

Application form

Environmental Protection Act 1994

Submission of a progressive rehabilitation and closure plan

This is the approved form for a progressive rehabilitation and closure plan (PRC plan) under section 126C of the Environmental Protection Act 1994 for a site-specific application for a mining activity relating to a mining lease.

Only use this application form if you are required to submit a PRC plan, where:

- You are applying for a new site-specific environmental authority for a mining activity relating to a mining lease.
OR
- The administering authority has included the requirement to submit a proposed PRC plan in an information request for a new site-specific environmental authority for a mining activity relating to a mining lease.
OR
- You completed a PRC plan as part of an EIS process and are submitting the PRC plan in the approved form as required under section 126C.
OR
- You have an existing site-specific environmental authority for a mining activity relating to a mining lease and have received a transition notice from the administering authority¹ in accordance with section 754 of the *Environmental Protection Act 1994* (EP Act).
OR
- Where none of the above apply: you have an existing site-specific environmental authority for a mining activity, you do not otherwise have a PRCP schedule approved yet one is required, and any of the following applies:
 - You have failed to comply with a transition notice;
 - You did not receive a transition notice as required under the legislation;
 - The administering authority has refused your proposed PRCP schedule.

Before completing this application form it is recommended that you:

- Read the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964²), which explains the information you are required to provide with this application.
- Have a pre-lodgement meeting. To request a pre-lodgement meeting, please fill out and lodge the form Application for pre-lodgement services (ESR/2015/1664).

¹ The Department of Environment, Science and Innovation is the administering authority under the *Environmental Protection Act 1994*.

² This is the publication number. The publication number can be used as a search term to find the latest version of a publication at www.qld.gov.au.



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If you require assistance in answering any part of this form, or have any questions about your application, please contact the relevant business centre. Contact details are at the end of this form (Section 10).

Privacy statement

The administering authority is collecting the information on this approved form to process your application for a PRC plan. The collection of information is authorised under Chapter 3 and Chapter 5 of the EP Act. Some of the information may be disclosed to the Department of Resources and Queensland Treasury for the purpose of processing this application or the Rehabilitation Commissioner in accordance with s444J of the EP Act if accessing the information is necessary or convenient to be done in the performance of the Commissioner's functions.

Please note that the administering authority is required to keep this application on a register of documents open for inspection by members of the public under section 541 of the EP Act, and must permit a person to take extracts from the register pursuant to section 542 of the EP Act.

Your personal information will not be otherwise disclosed to any other parties unless authorised or required by law. For queries about privacy matters please email privacy@des.qld.gov.au or telephone 13 74 68.

Definitions of terms used in this form	
<i>(Where there is inconsistency between the definition of terms used here and the terms used in the EP Act, the terms in the EP Act apply)</i>	
Available for improvement	In relation to land in an improvement area for a non-use management area, means land in the improvement area that is not being mined, other than land to which any of the following applies— a) the land is being used for operating infrastructure or machinery for mining, including, for example, a dam or water storage facility; b) the land is identified in the PRCP schedule or the application for an environmental authority relating to the schedule as containing a probable or proved ore reserve that is to be mined within 10 years after the land would otherwise have become available for improvement; c) the land is required for the mining of a probable or proved reserve mentioned in paragraph (b).
Available for rehabilitation	For a rehabilitation area, means land in the area is not being mined, unless— a) the land is being used for operating infrastructure or machinery for mining, including, for example, a dam or water storage facility; or b) the land is identified in the PRCP schedule or the application for an environmental authority relating to the schedule as containing a probable or proved ore reserve, under section 126D(6) of the EP Act, that is to be mined within 10 years after the land would otherwise have become available for rehabilitation; or - ba) the land is required for the mining of a probable or proved reserve mentioned in paragraph (b); or c) the land contains permanent infrastructure identified in the proposed PRCP schedule as remaining on the land for a post-mining land use.
Land outcome document	For land, means the following documents relating to the land— a) an environmental authority for a resource activity on the land; b) a document made under a condition of an environmental authority

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	mentioned in paragraph (a), if– i. the document relates to the management of a void within the meaning of section 126D of the EP Act on the land, or the rehabilitation of the land; and ii. the document was received by the administering authority before the assent date; and iii. the administering authority has not, within 20 business days after the assent date, given notice to the environmental authority holder that the document is insufficient in a material particular relevant to a matter mentioned in subparagraph (i); and iv. before the assent date, the document has not been superseded; c) a document made under a condition of an environmental authority mentioned in paragraph (a), if– i. the document relates to the management of a void within the meaning of section 126D of the EP Act on the land, or the rehabilitation of the land; and ii. the environmental authority requires the document to be given to the administering authority on a stated day that is on or after the assent date, or does not state a day when the document must be given; and iii. the document is received by the administering authority within three years after the assent date; and iv. the administering authority does not, within 20 business days after receiving the document, give the environmental authority holder a notice that the document is insufficient in a material particular relevant to a matter in subparagraph (i); d) a report evaluating an EIS under the <i>State Development and Public Works Organisation Act 1971</i>, section 34D; e) an EIS assessment report; f) a written agreement between the holder of an environmental authority mentioned in paragraph (a) and the State that is in force on the assent date.
Improvement area	For a non-use management area, means an area of land in the non-use management area to which a management milestone relates.
Management milestone	For a non-use management area, means each significant event or step necessary to– a) achieve best practice management of the area; and b) minimise risks to the environment.
Non-use management area	Means an area of land the subject of a PRC plan that cannot be rehabilitated to a stable condition after all relevant activities for the PRC plan carried out on the land have ended.
Post-mining land use	For land the subject of a PRC plan, means the purpose for which the land will be used after all relevant activities for the PRC plan carried out on the land have ended.
PRC plan	For land the subject of a mining lease, means a progressive rehabilitation and closure plan for the land that consists of – a) the rehabilitation planning part of the PRC plan; and

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	b) the PRCP schedule for the PRC plan, including any conditions imposed on the schedule.
PRCP schedule	For a PRC plan, means a schedule of the plan that – a) complies with section 126D of the EP Act; and b) is approved under chapter 5, part 5, division 2 of the EP Act, with or without conditions.
Proposed PRC plan	For an application, a proposed PRC plan means a PRC plan proposed for land the subject of a mining lease that: (a) complies with Chapter 5, part 2, division 3; and (b) either – accompanies the application; or is submitted for the application after the application is made
Rehabilitation area	For land the subject of a post-mining land use, means an area of the land to which a rehabilitation milestone for the post-mining land use relates.
Rehabilitation milestone	For the rehabilitation of land, means each significant event or step necessary to rehabilitate the land to a stable condition.

The fields marked with an asterisk * are mandatory. If they are not completed then your application may be considered not properly made under section 128 of the EP Act.

Section 1 – Environmental authority details		
Does this application relate to an <u>existing</u> environmental authority for a mining activity relating to a mining lease approved through a site-specific application?*	☐ No – Provide the reference number for your environmental authority application:	AR Insert.
	☒ Yes – Provide your environmental authority number:	EPML00963013

Section 2 – Applicant details	
Details of the applicant are to be provided in this section. If there is an agent acting on behalf of the applicant, details of the agent are to be provided. An agent could be a consultant or contractor for the environmental authority holder. The person nominated as the application contact will receive correspondence relating to this application.	
NAME / COMPANY NAME*	TRADING NAME (*IF AN ORGANISATION)
Stanmore Resources SMC Pty Ltd	Stanmore Resources Limited
REGISTERED BUSINESS ADDRESS / RESIDENTIAL ADDRESS (NOT A POST OFFICE BOX) *	POSTAL ADDRESS (*WHERE DIFFERENT)
Level 32, 12 Creek Street Brisbane City QLD 4000	GPO Box 2602 Brisbane QLD 4001
ABN / ACN (*IF AN ORGANISATION)	NAME OF APPLICATION CONTACT*
ABN 27 131 920 968	Monique Roberts-Thomson
EMAIL*	TELEPHONE*
monique.roberts-thomson@stanmore.net.au	(7) 3238 1000

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- ☒ INDICATE IF YOU WANT TO RECEIVE CORRESPONDENCE VIA EMAIL
- ☐ INDICATE IF THIS FORM IS BEING COMPLETED BY AN AGENT FOR THE ENVIRONMENTAL AUTHORITY HOLDER*
- NOTE: If an agent is nominated, please provide evidence of appointment by the authority holder/s.**

Section 3 – Website address		
If this application relates to an application for a new site-specific environmental authority for a mining activity, would you like to use the details on the environmental application form?	☒ No – Provide details below.	
	☐ Yes – Go to next section.	
Provide the website address for the application notice and application documents.	Insert.	
Provide details of the contact person if technical assistance is required.	NAME Insert.	TELEPHONE Insert.
	EMAIL Insert.	

Section 4 – Non-use management areas (new environmental authority applications only)	
Does this application for a proposed PRC plan include a NUMA justified under section 126D(2)(b) of the EP Act? *	☒ No – Go to next section.
	☐ Yes
Has a public interest evaluation been carried out by a qualified entity for the NUMA(s)? *	☒ No – Go to next section.
	☐ Yes
Has the proposed NUMA(s) changed since the public interest evaluation was carried out in the EIS? *	☒ No – Go to next section.
	☐ Yes – Provide details below.
How has the proposed NUMA(s) changed since the public interest evaluation was carried out?	Please provide details below. NA

Section 5 – PRC plan structure	
The PRC plan must be prepared in accordance with the structure/format shown in Appendix 1 of this application form.	
Requirement	Requirement met?
Include a cover page that complies with Appendix 1 of this application form.	☒ Yes
Include a table of contents that complies with Appendix 1 of this application form.	☒ Yes

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Section 6 – PRC plan Checklist *

The PRC plan must meet the information requirements stated in section 3 of the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964), and sections 126C and 126D of the EP Act (note there is a limited exception for transitional PRC plans).

All PRC plan requirements are mandatory. For each requirement, insert a reference to the section of the PRC plan which satisfies the requirement.

Justification must be provided for any requirement for which the response is Not Applicable (NA).

If more space is required, please attach a separate sheet.

PRC plan Requirement	Requirement met? (Yes / NA)	PRC Plan Section No.	Justification
Rehabilitation planning part of the PRC plan			
The rehabilitation planning part of the PRC plan must include the information required under section 126C the EP Act, including information requirements described in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964) in accordance with section 126C(1)(j) of the EP Act.			
Project description			
<i>Note: For existing mines transitioning to the PRC plan framework, pre-disturbance information collected as part of an EIS process or original environmental authority application should be included. If this information is unable to be provided, or cannot be developed because of the mine's life stage, this should be clearly explained in this section of the rehabilitation planning part of the PRC plan.</i>			
Describe the following:			
each resource tenure, including the area of each tenure, to which the application relates;	Yes	Section 3.1.1.2 Relevant Activities	Refer to Table 3 'PTM Mining Tenements' and Figure 3 'PTM Tenements' for details.
the relevant activities to which the application relates;	Yes	Section 3.1.4 Rehabilitation and	Refer to Table 20 'Relevant Activities Requiring Rehabilitation at PTM and Associated PMLUs'

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		Improvement Planning	and Table 22 'Improvement Areas for PTM' for details.
the likely duration of the relevant activities	Yes	Section 3.1.4 Rehabilitation and Improvement Planning	Refer to Table 20 'Relevant Activities Requiring Rehabilitation at PTM and Associated PMLUs' for details
Include a detailed description, including maps, of how and where the relevant activities are to be carried out.	Yes	Section 3.1.4 Rehabilitation and Improvement Planning	Refer to Table 20 'Relevant Activities Requiring Rehabilitation at PTM and Associated PMLUs' and Figure 22 'Reference Map' for details.
Consultation			
Include details of the consultation undertaken by the applicant in developing the proposed PRC plan.	Yes	Section 3.2.2	Refer to Table 24 'Community Consultation Register'
Include details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.	Yes	Section 3.2.4	Refer to Table 27 'Community Consultation Plan'
Post-mining land use			
State the extent to which each proposed post-mining land use identified in the proposed PRCP schedule for the plan is consistent	Yes	Section 3.3.4	Insert.

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with the outcome of consultation with the community in developing the PRC plan.			
State the extent to which each proposed post-mining land use identified in the proposed PRCP schedule for the plan is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.	Yes	Section 3.3.5	Insert.
Non-use management area <i>Note for Transitional PRC plans: The holder is not required to comply with a requirements under section 126C(1)(g) or (h) or 126D(2) or (3) for the proposed PRCP schedule for the plan in relation to land if a land outcome document identifies the outcome for the land as the same, or substantially similar to, the outcome for the land if it were a non-use management area.</i>			
State the extent to which each proposed non-use management area identified in the PRCP schedule for the plan is consistent with the outcome of consultation with the community in developing the PRC plan.	Yes	Section 3.4.4	Insert.
State the extent to which each non-use management area identified in the PRCP schedule for the plan is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.	Yes	Section 3.4.5	Insert.
For each proposed non-use management area, state the reasons the applicant considers the area cannot be rehabilitated to a stable condition because of a matter mentioned in section 126D(2).	Yes	Section 3.4.2	The section discusses minimising environmental impacts, including options assessment for minimising the final void.
For each matter mentioned in the requirement above, include copies of reports or other evidence relied on by the proponent for each proposed non-use management area.	Yes	Appendix 8 Void Closure Plan	As outlined in section 754 (3) of the EP Act and section 6.3.2 of the PRC plan guideline 'a NUMA will be taken to be pre-approved if a land outcome, the same or substantially similar to a NUMA, is contained in a 'land outcome

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			document'. This is the case for PTM due to the residual voids being authorised under Schedule E (Condition E6 and E7) of the EA. The proposed NUMA is inclusive of the low wall, high wall and end walls. Further information is provided in Section 3.4 of the attached PRC Plan.
Rehabilitation and management methodology <i>Note: Section 3.5 of the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964) outlines the range of information that must be included as appendices to the rehabilitation planning part of the PRC plan.</i>			
For each post-mining land use, state the applicant's proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRCP schedule.	Yes	Sections 3.3.2 and 3.6.1	Refer also to Table 31 'Milestone Criteria' and Table 32 'Timeframe Justification for Rehabilitation Milestones'
For each non-use management area, state the applicant's proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP schedule for the area.	Yes	Section 3.6.3	Further detail can be found in Appendix 8 Void Closure Plan
Risk assessment			
Identify the risks of a stable condition for land described as a post-mining land use not being achieved, and how the applicant intends to manage or minimise the risks.	Yes	Section 3.7 Table 75	A Risk Assessment has been completed and is included in Section 3.7 of the PRC Plan
PRCP Guideline			

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Include any other information prescribed by the administering authority in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964).	Yes	Appendix 1 and Attachment 1	Appendix 1 'Poitrel Mine Environmental Authority (EPML00963013) (1 March 2024)' (Land Outcome Document) and Attachment 1 'EPML00963013 Poitrel Mine PRCP schedule'
Include the spatial information required in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964). See Attachment 1 of this form for details on how spatial information must be submitted.	Yes	Attachment 2 and 3 Spatial submission email and confirmation	Email of required spatial data was supplied via spatialsupport@des.qld.gov.au on 1 July 2024. All spatial information has been prepared and submitted in accordance with the guideline 'Spatial Information Submission' (ESR/2018/43372). Correspondence email was received was provided on the same day.
Other information			
Include the other information the administering authority reasonably considers necessary to decide whether to approve the PRCP schedule.	Yes	Appendices 1 to 12	In addition to the PRC Plan, Schedule and spatial data; technical reports and the relevant LoD is provided.
PRCP Schedule The proposed PRCP schedule must comply with section 126D of the EP Act, and be written in accordance with the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964). The administering authority will assess the proposed PRCP schedule in conjunction with the rehabilitation planning part of the PRC plan and other application documents, and decide whether to approve the proposed PRCP schedule, with or without conditions, or refuse the proposed PRCP schedule.			
Include a PRCP schedule prepared using the PRCP schedule template (ESR/2019/5103 ³).	Yes	Section B – PRC Plan Schedule	The PRC Plan Schedule is provided as Attachment 1 (Poitrel Mine Environmental Authority ('EPML00963013 Poitrel Mine PRCP schedule' and complies with the template as specified in ESR/2019/5103.

³ This is the publication number. The publication number can be used as a search term to find the latest version of a publication at www.qld.gov.au.

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		and Attachment 1	As required by the guideline the schedule (Attachment 1) is submitted in .xls format.
Include maps showing all of the land mentioned in the PRCP schedule, as it relates to being progressively rehabilitated.	Yes	Section B PRC Plan Schedule Figures 81 and Figure 82	Relevant maps are provided. These include but not limited to: reference map and final site design map. The above mentioned maps have been developed in line with the information requirements specified in the PRC Plan Guideline (ESR/2019/5103).

Section 7 – Non-use management areas (transitional applications only)	
Does this application for a proposed PRC plan include a NUMA? *	☐ No – Go to next section.
	☒ Yes
Does the relevant environmental authority or any other land outcome document identify an outcome for the land that is the same, or substantially similar, to the outcome for the land if it were a NUMA under a PRCP schedule?	☐ No – Go to next section.
	☒ Yes
Does the environmental authority or any other land outcome document state sufficient detail to identify either the location or the area of the land to which the outcome relates?	☒ No – Provide details below.
	☐ Yes – Provide the document name(s) in Section 8.
If the area is not identified – how will the total area of the land to which the outcome relates be minimised? *	Based on the outputs of the initial PRCP studies and the options assessment, the NUMA extent has been minimised with the high-wall and end-wall redesigned to increase the distance from the approval boundary and watercourses for all voids, with the aim to achieve structural stability of $FoS \geq 1.25$ within the NUMA extents and to limit interaction with the

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	floodplain. Refer to Section 3.4 for further details.
If the location is not identified – how will the environmental authority holder ensure the location of the land to which the outcome relates minimises risks to the environment? *	The key outcomes of the technical studies relevant to demonstrating prevention or minimising environmental harm are captured in Appendix 8 (Void Closure Plan)

Section 8 – Transitional PRC plan requirements (transitional applications only)						
In accordance with transitional provisions in the EP Act, an applicant with an existing environmental authority is able to transition aspects of the PRCP schedule from existing land outcome documents. Indicate below any information that is being transitioned from a land outcome document.						
PMLU/NUMA	Rehabilitation /Improvement area	Milestone Reference	Identify which of the below is being transitioned from a land outcome document		Land outcome document	Page No.
			Land outcome	Milestone criteria		
PMLU	Cattle grazing	RM7	☒	☒	EPML00963013	15
PMLU	Woodland habitat	RM8	☒	☒	EPML00963013	16
PMLU	Watercourse	RM9	☒	☒	EPML00963013	16
NUMA	IA1	MM1-MM3	☒	☐	EPML00963013 – E6	18
Insert.	Insert.	Insert.	☐	☐	Insert.	Insert.
Each land outcome document must be submitted with this approved form						
☒ All land outcome documents identified above have been attached to this approved form.						

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Section 9 – Declaration*		
Note: If you have not told the truth in this application you may be prosecuted.		
I declare that: - I am the holder of the environmental authority, or authorised signatory for the holder of the environmental authority. - The information I have provided is true and correct to the best of my knowledge. - I understand that it is an offence under section 480 of the <i>Environmental Protection Act 1994</i> to give to the administering authority or an authorised person a document containing information that I know, or ought reasonably to know, is false or misleading in a material particular. - I understand that under section 480A of the <i>Environmental Protection Act 1994</i> that, if I am required to give a document to the administering authority or an authorised person, it is an offence to give a document that I know or ought reasonably to know, contains incomplete information in a material particular. - I understand that failure to provide sufficient information may result in the application being refused. I understand that an incomplete application may be invalid. Invalid applications will be returned without processing and will only be processed if resubmitted with all invalidating issues addressed. - I understand that all information supplied on or with this application form may be disclosed publicly in accordance with the <i>Right to Information Act 2009</i> and the <i>Evidence Act 1977</i>. - I will comply with all conditions and milestones of my approved PRCP schedule as well as any relevant provisions in the <i>Environmental Protection Act 1994</i>. - I understand that I am responsible for managing the environmental impacts of these activities, and that approval of this application is not an endorsement by the administering authority of the effectiveness of management practices proposed or implemented.		
Where an agreement is in place between all holders of the environmental authority, one holder can sign on behalf of the other joint holders. Please tick the checkbox below.		
☒ I HAVE AUTHORITY TO SIGN THIS FORM ON BEHALF OF ALL THE JOINT HOLDERS OF THE ENVIRONMENTAL AUTHORITY.		
Applicant's signature		
APPLICANT'S NAME Hayden Bachmann	POSITION General Manager – Technical Services	COMPANY / ORGANISATION Stanmore Resources SMC Pty Ltd
APPLICANT'S SIGNATURE 		DATE 1/07/2024
Joint holder(s) signature if applicable		
NAME, POSITION AND COMPANY NAME NA	SIGNATURE	DATE Select.
NAME, POSITION AND COMPANY NAME NA	SIGNATURE	DATE Select.

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OR ☐ I HAVE ATTACHED A DOCUMENT THAT PROVIDES THE REQUIRED INFORMATION FOR ALL JOINT HOLDERS.		
Where the environmental authority holder is a company, this form must be signed by an authorised person for that company. Where there is more than one holder of the environmental authority, this declaration is to be signed by all holders, unless there is an agreement between all holders that one can sign on behalf of the other(s). If you are signing on behalf of the environmental authority holder(s) you must provide a letter of authorisation.		

Section 10 - Submission

Please submit your completed application form and supporting material to the Department of Environment, Science and Innovation office that services the industry applicable to your environmental authority.

A list of business centres can be found at www.des.qld.gov.au using the words 'business centres' as a search term.

Enquiries: Minerals Business Centre
PO Box 7230
Cairns QLD 4870
Phone: 07 4222 5352
Fax: 07 4222 5070
Email: ESCairns@des.qld.gov.au

Coal Business Centre
PO Box 3028
Emerald QLD 4720
Phone: 07 4987 9320
Email: CRMining@des.qld.gov.au

The latest version of this publication and other publications referenced in this document can be found at www.qld.gov.au using the relevant publication number (ESR/2019/4957 for this form) or title as a search term.

Appendix 1–PRC plan structure

Appendix 1 describes the formatting/structural requirements for a completed PRC plan. This includes the information required in a PRC plan cover page and table of contents, and the structure of a PRC plan.

A PRC plan must include the following sections in the order listed:

1. **Cover page:** This section must include the following information:
 - Title of the project
 - Document title
 - Version number
 - Document ID number
 - Date of submission
 - Tenure number(s)
 - Environmental authority holder name
 - Environmental authority holder contact details.
2. **Table of contents:** This section must include the following information:
 - Sections of PRC plan
 - Sub-sections of PRC plan
 - Figures, tables and maps (as applicable).
3. **Rehabilitation planning part**
 - 3.1. **Project planning:** This section will include baseline information, site location details, a description of the project and information on rehabilitation/improvement planning.
 - 3.2. **Community consultation:** This section will include information on stakeholder consultation including a community consultation register and community consultation plan. The community consultation register must include consultation dates, identification of each community member, description of consultation type (workshop, quarterly meetings, etc.), information provided to the community, issues raised/discussed by the community, how issues have been considered, decisions/outcomes of engagement, and commitments made by the applicant. The community consultation plan must include the objectives for community consultation, how the community will be engaged, proposed consultation frequency, what information will be released for community consultation, and how feedback/comments will be considered.
 - 3.3. **Post-mining land use:** This section will include the assessment of PMLU options, methodology for determining PMLU options, and details of each nominated PMLU. It must be consistent with the outcome of consultation with the community in developing the plan, and any strategies or plans for the land of a local government, the State or the Commonwealth.
 - 3.4. **Non-use management areas (if applicable):** This section will include the justification for the NUMA and details of each nominated NUMA. In providing justification for the NUMA, it must:
 - state the reasons the applicant considers the area cannot be rehabilitated to a stable condition
 - include copies of reports or other evidence relied on by the applicant for each proposed non-use management area
 - state the extent to which the proposed non-use management area is consistent with the outcome of consultation with the community in developing the plan, and
 - state the extent to which the non-use management area is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.
 - The detail of each nominated NUMA must include information demonstrating that the proposed footprint of each NUMA is as small as practicable, an assessment of the NUMA location options, a description of the proposed location of each NUMA and the environmental values of the

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surrounding environment, and evidence showing how the proposed location will prevent or minimise environmental harm.

3.5. Rehabilitation management methodology: This section will include information describing how the proposed rehabilitation and management methodology have been developed and will be implemented. For each proposed post-mining land use for land, state the proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRCP schedule. This should include details of the general rehabilitation practices, tailings storage facilities, voids, underground mining and built infrastructure. For each proposed NUMA, state the proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP schedule for the area.

3.6. Risk assessment: This section will include a risk assessment that identifies the risk of a stable condition for land not being achieved and a risk treatment plan outlining how the applicant will manage or minimise the risk. All proposed NUMAs should also have a completed risk assessment. If rehabilitation trials are planned, this is also where relevant details must be given.

3.7. Monitoring and maintenance: This section will include a monitoring and maintenance program that identifies and describes the monitoring systems that will be undertaken to demonstrate a milestone and milestone criteria have been achieved. It must include timing of when each rehabilitation or management milestone is to be achieved and be accompanied by maps outlining the relevant land.

4. **Appendices and attachments:** The completed PRCP schedule and any relevant required reports/plans are to be included in this section. The Progressive Rehabilitation and Closure Plan Schedule template (ESR/2019/5103) should be included.

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Attachment 1—Spatial data requirements for PRC plan

Attachment 1 provides guidance on the required content of spatial information (shapefiles) for the submission of a PRC plan. This attachment should be read in conjunction with the department's guideline: Spatial Information Submission (ESR/2018/4337). To obtain a copy of the guideline, the spreadsheet containing the schema (in Table 2) and a shapefile template for PCR plans are available on the Queensland Government's website at www.qld.gov.au, using the search term "submission of spatial information". The following sections provide information about the required fields and attributes for datasets.

Required files—Table 1

The applicant must submit shapefiles detailing the following:

- the location and maximum extent of disturbance footprint for the mine life
- the PMLU and NUMAs for the area within the resource tenure(s)
- the rehabilitation and improvement areas within the resource tenure(s)
- any sensitive receptors
- extent of a floodplain
- existing rehabilitation (if the PRC plan is for an existing environmental authority).

A minimum of one (1) shapefile must be submitted for a PRC plan, detailing the above-listed information, as outlined within Table 1. Each file must be named in accordance with the requirements outlined within the department's guideline: Spatial Information Submission (ESR/2018/4337).

Where the PRC plan relates to a site where a NUMA or floodplain are not present, this should be stated in the spatial information submission email to which the relevant spatial files are attached.

Table 1: Shapefile checklist

File	Spatial information requirement	Schema	Example file name (e.g. using submission date of 30 June 2020)
1	PRC plan – polygon	Table 2	EPPR00372556_PRCP_PY_30062020

Where:

- PRCP = PRC plan
- PY = polygon (geometry)

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Table 2: Schema for PRC plan

Field Name	Type	Length	Definition	Domain Values ⁴	Domain Value Description	Mandatory/ Optional
PERMIT_REF	TEXT	50	The alpha-numeric environmental authority number relevant to the spatial information (if this PRC plan does not relate to an existing EA, please provide the relevant application number instead).			Mandatory
PROCESS	TEXT	4	The relevant process spatial data is being submitted for	PRCP	Progressive rehabilitation and closure plan	Mandatory
SITE_NAME	TEXT	254	Site name relating to the environmental authority.			Mandatory
SITE_ID	TEXT	20	This field contains a unique identifier for the spatial feature, which has been generated by the applicant.			Mandatory
FEATURE	TEXT	10	This field contains the land use feature on site which this polygon or point is describing. Select the relevant option of either post-mining land use, rehabilitation area, non-use management area, improvement area, maximum disturbance footprint, sensitive receptor, existing rehabilitation or floodplain using the codes specified.	PMLU	Post-mining land use	Mandatory
				REHAB_AREA	Rehabilitation area	Mandatory
				NUMA	Non-use management area	Mandatory if the PRC plan schedule proposes or changes a non-use management area
				IMPRV_AREA	Improvement area	Mandatory if the PRC plan schedule proposes or changes a non-use management area

⁴ If blank, populate based on Attribute type & definition

Application form

Submission of a progressive rehabilitation and closure plan

				FOOTPRINT	Maximum disturbance footprint over mine life	Mandatory
				SR	Sensitive receptor	Mandatory
				EX_REH	Existing rehabilitation	Mandatory if the application is for an existing EA and there is existing rehabilitation undertaken
				FLDP	Floodplain	Mandatory if there is a floodplain located within the EA boundary
FEAT_DESC	TEXT	254	Feature description		This field provides a description of the feature identified in 'FEATURE'.	Mandatory
PMLU_TYPE	TEXT	10	This field provides a description of the post mining land use type. If PMLU_TYPE is 'Other' additional information in the comments field is required.	GRAZ	Grazing	Mandatory for each PMLU.
				NAT_ECO	Native ecosystem	
				WTR_ST	Water storage	
				REC	Recreation	
				HB_ECS	Habitat and ecosystem services	
				AGRI	Agriculture	
				FOR	Forestry	
				CROP	Cropping	
				PERM_INFRA	Permanent infrastructure	
				IND	Industrial	
				LNDFL	Landfill	
				Oth	Other	
DATE_SUBMT	DATE	dd/mm/yyyy	Date of submission. This field identifies the date the spatial information was submitted.		Date of submission	Mandatory
SOURCE	TEXT	5	This field identifies the source of the spatial information and the capture	DIG	Digitising (Tracing over Ortho Imagery)	Mandatory

Application form

Submission of a progressive rehabilitation and closure plan

			methodology for the spatial information provided.	GPSD	GPS Differential Survey	
				GPSND	GPS Non Differential Survey	
				RTK	Real-Time Kinematic (RTK) Survey	
				UK	Unknown	
AREA_HA	DOUBLE	N/A	This field indicates the area in Hectares. (Polygon only)			Mandatory if GEOMETRY = polygon.
COMMENTS	TEXT	254	A free text field has been provided to include any additional information the proponent wishes to provide in relation to the data.			Mandatory if PMLU_TYPE = Oth

Poitrel Mine Progressive Rehabilitation and Closure Plan

Poitrel Mine



Version: ~~21.0~~

Title of the Project: Poitrel Mine

Document Title: Progressive
Rehabilitation and Closure Plan

Document ID: 001

Date of Submission: 1 July 2024

Tenures: ML4749 and ML70116

EA Holder: STANMORE SMC PTY LTD

EA Contact Details: Level 32, 12 Creek
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Definitions

Key terms and abbreviations, and associated definitions used in this report are listed below.

Term	Definition
3P Grasses	Perennial, productive and palatable
AC	Acid Consuming
AEP	Annual Exceedance Probability
AMD	Acid and Metalliferous Drainage (AMD). Includes acid/acidic drainage (AD), pH-neutral and metalliferous drainage (NMD) and sulphide-derived saline drainage (SD) – and/or any combination of these.
ANC	Acid Neutralising Capacity
AMWU	Australian Manufacturing Workers' Union
AQP	Appropriately Qualified Person
ASC	Australian Soil Classification
bcm	Bank cubic meter. One cubic meter of material as it lies in the natural bank state.
Biodiversity Act	Biodiversity Act 2004 (Queensland)
CCP	Community Consultation Plan
CEC	Cation Exchange Capacity
CHPP	Coal Handling and Preparation Plant
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DAWE	Department of Agriculture, Water and Environment (Australia)
DEM	Digital Elevation Model
DESI	Department of Environment, Science, and Innovation (Queensland). (The Adminstrating Authority)
DM	Dry matter (with reference to vegetation)
DoR	Department of Resources (Queensland) (previously referred to as the Department of Natural Resources, Mines and Energy)
DSI	Detailed site investigation
DSITI	Department of Science, Information Technology and Innovation (Queensland)
EA	Environmental Authority (in terms of the Environmental Protection Act 1994, Queensland)
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EV	Environmental Value
EP Act	Environmental Protection Act 1994 (Queensland)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERA	Environmentally Relevant Activities
ESP	Exchangeable Sodium Percentage
FCCM	Fort Cooper Coal Measures
FOS	Factor of Safety
FVLMP	Final Void and Landform Management Plan

Term	Definition
GAI	Geochemical Abundance Index
Ha	Hectares
Interburden	Non-carbonaceous or carbonaceous mine waste located between coal seams. In this report the term 'overburden' shall be used to define overburden and interburden.
IDC	Index of Diversion Condition
IRC	Isaac Regional Council
km	Kilometre
lcm	Loose cubic meter. One cubic meter of material which has been disturbed and has swelled as a result of movement
LDRMP	Land Disturbance and Rehabilitation Management Plan
LGA	Local Government Area
LOA	Life-of-Asset
LOD	Land outcomes document
LOM	Life-of-Mine
LSA	Land suitability assessment
MERFP Act	Mineral and Energy Resources (Financial Provisioning) Act 2018 (Queensland)
Mine Waste	Material comprising overburden, ± coarse/fine reject (dewatered), ± Waste coal. Sometimes called 'mineral waste' or 'mining waste'
ML	Mining Lease
MLES	Matter of Local Environmental Significance
MNES	Matter of National Environment Significance
MCM	Moranbah Coal Measures
MPA	Maximum Potential Acidity
MSES	Matter of State Environmental Significance
NAF	Non-Acid Forming
NAPP	Non-Acid Producing Potential
NC Act	Nature Conservation Act 1992 (Queensland)
NUMA	Non-Use Management Area
Overburden	Non-carbonaceous or carbonaceous mineral waste located above (overburden proper) or between (interburden) coal seams. Carbonaceous overburden is generated during mining of non-ore material and may be represented by sedimentary units (non-coal) rich in organic carbon. Carbonaceous overburden does not include coarse reject, seam floor, seam roof or coal partings. Overburden reports to spoils dumps
PAF	Potentially Acid forming
PMLU	Post Mining Land Use
PRC Plan	Progressive Rehabilitation and Closure Plan <i>"... for land the subject of an ineligible mining activity, means a progressive rehabilitation and closure plan for the land that consists of two parts –</i> • The rehabilitation planning part – PRC Plan, and • The approved part – PRC Plan Schedule that includes milestones and conditions"

Term	Definition
	(PRC Plan Guidelines, 2023) (in terms of the Environmental Protection Act 1994 (Queensland))
PRC Plan Guideline	Progressive Rehabilitation and Closure Plan Guideline (April 2023) (DES, Queensland)
PTM	Poitrel Mine
RA	Rehabilitation Area As defined in the PRC Plan Guideline: a rehabilitation area, for a post-mine land use, means an area of land in the post-mine land use to which a rehabilitation milestone for the post-mining use relates.
RE	Regional Ecosystems
Reject	Waste material produced during coal washing, separated from run-of-mine (ROM) coal in the coal handling and preparation plant (CHPP). Can be separated and disposed as fine rejects (tailings) and coarse reject, or co-disposed as mixed plant reject which is a mixture of coarse reject and 'dewatered' fine reject.
ROM	Run-of-Mine
RM	Rehabilitation Milestone As defined in the PRC Plan Guideline: a rehabilitation milestone, for the rehabilitated land, means each significant event or step necessary to rehabilitate the land to a stable condition (section 115 of the EP Act).
RRR	Residual risk rating (with reference to the risk assessment)
Qld	Queensland
SMART	Specific, measurable, achievable, reasonable/relevant, time-specific
SMC	Stanmore SMC Pty Ltd
SMU	Soil Mapping Unit
Spoil	Mine waste comprising non-ore (non-ROM) material such as overburden and waste coal. Within this report, unless stated otherwise, spoil is assessed as a whole (bulk material) with no distinction made between carbonaceous and non-carbonaceous overburden.
SQP	Suitably Qualified Person
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
Waste Coal	Sub-economical coal that reports to the spoil dumps as waste. Waste coal can be fresh or oxidised. All oxidised and coked (cindered) coal is waste.

1. INTRODUCTION

This transitional Progressive Rehabilitation and Closure Plan (**PRC Plan**) has been prepared for Poitrel Mine (**PTM**) in accordance with the requirements of the *Mineral and Energy Resources (Financial Provisioning) Act 2018 (MERFP Act)*. This PRC Plan has been developed to meet the requirements of the *Environmental Protection Act 1994 (EP Act)* and the Progressive Rehabilitation and Closure Plan Guideline (**PRC Plan Guideline**) (DES, 2023).

Environmental Authority Holder:	Stanmore SMC Pty Ltd
Environmental Authority Number:	EPML00963013 (1 March 2024)
Land Description	ML4749 and ML70116

Environmentally relevant activities (**ERAs**) at PTM are mining black coal, chemical storage, waste disposal, resource recovery and transfer facility operation and sewage treatment. They are undertaken under the conditions of the site's Environment Authority (**EA**) EPML00963013 (Appendix 1). This EA is the land outcome document (LOD) for this transitional PRC Plan.

This PRC Plan comprises two parts:

- **Section A:** Rehabilitation Planning - providing information about the site, the rehabilitation plans, and evidence and justification to support the development of the proposed PRC Plan Schedule.
- **Section B:** PRC Plan Schedule - including maps of rehabilitation and closure outcomes for the site, and tables of time-based rehabilitation milestones.

This PRC Plan also includes Appendices, providing key information and technical studies used to support development of this plan.

2. TRANSITIONAL PROVISIONS

PTM is an established open-cut coal mine located 35 kilometres east of Moranbah, Queensland. PTM operates under an existing site-specific EA, EPML00963013. The mine has operated under the EA since 2006. Stanmore SMC Pty Ltd (**Stanmore**) acquired the controlling interest in PTM in May 2022, with the EA previously held by BHP Mitsui Coal Pty Ltd.

The mine and EA meet the transitional provisions for PRC Plans (EP Act, Part 27), in the following ways:

- Stanmore is a 'mining EA holder' for the purposes of the definition in section 750 of the EP Act;
- The EA was granted in February 2006, prior to the assent of the progressive rehabilitation and closure plan amendments to the EP Act (introduced by the MERFP Act). Accordingly, the transitional provisions in Chapter 13, Part 27 of the EP Act apply; and
- A Transition Notice for a PRC Plan was sent to BHP Billiton Mitsui Coal Pty Ltd on 3 December 2020, stating that a PRC Plan must be submitted to the administering authority by 1 July 2023. The EA was transferred to Stanmore in May 2022, and the due date for the PRC Plan submission was subsequently extended to 1 July 2024.

Part 27, Chapter 13 of the EP Act sets out the transitional provisions following the commencement of the MERFP Act. Stanmore SMC Pty Ltd (hereby referred to as the proponent) is a 'mining EA holder' for the purposes of the transitional provisions (Refer to Section 2.1).

Section 6 of the PRC Plan Guideline makes provision for "existing EA holders who must transition into the new PRC Plan framework" (DES, 2023). As PTM had an approved EA at the time of commencement of the MERFP Act, the site falls under the ambit of the requirements of a transitional PRC Plan. Based on the requirements of Section 6 of the PRC Plan Guideline, the following underpin this PRC Plan:

- A Transition Notice for PTM was issued to the former EA holder BHP Mitsui Coal Pty Limited (BMC) by the Adminstrating Authority (the then Department of Environment and Science (DES)), dated 29 July 2020 (Appendix 2). This Transitional Notice required submission of the PTM PRC Plan and PRC Plan Schedule by 1 March 2023.

- The Notice transitioned to the proponent after acquisition on 12 July 2022. The proponent requested and was approved for an extension on the Transition Notice. The renewed date for submission of the transitional PTM PRC Plan and PRC Plan Schedule is 1 July 2024 (Appendix 2).
- In accordance with transitional provisions (Section 750, EP Act), the PTM EA is an approved LOD (Refer to Section 2.1).
- Prior to the PRC Plan submission, a pre-lodgement meeting between the Adminstrating Authority (Department of Environment, Science and Innovation (DESI)) and the proponent was held on 6 June 2024. This was arranged to discuss the key content of the PTM draft closure plan, aimed at identifying any notable gaps or refinements needing to be addressed prior to the final submission.

~~Aligned to the above, and the PRC Plan Guideline requirements¹, the following process for transitioning rehabilitation and closure outcomes from the PTM EA into the site's PRC Plan Schedule has been followed:~~

- ~~1. Identifying rehabilitation and closure outcomes in the LOD (EA EPML00963013).~~
- ~~2. Identifying post-mine land uses (PMLUs) and non-use management areas (NUMAs).~~
- ~~3. Defining rehabilitation or improvement areas within the PMLUs and NUMAs.~~
- ~~4. Identifying milestones.~~
- ~~5. Identifying milestone criteria.~~
- ~~6. Identifying when the first milestone must commence and completion dates for the milestones.~~

2.1 Land Outcome Documents

In accordance with section 750 of the EP Act, the following land outcome documents are applicable to this PRC Plan:

- EA EPML00963013, as last issued on 1 March 2024.
- Land Disturbance and Rehabilitation Management Plan (PRM ENV PLN 0009 V6), dated March 2014.
- Poitrel Mine Final Void & Landform Management Plan, dated 23 June 2010.
- Assessment Report under the Environmental Protection Act 1994 on the Environmental Impact Statement for the Poitrel Coal Mine, dated November 2005.

The land outcome documents list as per section 750 of the EP Act is hierarchical (i.e. the document appearing higher in the list takes precedent over those lower in the list). Where inconsistencies exist between LOD, the highest order of LOD is elected as the primary LOD.

~~As contemplated by the 3 December 2020 transition notice, the EA was granted prior to the commencement of the progressive rehabilitation amendments to the EP Act introduced by the MERFP Act. The proponent is a 'mining EA holder' for the purposes of the definition in section 750 of the EP Act.~~

~~As a result, this PRC Plan has the benefit of the transitional provisions in Chapter 13, Part 27 of the EP Act. These exempt the PRC Plan from certain content requirements in sections 126C and 126D of the EP Act where rehabilitation outcomes have been identified in a 'land outcome document'.~~

~~This PRC Plan identifies where transitional provisions provide exemptions from the content requirements of sections 126C and 126D of the EP Act, having regard to these LODs. In accordance with section 750 of the EP Act, the following LODs are applicable to this PRC Plan application:~~

- ~~EA EPML00963013, as last issued on 1 March 2024. This is a LOD under paragraph (a) of the definition in section 750 of the EP Act.~~
- ~~Land Disturbance and Rehabilitation Management Plan (PRM ENV PLN 0009 V6), dated March 2014. This is a LOD under paragraph (b) of the definition in section 750 of the EP Act.~~
- ~~Poitrel Mine Final Void & Landform Management Plan, dated 23 June 2010. This is a LOD under paragraph (b) of the definition in section 750 of the EP Act.~~

¹ As per Section 6.4 (Transitioning rehabilitation and closure outcomes into PRC Plan Schedule) of the PRC Plan Guideline

- ~~Assessment Report under the Environmental Protection Act 1994 on the Environmental Impact Statement for the Poitrel Coal Mine, dated November 2005. This is a LOD under paragraph (e) of the definition in section 750 of the EP Act.~~

On 20 June 2022, DESI and the proponent had written correspondence regarding applicable LODs to support this PRC Plan application. DESI indicated in this correspondence that:

- ~~LOD insufficiency notices have never been issued.~~
- ~~The “Poitrel Mine Rehabilitation Monitoring 2016 Report” dated 19 June 2017 was considered a LOD.~~
- ~~The “EIS Assessment report under the EP Act (2005)” was considered a LOD.~~

~~The proponent refute the determination that the report titled “Poitrel Mine Rehabilitation Monitoring 2016 Report” dated 19 June 2017 and the report titled “Poitrel Coal Mine Project Environmental Impact Statement”, dated June 2005 are LODs.~~

~~Regarding the “Poitrel Mine Rehabilitation Monitoring 2016 Report”, this document does not meet the criteria defined under section 750(b) and 750(c) as the report is not made under a condition of an environmental authority mentioned in paragraph (a). The current EA does not require either the development or submission of a rehabilitation monitoring report to the administering authority.~~

~~Regarding the “Poitrel Coal Mine Project Environmental Impact Statement”, under section 750 of the EP Act, a LOD, for land, means the following documents related to the land—~~

- ~~(d) a report evaluating an EIS under the State Development and Public Works Organisation Act 1971, section 34D.~~
- ~~(e) an EIS assessment report.~~

~~The report “Poitrel Coal Mine Project Environmental Impact Statement” was produced by the proponent, who at that time was BHP Billiton. As such is neither a report evaluating an EIS under the State Development and Public Works Organisation Act 1971 or an EIS assessment report as these reports must be written by an agency of the State Government.~~

2.1.1 Environmental Authority

The PTM EA is the primary LOD for the purposes of rehabilitation and residual void authorisation, with conditions relevant conditions generally presented in Schedule E, particularly Conditions E3-E12.

Condition E3 of the PTM EA states the following:

*Unless otherwise permitted under the conditions of this environmental authority, all areas significantly disturbed by mining activities must be rehabilitated in accordance with **Table E1 (Rehabilitation Requirements)**.*

Table E1 provides the basis for the nominated PMLUs, rehabilitation milestone criteria, and rehabilitation completion criteria presented in **Section 3.3** of this PRC Plan.

2.1.2 Land Disturbance and Rehabilitation Management Plan

Condition E5 of the PTM EA requires the development of a Rehabilitation Management Plan as follows:

*Review and update an investigation into rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria by **30 June 2010** for the administering authority review and comment. The Rehabilitation Management Plan must, at a minimum:*

- map existing areas of rehabilitation;*
- develop design objectives for rehabilitation of disturbed areas and post mining land uses across the mine;*
- specify spoil characteristics, soil analysis, soil separation for use on rehabilitation;*
- detail rehabilitation methods applied to areas;*
- contain landform design criteria including end of min design;*

- f) detail how landform design will be consistent with the surrounding topography;
- g) identify success criteria for areas and itemise revegetation criteria;
- h) explain planned native vegetation rehabilitation areas and corridors;
- i) identify at least a minimum of **three (3) reference** and **three (3) rehabilitation** sites to be used to develop rehabilitation success criteria;
- j) describe the rehabilitation indicators and the monitoring program to be used;
- k) develop a contingency plan for rehabilitation maintenance or redesign;
- l) describe end of mine landform design plan and post mining land uses across the mine; and
- m) include a cost benefit analysis / triple bottom line assessment (or an alternative assessment method) of the proposed final landform design criteria and alternatives.

The above requirements are acquitted by the *Land Disturbance and Rehabilitation Management Plan* (March, 2014), and the document is considered an LOD under paragraph (b) of the definition in section 750 of the EP Act

2.1.3 Poitrel Mine Final Void & Landform Management Plan

Condition E7 of the PTM EA requires the development of a Residual Void Management Plan as follows:

Complete an investigation into residual voids and submit a report to the administering authority proposing acceptance criteria and landform design criteria by 30 June 2010 for administering authority review and comment. On acceptance of the criteria proposed in the Residual Void Management Plan, the criteria must be specified in the environmental authority.

The investigation must at a minimum include the following:

- a) a study of options available for minimising final void area and volume;
- b) develop design criteria for rehabilitation of final voids;
- c) a void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long term;
- d) a pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events;
- e) a study of void capability to support native flora and fauna; and
- f) a proposal/s for end of mine void rehabilitation success criteria and final void areas and volumes.

The above requirements are acquitted by the *Poitrel Mine Final Void & Landform Management Plan* (June, 2010), and the document is considered an LOD under paragraph (b) of the definition in Section 750 of the EP Act.

2.1.4 Assessment Report under the Environmental Protection Act 1994

The Assessment Report under the Environmental Protection Act 1994 on the Environmental Impact Statement for the Poitrel Coal Mine (November, 2005) was drafted by the administering authority, and is considered an LOD under paragraph (e) of the definition in Section 750 of the EP Act.

2.2 Feasibility of Implementing Historical Conceptual Final Landform Designs in 2024

The documents listed in **Section 2.1** were reviewed against the PTM EA (the primary LOD) during the NUMA options assessment detailed in **Section 3.4.3**.

An iterative options assessment was conducted, and based on the current, EA approved life of mine plan and modern closure studies included in this PRC Plan. The purpose of assessing alternative options was to understand the potential for minimising the NUMA extent against final landform designs that have evolved

since the *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) and *Land Disturbance and Rehabilitation Management Plan* (March, 2014) LODs.

Constructing the void in accordance with dimensions listed in conceptual final landforms presented in the *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) and *Land Disturbance and Rehabilitation Management Plan* (March, 2014) is not feasible for the following reasons:

- The *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) was developed four years after the commencement of first mining. The then EA holder was operating on a geologic model with approximately 30% of the technical information the 2024 geologic model now has. This is an important consideration in mine planning and associated scheduling of waste removal, which has changed over time due to the improved understanding of the coal resource since 2010.
- The *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) did not consider closure specific hydrogeological, hydrologic, erosion and mining studies as the statutory requirements at the time did not include robust assessment mechanisms. As a result, chapters related to void locations and dimensions such as the regraded slopes and final stability of low wall and highwalls stated further research was required to support the final landform design as the feasibility of the design put forward was too conceptual.
- Attachment 4 of the *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) is Figure 2-9 Conceptual Landform – Year 20 from the 2005 EIS identified as the original closure concept scenario. However, Year 20 was not the proposed closure year at that time or currently, rather an operational year without consideration of the final landform dimensions. It is therefore used incorrectly and a misrepresentation of the conceptual closure landforms and void locations.
- The *Land Disturbance and Rehabilitation Management Plan* (March, 2014) does not rely on updated mining studies and Figure 2-9 Conceptual Landform – Year 20 from the 2005 EIS for the void closure size, which had incorrectly been used to define angle of repose ramps and low wall spoil slopes at that point in time. Therefore, final landform dimensions listed in this document were inaccurate and not in accordance with the life of mine as understood at that time.

In sum, the void dimensions stated in the *Poitrel Mine Final Void & Landform Management Plan* (June, 2010) and *Land Disturbance and Rehabilitation Management Plan* (March, 2014) LODs are based on preliminary versions of the geologic model. All dimensions proposed in these documents were caveated with limitation statements and noted the likely potential for changes. As the mine evolved, updated closure studies and final landform designs were conducted by the previous EA holder, but the EA conditions that required a point-in-time Final Void & Landform Management Plan and Rehabilitation Management Plan did not have scope for revisions.

The final landform presented this PRC Plan has been iteratively designed and informed by technical studies that demonstrate the reduction of environmental harm, ensures stability, improved mine technology, and current life of mine with the overall aim to minimise the extent of the NUMA where feasible.

2.2—Residual Void Authorisation

Condition E6 of EPML00963013 provides the proponent with provisions to transition residual voids outcomes into the PRC Plan Schedule. The condition is reproduced in its entirety below:

E6: “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”.

The proponent has relied on this condition to inform the following transitional provisions for the PRC Plan Schedule:

- ~~Residual voids are a NUMA identified in a LOD that is to be transitioned into the PRC Plan Schedule.~~
- ~~Reference to “residual voids” noting plurality provides authorisation for more than one residual void to remain at end of mine life that can be transitioned into the PRC Plan Schedule.~~
- ~~Residual voids are authorised as long as they do not cause serious environmental harm to land, surface water or any recognised aquifer. To inform whether serious environmental harm can be caused, a void closure plan has been developed as referenced in Section 3.6.3 of this planning part.~~

As EA EPML00963013 does not provide locations and maximum disturbance of the residual void domain, the location and size of voids are not constrained.

2.3—Inconsistency Between LODs

Considering the number of LODs applicable to this PRC Plan application and acknowledging the historic nature of these documents, there is inherent inconsistency between some content which influences the ability for the proponent to effectively rely on transitional provisions.

In accordance with section 754(5) of the EP Act:

For subsections (3) and (4), if there is an inconsistency in land outcome documents for land, the document appearing first in the list mentioned in section 750, definition *land outcome document* prevails to the extent of the inconsistency.

It is apparent that the *Land Disturbance and Rehabilitation Management Plan (LDRMP)* and *Poitrel Mine Final Void & Landform Management Plan (FVLMP)* LODs are planning documents, produced at a point in time based on information available. The plans are always expected to evolve as mining progresses, however as there was no regulatory requirement to resubmit these plans the documents were never updated. There is deliberate reference in Section 5.2 and Figure 1 of the LDRMP regarding the proposed final landforms. It is recognised in this plan that the final landform is based on the EIS and that a more rigorous final landform study is to be undertaken which may alter the final landform and disturbance footprint. The question of whether final landform studies were undertaken is immaterial as there is no ability under the EA for the LDRMP to be resubmitted to the administering authority. Furthermore, as acknowledged in Condition E7 of EPML00963013 “These studies will be undertaken during the life of the mine and will include detailed research and modelling”.

The *Assessment Report under the Environmental Protection Act 1994 on the Environmental Impact Statement for the Poitrel Coal Mine (AR)* was similarly written based on the information available at the time of EIS preparation and references significant uncertainty with both the mining operations and type of mining, including the following quote in the context of the final void “there is potential to introduce a dragline later in the mining schedule”. This report is brief and does not provide any further certainty regarding rehabilitation and closure outcomes that can be transitioned into the PRC Plan.

