup>1</sup> Includes estimated background concentration of $27.8 \mu\text{g}/\text{m}^3$								
<sup>2</sup> Includes estimated background concentration of $22.7 \mu\text{g}/\text{m}^3$								

TABLE 20 PREDICTED TSP CONCENTRATIONS AND DEPOSITION RATES

Receptor	Annual Average TSP Concentrations ( $\mu\text{g}/\text{m}^3$ )				Monthly Average Dust Deposition ( $\text{mg}/\text{m}^2/\text{day}$ )			
	Increment		Cumulative <sup>1</sup>		Increment		Cumulative <sup>2</sup>	
	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit	Project	Project + A Pit
R1	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R2	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R3	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R4	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R5	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R6	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R7	<0.1	<0.1	<56.9	<56.9	<0.1	<0.1	<61	<60.1
R8	<0.1	0.7	<56.9	57.5	<0.1	0.6	<61	60.6
R9	<0.1	0.3	<56.9	57.1	<0.1	0.4	<61	60.4
<b>Criteria</b>	-		<b>90</b>		-		<b>120</b>	
<sup>1</sup> Includes estimated background concentration of $56.8 \mu\text{g}/\text{m}^3$								
<sup>2</sup> Includes estimated background deposition rate of $60 \mu\text{g}/\text{m}^3/\text{m}^2$								

### 8.3.6 Greenhouse Gas assessment

Greenhouse Gas (GHG) Technical Report has been prepared by SLR Consulting (Australia) Pty Ltd (SLR) for this EA amendment application.

The scope of this GHG assessment is limited to the extraction and handling of Run of Mine (ROM) coal from the proposed Mavis South extension area. Emissions associated with the extraction and handling of coal from the Millenium mining area is outside the operational boundary of this assessment. Processing of the coal at



the Red Mountain Infrastructure Pty Ltd (RMI) Coal Handling and Preparation Plant (CHPP) is also outside the operational boundary of this assessment, with the GHG emissions associated with those activities considered as part of the downstream Scope 3 emissions.

Mavis underground mine is not a gassy underground coal mine (defined in Section 1.8 of the National Greenhouse and Energy Reporting (NGER) Measurement Determination as ‘an underground mine that has at least 0.1% methane in the mine’s return ventilation’). As there is no (or negligible) methane in the coal extracted from such mines, methane in the return ventilation system would not trigger this threshold, hence GHG emissions from the Project’s underground air ventilation system and from post-mining activities (ie fugitive emissions from the coal stockpiles and coal handling processes) are not included in the inventory on the basis of materiality.

GHG emissions associated with the consumption of oils and greases and leakage of sulfur hexafluoride (SF6) may also be considered below the materiality threshold, however were included in the inventory as they have historically been included in the annual NGER reports submitted for the mine.

Scope 3 emissions not included in the GHG inventory due their lack of materiality in relation to the total Project GHG emissions are:

- Disposal of waste generated by the Project
- Employee business travel
- Employees commuting to and from work
- Extraction, production and transport of other purchase materials and goods
- Out-sourced activities (other than coal processing by the RMI CHPP)
- Transport of non-product materials and waste off-site.

As no construction of new facilities is required, there will be no construction phase GHG emissions for the Project. Decommissioning of the Project will involve the removal of underground equipment and then the underground mine will be allowed to flood. This will seal off the Mavis underground extension area from the surface, and as a result, there would be no fugitive methane emissions from the Project after decommissioning. Emissions from the decommissioning phase were therefore also not considered further.

### **8.3.7 Conclusions**

To predict the potential worst-case impact at each of the identified sensitive receptor surrounding the Project Site, potential particulate emissions associated





with the proposed Project as well as approved A Pit operations were quantified, modelled and assessed against relevant ambient air guidelines for sensitive uses.

The fugitive particulate emissions from the proposed and approved operations were estimated using emission **estimation** techniques outlined in USEPA AP42 (USEPA 2006 and updates), National Pollutant Inventory (NPI) emission factors for coal mining (DSEWPC, 2012) and published emission factors for Australian coal mines based on measurements performed as part of an Australian Coal Association Research Program project (ACARP, 2015).

