MILLENNIUM MINE

APPLICATION TO AMEND ENVIRONMENTAL AUTHORITY EPML00819213

Attachment A: Non-Use Management Area (NUMA) Supporting Information

For

MetRes Pty Ltd

Document Status Sheet

Revision	Date	Prepared By	Checked By	Authorised By
1.0	5 June 2024	SLR	F. Kuranchie	C. Moffatt
	Click to enter a date.			

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1.0 Introduction

1.1 Project Background

The Millennium Coal Mine (MCM) is an open cut and underground metallurgical coal mine located in the Bowen Basin in central Queensland. It is located approximately 160 km south-west of Mackay, 15 km south-west of the township Coppabella and 20 km south-east of Moranbah, shown in **Figure 1-1**.

MCM is owned by Stanmore Resources (MetRes) and the site is currently operated by M Mining Pty Ltd (M Mining). The mine covers an area of approximately 3,258 hectares (ha) and is authorised under Environmental Authority (EA) EPML00819213 and Mining Leases (ML) ML 70313, ML 70344, ML 70401, ML 70457, ML 70483 and ML 70485, see **Table 1-1**.

MCM consists of two mining areas with six contiguous MLs: the Mavis area (ML 70457, ML 70483, ML 70485); and the Millennium area (ML 70313, ML 70401, ML 70344), which together form a single operational project. The Mavis and Millennium areas are intersected by New Chum Creek and consist of five open cut pits and an active underground area. A Pit and B Pit are located to the west of New Chum Creek and M Pit, D Pit, E Pit and Mavis Underground are located to the east, see **Figure 1-2**.

The mine is currently approved to produce at a rate of 5.5 Mtpa of Run-of-Mine (ROM) coal. The ROM coal is processed and loaded for transport by rail at a coal handling and preparation plant (CHPP) on an adjoining infrastructure lease, ML 70312 Millennium East. This CHPP is owned by SMC Stanmore (80%) and Mitsui Coal Limited (20%) and is operated by Red Mountain Infrastructure (RMI). MetRes has agreements with RMI/SMC for access to the CHPP and associated infrastructure, to process and load Millennium's coal.

The land outside of MCM mining activities is dominated by native pasture used for grazing and active coal mining operations. The coal mining operations of Poitrel, Daunia and Carborough Downs are adjacent to MCM.

Pre-mining land use was grazing for all mining leases, with significant coal mining operations already present in the surrounding regions. Prior to the commencement of mining activities, the land had already been significantly modified, having been cleared and seeded with Buffel Grass, to improve its grazing capacity. The mine has been progressively rehabilitated over its operational history, with approved post-mining use primarily categorised as grazing, native bushland, and waterbody. Pre-approved NUMAs exist for the highwalls and endwalls.

Table 1-1 MCM Mine Tenements

Tenure Number	Grant Date	Expiry Date	Total Area (ha)
ML 70313	16 December 2004	31 December 2034	1,953
ML 70401	16 September 2011	31 December 2034	402.6
ML 70344	3 November 2005	30 November 2035	164.1
ML 70457	9 December 2011	31 December 2034	574.4
ML 70485	15 July 2013	31 December 2034	163.4
ML 70483	15 July 2013	31 December 2034	0.4

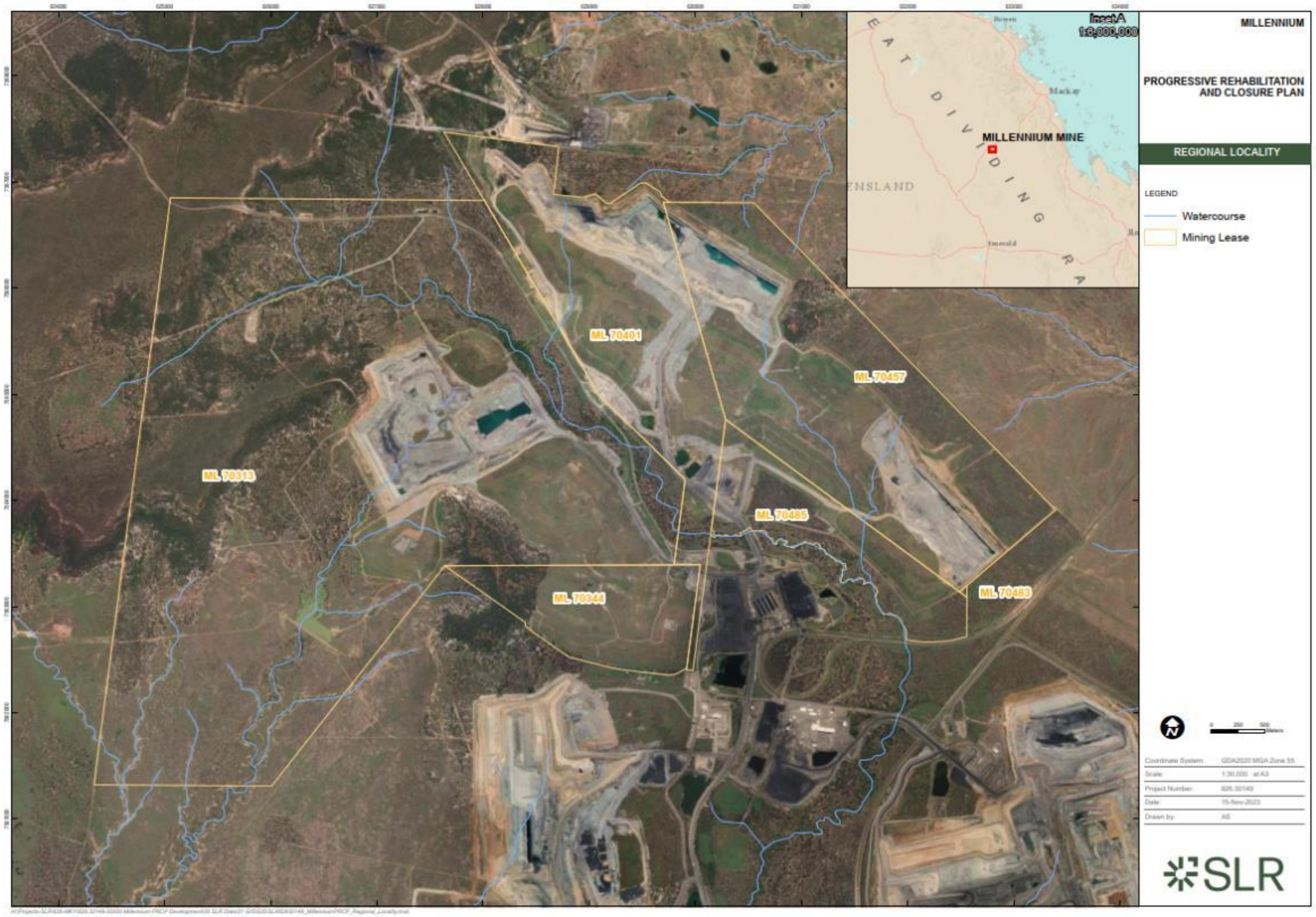

Figure 1-1 Site Locality

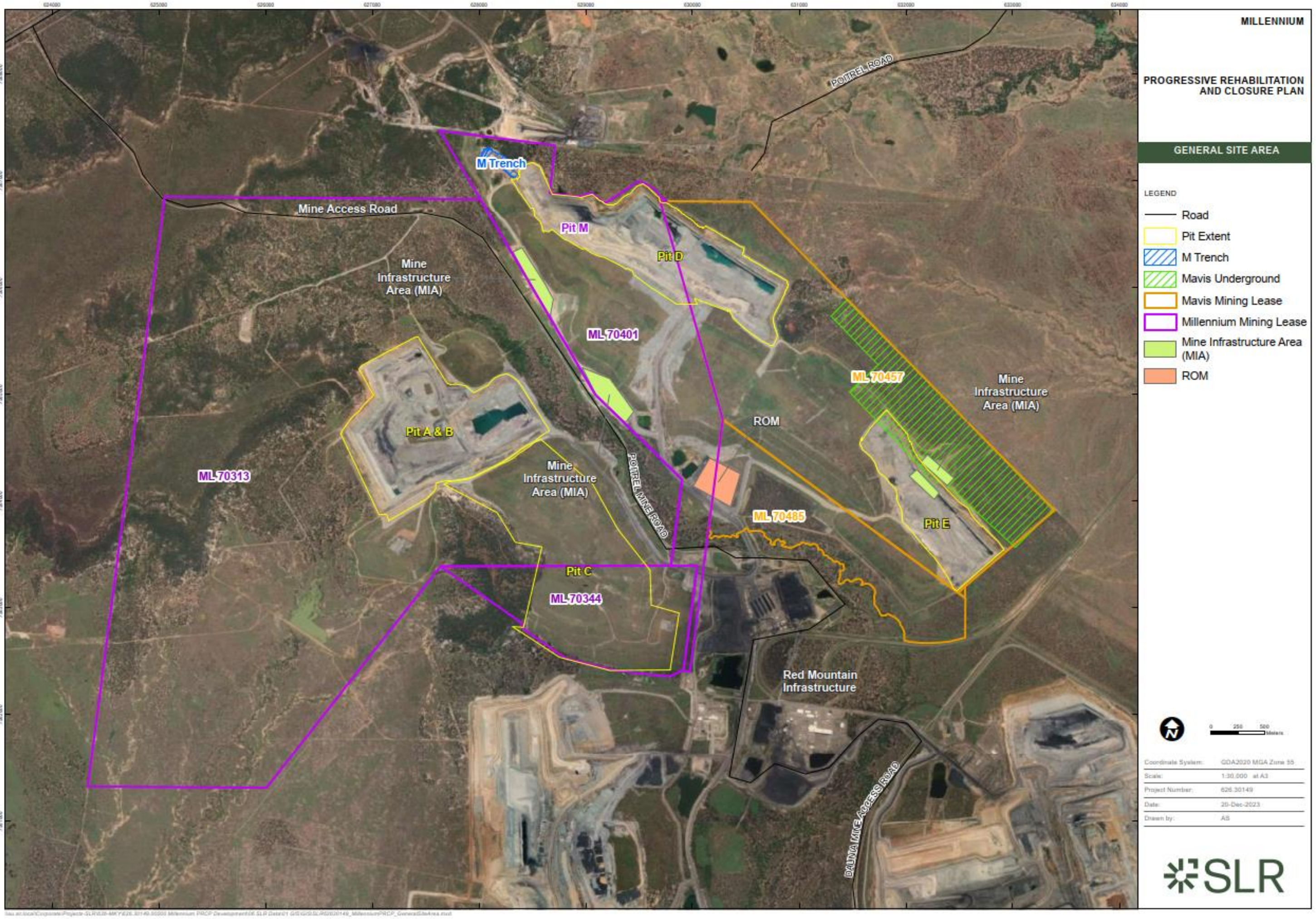

Figure 1-2 Mining Operations

1.2 Ownership and Current Operations

The mine has been in operation since 2005. During 2021, the ownership and operation of MCM changed:

- Prior to 16 July 2021:
    - Peabody Energy Australia (Peabody) owned and operated MCM; and
    - Coal extraction ceased in 2020 with MCM put into care and maintenance.
- From 16 July 2021 onwards:
    - MetRes owned and M Mining Pty Ltd operated the MCM.