In order to determine the specific inconsistencies between LODs and to consider implications of transitioning rehabilitation and closure outcomes into the PRC Plan, a comparison of key transitional aspects for the LODs are presented in Table 1. Quotation marks have been used to indicate a direct reference from a LOD. Within this table consideration is given for identification of quantifiable criteria that can be transitioned to align with the SMART principles outlined in Section 4.1 of the PRC Plan Guideline. As such, Table 1 focuses on identifying quantitative criteria that can be transitioned into the PRC Plan Schedule.

Table 1 Inconsistencies Between LODs

Aspect	EA (2024)	LDRMP (March 2014)	FVLMP (June 2010)	AR (2005)
Residual Void Authorisation	"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"	This plan references a final void	This plan references condition F7 of EA MIN100661507 whereby an investigation into residual voids must be submitted to the administering authority by 30 June 2010	The report references a final void
Residual Void Size	EA is silent on final void size	"Overall, about 1450ha of the disturbed area will be rehabilitated, leaving about 150ha as a final void". "These figures are based on the EIS. The operations is currently undertaking a more rigorous final landform study which may alter the final landform and disturbance footprint that is currently shown in this plan."	"The final position and extent of the final void cannot be determined with certainty due to external affects such as the global economy"	"A final void covering an area of 120ha and up to 80m deep will remain at the conclusion of mining the Poitrel Project coal resource"
Residual Void Location	EA is silent on final void location	"The proposed final landform shown in Figure 1." However the Figure does not reference residual voids. Further details on the content of this figure is provided in Section 2.3.2.	"The final position and extent of the final void cannot be determined with certainty due to external affects such as the global economy"	AR does not show the residual void location
Residual Void Completion Criteria/ Management Milestones	EA is silent on residual void completion criteria	"The final void will be fenced and/or bunded to prevent access"	"Safety: the potential for highwall collapse causing injury to persons, stock or fauna will be eliminated by substantial	AR does not provide residual void completion criteria

Aspect	EA (2024)	LDRMP (March 2014)	FVLMP (June 2010)	AR (2005)
		"The final void will then collect water from direct rainfall and runoff from the rehabilitated landform" "Stable final void highwall" "No mass failure of slopes" "All final void highwalls will be assessed to determine geotechnical stability"	backfilling or regrading of the residual void. Stability: There are no plans to leave standing highwalls, thus geotechnical issues such as collapse, and slumping should not arise. Sustainability: the residual void will form part of the overall spoil rehabilitation of the mine site. Spoil may be subject to one or more treatments based on minimising erosion potential including: 1V:6H (17%) or flatter regrade sufficient to support erosion and drainage stability and conventional topsoiling, or use of steeper 25% regrade supported with durable rock mulch to prevent erosion. Biodiversity: A variety of native trees and shrubs, and native and introduced grasses as are currently used at nearby BMA mines will be established. Protection of Useful Water Resources: the eventual void treatment will not result in loss of beneficial use capability to surface or underground water resources. The amount of backfill/ regrade will be determined well before mine closure."	
Residual Void Slopes	EA is silent on residual void slopes	LDRMP does not provide quantifiable limits for residual void slopes	"Voids will either be completely backfilled or rehabilitated with 1 in 6 (17 percent) slopes or flatter"	AR does not provide quantifiable limits for residual void slopes
Residual Void Factor of Safety	EA is silent on residual void factor of safety	LDRMP does not provide quantifiable limits for the factor of safety	FVLMP does not provide quantifiable limits for the factor of safety	AR does not provide quantifiable limits for the factor of safety
Rehabilitation Completion Criteria	Table E1 of the EA provides rehabilitation requirements for five (5) PMLUs	Section 6 of the LDRMP provides rehabilitation acceptance criteria	FVLMP is not applicable for domains intended to sustain a PMLU	AR does not provide rehabilitation completion criteria

The results provided in Table 1 clearly show inconsistency between LODs pertaining to the residual void size and location. Of most significance is the conclusion reached in the FVLMP (published 2010) which determined that the final position and extent of the final void cannot be determined with certainty. The LDRMP (published 2014) states an approximate residual void area, however notes that this information has been referenced from the EIS and that further landform design studies are required which may alter the final landform. It is unclear why the approximate void sizing from the EIS, at 120ha, is different from that approximated in the LDRMP at 150ha.

As stated in the EP Act and PRC Plan guideline, information in the LODs at the top of the hierarchy must be used where there are any conflicts in the information. As both the FVLMP and LDRMP are LODs under paragraph (b) of the definition in section 750 of the EP Act, they are equal in hierarchy. Regarding residual void size and final location, these two LODs are in clear conflict as the LDRMP references a final void of about 150ha whilst the FVLMP rightly recognises that the final position and extent of the final void cannot be determined with certainty due to external affects.

Because of the conflict in lower order LODs, the EA remains the highest order LOD and is being relied upon by the proponent to inform:

Number of residual voids.

Residual void size.

Residual void location.

Residual void completion criteria.

Residual void slopes.

Residual void management milestones.

As such, the proponent is not bound to transition the final void sizes from the LDRMP (150ha) and the AR (120ha) into the PRC Plan Schedule.

Sections 2.3.1 to 2.3.5 below provide more detail on content of the LODs and how they have been relied upon to transition rehabilitation and closure outcomes into the PRC Plan Schedule in accordance with Section 6.4 of the PRC Plan Guideline. Specific outcomes that the proponent intend to transition into this PRC Plan are outlined where relevant.

2.3.1 Environmental Authority

As outlined in section 754 (3) of the EP Act and Section 6.3.2 of the PRC Plan Guideline 'a NUMA will be taken to be pre-approved if a land outcome, the same or substantially similar to a NUMA, is contained in a 'land outcome document'. This is the case for PTM due to the residual voids being authorised under condition E6 of EPML00963013 of the EA. The proposed NUMA is inclusive of the low wall, high wall and end walls.

As per section 754(3) of the EP Act, if a NUMA has already been identified in a LOD document, the applicant is not required to comply with sections 126C(1)(g) or (h), or section 126D(2) or (3) of the EP Act and is not required to complete the information requirements under section 126C(1)(j) of the EP Act for the approved NUMAs. The application for PTM is still required to meet the legislative requirements under section 126C(1)(d) of the EP Act.

The EA does not state the area or location of the proposed NUMAs, therefore Section 3.4.2 of this PRC Plan includes detail on how the total area of the land will be minimised and how the location of the proposed NUMAs will minimise risk to the environment.

The residual voids are authorised as NUMAs. Whilst attempts are made to minimise the size of the residual voids at closure, an underlying design principal is that the land is to be safe and structurally stable. There are potential landform design options that may reduce the size of the residual void; however this would result in a landform that would not meet the minimum Factor of Safety that has been determined by the Appropriately Qualified Person (AQP). Not achieving a safe and structurally stable residual void represents an unacceptable environmental outcome and necessitates designing a residual void that is based on practicalities, rather than an arbitrary size that was determined during the EIS. This is discussed further in Section 3.4.2.

~~2.3.2 Land Disturbance and Rehabilitation Management Plan~~

~~Discussion regarding the final void is limited in the LDRMP. Of most significance, the LDRMP references that “Overall, about 1450ha of the disturbed area will be rehabilitated, leaving about 150ha as a final void and the balance as infrastructure left for the benefit of the background landholder. These figures are based on the EIS”.~~

~~As stated in Section 2.3 of this PRC Plan, the EIS was developed to support a proposed mine plan incorporating a proposed final landform at closure. The EIS denotes an approximate residual void area and states that further landform design studies are required which may alter the final landform.~~

~~The LDRMP notes that the proposed final landform is shown in “Figure 1”. This figure is replicated below as Figure 1.~~

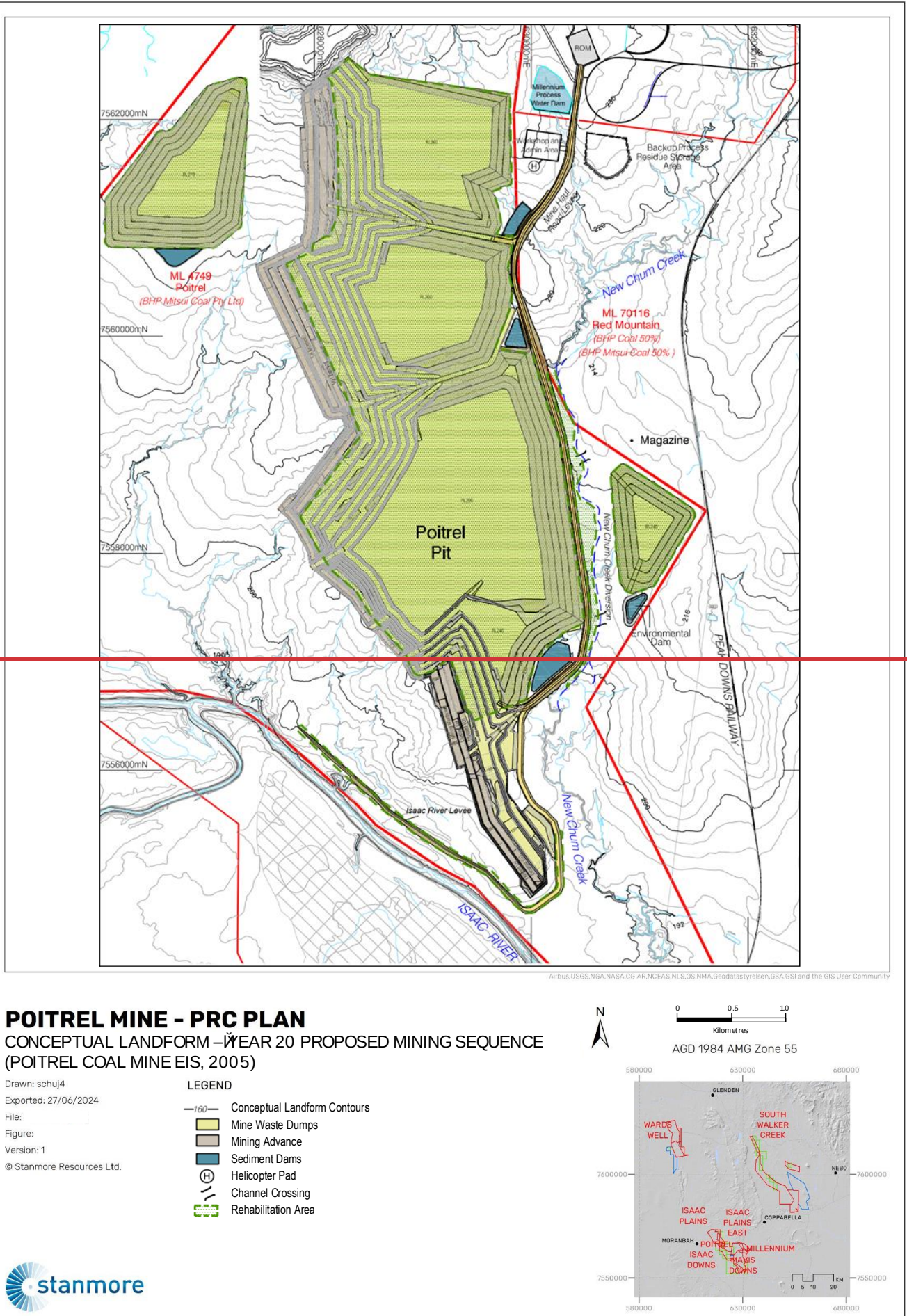


Figure 1 EIS Proposed Final Landform-at-Closure from LDRMP

As the legend is difficult to read due to the poor resolution, reflecting that the genesis of the proposed conceptual landform was the 2005 EIS that appears to have been copied directly into the LDRMP document. Key features of the legend have been replicated below:

~~Conceptual Landform Contours.~~

~~Mine Waste Dumps.~~

~~Mining Advance.~~

~~Sediment Dams.~~

~~Helicopter Pad.~~

~~Channel Crossing.~~

~~Rehabilitation Area.~~

The legend also provides for proposed location of sediment dams, however these are not construed as a proxy for a final residual void. As the final spoil dump landforms would be free draining across the entire profile and considering that these landforms should be designed for closure to achieve acceptable erosion, the proposed sediment dams are not intended to support the function of the spoil dumps nor were they intended to be residual voids associated with mining activities.

It is inferred that the 'mining advance' feature is indicative of the proposed final voids. This proposed landform does not match the proposed final landform that has been determined to support this PRC Plan application. The location of the final voids from the EIS do not reflect the current mine plan which has the final voids occurring closer towards the western boundary of Mining Lease (ML) 4749. It is important to distinguish that approximately 20 years have passed since the development of the proposed final landform during the EIS and the most recent final landform represents the mining activities that have occurred and the proposed future mining activities.

As the final void size in the LDRMP is "based on the EIS" and given the references to a "proposed final landform" and "leaving about 150ha as a final void", the LDRMP does not provide a definitive NUMA rehabilitation and closure outcome that can be transitioned into the PRC Plan Schedule.

As the proponent have multiple PTM LODs with relevant rehabilitation and closure outcomes, the proponent must adhere to the hierarchy in the definition for land outcome documents in section 750 of the EP Act for the use of the information. Given that the EA, which is at the top of the LOD hierarchy, does not constrain the location and size of voids it is determined that this would conflict with the LDRMP and as such the EA has been relied upon to inform transitional provisions for residual voids.

2.3.3 Poitrel Mine Final Void & Landform Management Plan

Development and submission of the FVLMP was required to achieve compliance with EA condition F7 associated with EA MIN100661507. That condition exists in the current EA EPML00963013 as condition E7. This condition is replicated in full below:

"Complete an investigation into residual voids and submit a report to the administering authority proposing acceptance criteria and landform design criteria by 30 June 2010 for administering authority review and comment. On acceptance of the criteria proposed in the Residual Void Management Plan, the criteria must be specified in the environmental authority. The investigation must at a minimum include the following:

A study of options available for minimising final void area and volume;

Develop design criteria for rehabilitation of final voids;

A void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long term;

A pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events;

A study of void capability to support native flora and fauna; and

A proposal/s for end of mine void rehabilitation success criteria and final void areas and volumes.

These studies will be undertaken during the life of the mine and will include detailed research and modelling."

Sections of the FVLMP that are relevant to this PRC Plan, especially when considering information in the LODs at the top of the hierarchy must be used where there are any conflicts in the information, includes:

~~“The final configuration of the mine will ultimately depend on demand for coal and other factors”.~~

~~“The last round of Life of Asset (LoA) mine planning indicated that the final void length could be reduced from approximately 8km to 2.4km using cost effective progressive backfill of the void and the ramps”.~~

~~“Major mine planning revisions are currently underway and it is likely that the projected location and extent of the final void will again change”.~~

~~“Thus, provision of specific geotechnical and hydrological performance of the “residual void” and a final treatment specification is not feasible until the final void location and extent can be confidently projected”.~~

~~“The final position and extent of the final void cannot be determined with certainty due to external affects such as the global economy”.~~

~~“Poitrel Mine is however committed to planning for and conducting its operations so that the size and extent of the residual void is limited to the most practicable extent and that the residual void will be treated to ensure safe, stable and sustainable outcome.”~~

~~“Further investigation in support of firming up the likely residual void stability, hydrological performance and rehabilitation concepts identified by this overview study”.~~

It is apparent that throughout the development of the FVLMP, it was recognised that the determination of the residual void location and size cannot be accurately forecasted and is subject to change depending on the Life of Asset (LoA) assumptions. The FVLMP correctly identified that further studies are required to inform residual void details. Given that the FVLMP is equal in the hierarchy to the LDRMP, the fact that the FVLMP deliberately does not commit to the location and size of the residual void indicates that these two documents are in conflict and therefore the document at the top of the hierarchy, being the EA, must be used where there are any conflicts in the information.

2.3.4 Assessment Report

The AR was written based on the information available at the time of EIS preparation and references significant uncertainty with both the mining operations and type of mining. This report is brief and does not provide any further certainty regarding rehabilitation and closure outcomes that can be transitioned into the PRC Plan.

2.3.5 Land Court Determination

When determining transitioning rehabilitation and closure outcomes into the PRC Plan Schedule, and to aid in statutory interpretation, consideration is given to the Land Court of Queensland determination delivered on 13 May 2024 (File No EPA503-23) relevant to EA EPML00561913. The land court determined that the appellant not required to comply with section 126C(1)(g) and (h) of the EP Act because of section 754(3) of the EP Act.

Central to the Land Court of Queensland determination was interpretation of EA EPML00561913 conditions. As BHP were the former EA holder of both EA EPML00561913 and EA EPML00963013, consideration must be given to the fact that BHP historically amended twelve EAs to achieve both consistency of conditions and achievement of compliance across their operations. As such there are numerous similarities between both EA EPML00561913 and EA EPML00963013 which are relevant for this PRC Plan. However, the proponent recognises there are some meaningful differences between EAs EPML00561913 and EA EPML00963013, especially in relation to additional tables that provide for more certainty on the void outcomes.

The appellant's appeal was based on resolving the following two questions:

- (a) Does the PRC plan need to comply with 126C(1)(g) and (h) of the EP Act.
- (b) Does it comply with 126C(1)(d)(i) of the EP Act.

As stated in the determination, the provisions referred to in (a) concern why there would need to be a void left on the site and the provision in (b) relates to how that would be consistent with the outcome of community consultation. The respondent was concerned that the size of the projected void would be larger than that previously the subject of consultation.

The proponent's position is that a similar viewpoint could be reached with this PRC Plan in respect to the size of the projected voids that have been documented in the AR and LDRMP. As discussed in Section 3.4, based on the most recent landform design that residual voids are estimated to occupy an area of 316ha would be larger than the 150ha and 120ha provided for in the LDRMP and AR respectively. However, it has been demonstrated throughout Section 2.2 and Section 2.3 that the LODs are in conflict and therefore the

~~EA as the LOD at the top of the hierarchy must be used where conflicts exist. It is therefore considered that approval of the EA has considered outcomes of consultation with the community in developing the plan and as the EA does not limit the number or size of the residual voids further community consultation is not required to support this PRC Plan Schedule application.~~

3. REHABILITATION PLANNING PART

Legislative Requirement

In accordance with Section 126C(1)(b) and (c)(ii) of the EP Act, the rehabilitation planning part of the PRC Plan must include a description of:

- each resource tenure, including the area of each tenure;
- the relevant activities to which the application relates;
- the likely duration of the relevant activities;
- how and where the relevant activities are to be carried out, including maps.

PRC Plan Guideline

The following spatial information must be submitted as part of the PRC Plan:

- the location and maximum extent of disturbance footprint for the mine life;
- the PMLUs and NUMAs for the area within the resource tenures;
- any sensitive receptors.

In addition to the list above, the PRC Plan must include spatial information outlining the rehabilitation and improvement areas that correspond to the proposed PRC Plan Schedule. The spatial information must show the locations of the rehabilitation and improvement areas for a 10-year period (minimum).

All spatial information must be prepared and submitted in accordance with the guideline 'Spatial Information Submission' (ESR/2018/4337).

3.1 Project Planning

3.1.1 Project Description

3.1.1.1 Geographic Location

PTM is an open cut coal mine located in the Northern Bowen Basin subregion of Central Queensland, approximately 20km southwest of Coppabella and approximately 25km southeast of Moranbah and is located within the Isaac Regional Council Local Government Area ([Figure 1](#)~~Figure 1~~).

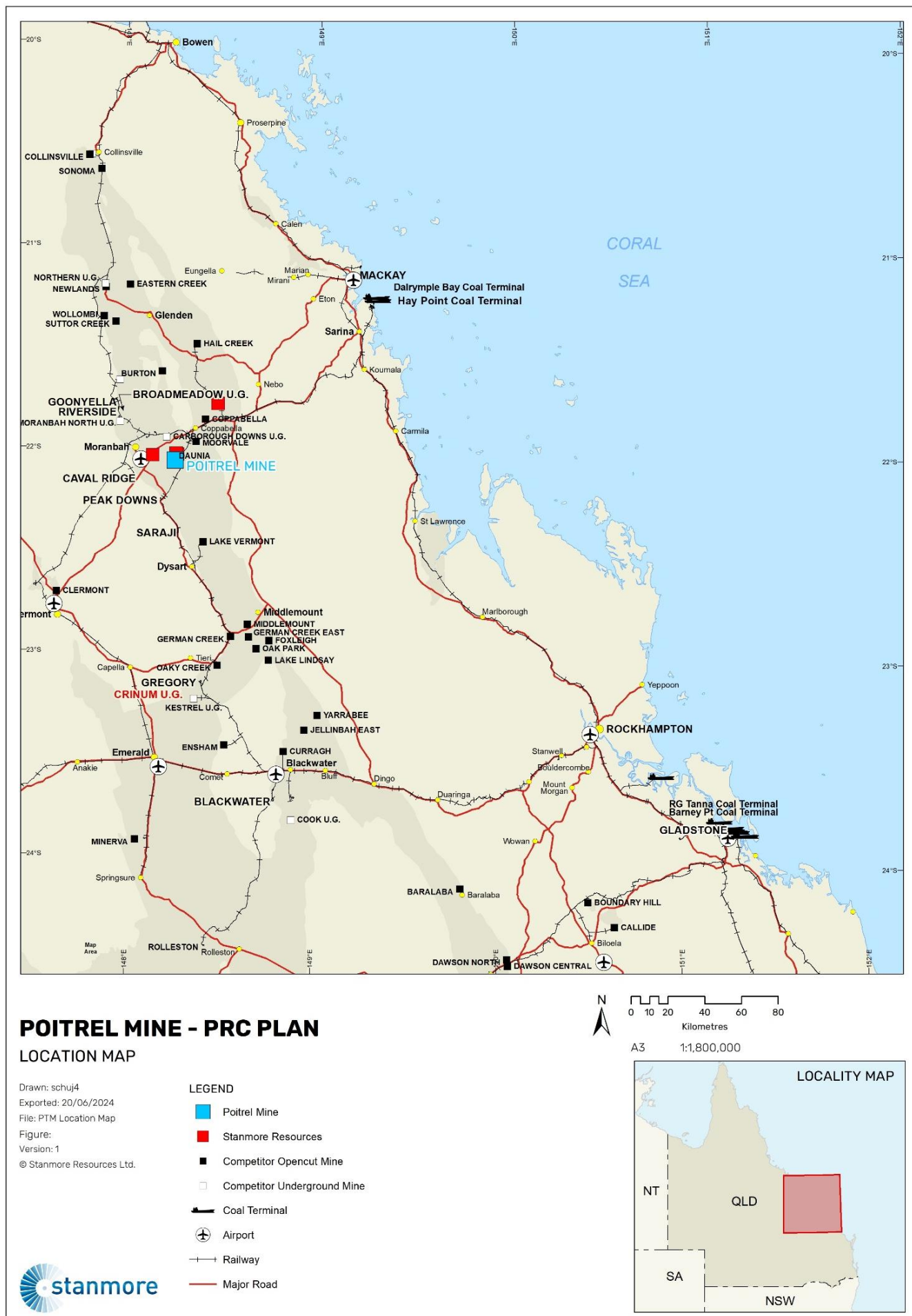


Figure 1 Location Map

3.1.1.2 Relevant Activities

The ERAs and location details approved within the EA for PTM are summarised in Table 1.

Table 1 Environmentally Relevant Activities and Location Details at PTM

Environmentally Relevant Activity	Locations
Schedule 3 13: Mining black coal.	ML4749, ML70116
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).	ML4749, ML70116
Ancillary 60 - Waste disposal 1(a) - Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(a) - less than 50,000t.	ML4749, ML70116
Ancillary 62 - Resource recovery and transfer facility operation 1(c) - Operating a facility for receiving and sorting, dismantling, baling or temporarily storing category 2 regulated waste.	ML4749, ML70116
Ancillary 63 - Sewage Treatment 1(b-i) - Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.	ML4749, ML70116

PTM operates under EA EPML00963013 for activities on ML 4749 and ML 70116. The area of the PTM MLs are provided in Table 2 and location presented in [Figure 2](#). As shown in Figure 3, there are some infrastructure areas within ML70116 that are managed under the Daunia Mine (Whitehaven Coal formerly BMA) EA and PRC Plan.

Table 2 PTM Mining Tenements

Mining Lease No.	Name	Date Granted	Area (ha)
ML4749	Poitrel	8 July 2004	3361
ML70116	Red Mountain	13 July 1978	754

3.1.1.3 Primary Mine Features and Infrastructure

The main features and infrastructure approved within the EA for PTM are summarised in Table 3. The current site layout is shown in ~~Figure 3~~[Figure 3](#). Of note, there are large portions of the MLs that are undisturbed (including three undisturbed exclusion areas) that do not form part of the PTM PRC Plan Schedule due to their undisturbed nature (Refer also Section 3.1.4.2 and 3.3).

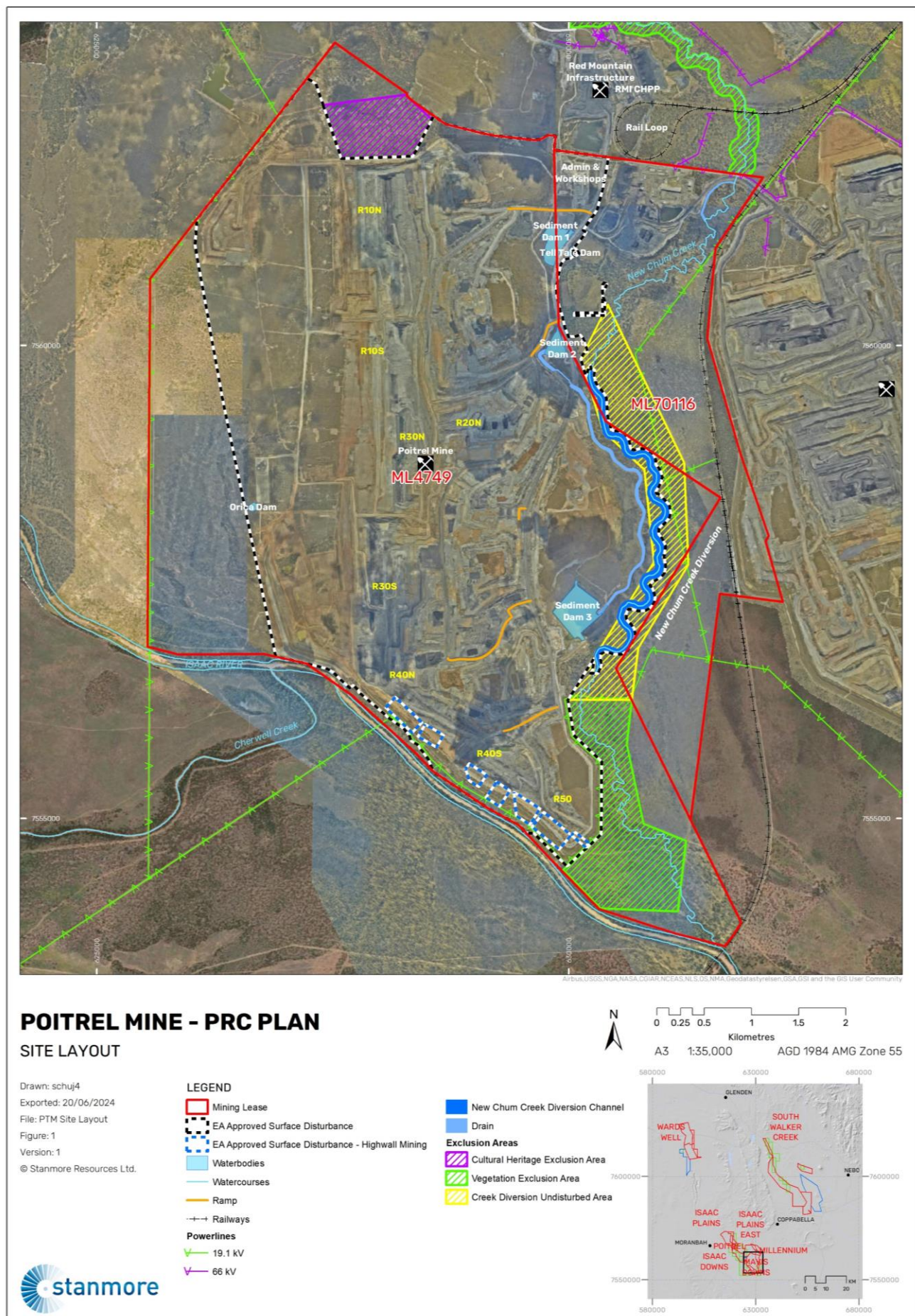


Figure 3 PTM Site Layout

Table 3 Primary Mine Features and Infrastructure at PTM

Mine Domain	Mine Feature Name
Pits and Ramps	R10N, R10S, R20N, R30N, R30S, R40N, R40S and R50 pits with associated ramps
Stockpiles	In-pit spoil and out-of-pit spoil dumps, including co-disposal (coarse rejects and dewatered fine rejects)
Dams	Water storage dams
Creek Diversions	4.5km New Chum Creek Diversion
Flood Protection	Levee
General Infrastructure	- Administration - Workshop - Fuel, oil, and chemical storage - Fuel and wash bays - Pipes and pumps (including Braeside pipelines) - Power lines - Switchyard and substations - Communications towers - Fences
General Disturbance	- Laydown areas - Access roads - Haul roads - Drains - Topsoil stockpiles
Undisturbed Area	Land that has not been impacted by mining operations

3.1.1.4 Type of Mining Operation

PTM has a strike extent of 6km north to south ([Figure 3Figure-3](#)). The mine comprises a series of open-cut pits, and shares process and rail loading facilities with neighbouring Millennium Mine to the immediate north of PTM. Daunia Mine is located immediately to the east of PTM. Mining commenced at PTM in 2006 and has included the extraction of coal through open cut strip mining from a series of pits that progress in a general east to west direction ([Figure 3Figure-3](#)). Mining activities to date have resulted in a continuous but partially backfilled void that includes a series of mining areas, which (from north to south) are designated Ramp 10, Ramp 30 and Ramp 40.

PTM is predominantly a strip mine operating the cast, doze, excavate method (CDX), although a single pit of truck excavator terrace mining is also planned in an area of highly structured geology. Overburden stripping operations advance to the west, with overburden progressively backfilled into already mined strips.

The PTM mine plan moves approximately 50M BCM of Prime waste per annum to mine ~5.8M ROM tonnes per annum and produce ~4M Product tonnes per annum. Mine production tapers off as pits are completed with final coal mined 2033.

PTM has been mapped as three separate rock units: Permian Rocks, Tertiary Sediments and Post-Tertiary Sediments. The deposit occurs in the Late Permian Rangal Coal Measures in a drag syncline within the Burton Range fault system. The local structures, the Isaac Fault and New Chum Fault, form the western and eastern limits of the deposit respectively.

Mining occurs on mining lease ML 4749. ROM coal is transported to ML 70312 (Red Mountain Infrastructure) Coal Handling Preparation Plant (CHPP) for washing. Product coal is transported from PTM's train load out (TLO) for rail to the Dalrymple Bay Coal Terminal (DBCT) for export. Rejects (coarse and fine) from the CHPP are deposited within overburden dumps and pits respectively in accordance with authorised EA conditions.

3.1.1.5 Proposed Duration

Operations commenced at PTM in 2006. Current approved areas are planned to be mined until 2033. The current long-term mine plan outlines that mining operations have a LoA of approximately 9 years.

3.1.2 Baseline Information

PRC Plan Guideline (Section 3.1)

In addition to the legislative requirements, the following information about the site, where relevant, is considered necessary by the administering authority (as per section 126C(1)(j) of the EP Act) to decide whether to approve the PRC Plan Schedule:

- site topography (locally and regionally)
- climate (general and specific (rain, evaporation, temperatures)) including long-term projections.
- geological setting
- site hydrology and fluvial networks
- groundwater levels and properties
- soil types, properties, and productivity
- land stability (pre-existing land degradation/erosion and predisposition to ongoing stability issues)
- vegetation communities and ecological data (including existing regional ecosystem mapping)
- fauna presence and populations
- pre-mining land use
- identification of underlying landholders

Transitional PRC Plans must include any baseline information collected as part of an EIS process or original EA application. If this information is unavailable, the reasons should be explained in this section of the rehabilitation planning part. Transitional PRC Plans are not required to demonstrate how aspects of the mine site have been designed for closure for existing or approved disturbance. However, any expansion to an existing site must demonstrate how it has been designed for closure. The rehabilitation/improvement planning must include data from when mining first commenced up until planned surrender. The transitional provisions of the EP Act include an exceptional circumstance for when land is available for rehabilitation.

3.1.2.1 Site Topography

The pre-mining topography of the study area is dominated by gently undulating grazing lands with low relief. The location of PTM straddles a low ridge line which runs roughly north south and forms the catchment divide between New Chum Creek on the east and an unnamed creek to the west. The topography surrounding PTM ranges from 283 mAHD to the north, down to 52 mAHD in the south. The surrounding land is characterised by poorly defined ephemeral drainage lines that flow only immediately after rain, draining into New Chum Creek (Landloch, 2022).

3.1.2.2 Climate

The climate of the Study Area is sub-tropical, with a distinct wet and dry season. The Queensland government operates a database of long-term climate data termed SILO (Scientific Information for Landowners) with interpolation across a statewide grid based on observation stations (Queensland Government, 2024).

Historical climate data for the period from January 1970 to January 2024 from the SILO database for the grid point closest to the PTM Area (latitude -22.05, longitude 148.25) is presented in Table 4. The SILO database provides the most comprehensive long-term dataset and is therefore the most useful for assessing long term rainfall and evaporation trends in the vicinity of the PTM Area.

Long-term average monthly rainfall, Moreton's areal actual evapotranspiration and Class A Pan evaporation from SILO is presented in Table 4. The PTM locality is characterised by a long-term average rainfall of approximately 591mm per year, with wetter conditions during the summer months of December, January and February and relatively dry conditions during the remainder of the year. As shown in Figure 4, average monthly evaporation and evapotranspiration exceed rainfall in all months. The highest rate of evapotranspiration occurs along creek lines, where the water table is closer to ground surface and deeper-rooted vegetation is present.

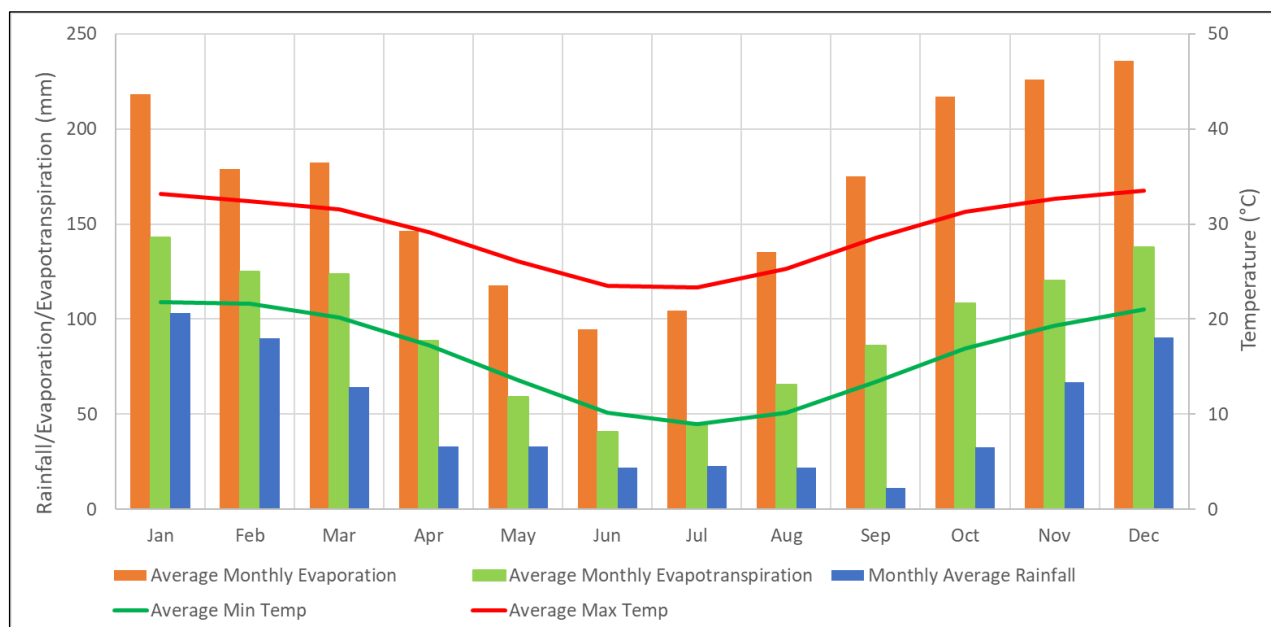


Figure 4 Average Monthly Evaporation, Evapotranspiration, Rainfall and Temperature (January 1970 to January 2024) – SILO.

To place rainfall over the years into an historical context, cumulative rainfall departure (CRD) was calculated for the full data period (Figure 5). This is a summation of the monthly departures of rainfall from the long-term average monthly rainfall. A rising slope in the CRD plot indicates periods of rainfall above the long-term average, as is the case from March 2022 to January 2023, whereas a falling slope indicates periods when rainfall is below the long-term average (e.g. May 2017 to May 2021). Rainfall volumes over the more recent period of the record (i.e., January 2023 to January 2024) have been lower than average, as is indicated by the falling slope in the CRD (Figure 5).

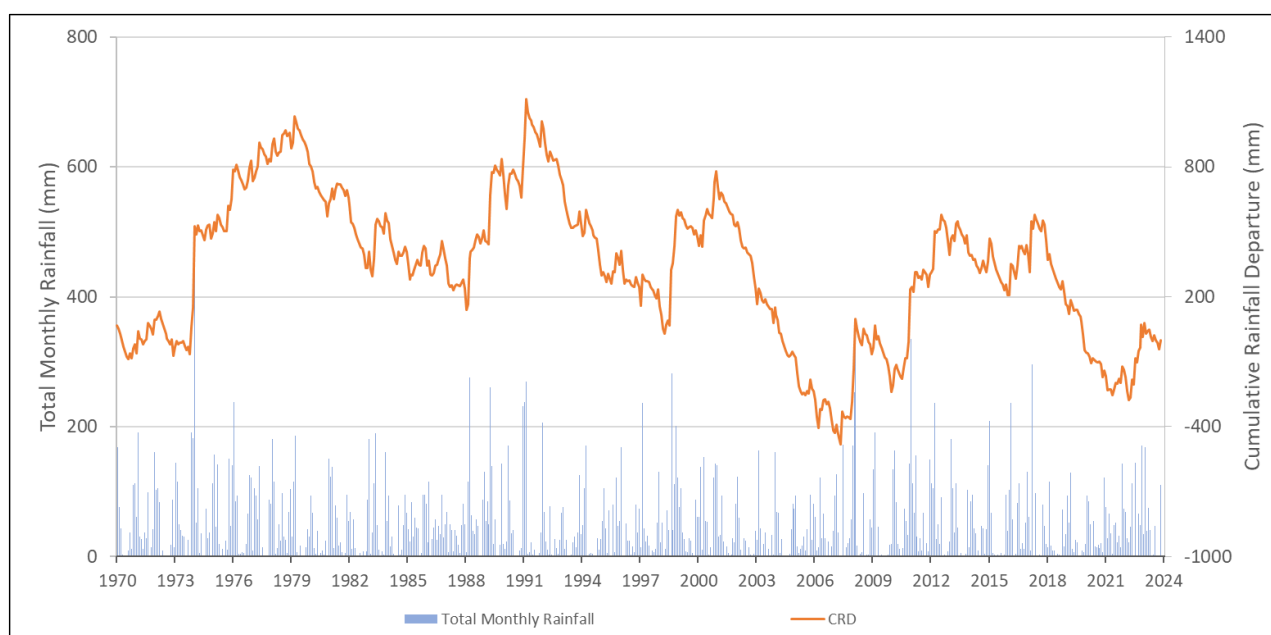


Figure 5 Cumulative Rainfall Departure and Total Monthly Rainfall – SILO

Table 4 Total Monthly Rainfall, Evaporation and Evapotranspiration (January 1970 to January 2024) - SILO

Month	Rainfall	Evaporation (Class A Pan) (mm)	Evapotranspiration (Moreton's Areal Actual) (mm)
January	103	219	143
February	90	179	125

Month	Rainfall	Evaporation (Class A Pan) (mm)	Evapotranspiration (Moreton's Areal Actual) (mm)
March	64	183	124
April	33	146	89
May	33	118	59
June	22	95	41
July	23	105	45
August	22	135	66
September	11	175	86
October	32	217	108
November	67	226	120
December	91	236	138
Total	591	2032	1143

3.1.2.2.1 Wind

Wind records for Moranbah for January-April show an easterly predominance of moderate strength (1-20km/h), with easterlies continuing to dominate for remainder of the year but with some south-easterly influence during May-July and north to north-easterly influences from October to December.

3.1.2.2.2 Climate Variability and Long-Term Projections

The 2020 State of the Climate Report by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Bureau of Meteorology (BoM) underscores the high variability of Australian rainfall, posing challenges in identifying consistent trends. Since 1900, the average annual rainfall in Northern Australia has risen, primarily attributed to heightened precipitation from October to April each year.

The report affirms that Australia's weather and climate are responding to a warming global climate system, with a temperature increase of approximately 1.44°C (+/-0.24 C) since 1910. The majority of this warming occurred post-1950, and each successive decade since then has been warmer than its predecessor. Warming is evident across Australia in all months, affecting both daytime and nighttime temperatures and contributing to a rise in extreme heat events. The warmest year on record was 2019, and from 2013 to 2019, seven out of nine years rank among the warmest.

This warming trend occurs amidst year-to-year climate variability, notably associated with El Niño and La Niña in the tropical Pacific Ocean. Rainfall and streamflow have increased in parts of northern Australia since the 1970s, with heavy rainfall events expected to intensify as the climate warms.

Australia's shift to a warmer climate is accompanied by an increase in extreme heat events on daily, multi-day, and seasonal scales. Models predict more intense short-duration heavy rainfall events nationwide, a decrease in tropical cyclones, but a higher proportion of high-intensity cyclones, subject to significant year-to-year variations.

Since the 1950s, there has been an increase in extreme fire weather and the duration of the fire season across large parts of Australia. Specifically, the Bowen Basin region has experienced a notable rise in dangerous fire weather days.

According to the CSIRO (2024), the impacts from climate change up to 2050 for the site location include an increase of maximum temperature by approximately 1.8°C, approximate 0.1mm/day decrease in precipitation, an approximate 0.88mm/day increase in pan evaporation, and approximate 1.2% decrease in relative humidity (CSIRO, 2024).

3.1.2.3 Geological Setting

PTM is located in the northern part of the Bowen Basin, a foreland sedimentary basin of approximately 200,000km². The Bowen Basin is a north-northwest to south-southeast oriented basin and contains the

largest coal reserves in Australia. The southern half of the Bowen Basin is covered by the Surat Basin, and the Galilee Basin exists to the west (Geoscience Australia, 2017).

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 Moranbah Coal Measures, Fort Cooper Coal Measures and Rangal Coal Measures. The Permian strata occur at outcrop on the eastern and western edges of the Basin and are generally unconformably overlain by the Triassic aged terrestrial sedimentary rocks of the Rewan Group. The economic coal seams that are targeted by PTM are contained in the Late Permian Rangal Coal Measures.

The Permian and Triassic units are covered by a thin veneer of unconsolidated to semi-consolidated Cainozoic sediments (Tertiary to Quaternary alluvium and colluvium). The alluvial sediments are localised along rivers and creeks (i.e., Isaac River and its main tributaries). Volcanic intrusions and extrusions (i.e., basalt) are also present within the region. The generalised regional stratigraphy is summarised in Table 5 (SLR, 2024) and shown in Figure 6 (GHD, 2019).

Table 5 PTM Stratigraphy

Period		Stratigraphic Unit	Description	Distribution
Cainozoic		Isaac River Quaternary alluvium (Qa)	Flood plain alluvium comprising clay, silt, sand, and gravel.	Surficial cover localised in the vicinity of the PTM Area along Isaac River and its unnamed tributaries, and Cherwell Creek.
		Regolith - alluvium, colluvium and other sediments in floodplains, alluvial fans, and high terraces (Qr, Qr\l and TQa)	Colluvial and residual deposits comprising poorly sorted clay, silt, sand, gravel and black soils, silts and muds derived from weathered basalts.	Surficial cover throughout much of PTM and surrounding areas.
		Duaringa Formation (Tu)	Mudstone, sandstone, conglomerate, siltstone, oil shale, lignite and basalt.	Isolated outcrop to the far south-east of the Study Area.
Triassic		Clematis Group (Re)	Cross-bedded quartz sandstone, some quartz conglomerate and minor red-brown mudstone.	Isolated outcrop to the far south-east of the Study Area.
		Mimosa Group (Rewan Group (Rr) (Rewan Formation and Sagittarius Sandstone))	Rewan Formation: green lithic sandstone, pebbly lithic sandstone, green to reddish brown mudstone and minor volcanilithic pebble conglomerate (at base). Sagittarius Sandstone: lithic sandstone interbedded with mudstones and siltstones with scattered carbonaceous plant material.	Outcrops or subcrops within the PTM Area.
Permian	Late	Blackwater Group Rangal Coal Measures (Pwj)	Coal seams, carbonaceous shale and mudstone, tuff, siltstone and mudstone.	Within the PTM Area; shallowest Permian unit at PTM.

Period	Stratigraphic Unit	Description	Distribution
	Fort Cooper Coal Measures (Pwt) (Fair Hill Formation)	Coal, brown and green sandstone, conglomerate, carbonaceous shale, tuff.	Within the PTM Area; underlies Rangal Coal Measures at PTM.
	Moranbah Coal Measures (Pwb)	Quartzose to sublabile locally argillaceous sandstone, siltstone, mudstone, carbonaceous mudstone, and coal.	Within PTM Area; underlies Fort Cooper Coal Measures at PTM.
	Early to Middle	Back Creek Group (Pb)	Quartzose to lithic sandstone, siltstone, carbonaceous shale, minor coal and sandy coquinite.

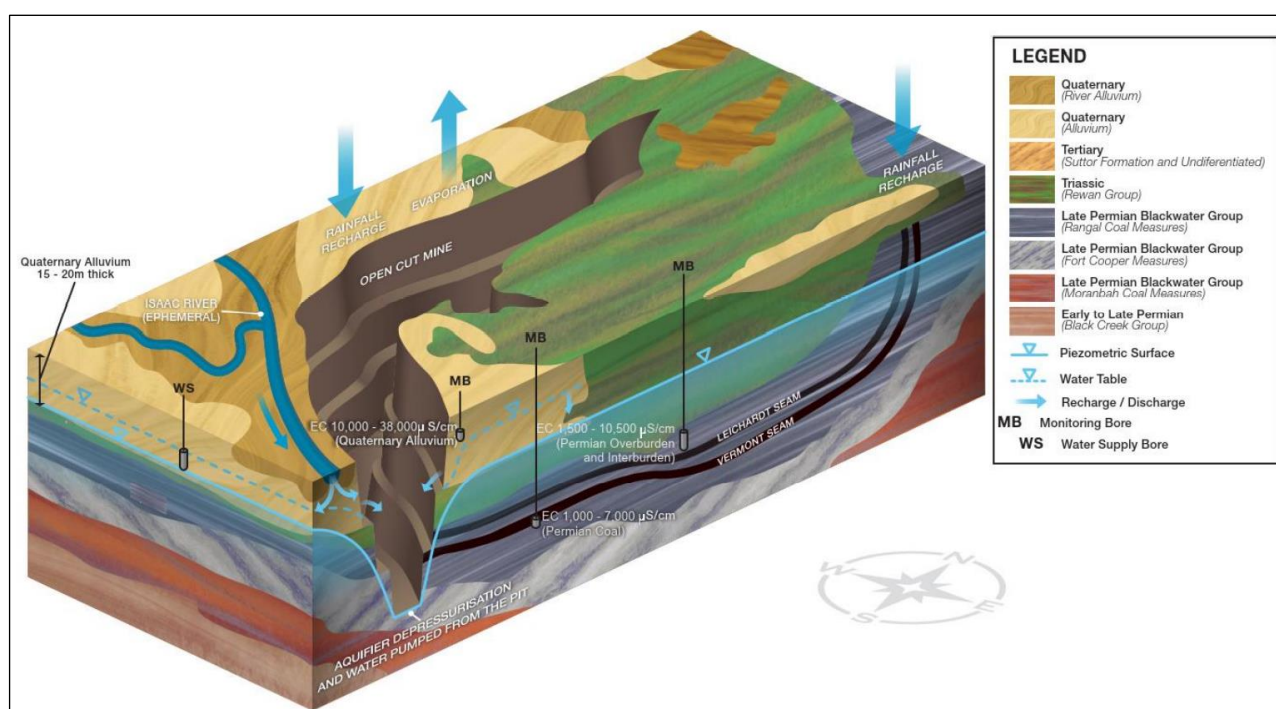


Figure 6 Baseline Hydrogeological Conceptual Model (GHD, 2019)

3.1.2.4 Site Hydrology and Fluvial Networks

PTM is located within the headwaters of the Isaac sub-catchment within the greater Fitzroy Basin with the Isaac River flowing from the north-west to south-east. The total catchment of the Isaac River is 2,711km², with headwaters in the Denham Range approximately 100km north of PTM, joining with the Connor's River 120km south the ML 4749, eventually converging with the Mackenzie River before joining the Fitzroy (Table 6). Several minor tributaries join the Isaac River in the vicinity of PTM, including Cherwell Creek near the southwestern boundary of the PTM, and New Chum Creek which has been diverted for mining operations to progress (Table 7). New Chum Creek runs along the eastern portion of the PTM site, and the New Chum creek diversion will remain in place post mining (Refer to Section 3.6.1).

Several smaller ephemeral streams also traverse the PTM site from west to east. The confluence of the Isaac River and New Chum Creek is approximately 6km upgradient of where the Cherwell Creek flows into the Isaac River. The Isaac River, New Chum Creek and Cherwell Creek are reported to be ephemeral waterways which drain to the Fitzroy River. Burton Gorge Dam, the only significant water retaining structure of the Isaac River is located approximately 47km north of PTM site.

The total length of the Isaac River channel is approximately 450km. The flood channel is characterised by extensive deposits of coarse sand indicating a sediment excess, and sand point bars deposit on the inside of channel meanders, occasionally with well- developed riparian vegetation. Broad, vegetated lower terraces fringe the river in some areas, although on outer meander bends and straighter sections of the river, the upper terrace plunges relatively steeply to the riverbank. Riverbanks are generally well vegetated with eucalypts and have eroded to near vertical for depths of 1m to 2m along much of channel length. The river has seasonal surface flows during the wetter months from November to April though reduces to subsurface flows in the channel sands from May to October (WRM 2020). On average, when the Isaac River flows, 161,863ML/year of surface water is discharged downstream.

The surface water environmental values (EVs) and water quality objectives (WQO) for the region are specified under the *Queensland Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water and Wetland Biodiversity (EPPWWB)) and within the Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (Part) including all waters of the Isaac River Sub-basin (including Connors River) (DEHP, 2011) [Figure 7](#) ~~Figure 7~~. The site is located within the Central Tributaries zone. Relevant EVs for receiving waters are displayed in Table 8.

Surface water sampling at PTM is undertaken in accordance with EA conditions, including a Receiving Environment Monitoring Program (REMP) and water release sampling. Water sampling locations nominated in the EA are provided in Table 9.

Table 6 PTM Catchment Areas

Sub-Catchment Level 1	Sub-Catchment Level 2
Isaac River –from Denham Range to Connors River – 2711km ²	New Chum Creek
	Cherwell Creek

Table 7 Waterways Within and Immediately Surrounding the PTM Site

Watercourse	Perennially	Hierarchy	Stream Order
Isaac River	Non Perennial	Minor	6
Cherwell Creek	Non Perennial	Minor	5
New Chum Creek	Non Perennial	Minor	3

Table 8 Environmental Values of Receiving Waters (EPP Water and Wetland Biodiversity, 2019)

Environmental Value	Applicable to PTM
Protection of aquatic ecosystems	✓
Suitability for crop irrigation	✓
Suitability for farm supply / use	✓
Suitability for stock water	✓
Suitability for aquaculture	✗
Suitability for human consumers of aquatic foods	✓
Suitability for primary recreation	✓
Suitability for secondary recreation	✓
Suitability for visual recreation	✓
Suitability for drinking water	✓
Suitability for industrial use	✓
Protection of cultural and spiritual values	✓

Table 9 Surface Water Monitoring Locations

Monitoring Point	Receiving Waters Location Description	Easting (GDA94)	Northing GDA94
Upstream Background Monitoring Points			
MP4 ¹	New Chum Creek – Upstream of the diversion	630824	7560800
MP5	Isaac River – 4760m upstream of the confluence of New Chum Creek and Isaac River	627831	7556405
Downstream Background Monitoring Points			
MP2 ¹	New Chum Creek – downstream of the diversion	631136	7554887
MP3	Isaac River – 3000m downstream of the confluence of New Chum Creek and Isaac River	633694	7552809

¹ Requires only in situ samples taken using electronic sampling equipment. Data obtained from MP4 and MP2 are for information purposes only and is not subject to condition F22 of the EA.

Water quality data for New Chum Creek and the Isaac River has been compared to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000) as part of the PTM EIS (2005). These comparisons addressed the protection of upland river aquatic ecosystems in tropical Australia, using 90% protection trigger levels for metal toxicants due to the degraded nature of the catchment. Additionally, the comparisons covered water quality for irrigation, general use, and livestock drinking water quality values.