Air dispersion modelling was conducted for TSP, PM10, PM2.5 and deposited dust, and incremental ground level concentrations and deposition rates were predicted at sensitive receptors identified in the surrounding area. Modelling was performed using the CALPUFF dispersion model, and a site-representative 3-dimensional meteorological file compiled for the 2021 calendar year using the WRF and CALMET meteorological models. Cumulative impacts were then calculated by including background TSP, PM10 and PM2.5 concentrations and dust deposition rates estimated based on a review of ambient air quality monitoring data for the local area.

Based on the modelling results, it is concluded the estimated TSP, PM10 and PM2.5 emissions from the Project are not predicted to contribute to exceedances of current relevant ambient air quality guidelines at any potentially affected sensitive receptors over the life of the Project.

## 8.4 NOISE ASSESSMENT

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SLR Consulting Australia Pty Ltd (SLR) was engaged by MetRes Pty Ltd (MetRes) to conduct a review of potential changes to the Acoustics environment as a result of the proposed Project.

Refer to the **Appendix F** for full detail of the Acoustics assessment.

### 8.4.1 Existing environment

Millennium Mine is situated approximately 22 km east of Moranbah in a well-established grazing and mining region. The area surrounding the site has undulating topography, comprising mines, open farmlands and native scrublands.

As the Project relates to underground mining, there are limited activities with the potential to generate above ground noise emissions. These above ground activities which form the basis for this Assessment are as follows:

- Loading and hauling of ROM coal using a combination of loaders and trucks
- Dust suppression on haul routes
- Maintenance of haul routes using graders, excavators and dozers
- Fixed plant located at the entrance of Mavis underground mine to support underground operations including mine ventilation system, compressors, and ROM coal conveyors and stackers.

As blasting is not proposed as part of the Project, no sources or activities are proposed that would produce measurable or perceptible vibration levels at assessed sensitive receptors. This is due to the offset distances between the Project operations and sensitive receptors (the nearest receptor is located approximately 7.4 km from the proposed Project activities).

Potential impacts associated with cumulative mine noise emissions from Daunia, Poitrel and Carborough Downs mines have also been considered in the assessment.

BMA's Peak Downs Mine is the largest mine in the region and is situated approximately 20 km south-west of the Millennium Mine.

**Appendix F** presents the full detail of the acoustic assessment.

### 8.4.2 Noise Sensitive Places

The Millennium and Mavis mines EA provides the following definitions regarding sensitive places:

A sensitive place means:

- a) a dwelling, residential allotment, mobile home or caravan park, residential marine or other residential premises; or
- b) a motel, hotel or hostel; or
- c) an educational institution; or
- d) a medical centre or hospital; or
- e) a protected area; or
- f) a public park or gardens.

Based on the above definition, the nearest noise sensitive receptors surrounding the Project (and the broader Millennium Mine) are outlined previously **Table 17** and shown on **Figure 12**.

Consistent with the Department of Environment and Science's (DES) Model Mining Conditions Guideline (MMC), the sensitive receptors do not include places that are within the boundaries of the Millennium and Mavis mines ML (or its proposed extension under the Project), nor places that are owned or leased by Millennium Mine. At the time of reporting, no current noise agreements were understood to be in place between Millennium Mine and any assessed sensitive receptor therefore rendering a receptor 'non-noise sensitive'.

#### **8.4.3 Baseline Noise Levels**

No background noise measurements were completed for this assessment. The Project is willing to accept the deemed minimum background noise level of 30 dBA as stated in MMC (see **Appendix F**, Section 4.0 for further details).

Based on SLRs experience in conducting background noise measurements in Queensland's mining fields, measured background noise levels at noise sensitive receptors are routinely equal to or lower than the deemed background noise levels. This is generally due to 'natural' noise sources (i.e. bird song, wind and wind generated vegetation noise, seasonal insects) controlling the sound scape.

During the most sensitive night-time periods, these 'natural' sources are often either infrequently measured or are not present for periods of time, therefore the background noise level is routinely below the deemed minimum background noise level of 30 dBA LA90.