MCM commenced open cut coal mining operations through truck and shovel method in 2006, however, was placed in care and maintenance by the previous owner Peabody, with the pause of open-cut mining in 2018 and highwall mining in 2019. With the successful acquisition of MCM in July 2021, MetRes recommenced operation in September 2021 to continue open-cut mining, utilising truck and shovel mining techniques, as well as auger miners to extract the Leichhardt seams of the Rangal Coal Measures.

Mining of coal from the Leichhardt seams of the Rangal Coal Measures reserves at MCM is currently undertaken at Mavis Underground using bord and pillar methods. ROM coal from the underground operations is fed to the underground portal in E Pit via a series of conveyors to the ROM coal stockpile area. The coal is transported for washing and processing at the CHPP operated by RMI on the adjoining mining lease. Product coal is then dispatched via Goonyella rail line to the Dalrymple Bay Coal terminal located in Hay Point, south of Mackay for export to the overseas market.

The current main active mining infrastructure and activities that support mining at MCM include:

- Underground mining of Leichhardt seam in Mavis area on ML 70457.
- Underground mining surface facilities.
- Surface support infrastructure including workshops, wash bays, administrative buildings, potable water treatment plants and a sewage treatment plant.
- Coal handling and ROM stockpile area.
- Processing of ROM coal through RMI CHPP to produce coking coal and PCI (Pulverised Coal Injection) coal.
- Backfilling open cut pits with tailings and rejects generated at RMI CHPP.
- Reshaping of spoil dumps, replacement of topsoil and revegetation of the mined out and backfilled areas.
- Progressive rehabilitation.

1.3 Purpose of Report and Executive Summary

The purpose of this report is to accompany the application to amend an environmental authority submitted by MetRes Pty Ltd (MetRes). This report contains the supporting information required by the *Environmental Protection Act 1994* (EP Act) and the approved form.

Following discussions with the Department in relation to post mining land uses for mine voids, it was agreed that MetRes would submit an amendment application to address the issue by changing part of the PMLU for the residual void lakes to NUMA’s.

The intention of this amendment is to amend the Landform and Rehabilitation tables as well as include a condition outlining the rehabilitation landform criteria in the EA, as follows:

- Amend 'Table F1: Final Land Use and Rehabilitation Approval Schedule' of the Current EA to change the disturbance type 'Residual Void' reference of PMLU for Waterbody to NUMA. Additionally, split the component parts of the Residual Void (low and high walls) to maximise the opportunity for a PMLU as follows:
  - Low wall (39ha) – PMLU for Native bushland
  - Residual void and Highwall* (242ha) – NUMA

    ***Note:** (99ha) of highwalls have been pre-approved as NUMAs and this amendment proposes to include an additional (143ha) of void water body, as defined by the high-water mark, to this classification **(see Figure 4-14**). Proposed updates to Table F1 have been aligned with the areas and PMLU's provided in the PRCP schedule of the MCM PRCP Application.

    See Table 9-1 for complete proposed amendments to Table F1.
- Amend 'Table F2 – Landform Design Criteria' of the Current EA to separate the disturbance type 'voids, ramps and highwalls' and the corresponding projective surface area (see **Table 9-2** for complete proposed amendments to Table F2).

- Amend 'Condition F3: Rehabilitation landform criteria' of the Current EA to remove the words "with a self sustaining vegetation cover" and insert "alternative rehabilitation outcomes for other mine domains that will not be adopted in the PRCP (See **Section 9.0** for proposed wording).

2.0 Legislative Requirements

The *Environmental Protection Act 1994* (EP Act) states the requirements for an EA amendment application. The requirements have been addressed in this report, **Table 2-1** outlines the requirements and response.

Table 2-1 Legislative Requirements and Response

Requirement	Response
Section 226 of the EP Act:	
a) Be made to the administering authority;	The amendment application has been submitted to the Department of Environment, Science and Innovation (DESI) (the administering authority).
b) Be in the approved form;	The approved form "Application to amend an environmental authority" (ESR/2015/1733), version 21.02, effective 23 February 2024 has been used.
c) Be accompanied by the fee prescribed by regulation;	A fee of $367.40 has been included with the amendment application and 30% of the annual fee for the authority at the time the application is made.
d) Describe the proposed amendment;	See Section 3
e) Describe the land that will be affected by the proposed amendment; and	There will be no additional disturbances or impacts and no land will be affected by the proposed amendment.
f) Include any other document relating to the application prescribed by regulation.	There are no other documents relating to an amendment application prescribed by regulation.
Section 226A of the EP Act:	
a) Describe any development permits in effect under the Planning Act for carrying out the relevant activity for the authority;	There are no development permits required for the carrying out of the proposed activity.
b) State whether each relevant activity will, if the amendment is made, comply with the eligibility criteria for the activity;	The relevant environmental authority was approved under a site-specific application as the site activities do not comply with the eligibility criteria for mining lease activities.
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;	The EA was granted under a site-specific EA and therefore does not require compliance with the eligibility criteria.
d) State whether the application seeks to change a condition identified in the authority as a standard condition;	The relevant environmental authority was approved under a site-specific application and therefore all conditions are site specific and not standard.
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;	The application does not relate to a new relevant resource tenure.

Requirement		Response
f)	Include an assessment of the likely impact of the proposed amendment on the environmental values, including-	
	i) A description of the environmental values likely to be affected by the proposed amendment;	Section 5.
	ii) Details of emissions or releases likely to be generated by the proposed amendment;	Section 5.
	iii) A description of the risk and likely magnitude of impacts on the environmental values;	Section 5.
	iv) Details of the management practices proposed to be implemented to prevent or minimise adverse impacts;	Section 5.
	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;	Section 7.
g)	Include a description of the proposed measures for minimising and managing waste generated by amendments to the relevant activity; and	Section 6.
h)	Include details of any site management plan or environmental protection order that relates to the land the subject of the application.	A site management plan or environmental protection order does not relate to the land subject of the application.

The application does not relate to a PRCP Schedule, CSG activity or Underground Water Rights, therefore sections 226B, 227 and 227AA of the EP Act do not apply to this application.

3.0 Proposed Amendment Description

As required under the PRCP transitional provisions, MetRes submitted the MCM PRCP Application to DESI on the 20th of December 2023. The MCM PRCP Application proposed a number of post mining land uses (PMLUs) and pre-approved non-use management areas (NUMAs) (**Table 3-1)** which were transitioned from the EA **(Appendix A)**. When considering PMLU's the following documents were also considered.

- Residual Void Management Plan - **Appendix B**
- Rehabilitation Management Plan - **Appendix C**
- Post-Closure Management Plan - **Appendix D**

Table 3-1 PRCP Proposed PMLU Transitioned from LODs

Final Land Use	Definition	Applicability
Light Grazing	Land will support light grazing as per the surrounding environment. Includes any infrastructure to be retained with a landholder agreement.	All areas of existing rehabilitation, infrastructure, road areas, ancillary disturbance, and subsidence.
Native Bushland	Land will support native bushland.	Overburden not yet rehabilitated.
Waterbody	Water quality to meet quality guidelines and provide safe access.	This includes the waterbody that will form in each residual void.
Non-use Management Area (NUMA)	Unable to sustain a PMLU.	Open cut mining remaining highwalls and end walls.

As part of the MCM PRCP Application and as per Table F1 of the EA**,** the PMLU of "waterbody" was proposed for the void lakes that would form in each residual void at closure. A Final Void Hydrology study **(0)** was undertaken to inform the PRCP Application which identified that the void lakes could sustain a PMLU and provide stock water quality for up to 300 years and that other beneficial uses such as Aquatic Habitat could be sustained for up to an additional 200 years.

The PRCP application was deemed 'Not Properly Made' and a notice was sent to MetRes on the 22nd of January 2024. The response to the Not Properly Made Application notice is due to DESI 19 June 2024.

3.1 Regulator Consultation

On the 2nd of May 2024, a meeting was held between DESI, MetRes and SLR to discuss:

- The ability of the void water to sustain the PMLU Waterbody in perpetuity and viability of a long term PMLU in consideration to water quality.
- EA amendment for potential necessary changes to EA tables F1 Final Land Use and Rehabilitation Approval Schedule and F2 Landform Design Criteria.
- Procedural implications of a change application including public notification.

It was determined that the PRCP will not be approved if the residual void lakes continue to have two proposed PMLU Waterbody with outcomes of stock water quality and aquatic habitat and Additionally, the requirement for waterbodies to sustain the nominated PMLU in perpetuity based on available data is unlikely to be achieved and would otherwise be classified as a NUMA.

3.2 Proposed Amendment

Whilst the proposed EA amendment is by definition a major amendment it is administrative in nature as the amendment is to better categorise part of the residual void lakes domain from PMLU Waterbody to NUMA. DESI's feedback from the meeting detailed above was to amend the EA to change tables F1 and F2, to reflect this realignment of the residual void from PMLU Waterbody to NUMA. There are no changes to void water quality or impacts to the environment proposed in this amendment.

In Table F1 of the current EA, residual voids include both the highwall and low wall components of the void and have a nominated PMLU of waterbody/native bushland with the highwalls being a pre-approved NUMA. Rather than classify all the components of the residual void to NUMA. This EA amendment proposes to split the residual void into its component parts to maximise the opportunity for a PMLU as per the following:

- Low wall – PMLU native bushland
- Highwall and residual void lakes - NUMA

This amendment does not affect the rehabilitation methodology and does not increase the area already proposed as a void lake in the PRCP. Further details are in **Section 4**.

Further, the purpose of this amendment is to update the PMLUs for the residual void including High walls and Low walls disturbance area in the EA, with the intention of using the EA as the primary LOD for the development of the MCM PRCP.

4.0 Final Landform

4.1 Proposed Land Outcomes

A conceptual final landform has been developed for the PRCP submission. Rehabilitation has been progressively undertaken at MCM working towards reducing residual void areas through partial and fully backfilling pits with spoil during mining activities.

Table 4-1 shows the areas associated with the residual void, highwall and low wall disturbance areas. The residual voids will be allowed to fill up with water as the highwalls and end walls will remain as a NUMA. The geotechnical report undertaken for the purposes of the PRCP Application outlines that each pit is stable **(Appendix F)** Lowwalls and ramps are to be reprofiled, spoil pushed down the pit as far as the low-water mark.