- Both the Isaac River and New Chum Creek exhibit degraded conditions for aquatic ecosystems. The pH, electrical conductivity, and turbidity can exceed guideline levels at times. Phosphorus levels regularly surpass guideline values, and metals such as copper and iron frequently exceed the values recommended for the protection of aquatic ecosystems.
- The water in the Isaac River and New Chum Creek is generally suitable for irrigation and stock use. The pH levels are generally alkaline, reaching up to 8.60. Electrical conductivity and total dissolved solids (TDS) can exceed guideline values, likely in pools that form after flow events. Total suspended solids (TSS) and turbidity are often high, reflecting the agricultural influence in the catchments. Metal concentrations in these water systems are generally low, with occasional elevated iron levels during major flow events.

Surface water quality monitoring is also conducted by the Department of Regional Development, Manufacturing and Water (DRDMW) at several locations along the Isaac River. Although continuous monitoring sites are not present on New Chum Creek, a single-event monitoring was conducted for the EIS. Key monitoring sites include the Goonyella site, located 35km upstream of the confluence of the Isaac River and New Chum Creek, and the Deverill site, situated 21km downstream of the confluence.

The condition of New Chum Creek at the time of the EIS was variable, with areas ranging from highly disturbed to sections with good riparian vegetation. The vegetation primarily consists of Eucalypt open woodland and Brigalow communities, though it has been disturbed by grazing. Some sections of the creek had experienced moderate erosion due to farming practices.

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Figure 8 Fluvial Networks, Creek Diversion and Local Hydrology

3.1.2.5 Groundwater Properties, Levels and Values

3.1.2.5.1 Hydrogeological Units

The hydrogeological units relevant to PTM comprise of the following (Figure 6):

- Quaternary alluvium – unconfined aquifer where sparsely saturated (water-bearing strata of permeable rock, sand, or gravel) localised along the Isaac River and effectively in direct hydraulic connection with the underlying Regolith unit.
- Quaternary to Tertiary alluvium, colluvium and weathered units (collectively termed Regolith) – unconfined and largely unsaturated unit bordering alluvium and effectively in direct hydraulic connection with the alluvium.
- Triassic Rewan Group – Considered a regional scale aquitard, however, some saturated more hydraulically conductive horizons exist, particularly within the upper weathered zone.
- Permian Coal Measures - Coal seams of this unit form the primary regional aquifer. Groundwater flow is primarily within the coal seams (via interconnected cleats and fractures), which are confined by low permeability overburden and interburden (SLR, 2024).

3.1.2.5.2 Groundwater Levels

Limited historic groundwater levels and monitoring data exists for Cainozoic sediments (Tertiary to Quaternary alluvium and colluvium) at PTM due to sporadic saturation occurrences. Five current and historic monitoring bores are installed in these sediments, with records predating 2024. Four are in the unconsolidated alluvial sediments of the Isaac River (OBS5, OBS7, OBS8, and SP_Levee_3), and one (OBS 11) is in New Chum Creek sediments. Historic water level data from these bores is shown in Figure 9. Three additional bores along PTM's southern boundary were installed in February 2024 (SLR, 2024).

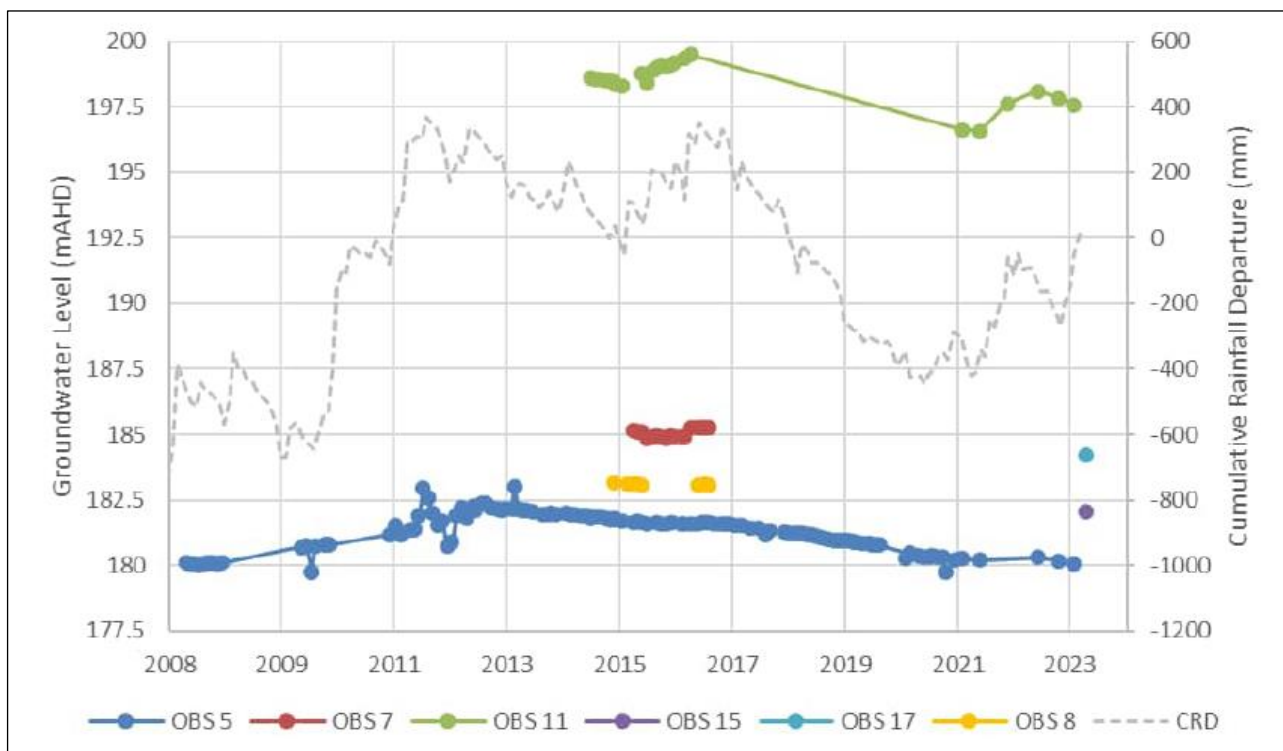


Figure 9 PTM Monitoring Bore Hydrograph – Cainozoic Sediment Aquifer

Figure 9 depicts OBS5's increasing trend before 2013, followed by a marginal long-term decline since 2014, paralleling general rainfall trends. Mining influence likely contributes to OBS5's post-2014 groundwater level drop of around 2m over 10 years. OBS7 and OBS8 exhibit stable water levels with slight increases, aligning with rainfall trends until monitoring ceased in 2017 due to drying. OBS11's monitoring data also reflects a response to rainfall patterns.

During the 2016-2017 period, groundwater levels from multiple bores indicate consistent flow direction in Cainozoic sediments, mirroring the Isaac River's direction (OBS7: 185 mAHd, OBS8: 183 mAHd). OBS11 (198-199 mAHd) suggests a north-south flow towards OBS8, aligning with New Chum Creek's surface flow.

Recently installed EA monitoring bores (installed between 17/02/24 and 03/03/24) along PTM's southern boundary show levels ranging from 184.2 mAHD (OBS17) to 182.1 mAHD (OBS15), with OBS19 reported as 'dry'. Given the amount of data currently available, bore stabilization and reliability of these water levels will be determined after the appropriate amount of data has been collected.

3.1.2.5.3 Groundwater Environmental Values

According to the Fitzroy Basin Groundwater Chemistry Zones (Basin 130; Environmental Protection (Water) Policy 2009), PTM is located within the Issac Groundwater Zone and is mapped as 'saline', with an ionic balance dominated by sodium (Na⁺) and chloride (Cl⁻) ions. The following EVs for Issac Groundwater are identified under EPP Water and Wetland Biodiversity (2019) and within the Isaac River Sub-basin Environmental Values and Water Quality Objectives (DEHP, 2011). These are outlined in Table 10 and displayed in Figure 10.

Table 10 Summary of Groundwater Environmental Values for Issac Groundwater Zone (DEHP, 2011)

Environmental Values	Applicable to PTM
Aquatic ecosystem	✓
Irrigation	✓
Farm Supply/Use	✓
Stock Water	✓
Aquaculture	✗
Human Consumer	✗
Primary Recreation	✓
Secondary Recreation	✗
Visual Recreation	✗
Drinking Water	✓
Industrial Use	✗
Cultural and Spiritual Values	✓

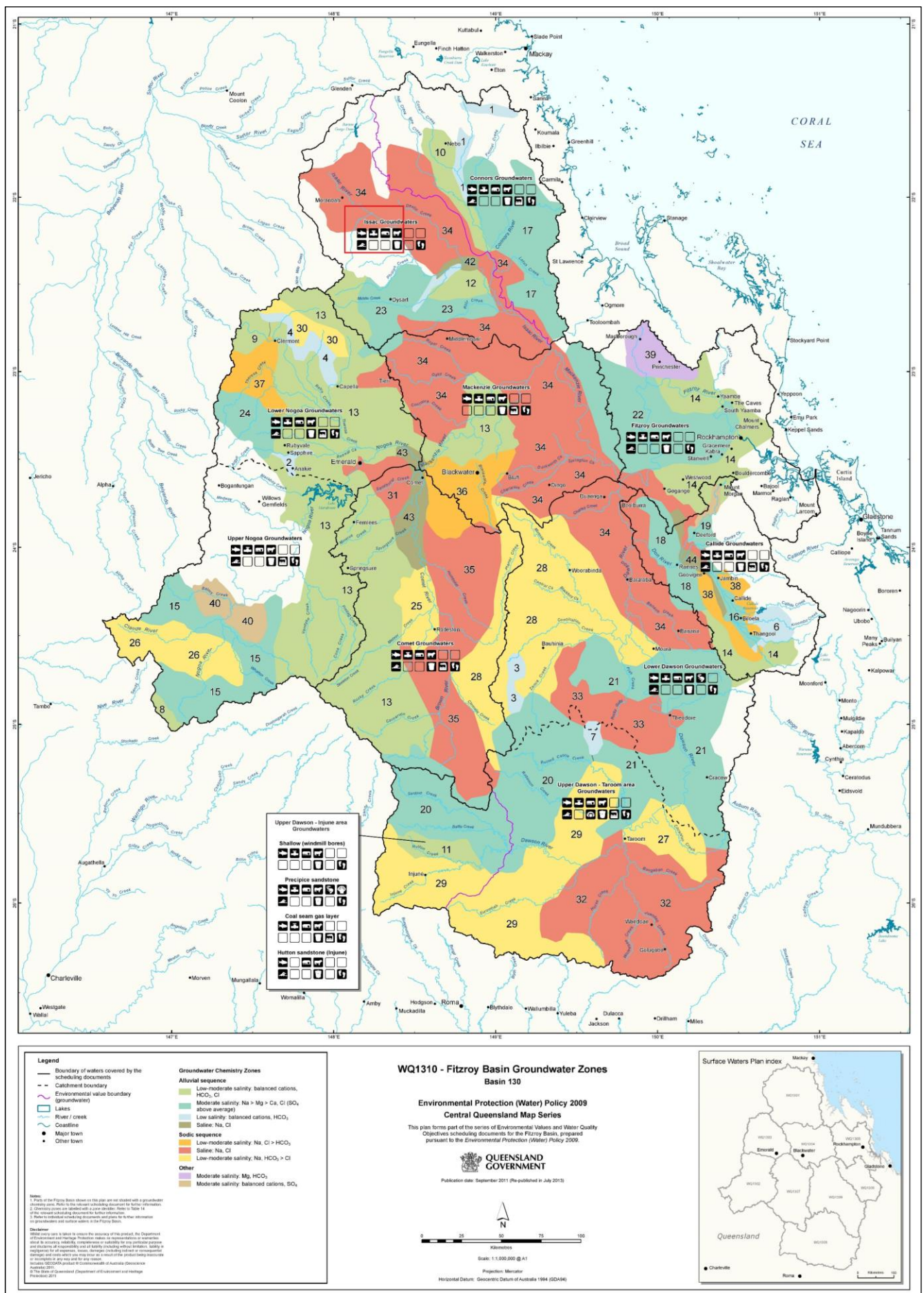


Figure 10 Groundwater Zones Surrounding the PTM Site (see red polygon)

Desktop mapping of potential aquatic and terrestrial Groundwater Dependent Ecosystems (GDEs) near PTM indicates varying levels of groundwater interaction along Isaac River, Cherwell Creek, and New Chum Creek. No known GDEs or springs are mapped within 10km of PTM. A portion of the high potential aquatic GDE along Isaac River is identified as a High Ecological Significance (HES) wetland, as per the Map of Queensland wetland environmental values. Wetland protection areas (WPA) buffer HES wetlands to limit nearby development, with a trigger area extending onto the PTM site but outside its mining footprint. Further details on GDE ground-truthing at PTM are discussed in Section 3.6.1.1.

3.1.2.6 Soil Types, Properties and Productivity

3.1.2.6.1 Soil Context

Pre-mining soil and land suitability assessment of the region, that includes the study area, was completed by CSIRO (Story, Galloway, Gunn, & Fitzpatrick, 1967) and agricultural management units were described by Bourne and Tuck (1993). Both surveys produced land and soils information at a scale of 1:500 000. A more detailed soil survey was conducted as part of the EIS (BHP Billiton, 2005), which included approximately 203 survey sites at a scale of 1:25 000 across the Study Area. Across all surveys, a total of 13 soil mapping units (SMU) were identified, including 3 variants (Landloch, 2022).

A summary of all SMUs, including the Australian Soils Classification (ASC) and Agricultural Management Units (AMU) are detailed in Table 11 and Figure 11. Chemical properties and productivity potential of soil types identified within the PTM locality are detailed in Table 12 (PTM EIS, 2005).

Table 11 Summary details of the SMUs developed in the previous soil assessments for the mine site (BHP Billiton, 2005)

SMU Code	SMU Concept	Description	ASC	AMU (Bourne and Tuck, 1993)	Area on MLs at Time of Study (ha)
A1	Alluvial – Deep Isaac Sands	Alluvial soils adjacent to the Isaac River which are either uniform deep coarse sands or duplex with coarse loamy sands extending past 50cm. River red gum and Moreton Bay Ash.	Arenic Rudosol	Isaac	98.6
A2	Alluvial -Sandy Hard Duplex	Hard setting sandy loam duplex soils alongside New Chum Creek often with bleached A2 over hard, coarse structured medium yellow clay often heavily mottled. Poplar Box mixed woodlands with associated Brigalow and Blackbutt.	Brown Sodosol	Lascelles	600.8
A3	Alluvial – Uniform Brigalow Clay	Deep, generally alkaline with carbonate nodules, possibly bleached A2 Horizon, uniform medium sandy clay which is non-cracking. Brigalow, Blackbutt, and Bauhinia.	Brown Dermosol	Rolleston	150.0
B1	Red / Brown Deeper Uniform Clay Undulating Mixed Brigalow Plains	Undulating plains up to 3% slope of mostly cleared Brigalow, Blackbutt, and Bauhinia. A firm to hard setting sandy surface, often gravely, overlies stiff medium sandy clays which are neutral and red to brown coloured. Weathered parent material or gravels generally predominate by 80cm depth.	Red Dermosol	Glengallan	1520.7
B2	Gravely Clay on Ridgelines	Relic ridgelines and scree slopes associated with residual mesas. Uniform non-cracking clay and thin duplex with hard setting sandy clay surface with strong gravel layer starting from 10-15cm depth underlying light clay is pale to red coloured. Mostly cleared of original Brigalow, Blackbutt with minor Poplar Box.	Petroferric Red Chromosol	Glengallan / Highlands	202.0
B3	Brigalow Lowlands With Grey / Brown Clays and Areas of Gilgai	Generally non-cracking uniform grey/brown clay but includes areas of normal gilgai (up to 40cm deep) which may crack. Also includes isolated areas of B4 (melanholes) in lower slope positions.	Brown Dermosol	Rolleston	251.3
B3v	Melon Holed Brigalow Clay Lowlands	Approx. 50% or more of land surface is Melan holed, (40-100 cm deep) with deep grey cracking clay.	Brown Dermosol	Lonesome	-
B4	Friable Brigalow Scrub Soil	Deep well-structured black cracking clay with granular surface mulch.	Black Vertosol	Picardy	141.5

SMU Code	SMU Concept	Description	ASC	AMU (Bourne and Tuck, 1993)	Area on MLs at Time of Study (ha)
B4v	Variant to B4	Fine granular non-cracking red / brown Brigalow scrub soil.	Brown Dermosol	-	35.2
B5	Linear Gilgai Complex of Black Cracking Clay and Red/Brown Non-Cracking Clay. (Brigalow)	Dark cracking clay in association with red noncracking clay in linear gilgai complex.	Crusty Black Vertosol	Rolleston	348.0
E1	Sandy Duplex Plains with Poplar Box	Undulating plains of Poplar Box and blackbutt with very uniform duplex soils with 30-40cm sandy clay loam over hard yellow / brown clays, often with a bleached A2.	Brown Sodosol	Lascelles	535.9
E2	Residuals (Mesas)	Mixture of outcropping rock, skeletal and shallow, gravely duplex soils with a range of vegetation. Includes mesa tops and rugged margins.	Sodosol	Highlands	25.0
E3	Thin Duplex – Poplar Box and Brigalow	Duplex soils with thin sandy loam A Horizon.	Brown Chromosol	Lascelles	210.4

All the soils, apart from the residual mesas have been used for beef cattle grazing for many years. Only the better Brigalow clays are known to have cropping potential in the district.

Table 12 Chemical Properties and Productivity Potential of Soil Types Identified Within the PTM Locality (PTM EIS, 2005)

SMU Codes												
Analysis (Unit)	A1	A2	A3	B1	B2	B3	B3v	B4	B5	E1	E2	E3
Soil pH (H2O)	6.6	6.4	6.2	6.9	6.5	7.6	8.4	7.5	7.9	6.9	not recorded	7.2
Soil EC (dS/m)	0.03	0.02	0.16	0.09	0.42	0.12	0.54	0.11	0.15	0.09	not recorded	0.09
R1 Dispersion	0.84	0.72	0.46	R1 not recorded (ESP 2.8)	0.52	0.33	0.45	0.29	0.39	0.77	not recorded	0.28
Preferred Use / Productivity	Grazing native pastures. Deep sandy A horizon improves short term water availability	Grazing native pastures. Hard coarse clay B horizon restricts moisture availability and root exploitation	Grazing improved pastures. The local microrelief (i.e., braided creek channels) increases k and p restrictions	Grazing of improved pastures. Susceptible to erosion degradation	Grazing of improved pastures. Highly susceptible to erosion degradation	Grazing of improved pastures. Productive grazing lands with possibility of opportunist forage in good years.	Waterlogging in saline depressions severely restricts pasture.	Excellent grazing land. Could be used for opportunist forage or cropping.	Variable soils create management difficulties if cropped. Very good grazing land.	Broadscale grazing if well managed.	Very marginal grazing lands.	Marginal grazing land.

Note: Samples above were taken 0-10cm depths

Red/brown clays are the main soil type at the PTM, typically dark brown to reddish brown with clay loam to medium clay textures. Gravel content is usually below 10%, occasionally reaching 20%. These clays are non-sodic and generally stable, comparable to the most stable clay topsoils in the area for rehabilitation. Red/grey loams are a smaller portion, less than 15% of samples, with sandy loam to sandy clay loam textures and 10–20% gravel content. They are non-sodic but prone to slaking and dispersion. See Table 13 for a summary of their key properties (Refer also to Appendix 7).

Table 13 Summary of Key Chemical and Physical Properties for Stockpiled Soils

Analysis	Red/Brown Clay	Red/Grey Loam
pHw (pH units)	Neutral to strongly alkaline (7.1–8.5)	Neutral to strongly alkaline (6.9–8.5)
EC1:5 (dS/m)	Low to moderate (0.9–0.28)	Low (0.12–0.14)
ESP (%)	Non-sodic (1.2–4.9)	Non-sodic (2.8–3.5)
Total N (mg/kg)	Low the moderate (270–1,384)	Low (396–471)
Available P (mg/kg)	Low (4–16)	Low (4–14)
Available K (mg/kg)	Low the moderate (76–364)	Low the moderate (124–222)
Organic C (%)	Low to moderate (0.57–1.82)	Low (0.29 – 0.83)
Clay content (%)	>30	<30
Rock content (%)	<20	10 – 20
Dispersion (EAT)	Slightly dispersive to stable (3b–7)	Slightly dispersive to slaking (3b–5)

Note: Chemical properties are based on average 10th and 90th percentile values for all stockpile samples analysed.

3.1.2.6.2 Pre-Mining Land Suitability

The 13 SMUs identified during the EIS were classified using the five-class land suitability classification (DSITI, DNRM, 2015) ,with land suitability decreasing progressively from class 1 to class 5. The five land suitability classes are summarised as follows:

- Class 1 - Suitable land with negligible limitations
- Class 2 - Suitable land with minor limitations
- Class 3 - Suitable land with moderate limitations
- Class 4 - Unsuitable land with severe limitations
- Class 5 - Unsuitable land with extreme limitations

The PTM SMUs and pre-mining Land Suitability for Cattle Grazing or Cropping are presented in Table 14

Table 14 Pre-Mining Land Suitability for Cattle Grazing and Cropping (PTM EIS, 2005)

SMU Code	SMU Concept	Land Suitability Class – Cattle Grazing	Land Suitability Class - Cropping
A1	Alluvial – Deep Isaac Sands	Class 3	Class 5
A2	Alluvial -Sandy Hard Duplex	Class 4	Class 5
A3	Alluvial – Uniform Brigalow Clay	Class 2	Class 4
B1	Red / Brown Deeper Uniform Clay Undulating Mixed Brigalow Plains	Class 3	Class 5
B2	Gravelly Clay on Ridgelines	Class 3	Class 5

SMU Code	SMU Concept	Land Suitability Class – Cattle Grazing	Land Suitability Class - Cropping
B3	Brigalow Lowlands With Grey / Brown Clays and Areas of Gilgai	Class 3	Class 5
B3v	Melon Holed Brigalow Clay Lowlands	Class 3	Class 5
B4 and B4v (variant to B4)	Friable Brigalow Scrub Soil – Black Cracking Clay	Class 2 (B4) Class 2 (B4v)	Class 3 (B4) Class 3 (B4v)
B5	Linear Gilgai Complex of Black Cracking Clay and Red/Brown Non-Cracking Clay. (Brigalow)	Class 3	Class 4-5
E1	Sandy Duplex Plains with Poplar Box	Class 4	Class 5
E2	Residuals (Mesas)	Class 5	Class 5
E3	Thin Duplex – Poplar Box and Brigalow	Class 4	Class 5

3.1.2.7 Land Stability

Susceptibility to erosion is influenced by soil characteristics such as exchangeable sodium percentage (which predisposes dispersion), Ca:Mg ratios (which can inhibit dispersion), particle size distribution (critical with respect to physical stability), R1 Dispersion Index (% dispersed silt+clays/ total silt +clays) and profile morphology. Naturally, pre-mining erosion susceptibility varied across PTM, depending on soil type, vegetation cover and topography. The vegetated deep cracking clays were found to be less prone to erosion, while lithosols and sodic duplex soils had formed gullies, due to stock tracks and vehicle tracks concentrating overland flow. During the EIS, instability of Brigalow soils (considered to be of better quality) was evidenced by the presence of heavily eroded drainage lines, likely formed/degraded further from clearing and pasture establishment.

SMUs identified during the EIS were characterised based on similarity in morphology, physical and chemical characteristics, vegetation, soil origin and topographic position. The principal soil types present were non-cracking sandy clay, associated with the undulating Brigalow plains and associated gravelly ridgelines (SMU B1 and B2). The identified SMUs susceptibility to landform instability (by means of erosion) is summarised as follows:

- Soil units A1 to A3 predominantly consist of alluvial soils with varying degrees of moisture retention, workability, and nutrient availability. They are suitable for grazing native pastures, with some variations in preferred use based on specific soil characteristics.
- Soil units B1 to B5 exhibit characteristics such as red/brown clay, gravelly clay, and linear gilgai complexes. These soils are generally suitable for grazing improved pastures but are susceptible to erosion degradation, particularly units B2 and B3.
- Soil units B3v and B4/B4v include Brigalow clay lowlands and scrub soils with varying degrees of moisture retention, workability, and nutrient availability. These soils are generally suitable for grazing improved pastures, with B4/B4v potentially suitable for opportunistic forage or cropping.
- Soil units E1 to E3 comprise sandy duplex plains, residuals, and thin duplex soils. These soils are generally marginal for grazing, with varying degrees of erosion susceptibility and nutrient availability.

3.1.2.8 Vegetation Communities and Regional Ecosystems

PTM is situated in the Northern Bowen Basin and the Isaac-Comet Downs biogeographical subregions of the Brigalow Belt Bioregion. The Brigalow Belt Bioregion is one of the suites of the 13 biogeographical areas defined for Queensland (Sattler & Williams, 1999).

Landscape connectivity in the area primarily relies on existing vegetation along riparian corridors of waterways and river systems.

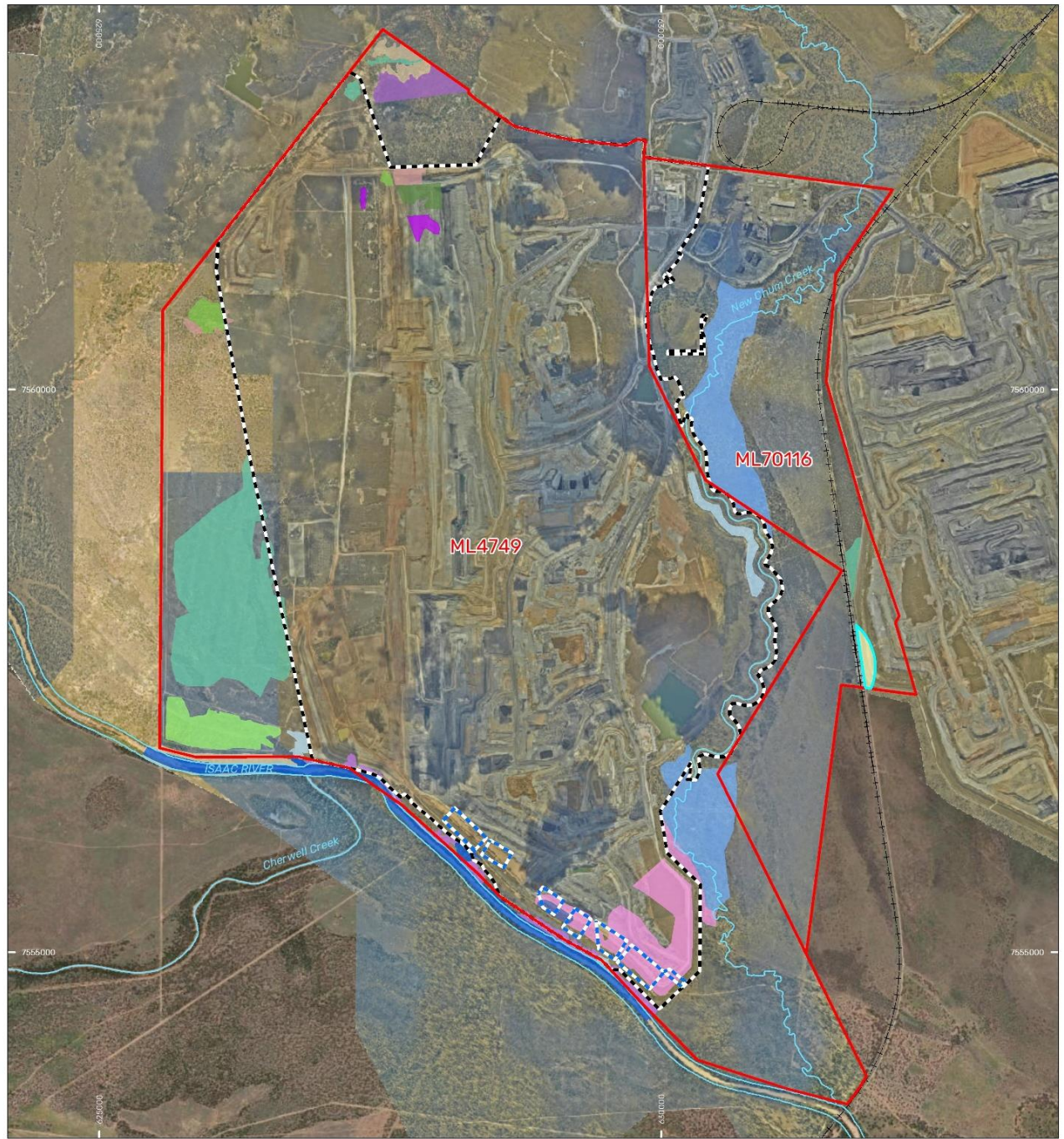
A desktop assessment and review of previous ground-truthed ecological studies, environmental databases, maps, and associated literature was conducted by BAAM in 2021 (BAAM, 2022). The study area for this assessment focused on undisturbed areas within the EA approved surface disturbance footprint Figure 13.

These assessments identified 11 Regional Ecosystems (REs) within the EA approved disturbance area and broader MLs (Table 15 and [Figure 12](#)).

The REs of the undisturbed footprint is shown in Figure 14, which visually shows how the pre-mining landscape did not host large areas of high value biodiversity.

Table 15 Regional Ecosystems in PTM MLs and the EA Approved Disturbance Footprint (BAAM, 2021)

RE Code	Short Description	BD Status	VM Act Status	Total Area Within MLs	
				Remnant (ha)	High-Value Regrowth (ha)
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Endangered	Endangered	28	0
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Of Concern	Of Concern	14	0
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Of Concern	Least Concern	45	0
11.3.27	Freshwater Wetlands. Occurs in a variety of situations including lakes, billabongs, oxbows, and depressions on floodplains. Palustrine	Of Concern	Least Concern	3	0
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plain	Of Concern	Of Concern	12	0
11.3.4a	<i>Corymbia tessellaris</i> woodland. On alluvial sand ridges to elevated levees and level terraces adjacent to larger stream channels which are irregularly flooded or possibly relict	Of Concern	Of Concern	16	0
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	Endangered	Endangered	8	0
11.4.9	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	Endangered	0	149
11.5.3	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces	No Concern	Least Concern	6	0
11.7.2	<i>Acacia spp.</i> woodland on Cainozoic lateritic duricrust. Scarp retreat zone	No Concern	Least Concern	16	0
11.7.3	<i>Eucalyptus persistens</i> , <i>Triodia mitchellii</i> open woodland on stripped margins of Cainozoic lateritic duricrust	No Concern	Least Concern	1	7



POITREL MINE - PRC PLAN

GROUND TRUTHED REGIONAL ECOSYSTEMS (GTRE)

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Exported: 20/06/2024

File: PTM RE

Figure: 1

Version: 1

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LEGEND

 Mining Lease

 EA Approved Surface Disturbance

 EA Approved Surface Disturbance - HW Mining

— Watercourses

—+—+— Railways

Validated RE Code

11.3.1
11.3.2
11.3.2/11.3.1/11.4.9
11.3.25
11.3.27
11.3.4
11.3.4a
11.4.8

11.4.8/11.4.9
11.4.8/11.4.9c
11.4.9
11.5.3
11.5.3/11.4.9
11.7.2
11.7.3
Non-remnant



0 0.25 0.5 1 1.5 2
Kilometres

A3 1:35,000 AGD 1984 AMG Zone 55

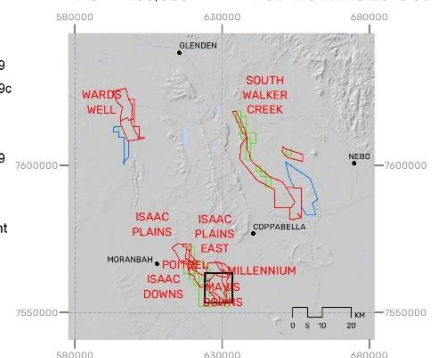
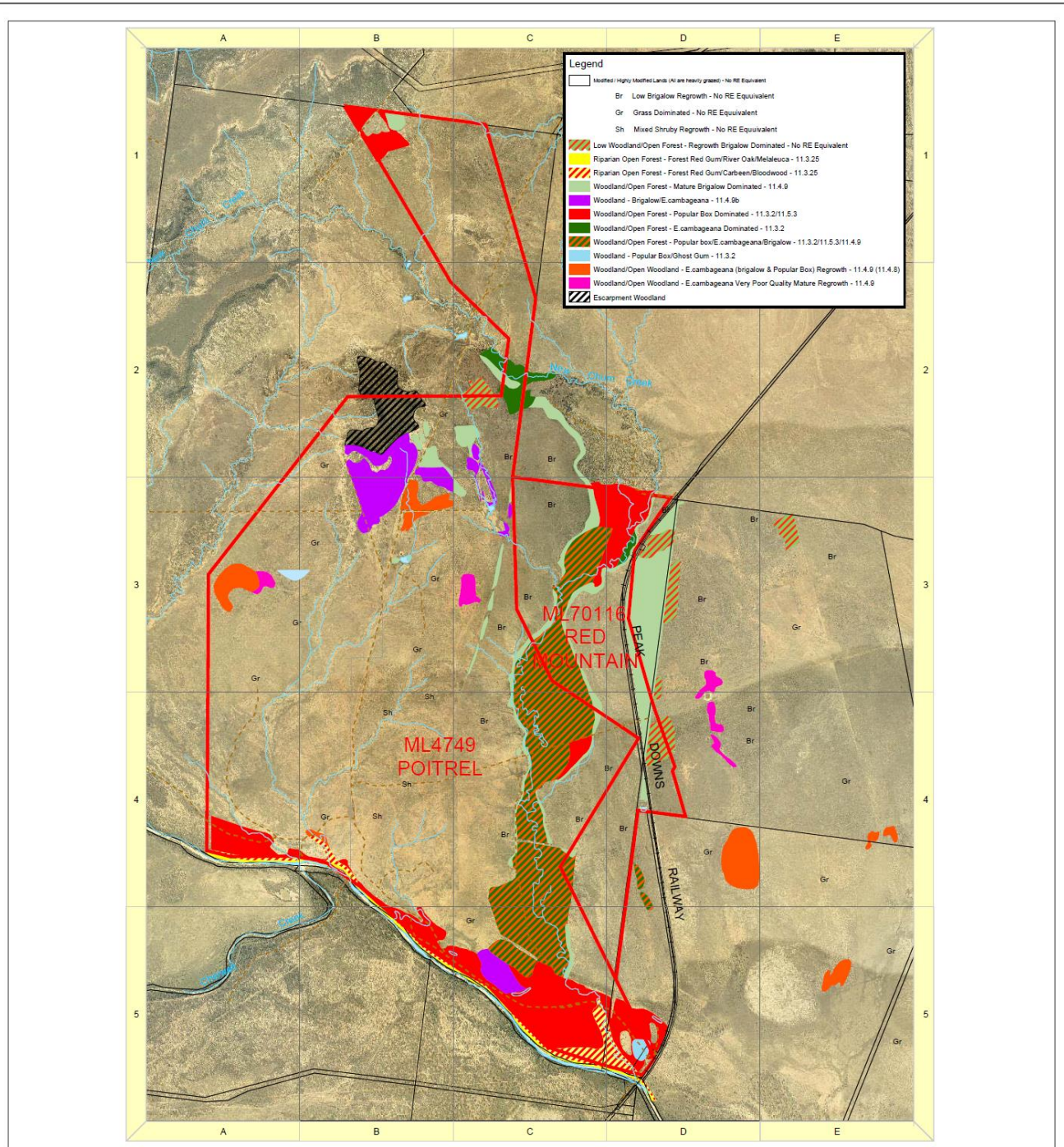


Figure 12 Regional Ecosystems within the PTM Leases and the EA Approved Disturbance Footprint (BAAM, 2021)



Airbus, USGS, NASA, CSA, NC FAS, NLS, OS, NMA, Geodatas by reisen, GSA, GSI and the GIS User Community

POITREL MINE - PRC PLAN

DISTRIBUTION OF REGIONAL ECOSYSTEMS (POITREL COAL MINE EIS, 2005)

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File:
Figure:
Version: 1
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LEGEND

- Drainage
- Railway
- Mining Lease Boundaries
- DCB
- Dams
- Tracks



0 10
Kilometres

AGD 1984 AMG Zone 55

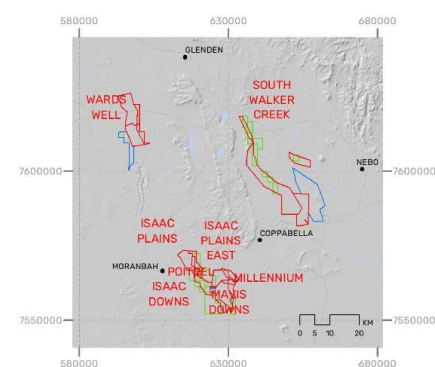


Figure 14 Distribution of Regional Ecosystems (Poitrel Coal Mine Project EIS, 2005)

3.1.2.8.1 Species Conservation Significance

Species of conservation significance are identified in Table 18. PTM has no obligations requiring specific inclusion of species of conservation significance in the revegetation planning. Nonetheless, the proposed woodland habitat and watercourse PMLUs, in particular those associated with riparian vegetation, will provide connectivity between rehabilitated areas and existing vegetation and habitat values. Additionally, areas rehabilitated to a watercourse PMLU will connect existing riparian habitat values for potential conservation significant species.

3.1.2.8.2 Threatened Flora Species

According to the EIS (2005), areas within PTM did not comprise of significant vegetation or habitat that supports threatened species but are dominated by common disturbance tolerant fauna species and introduced fauna. No threatened flora species under the EPBC Act were recorded during the 2021 field survey (BAAM). Table 16 outlines an assessment of likelihood of occurrence of threatened flora species from database searches.

Table 16 Assessment of Likelihood of Occurrence of Threatened Flora Species Identified from Database Searches

Threatened Flora Species	EPBC Act	NC Act	Likelihood of Occurrence	Comments
<i>Capparis humistrata</i>	-	Endangered	Unlikely	Only one record is shown 27km east of ML.
<i>Dichanthium queenslandicum</i>	Endangered	Vulnerable	Potential	Accurate records occur 10km west of ML.
<i>Eucalyptus raveretiana</i>	Vulnerable		Potential	Potential to occur within REs 11.3.25, 11.3.4, 11.3.1 and 11.3.2. Accurate records occur 38kms northeast of ML.
<i>Ptilotus uncinellus</i>	-	Endangered	Unlikely	Accurate records occur over 90kms north.
<i>Samadera bidwilli</i>	Vulnerable	Vulnerable	Unlikely	Records are more than 100km east of the ML and no preferred habitat occurs within the ML.
<i>Solanum adenophorum</i>	-	Endangered	Potential	An accurate record occurs 12km south-east of the site. Potential habitat within the ML is based on the mapping of REs 11.3.1, 11.4.8 and 11.4.9.
<i>Solanum elachophyllum</i>	-	Endangered	Potential	An accurate record occurs 12km east of the site. Potential habitat within the Study Area is based on the mapping of REs 11.3.1, 11.4.8 and 11.4.9.

3.1.2.8.3 Threatened Ecological Communities (TEC)

According to the state mapping and search of the EPBC Protected Matters Search Tool (PMST) undertaken by BAAM (2021) three EPBC Act listed Threatened Ecological Communities are known or may occur locally.

Table 17 Threatened Ecological Communities – Likelihood of Occurrence

Threatened Ecological Community	EPBC Act	VM Act	Likelihood of Occurrence	Comments
11.4.9 - Brigalow (<i>Acacia harpophylla</i> dominant and codominant)	Endangered	Endangered	Known	None of the potential patches of Brigalow TEC within the

Threatened Ecological Community	EPBC Act	VM Act	Likelihood of Occurrence	Comments
				2021 survey met the approved conservation criteria.
11.4.4 - Natural Grasslands of the Queensland Central Highlands and Northern Fitzroy Basin	Endangered	Least Concern	Potential	It is considered unlikely to occur within the MLs. During the 2021 survey (BAAM), potential areas of the Natural Grassland TEC were assessed as too small (≤ 1 ha), with greater than 30% projected woody shrub cover, and/or greater than 10% projected crown cover, indicating these areas did not meet the condition thresholds required to be considered the Natural Grasslands TEC.
11.3.2 - Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Of Concern	Known	None of the potential patches of Poplar Box TEC within the 2021 survey met the approved conservation criteria.

3.1.2.8.4 Weed Species

Weed surveys conducted at PTM identified several weed species as being present on the MLs and the surrounding areas. Weeds have the potential to impact on the ecological values of the rehabilitated areas. The 2021 survey identified four Weeds of National Significance (WoNS) on site. These include:

- Parthenium (*Parthenium hysterophorus*).
- Bellache Bush (*Jatropha gossypifolia*).
- Prickly pear (*Opuntia spp.*).
- Lantana (*Lantana camara*) – Class 3 Pest Plant.

All weeds listed above are classified as '*Restricted Invasive Plants*' under the Biosecurity Act 2014. The Act requires that all reasonable and practical steps be taken to minimise the risks associated with invasive plants.

3.1.2.9 Threatened Fauna

Two threatened fauna species (Ornamental Snake and Greater Glider) were recorded during the field survey conducted at PTM in November 2021 (BAAM, 2022). Two other conservation significant species are also likely to occur within PTM or in the adjacent MLs (Table 18).

Table 18 Conservation Significant Fauna Recorded or Likely to Occur within or Adjacent to PTM MLs

Species	EPBC Act Status	NC Act Status	Likelihood of Occurrence	Potential Habitat Area in MLs (ha) ¹
Squatter Pigeon <i>Geophaps scripta</i>	Vulnerable	Vulnerable	Likely to Occur	Total 882ha – includes 103ha, 2021(BAAM) survey -includes adjacent Isaac River area) and 778ha identified in 2017 survey.
Koala <i>Phascolarctos cinereus</i>	Endangered	Vulnerable	Likely to Occur	109ha – comprising of 87ha preferred habitat, 16ha suitable habitat and 6ha marginal habitats.
Ornamental Snake <i>Denisonia maculata</i>	Vulnerable	Vulnerable	Known to Occur	Total 310ha – comprising of 151ha preferred habitat, 130ha suitable habitat and 25ha marginal habitats.

Species	EPBC Act Status	NC Act Status	Likelihood of Occurrence	Potential Habitat Area in MLs (ha) ¹
Southern Greater Glider <i>Petauroides volans</i>	Endangered	Endangered	Known to Occur	Total 108ha.
Grey Falcon <i>Falco hypoleucos</i>	Vulnerable	Vulnerable	Potential	Total 103ha.

¹ Note includes the adjacent Isaac River Corridor.

Potential habitat areas for the species listed in Table 18 are detailed in Figure 15 to Figure 18.

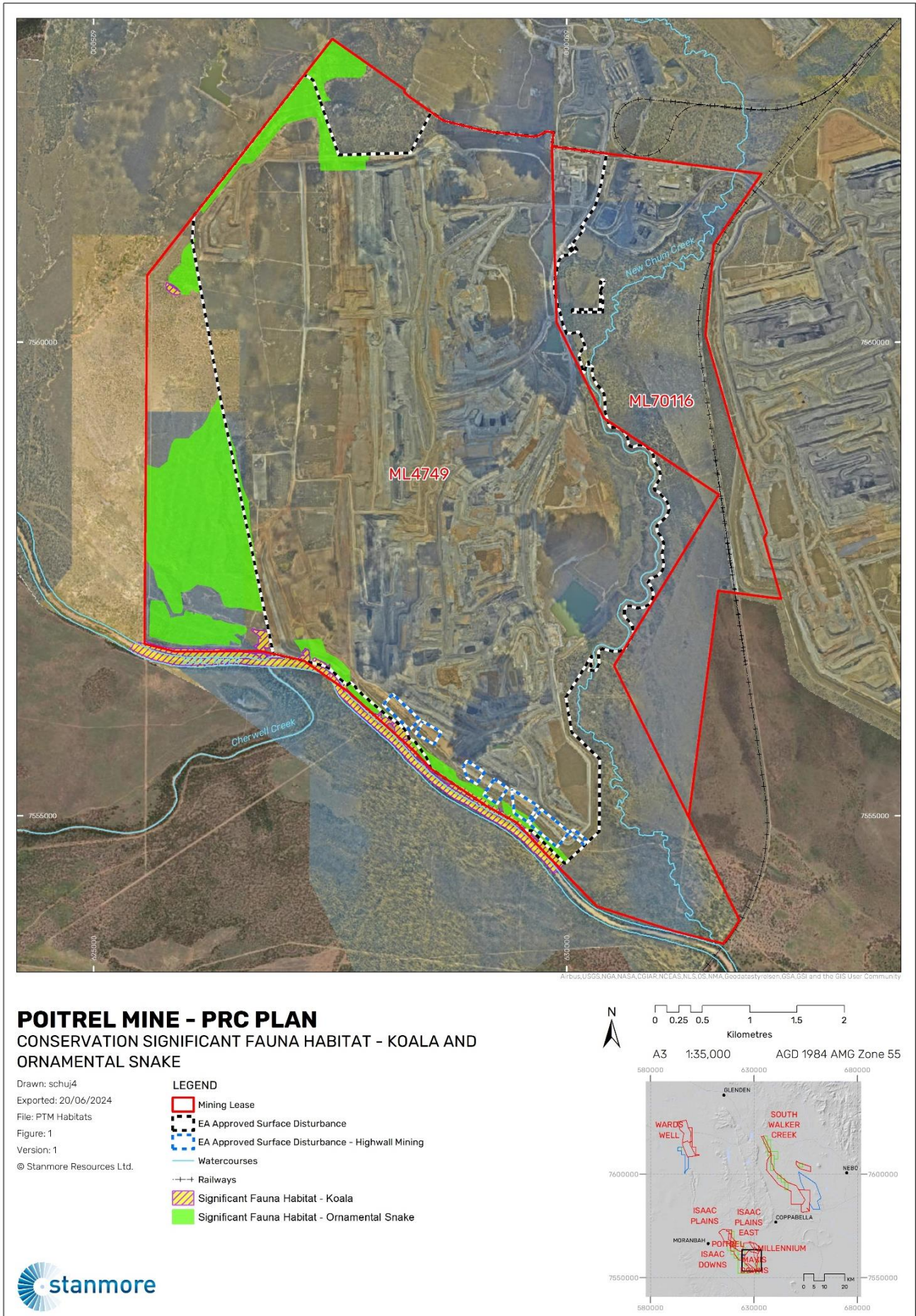


Figure 16 Koala and Ornamental Snake Habitat

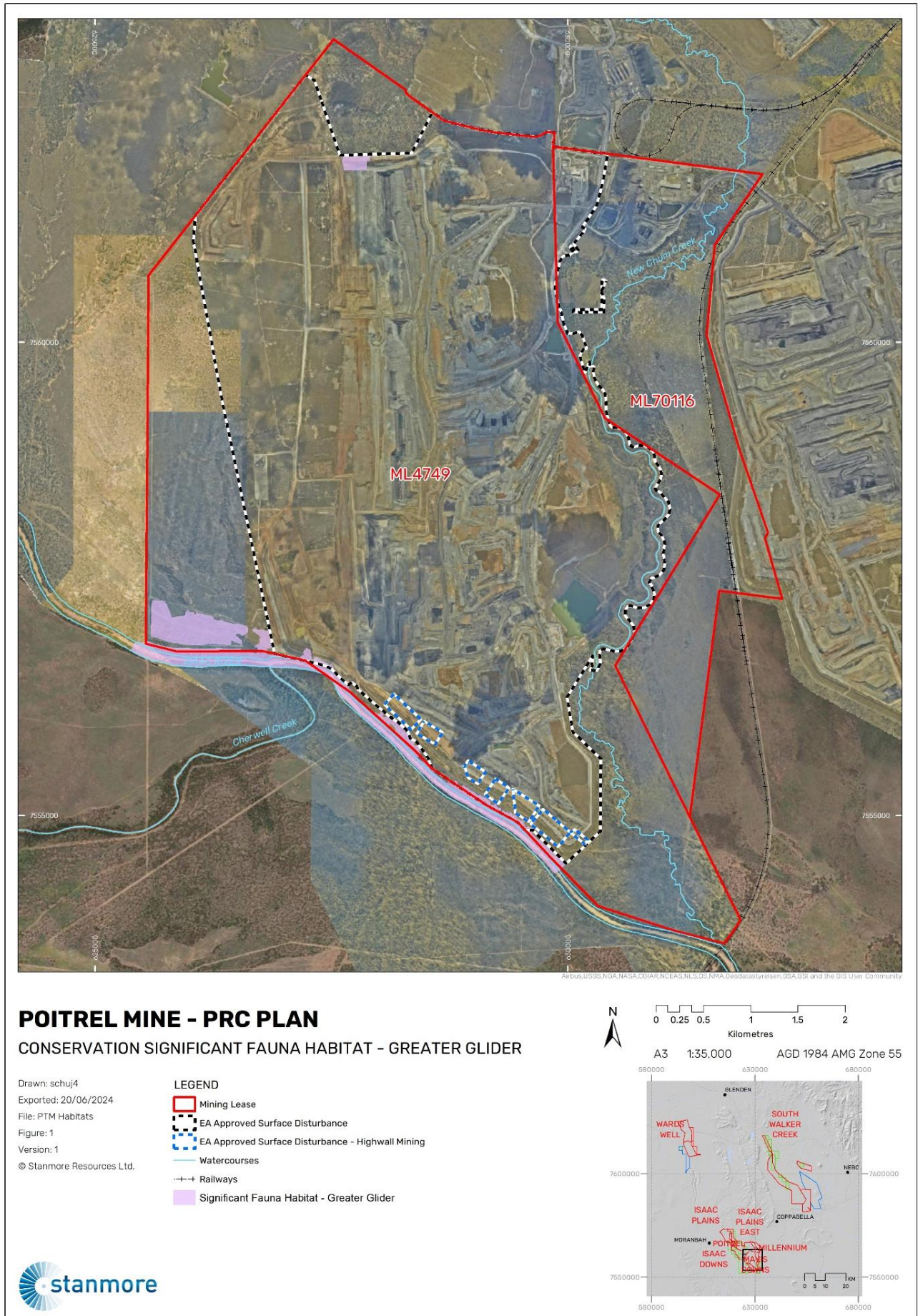


Figure 17 Greater Glider Habitat

3.1.2.9.1 Fauna Corridors and Connectivity

At a regional level the landscape is characterised by a mosaic of historically cleared land for pastoral uses and mining, natural grasslands, and native woodlands. Landscape connectivity in the region is predominantly provided by extant vegetation occurring along riparian corridors of waterway and river systems, providing wildlife movement opportunities.

No state or regional corridors have been mapped on PTM.

3.1.2.10 Pre-Mining Land Use

The land utilisation prior to mining operations primarily involved cattle grazing on both native and improved pastures (Figure 19). Adjacent land uses encompassed grazing, coal mining, and limited forestry activities. Presently, the neighbouring land uses comprise grazing, cropping, and continued coal mining activities (PTM EIS, 2005).

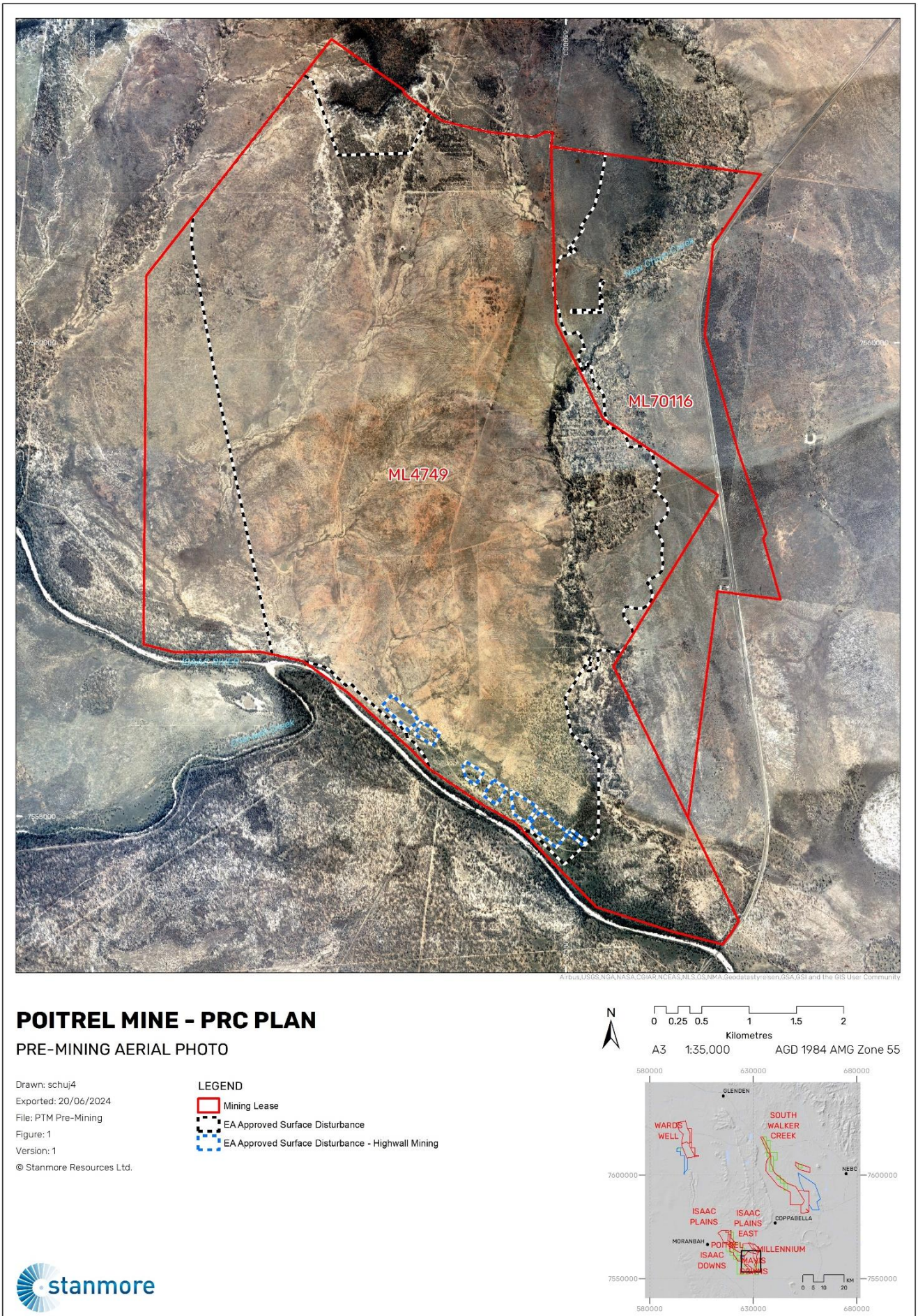


Figure 19 Pre-Mining Aerial Photo of PTM (2004 Imagery)

3.1.2.11 Underlying Landholders

B. Neilson holds the majority of land within the designated surface disturbance zone (refer to Figure 20).

Queensland Rail possesses the land and infrastructure pertaining to the train load-out and rail corridor.