Even where anthropogenic noise sources are present (i.e. from roads, existing mines etc), their contribution tends to be influenced by meteorological conditions. That is, there are periods of time where these sources can contribute to or dominate the measured background noise level (and potentially elevate it above the deemed

minimum noise levels). However the opposite can also occur where meteorological conditions are such that these sources are either inaudible/ unmeasurable or they do not significantly contribute to the measured background noise level.

For this Project, the deemed minimum background noise levels are considered applicable for the Project given the rural nature that the Project area is located within and the expected low background noise levels within this area.

#### 8.4.4 Noise modelling assessment methodology

Refer to **Appendix F** (Section 5) for full detail of the acoustic modelling methodology applied for this assessment.

#### 8.4.5 Noise Impact Assessment

##### *Project predicted noise levels*

The predicted noise levels from the modelled Project scenario listed in **Appendix F**, Section 5.1 are summarised in **Table 21** for neutral and adverse weather conditions. These predictions relate to the listed mobile and fixed mining equipment detailed in **Appendix F** and are representative of the night-time period upon which the most stringent noise criteria applies noting the 24 hours, seven days a week operation proposed by the Project.

TABLE 21 PREDICTED PROJECT NOISE LEVELS

Sensitive Receptor	Predicted Project Noise Level (LAeq,adj,15min dBA)	
	Neutral Weather	Adverse Weather – Temperature Inversion
Annadale	<0	7
Moorvale	0	8
Moorvale Workers Accommodation	3	10
Mavis Downs	8	15
Daunia	4	12
Olive Downs	2	10
Winchester Downs	<0	7
Wotonga	4	12
Tarkari	10	17

From the modelling results summarised in **Table 21**, the highest predicted noise level from the proposed Project is 17 dBA LAeq at Tarkari under adverse weather

conditions which is compliant with the 25–27 dBA LAeq, considered to be equivalent to the EA noise limit of 30 dBA LA10. All other Project noise levels (presented in **Table 21**) are predicted to be 15 dBA LAeq or less. The predicted noise level at Tarkari is largely dominated by the haul trucks on the rejects and tailings haul routes, which are the closest Project sources to this receptor. The noise contribution of all fixed plant sources are negligible at Tarkari.

Noise contours for this Project scenario are presented in **Appendix F**.

On the basis of the above findings, specific noise mitigation measures are not warranted for the proposed Project. Notwithstanding these findings, best practice noise mitigation and management measures are outlined in Section 7.0.

#### **8.4.6 Assessment of Noise Characteristics**

The potential impacts from mine noise experienced at the sensitive receptors are not solely a function of the overall level of noise but also the characteristics of the noise. Consideration for the potential presence of tonal, impulsive and/or low frequency noise characteristics was investigated.

To complete a true tonal assessment, the inclusion of one-third octave data is required. The spectrum data used for this assessment has been simplified at octave band data (which is widely accepted for an assessment of this nature). Consistent with the description of tonal noise in the PNC guideline and SLR's experience of noise from mine sites, there may be a distinguishable (non-tonal) "hum" associated with diesel powered equipment however the presence of tonal characteristics can often be attributed to mining plant with mechanical faults. For this Assessment, no specific tonal correction has been considered on the assumption that all mining plant would be operated in good working order and that "buzzer", not "beeper", reversing alarms would likely be utilised on mobile equipment particularly if working in exposed areas.

In the absence of specific low frequency noise assessment requirements in the existing EA, the following two (2) documents and associated criteria are referenced to provide consideration of potential low frequency noise impact from the Project 2 onto the assessed receptors:

- DES's former *Ecoaccess Assessment of Low Frequency Noise Guideline*, which contains an initial screening test at noise sensitive receptors whereby the overall noise level should not exceed 50 dBL Leq (internal) and the difference between the overall dBL and dBA Leq (internal) noise levels should not exceed 15 dB. For this assessment, a (conservative) 5 dB façade

reduction has been applied to convert the 50 dBL internal level to an external level (i.e. 55 dBL Leq external) given that building facades generally do not attenuate low frequency noise as well as broader spectrum noise.