Table 4-1 Proposed Amendment of PMLU for Residual Void

	Residual Void	High wall	Low wall
Area (ha)	143	99	39
PMLU	NUMA	NUMA	Native Bushland

The residual voids have a current PMLU of waterbody. Review of modelled water quality indicates that void water can support stock water quality guidelines (ANZECC, 2000 – 5000 mg/L or 7.5 mS/cm for Beef Cattle) from approximately 140-290 years with the potential for water bodies to change PMLU to aquatic habitat for a further 200 years before the water becomes too saline. However, a domain cannot have two PMLU overtime, therefore, the residual voids are being proposed as NUMAs. **See Figure 4-1**

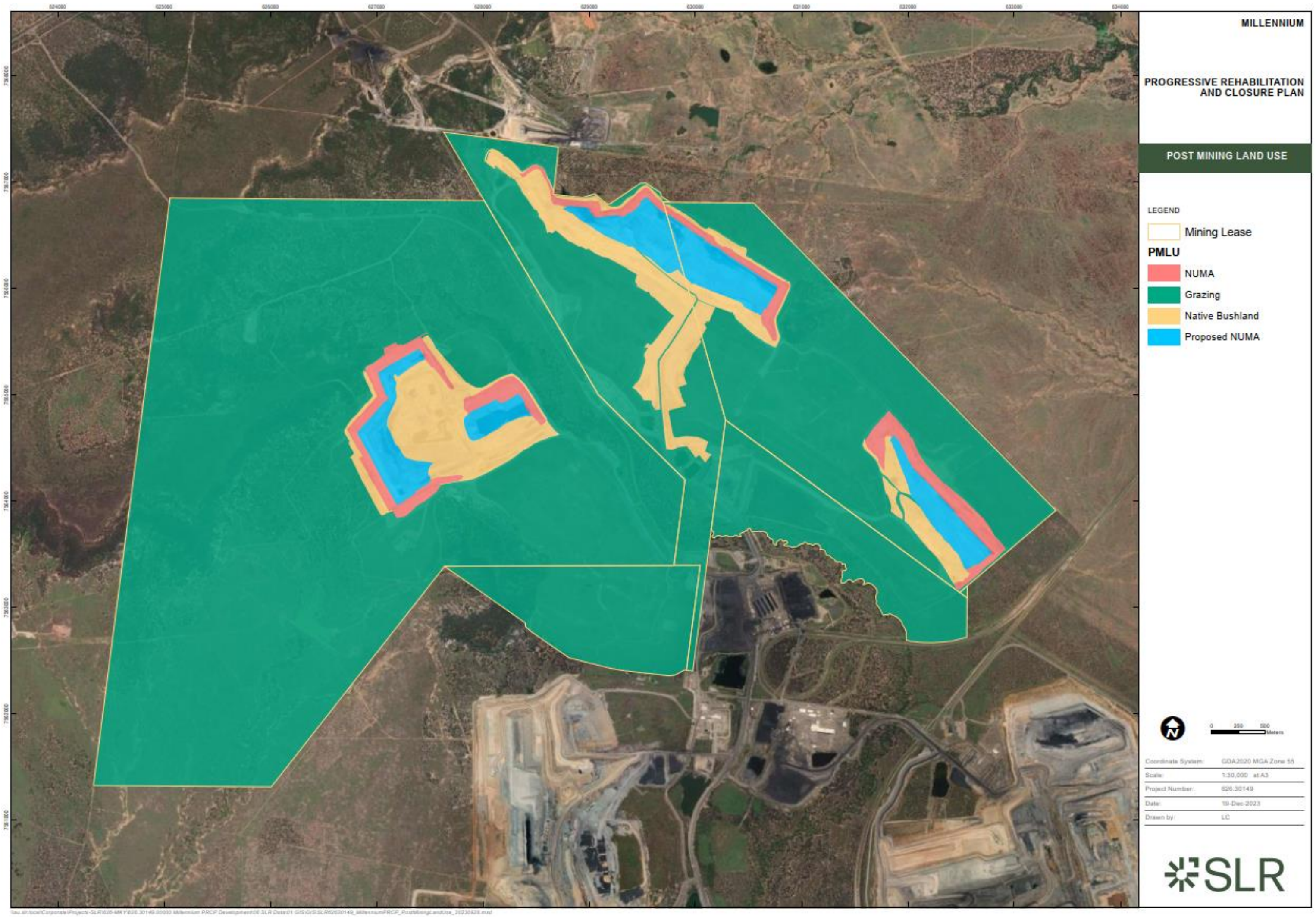

Figure 4-1 Proposed NUMAs for Residual Void Waterbody

4.2 Outcomes for Final Voids

A review of previous approval documents has been undertaken to identify the land outcome intent of the final voids at MCM over time. **Table 4-2** summarises the land outcome for residual voids in the documents listed.

Table 4-2 Final Void Land Outcome History

<table>
<tr><th>Document</th><th>Final Land Use for Residual Voids</th></tr>
<tr><td>EA (June 2023)
Appendix A</td><td>Condition F6 “Residual Void Outcome - Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.”</td></tr>
<tr><td>Residual Void Management Plan (June 2019)
Appendix B</td><td>“Additional amendments between the varies scenarios have also resulted in a positive outcome for the site, such as the partial backfilling of Mavis E Pit to natural ground level at the northern end, which was originally planned/designed to remain as a void. Similarly, the creation of the Millennium A Pit in-pit spoil dump has resulted in a large flat top of dump being created on the RL225 level, which will be rehabilitated and returned to cattle grazing. This area was originally planned/designed to remain as a void and the spoil material hauled to the top of dump above natural ground level on the RL305 and RL285 level.”

“Options to minimise the residual voids at Millennium Mine have been considered over the life of the mine and, more recently, as part of the planned staged closure process. The balance between recovering economic coal using traditional and non-traditional mining methods has been taken into consideration and the final landform outcomes incorporated into options analysis throughout this process to provide the best business, environmental and post mine land use outcome, which is to support sustainable cattle grazing on non-mined and rehabilitated land and water storage within the final voids. Millennium’s efforts have resulted in the final void area being reduced and additional cattle grazing area being developed whilst maximising the recovery of coal.”

“Scenario 11 will result in a residual void (including ramps, high walls and low walls) of 389 ha. Details of the total void area and in-pit useable area for Scenario 11 are presented in Table 6 and Table 7 below.”

Table 6 –Final Landform Void Area Analysis
<table>
<tr><th></th><th>Base Case</th><th>Scenario 11</th></tr>
<tr><td>Millennium Pit</td><td>163</td><td>171</td></tr>
<tr><td>Mavis Pit</td><td>220</td><td>218</td></tr>
<tr><td>Total Void Area (ha)</td><td>383</td><td>389</td></tr>
</table>
Table 7 – Final Landform In-pit Usable Area Analysis
<table>
<tr><th></th><th>Base Case</th><th>Scenario 11</th></tr>
<tr><td>Millennium Pit</td><td>0</td><td>28</td></tr>
<tr><td>Mavis Pit</td><td>0</td><td>19</td></tr>
<tr><td>Total Usable Area (ha)</td><td>0</td><td>46</td></tr>
</table>
</td></tr>
</table>

Document	Final Land Use for Residual Voids
Rehabilitation Management Plan (June 2019) **Appendix C**	"In pit low wall dump slopes below natural ground level will be re-graded by dozers to provide a final landform design angle of 1 (v): 3 (h) to the height of the modelled residual void high water mark. This will mitigate against erosion of spoil material compared to the as dumped angle of repose slope angle, which is steeper at 1:3.3. Regrading below the residual void high water mark will not occur given this spoil material will be covered with water."
Post Closure Management Plan (June 2019) **Appendix D**	"The residual void may be used by Peabody for short, medium and long-term water storage for other Peabody sites and neighbouring sites (subject to commercial agreement) until the mining leases and/or land is relinquished back to underlying landowner or sold to an alternate landowner."

4.3 Final Void Water Balance Modelling

A void water balance and water quality modelling has been undertaken by KCB Australia Pty Ltd (KCB) for the existing open cut voids at MCM as part of the PRCP development **(Appendix A).**

The final void Water Balance Model (WBM) included a total dissolved solids (TDS) mass balance which when compared to stored volume allows estimation of EC. The results have been compared against typical reuse tolerances for stock.

Predicted long-term TDS fluctuations for A and B Pit base case are presented in **Figure 4-2**. Modelled results for A and B pit indicate that simulated TDS concentrations are expected to increase over time, with some fluctuations dependent on seasonal changes and expected wet periods and droughts.

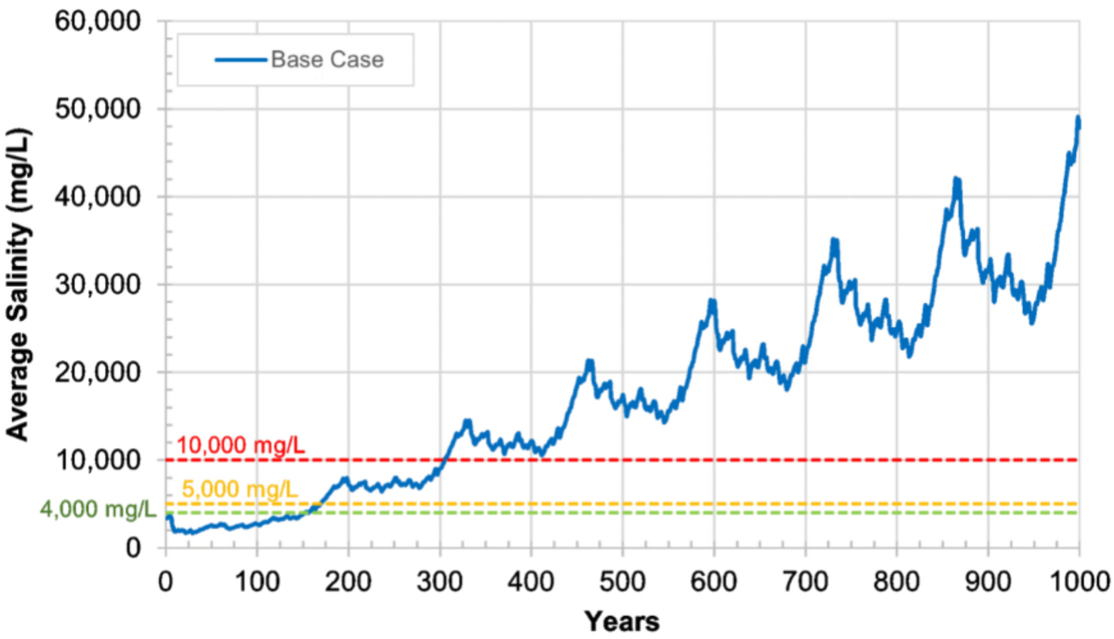

Figure 4-2 A and B Pit salinity – base case (expressed as TDS mg/L)

Predicted long-term TDS fluctuations for M and D Pit for the base case have been presented in **Figure 4-3** (M and D Pit salinity). Due to the large external catchment contributing to M and D Pit, modelled salinity levels within the void increased more gradually with the 10,000 mg/L threshold being maintained over a longer time frame compared to A and B Pit. The long-term increase in salinity however was also predicted at M and D Pit due to the evaporation dominating the salt balance. Similar to A and B Pit, some fluctuations are predicted due to seasonal changes and expected wet periods and droughts over the 1,000 years, however, were more significant within the M and D Pit due to the larger amount of catchment contributing to the final void.