A.G.H. Williams owns the land encompassing the Olive Downs area situated in the southern sections of ML 4749 and ML 70116. Other neighbouring landholders are also outlined in Figure 20.

3.1.3 Design for Closure

As this PRC Plan for PTM is subject to transitional PRC Plan provisions it is not required to demonstrate how aspects of the mine site have been designed for closure for existing or approved disturbance (PRC Plan Guideline, Section 3.1).

3.1.4 Rehabilitation and Improvement Planning

Legislative Requirement

In accordance with sections 126C(1)(b) and (c)(ii) of the EP Act, the rehabilitation planning part must include:

- identification of all relevant activities on the mine site
- the predicted duration of each of the relevant activities proposed for the mine site
- the size/extent of the relevant activities
- whether the different relevant activities can be progressively rehabilitated

PRC Plan Guideline (Section 3.1)

Under section 126C(1)(j) of the EP Act, transitional PRC plans must also include the following details about any existing rehabilitation already completed at the time of submission of the proposed PRC plan:

- a description of the rehabilitation works previously carried out
- when the rehabilitation works commenced and were completed
- whether the rehabilitation has been applied for or approved as progressively certified under the EP Act.

3.1.4.1 Relevant Activities Requiring Rehabilitation

The rehabilitation areas (RA) included in the PRC Plan Schedule for PTM are referred to throughout this PRC Plan.

A RA is defined in the PRC Plan Guideline (DES, 2023) as an area of land in the post-mine land use to which a rehabilitation milestone for the post-mining use relates.

The PTM RAs and their relevant activities at PTM that will require rehabilitation are provided in Table 19 along with their PMLUs, predicted duration (time from which RA was first disturbed to when it becomes available for the first rehabilitation milestone), area and availability for progressive rehabilitation. Progressive rehabilitation has been optimised in the PRC Plan Schedule within the constraints of the current mine plan operations. Any infrastructure that is beneficial to the PMLU on the proponent land tenure may be retained and will not be available for rehabilitation.

Of note, RA8 constitutes a riparian buffer on the northern side of the Isaac River, with a PMLU of woodland habitat. The riparian buffer supports the continued presence and return of fauna habitat.

All RAs are shown in Figure 21.

The areas on site that are undisturbed, including the three undisturbed exclusion areas, are not mapped with a RA (Refer also Section 3.1.1.3).

Table 19 Relevant Activities Requiring Rehabilitation at PTM and Associated PMLUs

Rehabilitation Area (RA)	PMLU	Relevant Activity	Predicted Duration	Size (ha)	Availability for Progressive Rehabilitation
RA1 Existing Rehabilitation	Cattle Grazing	Existing Rehabilitation	2010-2030	203	NA
RA2 Infrastructure for Decommissioning	Cattle Grazing	Mining Infrastructure Administration Workshop Roads, laydown, and general disturbance areas Water storages Topsoils stockpiles Exploration bores	2004-2040	203	Required for the life of the project. Depending on the location, will be available either at the end of mining, or final rehabilitation
RA3 Infrastructure to be Retained	Cattle Grazing	Dams and drains	2006-2040	42	Generally required for the life of the project. Depending on the location, will be available either at the end of mining, or final rehabilitation
RA4 Landform Embankment	Woodland Habitat	Embankment	2010-2025	36	Available for progressive rehabilitation as areas reach final position
RA5 WRD and Topsoil Dumps (Woodland)	Woodland Habitat	Waste rock dumps and topsoil dumps	2007-2035	569	Available for progressive rehabilitation as areas reach final position
RA6 WRD and Topsoil Dumps (Grazing)	Cattle Grazing	Waste rock dumps and topsoil dumps	2007-2030	1056	Available for progressive rehabilitation as areas reach final position
RA7 Permanent Watercourse	Watercourse	Existing Watercourse diversion	2006-2030	45	Existing diversion tracking towards rehabilitation milestones
RA8 Infrastructure for Decommissioning (Riparian Buffer)	Woodland Habitat	Riparian Buffer Zone Exploration bores	2010-2039	68	Required for the life of the project

Rehabilitation Area (RA)	PMLU	Relevant Activity	Predicted Duration	Size (ha)	Availability for Progressive Rehabilitation
RA 9 New Chum Creek Diversion Disturbance	Watercourse	Return section of watercourse diversion to a more natural state	2006-2025	3	Required for the life of the project

Figure 21 Schematic Illustration of PTMs Rehabilitation Areas – Reference Map

3.1.4.2 Rehabilitation Areas and Milestones

The rehabilitation milestones (RM) included in the PRC Plan Schedule for PTM are referred to throughout this PRC Plan. A RM is each significant event or step necessary to rehabilitate the land to a stable condition (section 112 of the EP Act).

The RMs are detailed in Table 20. As required by the PRC Plan Guideline, only PMLU areas where disturbance has occurred or will occur, are mapped as a RA. Areas that are undisturbed including exclusion areas are expected to remain undisturbed through the mine life and are therefore not mapped as a RA. To support ongoing operations, exploration and minor ancillary activities may be required in areas not mapped as a RA. Minor ancillary activities can occur without a PRC Plan amendment and may include roads, access tracks and culverts, fences, underground services, low-impact telecommunication facilities, electrical sub-stations and switch yards, transmission grid works and supply network works, storage depots, pipelines and pumps, groundwater bores, gas drainage bores, monitoring and investigation works and exploration activities. Disturbance must be rehabilitated in accordance with the provisions detailed in the Eligibility criteria and standard conditions for exploration and mineral development projects (DEHP, 2016) or its successor, with the exception that land must be rehabilitated to a stable condition and achieve the proposed PMLU.

Table 20 Rehabilitation Milestones for PTM

Rehabilitation Milestones (RM)	
RM1	Infrastructure decommissioning and removal
RM2	Identification and remediation of contaminated land
RM3	Landform establishment
RM4	Surface preparation
RM5	Revegetation
RM6	Achievement of stable condition
RM7	Achievement of cattle grazing PMLU
RM8	Achievement of woodland habitat PMLU
RM9	Achievement of watercourse PMLU

3.1.4.3 Improvement Areas and Milestones

The improvement areas (IA) and management milestones (MM) included in the PRC Plan Schedule for PTM are referred to throughout this PRC Plan (Table 21 and Table 22).

An IA is defined in the PRC Plan Guideline as, for a NUMA, an area of land in the NUMA to which a management milestone for the NUMA relates and a MM is each significant event or step necessary to achieve best practice management of the area and to minimise risks to the environment (section 112 of the EP Act).

There is one (1) residual void that will be retained as a NUMA. Relevant safety features of the NUMA are incorporated into the MMs (Section 3.4.3) and include:

- Safety bund is constructed, where required, at the geotechnical set-back distance.
- Fencing erected around perimeter of safety bund, where required.
- Warning signage placed along fence line, where required.

Refer to Section 3.4 for more information on the assessment of NUMAs for PTM.

Table 21 Improvement Areas (IAs) for PTM

Improvement Area (IA)	Non-Use Management Area (NUMA)	Relevant Activity	Area (ha)
IA1	No Use	Final Void	316

Table 22 Management Milestones for PTM

Management Milestone	
MM1	Achievement of structural stability
MM2	Achievement of surface requirements
MM3	Achievement of sufficient improvement

3.1.5 Existing Rehabilitation

PTM has commenced approximately 203.12ha of progressive rehabilitation between 2009 and 2024, categorised as approximately 4.8ha of established rehabilitation and 198.32ha of seeded rehabilitation. These areas have been seeded to achieve cattle grazing and woodland habitat PMLUs with the majority being cattle grazing. In addition to this, there is also existing rehabilitation related to the New Chum Creek diversion in which the riparian vegetation along the diversion is establishing and on a trajectory for relinquishment (Refer to Section 3.6.1).

A total of nine monitoring sites have historically been established and monitored (seven rehabilitation monitoring sites and two reference sites) at PTM which encompass initial and majoring monitoring events as per the site's rehabilitation monitoring plan (Section 3.8). This existing rehabilitation was completed between the years 2009 -2024 (Ecological, 2023).

3.1.5.1 Progressive Rehabilitation

No rehabilitation areas at PTM have been applied for progressive certification under the EP Act.

3.2 Community Consultation

Legislative Requirement

- In accordance with section 126C(1)(c)(iii) and (iv) of the EP Act, the rehabilitation planning part of the PRC Plan must include:
- details of the consultation undertaken by the applicant in developing the proposed PRC Plan, and
- details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.

PRC Plan Guideline (Section 3.5)

In developing the proposed PRC Plan, the community should at least be engaged on the plan for the mine, PMLUs or NUMAs, areas of disturbance, rehabilitation and management methods, progressive rehabilitation, and closure timeframes. Ongoing community consultation should continue throughout the stages of the mine life so that progressive rehabilitation and the socio-economic and environmental impacts related to mine closure can be discussed with the community.

Community consultation carried out through different processes (such as an EIS) may be used to address the requirements in section 126C(1)(c) of the EP Act. The details of this consultation must be provided in the rehabilitation planning part of the proposed PRC Plan).

Transitional PRC Plans are still required to meet the legislative requirements in section 126C(1)(c) of the EP Act. All proposed PRC Plans must contain a community consultation plan regardless of whether the site has an existing EA.

3.2.1 Community and Stakeholder and Engagement Plan

This Community and Stakeholder Engagement Plan (CSE Plan) provides an overview of community and stakeholder engagement activities for PTM as they relate to the PRC Plan, to help guide the organisation in its engagement approach. Following the recent acquisition of the BHP Mitsui Coal Pty Ltd (BMC) joint venture, the proponent has recognised an opportunity to formally revisit its stakeholder engagement approach to ensure it aligns with best practice, and to achieve both synergies and efficiencies across the organisation.

The purpose of this CSE Plan is to ensure the proponent's stakeholder engagement function supports the organisation in delivering on its vision:

To be a leading resources company in Australia, creating value to our stakeholders through sustainable development.

The CSE Plan is designed to tell a compelling benefits story for the proponent. The proponent is a facilitator of regional employment, economic growth, and future opportunities, while being a responsible steward of the environment. The proponent drives positive engagement with its critical stakeholders and the community, in relation to key operational, exploration, development and production milestones and projects. Critical stakeholder groups identified and discussed in this CSE Plan include Federal and State governments, industry groups and businesses, local community, and Traditional Owners of the land on which the proponent operates.

The CSE Plan provides a comprehensive overview of the environment in which communication and stakeholder engagement will occur, and includes:

- Identifying a clear and realistic goal and objectives that determine the proponent's position.
- Analysis of challenges to provide a thorough understanding of potential 'pain points', as well as strategies to help mitigate/manage potential risks/issues.
- Analysis of opportunities, including strategies to leverage those opportunities during stakeholder engagement.
- Identification of stakeholders classified according to their level of interest and influence in the proponent's operations.
- A strategic approach to engagement and tactical plan for implementation, including how and when communication and stakeholder engagement will be undertaken in relation to the proponent's operations and role in the community.

- Key messages to position the proponent among its stakeholders, ensuring alignment of communication activities across the organisation.

It is recommended this CSE Plan is reviewed and updated as required to reflect emerging issues and opportunities, and any changes to the proponent's or PTM's strategic priorities.

This CSE Plan is positioned as a site-specific Community and Stakeholder Engagement Plan, developed in line with local requirements and projects (e.g., Environmental Impact Assessment public consultation activities).

A corporate-level document for business-as-usual engagement has been developed and is currently being reviewed for incorporation into the proponent's newly developed Social Performance Strategy.

3.2.2 Consultation to Date

Engagement with affected landowners for PTM was undertaken to develop compensation, leasing and agistment agreements, based on the assumption that land disturbed for mining will be rehabilitated to be suitable for its previous use (grazing) after the proponent's use of the land has ceased. The proponent continues to engage with underlying and neighbouring landholders regularly on land management including lease/license issues; and on operational matters (such as air quality monitoring) as required.

The proponent (formerly BMC) also provided PRC Plan briefings to Isaac Regional Council (IRC) (December 2020, April 2021, and February 2024).

Consultation undertaken by the proponent (formerly BMC) as part of PRC Plan preparation for PTM included:

- A letter to IRC regarding the PTM PRC Plan, and an invitation for further discussion with Council about their involvement in PRC Plan consultations.
- Letters to two landowners whose properties are adjacent to PTM, one landowner whose property is not adjacent but accommodates the access road to PTM and two landholders who are affected by or adjacent to Daunia or Millenium Mines.
- A letter to utility owners/operators and the owners of overlapping tenures (gas exploration) within and adjacent to ML4749 and ML70116, including Aurizon, Queensland Rail, Powerlink, Ergon Energy and Arrow Energy.
- A letter to the owners of adjacent mining operations which include, Daunia Mine (Whitehaven Coal formerly BMA), and Peabody (Millenium Coal Pty Ltd) as owner of adjacent land.
- A letter to the Traditional Owners Group Barada Barna Aboriginal Corporation (BBAC) advising of the PRC Plan.
- Annual meetings with managers of Winchester Downs and PTM properties regarding rehabilitation progress and final landform plans. Routine discussions with the Winchester property manager regarding interactions with the project and environment teams.

3.2.3 Community Consultation Register

A community consultation register has been provided as part of the PRC Plan in compliance with section 126C(1)(c)(iii) of the EP Act and includes:

- Identification of each community member/stakeholder.
- Previous engagements with the community.
- Consultation date(s).
- Description of consultation type.
- Information provided to the community.
- Issues raised/discussed by the community.
- How issues have been considered.
- Decisions/outcomes of engagement.
- Commitments made by BMC ([which will](#) now [be delivered by](#) the proponent).

The stakeholders identified as part of this register are considered as having a genuine, demonstrable, and legitimate interest in PTM's ongoing rehabilitation and closure planning. Compensation agreements have been established and maintained with all landholders.

The community consultation register will be a live instrument for recording future consultation on PTM's PRC Plan. The community consultation register, and the community and stakeholder register are provided in Table 23 and Table 24, respectively.

Table 23 Community Consultation Register

Consultation Date	Community Member / Stakeholder	Consultation Type	Information Provided	Issues Raised by Community	How Issues Were Considered	Decisions and Outcomes	Commitments
Local Government							
December 2020	Isaac Regional Council (IRC)	Meeting	Planning Briefing – PRC Plan	No issues raised.	No issues raised.	Engagement for information purposes.	• Engagement for information purposes.
April 2021	Isaac Regional Council (IRC)	Meeting	Planning Briefing – PRC Plan	No issues raised.	No issues raised.	Engagement for information purposes.	• Engagement for information purposes.
February 2024	Isaac Regional Council (IRC)	Meeting	Planning Briefing – PRC Plan	No issues raised.	No issues raised.	Engagement for information purposes.	• Engagement for information purposes.
6 June 2024	Central Highlands Regional Council (CHRC)	Campaign Letter / Email	PRC Plan	No response to date.	No issues raised.	Engagement for information purposes.	• Annual updates the Progression of the PRC Plan.
Traditional Owner Group (BBAC)							
10 February 2023	Barada Barna Aboriginal Corporation (BBAC)	Incoming phone call	Query from BBAC regarding opportunities for participation in tender for rehabilitation work.	Contracting Activities; and Employment opportunities.	Continue to engage as required.	Continue to engage as required.	• Continue to engage as required.
4 June 2024	Barada Barna Aboriginal Corporation (BBAC)	Campaign Letter / Email	PRC Plan.	No response to date.	No issues raised to date.	Continue to engage as required.	• Annual updates the Progression of the PRC Plan.
Adjacent Landowners							
15 December 2022	Winchester Downs	Scheduled Interaction	Briefing for Winchester representatives regarding latest mine plan and PRC Plan.	No response to date.	Continue to engage as required.	Continue to engage as required.	• Compensation Agreement and Agistment License in place. • Annual updates the Progression of the PRC Plan.
16 March 2023	Winchester Downs	Scheduled Interaction	Site visit to inspect proposed fencing and amendments to the Agistment License; and Review of areas required for mining. Fencing standards. Water point options.	As per meeting agenda	Continue to engage as required.	Continue to engage as required.	• Compensation Agreement and Agistment License in place. • Regular interactions.
4 June 2024	Winchester Downs	Campaign Letter / Email	PRC Plan	No response to date.	Continue to engage as required.	Continue to engage as required.	• Compensation Agreement and Agistment License in place.
4 June 2024	Winchester Downs	Campaign Letter / Email	PRC Plan	No response to date.	Continue to engage as required.	Continue to engage as required.	• Annual updates the Progression of the PRC Plan.
23 October 2023	Olive Downs	Ad Hoc Interaction	PRC Plan; and Land Access - Access to dust monitoring equipment	-	-	Permission to access property provided.	• Continue to engage as required.
4 June 2024	Olive Downs	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	No rehabilitation/ closure commitments made.	• Annual updates the Progression of the PRC Plan.
Utility Owners							
4 June 2024	Aurizon	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	As per agreement	• Agreement in place. • Annual updates the Progression of the PRC Plan.
4 June 2024	Powerlink	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	As per agreement	• Agreement in place.

Consultation Date	Community Member / Stakeholder	Consultation Type	Information Provided	Issues Raised by Community	How Issues Were Considered	Decisions and Outcomes	Commitments
							Annual updates the Progression of the PRC Plan.
4 June 2024	Arrow Energy	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	As per agreement	- Agreement in place. - Annual updates the Progression of the PRC Plan.
4 June 2024	Ergon Energy	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	As per agreement	- Agreement in place. - Annual updates the Progression of the PRC Plan.
Adjacent Mining Operations / Other Tenure Holders							
4 June 2024	Daunia Mine – BHP (now Whitehaven Coal)	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	No rehabilitation/ closure commitments made.	Annual updates the Progression of the PRC Plan.
4 June 2024	Millenium Mine	Campaign Letter / Email	PRC Plan	No response to date.	Engagement for information purposes.	No rehabilitation/ closure commitments made.	Annual updates the Progression of the PRC Plan.

Table 24 Relevant Community and Stakeholder Register

Stakeholder	Details	Key Interests
State Government		
- DoR - DESI - Member for Burdekin - Office of the Minister for Environment, Great Barrier Reef, Science, and the Arts	The proponent conducts as-needed engagement with Ministers and Members of Parliament and will provide briefings on PRC Planning as part of regular engagements. DoR's Deputy Director- General Georesources and Director Native Title Services and Coal Hub have been kept informed on PRC Planning.	- Legislative compliance. - Resource development. - Employment opportunities. - Public interest. - Environmental management. - Economic transformation (towards post-mining). - Financial assurance. - Environmental risk management. - Future land use and landform.
Local Government		
Isaac Regional Council (IRC)	The proponent has a long established and cooperative relationship with IRC. The proponent and IRC meet at least six monthly. BMC/ the proponent previously had three recent briefings with Council regarding PRC Plan requirements (December 2020, April 2021, and February 2024).	- Local employment and business opportunities. - Stock routes. - Effects on Council services and infrastructure. - Environmental management. - Rehabilitation progress. - Post-mining landforms. - Management of closure impacts on employment and businesses. - Alignment of rehabilitation plans with local/regional planning goals. - Economic transformation (towards post-mining) and community sustainability.
Traditional Owner Groups		
Barada Barna Aboriginal Corporation (BBAC)	Barada Barna people were engaged in the management of Aboriginal cultural heritage through a Cultural Heritage Management Plan for PTM. Barada Barna people's native title determination including areas of land within the Isaac, Central Highlands and Mackay LGAs was determined by the Native Title	- Cultural heritage impacts. - Impacts on Native Title (e.g., within stock routes or associated with the Isaac River). - Post-mining land use and landform/landscape. - Future access to and ownership of land.

Stakeholder	Details	Key Interests
	Tribunal in June 2016. Barada Barna People are represented by BBAC. The proponent is in regular communication with BBAC.	- Environmental management/stewardship. - Employment and business opportunities in exploration, environmental management and monitoring, rehabilitation.
Adjacent and Underlying Affected Property Owners		
Adjacent and Underlying Affected Property Owners	There are two landowners whose properties are adjacent to PTM, and one landholder whose property is not adjacent but accommodates the access road to PTM, Daunia Mine and Millenium Mines. Mavis Downs is located to the east of PTM and Isaac Downs is located to the west. The access road to PTM is on a property called Wotonga. PTM has compensation agreements with two landowners whose properties are affected by mining. The two properties are Winchester Downs and Wotonga. The proponent has constructive working relationships with all underlying and adjacent landowners.	- Water access – underground and surface water allocations. - Environmental management/stewardship. - Post-mining land use and landform/landscape. - Rehabilitation schedule. - Future access to and ownership of land.
Utility Owners		
- Powerlink - Aurizon - Queensland Rail - Ergon Energy - Arrow Energy	Aurizon operates the TLO and rail loop which are owned by Queensland Rail and are located on land leased from the proponent. Powerlink owns overhead and underground power lines. The proponent engages with utility owners as required, i.e., issue-specific, or transactional engagement.	- Impact on assets/asset value. - Rehabilitation of impacts on assets. - Service disruptions and mitigations. - Crossing/interface agreements.
Other Key Stakeholders		
Adjacent Mine Managers and Key Stakeholders	PTM is adjacent to Daunia to the south-east and interact with infrastructure at the TLO and rail loop. PTM utilise the RMI CHPP and a shared ROM with Millenium Mine.	- Any impacts on the use of land within overlapping tenures. - Water access. - CHPP access. - TLO and rail loop access. - Stakeholder (including employee/contractor) perceptions about closure.
Adjacent and Overlapping Mining Tenures		
Adjacent Mining Tenures – Millenium and Daunia Mines	Millennium Coal Mine re-commenced utilisation of PTM's processing and train load-out facilities in September 2021. Whitehaven Coal hold tenements to the south and east of PTM. Whitehaven Coal recently acquired the Daunia mine from BHP. Pembroke Resources has rights to a rail corridor alongside the existing Norwich Park Branch Line.	- Access to RMI processing capacity. - TLO access. - Future land use and ownership. - Access to rail corridor land.
Overlapping Tenure Holders	Arrow Energy holds an Authority to Prospect which overlaps the PTM ML.	Future land use and tenure.
Interested Stakeholders		
The proponent Employees and Contractors	The proponent has operated PTM since 2022, using a predominately owner operated workforce that transferred over with the acquisition from BHP. The proponent communicates regularly with its personnel through various means. Information on PRC Planning and its relevance to PTM has been provided on-site by managers and through regular communications.	- Timing of closure. - Rehabilitation obligations. - Employment continuity and other employment opportunities. - Loss of employment/contracting opportunities at closure. - Closure planning in context with other mining industry changes e.g., autonomous haulage. - Workers' conditions. - Sustainability of communities that are dependent on mining.
Local Business		
Local Business	The proponent's procurement team have relationships with an extensive network of small business suppliers, including Indigenous businesses. As there is no likelihood of PTM's PRC Planning having a significant effect on businesses during the next ten (10)	- Opportunities to participate in supply chain (e.g., exploration, environmental management, rehabilitation). - Economic transformation (towards a post-mining landscape).

Stakeholder	Details	Key Interests
	years, business are considered interested rather than affected stakeholders at this point.	- Economic and community sustainability. - Loss of supply opportunities with closure.
Traditional Owner Groups and Businesses	There is potential to engage Traditional Owners and other Indigenous businesses in e.g., rehabilitation services as part of a broader portfolio-wide or business-wide program.	Opportunities to participate in environmental management or rehabilitation.
Community Members and Other Local Groups		
- Moranbah Community - Coppabella Community	The Moranbah Community is the closest to PTM and is located approximately 35km east south-east of PTM. The Coppabella Community is located approximately 25km west north-west of PTM. Community members and groups in Moranbah and throughout the Bowen Basin have been provided with information about the PRC Planning through Community Consultation processes.	- Local employment and business opportunities. - With closure, loss of jobs and supply opportunities. - Community and regional sustainability. - Environmental management.
Fitzroy Basin Association (FBA)	Participation in workshops and meetings.	- Impact on water resources: - Environmental impact. - Post mine land use.

3.2.4 Ongoing Consultation

3.2.4.1 Consultation Objectives, Engagement Type and Frequency

Table 25 identifies stakeholders and details the current proponent relationships and potential planning areas of interest. A dedicated Community Consultation Plan (CC Plan) has been compiled for PTM's PRC planning (Table 25). This plan documents the iterative consultation process to be followed to enable ongoing PRC Plan-related engagement with the relevant stakeholders.

Table 25 Identified Stakeholders and Details on Current Proponent Relationships and Potential PRC Plan Planning Areas of Interest

Stakeholder	Details	Key Interests
Traditional Owner Group		
Barada Barna Aboriginal Corporation (BBAC)	- Barada Barna people were engaged in the management of Aboriginal cultural heritage through a Cultural Heritage Management Plan for PTM to achieve its duty of care obligation under the <i>Aboriginal Cultural Heritage Act 2003</i>. - Barada Barna people's native title to areas of land within the Isaac, Central Highlands and Mackay LGAs was determined by the Native Title Tribunal in June 2016. - Barada Barna People are represented by BBAC. - The proponent is in regular communication and has as constructive working relationship with BBAC.	- Cultural heritage impacts. - Impacts on Native Title (e.g., within stock routes or other associated areas i.e., Cultural Heritage Exclusion Areas). - Post-mining land use and landform / landscape. - Future access to and ownership of land. - Environmental management / stewardship. - Employment and business opportunities in exploration, environmental management and monitoring, rehabilitation.
Adjacent Property Owners and Licence Agreement Holders		
Adjacent and Affected Property Owners	PTM has compensation agreements with two (2) property owners: - Wotonga – Access Road to PTM and RMI; and - Winchester Downs – ML4749 and ML70116.	- Water access – underground and surface water allocations. - Environmental management / stewardship. - Post-mining land use and landform/landscape. - Rehabilitation schedule. - Future access to and ownership of land.
Underlying and Adjacent Property Owners and Properties	Other properties located adjacent to PTM include: Olive Downs.	- Water access – groundwater and surface water allocations. - Environmental management / stewardship. - Post-mining land use and landform/landscape. - Rehabilitation schedule. - Future access to and ownership of land.
Utility Owners		
- Ergon Energy - Arrow Energy - Aurizon	Agreements are in place with the utility holders.	- Impact on assets / asset value. - Rehabilitation of impacts on assets. - Service disruptions and mitigations. - Crossing/interface agreements.
Adjacent and Overlapping Tenure Holders		

Stakeholder	Details	Key Interests
• Millenium Mine – Peabody Resources	Adjacent tenure and overlapping ML.	• Future land use and ownership. • Access to rail corridor land.
• Daunia Mine – Whitehaven Coal (formerly BHP)	Adjacent tenure.	• Future land use and ownership. • Access to rail corridor land.
• PCA 143 – CH4 Pty Ltd	Petroleum lease PCA143 overlaps ML4749.	• Future land use and tenure.
Interested Stakeholders		
The proponent Employees and Contractors	• The proponent communicates regularly with its personnel through various means. • Information on PRC Planning and its relevance to PTM has been provided on-site by managers and through regular communications.	• Job opportunities. • Loss of jobs with closure. • Closure planning in context with other mining industry changes e.g., autonomous haulage. • Workers' conditions. • Sustainability of communities that are dependent on mining.
Businesses	• The proponent's procurement team have relationships with an extensive network of small business suppliers, including Indigenous businesses. As there is no likelihood of PTM's PRC Planning having a significant effect on businesses during the next ten years, business is considered interested rather than affected stakeholders at this point. • There is potential to engage Traditional Owners and other Indigenous businesses in e.g., rehabilitation services as part of a broader portfolio-wide or business-wide program.	• Opportunities to participate in supply chain (e.g., exploration, environmental management, rehabilitation). • Economic transformation (towards a post-mining landscape). • Economic and community sustainability. • Loss of supply opportunities with closure.
Community Members and Groups	• The Moranbah and Coppabella communities are the closest communities to PTM. PTM is 20km southwest of Coppabella and approximately 25km southeast of Moranbah. • Community members and groups in Moranbah, Coppabella and throughout the Bowen Basin have been provided with information about PRC Planning through Community consultation processes.	• Local employment and business opportunities. • With closure, loss of jobs and supply opportunities. • Community and regional sustainability. • Environmental management.
State Government		

Stakeholder	Details	Key Interests
- DoR - DES - Office of the Minister for Environment, Great Barrier Reef, Science, and the Arts	- Conduct as-needed engagement with Ministers and Members of Parliament and will provide briefings on PRC Planning as part of regular engagements. DoR's Deputy Director- General Georesources; and - Director Native Title Services and Coal Hub have been kept informed on PRC Planning.	- Legislative compliance. - Resource development. - Employment opportunities. - Public interest. - Environmental management. - Economic transformation (towards post-mining). - Financial assurance. - Environmental risk management. - Future land use and landform.

Table 26 Community Consultation Plan

Consultation Objective	Engage Key Stakeholders in Identifying Community Objectives and Aspirations for Post-Mining Land Use and Landform, and Social Value Opportunities			
Community Member	Engagement Type	Proposed Consultation Frequency	Information to be Provided	How Feedback / Comments are Considered
Landowners, Traditional Owner Groups, and Agreement Holders Within and Adjacent to PTM				
Barada Barna People (BBAC)	Advise landowners, lessees, Traditional Owners, and IRC in writing when the PRC Plan is approved.	Once-off	Provide a copy of the approved PRC Plan for their information.	As per the Community and Stakeholder Engagement Plan.
Isaac Regional Council (IRC)	Meet with directly affected and adjacent landholders, BBAC and IRC to provide an update on the PRC Plan and progress with rehabilitation and invite their inputs and feedback for the following: - The approved PMLUs and post-mining landforms. - Any values or opportunities in specific disturbed areas. - Rehabilitation methods which would optimise future grazing opportunities, land management or water storage.	As requested, or as agreed with individual representatives / agencies.	Provide a copy of the approved PRC Plan for their information.	As per the Community and Stakeholder Engagement Plan.

Consultation Objective: Engage Key Stakeholders in Identifying Community Objectives and Aspirations for Post-Mining Land Use and Landform, and Social Value Opportunities				
Community Member	Engagement Type	Proposed Consultation Frequency	Information to be Provided	How Feedback / Comments are Considered
	- Shared value initiatives, e.g., infrastructure retention, capacity building, environmental management, research, or delivery partnerships. - Rehabilitation methods, schedule, and progress towards milestones.			
	Meetings with IRC: - Provide an update on the status of the PRC Plans and rehabilitation. - Forecast upcoming PRC Plan consultation for other proponent assets. - Seek to understand Council's strategic analysis and planning for Isaac LGA and the PTM area.	Bi-annually, or as agreed with IRC.	- Provide an update on the status of the PRC Plans and rehabilitation. - Forecast upcoming PRC Plan consultation for other proponent assets. - Seek to understand Council's strategic analysis and planning for Isaac LGA and the PTM project area.	As per the Community and Stakeholder Engagement Plan.
	Participate in Council, community or industry led initiatives which aim to harness social value from mine closure and rehabilitation planning, and/or work towards from economic transformation/transition.	As invited.	Community and Stakeholder Engagement Plan.	As per the Community and Stakeholder Engagement Plan.
	In cooperation with BBAC and other First Nations within Isaac LGA, and on a portfolio-wide basis: - Communicate the pipeline of opportunities relating to the rehabilitation work and land management. - Develop a shared understanding of business capabilities relevant to closure and rehabilitation works.	Once-off process.	Communicate the pipeline of opportunities relating to rehabilitation work and land management.	As per the Community and Stakeholder Engagement Plan.

Consultation Objective: Engage Key Stakeholders in Identifying Community Objectives and Aspirations for Post-Mining Land Use and Landform, and Social Value Opportunities				
Community Member	Engagement Type	Proposed Consultation Frequency	Information to be Provided	How Feedback / Comments are Considered
	Plan and implement an Indigenous business capability development program to match rehabilitation opportunities, if this is required.			
	PRC Plan-specific workshops or focus groups, seek the involvement of community members and groups in articulating community aspirations for rehabilitation, PMLUs and economic transformation.	Once-off, portfolio-wide process.		As per the Community and Stakeholder Engagement Plan.
Proponent Employees and Contractors	Keep the PTM workforce updated (via intranet news and Website, emails, and newsletters to personnel) if there are changes to the PRC Plan.	Ongoing engagement process.	- Project description. - Life of Mine (LOM) schedule. - Workplace transition.	As per the Community and Stakeholder Engagement Plan.
Moranbah and Coppabella Community Members and Groups	Using community forums such as interagency meetings, partnership meetings and community and business networks, provide community updates on PRC Planning (PTM-specific as relevant and portfolio wide).	Ongoing engagement process.	- Project description . - Life of Mine schedule. - Rehabilitation success. - How to provide feedback.	As per the Community and Stakeholder Engagement Plan.
Local Businesses and Proponent Suppliers	Provide information about the plan for closure of PTM and potential future supply opportunities as part of closure and rehabilitation.	Two (2) years prior to closure; subsequent consultation to be agreed.	- Project description. - Life of Mine schedule.	As per the Community and Stakeholder Engagement Plan.
Elected Representatives and Government Agencies	Provide updates via letters and/or meetings on PRC Planning to: - Office of the Minister for Resources (Queensland). - Office of the Minister for Environment, Great Barrier Reef, Science and Youth Affairs (Queensland).	As requested, or as agreed with individual representatives / agencies.	Project description. Life of Mine schedule. Existing rehabilitation tours. Rehabilitation success. Post-mining land uses.	As per the Community and Stakeholder Engagement Plan.

Consultation Objective: Engage Key Stakeholders in Identifying Community Objectives and Aspirations for Post-Mining Land Use and Landform, and Social Value Opportunities				
Community Member	Engagement Type	Proposed Consultation Frequency	Information to be Provided	How Feedback / Comments are Considered
	- Shadow Minister for Resources. - Shadow Minister for Environment, Great Barrier Reef, Science and Youth Affairs Resources. - Member for Burdekin (Queensland Parliament). - DES PRC Plan Team and Business Centre Coal. - Director, Native Title Services and Coal Hub, Department of Resources. - Deputy Director-General Georesources, Department of Resources. - Assistant Secretary Assessments and Governance Branch, DAWE.			
Adjacent Tenement Holders: Daunia Mine (Whitehaven Coal)	- Advise (letter) adjacent and overlapping tenement holders of any substantive changes to PTM's closure or rehabilitation schedule in future iterations of the PRC Plan. - At a business level, the proponent will participate in industry and research partnerships of relevance to PRC Planning and rehabilitation.	As requested, or as agreed with company representatives.	Project description. Life of Mine schedule.	As per the Community and Stakeholder Engagement Plan.
Overlapping Tenement Holders: Arrow Energy	Consult with overlapping tenement holders regarding their interests in areas of overlapping tenure within PTM.	As requested, or as agreed with company representatives.	Project description. Life of Mine schedule.	As per the Community and Stakeholder Engagement Plan.
Utility Owners: - Aurizon - Powerlink	Maintain correspondence with Queensland Rail and Aurizon regarding progressive rehabilitation activities.	As requested, or as agreed with individual representatives / agencies.	Project description. Life of Mine schedule.	As per the Community and Stakeholder Engagement Plan.

Consultation Objective				
Engage Key Stakeholders in Identifying Community Objectives and Aspirations for Post-Mining Land Use and Landform, and Social Value Opportunities				
Community Member	Engagement Type	Proposed Consultation Frequency	Information to be Provided	How Feedback / Comments are Considered
- Ergon Energy - Arrow Energy	Engagement regarding the decommissioning of the train load-out facility/rail interface.			

3.2.4.2 Community Consultation Information Sharing

Information to be released as part of ongoing community consultation will include:

- Rationale and scope for the PRC Plan and PRC Plan Schedule.
- Approved activities and PMLUs for PTM.
- On-site activities and areas of disturbance.
- Proposed rehabilitation methods, schedule, and milestones.
- Opportunities for community consultation as part of the PRC Plan's implementation.

Where required, communication tools could include:

- A holding statement for general enquiries.
- Frequently asked questions and answers (FAQs) and a PRC Planning fact sheet available to support consultation activities.
- Face-to-face and virtual meetings.

3.2.4.3 Addressing Feedback/Comments

As noted in the PRC Plan Guideline (DES, 2023), in addition to the annual return requirements that relate to the approved EA, if a PRC Plan applies to the activities, the annual return must also include an evaluation of the effectiveness of the PRC Plan, including the environmental management carried out under the PRC Plan Schedule, for the year to which the annual return relates.

The proponent will monitor and report on the progress and outcomes of progressive rehabilitation activities against rehabilitation milestones provided in the PRC Plan Schedule. This monitoring will aim to demonstrate a successful rehabilitation trajectory towards achievement of the approved PMLU, and/or to inform corrective action where required, which will be reported as part of annual returns.

Information about rehabilitation progress will also be delivered as part of the consultation methods detailed in and any feedback will be considered in subsequent updates of this PRC Plan.

The PRC Plan Community Consultation Register will also be updated as community consultation activities outlined are completed. Feedback recorded in the Community Consultation Register will be considered in framing and detailing future PRC Plan amendments for PTM.

3.3 Post-Mining Land Uses

PRC Plan Guideline (Section 3.2)

A PMLU is defined under section 112 of the EP Act as the purpose for which the land will be used after all relevant activities for the PRC Plan carried out on the land have ended. Relevant activity for a PRC Plan is defined in the EP Act as the relevant activities to be carried out on land the subject of the plan. It is not the intention of this definition to include third-party activities or assets that continue to exist once mining activities have ceased, such as third-party pipeline easements, power easements or overlapping tenures for other EAs.

The rehabilitation planning part of the PRC Plan must include a detailed description of the nominated PMLU(s) for the site. The description must include (where relevant), but is not limited to:

- a description of the use of the land.
- if applicable, the specific vegetation types (e.g., RE 13.2.9) or land suitability classification (e.g., Class 4).
- identification of any permanent or essential management infrastructure to be included as part of the PMLU.
- completion criteria for measuring whether the PMLU has been successfully achieved.

Where a PMLU has been previously addressed in a land outcome document and is able to be transitioned into the PRC Plan Schedule, the holder is not required to complete the information requirements under section 126C(1)(j) of the EP Act in this section for those PMLUs.

However, the legislative requirements under section 126C(1)(d) of the EP Act still apply. All PMLUs transitioned into the PRC Plan Schedule must still meet the requirements of a PMLU explained in this section, particularly that the PMLU can be rehabilitated to a stable condition.

Where PMLUs have not been pre-approved, the applicant must include all of the requirements stated in this section.

Legislative Requirement

In accordance with section 126C(1)(d) of the EP Act, the rehabilitation planning part of the PRC Plan must state the extent to which each post-mining land use for land identified in the PRC Plan schedule for the plan is consistent with:

1. the outcome of consultation with the community in developing the plan, and
2. any strategies or plans for the land of a local government, the State or the Commonwealth.

3.3.1 Nominated PMLUs

The PMLUs proposed in this PRC Plan are transitioned from the PTM EA (Table E1) are outlined below and displayed in Figure 22.

- Cattle grazing.
- Woodland habitat.
- Watercourse.

In addition to the adhering to transitional provisions, the proposed PMLUs have been assessed and deemed to be appropriate based on:

- Rehabilitation objectives that focus on achieving a safe, stable, non-polluting and sustainable post-mining land use.
- Rehabilitation and closure technical assessments and investigations which underpin this PRC Plan. These include closure landform design, existing and pre-existing vegetation, existing and pre-existing ecological values, pre-mining land uses and the outcomes of the rehabilitation and closure studies supporting this PRC Plan.

As noted above, where a PMLU has been previously addressed in a LOD and is able to be transitioned into the PRC Plan Schedule, the proponent is not required to complete the information requirements under section 126C(1)(j) of the EP Act in this section for those PMLUs.

3.3.1.1 Cattle Grazing

The PMLU of grazing will be supported by retained water management structures which will provide safe access to water for livestock or other water management purposes. Any unnecessary water management structures or infrastructure not consistent with the grazing PMLU will be decommissioned and rehabilitated according to the proposed PRC Plan Schedule. Infrastructure will be retained for beneficial re-use where consistent with the PMLU and has been assigned a rehabilitation area (RA3).

The EA objectives, indicators, and acceptance criteria for cattle grazing PMLU are listed in Table 27.

The EA acceptance criteria have been transitioned to the milestone criteria. Modifications of the criteria have been undertaken to ensure they meet the SMART criteria. These criteria presented in the PRC Plan Schedule for the final milestone of achieving a safe, stable, non-polluting, and sustainable post mining land use.

As noted above, as the grazing PMLU has been previously addressed in a LOD (EA) and is able to be transitioned into the PRC Plan Schedule, the proponent is not required to complete the information requirements under section 126C(1)(j) of the EP Act in this section for the grazing PMLU.

Table 27 PTM EA Post Mine Land Use Objectives, Indicators and Acceptance Criteria – Cattle Grazing

Goal	Objective	Indicator	Approved Acceptance Criteria
Safe to humans and wildlife	Safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use	Hazard assessment	No significant difference
Stable	Rehabilitation is geotechnically stable	Factor of safety	≥1.5
	Rehabilitation is erosionally stable	Extent, slope gradient and groundcover	1. Groundcover >50% 2. 70% of slopes ≤20%
Non-polluting	Rainfall runoff from rehabilitation achieves relevant water quality objectives for receiving waters	pH EC Turbidity	Not significantly different to upstream values
	Deep drainage from rehabilitation achieves relevant water quality objectives for groundwater	EC	Not significantly different to: (a) the EPP (Water) schedule documents water quality objectives for relevant groundwater chemistry zones; or, (b) local water quality objectives developed in accordance with the Queensland Water Quality Guidelines.
Able to sustain an agreed post mining land use	Rehabilitation is suitable for sustainable cattle grazing	Land suitability assessment for cattle grazing	Land suitability class ≤3 or not different from pre-mining class if ≥4. Assessment completed in accordance with <i>LSA Framework for Open-Cut Coal Mine Rehabilitation 2018 (A rule-set for land suitability assessment of sustainable beef cattle grazing on land rehabilitated after open-cut coal mining in the Bowen</i>

Goal	Objective	Indicator	Approved Acceptance Criteria
			<i>Basin Queensland</i>) unless otherwise agreed in writing between the administering authority and the environmental authority holder.
		Leucaena stem density	<250 stems 2m height per ha (1 per 40m ²), mean total area

3.3.1.2 Woodland Habitat

Revegetation activities for the woodland habitat PMLU will focus on the establishment of groundcover to facilitate stability and topsoil retention and shrub and tree cover to enable the return of fauna habitat. Native seed mixtures will contain a variety of perennial grass, shrub, and tree species introduced by direct seeding to establish a self-sustaining woodland ecosystem.

Current EA objectives, indicators, and acceptance criteria for the PMLU of woodland habitat are listed in Table 28.

As noted above, as the woodland habitat PMLU has been previously addressed in a LOD (EA) and is able to be transitioned into the PRC Plan Schedule, the proponent is not required to complete the information requirements under section 126C(1)(j) of the EP Act in this section for the woodland habitat PMLU.

Table 28 PTM EA Post Mine Land Use Objectives, Indicators and Acceptance Criteria – Woodland Habitat

Goal	Objective	Indicator	Approved Acceptance Criteria
Safe to humans and wildlife	Safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use	Hazard assessment	No significant difference
Stable	Rehabilitation is geotechnically stable	Factor of safety	≥1.5 unless an alternative is justified by an appropriately qualified person
	Rehabilitation is erosionally stable	Groundcover (steep slopes, >15%)	80%
		Groundcover (lesser slopes, ≤15%)	50%
Non-polluting	Rainfall runoff from rehabilitation achieves relevant water quality objectives for receiving waters	pH EC Turbidity	Not significantly different to upstream values
	Deep drainage from rehabilitation achieves relevant water quality objectives for groundwater	EC	Not significantly different to: (a) the EPP (Water) schedule documents water quality objectives for relevant groundwater chemistry zones; or, (b) local water quality objectives developed in accordance with the Queensland Water Quality Guidelines.

Goal	Objective	Indicator	Approved Acceptance Criteria
Able to sustain an agreed post mining land use		Species richness:	
		• Trees	• ≥ 2
		• Shrubs	• ≥ 3
		• Grasses	• ≥ 4
		Tree canopy cover	$\geq 16\%$

3.3.1.3 Watercourse

A watercourse is defined under the Water Act 2000 as “...a river, creek or other stream, including a stream in the form of an anabranch or a tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events, in a natural channel, whether artificially modified or not; or in an artificial channel that has changed the course of the stream”.

A waterway as defined under the Fisheries Act 1994 includes a “river, creek, stream, watercourse, or inlet of the sea. This definition includes freshwater and tidal waters, both permanent and ephemeral waterways, and includes drainage features.”

The EA objectives, indicators, and acceptance criteria for a PMLU of watercourse are listed in Table 29. These criteria have been developed for rehabilitated creek diversions. The EA acceptance criteria have been transitioned to the milestone criteria in the PRC Plan Schedule for the final milestone of achieving the post-mining land use to a stable condition.

As noted above, as the watercourse PMLU has been previously addressed in a LOD (EA) and is able to be transitioned into the PRC Plan Schedule, the proponent is not required to complete the information requirements under section 126C(1)(j) of the EP Act in this section for the watercourse PMLU.

Table 29 PTM EA Post Mine Land Use Objectives, Indicators and Acceptance Criteria – Watercourse

Goal	Objective	Indicator	Approved Acceptance Criteria
Safe to humans and wildlife	Safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use	Hazard assessment	No significant difference
Stable	Rehabilitation is geotechnically stable	Geomorphic index (IDC method)	Greater or equal to upstream or downstream values.
Non-polluting	Rainfall runoff from rehabilitation achieves relevant water quality objectives for receiving waters	pH EC Turbidity	Not significantly different to upstream values
Able to sustain an agreed post mining land use	Riparian vegetation	Riparian vegetation index (IDC method)	Greater or equal to upstream or downstream values.

3.3.2 Rehabilitation Milestones

The proposed rehabilitation milestones and milestone criteria are provided in Table 30. Within this table, the source of the milestone criteria has also been provided to show evidence of which milestone criteria has been transitioned from the existing LOD. SMART principles have been applied where possible, with consideration given to the following parameters:

- Milestone criteria has been transitioned from the LOD.
- Milestone criteria development has considered understanding of best practice.

Table 30 Milestone Criteria

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
RM1	Infrastructure decommissioning and removal	a. Services with no beneficial PMLU re-use are disconnected and decommissioned. b. All buildings with no beneficial PMLU re-use are demolished and removed. c. All mine roads and access tracks with no beneficial PMLU are removed. d. All pipelines with no beneficial PMLU, are drained, and removed. e. All waste removed from site. f. Mine water dams with no beneficial PMLU are decommissioned. g. All exploration drill holes have been rehabilitated in accordance with the eligibility criteria and standard conditions for exploration and mineral development projects – V2 (DEHP, 2016).	Bespoke milestone criteria to ensure: 1. Land available for rehabilitation to safe, stable outcome. 2. Waste removal from site to ensure land achieves safe, stable, non-polluting state. 3. Best practice 4. Achieves SMART principals. 5. Best practice and consistent with standard conditions outlined in current version of the eligibility criteria and standard conditions for exploration and mineral development projects – V2 (DEHP, 2016)
RM2	Identification and remediation of contaminated land	a. Contaminated land investigation completed by a suitability qualified person (SQP)¹ in accordance with the Environmental Protection Act (1994) including: – I. Contaminated and hazardous material either remediated in-situ or removed/transported to an approved landfill for disposal and waste tracking information recorded and submitted. – II. Validation testing confirms that contaminated and hazardous materials have been removed or remediated successfully. – III. Contaminated land assessment indicates that no contamination unsuitable for the post-mining land use remains or is occurring. – IV. If required, a site investigation report including a site suitability statement must be prepared and submitted in accordance with the provisions of Chapter 7, Part 8 of the EP Act.	Bespoke milestone criteria to ensure: 1. Investigation and remediation of potentially contaminated land ensure safe, stable, non-polluting state is achieved 2. Achieves SMART principles 3. References EP Act (1994) 4. Best practice

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		– V. A Site suitability statement from a SQP confirms the uses or activities for which the land is suitable, aligns to the approved PMLUs for the site. ¹ <i>Suitability qualified person (SQP): for performing a regulatory function under chapter 7, part 8 (Contaminated Land) of the EP Act or another function prescribed under a regulation, means a person who—</i> <i>(a) has qualifications and experience relevant to performing the function; and</i> <i>(b) if a regulation prescribes an organisation for this paragraph—is a member of the organisation</i>	
RM3	Landform establishment	All rehabilitation areas - Engineering and design plans including drainage are developed by an AQP and finalised - Bulk earthworks to achieve required landform and slopes are complete. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. Cattle grazing (RA2, RA3, RA6) - Landforms reshaped with maximum 15% slope - Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5. - Retained dams are safe for stock access and have vegetated bank Woodland Habitat PMLU (RA4, RA5, RA8) - Landforms reshaped with maximum 25% slopes - Areas >15% to be assessed by an AQP as being stable long term, with rock mulch applied as required	All rehabilitated areas - Considered best practice - Considered best practice - Considered best practice Cattle grazing (RA2, RA3, RA6) Note: EA requirement of 70% slopes <20% removed to achieve best practice and sustainable land use - Transitioned from Table E1 of EPML00963013 - Transitioned from Table E1 of EPML00963013 - Considered best practice Woodland Habitat PMLU (RA4, RA5, RA8) - Consistent with the objective of Table E1 of EPML00963013 to achieve stable and sustainable woodland habitat PMLU - Considered best practice and consistent with the objective of Table E1 of EPML00963013 to achieve stable and sustainable woodland habitat PMLU.

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		i. Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5 unless an alternative is justified by an AQP j. Rock mulch thickness placed as required based on final slope and iterative waste rock characterisation and erosion assessments Watercourse (RA9) k. Updated hydraulic flood modelling using drainage designs l. Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use.	9. Considered best practice and therefore transitioned from Table E1 of EPML00963013 10. Proposed to ensure erosional stability of landform and successful establishment of woodland habitat vegetation. Best practice and consistent with DESI ERC Guideline ESR/2018/4425 Watercourse (RA7) 11. Considered best practice 12. Transitioned from Table E1 of EPML00963013
RM4	Surface preparation	a. Growth medium placed at a minimum depth of 100mm b. An assessment of growth media characteristics is completed by an AQP that identifies amelioration and other treatments required to achieve the following primary growth media quality targets^: c. Growth medium to meet the following suitability targets: Cation exchange capacity of above 14meq/100g for clays and 6meq/100g for loams. Major macronutrient concentrations in root zone (0–0.3m): Total nitrogen (N) above 1000 mg/kg. Available phosphorus (P) above 10 mg/kg. Potassium (K) above 160 mg/kg. Total organic carbon (TOC) above 1%. pHw range of soil is between 6.0–9.0 to at least 0.3m. Primary growth media (0–0.3m) salinity (EC1:5) is less than 0.75dS/m.	Considered SMART, proactive and best practice. Criteria has been informed by cover and revegetation assessments for PTM.