- DES's *Streamlined Model Conditions for Petroleum Activities Guideline*, which is relevant to operations of industrial noise sources operating in rural Queensland, contains the following external and internal criteria that must not be exceeded (Leq unless noted otherwise). It is noted the internal criteria are generally consistent with the former Ecoaccess Assessment of Low Frequency Noise Guideline noted above.
  - 60 dBC measured outside the sensitive receptor; and
  - the difference between the external A-weighted and C-weighted noise levels is no greater than 20 dB; or
  - 50 dBZ measured inside the sensitive receptor; and
  - the difference between the internal A-weighted and Z-weighted (Max LpZ, 15 min) noise levels is no greater than 15 dB.

Consistent with the overall A-weighted predicted noise levels (presented in **Table 21**), the highest predicted dBC and dBL external noise levels are predicted to occur at Tarkari under adverse conditions. The predicted Leq noise levels are 35 dBL and 33 dBC (under adverse weather) which complies with the respective criteria. Therefore, low frequency noise is not predicted to be an issue for the Project.

#### **8.4.7 Cumulative Noise**

A comparison of relevant EA night-time noise limits for each of the noted mines/ infrastructure areas immediately surrounding Millennium Mine, the Project and the assessed noise sensitive receptors was undertaken for this assessment. The focus for this comparison is on noise limits applicable to more steady-state noise emissions (ie LAeq, LA10) rather than short-term LA1/LAmax noise limits. This comparison also focuses on 'Sensitive Places' and not 'Commercial Places' as no commercial place has been identified for the Project assessment. In addition to the summary of applicable noise limits, it is also important to put into context the planned coal extraction rates for the Project in comparison to the approved ROM coal tonnage rates for each of these mines (where reported).

Adapting the predicted Project noise levels reported in **Table 21** to the LAeq equivalent night-time noise levels, with reference to Tarkari which had the highest predicted noise level of 17 dBA LAeq, the predicted noise level is generally 10 dBA or greater below the summarised night-time noise levels. Where a noise source is 10 dBA (or greater) below another noise source, the cumulative noise level of the two (2) sources when logarithmically summed is no greater than the higher noise level.

Therefore where noise levels from these surrounding mines and infrastructure are achieving their respective LAeq equivalent night-time noise level, cumulative noise issues with the inclusion of the Project are not expected.

Regarding a comparison to concurrent operational noise levels at Millennium Mine, with reference to Tarkari which had the highest predicted noise level of 26 to 27 dBA LAeq depending on scenario, these predicted noise levels are comparable to the LAeq equivalent night-time noise levels for a number of noted mine EA (namely RMI CHPP, Carborough Downs Coal Mine and Moorvale South Mine). These concurrent operational noise levels at Tarkari are dominated cut coal mining in A-Pit, with the Project's attributable noise levels being 9-10 dBA lower than A-Pit attributable noise levels. Of these noted mines/infrastructure areas, Carborough Downs Coal Mine is the only mine within a proximity to Takari homestead (ie within 5 km) that could generate noise levels nearing the LAeq equivalent night-time noise level of 25-27 dBA LAeq. SLR understands that Tarkari is owned by Carborough Downs Coal Mine, therefore this receptor would be considered non-noise sensitive to Carborough Downs Coal Mine operations and their EA noise limits do not apply. This inherently manages any cumulative noise issues from operational mine noise for these two (2) mines as experienced at Tarkari.

Regarding extraction rates, the Project proposes to extract 854,000 tonnes of ROM coal over an approximate 12-month period. Similarly, the approved A-Pit project has targeted 884,000 tonnes of ROM coal to be extracted over a 20-month period (mining in A-Pit has already commenced).

Both values are well below the approved 5.5 Mtpa ROM coal rate for Millennium Mine. The proposed ROM coal extraction amount for the Project when expressed as an Mtpa value, being 0.85 Mtpa, is the lowest of the surrounding mines considered in this review.