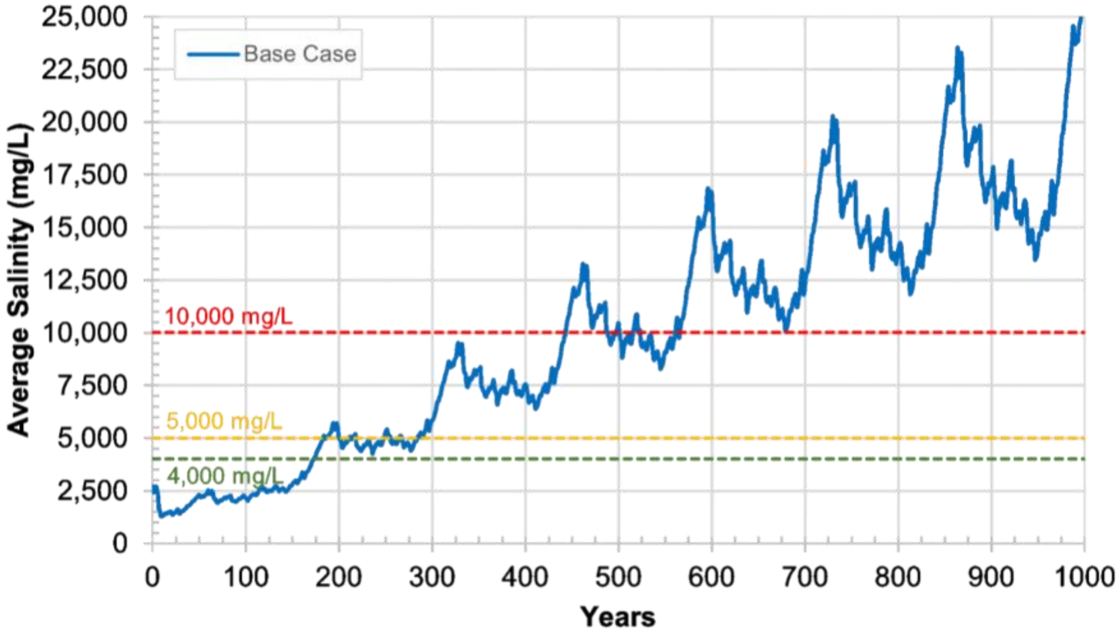

Figure 4-3 M and D Pit salinity – base case

Predicted long-term TDS fluctuations for E Pit for the base case are presented in **Figure 4-4**. Salinity levels predicted within E Pit were expected to be the highest of the three final voids at MCM. This result was likely because of the relatively small available storage volume of E Pit and its small contributing catchment. The highly saline groundwater contribution to E Pit was similar to that predicted at M and D Pit and unlikely to be a specific factor to overall salinity.

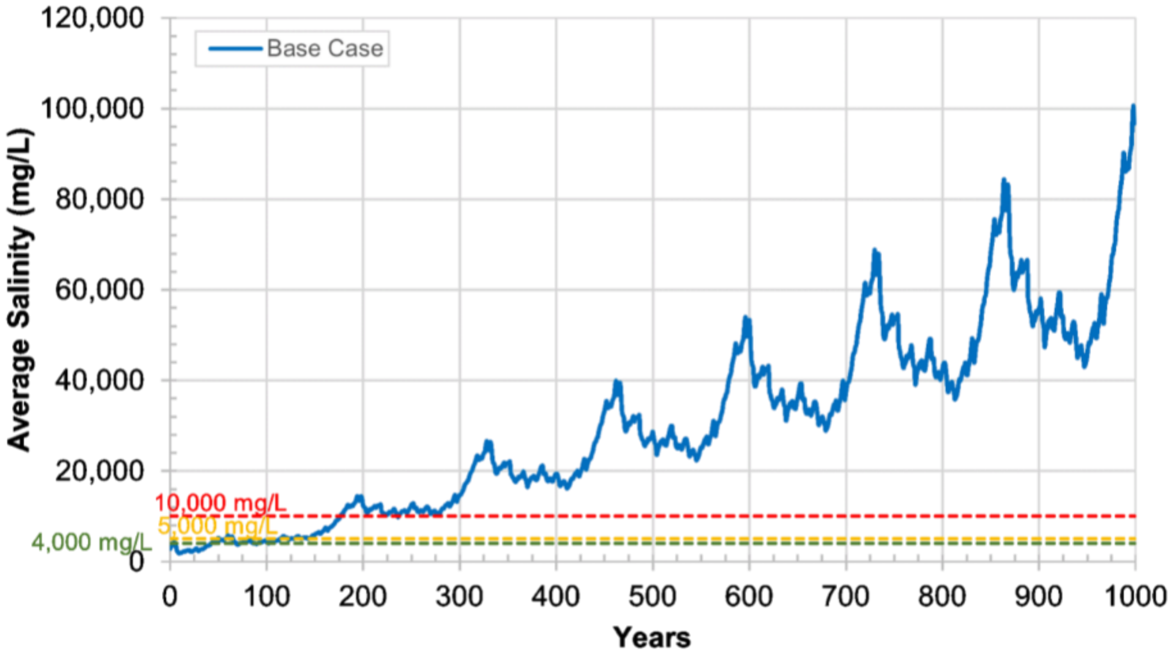

Figure 4-4 E Pit salinity – base case

Base case average salinity within each void at various years are presented in **Table 4-3**. Whilst salinity levels within each void were initially representative of the existing pit water quality and the relative contribution of inflows, the concentrating effect of evaporation increased salinity to values typical of seawater (or higher) by the end of the simulation period. The highest electrical conductivity (EC) over the model period was predicted to occur in E Pit which also had the fastest rate of salinisation.

Because of the dominance of evaporation, the void salinity will progressively increase with limited opportunities for dilution effects from local runoff and rainfall.

Table 4-3 Predicted average Salinity in the Final Voids (rounded to the nearest 10 mg/L)

Model Year	A and B Pit (mg/L)	M and D Pit (mg/L	E Pit (mg/L)
100	2650	2140	4290
150	3810	2780	5940
500	17410	10460	28640
1000	47800	25840	96650

Water quality within final void pit lakes typically evolves over time and are dependent upon the dominant sources of water contributing. In many cases this is groundwater once equilibrium is achieved.

Beneficial reuse opportunities for grazing were shown to be supported for a period of between up to 140 to 290 years post closure.

An assessment was undertaken of how much void water could be reused for stock watering and to understand the potential supply reliability and benefit to reducing salt load.

Based on the total reuse demand of 10.3 ML/year of water up to a TDS limit of 5,000 mg/L, each void was assumed to supply a portion of this demand based on available area of stocking. Model results indicated:

- A and B Pit supplied a maximum of 1.5 ML/year between 2027 and 2197 (170 years);

- M and D Pit supplied a maximum of 6.0 ML/year between 2027 and 2318 (291 years); and
- E Pit supplied a maximum of 2.8 ML/year between 2027 and 2172 (145 years).

The TDS limit of 5,000 mg/L was found to be a major limiting factor in the reliability of supply for stock watering. The potential change of water level within each final void was predicted to be minor, with total reuse volumes from each void predicted to be between 255 and 1,660 ML. Reuse opportunities were found to be best up to a period of 150 years post closure. During this period stock access to the free water surface may be constrained due to the stored volume being present within spoil material.

Once equilibrium conditions are reached the water level within each void will vary seasonally within the maximum and minimum water levels. Water level fluctuations have been modelled to be below the pit crest with no release of water from the voids via overtopping. **See Figure 4-5, Figure 4-6 and Figure 4-7.**