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		d. Rip along contour	
		<i>^Primary growth media quality targets: criteria provided as a post-ameliorant target. Initial soil analysis values may be outside of these ranges; however they must be achieved where that is a requirement of this PRC Plan Schedule.</i>	
RM5	Revegetation	Cattle Grazing (RA2, RA3, RA6) a. Complete seeding in accordance with target species of 3P (perennial, palatable and productive) and rate as per the PRC Plan Schedule Appendix 1: Grazing species and seeding rate. b. Primary growth media quality targets listed in RM4(c) are achieved based on a number of representative samples as determined by AQP Woodland Habitat (RA4, RA5) c. Completed seeding using a selection of species outlined in PRC Plan Schedule Appendix 2: Recommended species to be established for woodland habitat at RA4 and RA5 d. Completed seeding as per recommended sowing rates for individual species where possible and total recommended seeding rates for dominant tree species (5kg/ha), mid-storey species (5kg/ha), and groundcover species (5kg/ha). e. Primary growth media quality targets listed in RM4(c) are achieved based on a number of representative samples as determined by AQP Woodland Habitat (RA8) f. Complete seeding using a selection of species and sowing rates outlined in PRC Plan Schedule Appendix 3: Recommended species and sowing rates to be established for woodland habitat at RA8	Cattle Grazing 1. Productive and sustainable grazing PMLU. Woodland Habitat 2. Woodland habitat species have been selected on that basis that they are known to occur within the PTM region and are typically located on hilly, rocky terrain and/or substrates with poorer soils. The target RE for RA4, RA5 and RA8 is 11.10.1 and BVG is 10a. 3. Ensures successful rehabilitation to a sustainable ecosystem that has habitat values. Watercourse 4. Watercourse riparian (woodland habitat) species selection based on pre-mining flora and subsequent ecological surveys undertaken at PTM. The target RE for RA9 is 11.3.25 and BVG is 16a 5. Ensures successful rehabilitation to a sustainable ecosystem that has habitat values and is generally consistent with REs surrounding RA9. 6. Re-instates landscape connectivity in the area primarily relies on existing vegetation along riparian corridors of waterways and river systems.

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		g. Completed seeding as per recommended sowing rates for individual species where possible and total recommended seeding rates as established in PRC Plan Schedule Appendix 3 h. Primary growth media quality targets listed in RM4(c) are achieved based on a number of representative samples as determined by AQP Watercourse (RA9) i. Completed seeding using a selection of species outlined in PRC Plan Schedule Appendix 4: Recommended species to be established for watercourse at RA9 j. Completed seeding as per recommended sowing rates for individual species where possible and total recommended seeding rates for upper bank (5kg/ha), mid bank (5kg/ha), and lower bank (5kg/ha) k. Primary growth media quality targets listed in RM4(c) are achieved based on a number of representative samples as determined by AQP.	
RM6	Achievement of stable condition	a. Final landform for RA1, RA2, RA3, RA6 has achieved a geotechnically stable condition with minimum ≥ 1.5 factor of safety and slopes $\leq 15\%$ b. Final landform for RA4, RA5, RA8 has achieved a geotechnically stable condition with minimum ≥ 1.5 factor of safety unless an alternative is justified by an AQP and slopes $\leq 25\%$ c. Evidence that erosion for RA1, RA2, RA3, RA4, RA5, RA6 and RA8 is classified as 'minor' 'moderate' or 'severe' as defined by Appendix 7: Erosion classification framework. d. Assessment report completed by an AQP certifying that the diversion (RA7 and RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for	Transitioned from Table E1 of EPML00963013 with modifications to ensure safe, stable and non-polluting landform Stable (a-e) 1. Considered best practice, SMART and consistent with the intent of Table E1 of EPML00963013 to achieve stable landform Non-polluting (c-j) 2. Considered best practice, SMART and consistent with the intent of Table E1 of EPML00963013 to achieve an erosional stable and non-polluting landform

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition.	3. Erosion classification framework justified as the cover design implemented through application of the Permian layer underlying the growth medium layer is sufficient to mitigate long-term erosion risk.
	e.	Geomorphic index (IDC method) used to verify that Rehabilitation for RA7 and RA9 is erosionally stable with scores greater or equal to upstream or downstream values (IDC method)	4. Not significantly different to upstream values and modified to align with SMART Principles
	f.	Receiving water quality must be monitored at the locations specified in the Appendix 8: Receiving Water Upstream Background Sites and Downstream Monitoring Points for a period of at least three (3) years.	5. For rehabilitation monitoring of groundwater quality in Table E1 of EPML00963013 it currently specifies:
	g.	Surface water quality monitoring required by RM7(f) must be monitored for the following parameters. pH EC turbidity As Mb Se total recoverable hydrocarbons (C6–C9) total recoverable hydrocarbons (C10–C36)	EC not significantly different to: The EPP (Water and Wetland Biodiversity) schedule documents water quality objectives for relevant groundwater chemistry zones, or Local water quality objectives developed in accordance with the Queensland Water Quality Guidelines
	h.	The downstream receiving water quality monitoring points (MP2 and MP3) must not be significantly higher (>15%) when compared to the upstream value at MP4 and MP5 for the water quality parameters specified in RM6(g)	6. In order to comply with SMART principles the above acceptance criteria has been modified.
	i.	Groundwater bores specified in Table I2 in EPML00963013 must be monitored for quality and levels at the location specified in Appendix 9: Ground water monitoring points for a period of at least three years with monitoring intervals ≥ 4 weeks and ≤ 16 weeks.	Safe (all) 7. Considered best practice, SMART and consistent with the intent of Table E1 of EPML00963013 to achieve a safe landform including to ensure water quality in retained water infrastructure meets Australian stock drinking water standards.

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		j. Ground water quality results for compliance bores must remain within the 95th percentile of the site-specific limits detailed in Table I2 of EPML00963013 for a minimum of 36 samples taken at intervals specified in RM6(i). k. Groundwater levels for compliance bores specified in Table I1 EPML00963013 must not exceed a drawdown $\geq 2\text{m}$ from the baseline RL level. l. Water quality in retained dams must not exceed the trigger values for livestock drinking water defined in ANZECC & ARMCANZ 2000	
RM7	Achievement of cattle grazing PMLU	a. Certification by an AQP that pasture meets pasture condition rating ≤ 3, based on the Pasture Condition Assessment Table as per “Stocktake: Balancing Supply and Demand” (Developed by FutureBeef – futurebeef.com.au), as provided in PRC Plan Schedule Appendix 5: Pasture condition assessment, including: 1. Preferred pasture species (3P grasses^)^ diversity ≥ 2 species 2. Preferred pasture (3P) % DM yield $\geq 10\%$ 3. Annual grass DM yield % $< 70\%$ 4. Grasses other than 3P grasses and other weeds % DM yield $< 80\%$ 5. Crown cover (3P grasses) – at worst, moderate to low density and some plants dead b. Leucaena stem density < 250 stems $> 2\text{m}$ per ha (1 per 40m^2) c. Certification from an AQP that rehabilitation is resilient to fire and grazing pressures.	Transitioned from Table E1 of EPML00963013 with modifications to ensure productive and sustainable land use. The resulting milestone criteria are considered best practice and aligned to industry standards.

Milestone Reference	Rehabilitation Milestone	Transitioned and Proposed PMLU Milestone Criteria	Justification for Transition and Proposed PMLU Milestone Criteria
		d. Land suitability class ≤ 3 or not different from pre-mining if $\geq 4^{\wedge}$ $^{\wedge}$Assessment completed in accordance with LSA Framework for Open-Cut Coal Mine Rehabilitation 2018 (A ruleset for land suitability assessment of sustainable beef cattle grazing on land rehabilitated after open-cut coal mining in the Bowen Basin Queensland) unless otherwise agreed in writing between the administering authority and the environmental authority holder.	
RM8	Achievement of woodland habitat PMLU	a. A BioCondition assessment at RA4, RA5 and RA8 and is completed by an AQP using the methodology outlined in the latest version of the Queensland Herbarium's BioCondition Assessment Manual. b. The BioCondition assessment required by RM8(a) at RA5 and RA6 demonstrates achievement of the PRC Plan Benchmark for each assessable attribute for the relevant regional ecosystem as per PRC Plan Schedule Appendix 6: Representative RE benchmark criteria for woodland habitat rehabilitation at RA4 and RA5 c. The BioCondition assessment required by RM8(a) at RA8 demonstrates achievement of the PRC Plan benchmark for each assessable attribute for the relevant regional ecosystem as per PRC Plan Schedule Appendix 6: Representative RE benchmark criteria for woodland habitat rehabilitation at RA8	Transitioned from Table E1 of EPML00963013 with modifications to ensure sustainable land use Incorporation of BioCondition framework is considered best practice and ensures a woodland habitat with sustainable ecological values.
RM9	Achievement of watercourse PMLU	a. Riparian vegetation condition is greater or equal to upstream or downstream values using Riparian Vegetation Index (IDC method)	Transitioned from Table E1 of EPML00963013

3.3.2.1 Rehabilitation Milestone Timeframes

Progressive rehabilitation will continue throughout the life of the mine as soon as practicable after land becomes available. The term 'mined' in this case refers to the meaning under section 6A of the Mineral Resources Act 1989, which refers to mining of a probable or proved ore reserve. Disturbed land is available for rehabilitation (as per section 126D (5) of the EP Act) if the land is not being mined, unless:

- The land is being used for operating infrastructure or machinery for mining.
- The land contains a proved or probable ore reserve that is to be mined within 10 years after the land would otherwise have become available for rehabilitation.
- The land is being used to access active mining areas or proved or probable ore reserves, i.e., haul and pit roads, active mine face access.
- The land contains infrastructure to be handed over to a third-party post mining.

At PTM, there are site specific factors that influence when land is available for rehabilitation including:

- Coal market drivers have major implications for areas of the mine becoming available for rehabilitation due to the need to keep multiple pits 'open' for extended periods of time to provide variable grades of ore to blend to meet customer specifications. For this purpose, and with consideration to the EP Act definition provided above, evidence and experience shows that mine areas typically become available for rehabilitation within 5 years of clearing.
- As recognised in the EP Act definition above, there is a standing requirement to maintain roads accessing mining areas and active mine face offsets in mining areas. For this reason, these areas remain unavailable for rehabilitation until the end of end of mine life to accommodate such operational requirements.

An array of additional infrastructure is required to support mining operations, including communication networks, water, sewage and electrical services, fuel storage, mechanical workshops and more. Following cessation of mining, the schedule for decommissioning, demolition and/or removal of these facilities is unlikely to commence immediately and is dependent on a range of factors:

- The desire for third party land use partners to retain or reuse some assets.
- Many facilities will be required to support closure operations while the mining areas are subject to rehabilitation activities (e.g., requiring fleet) which may take upward of 5-10 years to complete rehabilitation execution works for whole mine areas.

For PRC Plan scheduling purposes, a general allowance of 10 years is provided for most infrastructure to be available for rehabilitation. Naturally, given the opportunity, areas no longer required to support closure activities will be rehabilitated.

In addition to this, there is a subset of buildings and other infrastructure which will not be decommissioned or rehabilitated (therefore not made available for 'rehabilitation'), but rather have potential to be utilised for:

- Post-closure maintenance and monitoring activities; and/or
- Post-closure community benefit and are thus assumed to be made safe and transitioned in a condition agreed with relevant third party(s).

Timeframes associated with the milestones for each RA were developed by considering the requirements of each rehabilitation activity outlined in previous sections and the associated risks identified through the risk assessment (Refer to Section 3.7). The nominated timeframes and respective justifications are detailed in Table 31. These timeframes have been used to develop the milestone schedule in the PRC Plan Schedule.

Table 31 Timeframe Justification for Rehabilitation Milestones

Rehabilitation Milestone	Nominated Timeframe	Justification
RM1 - Infrastructure decommissioning and removal	5 years	A five year timeframe is considered appropriate to ensure that all relevant decommissioning and demolition works can be undertaken safely, considering that there are very few specialist demolition service providers in the market and factoring in the forecasted high demand for demolition services in the next few decades. Given the significant size of the coal processing and load out facilities, make safe activities prior to decommissioning, include de-energisation, structural integrity assessments and HAZMAT investigations, take considerable time given inherent safety risks associated with demolition.
RM2 - Identification and remediation of contaminated land	5 years	A five-year timeframe is considered appropriate to investigate and remediate contamination. This timeframe accounts for the investigation, potential remediation works (typically involving excavators and trucks), engagement of SQPs and site auditor in line with EP Act requirements. Soil remediation projects typically extent for multiple years owing to the iterative nature of confirming that residual contamination meets the intended land use EILs/HILs through validation sampling.
RM3 - Landform establishment	5 years	Five years is justified as a sufficient time to complete this milestone considering that this milestone requires bulk earthworks across domains that are considerably large, factoring in that iterative works may be required to confirm that the landform is behaving as per the design intent and to reduce potential impacts associated with seasonal rainfall.
RM4 – Surface preparation	2 years	As this milestone requires verification from an AQP that growth medium is suitable to sustain vegetation, a 2 year timeframe is considered appropriate to account for investigations and development of appropriate amelioration strategies that require trials over multiple seasons.
RM5 - Revegetation	3 years	To account for further investigations to ensure the vegetation mix can be sustained and factoring in that optimal seed growing seasons may not occur during the nominated period that revegetation is planned, 3 years is deemed appropriate. This nominated timeframe is also justified on the basis of reducing risks associated with seed supply chain issues, that are known to naturally occur (i.e., and late/early seeding and unavailability of seed species to meet the required seed mix).
RM6 - Achievement of stable condition	10 years	Achievement of stable condition relies on extensive monitoring by AQPs that the planning rehabilitation measures are on the trajectory towards successfully sustaining the nominated PMLU. This requires extensive monitoring over large domains whereby frequent sampling is required to be undertaken and in some instances rehabilitation intervention may be required. Ten years is considered an appropriate timeframe to account for natural variation ins water quality and potential recitation works if erosion outside of tolerable limits is occurring.

Rehabilitation Milestone	Nominated Timeframe	Justification
RM7 - Achievement of cattle grazing PMLU	10 years	Achievement of the cattle grazing PMLU relies on certification from the AQP that the land can sustain this use based on achieving certain vegetative conditions to satisfy criteria from FutureBeef. Allowance is made for poor growing seasons and extreme events such as droughts or storms that could negatively impact vegetation establishment, and potential intervention. Given these factors, and considering that only grasses are to be grown, the timeframe assigned is 10 years.
RM8 - Achievement of woodland habitat PMLU	15 years	Achievement of the woodland habitat PMLU relies on certification from the AQP that the land can sustain this use based on achieving certain vegetative conditions to satisfy criteria from the BioCondition Assessment Manual. Allowance is made for poor growing seasons and extreme events such as droughts or storms that could negatively impact vegetation establishment, and potential intervention. Given these factors and considering that the establishment of some species requires years of maturity, the timeframe assigned is 15 years.
RM9 - Achievement of watercourse PMLU	15 years	Achievement of the watercourse PMLU relies on justification from the monitoring undertaken during RM6 that the land can sustain this use based on comparison of riparian condition to surrounding watercourse reaches. Allowance is made for poor growing seasons and extreme events such as droughts or storms that could negatively impact vegetation establishment, and potential intervention. Given these factors and considering that the establishment of some species requires years of maturity, the timeframe assigned is 15 years.

3.3.3 Exploration

In accordance with RM1(g) all exploration drill holes will be rehabilitated in accordance with the eligibility criteria and standard conditions for exploration and mineral development projects – V2 (DEHP, 2016).

3.3.4 Community Consultation

Achievement of the PMLUs of cattle grazing, woodland habitat and watercourse are consistent with LODs, consultation and respective agreements completed to date (refer to Section 3.2).

3.3.5 Consistency with Local, State and Commonwealth Strategies and Plans

All proposed PMLUs have been transitioned from the EA (LOD). The PMLUs at PTM consider the pre-mining land use, adjacent land uses and approved EA conditions. Existing land use in the area is primarily cattle grazing and coal mining.

Under the Isaac Regional Planning Scheme (February 2021), PTM is located within a rural zone, which includes uses such as grazing, farming, forestry, tourism, and extractive industries. Land use performance outcomes for this rural zone include ensuring development:

- Is consistent with the rural character of the locality.
- Supports the primary rural function of the zone.
- Protects rural, natural, and scenic values of the locality.

- Includes boundary realignments where they used to align with mining or petroleum tenements.

Concurrently, the Queensland Government, via its Mackay, Isaac, and Whitsunday Regional Plan (February 2012), maps PTM in a regional landscape and rural production area, which includes land used for agriculture, natural economic resources (including extractive resources), water catchment, traditional uses, conservation areas and native forests.

The defined uses for both regional plans are consistent with the PMLUs proposed for PTM.

3.4 Non-Use Management Areas

Legislative Requirement

In accordance with sections 126C(1)(d), (g) and (h) of the EP Act, for each proposed non-use management area, the rehabilitation planning part of the PRC Plan must:

- state the reasons the applicant considers the area cannot be rehabilitated to a stable condition;
- include copies of reports or other evidence relied on by the applicant for each proposed non-use management area;
- state the extent to which the proposed non-use management area is consistent with the outcome of consultation with the community in developing the plan, and
- state the extent to which the non-use management area is consistent with any strategies or plans for the land of a local government, the State, or the Commonwealth.

PRC Plan Guideline (Section 3.3)

A NUMA is defined in the EP Act as an area of land the subject of a PRC Plan that cannot be rehabilitated to a stable condition after all relevant activities for the PRC Plan carried out on the land have ended. Proposed NUMAs must be justified under the criteria set out in section 126D (2) of the EP Act.

The rehabilitation planning part of the PRC Plan must also include:

- a. information demonstrating that the proposed footprint of each NUMA is as small as practicable.
- b. an assessment of the NUMA location options, having regard to the constraint of the resource location, with an analysis of the potential environmental harm and sensitivity of the surrounding environment of each option.
- c. a description of the proposed location of each NUMA and the environmental values of the surrounding environment.
- d. evidence showing how the proposed location will prevent or minimise environmental harm.

In accordance with section 126D (1)(c) of the EP Act, the applicant must develop and implement management milestones within the PRC Plan Schedule which achieve best practice management and minimise environmental harm for any NUMAs contained in the proposed PRC Plan. As part of the development of management milestones, the applicant must conduct a NUMA specific risk assessment to identify and quantify risks and associated controls. The risk assessment should have an overarching goal of identifying and controlling any significant risks to the community and the environment.

The proposed PRC Plan must include a detailed description of the nominated NUMA(s) for the site. The description must include, but is not limited to:

- description of the land at surrender;
- any relevant safety features;
- completion criteria for measuring whether the NUMA has achieved sufficient improvement.

Where a NUMA has already been identified in a land outcome document and is able to be transitioned into the PRC Plan Schedule, the applicant is not required to comply with sections 126C (1)(g) or (h) or 126D (2) or (3) of the EP Act. NUMAs transitioned into the PRC Plan Schedule are not required to complete the information requirements under section 126C (1)(j) of the EP Act in this section for those NUMAs. However, the legislative requirements under section 126C (1)(d) of the EP Act still apply.

Where a NUMA has not been pre-approved and is proposed as part of the transition into the PRC Plan, the applicant must include all of the requirements identified in this section.

As outlined in section 754 (3) of the EP Act and section 6.3.2 of the PRC Plan guideline ‘a NUMA will be taken to be pre-approved if a land outcome, the same or substantially similar to a NUMA, is contained in a ‘land outcome document’. This is the case for PTM due to the residual voids being authorised under Schedule E, Condition E6 and E7 of the EA ~~being the only LOD applicable to PTM~~ (Refer to Section 2). As such the EA identifies an approved outcome for the land through these two conditions. The approved outcome is that residual voids are authorised for the land. The proposed NUMA is inclusive of the low wall, high wall, and end walls.

~~As outlined in section 754 (3) of the EP Act, if~~ a NUMA has already been identified in a LOD ~~then per section 754 (3) of the EP Act,~~ the applicant is not required to comply with sections 126C(1)(g) or (h), or section 126D (2) or (3) of the EP Act and is not required to complete the information requirements under section 126C (1)(j) of the EP Act for the ~~approved transitioned~~ NUMAs. PTM is still required to meet the legislative requirements under section 126C (1)(d) of the EP Act.

~~The EA does not state the area or location of the proposed NUMAs; therefore, this section of the PRC Plan will include detail on how the total area of the land will be minimised, and how the location of the proposed NUMA will minimise risk to the environment.~~

Although Sections 126C(1)(g), (h) and (i) and Section 126D(2)(a) of the EP Act are not required to be considered under the transitional provisions, these sections have been addressed in this document to demonstrate the efforts made by the Proponent to avoid environmental harm during the development of the NUMA design. Where these sections of the EP Act have been addressed in this chapter and technical appendices is detailed in Table 32 below.

Because the EA does not state the area or location of the proposed NUMAs, this section will include detail on how the total area of the NUMA will be minimised, and how the location of the proposed NUMA will minimise risk to the environment.

Table 32 Additional NUMA Information

<u>Section</u>	<u>Where in Document Addressed</u>
<u>126C(1)(g) – for each proposed non-use management area, state the reasons the applicant considers the area can not be rehabilitated to a stable condition because of a matter mentioned in section 126D(2)</u>	<u>Section 3.4.2 and 3.6.3.1.3</u>
<u>126C(1)(h) – for each matter mentioned in paragraph (g), include copies of reports or other evidence relied on by the applicant for each proposed non-use management area</u>	<u>Section 3.4.2, 3.4.3.3, Appendix 3 (Hydrogeology Assessment) and Appendix 8 (Void Closure Plan)</u>
<u>126C(1)(i) – for each proposed non-use management area, state the applicant's proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP schedule for the area</u>	<u>Section 3.4.4, 3.6.3.6, and Appendix 8 (Void Closure Plan – Section 8)</u>
<u>126D(2)(a) – The PRCP schedule may state the land is a non-use management area only if carrying out rehabilitation of the land cause a greater risk of environmental harm than not carrying out the rehabilitation</u>	<u>Section 3.4.2</u>

3.4.1 Nominated NUMAs

There is one (1) residual void that will be retained as a NUMA as shown on ~~Figure 23~~Figure 23. The NUMA has a total area of 316ha. The NUMA extents and key details are summarised in ~~Table 33~~Table 32.

Relevant safety features of the NUMAs are incorporated into the MMs (Section 3.4.3) and include:

- Safety bund is constructed, where required, at the geotechnical set-back distance.

- Fencing erected around perimeter of safety bund, where required.
- Warning signage placed along fence line, where required.

Figure 23 PTM Proposed NUMA

Table ~~333332~~ PTM Proposed NUMA Details

Proposed NUMA	Mining Tenement	Area (ha)	Factor of Safety (FoS)	Maximum Depth	Maximum Length
IA1	ML 4749	316	Minimum FoS of >1.25 as determined by an AQP	~145m	12km

3.4.2 NUMA Justification

Relevant studies have been undertaken to assess, refine and optimise the PTM residual void location and extent to minimise the potential for environmental harm in its closure state, and to ensure sufficient improvement of the NUMA. These studies resulted in the iterative refinement of the final landform and NUMA extent as documented for the three options NUMA design considered as described in **Section 3.4.3.1**. The preliminary NUMA locations and extent were based on mining the full resource extent of the approved area and were used as the basis for the following void studies:

- Void in a flood plain assessment.
- Rehabilitation flooding assessment.
- Initial void water balance model and assessment.
- Initial void geotechnical stability assessment.

Geochemical water quality assessment. The supporting technical studies appended to this document (Section C) support the proponent's conclusion on NUMA stability and avoidance of risk to environmental harm as identified below and **Section 3.4.3** (NUMA design options analysis).

3.4.2.1 Stable Condition Assessment

Although the NUMA has been approved as transitional in accordance with the PRCP Guideline and EP Act (see Section 2), a general discussion as to why the void cannot be rehabilitated to a stable condition (as per Section 126C(1)(g) of the EP Act) is presented below.

As per the findings presented in **Appendix 3** and **Appendix 8**, the void configuration as proposed will be a groundwater sink. As a groundwater sink, in a net evaporative environment (as is present for the site), water quality (particularly salinity) will continue to degrade over time to the limit of saturation. Therefore, the use of water within the pit cannot be guaranteed post closure and into perpetuity to sustain a PMLU.

The slope of the pit high and low walls in the optimal configurations (considering both operational constraints and best environmental outcomes) also generally precludes their use for grazing activities in the selected configurations as described in detail in **Section 3.6.3.1.3**.

3.4.2.2 Alternative Options Potential for Greater Environmental Harm

Although the NUMA has been approved as transitional in accordance with the PRC Plan Guideline and EP Act (see Section 2), a general discussion as to how the NUMA acquits the requirements of Section 126D(2)(a) is presented below.

During options analysis (**Section 3.4.3.1.1 – 3.4.3.1.3**), it was determined that the void, where backfilled to a certain point, had the potential to become a groundwater source, rather than a sink as described in greater detail in **Section 3.6.3.1.2** and **3.6.3.2**. This presents an increased risk of the mobilisation of contaminants from the residual void into the surrounding groundwater. Therefore, the proposed NUMA in **Table 33** presents the scenario with the minimal potential for impact.

Other configurations of the void where there is an attempt to establish appropriate conditions for a PMLU for the pit walls (high- and low-) is likely to lead to a greater potential for environmental harm. Due to the widening of the void, the catchment of the void increases, creating a more substantial lake, and removing a significant portion of the PMLU area gained by rehabilitation works. In this scenario, rehabilitation already completed on the PTM dumps would be impacted/removed by the layback of pit walls, requiring a repeat of

rehabilitation activities in these areas. Further, undisturbed areas behind high walls will also be impacted, leading to an increase in disturbance footprint and potential impacts to high value vegetation PEMS. -The increase in catchment area and void lake size also effectively consumes a non-trivial portion of the potential gains in PMLU area. Therefore, the limited NUMA and retention of existing rehabilitated land as presented in the selected NUMA configuration option presents the minimal potential for environmental harm of the viable options. The optimised NUMA design selected through the options assessment discussed in **Section 3.4.3** enables 112 ha of additional PMLU area and one to two percent less NUMA area (detailed in **Table 34**).

3.4.2.13.4.3 Minimising Environmental Impacts

In accordance with Section 6.3.2 of the PRC Plan Guideline, “if the land outcome document(s) does not state the area or the location of the proposed NUMA, the PRC Plan must state how the total area of the land will be minimised, and how the EA holder will ensure the location of the NUMA minimises risks to the environment”.

As documented in the Information Sheet – Non-Use Management Areas, Department of Environment and Science 2023 (ESR/2019/4954), rehabilitation and management activities must be implemented for a NUMA to achieve sufficient improvement of the land. Sufficient improvement of a NUMA means the last management milestone for the area has been achieved. On achieving sufficient improvement, the risk of the following has either been prevented or minimised to the greatest extent possible:

- Land collapsing, eroding or subsiding.
- The need to actively manage the area (e.g. to prevent generation, and limit the release of contaminants).
- Access to the area has either been prevented or minimised to the greatest extent possible.

~~Relevant studies have been undertaken to assess, refine and optimise the PTM residual void location and extent to minimise the potential for environmental harm in its closure state, and to ensure sufficient improvement of the NUMA. These studies resulted in the iterative refinement of the final landform and NUMA extent as documented below. The preliminary NUMA locations and extent were based on mining the full resource extent of the approved area and were used as the basis for the following void studies:~~

- ~~• Void in a flood plain assessment.~~
- ~~• Rehabilitation flooding assessment.~~
- ~~• Initial void water balance model and assessment.~~
- ~~• Initial void geotechnical stability assessment.~~
- ~~• Geochemical water quality assessment.~~

The iterative landform design process has resulted in a mine closure landform which minimises the area of the void and minimises potential environmental harm from the residual void in its closure state by:

- ~~Provides~~ Providing immunity from flooding interactions, up to a PMF event.
- Ensuring the voids acts as a sink for groundwater.
- Ensuring the NUMA extent is informed by the area of predicted instability as determined through geotechnical stability modelling, and citing of management measures (safety bund, signage) as defined in the management milestones is outside this area.

~~Void~~ Further, void water quality in ~~its~~ the proposed closure state is understood, and any limitations for use of this water is considered in the management milestones.

3.4.2.13.4.3.1 Options Assessment for Minimising Final Void

Mining construction and operations at PTM commenced in 2006. PTM targets the coal seams of the Rangal Coal Measures (RCM) via removal and stockpiling of topsoil, drilling, and blasting of overburden/interburden and stripping of overburden/interburden via excavator and truck/shovel to expose the coal seams. The overburden/interburden is placed back into the previously mined voids progressively. There are five mining pits that make up the mining operation - Ramp 10, 20, 30, 40 and 50. At the end of mining, one continuous residual void is proposed.

As detailed in Section 3.1 of this PRC Plan, the residual voids are authorised as NUMAs. A NUMA is an area of land that cannot be rehabilitated to a stable condition after all the relevant activities for the PRC Plan carried out on the land have ended.

As described above, the final landform has been iteratively designed with consideration of relevant technical studies, the mine plan and waste tonnages, and to minimise the extent of the NUMA where feasible. A detailed options assessment has been undertaken to assess the potential to minimise the NUMA extent, and is described below (see **Appendix 8** for further detail).

The options assessment to minimise the extent of the NUMA was conducted with consideration of the broader risks relevant to the closure landform (including contaminant migration), the land collapsing, eroding or subsiding and the need to actively manage the area. There are potential landform design options which may reduce the size of the residual void, however may result in a landform that would not meet the minimum FoS that has been determined by the AQP.

Not achieving a safe and structurally stable residual void represents an unacceptable environmental outcome and necessitates designing a residual void that is based on practicalities that have been extensively modelled to support this PRC Plan. This context is important when determining the viability of various landform design options. In total three (3) landform design options were considered for PTM that were underpinned by a landform design objective to minimise the extent of the residual void and maintain best practice environmental management. Results of the options assessment is discussed in the sections below.

3.4.2.1-3.4.3.1.1 Option 1: Base Case No Filling of Void Along Isaac River

Previous iterations of the PTM mine plans commenced by BHP in the early 2000s and submitted with the EIS for approvals had no planned partial or full backfill of the final void. The void was anticipated to fill to an equilibrium water level which was not determined in the EIS.

Figure 24 shows the result of scheduling mining to extend down-dip along the entire strike length of the mine. This schedule is the most optimal and value adding case, given it achieves maximum recovery of coal, and provides the shortest haul distances for overburden waste. The section taken across R40 showing extent of the NUMA is provided in [Figure 25](#).

The resultant southern void would lie adjacent to the Isaac River for a length of 2km with a void length of 12km and a total surface area of 405ha which would include fencing and bunding and highwall and low wall setbacks to achieve the target FoS.

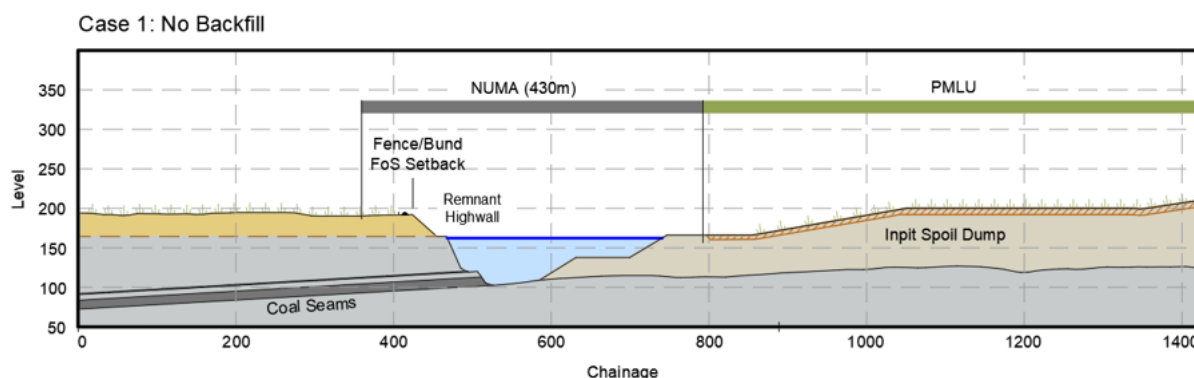


Figure 24 Option 1: Base Case No Filling of Void Section (Minserve)

Although this was originally the preferred option for the PTM final void, the proximity of the proposed NUMA to the Isaac River to the south necessitated further consideration of the void/NUMA configuration.

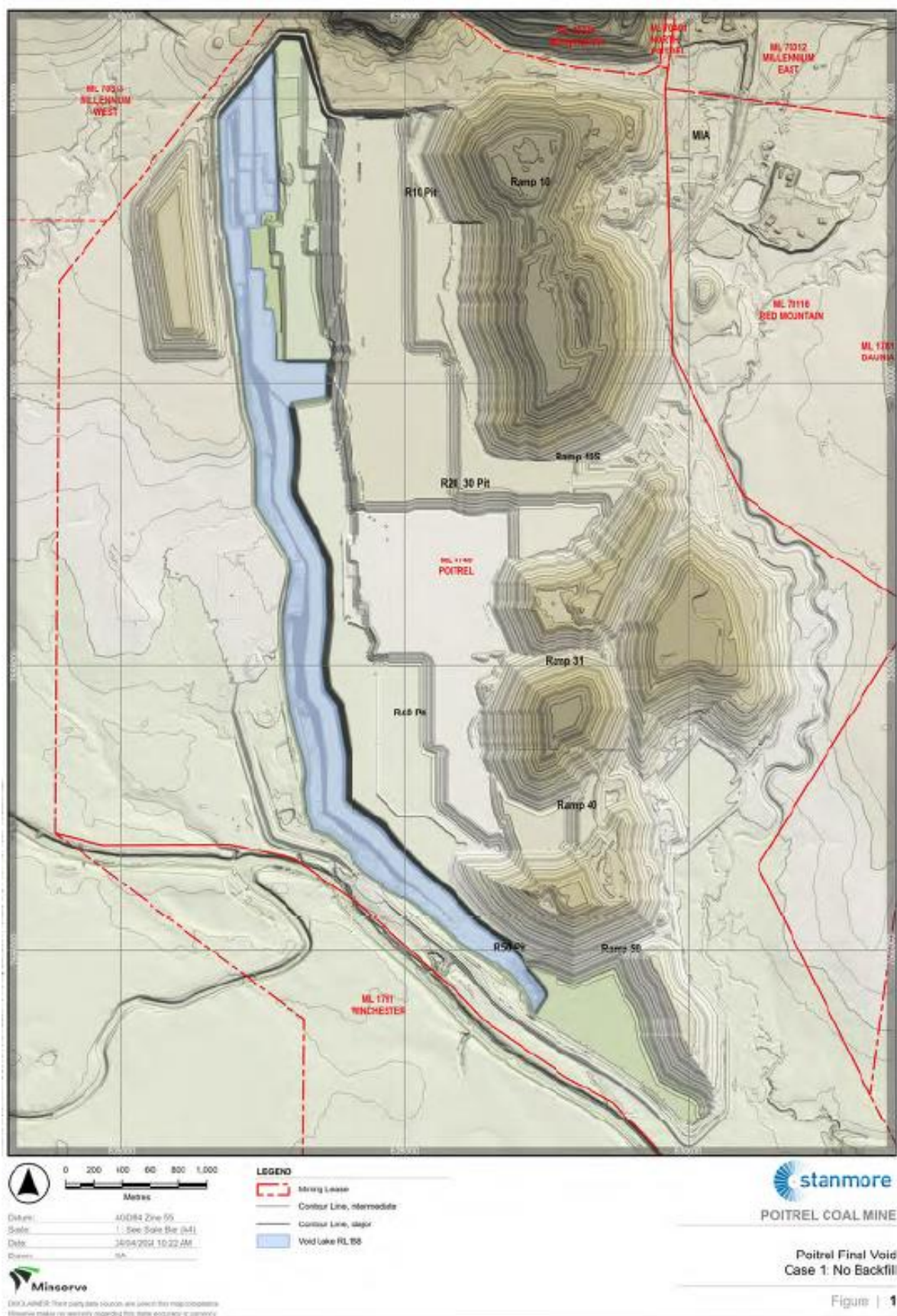


Figure 25 Option 1: Base Case No Filling of Void Plan View (Minserve)

Backfilling the Southern Voids – Option 2 Free Draining Landform Fully Backfilling the Southern Voids

This option provides for fully backfilling the southern voids adjacent to the Isaac River, however as indicated in Figure 27, the residual void size is approximately 428ha as there is less fill material available in the northern section of the void due to the flatness of the mine floor, resulting in a larger void, in contrast to Option 1. The section taken across R40 showing extent of the NUMA is provided in Figure 26 with a total void length of 7km. A significant barrier in achieving this landform is that it requires approximately 59Mm³ of backfill, with approximately 30Mm³ not available during remaining operations requiring this material to be rehandled at closure. This also prevents the progressive rehabilitation of the dumps this material would be sourced from until completion of the final backfill.

Of the three landform options considered, this option leaves the largest residual void, requires the most movement and placement of spoil with considerable rehandle at closure, delays progressive rehabilitation of some areas, and is the least financially viable. Consequently, there are few advantages associated with this option and it has been discounted.

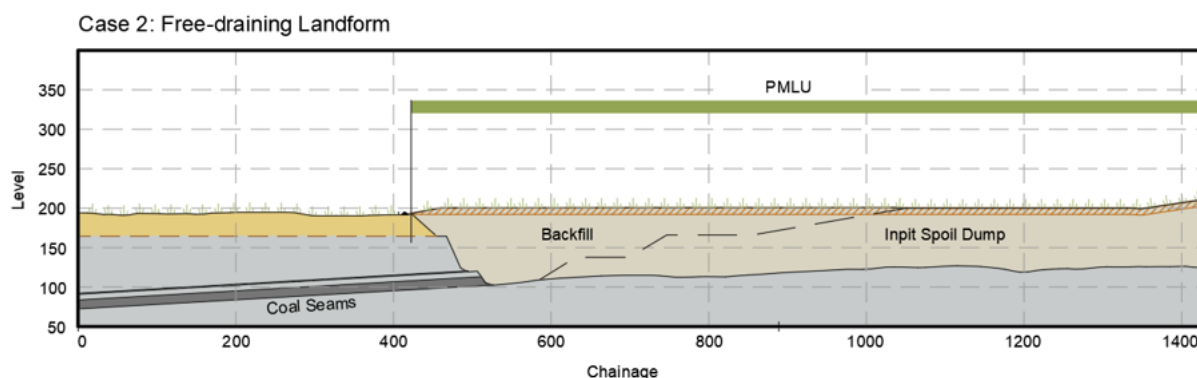


Figure 26 Option 2: Free Draining Landform Section

Due to the topography and altered landscape from mining activities, this landform continued to drain to the remaining residual void to the north. This significantly increased the risk that the void lake would reach levels where there would be interactions between the void lake and groundwater (i.e. the residual void would act as a groundwater source rather than a groundwater sink) with the potential for environmental harm.

This option also resulted in a shortfall of material in the north of the mine, which would necessitate the rehandling of large quantities of waste. Consequently, large sections of waste rock dump under this scenario would remain unavailable for rehabilitation, as the material would be required for future pit backfilling.

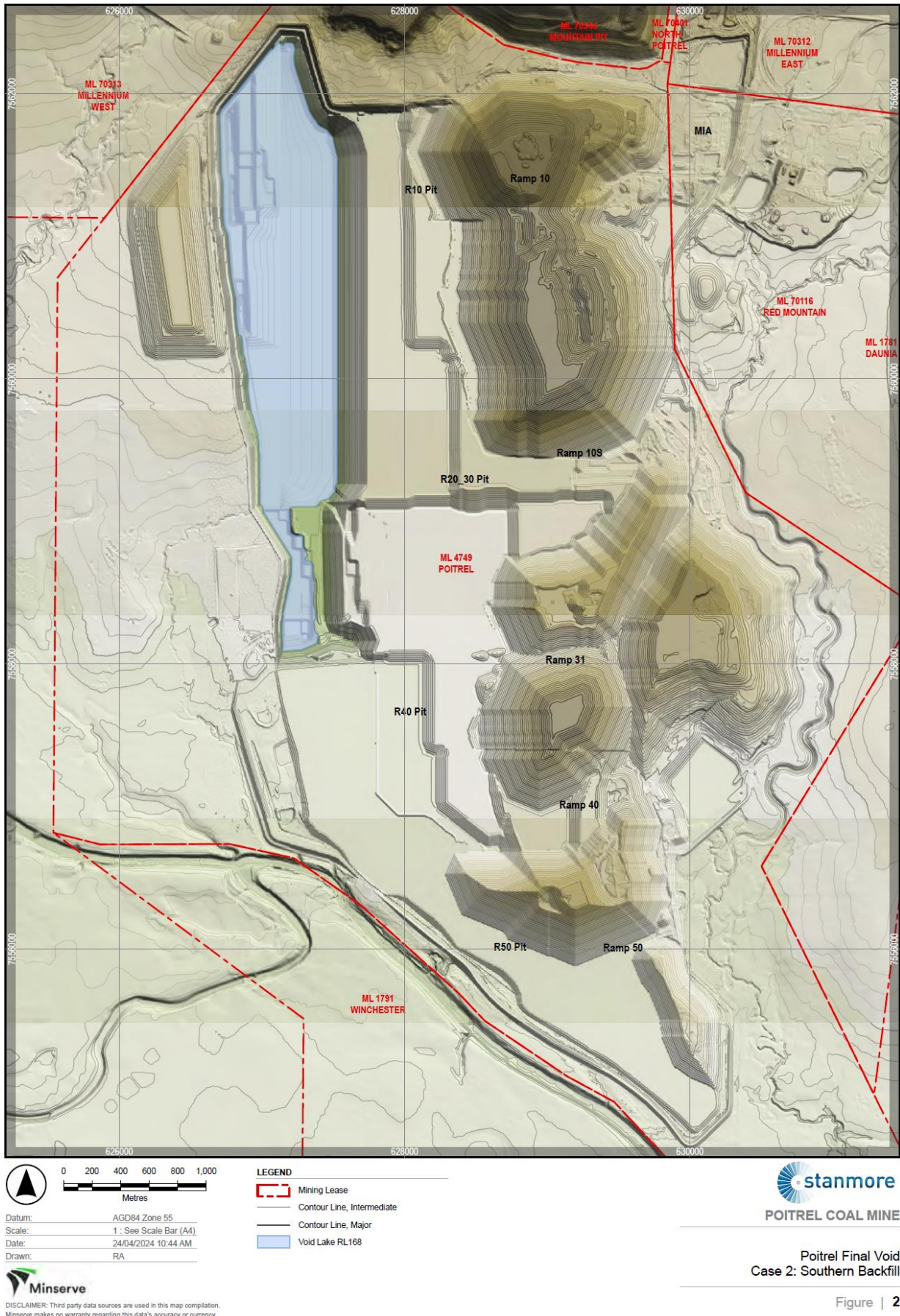


Figure 27 Option 2: Partial Backfill Voids Plan View

Operations (Chosen Option)

This option has been determined as being the preferred option to achieve the closure objectives. This option undertakes partial backfill of the southern void adjacent to the Isaac River above the groundwater table. This option utilises available spoil across the remaining life of mine to reduce the residual void size in the south, however there is insufficient spoil material available to completely backfill against the residual highwall as described in Option 2. This option results in substantially minimising the NUMA extent in contrast to Option 1 and achieves a stable landform for the PMLUs in the southern void footprint.

As discussed in Section 3.6.3.3, the residual void is a groundwater sink. The remnant highwall would include fencing and bunding and highwall and low wall factor of safety setbacks. A plan view of the final pit extent is provided in [Figure 29](#).

The length of the residual void is 12km and has a total surface area of 316ha. As indicated in [Figure 28](#), the final surface water elevation in the residual void will not extend to the partially backfilled area in the southern void.

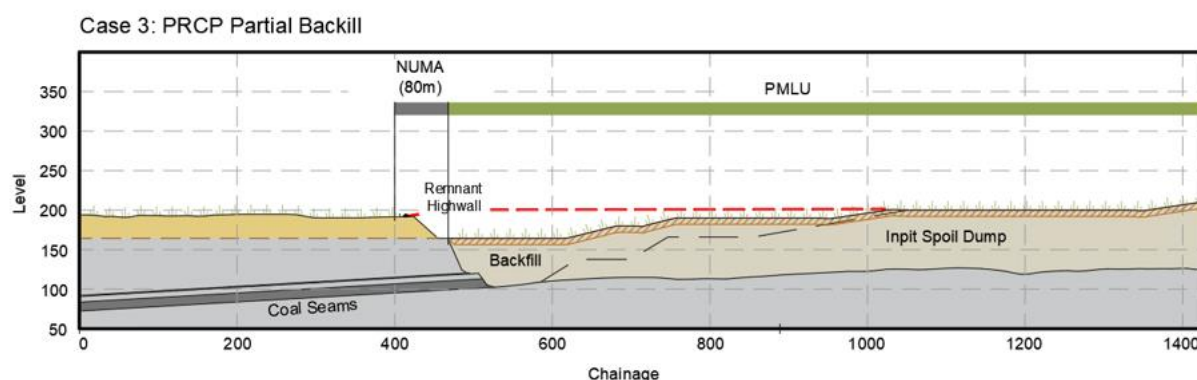


Figure 28 Option 3: Partial Backfill During Operations (Chosen Option) Section

In summary, this option reduces the likelihood of groundwater interactions with backfilled material in the void, and maintains the void's status as a groundwater sink, minimising the potential for the mobilisation of contaminants. Further, the area able to support a PMLU is maximised, while still factoring in slope safety and achievement of other associated milestone criteria for PMLUs adjacent to the high-, end-, and low walls. Potential impacts from and to the Isaac River are also minimised as a result of this landform configuration.

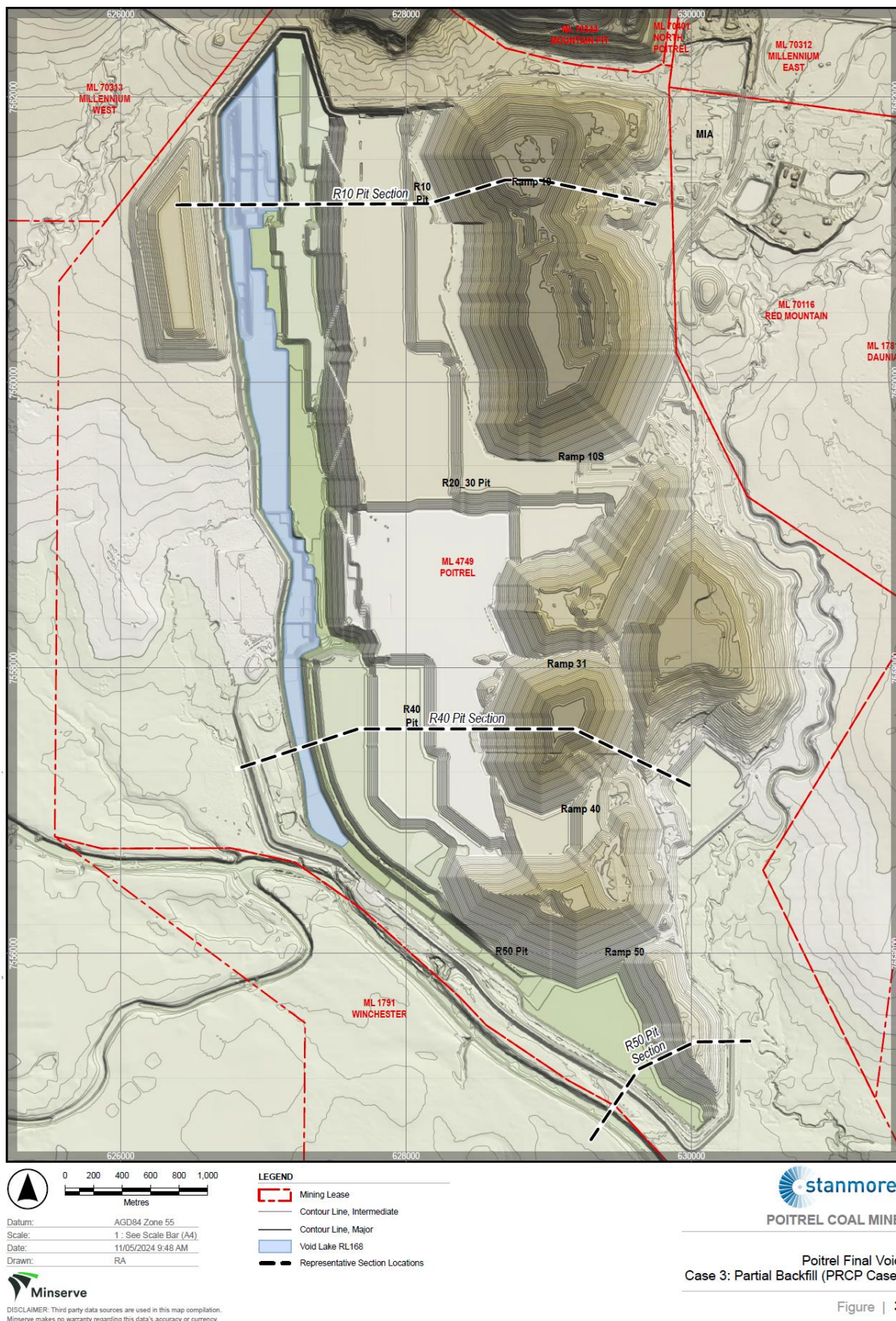


Figure 29 Option 3: Partial Backfill During Operations (Chosen Option) Plan View

A summary of the options analysis as it relates to the size of the residual NUMA and PMLUs is shown in [Table 34Table 33](#). Option 3 (the chosen option for this PRC Plan application), clearly demonstrates that this option provides for the smallest feasible NUMA extent and consequently provides more available land to sustain a PMLU. Visual representations of the proposed final landform (Option 3) are provided in [Figure 30Figure 30](#) to [Figure 43Figure 43](#) below.

Table [343433](#) Options Analysis Outcomes

Category	Option 1	Option 2	Option 3 (Chosen Option)
NUMA (ha)	404	428	316
PMLU (ha)	2137	2113	2225
Undisturbed (ha)	1352	1352	1352
Total	3893	3893	3893
NUMA (% of Disturbance)	15.9%	16.8%	12.4%

The preferred option for the PTM closure landform is Option 3. This is on the basis that:

- This option is feasible in consideration of the material available for backfill across the remainder of the mine plan.
- Allows progressive rehabilitation of areas across the mine in contrast to Option 2.
- Results in the smallest area of NUMA, and residual void extent as shown in [Table 34Table 34](#).
- Achieves safe and stable landforms for the proposed PMLU within the southern void footprint.
- Minimises the potential for environmental harm. This landform was used as the basis for the detailed assessments to assess potential environmental risks in closure, with the outcomes of these studies are discussed in detail in the following sections.

Significant re-sequencing of the mine plan has been undertaken by the proponent to incorporate the preferred option into the long term mine plan and schedule.