#### **8.4.8 Conclusion**

This technical noise assessment has modelled a typical worst-case operational mining scenario for the proposed Mavis South Underground Project at Millennium Mine and assessed the predicted noise levels at surrounding noise sensitive receptors against the applicable noise limits contained within the existing Millennium Mine EA EPML00819213. Additional concurrent mine operations scenarios have also been assessed incorporating modelled noise levels from the approved A-Pit North and South open cut mine operations at Millennium Mine. This Assessment has identified the following:

- The highest predicted noise level from the proposed Project is 17 dBA LAeq at Tarkari (under the adverse weather conditions) which is compliant with the 25–27 dBA LAeq, considered to be equivalent to the EA noise limit of 30 dBA LA10. All other Project noise levels are predicted to be 15 dBA LAeq or below.
- The Project predicted noise level at Tarkari homestead is largely dominated by the haul trucks on the rejects and tailings haul routes, which are the closest Project sources to this receptor. The noise contribution of all fixed plant sources are negligible at Tarkari.
- The highest predicted noise levels from the concurrent mine operations are 26 dBA LAeq (Project plus A-Pit North Strip 1) and 27 dBA LAeq (Project plus A-Pit South Strip 1), both occurring at Tarkari and under adverse weather conditions. These predicted noise levels are within the 25–27 dBA LAeq range, which is considered to be equivalent to the EA noise limit of 30 dBA LA10. For both scenarios, the dominant predicted noise sources at the Tarkari are associated with mobile mining equipment working in the A-Pit area, with Project attributable noise levels being 9–10 dBA lower than A-Pit attributable noise levels.
- The concurrent scenarios represent worst case noise predictions and technically may not line up with the mine schedule at the time of operations (ie the Project occurring at the same time as Strip 1 for A-Pit North or Strip 1 for A-Pit South).
- All other concurrent mine operations noise levels are predicted be 24 dBA LAeq or less under adverse weather.

On the basis of the above findings, specific noise mitigation measures are not warranted for the proposed Project and concurrent mine operations at Millennium Mine. Notwithstanding these findings, best practice noise mitigation and management measures should be maintained including record keeping of any noise complaints received during the operations of the Project area and investigate noise management options for verified complaints.



## 8.5 BIODIVERSITY

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Kleinfelder Australia Pty Ltd (Kleinfelder) was engaged by MetRes Pty Ltd (MetRes) to conduct a review of potential impact to the Terrestrial ecology environment as a result of the proposed Project.

Refer to the **Appendix G** for full detail of the ecological assessment.

The ecological assessment was undertaken to determine if any threatened vegetation communities, or flora and fauna listed under the *Vegetation Management Act 1999* (VM Act), the *Nature Conservation Act 1992* (NC Act) or the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) would be Significantly Impacted by the proposed mining activities. The impacts on Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act 1994* (EP Act) was also assessed.

### 8.5.1 Assessment

Six databases were used to identify if any Environmentally Sensitive Areas (ESAs) were located within the Project area. The Project area was further reviewed to determine if there were any MNES or MSES that would need to be analysed to determine if the proposed mining activities would cause any Significant Impacts.

The database searches were used to assess for any ESA Category A, B or C areas and 'endangered' (E), 'of concern' (OC) 'vulnerable' (V), 'near threatened' (NT) and 'special least concern' (SL) listed vegetation communities and / or wildlife (flora or fauna species) within the vicinity of Project area (Q = Queensland legislation, F = Commonwealth/Federal legislation) (**Appendix G**, Appendix 1).

The six Database Reports used were:

- Maps of Environmentally Sensitive Areas – Mining Activities (DES 2023a).
- Wildnet Database: Species List (Queensland Government 2023a).
- Environmental Reports – Matters of State Environmental Significance (DES 2023b).
- Vegetation Management Report (Regulated Vegetation Management Map, Vegetation Management Supporting Map, Essential Habitat Mapping, Vegetation Management Wetlands and Protected Plants Flora Survey Trigger Map) (Resources 2023).
- Environmental Protection Regulation Wetland Map (DES 2023c).
- EPBC Act Protected Matters Report (DCCEEW 2023).

The search area for the ESA Map included the extent of ML 70457, and the Wildnet Database and EPBC Act Protected Matters Report search area included a 10 km buffer around the central point at Latitude -22.0316 and Longitude 148.2866 (i.e., a minimum of 10km from the Project area extent). Land parcel Lot 3 SP190266 was used as the search area for the Vegetation Management Report, MSES Environmental Report and the Environmental Protection Regulation Wetland Map.