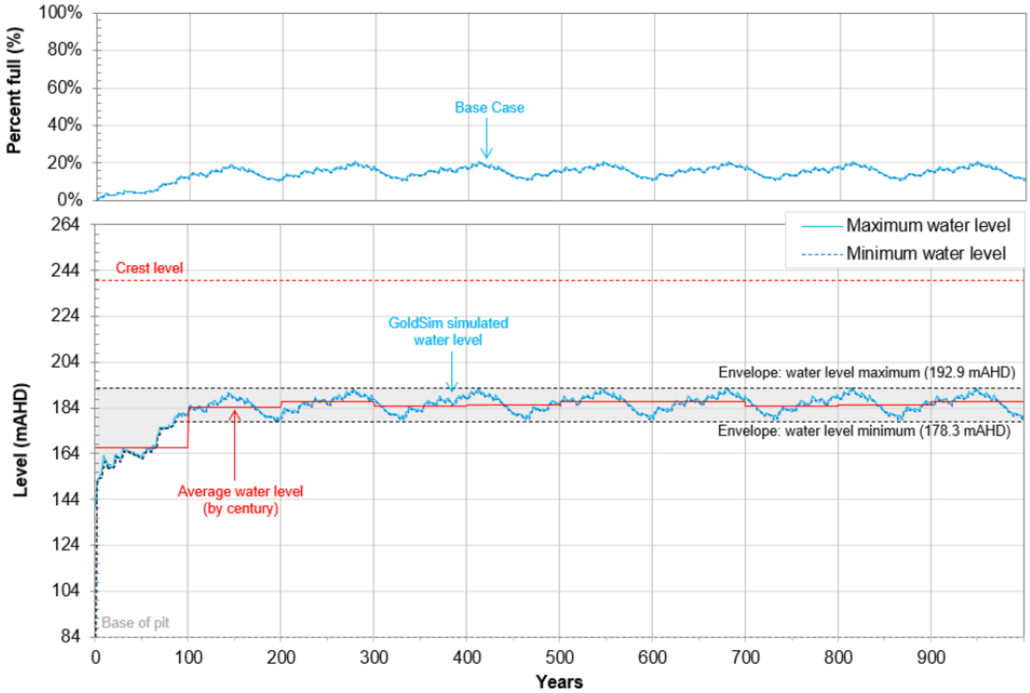

Figure 4-5 A and B Pit Water Levels

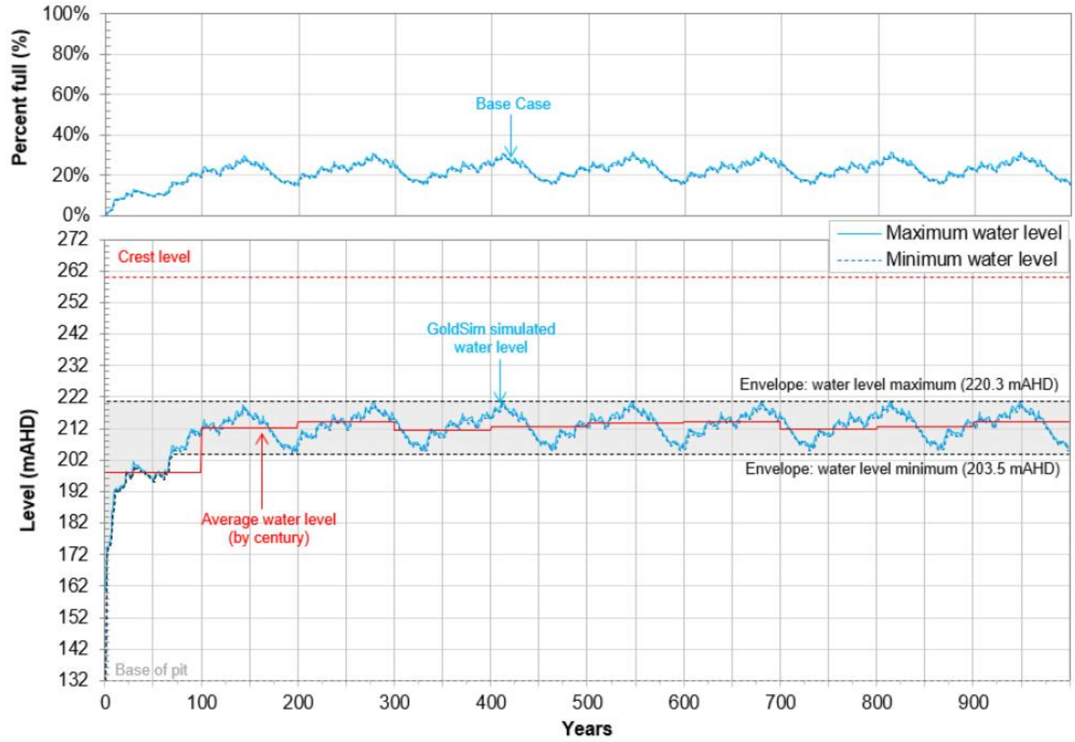

Figure 4-6 M and D Pit Water Levels

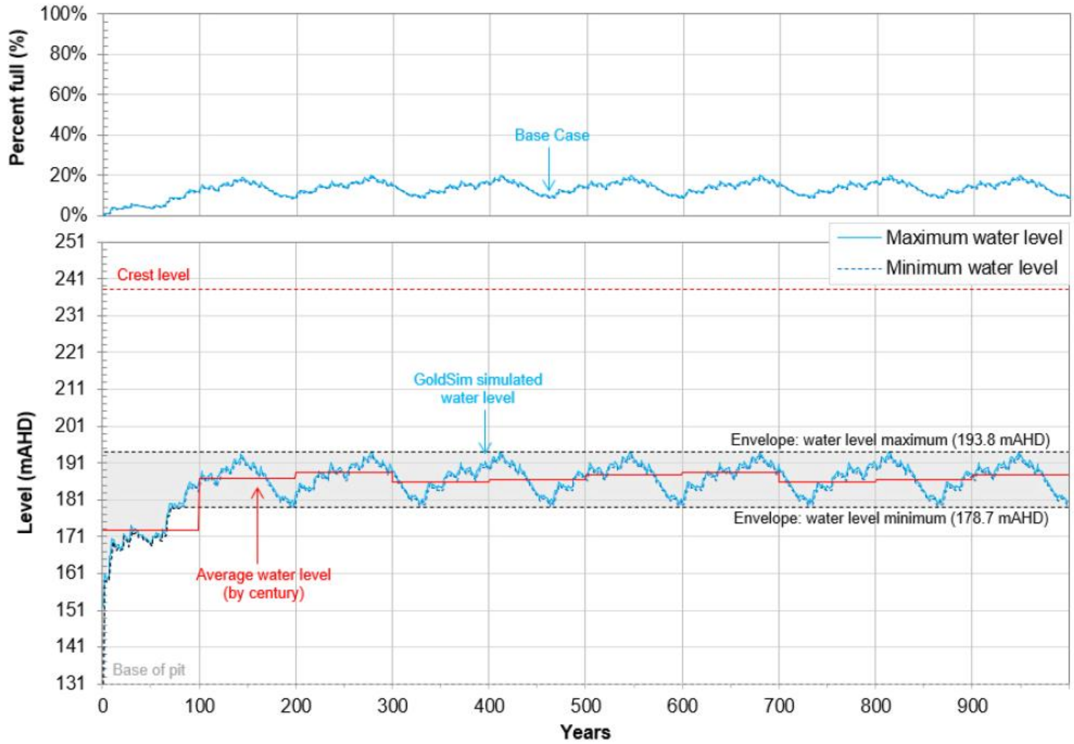

Figure 4-7 E Pit Water Levels

4.4 Groundwater

A groundwater assessment was undertaken by SLR Consulting Australia Pty Ltd (SLR) to provide an associated report to support the MCM transitional PRCP **(Appendix G).**

The proposed post-mining final MCM landform consists of five Pits: A Pit, B Pit, M Pit, D Pit and E Pit. Due to the interconnectedness between Pits A&B, and Pits M&D, they each act hydro-geologically as a single void system. This means, post mining, there are three independent residual void systems at MCM referred to as: A&B Pit, M&D Pit, and E Pit.

The void system in general was surface water driven for all three voids. The contributions from the spoil and groundwater were minor compared to the contributions from rainfall and runoff. The groundwater system appeared to be predominantly spoil side driven. The water level in the spoil exceeded the water level in the void for all scenarios and therefore, in the long-term, the void acted as a sink for all rehabilitation options.

The results from the groundwater model simulations are summarised in **Table 4-4** and **Table 4-5** and presented in **Figure 4-8** to **Figure 4-11**.

The long-term fluxes between Spoil and void lakes as well as rock and void lakes are listed in **Table 4-4**. All voids are predicted to be groundwater sinks. Generally, the flow is from spoil and rock towards the void, with the spoil inflows being approximately 100 times higher than from the rock. This is due to the spoil receiving higher recharge than the in-situ rock. M+D void have a negative flux, meaning the void water is discharging not the groundwater. However, this contribution is minor (250 L/day over the entire void). This potential net outflow is caused by the M&D void lake level being slightly higher than the equilibrium water level in model layer 3 (Rewan Group) in the area southeast of the void. The E void lake level is much lower than the M&D void lake level, and any of this minor net outflow will be drawn towards the E pit void lake and so this discharge is not predicted to leave Site. The particle tracking (**Section 6.4.2**) showed that all voids are full sinks.

Table 4-4 Groundwater Model Long Term Void Fluxes Post-Recovery

A&B Pit Net Flux (Spoil) (m3/day)	A&B Pit Net Flux (Rock) (m3/day)	M&D Pit Net Flux (Spoil) (m3/day)	M&D Pit Net Flux (Rock) (m3/day)	E Pit Net Flux (Spoil) (m3/day)	E Pit Net Flux (Rock) (m3/day)
64.74	0.79	44.46	-0.25	38.08	0.71

Table 4-5 lists the groundwater levels in the void as well as in the adjacent spoil for each pit. The spoil levels are higher than the void, which conceptually is expected for the void that act as groundwater sinks. The differential between spoil and groundwater is largest for E-Pit.

Table 4-5 Groundwater Model Long Term Water Levels Post-Recovery

A&B Pit Void Water Level (mAHD)	A&B Pit Spoil Water Level (mAHD)	M&D Pit Void Water Level (mAHD)	M&D Pit Spoil Water Level (mAHD)	E Pit Void Water Level (mAHD)	E Pit Spoil Water Level (mAHD)
181.39	181.44	207.51	207.72	182.18	188.12

Figure 4-8 shows the net flux from the spoil into the void. A positive number means that the water flows from the spoil into the void. A negative number means that the water flows from the void into the spoil. The initial water levels in the voids are lower than the surrounding groundwater elevation in the spoil, this leads to the voids acting as groundwater sinks, in particular the A&B void. Then, as void water level increases the void begins to discharge to the now desaturated spoil. Once groundwater and void levels have equilibrated all three voids act as long term groundwater sinks.

Figure 4-9, shows the net flux from non-spoil groundwater into the void. A positive number means that the water flows from the aquifers into the void. A negative number means that the water flows from the voids into the aquifer. The non-spoil flux values are two orders of magnitude lower than the spoil, indicating that void groundwater fluxes are dominated by spoil interaction. The A&B void and E void act as long term groundwater sinks for adjacent aquifers whereas the M&D void will discharge 250 L/day of water a day into aquifer rock due to the presence of a hydraulic gradient from the M&D void towards the E voids. This potential outflow from M&D voids will be captured by the E void via this gradient. The dominance of spoil over the fluxes is due to the high permeability and recharge rate of spoil material and the large number of spoil cells in contact with the voids in the model.

Figure 4-10 shows the water levels in the void for each of the three designated void areas. The final water level equilibrates at 181.39mAHD for the A&B pit void, 207.51mAHD for M&D void and 182.18mAHD for E void. **Figure 4-11** shows the water levels in the spoil for each of the voids. These hydrographs were produced using the heads in a cell assigned spoil properties near each of the void lakes.