Figure 30 North End Current Viewpoint



Figure 31 North End Proposed Final Landform



Figure 32 Entire Site Current Disturbance



Figure 33 Entire Site Proposed Final Landform



Figure 34 Southern End Current Viewpoint



Figure 35 Southern End Proposed Landform

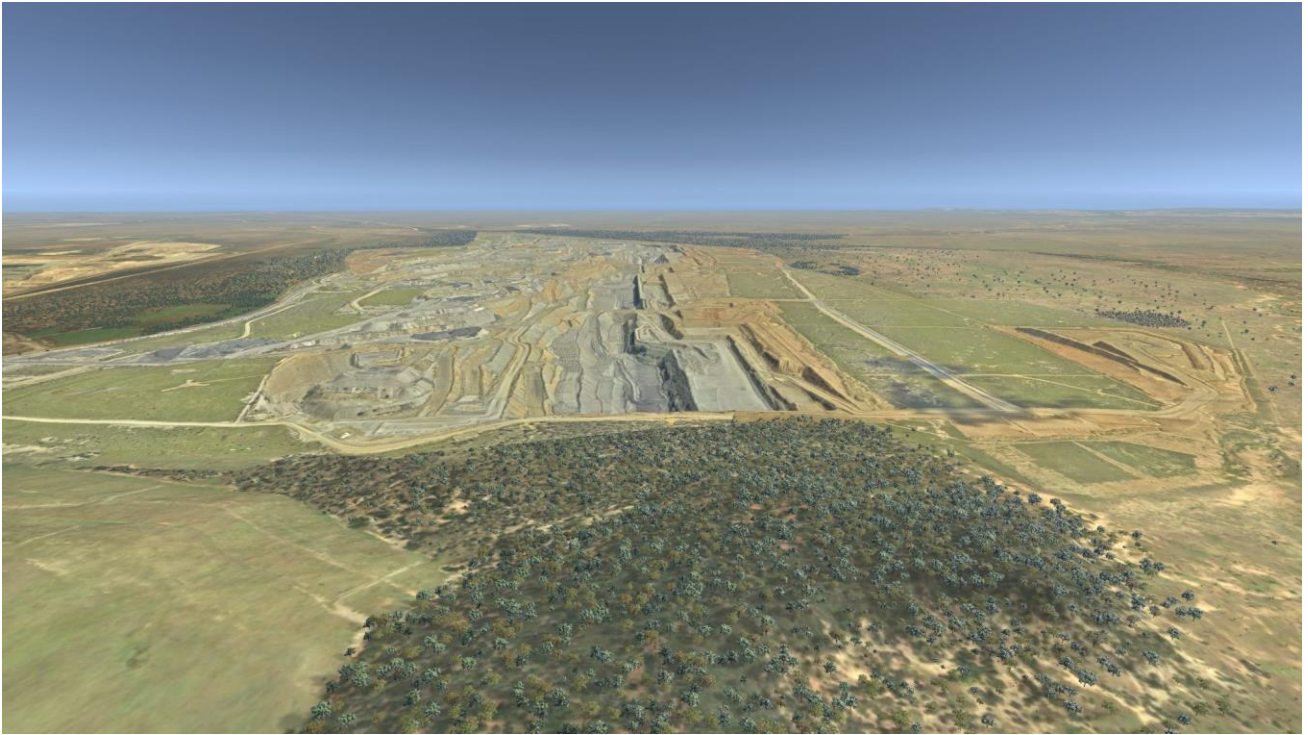


Figure 36 Northern End Current Viewpoint

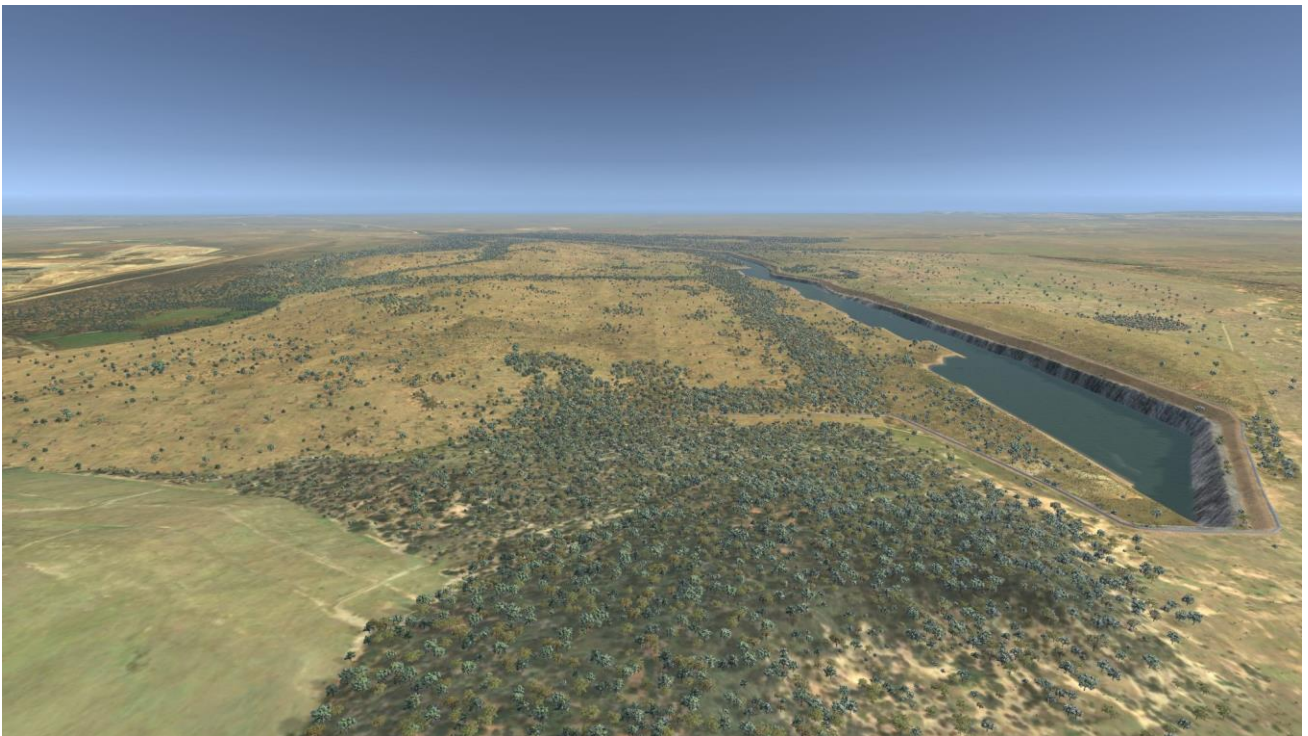


Figure 37 Northern End Future Landform



Figure 38 Current Viewpoint Looking East



Figure 39 Proposed Final Landform Looking East

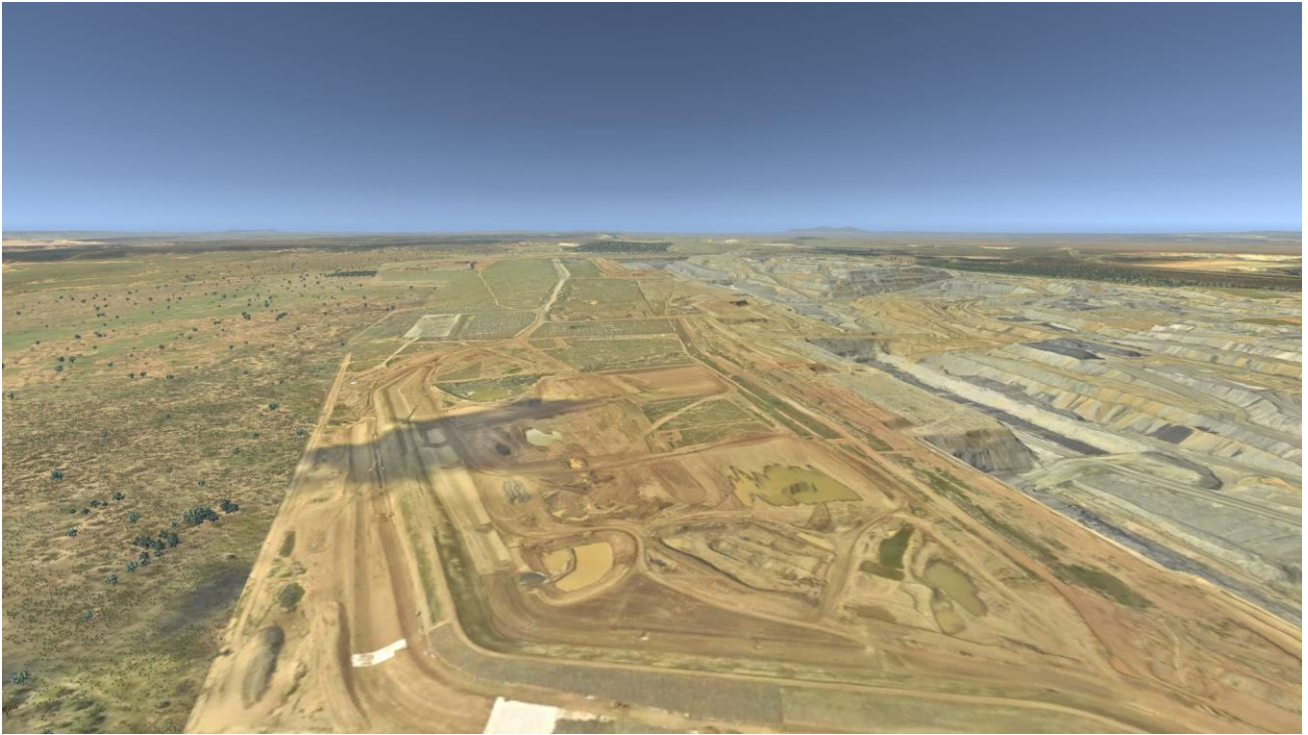


Figure 40 Current Landform Looking North

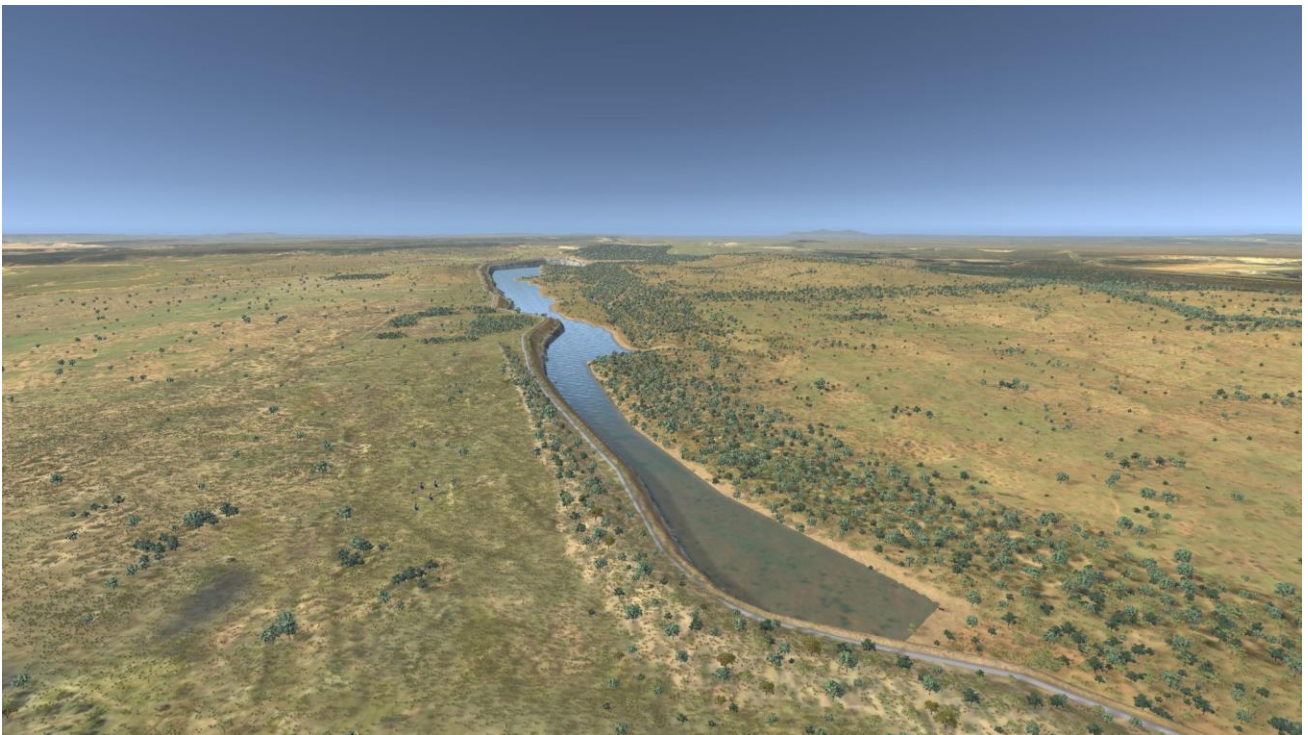


Figure 41 Proposed Final Landform Looking North



Figure 42 Current Drone Imagery Looking South



Figure 43 Proposed Final Landform Looking South

3.4.2.23.4.3.2 Minimising Size and Area

Based on the outputs of the initial PRC Plan studies and options assessment, the NUMA extent has been minimised with the high-wall and end-wall redesigned to increase the distance from the approval boundary and watercourses for the void, with the aim to achieve the minimum geotechnical stability FoS of ≥ 1.25 within the NUMA extents, and to limit interaction with the floodplain.

The refined NUMA locations and reduced extent, were then used as the basis for the following studies:

- Updated void in a flood plain assessment (Section 3.5).
- Rehabilitation flood modelling (Section 3.6.1.2).
- Updated void water balance modelling (Section 3.6.3).
- Updated void water quality modelling (Section 3.6.3).
- Updated void geotechnical assessment (Section 3.6.3).
- Groundwater modelling (Section 3.6.1.1).

3.4.2.33.4.3.3 Minimising Environmental Harm

The detailed technical studies have been undertaken in an iterative approach as part of the final landform design. These iterations have resulted in a closure landform design that minimises environmental harm and achieves sufficient improvement of the NUMA. The detailed assessments and management milestones are described in the Void Closure Plan (Appendix 8).

The key outcomes of the technical studies relevant to demonstrating prevention or minimising environmental harm from the NUMA include:

- The flood modelling assessed a range of modelled design storm events, being the 1%, 0.1% AEP and PMF flooding simulations. The findings indicate that:
- The final landform embankment between the Isaac River and R40/ R50 Pit provides flood immunity from 1% and 0.1% AEP flood events in the Isaac River.
- The configuration of the final landform and the out of pit dumps located on the eastern side of the site (adjacent to Ramp 10, 10S, 31 and 50) prevents flood waters from entering into the final void from the eastern side.
- No stream velocities in excess of 1.5m/s occurred in flood events up to and including the 0.1% AEP. It is expected that the final landform is likely to have low erosion/scour risk following the establishment of vegetation.
- The mean pit lake water levels at equilibrium stabilise at 169 mAHD and remain below the void spill point (197 mAHD). Therefore, the voids will not overtop and environmental harm beyond that of the void itself is not expected.
- The mean pit lake water levels at equilibrium stabilise at 169 mAHD and remain below the recovered groundwater levels (180 mAHD) for the residual voids ensuring the void will act as long-term groundwater sinks. This reflects an available storage capacity of between 15,871ML and 23,308ML for the void to continue acting as a sink.
- Acidic conditions are unlikely to develop in the residual void lake, with alkaline conditions developing throughout the modelled period. TDS concentrations increase over the model duration but are not predicted to exceed the EA trigger value until after the simulation period (year 2190).
- The void achieved the minimum geotechnical FoS for both the highwall and low walls, with only the northern end of the NUMA extent being increased to account for setback distances from the highwall to achieve the minimum FoS.
- A calibrated numerical groundwater modelling was developed and has been used to assess the proposed final landform and NUMA. The modelling also utilised particle tracking to simulate and assess the movement and fate of water particles through the groundwater system post mining. The model indicates that the residual void will act as a terminal sink for groundwater, with the hydraulic gradient being towards the residual void across the majority of the site:

- The particle movement simulation for particles placed within the residual void indicated that groundwater will remain within the mine closure landform (i.e., rehabilitated in-pit spoil and residual void) in the long-term (SLR, 2024). This includes the modelled fluxes of water from the residual void to the in-pit spoil of the mine closure landform, with these particles returning to the residual void. The simulation also predicted that the void remains as a groundwater sink and the particles would not flow from the residual void off-site to the receiving environment. The particles placed outside of the residual void at the potential contaminant source, the MIA, are all captured within the residual void or remain within the mine closure landform for the duration of the post-mining simulation.
- Predictive hydrographs were derived at the potential GDE sites identified within and adjacent to PTM. The hydrographs indicate that drawdown of the water table in the vicinity of the potential GDEs is predicted to occur prior to the end of mining, with any additional drawdown occurring over the post-mining period predicted to be a result of continuing operational drawdown trends (i.e., a time lag from active mining), rather than new impacts caused by the mine closure landform design.

All NUMAs have management considerations, developed as part of the Void Closure Plan, to further support attainment of NUMA voids that are safe and do not present an unacceptable risk of environmental harm.

MMs have also been developed, refer section below, as part of the PRC Plan Schedule and will require certification from an AQP that residual voids (NUMAs) will not cause environmental harm to land, surface waters or any recognised groundwater aquifer.

3.4.33.4.4 Management Milestones

For each NUMA, MMs must be supported by milestone criteria that:

- Are the most appropriate for achieving the milestone.
- Facilitate achieving subsequent management milestones.
- Have regard to the technical knowledge available when the PRC Plan objective assessment is being conducted about managing risks of the NUMA to the environment.
- Achieve the prevention of the production and release of contaminants or, if prevention is not possible, minimise the impact of the release of contaminants.

The PRC Plan Guideline states that management of a NUMA must be done in a way that achieves best practice management of the area and minimises risks to the environment.

The proposed MMs and associated justification are provided in [Table 35Table 34](#).

Table ~~35~~³⁴ Management Milestones for PTM

Milestone Reference	Management Milestone	Milestone Criteria	Justification for Transition and Proposed NUMA Milestone Criteria
MM1	Achievement of structural stability	• Rehabilitation is geotechnically stable and achieves a minimum Factor of Safety of ≥ 1.25 as determined by an AQP.	• Given the absence of criteria to be transitioned from LODs, an AQP has undertaken an assessment to determine the FoS.
MM2	Achievement of surface requirements	• Safety bund is constructed, where required, at the geotechnical set-back distance. • Fencing erected around perimeter of safety bund, where required. • Warning signage placed along fence line, where required.	• Considered best practice to adequately prevent human and livestock access to voids. • Considered best practice to adequately prevent human and livestock access to voids.

Milestone Reference	Management Milestone	Milestone Criteria	Justification for Transition and Proposed NUMA Milestone Criteria
			Considered best practice to warn humans of potential risks.
MM3	Achievement of sufficient improvement	- Certification from an AQP that residual voids will not cause environmental harm to land, surface waters or any recognised groundwater aquifer. - Certification from an AQP that the residual voids are safe to humans and livestock.	- Transitioned from Condition E6 of EPML00963013 with the addition of a certification process. - Considered best practice based on outcomes of Void Closure Plan.

3.4.3.13.4.4.1 Management Milestone Timeframes

Given the dynamic nature of life of mine planning there is inherent uncertainty when planning for the achievement of management milestones. Timeframes associated with the milestones for the IA were developed by considering the requirements of each management milestone as outlined in previous sections and the associated risks identified through the risk assessment. The nominated timeframes and respective justifications are detailed in [Table 36](#) [Table 35](#). These timeframes have been used to develop the milestone schedule in the PRC Plan Schedule.

Table [36](#) [35](#) Timeframe Justification for Management Milestones for IA1

Management Milestone	Nominated Timeframe	Justification
MM1 – Achievement of structural stability	5	To validate that stable batters are achieved, geotechnical investigations may be required, and modelling undertaken to quantify stability. Sufficient time has been accounted for these activities, which factor in the availability of geotechnical drill rigs. Considering that this milestone requires validation that the void is performing as per the design intent, five years is considered a sufficient time to complete this milestone.
MM2 - Achievement of surface requirements	5	Considering the large spatial extent of the voids, designing, and constructing the required bunds and fencing, five years is considered a sufficient time to complete this milestone
MM3 - Achievement of sufficient improvement	5	Sufficient time must be factored into this milestone timeframe to allow for detailed analysis of data by an AQP to certify that the residual voids won't cause harm to the environment, humans and livestock. A five year timeframe is considered sufficient to facilitate meaningful trend analysis.

3.4.3.4.5 Community Consultation

The final land use encompassing NUMAs is consistent with the outcomes of community consultation as outlined in Section 3.2. As discussed in Section 2.3.5, approval of the EA has considered outcomes of consultation with the community in developing the plan and, as the EA does not limit the number or size of the residual voids, further community consultation is not required to support this PRC Plan Schedule application.

3.4.53.4.6 Consistency with Local, State and Commonwealth Strategies and Plans

The extent to which the NUMAs are consistent with Local, State and National strategies and plans is outlined in [Table 37](#) ~~Table 36~~ below.

Table ~~37~~³⁷³⁶ Consistency of the NUMA with Local, State, and Commonwealth Strategies and Plans

Strategy or Plan	Purpose	NUMA Consistency
Local / Regional		
Isaac Regional Planning Scheme 2021 (Isaac Regional Council, 2021)	The Isaac Regional Council planning scheme has been prepared in accordance with the Planning Act 2016 as a framework for managing developing in a way that advances the purpose of the Act.	The region has a long history of mining and the Town Plan and urban areas of the Isaac region act as a gateway for supporting major mining activities. Final voids are a common occurrence with open cut mining activities. As such the existing of a final void (i.e., NUMA) is not inconsistent with the planning scheme
Mackay, Isaac, and Whitsunday Regional Plan	The Mackay, Isaac and Whitsunday Regional Plan establishes a vision and direction for the regional to 2031. It provides certainty about where the region is heading and provides a framework to respond to challenges and opportunities that may arise.	Mineral and extractive resource industries are significant components of the region's economy, in particular, coal and coal seam gas, as detailed in the desired regional outcomes in the regional plan. Final voids are a common occurrence with open cut mining activities. As such the existing of a final void (i.e., NUMA) is not inconsistent with the regional plan.
State		
State Planning Policy (SPP) (Department of Local Infrastructure, Local Government and Planning, 2017)	The SPP expresses the states interests in land use planning and development. A state interest is defined under the Planning Act as an interest that the Planning Minister considers affects an economic or environmental interest of the state or a part of the state, or affects the interest of ensuring that the purpose of the Act is achieved. Under the Planning Act, local governments must integrate relevant state interests into the planning scheme for their local government area.	The inclusion of the final void (i.e., NUMA) does not compromise the SPP overlays that apply to PTM: • Bushfire hazard, • Natural environment, • Regional infrastructure.
A Strategic Blueprint for Queensland's Northwest Minerals Province (The Strategic blueprint) (Queensland Government, 2017)	A strategic Blueprint for Queensland's Northwest Minerals Province contains a suite of actions to secure the long term future of Northwest Queensland. It will facilitate a strong and prosperous future by building on existing economic and community strengths in collaboration with industry, business, and community leaders.	The Strategic Blueprint acknowledges that mining industry has been the primary driver for regional employment and economic growth in the province. The Strategic Blueprint also notes that a Northwest Minerals Province Taskforce has been established to identify issues affecting the Province's mining industry and to help plan a strategic way forward. The Queensland Government has also committed, through the blueprint, to facilitating a smooth economic and social transition towards a strong and more

Strategy or Plan	Purpose	NUMA Consistency
		diversified economy, building on existing economic and community strengths, includes mining. A final void is typical for open cut mining operations and therefore a NUMA is not inconsistent with the Strategic Blueprint.
Mackay-Whitsunday Regional Action Plan	As part of the Queensland Budget for 2021 – 2022 a regional action plan for the Mackay Whitsunday area was established. The regional plan outlines how the Queensland Budget will directly support Mackay-Whitsunday.	A new \$7 million Resources Centre of Excellence to be built in Mackay. The centre is a one of the kind in Queensland. The Region remains one of the world's best sources of mining expertise and innovation in the mining equipment, technology, and services (METs) sector. The centre features a simulated underground coal mine. A final void is typical for open cut mining operations and therefore a NUMA is not inconsistent with the Mackay-Whitsunday Regional Action Plan.
Commonwealth		
Our North, Our Future: White Paper on Developing Northern Australia (The White Paper) (Australian Government, 2015)	The White Paper sets out how the Commonwealth Government will address challenges to development in northern Australia by: • Making it easier to use natural assets, in close consultation with, and the support of indigenous communities. • Providing a more welcoming investment environment. • Investing in infrastructure to lower business and household costs. • Reducing barriers to employing people. • Improving governance.	The White Paper identified the Australian Government's aspirations for resources as a diverse portfolio of mining across the north including existing large scale resources such as iron ore, base metals and gold, and new mines for strategic minerals such as rare earths. A final void is typical for open cut mining operations and therefore a NUMA is not inconsistent with the White Paper aspirations.

3.5 Voids in Floodplains

Legislative Requirement

In accordance with section 126D (3) of the EP Act, if land the subject of the proposed PRC Plan Schedule will contain a void situated wholly or partly in a flood plain, the schedule must provide for the rehabilitation of the land to a stable condition.

PRC Plan Guideline (Section 3.4)

Section 41C of the EP Regulation states the decision considerations for a void situated wholly or partly in a flood plain. A void is considered to be located in a flood plain if the flood plain modelling shows that, when all relevant activities carried out on the land have ended, the land is the same height as, or lower than, the level modelled as the peak water level 0.1% AEP for a relevant watercourse under the guideline Australian Rainfall and Runoff (2019) (ARR).

Where a land outcome document has a pre-approved land outcome for a void with a location specified, flood plain modelling is not required. If a void has been identified as a NUMA in a land outcome document but the location is not identified, the applicant is required to carry out flood plain modelling in accordance with this section of the guideline. While the provision in the EP Act relating to voids located within a floodplain having to rehabilitate to a stable condition does not apply, the PRC Plan must include how the proposed location of the void minimises risks to the environment. Therefore, the flood plain modelling is required to support the assessment of the proposed location of the void.

If there are no land outcomes identified in a land outcome document, the applicant is required to carry out flood plain modelling in accordance with this section of the guideline.

3.5.1 Background

The PRC Plan Guideline states that "Where a NUMA has already been identified in a land outcome document and is able to be transitioned into the PRC Plan schedule, the applicant is not required to comply with sections 126C(1)(g) or (h) or 126D(2) or (3) of the EP Act. As the NUMA is identified in the EA, under the transitional provisions (section 754(3)) exists and the applicant is not required to comply with section 126D(3) of the EP Act and as portions of the NUMA will be located within the floodplain.

~~PTM is proposing to transition a NUMA as part of this PRC Plan and has therefore~~The proponent has completed a Voids in Floodplain assessment, included in Appendix 5. The assessment has been undertaken in accordance with the requirements of the Australian Rainfall and Runoff (ARR) 2019 Guideline, and addresses Section 3.4 of the PRC Plan Guideline, and the DES *Information Sheet – Voids in Flood Plains* (DESI, 2024).

To determine the floodplain extent, the 'pre-mining' contour data was processed into a 1 metre spaced DEM and combined with the available Isaac River LiDAR DEM, and publicly available 1 second hydrologically enforced SRTM data. All artificial features (such as pits, waste rock dumps and infrastructure) located on the PTM mining leases were removed, however some features on neighbouring leases were retained (SLR, 2022).

3.5.2 Relevant Watercourses

Under the Voids in Flood Plains Information sheet, a 'Relevant Watercourse' is defined as:

- (a) A watercourse classified as stream order 4 or higher under the Strahler stream order classification system; or
- (b) If a watercourse mentioned in paragraph (a) is permanently diverted under—
 - (i) A condition, or proposed condition, of an environmental authority mentioned in the Water Act 2000, Section 98; or
 - (ii) A water licence or proposed water licence under the Water Act 2000.

~~The~~ the watercourse as permanently diverted.

SLR (2022) identified two relevant watercourses in proximity to PTM:

- Isaac River.
- Cherwell Creek.

3.5.3 Modelling

A hydrological model was developed using the Watershed Bounded Network Model (WBNM), with the Isaac River and Cherwell Creek catchments totalling approximately 8,300km². WBNM hydrological inputs were adopted in accordance with the ARR 2019 Guideline. The 0.1% AEP (1000yr) design rainfall depths were sourced using the Australian Rainfall and Runoff 2019 IFD generation tool available from the Bureau of Meteorology (BoM).

The closest stream gauges to the site are located at Goonyella (130414A) and Deverill (130410A). However, these gauges did not have suitable data records to enable calibration of modelled hydrographs. Instead, the 0.1% AEP peak flows were validated using a scaled Flood Frequency Analysis (FFA) using the Water Monitoring Information Portal (WMIP).

The WBNM flow hydrographs were then applied to a two-dimensional hydraulic model (TUFLOW). Results extracted from TUFLOW included peak water surface levels and depths for the 0.1% AEP event. The accuracy of hydraulic model results were limited to the accuracy of the available topographic data sets. Further to this, consideration was given to the groundwater influence on the floodplain extent. However, SLR (2022) determined that groundwater would have no significant impact on the extent of the floodplain.

Further detail on the hydrologic and hydraulic model setup, inputs and assumptions can be found in Appendix 5.

3.5.4 Results

Peak water surface levels and depths for the 0.1% AEP event are illustrated in Figure 44. The results indicate that the southern portion of the final void interacts with the Issac River Floodplain. Given this interaction, the final landform includes a final landform embankment that prevents flood ingress (for events up to, and including the 0.1% AEP) into the final void. Flooding susceptibility and influence on closure landforms, along with mitigation strategies to manage risks presented by floodwaters, is discussed in Section 3.6.1.2.

~~Despite The proponent has~~ optimised the landform design to reduce the size of the residual NUMAs referenced in Section 3.4, ~~126D(3) of the EP Act is not applicable as transitional provisions apply.~~

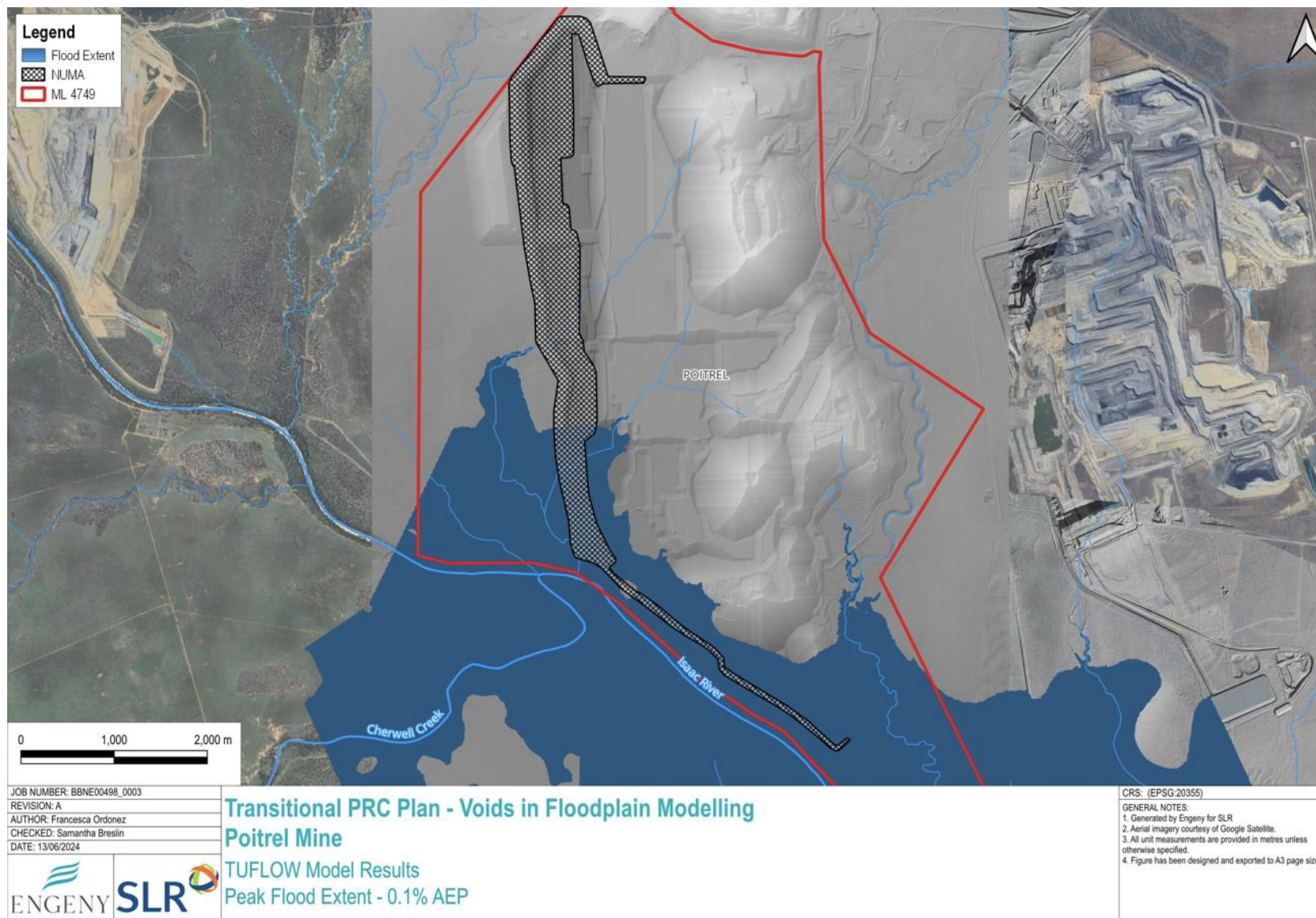


Figure 44 Peak Flood Extent – Voids in Floodplain – 0.1% AEP

3.6 Rehabilitation and Management Methodology

Legislative Requirement

In accordance with section 126C (1)(e) and (i), the rehabilitation planning part of the PRC Plan must:

- For each proposed post-mining land use for land, state the proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRC Plan Schedule.
- For each proposed non-use management area, state the proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRC Plan Schedule for the area.

PRC Plan Guideline (Section 3.6)

The proposed rehabilitation or management methodologies will underpin the development of the milestone criteria and support how the proposed PMLU will be achieved, or the NUMA will be managed. As per section 126C(1)(j) of the EP Act, the administering authority requires information describing how the proposed rehabilitation or management methodologies have been developed and will be implemented.

This section identifies a number of studies or reports that must be provided in the proposed PRC Plan. If any of the required information outlined below is not relevant to the specific operation, the applicant must provide justification in the PRC Plan outlining why the information is not required.

3.6.1 General Rehabilitation Practices

PRC Plan Guideline (Section 3.6.1)

This section outlines the range of information that the administering authority considers is necessary to underpin the development of the rehabilitation or management methodologies applicable to new and existing mines for most domains. The applicant must include the information as appendices to the rehabilitation planning part.

A series of technical studies have been completed to both inform final landform design and to address the general rehabilitation practices for PTM. Initial rehabilitation flood modelling, void water balance modelling, hydrogeological assessments and void geotechnical stability assessments were undertaken in an iterative manner to inform final landform design (Refer to Section 3.6.1.5).

The following studies were completed and/or updated based on the final landform:

- Rehabilitation flood modelling (Section 3.6.1.2).
- Void Closure Plan (Section 3.6.3) including:
 - Void water balance modelling
 - Void water quality modelling
 - Void geotechnical assessment
- Groundwater modelling (Section 3.6.1.1)
- Waste and Soils characterisation assessments (Section 3.6.1.3 and 3.6.1.4)
- Revegetation Plan (Section 3.6.1.8)
- Cover design (Section 3.6.1.6)

3.6.1.1 Hydrogeology

PRC Plan Guideline (Section 3.6.1)

Assess the hydrogeology of the site and all connected strata and develop a conceptual model of the mine site's groundwater systems. This information must be integrated into the design of rehabilitation strategies and choice of PMLU or NUMA.

A hydrogeological assessment has been undertaken to support the development of this PRC Plan. The detailed report – Hydrogeology Assessment: Poitrel Mine is provided in Appendix 3. PTM conducts monthly groundwater monitoring in accordance with EA condition I3 and EA Tables I1 and I2 to assess groundwater trigger levels. Additionally, an annual groundwater monitoring data review is conducted by a hydrogeologist (EA condition I5). The review includes the assessment of the groundwater levels and water quality data, and the suitability of the monitoring network. The review is a detailed report that assesses the impacts of mining on groundwater.

3.6.1.1.1 Hydrogeological Setting

The geological composition within PTM encompasses the Permian Rangal Coal Measures underlying the Triassic Rewan Group, with Quaternary alluvium deposits adjacent to the Isaac River. Key hydrostratigraphic units comprise of Cainozoic Sediments, the Triassic Rewan Group, and the Permian Coal Measures.

Groundwater movement primarily occurs within the Permian Coal Measures, mainly through interconnected cleats and fractures within coal seams, which act as the primary regional aquifer. However, the presence of low permeability overburden and interburden confines the flow. Notably, extensive deformation, including folding and faulting, has occurred within the Permian coal measures, leading to compartmentalization of groundwater systems, particularly due to northwest-southeast trending faults like the Isaac Thrust Fault and New Chum Fault.

The Cainozoic Sediments, including Quaternary alluvium and weathered regolith, form an interconnected hydrogeologic unit with significant lithological and stratigraphic heterogeneity. Groundwater within this unit generally flows towards the PTM mining area, influenced by topographic gradients, with potential losing conditions from the Isaac River to the underlying alluvium during flow periods.

The Triassic Rewan Group, acting as a regional aquitard, presents limited hydraulic connectivity with surrounding units due to its fined-grained nature, though some saturated horizons exist. Recharge predominantly occurs via leakage from overlying units, with low recharge rates due to low hydraulic conductivity.

Water quality varies across these units, ranging from moderately saline to highly saline, rendering it generally unsuitable for drinking purposes but potentially applicable for irrigation or stock use. Groundwater discharge primarily happens through evaporation from pit faces in mining operations.

3.6.1.1.2 Groundwater Recharge and Discharge

Recharge to the alluvium primarily occurs through stream flow and flooding, with rainfall directly infiltrating where clay barriers are absent. Alluvial groundwater levels correlate with rainfall, and discharge happens through evapotranspiration from riparian vegetation along the Isaac River, as well as baseflow contributions post-rainfall and floods. Private bores also contribute to groundwater discharge. Low hydraulic conductivity strata underlie the alluvium, limiting downward leakage. Perched water tables are observed where clay layers impede surface water percolation.

Recharge to non-alluvial Tertiary sediments and weathered strata is limited by low hydraulic conductivity material, hindering rainfall infiltration. Groundwater discharge from these strata occurs mainly through evapotranspiration, with some short-term baseflow to streams after wet periods. Vertical seepage is restricted by the presence of low hydraulic conductivity materials.

3.6.1.1.3 Groundwater Quality

Proportions of major anions and cations were analysed to determine the hydrochemical facies of PTM groundwaters. Durov diagrams (Figure 45 to Figure 47) showcase the anion-cation balance, pH, and EC from historical monitoring bore data, divided by aquifer.

In the Cainozoic Sediments (Figure 45), groundwater exhibits a Na-Cl type with a pH range from weakly acidic to weakly alkaline and an EC range from 13,800 to 29,800 μ S/cm.

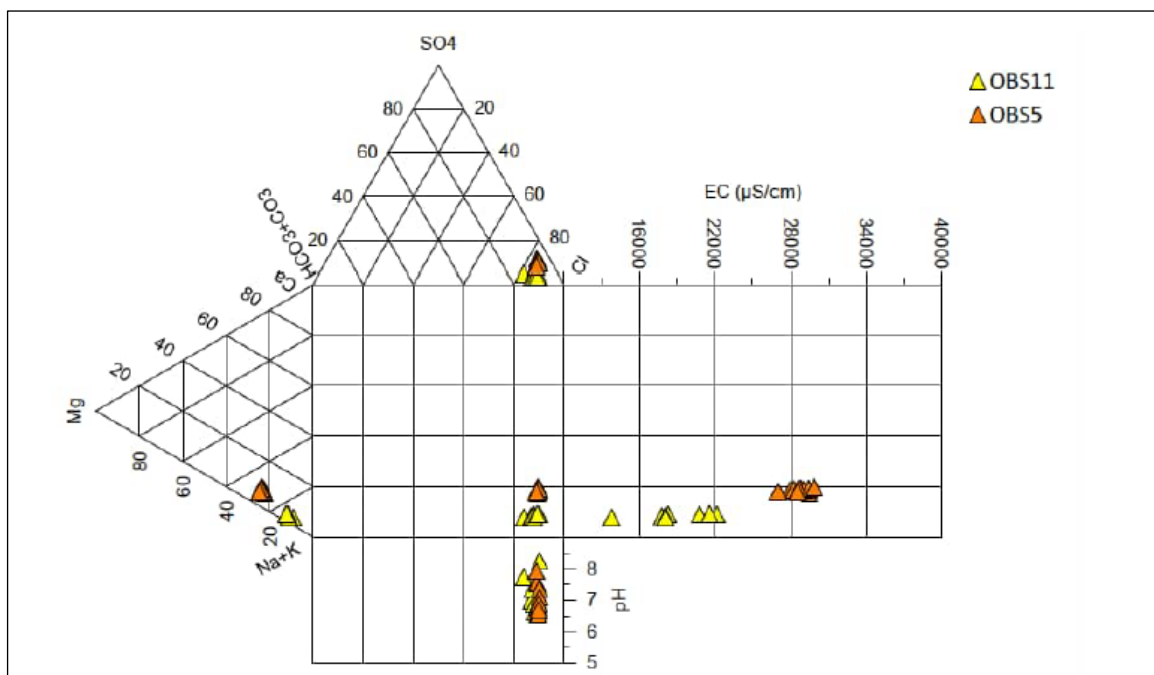


Figure 45 Durov Diagram – Cainozoic Sediments

Groundwater quality from two bores screened in the Rewan Group shows a Na-Cl groundwater type with pH range from weakly acidic to weakly alkaline and an EC range from 8,500 to 12,800 μ S/cm (Figure 46).

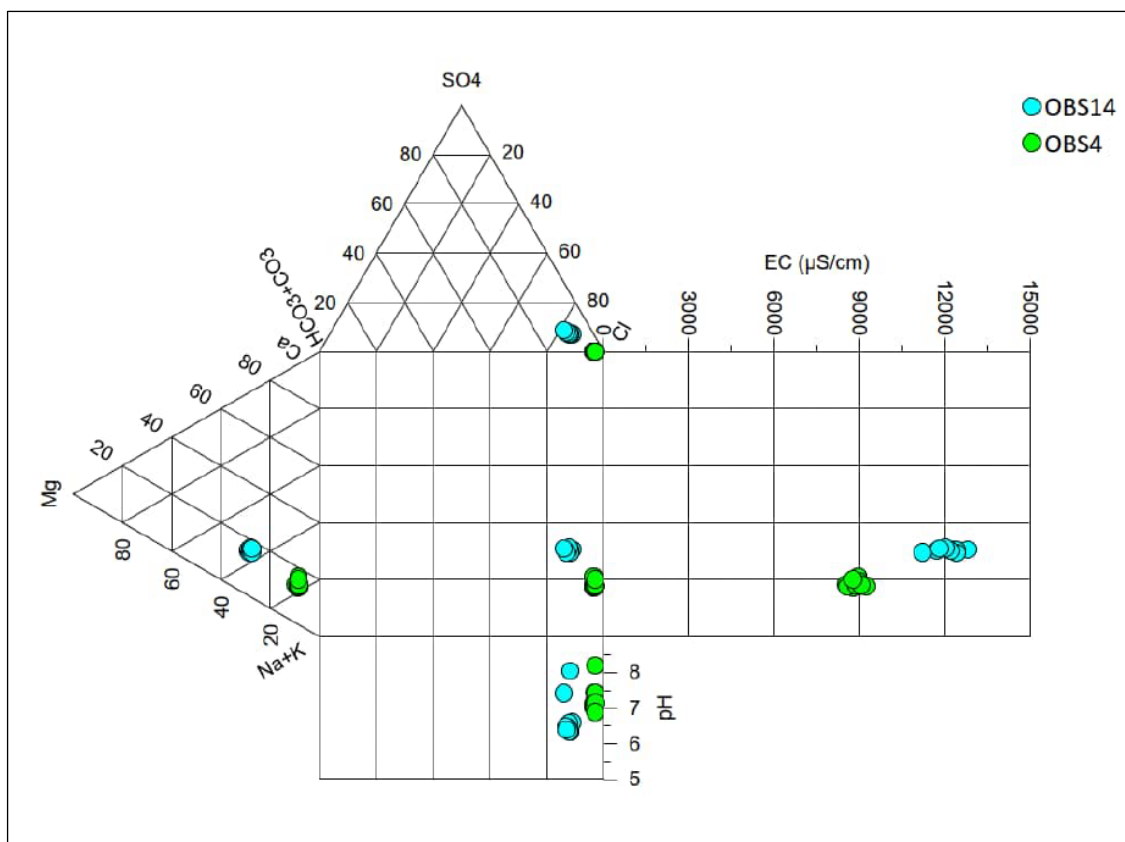


Figure 46 Durov Diagram – Rewan Group

Groundwater from Permian Coal Measures generally exhibits a Na-Cl type, aligning with findings from Cainozoic Sediments and Rewan Group bores. Exceptions include OBS2 and OBS10, displaying Na-HCO₃ type, possibly indicating recharge. pH ranges from weakly acidic to alkaline, while EC ranges from 830 to 30,500µS/cm (Figure 47).

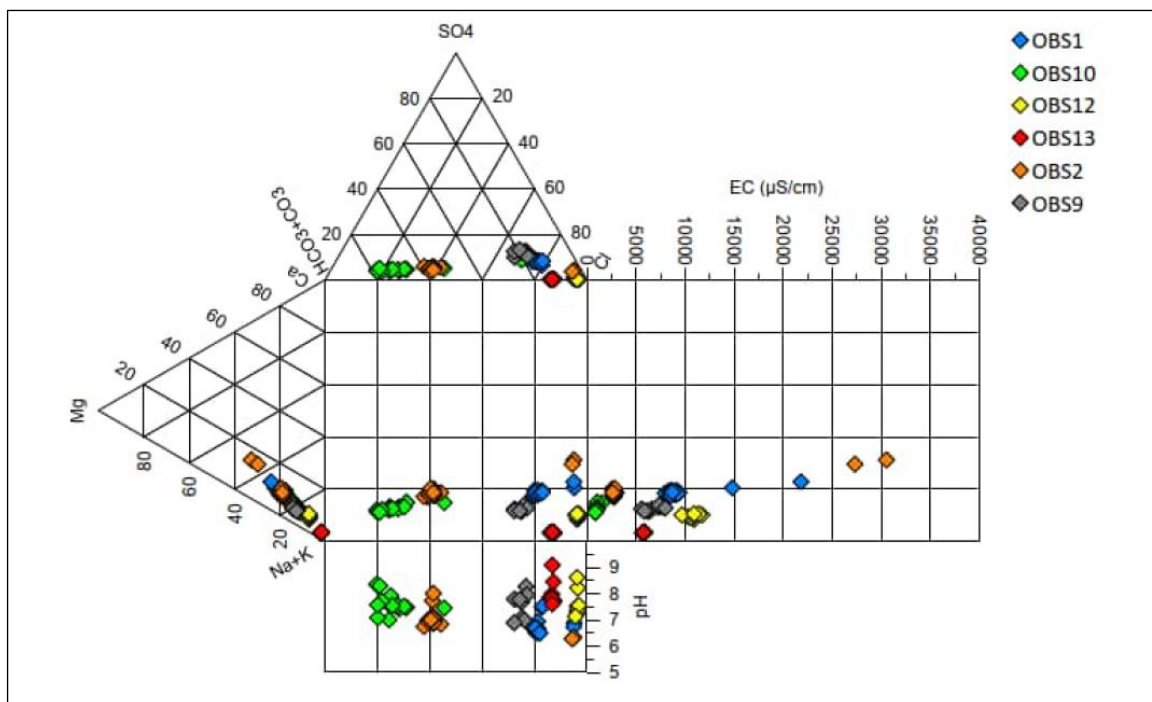


Figure 47 Durov Diagram – Permian Coal Measures

Salinity

Salinity, described by TDS concentrations, is crucial for water management. Figure 48 presents TDS data from monitoring bores across hydrostratigraphic units:

- Cainozoic Sediments: TDS ranges from saline to highly saline, averaging 16,961mg/L with a range of 7,550 to 26,500mg/L.
- Rewan Group: TDS varies from moderately saline to highly saline, averaging 6,725mg/L with a range of 4,910 to 20,400mg/L.
- Permian Coal Measures: TDS ranges from brackish to saline, averaging 6,687mg/L with a range of 506 to 7,210mg/L for Leichhardt and Vermont Seams. Interburden groundwater ranges from moderately saline to highly saline, averaging 3,984mg/L with a range of 1,570 to 21,400mg/L.

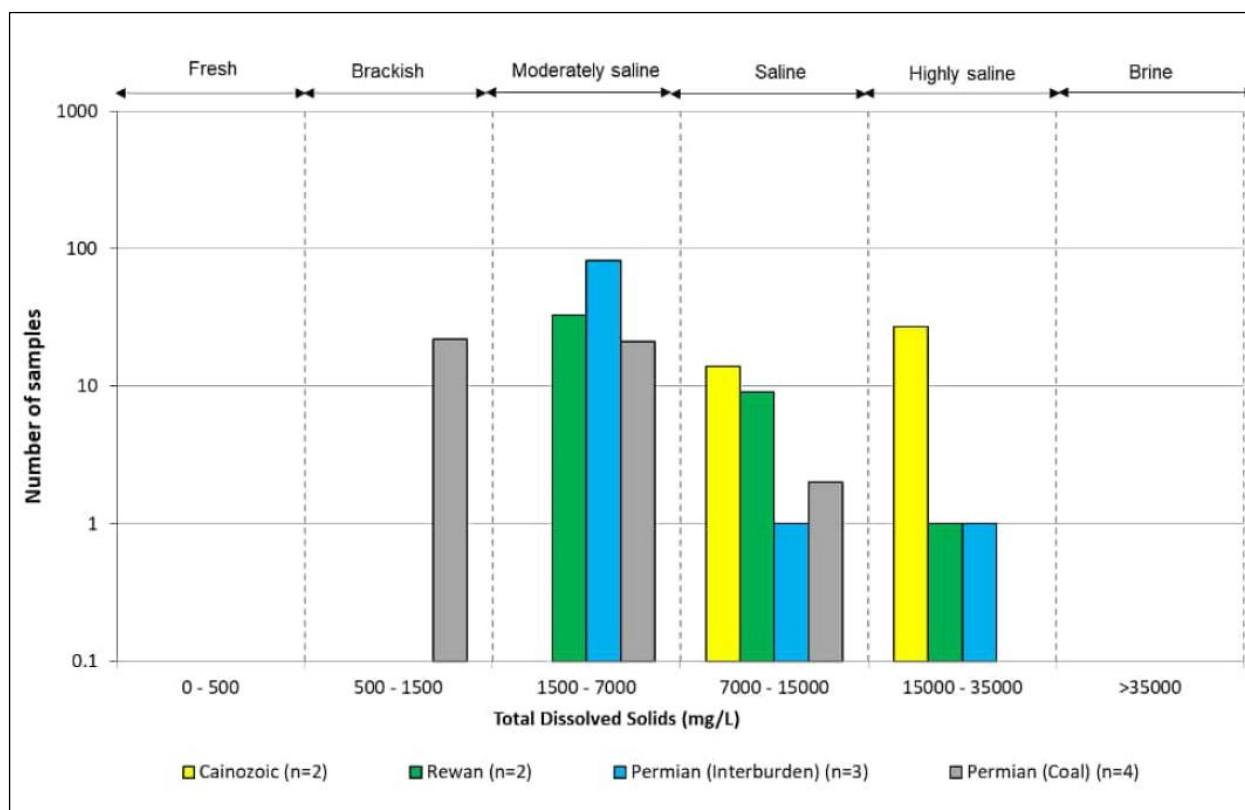


Figure 48 Salinity Ranking by Hydrostratigraphic Unit (Note: n = number of bores)

3.6.1.1.4 Groundwater Flow (Groundwater flow direction and velocity 4.2)

At PTM, the unconsolidated alluvial sediments of the Isaac River, along with other Cainozoic sediments (e.g., Tertiary sediments), and weathered regolith, form a single interconnected hydrogeologic unit, albeit with notable lithological and stratigraphic distinctions within.

Limited historic groundwater monitoring data is available from the Cainozoic sediments at PTM due to sporadic saturation occurrences. Five current and historic monitoring bores are installed into these sediments, with records prior to 2024. Four of these bores (OBS5, OBS7, OBS8, and SP_Levee_3) are installed into the unco of the Isaac River, while OBS11 is installed into the sediments of New Chum Creek. Historic water level monitoring data from these bores is depicted in Figure 49. Additionally, three recently installed EA monitoring bores along the southern boundary of PTM (SLR, 2024) provide groundwater level data, ranging between 184.2 mAHD (OBS17) and 182.1 mAHD (OBS15), with OBS19 reported as 'dry'.

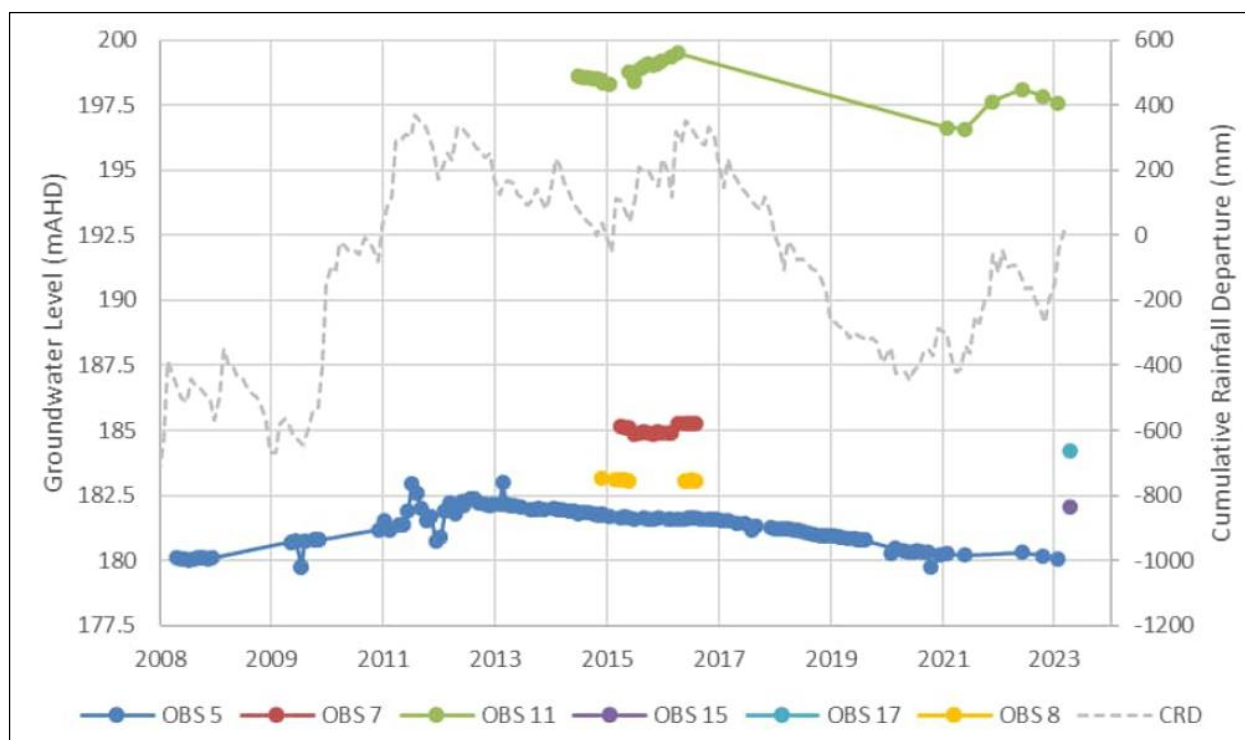


Figure 49 PTM Monitoring Bore Hydrograph – Cainozoic Sediment Aquifer

SLR (2020) analysed data from three bores installed into the Isaac River alluvium downstream of PTM, with groundwater elevations ranging from approximately 171 to 179 mAHd (14 to 16mBGL). Higher elevations were recorded in bores further upstream, indicating limited saturation, consistent with sporadically dry drillholes historically intersecting the alluvium in the PTM area. SLR (2020) also noted that the regolith is largely unsaturated, with saturation mainly confined to lower elevations along the Isaac River and its tributaries, where flow direction reflects topography, moving towards nearby drainage lines.