Wildlife, named in the Special Values list in the Regional Ecosystem Description Database (Queensland Herbarium 2021), that have a recognised range in, and use characteristic habitat of the REs mapped in the Project area, were included. General Environmental Significant Wetlands were also assessed in the Project area using the Environmental Protection Regulation Wetland Map.

GIS Databases and information used to assess MNES and MSES in the Project area were:

- The Biodiversity Status of Pre-Clearing and Remnant Regional Ecosystems V13 (Queensland Herbarium 2023a).
- The Regional Ecosystem Description Database V13 (REDD) (Queensland Herbarium 2023b).
- Protected Areas of Queensland (DES 2023d).
- Species Profile Search Database (Queensland Government 2023b).
- Flora Survey Trigger Map for Clearing Protected Plants in Queensland (FSTMCP) spatial (DES 2023e).
- Matters of State Environmental Significance (MSES) – Queensland Series (DES 2023f).
- Ramsar Wetlands (DES 2020).
- Wetland Management Area (WMA) – Wetland (DES 2019a).
- Biodiversity Planning Assessment (BPA) for the Brigalow Belt (DES 2018).
- The Groundwater Dependent Ecosystems Atlas (GDE-BOM) (Bureau of Meteorology, 2021).
- Groundwater Dependent Ecosystems – Queensland (GDE-Qld) (DNRM 2022).
- Atlas of Living Australia (ALA) (Atlas of Living Australia 2023).
- Subsidence Report for the Mavis Downs South Bord And Pillar Project (Gordon Geotechniques 2023).

### **8.5.2 Field survey**

The vegetation community in the Project area was assessed to a partial tertiary level in the 'Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland' (Neldner et al. 2020; Queensland

Herbarium 2021). Overstorey plant species (emergent and canopy) and other notable species were identified on site with vegetation layer dominance recorded. The height of each vegetation layer was also recorded

### 8.5.3 Desktop assessment

#### *NCA Act and VM Act*

The ecological assessment of Queensland database reports for the Project area determined that:

- The Project area is mapped as non-remnant by the Queensland Herbarium regional ecosystem mapping.
- There were no ESAs mapped within the Project area.
- There were two threatened plants, one threatened bird, four threatened mammals and one threatened reptile recorded within 10 km of Project area, but habitat for these species was not mapped in the Project area, which was mapped as non-remnant vegetation.
- No Matters of State Environmental Significance (MSES) were listed in the Project area.
- There were no wetlands in wetland protection areas of High Ecological Value or of General Ecological Value mapped within the Project area.
- There were not any high risk areas on a Flora Survey Trigger Map for Clearing Protected Plants mapped within the Project area.
- There were no Groundwater Dependent Ecosystems in the Project area (GDE – Qld).
- There were no State, Regional or Local significantly rated areas listed by the BPA.

#### *EPBC Act*

The ecological assessment of the EPBC Act Protected Matters Report of the Project area determined that:

- There were three threatened ecological communities (TECs) mapped within vicinity of Millennium Mine. These were Brigalow (Acacia harpophylla dominant and co-dominant) (RE 11.4.9), Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin (RE 11.4.4) and Poplar Box Grassy Woodland on Alluvial Plains (11.3.2). However, none of these were mapped in the Project area which was mapped as non-remnant vegetation.
- There were four threatened plants, eight threatened birds, five threatened mammals, seven threatened reptiles and nine migratory birds listed as species or species habitat was known, likely or may occur in the vicinity of Millennium Mine. However, the Project area was mapped as non-remnant vegetation which would not support any of the above species.

- There were no Groundwater Dependent Ecosystems in the Project area (GDE – BOM).

#### **8.5.4 Field survey assessment**

Survey data collected from sites T12 and T13 during the field assessment confirmed that the Mavis South Underground Project area was non-remnant vegetation and did not meet the definition for any EPBC listed TECs. Assessment of the vegetation determined that it was RE 11.4.9 low regrowth with cracking clay and gilgai and could provide habitat for the Ornamental Snake (Q-V F-V), Dunmall's Snake (*Furina dunmalli*, Q-V F-V) and Grey Snake (*Hemiaspis damelii*, Q-E F-E). Historical imagery indicated that most of the area was last cleared in 2011, making the regrowth 12 years old which is too young to be considered the EPBC listed Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community.