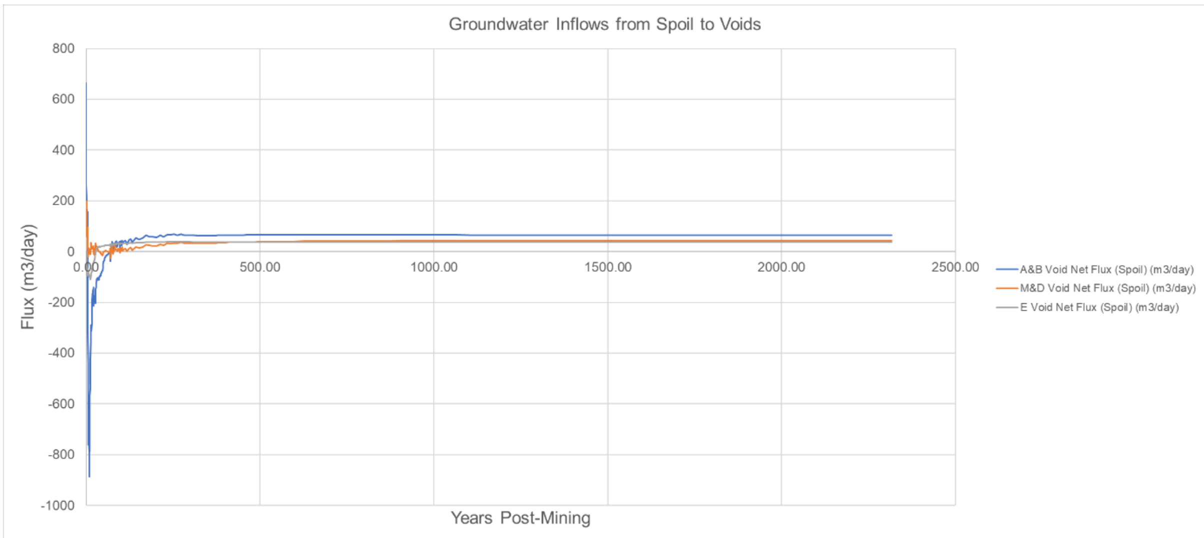

Figure 4-8 Groundwater Inflows from Spoil to Voids

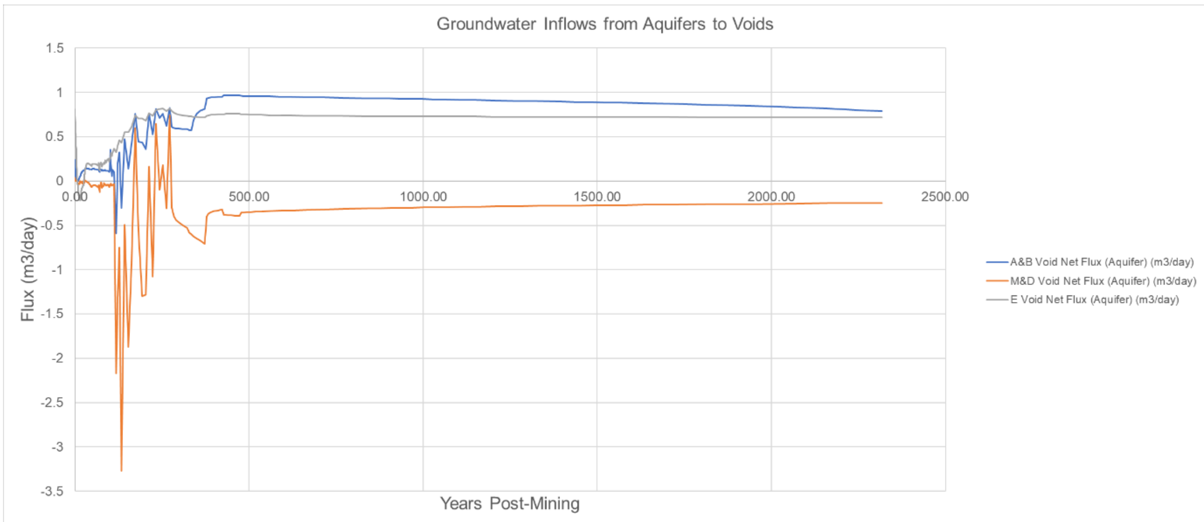

Figure 4-9 Groundwater Inflows from Aquifers to Voids

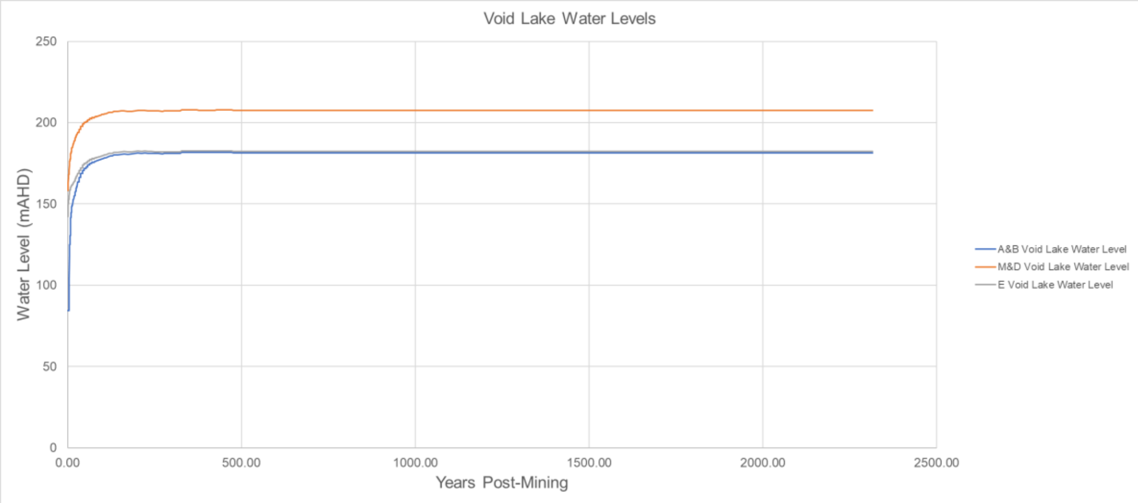

Figure 4-10Void Lake Water Levels

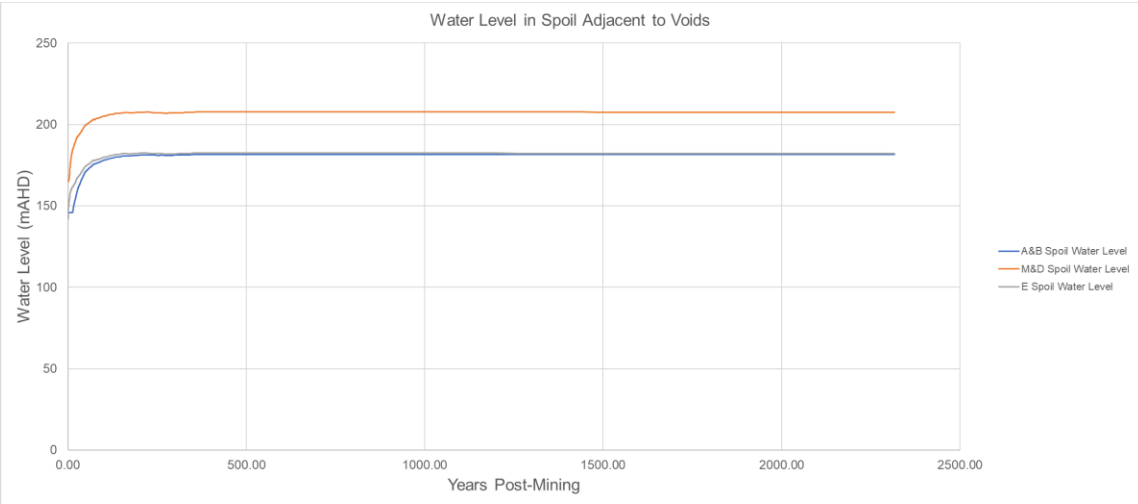

Figure 4-11Water Level in Spoil Adjacent to Voids

4.4.1 Flow Path Simulator

An analysis of the water movement within mine site was undertaken to simulate and assess the movement and fate of water particles through the groundwater system post-mining. A number of particles were placed on the final landform and within the residual voids and the mod-PATH3DU (S.S. Papadopulos & Associates, Inc., 2018) was used to simulate the particle pathways along the groundwater flow field during recovery. Transient heads output from the groundwater flow model were used by mod-PATH3DU to simulate particle flow lines. Additional care was given to ensure that the waste rock and spoil dumps to the south of the A&B pit and in the M&D pit area, as well as the underground extension adjacent to E pit were properly represented in the distribution of initial particle locations.

Figure 4-12 shows the initial location of particles on the landform. The particle's initial location is the mid-way point between the water level and layer bottom in the shallowest saturated model layer. Many of the particles begin in the deeper layers such as the Leichhardt and Vermont layers due to the desaturation of the upper model layers in the first postmining stress period. Some particles also migrate to deeper layers over time in the predicted flow paths shown in **Figure 4-13**.