3.6.1.1.5 Groundwater Modelling

To support the assessment of potential groundwater impacts, numerical groundwater modelling was undertaken. Full details of this numerical model are included within the PTM Hydrogeology Assessment technical report (SLR, 2024) (Appendix 3). The groundwater modelling has been undertaken in a manner consistent with the Australian Groundwater Modelling Guidelines (Barnett et al., 2012) and in accordance with the IESC explanatory notes on uncertainty analysis (Middlemis & Peeters, 2018). The objectives of the modelling were to:

- Identify areas of potential risk, such as private supply bores or GDEs, where groundwater impact mitigation/control measures may be necessary post-closure and.
- Simulate the level and rate of recovery of the residual void lake, and the level and rate of mining-related groundwater drawdown recovery in the groundwater system surrounding the residual void.
- Assess groundwater inflow to the final landform's residual void.

The PTM numerical groundwater model was developed to assess the potential impacts on the groundwater system from operational changes. This model was utilised in this assessment with some adjustments required to assess the post-closure conditions. The post-closure condition considers the approved area, the accumulation of water within the residual voids and the rebound of the regional groundwater level.

Potentiometric Surface Mapping

Groundwater levels in the Cainozoic (Alluvium) sediments (represented by OBS5) show a marginal long-term declining trend since 2014, likely influenced by mining activities. Groundwater in the Cainozoic (Tertiary Unconsolidated Sand) sediments (represented by OBS7 and OBS8) demonstrate relatively stable water levels, with monitoring ceasing when they became 'dry' in 2017. OBS11 (also in the Cainozoic (Unconsolidated Sand) sediments shows a response to rainfall trends. Groundwater flow direction in the

Cainozoic sediments appears consistent with that of the Isaac River, while OBS11 suggests a north to south flow direction towards OBS8, consistent with New Chum Creek's surface water flow direction.

SLR (2020) developed a potentiometric surface for the Isaac River alluvium near PTM downstream, utilizing data from Winchester South, Moorvale South, and Olive Downs Projects. AGE (2019) provided a surface for upstream. Groundwater modelling by SLR (2020 and 2021) also contributed to potentiometric surfaces. An updated surface incorporating PTM monitoring bore data and SLR information shows a southeasterly groundwater flow direction, mirroring the Isaac River. Elevations range from around 185 mAHD in the southwest PTM corner to approximately 180 mAHD downstream. Local modifications are observed near existing PTM operations, supported by SLR's modelling, indicating PTM's influence on the alluvial groundwater system. Comparison with geologic thickness suggests limited alluvial saturation and indicates hydraulic connectivity between alluvium and underlying Tertiary/weathered units. AGE (2019) noted similar flow patterns west of PTM, suggesting local changes in permeability and recharge.

3.6.1.1.6 Hydraulic Testing

Site-Specific Hydraulic Conductivity Data

Advisian (2018) highlighted the absence of site-specific aquifer hydraulic testing at PTM until GHD (2020) conducted tests. GHD's testing involved one bore in the weathered Rewan Group (MB20PTM04T, now OBS14) and two in the Permian strata (MB20PTM02P and MB20PTM03P, now OBS12 and OBS13), revealing very low formation hydraulic conductivity.

Slug testing by SLR (2023a) followed, encompassing 15 bores: 11 in the Permian Coal Measures, two in the weathered Rewan Group, and two in the Cainozoic Sediments. Attempts on two additional Permian bores failed due to extremely low hydraulic conductivities. See [Table 38Table 37](#) for a summary of results.

Table [383837](#) Summary of Hydraulic Conductivity Estimates from Site-Specific Testing

Hydrogeologic Unit	Number of Bores Tested	Minimum Hydraulic Conductivity (m/day)	Maximum Hydraulic Conductivity (m/day)	Average Hydraulic Conductivity (m/day)
Cainozoic	2	0.003	0.007	0.006
Rewan	2	0.001	5.03	3.24
Permian	11	0.001	2.80	0.33

The results show a wide range of hydraulic conductivity, with the limited number of Cainozoic Sediments bores showing relatively low hydraulic conductivities typical of clay dominated sediments. Results for the Permian Coal Measures show a three orders of magnitude spread of hydraulic conductivity. Results for the Rewan Group also show a large range, indicative of a higher hydraulic conductivity for the weathered part of the formation.

Regional Hydraulic Conductivity Ranges

A significant record of aquifer hydraulic testing data from neighbouring mines and projects with similar hydrogeologic units as PTM provides valuable insights. This data is deemed representative of PTM's unit hydraulic properties due to similar geologies.

Figure 50 illustrates a histogram of horizontal hydraulic conductivity spread from field testing at adjacent/nearby sites like Daunia Mine, Winchester South Project, Olive Downs Project, and Moorvale South Project, compared to documented values in literature. Results show that PTM's hydrogeologic units fall within the range of data collected across the Bowen Basin. Additionally, the site-specific testing results ([Table 38Table 37](#) above) align with regional and literature values in Figure 50, indicating consistency between site-specific and regional datasets.

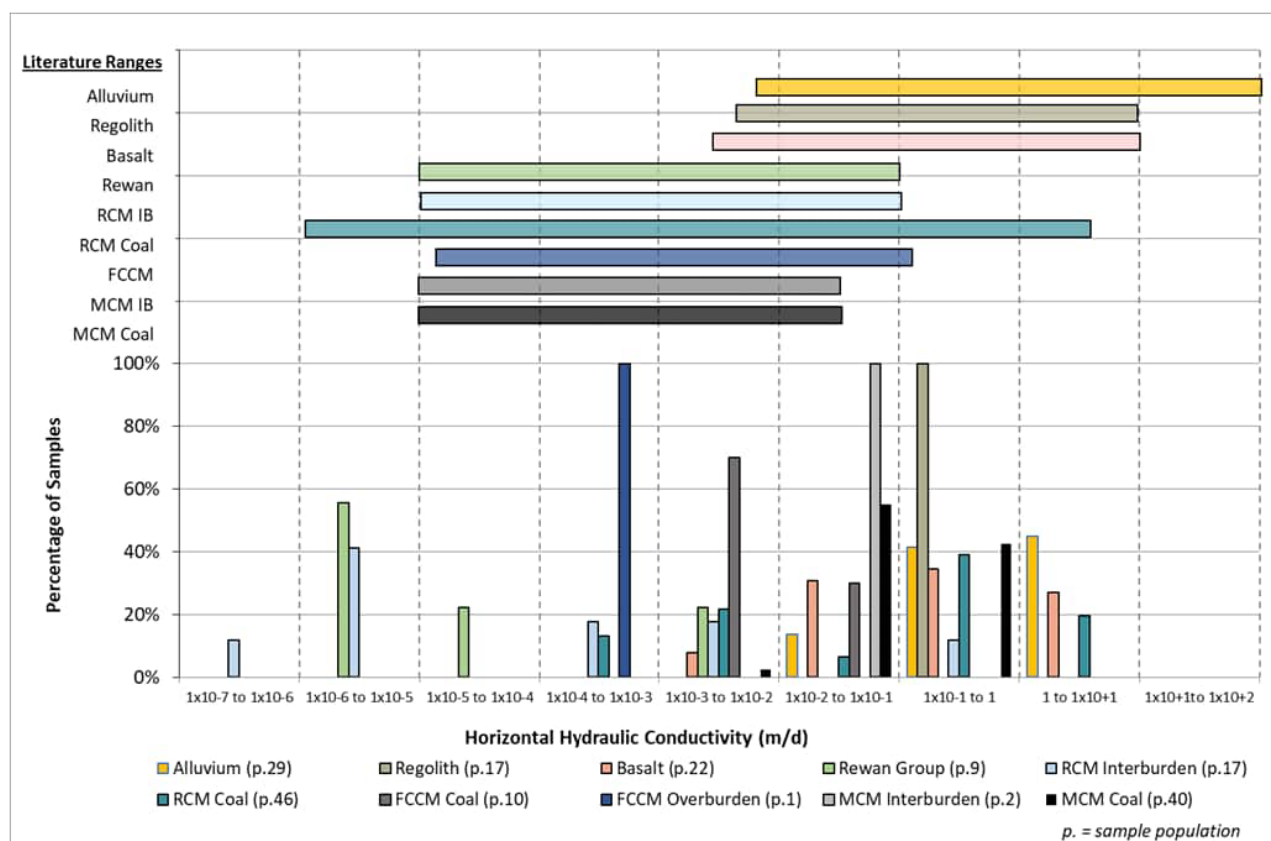


Figure 50 Horizontal Hydraulic Conductivity Ranges

3.6.1.1.7 Predicted Groundwater Levels

Groundwater levels around the final void are influenced by predicted void lake levels (Refer to Section 3.6.3), regulated by evaporation balancing surface and some groundwater inflows, including from spoil and natural formations. This relationship indicating that groundwater levels correspond to lake levels, primarily controlled by surface water fluxes and evaporation.

The water table near the residual void is expected to remain low over time due to continuous groundwater discharge to the void lake, governed by its elevation. This maintains inward groundwater flow gradients post-mining. There's a steep gradient from natural formations, while the gradient from spoil is relatively flat. This difference is partly due to a greater residual head gap between groundwater in natural formations and the void lake, compared to that of spoil, along with lower hydraulic conductivities in the natural geology.

The Alluvium and Regolith are expected to remain mostly dry throughout the PTM Area, with some saturation in specific southern and eastern regions, respectively. Groundwater levels in the Leichhardt and Vermont Seams are forecasted to remain low in the long term due to continuous groundwater discharge towards the void lake, regulated by its elevation.

Predictive hydrographs of groundwater can be found in Section 6.2.5 of Appendix 3 and demonstrate groundwater level changes over time for Leichhardt and Vermont Seams of the Permian Coal Measures, just outside (west) of the residual void due to the void's significant strike length. Additionally, the hydrographs indicate the following:

For the area west of the northern end of the void:

- At hydrograph site Permian1, lake levels are predicted to recover to within about 6m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.
- At hydrograph site Permian2, lake levels are predicted to recover to within about 2m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.

For the western area of the central void:

- At hydrograph site Permian3, lake levels are expected to recover to about 11m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.

- At hydrograph site Permian4, lake levels are forecasted to recover to approximately 11m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.

For the western area of the southern void:

- At hydrograph site Permian5, lake levels are anticipated to recover to about 13m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.
- At hydrograph site Permian6, lake levels are projected to recover to approximately 11m of the Leichhardt Seam and Vermont Seam groundwater elevation just outside the void.

The hydrograph findings for the Leichhardt and Vermont Seams reveal that while model predictions indicate persistent inward flow gradients towards the residual void over the long term, the differences between predicted void lake levels and groundwater levels in seams immediately adjacent to the void are relatively minor in certain instances, notably in Permian1 and Permian2 hydrographs located at the northern end of the void. It's important to note the absence of identified groundwater environmental receptors in these seams, minimizing environmental risk from any void outflow. Moreover, the net flux over the post-mining period remains inward for the void, indicating that any outward flux is eventually recaptured by the void.

To increase the head gradient towards the residual void lakes from the surrounding groundwater system, reducing predicted void lake levels by deepening the void or limiting surface water inputs is suggested. However, since surface water inputs contribute around 97% of the total volumetric inflow to the void, groundwater inflow has a relatively minor impact on void lake formation. Further backfilling of the void could elevate the void lake level and increase the potential for outflow to the groundwater system, leading to unfavourable environmental outcomes, particularly if beneficial evaporative control of groundwater gradients is compromised.

3.6.1.1.8 Particle Tracking

To assess the fate and movement of water particles within the mine closure landform, including the residual voids, particle tracking using mod-PATH3DU was undertaken. Particle tracking simulates the potential pathways and destinations of water and any contaminants that may be carried by the source water during the post-closure simulation period.

Initially, particles are positioned on the final landform surface and within the residual void, and then released at the onset of the post-mining simulation. Notably, the mod-PATH3DU code automatically moves particles from the surface to the shallowest saturated layer at the simulation's outset. In many instances, this corresponds to the Leichhardt seam due to the unsaturated nature of shallow layers (Layers 1 and 2) across much of the area initially.

The analysis reveals that particles initially situated within shallower saturated layers tend to migrate progressively towards deeper layers representing the Leichhardt and Vermont Seams or backfilled spoil over the post-mining period. Most particles converge towards the void lake, with many being captured within it. Additionally, particles originating from the void, or the Mine Infrastructure Area (MIA) are also depicted as being retained within the void.

Overall, the simulation suggests that groundwater, including that within backfilled spoil and the void, remains within the final landform over the long term, with no significant flow observed towards the receiving environment. However, it's noted that while particle paths generally align with predicted head gradients, there are instances where particle directions seem contrary to the head contours/gradients. This divergence may be attributed to transient head changes occurring during the recovery simulation, as the recovery process progresses over the 2309-year period.

3.6.1.1.9 Residual Void Groundwater Flow

The final predicted groundwater inflows to the residual void are depicted in Figure 51. These inflows are divided between those entering through spoil and those entering through natural geological formations. In the first 50 years post-mining, groundwater levels are expected to remain suppressed, especially in the spoil yet to saturate significantly. During this period, fluxes to the void are mainly influenced by:

- The day-on-day climatic simulation within the WSP (2024) water balance model.
- How the daily timestep water balance results are translated to the groundwater model's more simplified stress period setup.

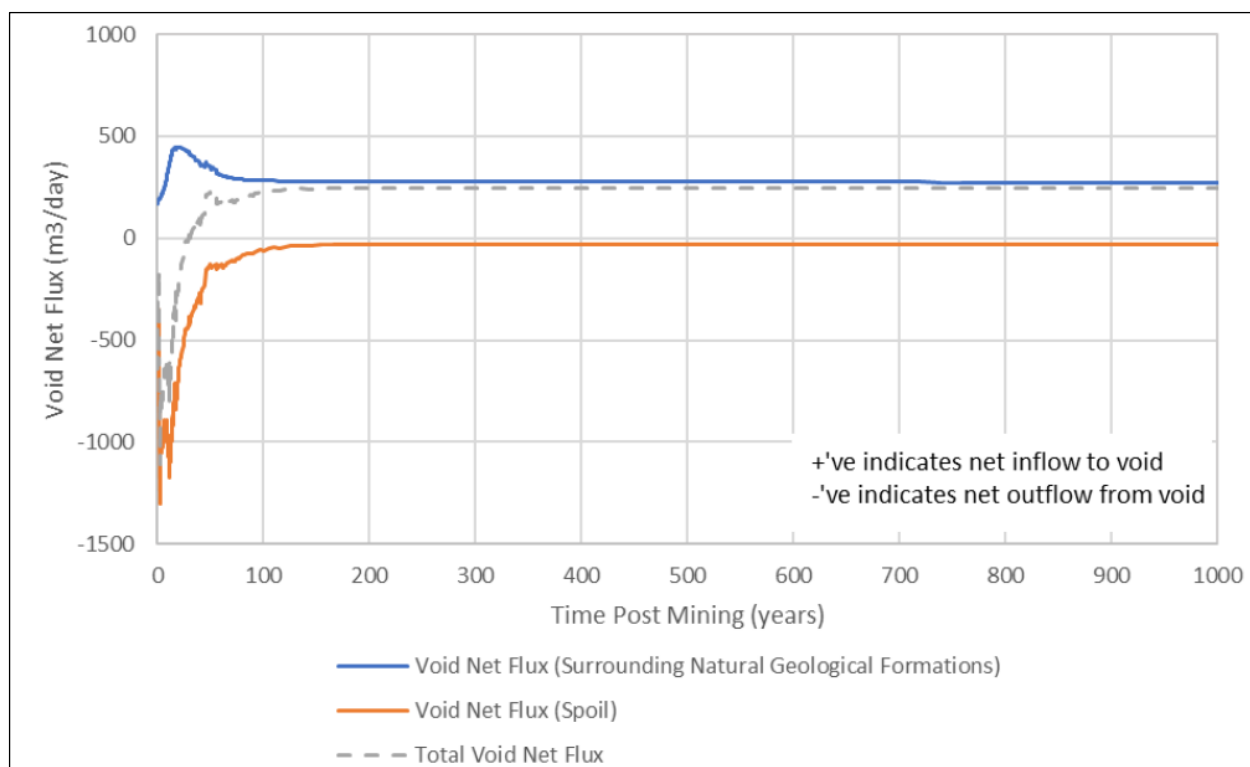


Figure 51 Predicted Void Groundwater Inflows – Ramp 10/20/30/40/50 Residual Void

The groundwater model predicts variable outflows from the void to the spoil and inflows from natural geological formations. During these periods, surface water from rainfall captured in the residual void per the WSP water balance model (Refer Section 3.6.3) is expected to seep into the spoil as groundwater levels slowly recover. All outflows from the void during this time are predicted to be directed to the spoil, with no outflow to natural geological formations. Further backfilling of the void above the groundwater level is cautioned against, as it may worsen environmental outcomes by creating a hydraulic gradient towards the surrounding groundwater system, facilitating discharge. Predicted equilibrium groundwater fluxes to the void are minimal compared to surface water contributions, representing approximately 3% of the total volumetric inflow to the void's water balance.

3.6.1.1.10 Post-mining - Conceptual Site Model Summary

A conceptual hydrogeological model (CHM) has been established for the PTM Area depicting the groundwater interactions with the mine closure landform including the residual void. The CHM key findings, relevant to post-mining groundwater impacts from the closure state landform, are as follows (SLR, 2024):

- Formation of a residual void lake was predicted, with lake water levels stabilising below both pre-mining groundwater elevations and shallow post-Permian strata including the base of surficial weathering and shallow hydrostratigraphic units (i.e., alluvium, Tertiary units and weathered regolith).
- Inward hydraulic flow gradients towards the residual void will be maintained within the RCM upon stabilisation of groundwater and residual void lake levels. This is driven by evaporative losses from the void lake, with no outflows of water to the surrounding hydrostratigraphic units predicted to occur.
- Infiltration of rainfall through in-pit spoil emplacements will continue to be captured in the residual void or remain within the spoil.
- There will be little to no impact on surficial aquifers, including alluvial aquifers beyond what has already been predicted at the time when mining is anticipated to end.
- There will be little to no impact on environmental or anthropogenic receptors.

See Figure 52 for a visual representation of the model.

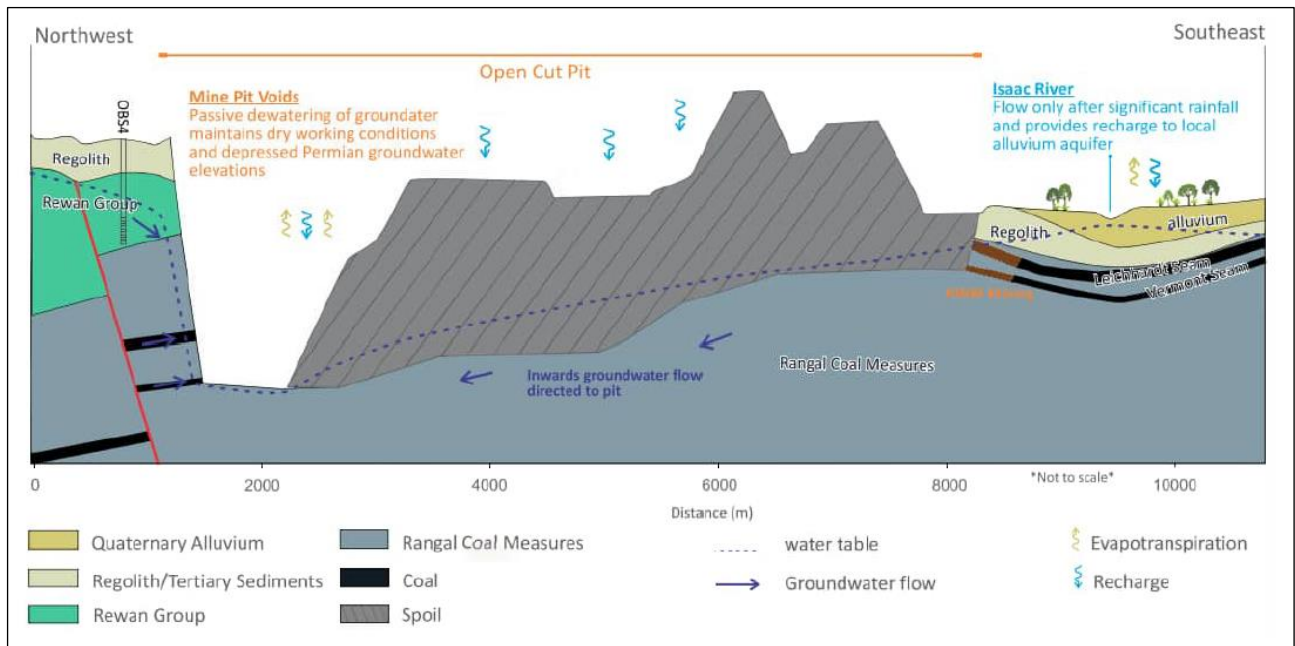


Figure 52 Conceptual Hydrogeological Model of PTM Groundwater System – (End of Mining)

3.6.1.2 Flooding Assessment

PRC Plan Guideline (Section 3.6.1)

Section 3.4 of this guideline requires flood plain modelling for the purpose of voids located within a flood plain being rehabilitated to a stable condition. In addition to this, the applicant must also assess the flooding susceptibility and influence across the site. If flooding is a consideration, develop a hydrologic model of the catchment and a hydraulic model of the proposed mining area. Knowledge of flooding is integral to the rehabilitation planning process, including the placement and design of mine domain.

A Rehabilitation Flood Assessment has been undertaken to support the development of this PRC Plan and is included in Appendix 10. As per Section 3.6.1 of the PRC Plan Guideline, a hydrologic model of the catchment and a hydraulic model of the proposed mining area was developed to address the following requirements:

- The location of domains in relation to potential flood levels for the 1%, 0.1% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF).
- Alteration of flow upstream and downstream.
- Model flood levels (including probable maximum flood levels) for a range of design storm events.
- Develop a flooding risk profile.

3.6.1.2.1 Flood Behaviour and Rehabilitation Areas

The flood modelling results have been used to identify locations where floodwaters from 1% AEP, 0.1% AEP and PMF events in the Isaac River, New Chum and Cherwell Creek catchments interact with the final landform (refer Appendix 10).

The final landform embankment (RA4) between the Isaac River and R40/R50 Pit provides flood immunity from 1% and 0.1% AEP flood events. However, floodwaters from a PMF event overtop the embankment and enter the R40 Pit portion of the residual void (refer Figure 54).

Some ponding occurs at the toe of Ramp 10S, 31 and 40 final landforms. This is considered temporary and would only occur during and immediately after rainfall events. It may also be the result of poor integration of conceptual final landform design surfaces with existing LiDAR within the TUFLOW model. During landform establishment (RM3), detailed engineering design will eliminate the potential for ponding, by rendering the areas free-draining. The instances of ponding are located in topographically favourable areas, whereby minor landform reshaping / grading toward existing watercourses will eliminate the ponding. The risk of long-term or permanent ponding is low.

No stream velocities in excess of 1.5m/s occur against or on reshaped final landforms in events up to and including the 0.1% AEP. Subsequently, the risk of erosion via floodwaters is low. Stream velocities in excess of 1.5m/s are confined within the modelled undisturbed watercourse channels, and within the New Chum Creek diversion channel, and ultimately aid in maintaining a sediment regime consistent with watercourses in the region. As discussed in Section 3.6.1.7.3, the New Chum Creek Diversion is permanent, with ongoing monitoring demonstrating that the diversion is trending towards achieving the water license outcomes, specifically Outcome 3, that the *hydraulic characteristics of the permanent watercourse diversion are comparable with other local watercourses and are suitable for the region in which the watercourse diversion is located*. These outcomes will be achieved and confirmed through RM6, where an AQP will provide certification confirming that RA7 and RA9 is performing in accordance with the DNRME Guideline: *Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000* (OSW/2019/4599).

The flooding assessment did not identify any risks related to surface water on reshaped landforms. For waste rock dumps and topsoil dumps (RA5 and RA6), engineering design of the landforms will ensure that surface water is managed in a way that limits erosion and allows establishment of vegetation. Section 3.6.1.5 describes this approach in more detail, with erosion protection measures proposed for any areas of concentrated surface water flow or gradient transition points. Surface water from landforms will be directed either to the void, or existing watercourses.

3.6.1.2.2 Alteration of Flows

Hydraulic modelling undertaken has considered flows prior to the establishment of PTM, against the post-mining final rehabilitation landform. Final landform flood modelling has included the embankments and diversion that are intended to remain in the final landform concept design. This model was developed as a two-dimensional TUFLOW model and demonstrates the following peak flow results for 1% AEP, 0.1% AEP, and PMF flow events. The model boundary was large enough to capture potential alteration of upstream and downstream flows.

Consideration has been given to pre-mining and post-mining flood scenario peak flows; however, since two separate flood models were used for both pre- and post-mining, there are limitations with explicitly comparing quantitative results.

No stream velocities in excess of 1.5m/s (initial risk-based indicator for erosion/scour potential against final landforms) occur in flood events up to and including the 0.1% AEP against the built final landform. It is expected that the final landform is likely to have low erosion/scour risk following establishment of vegetation.

Stream velocities exceed 1.5m/s in the PMF event against the final landform embankment. The final landform embankment adjacent to the Isaac River has been divided into two portions for the purposes of the flooding assessment. A northern section which protects the R40 Pit void that will remain as part of the final landform and a southern embankment which protects the R50 pit void that will remain as part of the final landform as per Figure 53.

3.6.1.2.3 Flooding Risk Profile

1% AEP, 0.1% AEP, and PMF flood events have been assessed to determine the flood risk profile for the final landform. The following outcomes are noted:

- The final landform embankment between Isaac River and R40/ R50 Pit provides flood immunity for 1% and 0.1% AEP flood events in the Isaac River.
- The configuration of the final landform and the out of pit dumps located on the eastern side of the site (adjacent to Ramp 10, 10S, 31 and 50) prevents flood ingress to the final void from events up to and including the PMF.
- Some ponding occurs adjacent final landforms, though it is expected that this would be temporary during, and immediately after rainfall events. Following removal of infrastructure (RM1), and landform reshaping (RM3) these areas will be rendered free draining.
- No stream velocities greater than 1.5m/s occurred against landforms in flood events up to and including the 0.1% AEP. It is expected that the final landform is likely to have low erosion/scour risk following implementation of erosion controls and the establishment of vegetation.
- Stream velocities exceed 1.5m/s in the PMF event against the final landform embankment. Events less frequent but of greater magnitude (i.e. rarer than the 0.1% AEP) may therefore present an erosion/sour risk to the embankment.

Monitoring of the landform embankment (RA4) prior to and during closure will assist in identifying protection methods to reduce the erosion/scour risk.

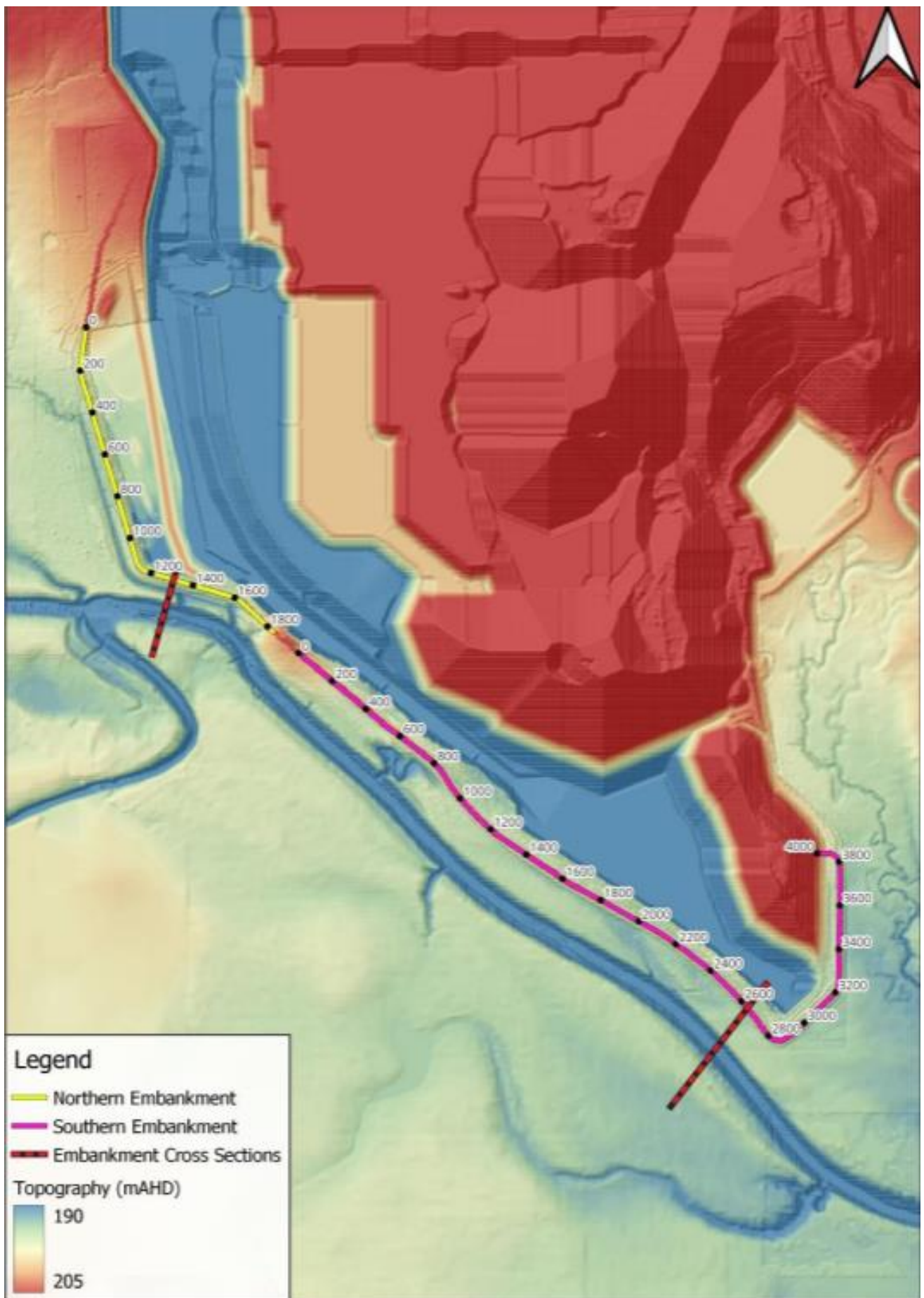


Figure 53 Landform Embankment Sections

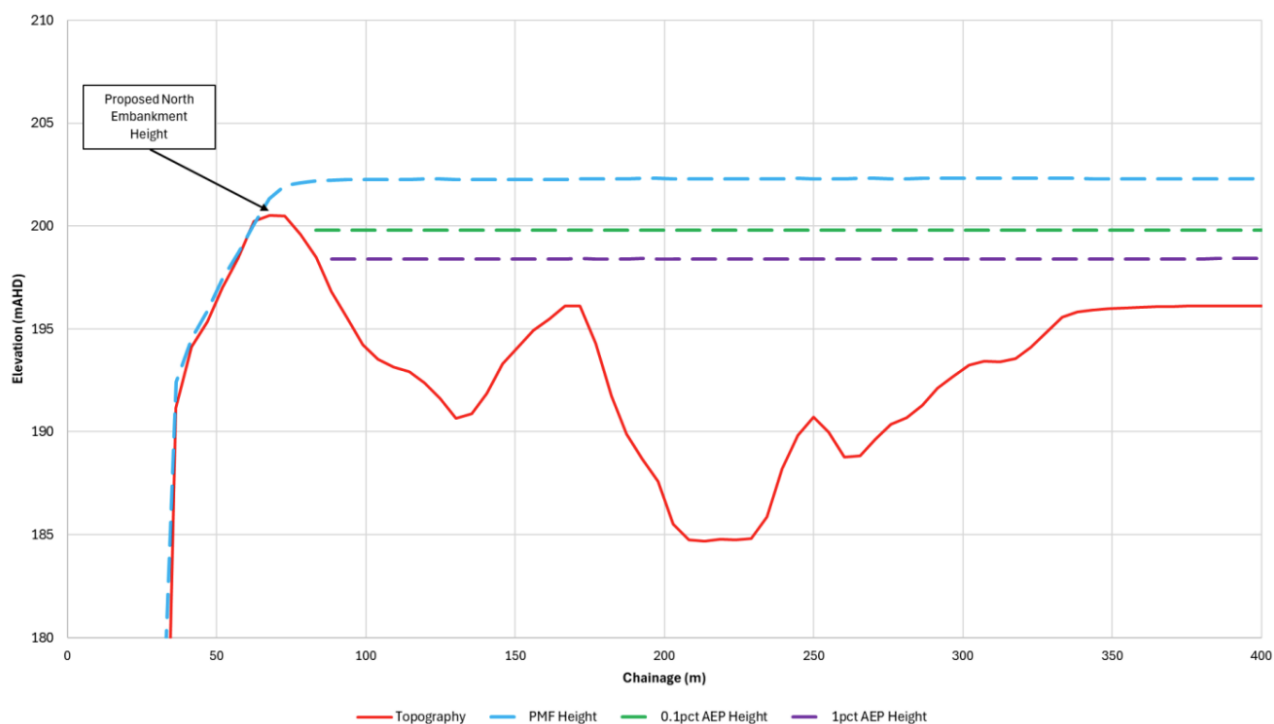


Figure 54 Northern Embankment - Cross Section at Chainage 1300 along Final Landform Embankment

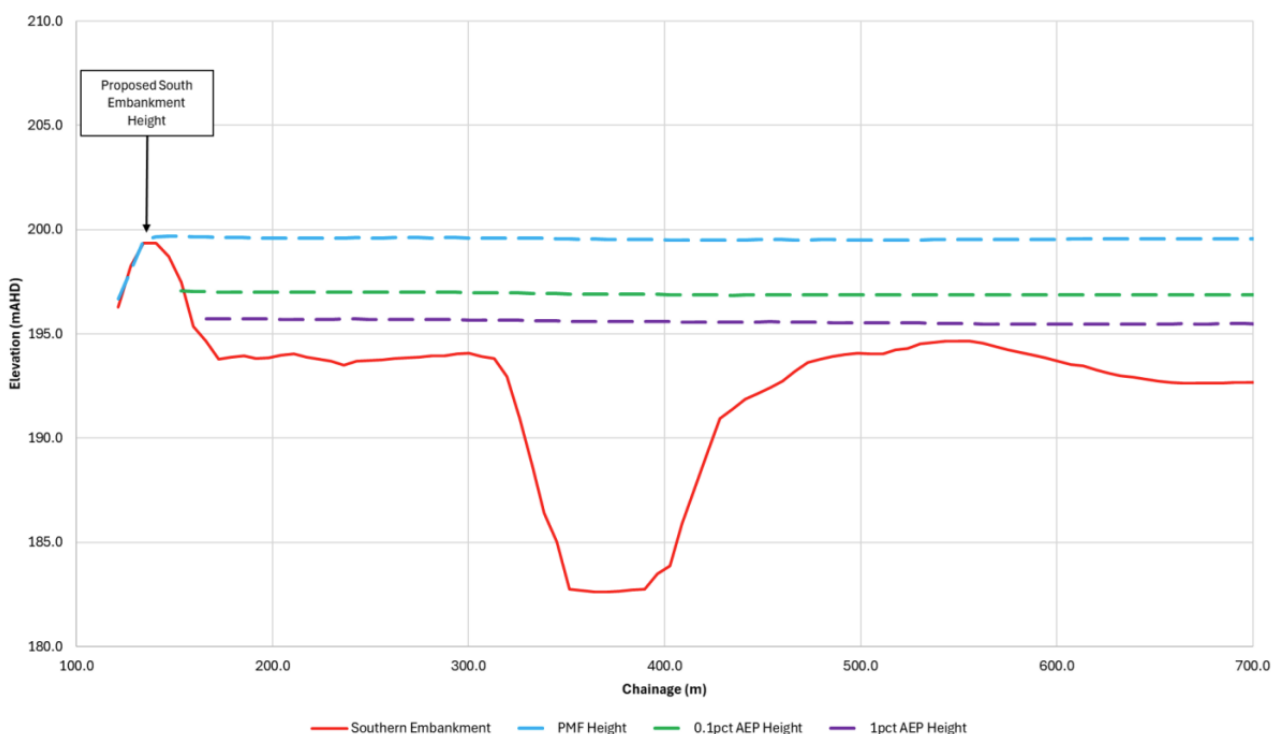


Figure 55 Southern Embankment - Cross Section at Chainage 2600 along Final Landform Embankment

3.6.1.3 Waste Characterisation

PRC Plan Guideline (Section 3.6.1)

Characterise mine wastes in a report that describes the likely physical behaviour and chemical reactivity of the waste materials under the conditions in which they would be stored. The report must address the constituent elements present, and their likely future speciation and mobility.

All mined material should be classified on its propensity to be potentially acid or non-acid forming, to generate neutral metalliferous or saline drainage, and its susceptibility to weathering.

A Mine Waste Characterisation Report (MWCR) (RGS, 2024) has been developed which summarises the chemical and physical properties of the mined material at PTM, and describes relevant management measures, and to inform rehabilitation strategies relevant to the proposed PMLUs. The MWCR is attached to this PRC Plan as Appendix 6.

All mined material has been classified based on its propensity to be potentially acid or non-acid forming, to generate neutral metalliferous or saline drainage and its susceptibility to weathering.

The deposit at PTM occurs in the Late Permian Rangal Coal Measures in a drag syncline within the Burton Range fault system. PTM has three separate rock units: Permian rocks, Tertiary sediments, and post-Tertiary sediments. The regional geology is a basin-like structure with seams dipping gently to the west. Two major coal seams have been identified, the Leichhardt and the Vermont seams.

Overburden consists of silty claystones and clayey to silty sandstones of low to medium strength along occasional thin bands of siderite-cemented siltstone and sandstone. The depth of weathering is typically 15 to 20m, often demarcated by contact with a coal seam or ply. Weathered coal measures are usually leached and oxidised. In spoil dumps, coal measures rock fragments typically weather to sandy and cobbly clay

The following section summarises the characterisation of the materials, the detailed analysis is included in the MWCR (Appendix 6).

3.6.1.3.1 Geochemical Classification of Spoil

The sampling of representative spoil materials (consisting of overburden, interburden, and partings) was conducted by collecting drill core materials. The first drilling program where spoil materials were characterised included 21 holes that were drilled as a requirement for the 2005 EIS. A more recent drilling campaign (2022) comprised 3 new drill holes and 244 samples. The drill hole locations of both the historical and recent drilling campaigns are shown in Figure 56.



Figure 56: Historical (2005) and FY22 drill hole locations (2022)

Geochemical assessment of the 2005 drill hole samples comprised soil quality testing and multi-element assays. The geochemical analyses performed on the 2022 drill hole samples is discussed in the following sections.

Acid Base Accounting

pH: The pH_{1:5} values for the overburden, interburden, and partings samples (n=244) are variable and range from 4.5 to 9.5, with a median value of 9.4 (Figure 57). Five samples (or 2 %) from drill hole 171870 are below pH 7.0, although this seems to be localised to a relative level (RL) between 135 and 145m and is associated with Leichhardt coal plies (L3 and L4). The remaining samples (98 %) are typically above pH 7.0 and are expected to add some alkalinity to contact water.

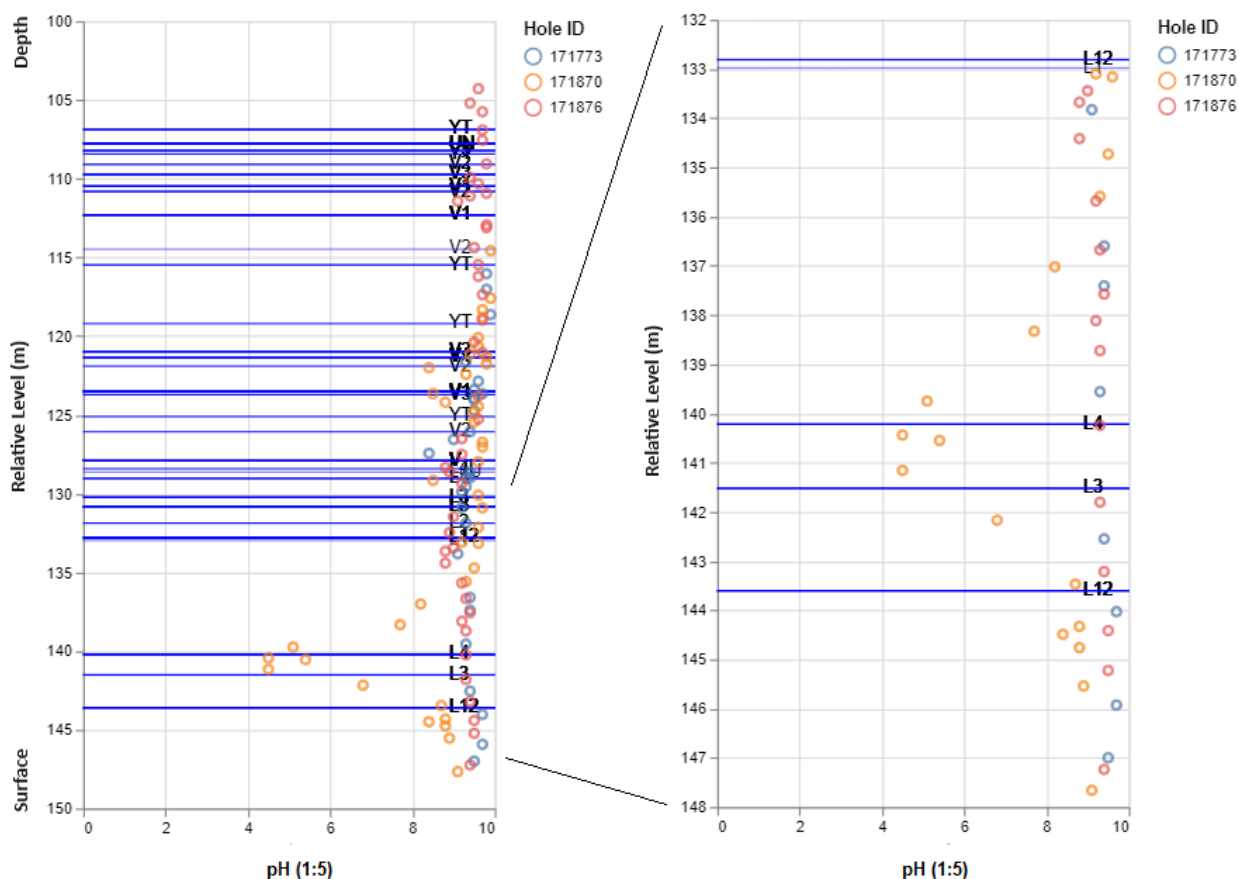


Figure 57: pH results for overburden, interburden, and partings

EC: The electrical conductivity (EC_{1:5}) values for the overburden, interburden, and partings samples are variable, range from 34 to 625µS/cm and are typically low (median 264 µS/cm) (Figure 58). Slightly higher EC values (>400µS/cm) are associated with the Yarrabee Tuff (YT) between RL 114 to 121m. Materials near coal seams typically have low EC (<400µS/cm), with the exception of one sample with 625µS/cm near L3.

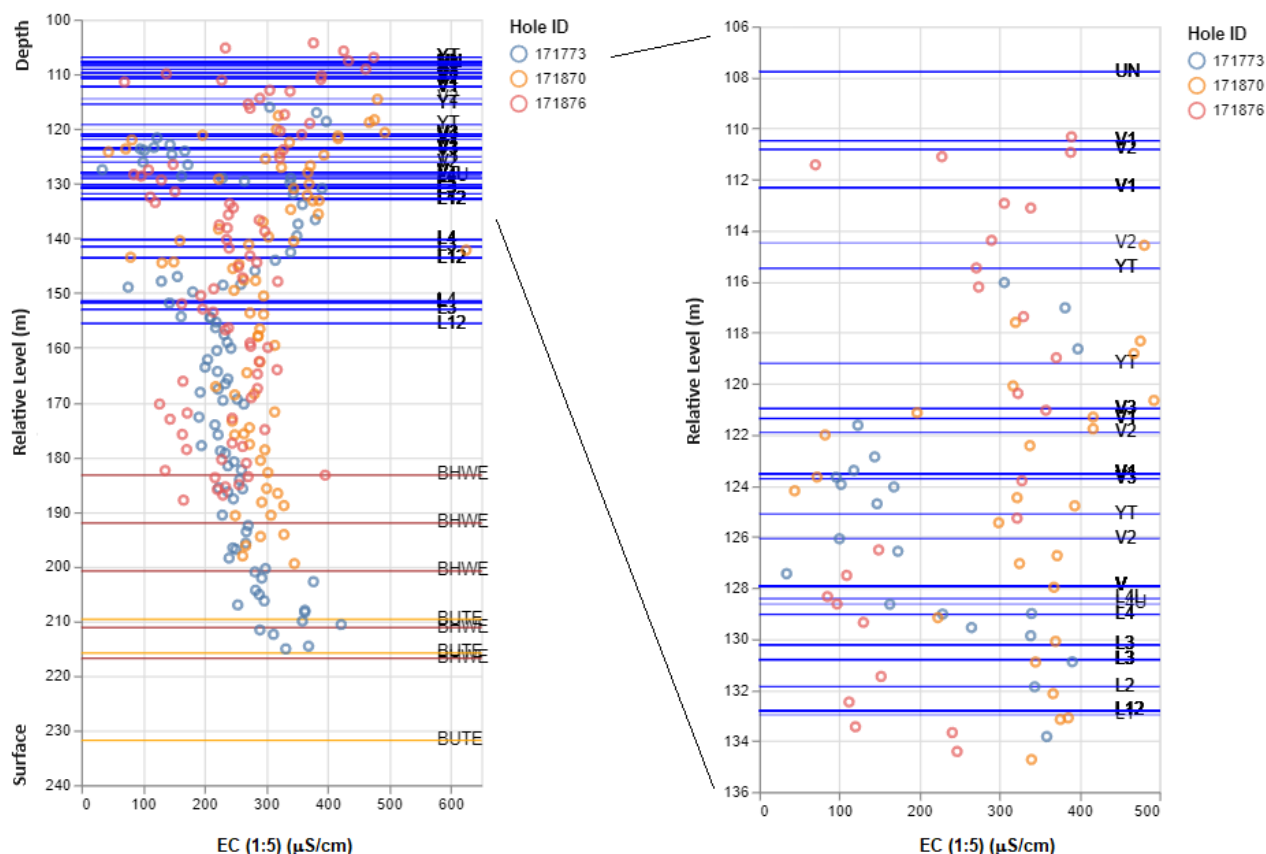


Figure 58: EC results for overburden, interburden, and partings

Total S: The total sulfur content of overburden, interburden, and partings samples ranges from <0.01 to 0.45 %S (median 0.01 %S) and is generally very low as shown in Figure 59. Materials with a total sulfur content less than or equal to 0.1 %S are considered barren of sulfur and have negligible capacity to generate acidity² through sulfide oxidation when exposed to oxidising conditions. Only 24 samples (or 10 %) have >0.1 %S, indicating that the overwhelming majority of samples (90 %) are barren of sulfur.

Results in Figure 59 demonstrate that higher total sulfur values (0.1 to 0.45 %S) are typically associated with materials situated near the Leichhardt and Vermont coal seams. This trend between total S and proximity to coal seams is consistent across all three drill holes

Sulfide S: The sulfide sulfur content of overburden, interburden, and partings samples was verified using the chromium reducible sulfur (S_{CR}) test. Samples with a total sulfur content greater than or equal to 0.1 %S (n=35) were selected for further testing using the S_{CR} method. The S_{CR} content of the 35 selected samples ranged from 0.006 to 0.501 % S_{CR} . Only 2 samples (or 1 %) had >0.1 % S_{CR} , which confirms the majority of total sulfur is likely to be present as non-acid generating forms of sulfur, such as sulfate or organic sulfur.

² The median crustal abundance of sulfur is 0.07 %S (Bowen 1979; INAP, 2023), which has been rounded to 0.1 %S.

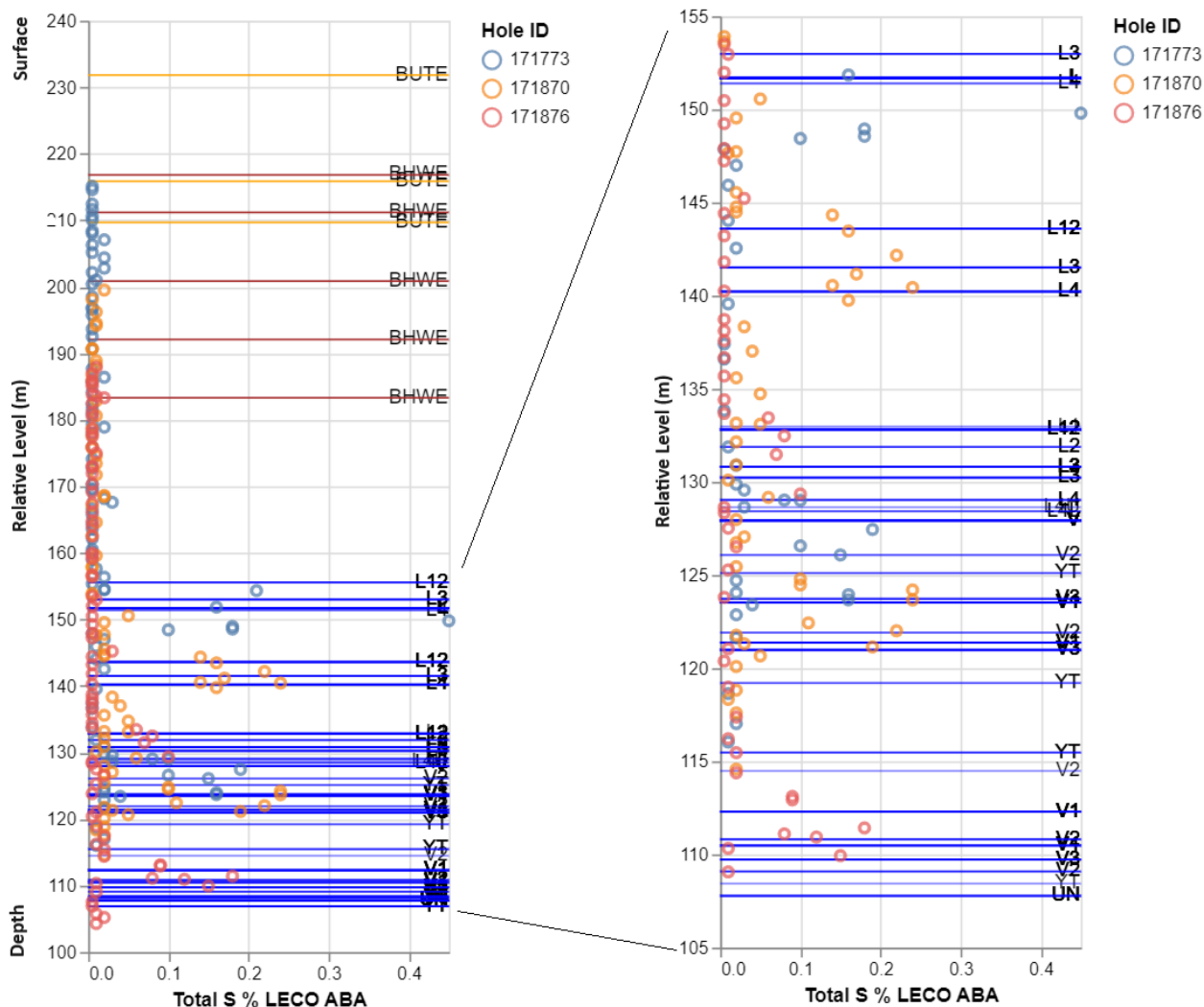


Figure 59: Total S results for overburden, interburden, and partings

MPA: Based on the total sulfur content, the Maximum Potential Acidity (MPA) that could be generated by the 244 samples of spoil materials has been calculated. The MPA ranges from 0.15 to 13.8 kg H₂SO₄/t; and has a low median value of 0.3 kg H₂SO₄/t. This indicates that the majority of samples have a low theoretical potential to produce acidity.