Regrowth of this community can be considered a TEC provided it is least 15 years since it was last comprehensively cleared (not just thinned). There were no other microhabitat features for listed fauna such as hollow trees, logs and log piles, or rocks and rock piles.

## 8.6 ADDITIONAL CONSIDERATIONS

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### 8.6.1 Cultural Heritage

MetRes commits, as far as is reasonably practicable, to avoid disturbance to cultural heritage, and will minimise disturbance in any circumstances where avoidance is not reasonably possible.

There is an approved Cultural Heritage Management Plan (CHMP) between the Barada Barna People and Millennium Mine, novated to MetRes under the Schedule 9 CHMP Deed of Assignment and Assumption, Millennium Mine Sale and Purchase Agreement. The intent is for this existing CHMP to cover the proposed Mavis South Underground mine lease application area.

Key Obligations and commitments include:

- Ensure that the Holder operates on the principle of minimum disturbance to Aboriginal Cultural Heritage, i.e. that the Holder's activities are, wherever possible, moved to avoid Aboriginal Cultural Heritage if necessary.
- Site inductions provided to employees, contractors and sub-contractors to include Aboriginal Cultural Heritage training;
- Comply with a clear and agreed process to the Holder and the Barada Barna People for the management of items of Aboriginal Cultural Heritage significance, including previously undiscovered materials;
- Provide the Barada Barna People with an acceptable level of comfort that items of Aboriginal Cultural Heritage significance within the Mavis area will be protected and managed according to their requirements; and
- Recognise Aboriginal people as the primary guardians, keepers, and knowledge holders of Aboriginal Cultural Heritage.

MetRes are committed to employees, contractors and sub-contractors completing induction informing them of their responsibilities should they discover artefacts of potential historical cultural heritage value. Should any such artefact, site or place be identified, the relevant authority will be notified and it will be managed in accordance with the applicable legislation.

### 8.6.2 Transport

Transport and traffic movement and requirements for the Mavis South Underground area will be in line with authorised operation.

The Project operation will utilise all the existing transport routes currently in use for the Mavis and Millennium Mine. No existing transport routes or infrastructure to site will require alteration or upgrade and no new transport routes or infrastructure will be required as a result of the proposed Project.

Product coal is transported to the Dalrymple Bay Coal Terminal via the Goonyella rail line. As a result of the Project, there is no proposed change to approved usage to the rail and port usage.

### **8.6.3 Waste**

The environmental values that have been considered in relation to waste management at Millennium Mine include:

- the health and wellbeing of people;
- the health and diversity of ecological processes and associated ecosystems;
- efficient and effective use of resources, including their potential re-use; and,
- utilising the correct disposal options.

The Mavis South Underground Area will utilise the existing waste management system in place at the Millennium Mine that has been developed in accordance with all relevant legislation and existing EA conditions.

Strategies to mitigate Millennium Mine's waste management issues were identified in the 2011 EIS and continue to apply to current site management.



## 8.7 CONCLUSION

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All specialist assessment has determined any potential impact due to additional Millennium underground activity as immaterial and within authorised limits. It has been determined that specific mitigation measures are not warranted for proposed mining in the Mavis South Underground extension area as the conditions established with the Mavis approved underground operation (2021) are consistent with requirements for this southern extension area.

From this self-assessment, the activities relating to the Project area are in accordance with the statutory criteria under the *Environmental Protection Act 1994* (Qld) (EP Act) and associated guidelines for a minor amendment application. In addition, consideration of what defines a significant impact has been considered in this supporting documentation to further support this self-assessment for a minor amendment decision level decision by Department of Environment and Science.

However, as the Project is linked to the Mine lease application for transfer of a portion of MDL3046, the actions relating to the Project will trigger the threshold for a major amendment.

Proposed changes to current EPML00819213 is provided in **Section 10**.

## 9. SUMMARY

This supporting documentation accompanies the application for an Environmental Authority (EA) amendment to EPML00819213 for the proposed actions:

A summary of findings is presented in **Table 22** below.