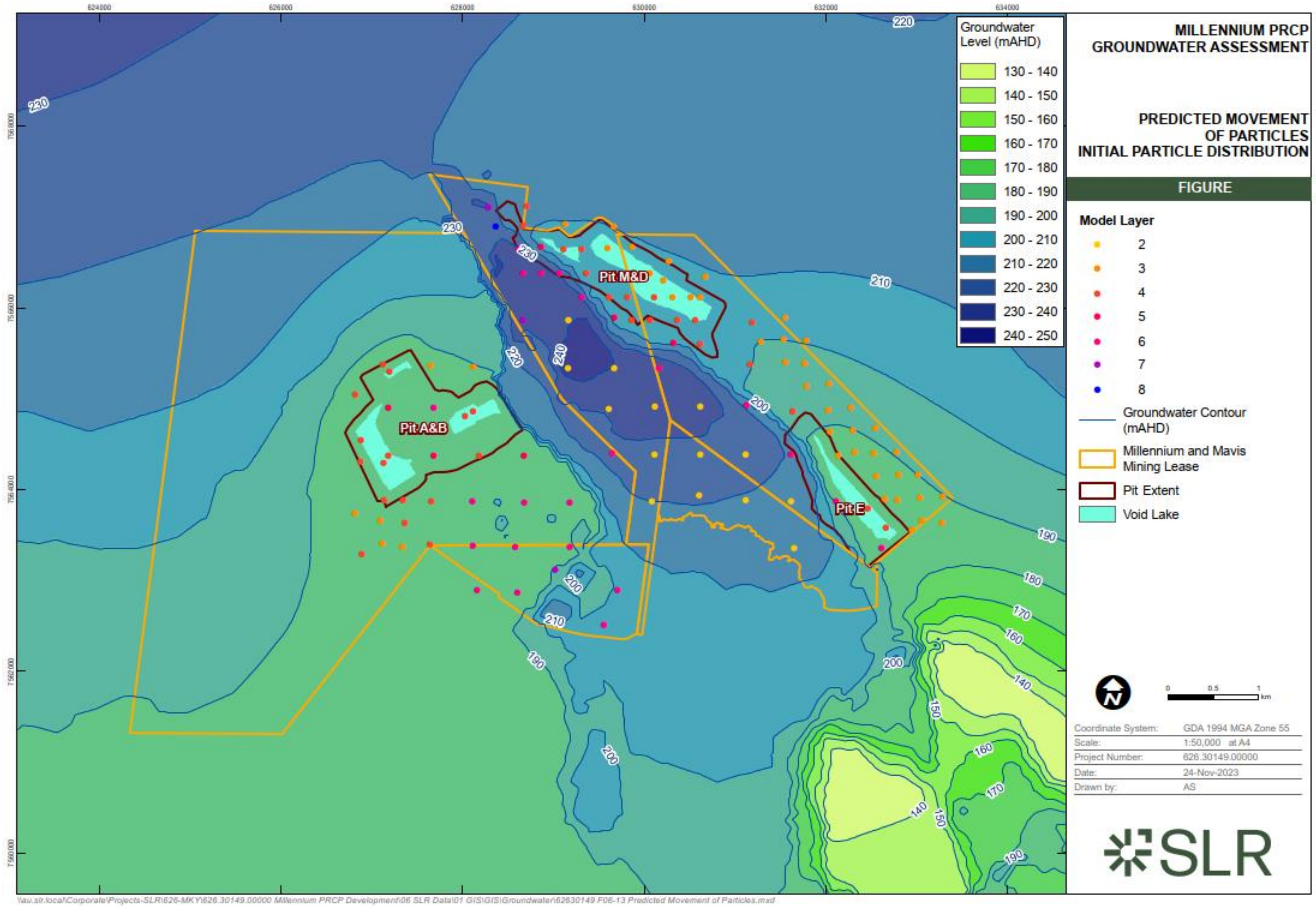

Figure 4-12 Initial Particle Placement for MODPATH Particle Tracking Simulation

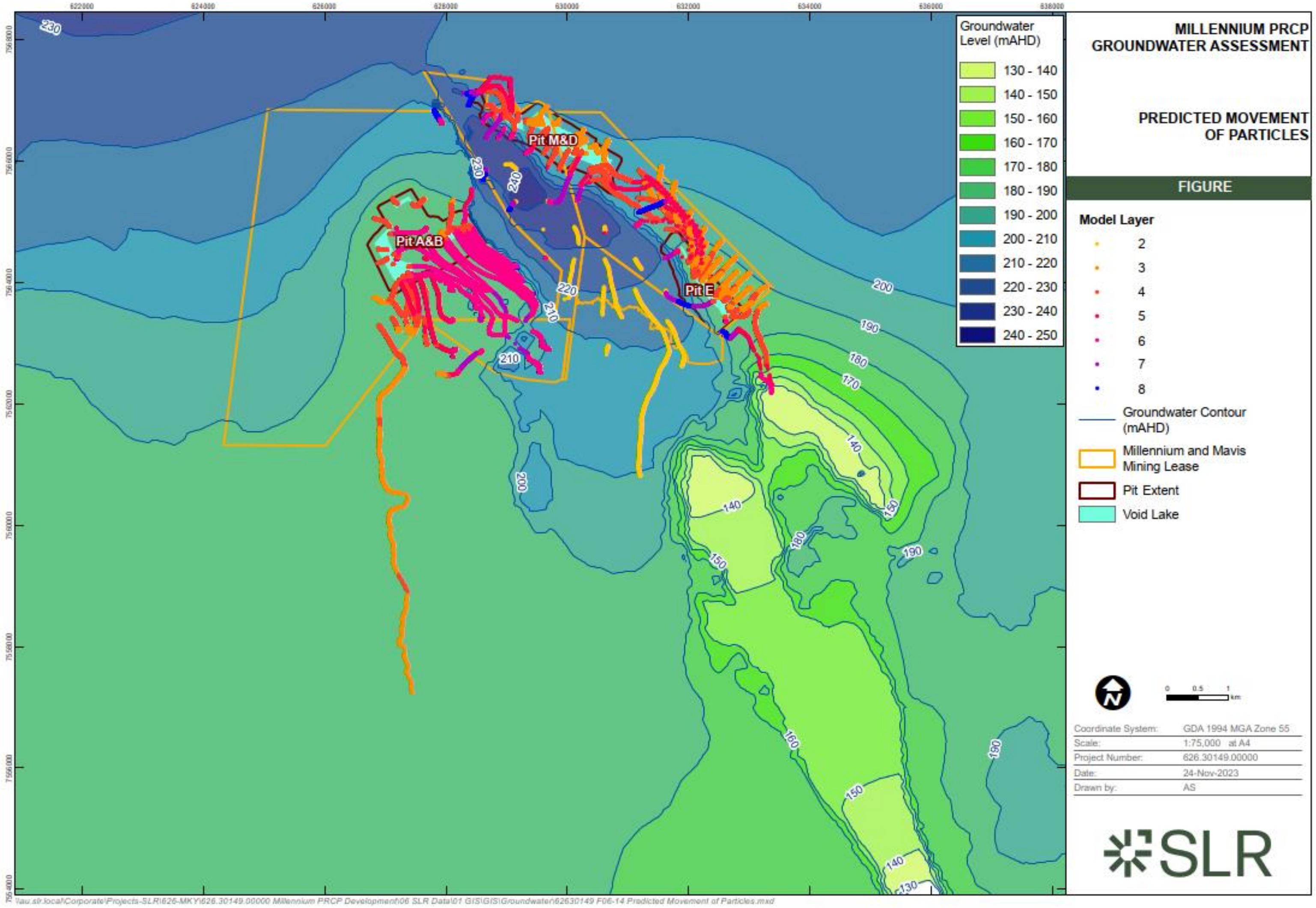

Figure 4-13 Simulated Particle Flow Paths from to End of Recovery

4.5 Proposed NUMA Management

In table F1 of the EA, 281 ha of disturbance is attributed to residual voids including highwalls and lowwalls. Instead of classifying the entire 281 ha as NUMA this amendment proposes to separate the disturbance areas and reduce the hectares of the proposed NUMAs. Areas attributed to low walls (39 ha) will be carved out and attributed a PMLU of native bushland, leaving 242 ha of highwall and residual void remaining. 99 ha of highwalls have been pre-approved as NUMAs and this amendment proposes to include an additional 143 ha of void water body, as defined by the high-water mark, to this classification. (**Figure 4-14)**.

Highwall safety bunds and buttressing on the toe of all highwalls and end walls will be constructed along with warning signage placed along the highwalls and end walls. The long-term geotechnical assessment, which considers the impact of groundwater and underground mining voids, indicates that the planned conceptual landform and pit walls meet widely accepted industry criteria and will remain structurally stable post-closure.

Therefore, the NUMAs proposed for MCM will be safe, structurally stable, and not cause environmental harm.

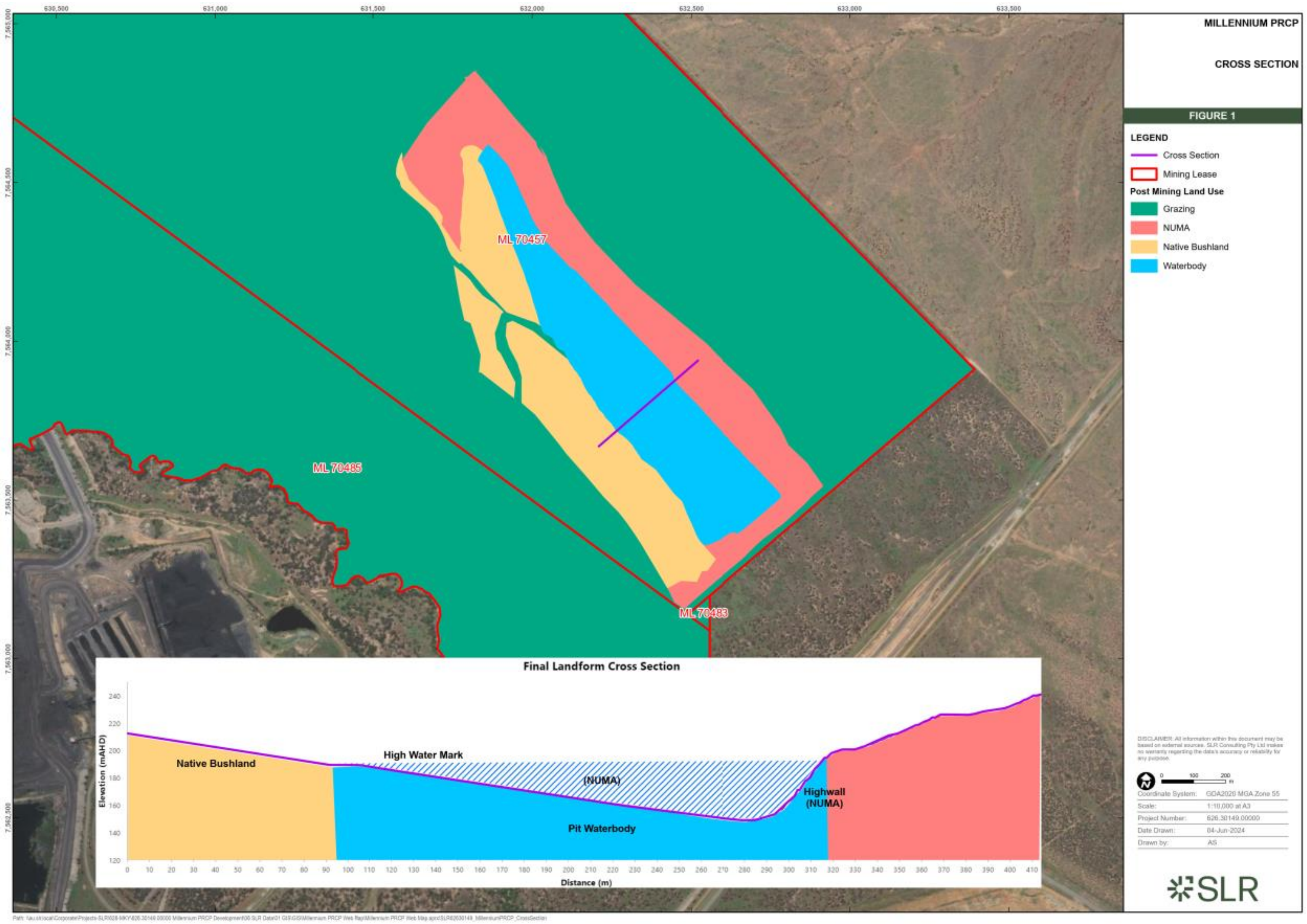

Figure 4-14 Residual Void Conceptual Cross Section

5.0 Environmental Assessment

5.1 Land

5.1.1 Environmental Values

Regionally the MCM sits within on the Isaac River valley slope. The topography of the area is generally flat and undulates with an overall gradient to the south, towards the Isaac River.

The elevations at mine between approximately 280 mAHD (metres above Australian Height Datum) 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.

A total of 10 soil types were described in the survey. Overall, the soils of the project are either uniform; thin duplex Brigalow clays with quite coarse structured subsoils; or sandy duplex eucalypt plains. Some notable exceptions include localised areas of reddish-brown sandy clays on sandstone and alluvial clay soils in the central portion of MCM associated with New Chum Creek.

The soil types at MCM are separated into three broad groups:

- A – Alluvial soils;
- B – Brigalow soils; and
- E – Eucalypt dominated soils.

Millennium area (ML 70313, ML 70401, ML 70344) nature conservation values were identified from four field surveys conducted between 2003 and 2009. The values for flora included Brigalow (Acacia harpophylla)-dominated or co-dominated vegetation made up from Acacia harpophylla-Eucalyptus cambageana and Acacia harpophylla and/or Casuarina cristata, and a shrub species Cerbera dumicola. Three fauna species were listed as conservation values Brigalow scaly-foot legless lizard (Paradelma orientalis), Little Pied Bat (Chalinolobus picatus) and migratory species Rainbow Bee-eater.

There were 27 flora species identified in the Mavis area (ML 70457, ML 70483, ML 70485) during a survey in March and August 2021. One was a threatened flora species under the NC Act (Bertya pedicellata) and two species Restricted under the Biosecurity Act 2014. The remnant vegetation had diverse micro-habitat features for vertebrate wildlife but there were little to no habitat features in the non-remnant vegetation. There were 35 species of vertebrate fauna observed in the Mavis area, but none of these were threatened species under the NC Act or the EPBC Act.

5.1.2 Emissions/Releases

This amendment does not include any emissions or releases to land. As detailed in the final void hydrology study there is no interaction between the void water and land outside of the direct area covered by the high-water mark.