TABLE 22: SUMMARY OF AMENDMENT ACTIONS SEEKING APPROVAL

Summary	Mavis South Underground Project	Potential impact based on concurrent action of activities proposed
Requested amendment is within authorised extraction rate	Yes Maximum ROM tonnage at 840,000 tonnes over 12 month period.	With consideration of the additional tonnage from Mavis South Underground area, overall production at Millennium Mine remains well under authorised limit of 5.5Mtpa.
Requested amendment is within authorised disturbance footprint	No	This EA amendment application is linked to mine lease application which covers a portion of MDL3046. No surface disturbance outcome as a result of this action. The Mavis South underground extension has a total surface area footprint of 45.521 Ha.
Requested amendment results in change in authorised environmental harm	No.	External specialist have been engaged to assess environmental harm based on technical guidelines. All actions have been self-assessed as minor amendment and no additional environmental harm above approved conditions.

The proposed activities for the amendment area align with approved conditions as established within EPML00819213.

All specialist assessment has determined any potential impact due to amendment area as immaterial and within authorised limits. It has been determined that specific mitigation measures are not warranted and where required, existing management plans and monitoring programs will be updated.

From this self-assessment, the activities relating to the amendment area, as part of this application, are in accordance with the statutory criteria under the





*Environmental Protection Act 1994 (Qld) (EP Act) and associated guidelines for a minor amendment application. In addition, consideration of what defines a significant impact has been considered in this supporting documentation.*

## 10. LIST OF COMMITMENTS

While the proposed activities for the Mavis South Underground area align with conditions as established within EPML00819213, MetRes are committed to continuous improvement.

Where required, existing management plans and monitoring programs will be updated.

In relation to surface water management, Millennium Mine’s Water Balance Model has been updated to reflect the changes expected because of the Mavis South Underground Area. As such, it is recommended that the Water Management Plan be updated to take into consideration the current water management system proposed for the future.

### 10.1 PROPOSED CHANGES TO THE EPML00819213

As a result of the actions proposed as listed in this EA amendment application, **Table 23** provides a summary of proposed changes to EPML00819213.

**TABLE 23: PROPOSED CHANGES TO EPML00819213**

Condition	Proposed changes		
Page 1	Inclusion of new ML reference once approved		
A3	<table border="1" style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;">A3</td> <td style="font-size: 8px;">In carrying out the mining activity (other than exploration) authorised by this environmental authority, the holder of this environmental authority must not cause disturbance greater than 1848.9 ha. All disturbance (other than exploration) must be located within the authorised disturbance footprint detailed within Figure 3: Authorised Disturbance Footprint.</td> </tr> </table> <p>Disturbance value to align with approved activity as part of this application once approved.</p>	A3	In carrying out the mining activity (other than exploration) authorised by this environmental authority, the holder of this environmental authority must not cause disturbance greater than 1848.9 ha. All disturbance (other than exploration) must be located within the authorised disturbance footprint detailed within Figure 3: Authorised Disturbance Footprint.
A3	In carrying out the mining activity (other than exploration) authorised by this environmental authority, the holder of this environmental authority must not cause disturbance greater than 1848.9 ha. All disturbance (other than exploration) must be located within the authorised disturbance footprint detailed within Figure 3: Authorised Disturbance Footprint.		
D6.0	Consideration of Mavis South area in update of predicted impacts from this application.		
Table F1	Consideration of Mavis South area in Final Land use and Rehabilitation from this application.		
Figure 3	(Draft) updated figure as provided in <b>Appendix I</b>		

## 11. REFERENCES

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SLR, 2023d: Millennium Mine. Mavis South Underground Project – Acoustic Review. 30 October 2023.



## APPENDICES



## APPENDIX A

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EPML00819213 (COPY)





## APPENDIX B

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### SUBSIDENCE







## APPENDIX C

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### SURFACE WATER





## APPENDIX D

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# GROUNDWATER IMPACT ASSESSMENT REPORT (STATE CONSIDERATIONS) UNDERGROUND IMPACT ASSESSMENT REPORT





## APPENDIX E

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### AIR QUALITY





## APPENDIX F

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### NOISE ASSESSMENT





## APPENDIX G

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### BIODIVERSITY



## APPENDIX H

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### CONSULTATION

# APPENDIX I

## PROPOSED CHANGES TO FIGURE 3