5.1.3 Risk

There is no risk of harm to land and environmental values.

5.1.4 Management

The amendment does not require any changes to management practices for land.

5.2 Land Use

5.2.1 Environmental Values

Overall, the two predominant land uses in the area are mining and agriculture (grazing). There are several proposed and active coal mining operations near MCM. The closest coal mines are adjacent to MCM and include Poitrel, Daunia, and Carborough Downs, Moorvale South Project and Isaac Plains Complex.

5.2.2 Emissions/Releases

This amendment does not change the actual final landform but does reflect a change in land use terminology. While modelling shows that surface water within the final voids can achieve a suitable quality for stock watering for a considerable time, regulator feedback has been that as the water quality is not sustainable in perpetuity the void lakes are required to be NUMAs. This does not change the emissions or releases from the landform. The final landform will not result in any emissions, releases, or contamination to other land uses.

5.2.3 Risk

There is no risk of harm to land and environmental values.

5.2.4 Management

The amendment does not require any changes to management practices for land.

5.3 Surface Water

MCM is in the upper Isaac River catchment, which is part of the Fitzroy River Basin with all drainage lines within the project area are ephemeral. Drainage lines feed into tributaries of New Chum Creek, which in turn discharges into the Isaac River. Further downstream, New Chum Creek has been diverted around a neighbouring mining operation. Users of water resources within the catchment are limited with one significant water retaining structure, the Burton Gorge Dam, located 45 km upstream of MCM.

The Environmental Protection (Water) Policy 2009 environmental values for site are:

- Aquatic Ecosystems;
- Irrigation;
- Farm supply/use
- Stock water;
- Human consumer;
- Primary recreation;
- Secondary recreation;
- Visual recreation;
- Drinking water;
- Industrial use; and
- Cultural and spiritual values.

The main environmental values surrounding MCM are stock water and industrial use.

5.3.1 Emissions/Releases

The residual void waterbodies can support the surrounding land use of stock water up until approximately 290 years. The waterbodies are unable to sustain this PMLU in perpetuity as salinity levels gradually increase and ultimately exceed the stock water guidelines.

The residual void waterbodies will not spill into the receiving environment.

5.3.2 Risk

Discussed in Section 5.5, the residual voids are sinks. There is no interaction with the surrounding land and the mine site. As detailed in the final void hydrology study there is no interaction between the void water and surface waters outside of the void.

5.3.3 Management

Surface water monitoring will take place in accordance with methodology outlined in the Receiving Environment Monitoring Program (REMP).

5.4 Wetlands

There are no high ecological significance wetlands present within MCM mining leases.

5.5 Groundwater

The three main hydrostratigraphic units in the vicinity of MCM 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; and
- Rangal and Fort Cooper Coal Measures - 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.

The coal seams within the Rangal Coal Measures are the primary aquifer units within the MCM area. These seams can be characterised as confined fractured rock aquifers, with the Leichardt Seam and combined Vermont Seams and immediate underlying strata being the main aquifer units. The overburden above the Leichardt Seam, including the Rewan Group where present, acts as an aquitard and is typically dry, or very low yielding.

Significant structural faulting associated with the Jellinbah Thrust System occurs at MCM and within the surrounding area and has a significant influence on the regional groundwater system. A field investigation in 2019 found the major structural features are effectively barriers to groundwater flow perpendicular to the faults. The major faults that repeatedly truncate the lateral east-west extent of the Permian units to both the west and east of MCM therefore result in hydrogeological compartmentalisation of the Permian groundwater system.

Given the lack of connection between these perched temporary groundwater systems and mining operations it is unlikely that any impact to terrestrial and aquatic groundwater dependant ecosystems would be incurred because of mining.

5.5.1 Emissions/Releases

This amendment does not include any emissions or releases to groundwater. The groundwater model conducted as a part of the PRCP shows the proposed post-mining landform leads to void lakes acting as long-term ground water sinks and prevents substantial discharge from the mine site to the wider groundwater system.

5.5.2 Risk

There is no risk of harm to groundwater and environmental values as the residual voids act as sinks.

5.5.3 Management

The amendment does not require any changes to management practices for land. Groundwater quality and water levels will be monitored in accordance with the locations and frequencies outlined in the EA.

5.6 Air and Acoustics

The air environmental values from Environmental Protection (Air) Policy 2019 are:

a) the qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems; and

b) the qualities of the air environment that are conducive to human health and wellbeing; and

c) the qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and

d) the qualities of the air environment that are conducive to protecting agricultural use of the environment.

The acoustic environmental values from Environmental Protection (Noise) Policy 2019 are:

a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—

    i. sleep;

    ii. study or learn;

    iii. be involved in recreation, including relaxation and conversation; and

c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

5.6.1 Emissions/Releases

This amendment does not include any emissions or releases to land. There are nine key surrounding sensitive receptors to MCM to monitor air and acoustics, shown by **Figure 5-1**. They consist of:

- One worker accommodation;
- One office administration building area; and
- Seven cattle farms.

5.6.2 Risk

There is no risk of harm to air or the acoustic environment.

5.6.3 Management

There will be no changes to the environmental impacts upon air and acoustics, resulting in the EA conditions for air and acoustics remaining the same.

Figure 5-1 Sensitive Receptors

6.0 Waste

No additional waste will be generated as a result of this amendment. General waste will be managed in accordance with the existing MCM Waste Management Plan.

7.0 Rehabilitation

The rehabilitation requirements or methodology does not change due to this amendment. The residual voids will be allowed to fill with water which will not be able to sustain a stock water quality outcome past 290 years. The rehabilitation strategy in the PRCP will remain substantially the same.

8.0 Stakeholder Engagement

MCM conducted face to face meetings with majority of the with neighbouring landowners and other stakeholders to inform them of the development and intended submission of PRCP, its use and relevance of amenity. For the landholders unable to meet, an email was sent out with a brochure and information on the PRCP process and possible post mining land use outcomes. The land outcome of having residual voids and highwall remain in the post-mining landscape has been transitioned from existing land outcome documents. These documents have been publicly available and received no significant feedback from the community. The land surrounding MCM are other mine sites, the post-mine land outcome is consistent with the surrounding landscape and consistent with the expectations of the community.

9.0 Proposed Conditions

As previously stated, the intention of this amendment is to amend the Landform and Rehabilitation tables and a condition outlining the rehabilitation landform criteria in the EA.

As per Schedule 8A, Part 3, Table 1 of the EP Regulation:

I) The total area of land proposed as a non-use management area is minimised to the extent possible by, for example, demonstrating that the land, or any part of the land, cannot be used for any post-mining land use.

II) Each non-use management area is located to prevent or minimise environmental harm having regard to—

a) all reasonably practical alternatives for the location; and

b) the nature of the environmental harm that may be caused because of the proposed location; and

c) the sensitivity of the environment surrounding the proposed location.

Table F1: Final Land Use and Rehabilitation Approval Schedule is proposed to be amended to change the waterbody post mine land use to NUMA for the residual void. Table F2: Landform Design Criteria is suggested to be amended to separate the disturbance type 'voids, ramps and highwalls' and the corresponding projective surface area, shown in **Table 4-1** above.

The suggested re-wording of Condition F3 is shown below.

"**Rehabilitation landform criteria**

All areas disturbed by mining activities must be rehabilitated to a stable landform in accordance with Table F1: Final Land Use and Rehabilitation Approval Schedule and Table F2: Landform Design Criteria."

The suggested update for Table F1 and F2 is shown below (**Table 9-1** and **Table 9-2**). Proposed updates to Table F1 have been aligned with the areas and PMLU's provided in the PRCP schedule of the MCM PRCP Application.

Table 9-1 Proposed Amended Table F1

Details	Disturbance Type					
	Residual Void including High Wall	Overburden (inc ramps and low walls)	Water Infrastructure	Subsidence (Mavis U/G)	Infrastructure	Existing Rehabilitation
Projective surface area (ha)[2]	242	246	44	129	365	724
Map Reference	TBA[1]	TBA[1]	TBA[1]	TBA[1]	TBA[1]	TBA[1]
Pre-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Post-mine land use	NUMA	Native bushland	Grazing	Grazing	Grazing	Grazing
Post-mine land use capability classification	N/A	N/A	Class 3 grazing land	Class 3 grazing land	Class 3 grazing land	Class 3 grazing land
Projective cover range (%)	TBA[1]	TBA[1]	TBA[1]	TBA[1]	TBA[1]	TBA[1]

Table 9-2 Proposed Amended Table F2

Disturbance Type	Projective Surface Area (ha)	Design Criteria
Spoil dumps including external walls, ramps and lowwalls	970	Slope <3(H):1(V) and shaped to reduce runoff downslope
Haul Roads	80.5	Remove any creek crossings and reshape to remain stable
Highwalls and voids	242	Highwall to remain as is if geotechnical stability is sound or otherwise benched with 15m benches at 20m intervals.

10.0 Amendment Classification

There are two different classifications for amendment applications: major amendment or minor amendment. An amendment application is considered to be a major amendment if it is not a minor amendment. The definition of a minor amendment is outlined in **Table 10-1** along with a response for this amendment. **Table 10-1** demonstrates this amendment is a Major (threshold) amendment under section 223 of the *Environmental Protection Act 1994*.

Table 10-1 Minor Amendment Criteria

Minor amendment (threshold) criteria	Proposed Amendment
Is not a change to a condition identified in the authority as a standard condition.	The relevant EA does not contain standard conditions therefore this amendment does not relate to the changing of a standard condition.
Does not significantly increase the level of environmental harm caused by the relevant activity.	This EA Amendment is not proposing any changes in environmental harm.
Does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority.	The purpose of this amendment is to amend the residual void waterbody PMLU to NUMA. With the intention of using the EA as a LOD. This does not change the rehabilitation outcomes in any way that would result in significantly different impacts on environmental values.
Does not significantly increase the scale or intensity of the relevant activity.	This EA Amendment does not propose any changes to activities.
Does not relate to a new relevant resource tenure for the authority that is- a) a new mining lease b) a new petroleum lease c) a new geothermal lease under the Geothermal Energy Act d) a new GHG injection and storage lease under the GHG storage Act.	The proposed amendment does not relate to a new resource tenure.
Involves an addition to the surface area for the relevant activity of no more than 10% of the existing area.	This EA Amendment does not propose any changes to activities.
For an environmental authority for a petroleum activity- a) involves constructing a new pipeline that does not exceed 150km b) involves extending an existing pipeline so that the extension does not exceed 10% of the existing length of the pipeline.	The proposed amendment is not for a petroleum activity.

Appendix A EA EPML00819213

Appendix B Residual Void Management Plan

Appendix C Rehabilitation Management Plan

Appendix D Post-Closure Management Plan

Appendix E Final Void Hydrology Study

Appendix F Landform Geotechnical Assessment

Appendix G Groundwater Assessment