ANC: The Acid Neutralising Capacity (ANC) measures the amount of acid (as kg H₂SO₄/t) that could be neutralised by acid neutralising minerals present in the sample materials. The ANC for the samples ranges from 1.8 to 492 kg H₂SO₄/t and has a median value of 28 kg H₂SO₄/t.

NAPP: The NAPP for the 244 samples has been calculated by subtracting the ANC from the MPA. Strongly positive NAPP values generally indicate some risk of acid production and that a material is classified as PAF. Strongly negative NAPP values generally indicate that a material is NAF or Acid Consuming (AC). NAPP values close to zero (i.e., between -5 and +5 kg H₂SO₄/t) have some inherent uncertainty in terms of material classification, although materials represented by these samples are expected to have a low risk and elevated factor of safety with respect to potential capacity to generate acid.

The NAPP value for the overburden, interburden, and partings samples ranges from -490 to +4.0 kg H₂SO₄/t (median -27.0 H₂SO₄/t) and is negative for all but 4 samples. Positive NAPP values are associated with materials close to coal seams and typically have relatively high total S and low ANC. The overwhelming majority of samples (98 %) have a negative NAPP value.

ANC:MPA Ratio: The ANC:MPA ratio measures the proportion of ANC present in the sample compared to the MPA. If the ANC:MPA = 3 or greater, there is an excess of ANC which is likely to buffer any acid

produced and there is generally negligible risk of acid generation (INAP, 2024³; COA, 2016). If the ANC:MPA ratio is less than 1, there are equal or lesser proportions of ANC compared to MPA, and there may be insufficient ANC to neutralise the MPA, and therefore materials represented by the samples may have some overall risk of generating acid.

The ANC:MPA ratio for the 244 spoil material samples ranges from 0.3 to 3,043 and has a median value of 119. The majority of samples (95 %) have an ANC:MPA ratio of 3 or greater and are considered to have a negligible risk of AMD. From the remaining samples, 3 % have an ANC:MPA ratio between 2 and 3 (indicating low risk), and only 2 % have an ANC:MPA ratio of less than 2 (indicating possible or increased risk).

Geochemical Classification:

~~Table 39~~ ~~Table 38~~ provides a summary of the geochemical classification criteria used to classify the acid forming potential of the 244 overburden, interburden, and partings samples from drill core subjected to static geochemical testing. The results demonstrate that 220 of the 244 samples (90 %) are classified as NAF (Barren) as they have a low total sulfur content (≤ 0.1 %S). Some samples (19 out of 244 or 9 %) have marginally elevated sulfur content (compared to background concentrations) but also have sufficient ANC to be classified as NAF. Two (2) samples are classified as Uncertain, both are coal.

Overall, most materials represented by the samples tested are expected to have a very low risk and increased factor of safety with respect to potential acid generation.

Table ~~39~~~~38~~~~39~~~~38~~: Geochemical classification criteria for spoil materials

Geochemical Classification	Total Sulfur (%)	ANC: MPA Ratio	NAPP (kg H2SO4/t)	Number of Samples (n=244)	% Samples
Non-Acid Forming (Barren)	≤ 0.1	-	-	220	90 %
Non-Acid Forming	> 0.1	≥ 2	≤ -5	22	9 %
Uncertain	> 0.1	< 2	> -5 and $\leq +5$	2	1 %
Potentially Acid Forming	> 0.1	< 2	> 5	0	0 %

Multi-Element Concentration

Multi-element analyses were completed on 93 selected individual samples from the 2005 drill holes and 63 selected individual samples from the 2022 drill holes.

The multi-element results were compared to the median background concentration (median crustal abundance) of those elements in unmineralised soils (Bowen, 1979, CRC, 2000 and INAP, 2024). From this comparison, a geochemical abundance index (GAI) was calculated. The GAI quantifies an assay result for a particular element in terms of the median crustal abundance for that element. The index, based on a log (2) scale, is expressed in seven integer increments (0 to 6), which correspond to enrichment factors from 0 to over 96 times median crustal abundance, as shown in ~~Table 40~~ ~~Table 39~~.

Table ~~40~~~~39~~~~40~~~~39~~: Geochemical Abundance Index enrichment factors

GAI	Enrichment Factor	GAI	Enrichment Factor
0	Less than 3-fold enrichment	4	24 – 48 fold enrichment
1	3 – 6 fold enrichment	5	48 – 96 fold enrichment
2	6 – 12 fold enrichment	6	Greater than 96 fold enrichment

³ INAP considers that mine materials with an ANC/MPA ratio greater than 2 are likely to be NAF unless significant preferential exposure of sulfides along fracture planes occurs in combination with insufficiently reactive ANC.

GAI	Enrichment Factor	GAI	Enrichment Factor
3	12 – 24 fold enrichment		

As a general rule, a GAI of 3 or greater signifies enrichment that may warrant further examination. This is particularly the case with some environmentally important ‘trace’ elements more so than with major rock-forming elements.

The GAI results indicate that most of the metals and metalloids tested in the samples have GAI values less than 3 and are therefore not enriched compared to unmineralised soils (Bowen, 1979; CRC, 2000; INAP, 2024). The only minor exception is calcium (Ca), which has a GAI value of 3 in a medium sandstone sample from drill hole 171773. Calcite cement is noted in the geological logs of other samples in this drill hole and may also be present here.

Soluble Water Quality Testing

The multi-element results in water extracts from 63 selected individual samples of mine materials were assessed against Australian guideline values for freshwater aquatic ecosystems (95 % species protection level) and livestock drinking water (ANZG, 2018). These guidelines are provided for context only and are not intended to be interpreted as “maximum permissible levels” for site water storage or discharge.

Acidity in the water extracts from the samples ranges from <1 to 617mg/L (as CaCO₃ equivalent) and is highest in the coal samples from drill hole 171870. The total alkalinity in the water extracts is variable and ranges from 23 to 44,200 mg CaCO₃/L. The majority of the alkalinity in the samples is in the form of bicarbonate (HCO₃), although some materials also contain carbonate. The net alkalinity values for the samples are positive apart from 3 samples comprised of coal sample in drill hole 171870, and the units either side of this sample. This indicates that most sample materials have excess acid buffering capacity in the unlikely event that any acidity is generated by a mine material.

The concentrations of dissolved trace metals/metalloids tested in water extracts from the samples of mine materials are typically low and predominantly below the laboratory limit of reporting. Most dissolved metal/metalloid concentrations are below the applied water quality guideline criteria. The exceptions are aluminium (93 % of samples), arsenic (44 % of samples), which can have concentrations marginally greater than the applied freshwater aquatic ecosystem water quality guideline values for 95% species protection. Occasional concentrations of molybdenum (8 % of samples) and selenium (16 % of samples) can exceed the applied guideline values for livestock drinking water (ANZG, 2018), although the majority of samples have dissolved concentrations well below these values.

Kinetic Leach Testing

Kinetic leach column testing has been undertaken to assess the reaction kinetics and geochemical properties of co-disposed mixed plant reject (MPR) and mine spoil from various operations including PTM, Daunia, and South Walker Creek Mines.

Kinetic leach testing was undertaken on the columns over a 12-month period. Results from the kinetic testing demonstrate that leachate samples were neutral to slightly alkaline with median pH values ranging from approximately pH 7.5 to 8.5. Total alkalinity results for leach extracts suggest the spoil portion of the KLCs is likely to be providing the bulk of the alkalinity observed. EC values of leach extracts generally stabilised around 1,000µS/cm after the first twelve weeks of leaching. Major ion concentrations (Ca, Mg, K, Na, Cl, SO₄) decreased over the first 12 weeks of the testing program then generally stabilised or continued to decrease over subsequent leach events.

Concentrations of metals and metalloids in leach extracts were generally low, with most results below the laboratory limits of detection. As with major ion concentrations, detectable metal and metalloid concentrations declined over the leach events of the initial 12 weeks. Most metal and metalloid concentrations stabilised.

3.6.1.3.2 Geochemical Classification of Coarse and Fine Rejects

Coarse and fine rejects from the adjacent CHPP were sampled in three separate sample programs in 2017-2018, 2020, and 2021-2022. The frequency of sampling was fortnightly over a four- month period. Eighty-

seven (87) samples were collected in total, including mid and coarse reject, thickener underflow fine rejects, and dry fine rejects.

Acid Base Accounting

pH: The pH1:5 value for the coarse rejects and fine rejects samples (n=87) is typically alkaline and ranges from 7.5 to 10.1, with a median value of 9.0 for coarse rejects and 8.8 for fine rejects. All samples are above pH 7.0 and are expected to add some alkalinity to contact water.

EC: The electrical conductivity (EC1:5) value for the coarse rejects and fine rejects samples ranges from 100 to 1,420µS/cm and are typically low (median 247µS/cm for coarse rejects and 305µS/cm for fine rejects).

Total S: The total sulfur content of coarse and fine reject samples ranges from 0.11 to 2.61 %S (median 0.28 %S for coal rejects and 0.52 %S for fine rejects). The total S is generally low although the materials are not barren of sulfur. All of the 87 samples have >0.1 %S.

Sulfide S: The sulfide sulfur content of coarse and fine reject samples was verified using the chromium reducible sulfur (SCR) test. The SCR content of the 87 samples ranged from 0.018 to 2.38 %SCR. Most samples (75 %) had >0.1 %SCR, which confirms that some of the of total sulfur is sulfide sulfur and the remainder is likely to be present as non-acid generating forms of sulfur, such as sulfate or organic sulfur.

MPA: Based on the SCR content, the MPA that could be generated by the 87 samples of coarse rejects and fine rejects has been calculated. The MPA ranges from 0.55 to 72.9kg H₂SO₄/t; and has a low median value of 3.6kg H₂SO₄/t for coarse rejects and 10.5kg H₂SO₄/t for fine rejects.

ANC: The ANC for the samples ranges from 11 to 172kg H₂SO₄/t and has a median value of 57kg H₂SO₄/t for coarse rejects and 70kg H₂SO₄/t for fine rejects, which is considered low to moderate.

NAPP: The NAPP for the 87 coarse rejects and fine rejects samples has been calculated by subtracting the ANC from the MPA. The NAPP value for the coarse and fine reject samples ranges from -149 to 0kg H₂SO₄/t (median -54.0 H₂SO₄/t for coarse rejects and -60.0 H₂SO₄/t for fine rejects) and is negative for all but one sample.

ANC:MPA Ratio: The ANC:MPA ratio for the 87 coarse and fine reject samples ranges from 1.0 to 129 and has a median value of 14 for coarse rejects and 7 for fine rejects. The majority of samples (94 %) have an ANC:MPA ratio of 3 or greater and are considered to have a negligible risk of AMD. From the remaining samples, 3 % have an ANC:MPA ratio between 2 and 3 (indicating low risk), and 3 % have an ANC:MPA ratio of less than 2.

Geochemical Classification: [Table 41](#)~~Table 40~~ provides a summary of the geochemical classification of the acid forming nature of the 87 coarse and fine reject samples subjected to static geochemical testing. The results demonstrate that 22 of the 87 samples (25 %) are classified as NAF (Barren) and have a low sulfide sulfur content (≤ 0.1 %S). Most samples (62 out of 87, or 71 %) have marginally elevated sulfide content (compared to background concentrations) but also sufficient ANC to be classified as NAF. Three (3) samples (or 3 %) are classified as Uncertain. The Uncertain samples are coarse reject (1 sample) collected April – June 2019 and fine reject (2 samples) collected April – June 2019 and 13 Oct 2020. Overall, materials represented by the coarse and fine reject samples tested are expected to have a very low risk and increased factor of safety with respect to potential acid generation.

Table ~~41~~[414140](#): Geochemical classification criteria for coarse and fine rejects

Geochemical Classification	Total Sulfur (%)	ANC: MPA Ratio	NAPP (kg H ₂ SO ₄ /t)	Number of Samples (n=87)	% Samples
Non-Acid Forming (Barren)	≤ 0.1	-	-	22	25 %
Non-Acid Forming	> 0.1	≥ 2	≤ -5	62	71 %
Uncertain	> 0.1	< 2	> -5 and $\leq +5$	3	3 %

Geochemical Classification	Total Sulfur (%)	ANC: MPA Ratio	NAPP (kg H ₂ SO ₄ /t)	Number of Samples (n=87)	% Samples
Potentially Acid Forming	> 0.1	< 2	> 5	0	0 %

Multi Element Concentrations

Multi-element analyses were completed on 18 selected individual coarse rejects and fine rejects samples. The multi-element results were compared to the median background concentration (median crustal abundance) of those elements in unmineralised soils (Bowen, 1979, CRC, 2000 and INAP, 2024). From this comparison, a GAI was calculated ([Table 40](#)~~Table 4-8~~).

The GAI results indicate that most of the metals and metalloids tested in the coarse and fine reject samples have GAI values less than 3 and are therefore not enriched compared to unmineralised soils (Bowen, 1979; CRC, 2000; INAP, 2024). The only minor exceptions are molybdenum (Mo), which has a GAI value of 3 in a fine rejects sample and sulfur (S), which has GAI values of 4 and 3 in two fine rejects sample.

Soluble Water Quality Testing

Multi-element results in water extracts from 18 selected individual samples of coarse and fine reject have been assessed against the Australian guideline values for freshwater aquatic ecosystems (95 % species protection level) and livestock drinking water (ANZG, 2018). These guidelines are provided for context only and are not intended to be interpreted as “maximum permissible levels” for site water storage or discharge.

Acidity in the water extracts from the samples ranges from <1 to 18mg/L (as CaCO₃ equivalent) and is generally very low. The total alkalinity in the water extracts is variable and ranges from 62 to 8,030mg CaCO₃/L. The majority of the alkalinity in the samples is in the form of bicarbonate (HCO₃), although some materials also contain carbonate. The net alkalinity values for the col reject and fine rejects samples are all positive, indicating the materials have excess acid buffering capacity in the unlikely event that any acidity is generated.

The concentrations of dissolved trace metals/metalloids tested in water extracts are typically low and predominantly below the laboratory limit of reporting. Most dissolved metal/metalloid concentrations are below the applied water quality guideline criteria. The exceptions are aluminum (22 % of samples), arsenic (17 % of samples), selenium (6 % of samples), and zinc (6 % of samples) which have concentrations marginally greater than the applied freshwater aquatic ecosystem water quality guideline values for 95% species protection. All of the metals/metalloid concentrations in the coarse and fine reject samples are below the applied guideline values for livestock drinking water (ANZG, 2018).

Kinetic Leach Testing

Static and kinetic characterisation of a single (1) fine rejects sample was undertaken over a 25-day period. The aim of this assessment was to understand the geochemical behavior of the materials over time if subjected to subaerial deposition within mine spoil stockpile.

The assessment determined the fine reject sample was unlikely to generate acid and had a low risk for saline drainage. However, there was some potential for generating neutral metalliferous drainage over time based on slightly elevated concentrations of SO₄, Mn, Cu, Ni, and Zn.

Physical Characterisation

Golder (2020) investigated the geotechnical properties of fine rejects sample as part of a study of the fluidity of fine rejects prior to dewatering.

The main findings of the geotechnical investigation program, were the following:

- The fine rejects can be classified as low to medium plasticity Silts and Clays.
- The fine rejects are potentially susceptible to “classic” liquefaction if the moisture content of the soil is >85% of the Liquid Limit.
- The degree of saturation for fine rejects is in the range of 79 to 100 % confirming the majority, but not all, fine rejects to be fully saturated.

- The degree of saturation estimated for the adjacent spoil material varies from 20 to 75 %.

A summary of the fine reject sample properties is provided in [Table 42](#).

Table 42: Geotechnical properties of a typical freshly placed fine rejects sample

Property	Value
Average Dry Density (t/m ³)	1.04
Solids Density (t/m ³)	1.85
Degree of Saturation	1.00
Porosity	0.44
Void Ratio	0.77
Solids Concentration by Mass (%)	70.5
Solids Concentration by Volume (%)	56.4
Bulk Density (t/m ³)	1.48

3.6.1.3.3 Management and Rehabilitation Measures

Spoil

The management of spoil materials will be consistent with the current approved mine waste management strategy, that is, in-pit disposal within waste dumps, then progressively rehabilitating with landform shaping directing run-off to the void.

No specific management measures are proposed or required for the spoil to manage risk of AMD, SD or ND.

Where highly sodic and/or dispersive spoil is identified it should, wherever practicable, not be placed at the surface of final landform (within 2m of the surface) and should not be used in construction activities.

However, it may not be practical to selectively handle and preferentially place highly sodic and dispersive spoil during operation. Therefore, in the absence of such selective handling, spoil landforms will be constructed to ensure they are stable, and progressively rehabilitated to minimise erosion, as per the Stanmore Landform Design Guideline (SMR, 2024).

Where rock is used for construction activities, this should be limited (as much as practical) to unweathered Permian sandstone, as this material has been found (generally) to be more suitable for construction and for use as embankment covering on final landform surfaces. Regardless of the rock type, especially where engineering or geotechnical stability is required, laboratory testing and rehabilitation field trials should be undertaken to determine the propensity for dispersion and erosion of spoil landforms.

Surface water run-off and seepage from waste rock emplacements, including any rehabilitated areas, should be monitored for water quality parameters.

Rejects

Reject materials generated as part of PTM operations will continue to be managed in accordance with the current approved coal reject management strategy - comprising the disposal (burial) of dewatered rejects within low-wall spoil at designated disposal areas. Coal reject areas will also undergo monitoring for AMD and related environmental impacts.

The concentration of total metals in coarse and fine reject materials is typically below applied guideline criteria for soils. Surface runoff and seepage from NAF materials left exposed to oxidising conditions is likely to be slightly alkaline, with low levels of salinity. The concentration of soluble trace metals and major ions in runoff and seepage from coarse rejects and fine rejects is also expected to be low.

Based on the current assessment, reject materials are regarded as posing a low AMD hazard with respect to generation of acidity and/or sulfate. However, to further reduce AMD risks and to assist rehabilitation, rejects will be disposed into low-wall spoil piles and be buried by at least 2m of spoil. Seepage would be confined within, and drain to, the footprint of residual voids.

Monitoring of Mineral Waste Characteristics

Ongoing analysis of mineral samples throughout mining will continue as detailed in the MWCR (Appendix 6). Progressive sampling would, at minimum, comprise a broad suite of environmental geochemical parameters, such as pH, EC (salinity), static geochemical suites and total and soluble metals/metalloids. This data will be recorded and managed within the site's environmental management system and integrated into the mine planning process for appropriate management commensurate with the risk presented. Waste placement and management strategies will continue to be refined as mining progresses.

3.6.1.4 Soil and Capping Material

PRC Plan Guideline (Section 3.6.1)

The rehabilitation and management methodology should include that soil assessment activities are supplemented by additional surveys conducted at appropriate intervals to assess soil resources in planned disturbance areas. In addition to the assessment of soils, the proposed rehabilitation methodologies in the rehabilitation planning part must also address topsoil management. Topsoil management must ensure sufficient topsoil quantity and quality is available in those instances that waste rock or tailings cannot support the proposed PMLU. Integrated soil and waste rock characterisation and mapping should form the foundation of the rehabilitation strategies. The available soil resources and capping material should be assessed prior to the commencement of operations.

A materials characterisation study has been conducted for PTM to assess the quality and quantity of soil and capping material available for rehabilitation (Appendix 4). The objectives of the study included:

- Develop an inventory of materials available for rehabilitation and assess the suitability of materials as growth media in rehabilitation.
- Interpret available data to characterise materials for use as growth media to support vegetation required to meet the PMLU.
- Assess the volume of materials available for use in rehabilitation activities.

Both soils and spoils were assessed for use as growth media for PTM rehabilitation activities. The soil assessment included field surveys and testing on stockpiled topsoil at PTM. Characterisation of spoils were undertaken as part of assessments for landform design (Section 3.6.1.5), and waste characterisation (Section 3.6.1.3) in addition to the existing spoil data from previous assessments. The materials were categorised into two management groups and two sub-groups below:

Topsoil:

- Red/Brown clays.
- Red/ Grey loams.

Spoil Material:

- Permian spoil (overburden).
- Weathered sediments and clay spoil (interburden).

The results of the study and suitability of these material groups for use in rehabilitation at PTM is described below.

3.6.1.4.1 Quality and Quantity of Available Resource

Topsoil Resources

Topsoil stockpiles across PTM were categorised into two groups, red/brown clays and red/grey loams. A total of 84 samples were collected across 21 stockpile sites representing these two groups, the results of which are summarised in [Table 43](#).

Table [43](#) Summary of Key Chemical and Physical Properties for Topsoil at PTM (Landloch, 2022)

Analysis	Red / Brown Clay	Red / Gray Loams
Chemical Properties		
pH _{1:5} (H ₂ O)*	Neutral to strongly alkaline (7.1 to 8.5)	Neutral to strongly alkaline (7.1 to 8.5)
EC _{1:5} (dS/m)	Low to moderate (0.9 – 0.28)	Low (0.12 – 0.14)
ESP (%)	Non-sodic (1.2 – 4.9)	Non-sodic (2.8 to 3.5)
Total N (mg/kg)	Low the moderate (270 – 1384)	Low (396 to 471)
Available P (mg/kg)	Low (4 – 16)	Low (4 to 14)

Analysis	Red / Brown Clay	Red / Gray Loams
Available K (mg/kg)	Low the moderate (76 – 364)	Low the moderate (124 to 222)
Organic Carbon (%)	Low to moderate (0.57 – 1.82)	Low (0.29 – 0.83)
CEC (meg/100g)	Low to moderate (5.5 – 24.6)	Low (5.8 – 8)
Ca/Mg (ratio)	Low Ca to balanced (2.7 – 8)	Low Ca to balanced (3 – 5.2)
Physical Properties		
Clay content (%)	>30	<30
Rock content (%)	<20	10-20
Dispersion (EAT)	Slightly dispersive to stable (3b – 7)	Slightly dispersive to slaking (3b – 5)
Permeability*	Low	Moderate
Erodibility*	Low to Moderate	Moderate
Associated regional soil	MM7	Ro9
Associated SMU	A3, B1, B3, B3v, B4, B4v and B5 (B2 where gravel content is >10%)	A2, E1 and E3 (E2 where gravel content is >20%)

Table Notes: Chemical properties are based on average 10th and 90th percentile values for all stockpile samples analysed.

*Based on measured erodibility parameters (Landloch Pty Ltd, 2017).

Red/brown clays are the dominant topsoil at PTM , consisting of dark brown, brown, or reddish brown with texture of clay loam to medium clay. Typical gravel content was found to be less than 10%, though in some stockpiles, gravel content of up to 20% is present. All red/brown clays were non-sodic and generally stable.

Less than 15% of the samples collected represented the Red/grey loams. Gravel content was found to vary between 10-20%. This material is pale red, pale grey, or grey with the texture of a sandy loam to sandy clay loam. The material was found to be non-sodic, but susceptible to slaking and dispersion, with some risk of erosion.

Topsoil proposed for use on rehabilitation areas should be sampled and characterised prior to use, with amelioration requirements applied as recommended by a suitably qualified person. Landloch (2022) summarised that the key limitation of these topsoil materials for use in rehabilitation is low fertility. A balanced NPK fertiliser or compost could be applied during rehabilitation to provide a starter source of nutrients for initial vegetation growth.

Spoil Resources

Overburden

Overburden spoil at PTM consists of grey or pale brown Permian material, comprised of rocky sandstone, siltstone, and claystone. The material was found to have clay content below 25%, resulting in low water holding capacity. Permian characteristics were found to vary slightly, depending the strata location, degree of weathering and degree of carbonaceous inclusions, but were concluded to be sodic and dispersive. A summary of key chemical and physical properties is presented in [Table 44](#).

Table [44](#) Summary of Key Chemical and Physical Properties for Permian Overburden Material at PTM

Analysis	Permian Overburden
Chemical Properties	
pH _{1:5} (H ₂ O)	Moderate to strongly alkaline (8 – 9.5)
EC _{1:5} (uS/cm)	Low to moderate (180 – 820)
ANC (H ₂ SO ₄ /t) *	High (20 – 30)
PAF	No

Analysis	Permian Overburden
CEC (meg/100g) *	Moderate to high (14 – 32)
ESP (%) *	Non-sodic to strongly sodic (5 – 27)
Metals	Comparable to background levels
Physical Properties**	
Clay content (%)	<25
Rock content (%)	>30
Slake durability (5)	Moderate (50 – 75)
Permeability	Very high
EAT*	Dispersive (Class 2)
Dispersion Risk	Moderate

*Chemical properties are based on average values for all spoil samples analysed

**Taken from erodibility testing results for similar spoil at Daunia mine (Landloch Pty Ltd, 2017).

Landloch (2022) considered fresh Permian the most suitable option as a growth medium, advising that fresh or recently stripped Permian material, that has not be exposed to extended periods of weathering, should be used in the upper growth media profile to greatly increase batter slope resistance to erosion while vegetation establishes.

Slake durability data indicated that only 25% of Permian samples have a slake durability higher than 70% (Landloch, 2017). If this material could be isolated, it may be useful to rock armour and stabilise steeper areas. Additional studies and testing for rock properties such as hardness (consolidation and cementation), mineralogy (susceptibility to weathering of the component minerals) and permeability would be useful to locate additional competent rock material.

Weathered Permian material may provide suitable growth media for establishment of woodland vegetation on lower slopes, given the material has only minor chemical limitations and is unlikely to significantly reduce growth of most plant species used in rehabilitation.

Interburden

Interburden at PTM comprises of weathered sediments and clay, containing portions of fragile rock, with a clay content of >35% resulting in moderate to high water holding capacity. It is typically pale orange to brown in colour. The materials were found to be strongly sodic and dispersive, meaning that – once some leaching of soluble salts occurs – it is likely to be prone to hard setting and tunnel and gully erosion (Landloch, 2022). Key chemical and physical properties are summarised in [Table 45. Table 44.](#)

Table [454544](#) Summary of Key Chemical and Physical Properties for Interburden Material at PTM

Analysis	Permian Interburden
Chemical Properties	
pH _{1:5} (H ₂ O)	Neutral to strongly alkaline (7 – 9)
EC _{1:5} (uS/cm)	Moderate to high (510 – 1200)
ANC (H ₂ SO ₄ /t) *	High (20 – 50)
PAF	No
CEC (meg/100g) *	Moderate to high (14 – 36)
ESP (%) *	Sodic to strongly sodic (6 – 24)
Metals	Comparable to background levels
Physical Properties**	
Clay content (%)	>35

Analysis	Permian Interburden
Rock content (%)	<20
Slake durability (5)	Low (<50)
Permeability	Low to moderate
EAT*	Dispersive (Class 2)
Dispersion Risk	Moderate

*Chemical properties are based on average values for all spoil samples analysed

**Taken from erodibility testing results for similar spoil at Daunia mine (Landloch Pty Ltd, 2017).

Landloch (2022) advised that placement of this material close to the final rehabilitated surface or its use for the construction of flow control structures (e.g. contour banks and drains) is not recommended, due to its high potential for erodibility. Use as a secondary growth medium on flat or very low gradient areas could be considered, if the intended material has no chemical limitations to vegetation growth.

3.6.1.4.2 Amelioration and Surface Treatment

Fertiliser and amendment rates for soil materials are dependent on the intended PMLU for a rehabilitated area. For example, cattle grazing requires generation of biomass from the growth media and planted grass species. Nitrogen and phosphorus-based amendments would be recommended for these areas. As a guide, soil amendment should aim to provide:

- Phosphorus (Colwell) content of the topsoil to within a target concentration of 25–40mg/kg.
- An appreciable source of starter nitrogen.
- Adequate macro and micronutrients.
- Reduced potential for dispersion.

For material at PTM, the materials were classified according to their ability to support plant growth, as either primary or secondary growth media. Primary growth media infers the materials have the ability to be used as a topsoil or alternative growth media. Secondary growth media infers the ability of materials to be used as a substrate and may consist of waste/spoil material that is then capped with the primary growth medium.

In addition to primary and secondary classification, materials at PTM were further classified into classes A to D by Landloch (2022), to assess suitability as a growth medium, and provide a guide for amendment requirements (Refer to [Table 46](#) ~~Table 45~~).

Table ~~46~~~~45~~ Material Suitability Classification

Class	Description
A	Good Quality - Nil to low levels of amendment will be required
B	Fair Quality - Low to moderate levels of amendment may will be required.
C	Marginal Quality - Moderate to high levels of amendment may be required to improve material quality to support plant growth.
D	Not Suitable - generally be uneconomic or unviable to amend these materials to the degree needed to support plant growth

Suitability of PTM topsoil and spoil material as primary or secondary growth media, along with amendment recommendations, is presented with [Table 47](#) ~~Table 46~~.

Table 474746 Potential Limitations of Topsoil and Spoil at PTM

Material	Potential Limitations	Amendments	Growth Media Suitability Classes	
			Primary (1)	Secondary (2)
Red/brown clay topsoil	- Sometimes strongly alkaline. - Often low N, P, K, and TOC.	Fertiliser and/or compost rates are to be determined by a suitably qualified person prior to individual stockpiles being used in rehabilitation.	1A	2A
Red/grey loam topsoil	- Sometimes strongly alkaline. - Often low N, P, K, and TOC.	Fertiliser and/or compost rates are to be determined by a suitably qualified person prior to individual stockpiles being used in rehabilitation.	1A	2A
Permian spoil (overburden)	- Strongly alkaline. - Sodic to strongly sodic and dispersive. - Rock content up to 50%.	- Gypsum: due to heterogeneity between spoil samples, rates should be calculated for broad spoil areas after placement for rehabilitation. - If to be used as a primary growth media, then further assessment is required.	1B/C	2B
Weathered sediments and clay spoil (interburden)	- Often strongly alkaline. - Can have elevated salinity. - Often sodic to strongly sodic and dispersive. - Slake durability.	- Gypsum: due to heterogeneity between spoil samples, rates should be calculated for broad spoil areas after placement for rehabilitation. - Bury all saline material to a depth greater than 2m below the surface.	1D	2C

Notes:

Class A – Good Quality: **Negligible** limitations to plant growth.

Class B – Fair Quality: **Minor** limitations to plant growth.

Class C – Marginal Quality: **Moderate** limitations to plant growth.

Class D – Not Suitable: **Severe** limitations to plant growth.

3.6.1.4.3 Quantity of Available Resources

The volume of existing stockpiles of topsoil was estimated to be approximately 2,793,354m³ (Landloch, 2022). The volume of fresh Permian spoil, suitable for use as a primary growth media (with moderate amendment) is estimated at 396,600,000m³.

Growth media is proposed to be applied to a minimum depth of 100mm on all rehabilitation areas overlying a 1.9m layer of fresh Permian. Considering this approach, the estimated required volume of growth media to complete rehabilitation activities is presented in- [Table 48](#).~~Table 47~~.

Table ~~48~~[47](#) Material Balance

RA/IA	PMLU	Area (Ha)	Growth Media Depth (m)	Growth Media Volume (m ³)
IA1	N/A	316.07	0	-
RA1	Cattle Grazing	203.12	0	-
RA2	Cattle Grazing	203.0	0.1	203,000
RA3	Cattle Grazing	42.38	0.1	42,380
RA4	Woodland Habitat	35.5	0.1	35,500
RA5	Woodland Habitat	569.45	0.1	569,450
RA6	Cattle Grazing	1,055.83	0.1	1,055,830
RA7	Watercourse	44.65	0	-
RA8	Woodland Habitat	68.0	0.1	68,000
RA9	Watercourse	2.61	0.1	2,610
Total				1,976,770

3.6.1.4.4 Location and Accessibility

The location of stockpiles topsoil resources at PTM are shown in Figure 60. These stockpiles are maintained in close proximity to each disturbance area to limit haul distances to approximately 1-5km during progressive rehabilitation.



Figure 60 Topsoil Stockpile Locations (Landloch, 2022)

3.6.1.4.5 Surface Treatment

Prior to growth media application, reshaped landforms will be ripped to a depth of approximately 0.5m to reduce compaction and allow adequate water and root penetration. Following this, the growth media will be ripped, across slope, no deeper than 0.3m. This will reduce machinery compaction, remove track marks that are not on contour, and assist in incorporating any soil ameliorants and fertiliser to encourage vegetation growth.

3.6.1.4.6 Relationship between Soils and Vegetation Ecosystems for the PMLU

Target growth media properties for target PMLU vegetation species are presented in Section 3.6.1.8.4. These target parameters are based on representative soil parameters provided in the QLD Department of Primary Industries (DPI) Land Management Manual – Understanding and Managing Soils in the Central Highlands (Bourne & Tuck, 1993), with consideration of the likely compromised condition of stockpiled topsoil and other rehabilitation materials at PTM. Given these target properties are based on substrates formed from natural processes over time, they are considered as a guide for amelioration, to render the material more suitable and supportive of vegetation growth. It is likely that some soil properties might fall outside of these ranges, hence the need to engage a SQP to assess proposed growth media (and recommend ameliorants) prior to applying to rehabilitation areas.

3.6.1.5 Landform Design

PRC Plan Guideline (Section 3.6.1)

The final landform design must be based on the proposed PMLUs and NUMAs and demonstrate that the land will be safe and structurally stable

The final landform design considers the landform development and associated reshaping of all relevant areas within the mining lease after the removal of infrastructure. The integrated landform has been refined based on the outcomes of relevant technical studies to support the PRC Plan. These studies include a Landform Design study attached as Appendix 7 and detail the relevant considerations for design of the final landform at PTM, including demonstrating that it is predicted to be safe, stable, non-polluting and able to sustain the required PMLUs.

The landform design has considered the relevant NUMAs and PMLUs that apply to the rehabilitation areas and has ensured that the geotechnical stability of the residual voids is achieved (Section 3.6.3.1.2), and that they are mitigated against flood impacts (Section 3.6.1.2).

3.6.1.5.1 Method of Determining Landform Design

The final landform design at PTM has considered the relevant design objectives outlined in [Table 49](#) ~~Table 48~~. The design objectives have been established to facilitate an optimised cut/fill balance with slope gradient, slope stability and groundcover criteria defined to achieve a safe, stable, non-polluting landform that sustains the required PMLUs.

Table [49](#) ~~48~~ Landform Design Objectives and Criteria

Post Mining Land Use	Rehabilitation Area	Landform Design Objectives	Design Criteria
Cattle grazing	RA1 RA2 RA3 RA6	- Landforms with gradients of <15% or less shall have clay or loam soils applied as growth media. - For waste landforms, at least 1.9m of NAF fresh or weathered Permian waste shall be present below the growth media.	- Landforms with gradients of <15% achieve 80% groundcover. - Landform obtains geotechnical FoS ≥ 1.5 (unless an alternative is justified by an AQP) - Set-back of high-wall and end-wall achieves stability FoS within NUMA extents - Flood mitigation provided for residual voids above the 0.1% AEP flood levels.
Woodland habitat	RA4 RA5 RA8	- Waste landforms reshaped to be free draining - For waste landforms, at least 1.9m of NAF fresh or weathered Permian waste shall be present below the growth media	- Landform FoS ≥ 1.5 unless an alternative is justified by an AQP - Slopes >15% to a maximum 25% achieve 30% groundcover - Set-back of high-wall and end-wall achieves stability FoS within NUMA extents - Flood mitigation provided for residual voids above the 0.1% AEP flood levels

Post Mining Land Use	Rehabilitation Area	Landform Design Objectives	Design Criteria
Watercourse	RA7 RA9	For RA9 only, banks to be reshaped following removal of rock	Riparian vegetation and geomorphic index is greater or equal to upstream or downstream values.

3.6.1.5.2 3D Design

3D imagery depicting the post-mining topography of the central-south and northern pits is presented in Figure 61, with the final eastward perspective of the post-mining landform illustrated in Figure 62.

The 3D design of the final landform configuration at PTM is also shown in [Figure 29](#) (Section 3.4.3) and has been developed to a conceptual level based on a dozer push plan to achieve final slope profiles. As such, the design is not representative of a final design in that there are sections that will require iterative refinement as design maturity increases (e.g., lift heights, detailed surface water management). The final landform will be water shedding and given the waste material properties, no liner is proposed.

Key specifications for the final landform are outlined in [Table 50](#) below.

Table 50 3D Final Landform Key Characteristics

Component	Specification	Unit of Measure
Footprint area (total)	2,225	ha
Landform height (maximum)	140	m
Maximum landform slope angle (grazing)	15	%
Maximum landform slope angle (woodland)	25	%

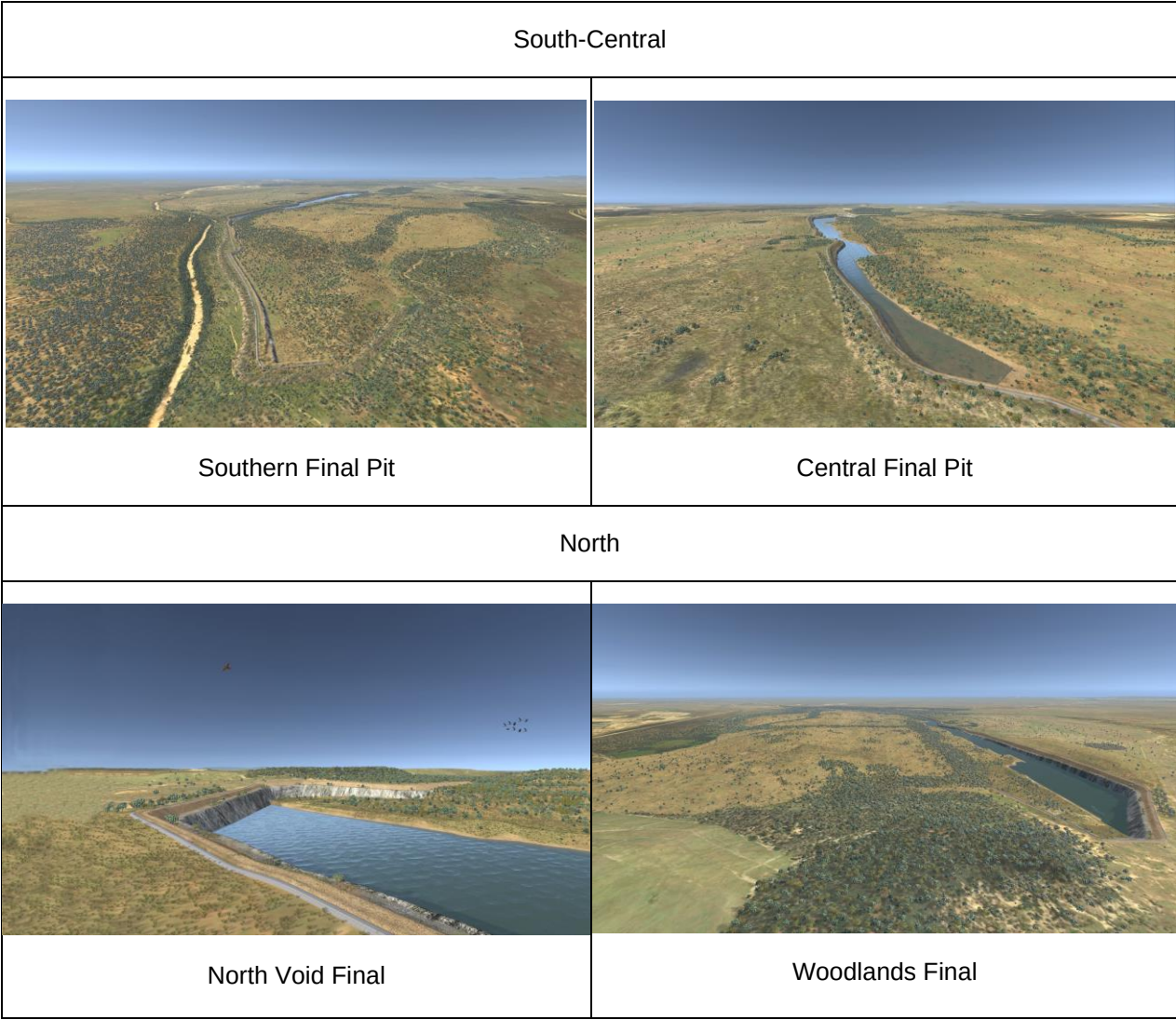


Figure 61 3D Post Mining Landform Design – Images (Minserve)



Figure 62 3D Post Mining Landform Design – Final Look East (Minserve)

3.6.1.5.3 Materials Availability

The materials available onsite for use in rehabilitation and closure consist of topsoils and overburden spoils (Landloch, 2024). Rejects are not considered a rehabilitation resource given their material properties and are considered bulk fill only.

Stockpiled topsoil materials have been categorised into two management groups:

- Clay textured topsoils are the dominant soil stockpiled at PTM. It occurs at approximately 85% of the sample sites.
- Loam soils account for approximately 15% of stockpiled topsoils at PTM.

Spoils are categorised into two management groups:

- Permian spoil.
- Weathered sediments and clay spoil.

A summary of key chemical and physical properties for growth media to support rehabilitation activities is provided in Section 3.6.1.4.

The following materials are proposed for use within the upper 2m of final landforms:

- Fresh Permian (1.9m).
- Clay topsoil (0.1, Grazing PMLU).
- Clay topsoil mixed into Fresh Permian rock (0.1, Woodland PMLU).

Topsoil materials will be stockpiled and used as growth media to facilitate vegetation growth and support rehabilitation of PTM landforms to achieve the approved PMLUs. Where required to increase the erosional resistance of landforms (where slopes > 15%), rock that is available onsite may be incorporated to increase erosional stability.

Rehabilitation materials available onsite under the current LoA plan has been indicated in [Table 51](#) ~~Table 50~~ below, with overall materials balance provided in Section 3.6.1.4 (noting that materials import is a function of

soil/capping requirements as the final landform will target a neutral cut/fill balance). The predicted total Permian requirements are approximately 41.4Mm³ with sufficient quantities present under the current LoA plan.

Table ~~515~~¹⁵⁰ Materials Availability

Material	Available (m ³)	Notes
Topsoil	2,793,354	Based on current stockpile estimates. Prior to recovery and stockpiling, materials will be characterised to develop an approach that limits the recovery and use of potentially acidic, sodic or saline materials in rehabilitation.
Fresh Permian	396,600,000	Based on LoA plan. Consideration may be required in waste management and scheduling to enable material to be incorporated into the upper 1.9m layers of the final design for grazing and woodland PMLUs. Some grading/selection may be required to achieve an appropriate rock mix for the upper 0.1m growth medium layer for the Woodland PLMU

3.6.1.5.4 Hydrological and Hydrogeological Assessments

Except for the localised catchment into the residual void, the final landform will predominately be water shedding. Specific surface water management measures that will be implemented are as follows:

- Reshaping of the spoil dumps to be free-draining and to tie-in with natural contours.
- Surface water to be directed towards natural water courses, with no permanent water management structures on slopes.
- Implementation of erosion protection measures in areas of concentrated flow or gradient transition points to mitigate risk of increased flow velocities on final landforms.
- Flood mitigation to prevent the risk of flooding into the residual voids up to the 0.1% AEP flood level.
- Implementation of landform structures to prevent flood and void interactions.
- Removal of road culverts and fill material from within the watercourse extents.

A flood assessment, including hydrologic and hydraulic modelling was completed for the PTM final landform (Refer to Section 3.6.1.2). It was shown that the final landform embankment between the Isaac River and R40/R50 pit (RA4) provides flood immunity from 1% and 0.1% AEP flood events.

A hydrogeological assessment (Section 3.6.3.2), including numerical modelling, and pit lake water balance modelling (Section 3.6.3.1) identified the residual void, once stabilised, will through evaporative losses continue to act as a sink. Therefore, groundwater gradients in the proximity of the residual voids will maintain flows towards the pit lakes and retain any contaminants within the residual voids.

As the current landform design is at a conceptual level, detailed profiling of the free-draining surface (including associated surface water control aspects) will be completed leading into and as part of RM3.

3.6.1.5.5 Erosional Stability

Landloch (2024) undertook assessments to determine acceptable rates of soil loss and subsequently assess long-term erosional stability of rehabilitated landforms at PTM. A reference target soil loss was determined by assessing the erosion potential of areas surrounding PTM using the Revised Universal Soil Loss Equation (RUSLE). Based on this assessment, the long-term erosion for vegetated surfaces range from 0.3—7t/ha/y, with an average of 2t/ha/y and uncertainty of 0.3t/ha/y. For 50% cover, the average predicted long-term erosion for the same area is 12t/ha/y.

A key priority in setting a tolerable erosion target is the prevention of significant rill or gully development. On that basis, for slopes where long-term erosion risk (for a range of reasons) is considered high, then a

maximum rate of erosion of 5t/ha/y at any point on the batter slopes being modelled has commonly been applied by Landloch on the basis that - at that value - rilling is largely if not completely absent. Accordingly, the 5t/ha/yr value was adopted for the purposes of Landform evolution modelling (LEM) for shallower grazing slopes. For the woodland PMLU, 7t/ha/yr was selected to align with RUSLE values given the steeper slope profiles.

LEM was completed for up to 300 years on the final landform DEM, with simulations of runoff and erosion for a range of a range of landform slope and vegetation cover configurations completed initially using the Water Erosion Prediction Program (WEPP) to allow derivation of parameters for the SIBERIA LEM

WEPP simulations were carried out for:

- Batter slopes 140m high, at 15-25% gradients, surfaced with clay soil with vegetation cover levels 50-90% (Grazing PMLU) (Figure 63 and Figure 64)
- Batter slopes 140 high, at 15-25% gradients, surfaced with a 4:1 blend of Fresh Permian waste and clay soil with 0-50% vegetation cover (Woodland PMLU) (Figure 65 to [Figure 67](#))

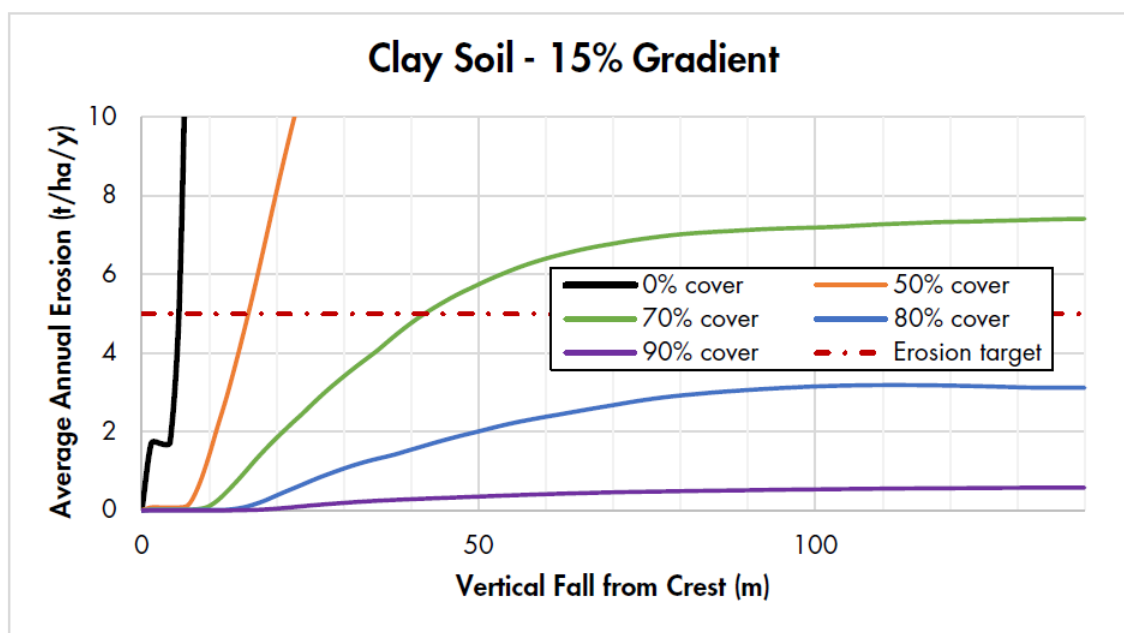


Figure 63 Predicted erosion rates along 15% gradient batter slopes with clay soil surface and 50%, 70%, 80%, and 90% vegetation cover

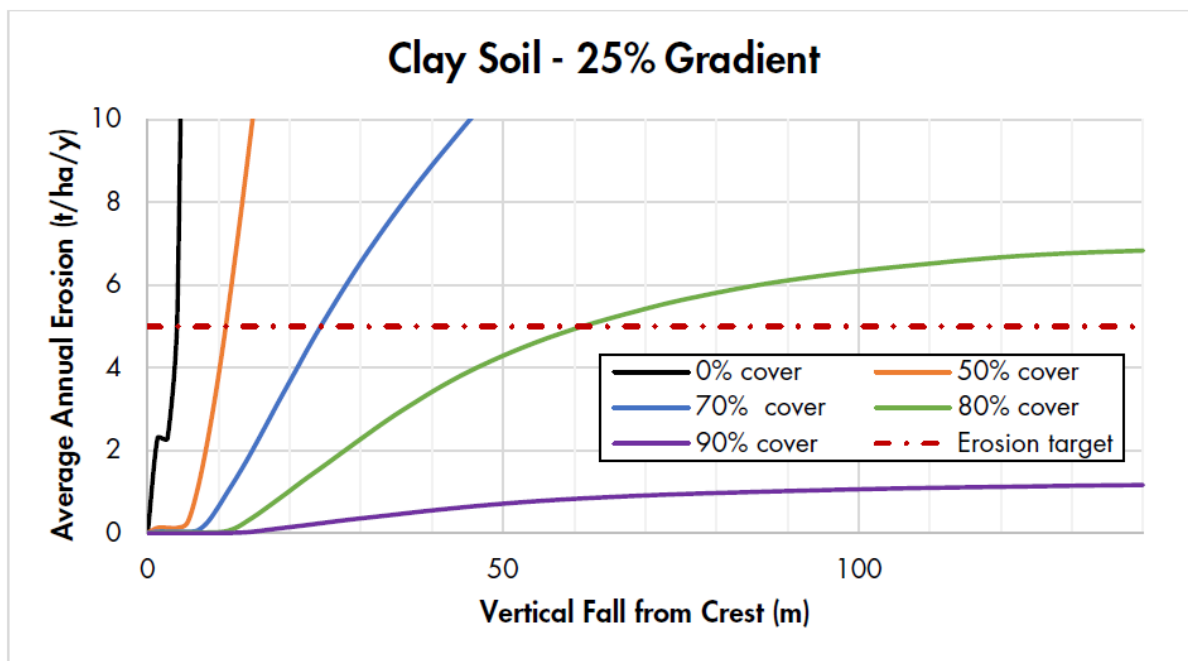


Figure 64 Predicted erosion rates along 25% gradient batter slopes with clay soil surface and 50%, 70%, 80%, and 90% vegetation cover

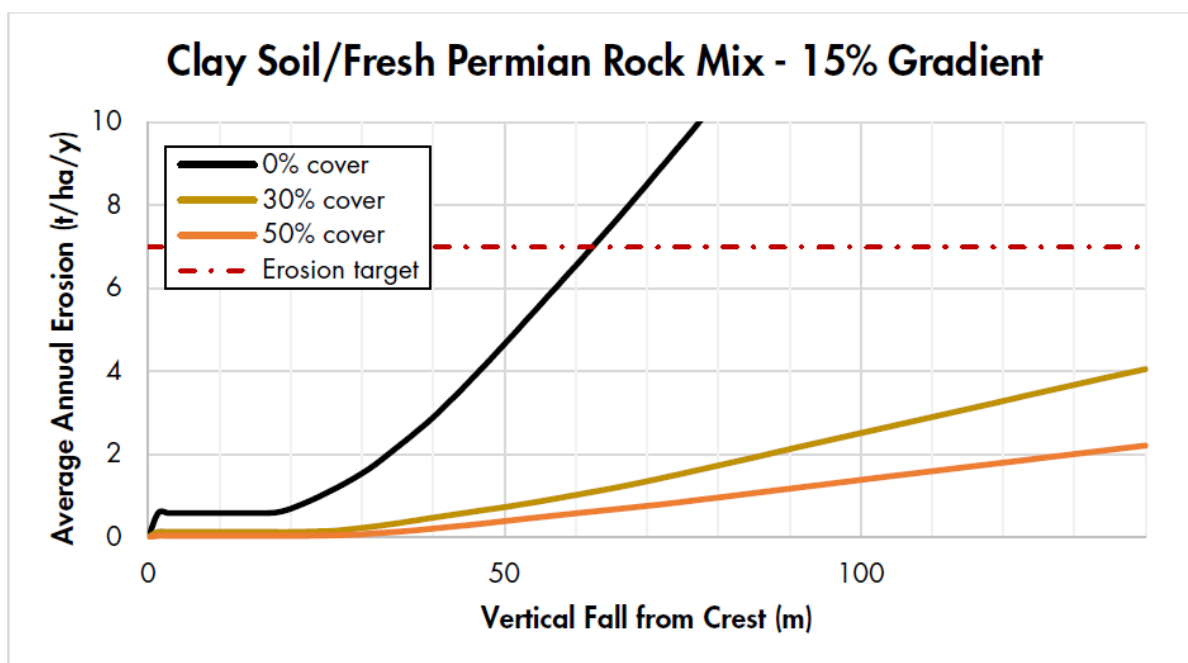


Figure 65 Predicted erosion rates along a 15% gradient batter slope with clay soil/ Fresh Permian rock mix surface and 0% - 50% vegetation cover

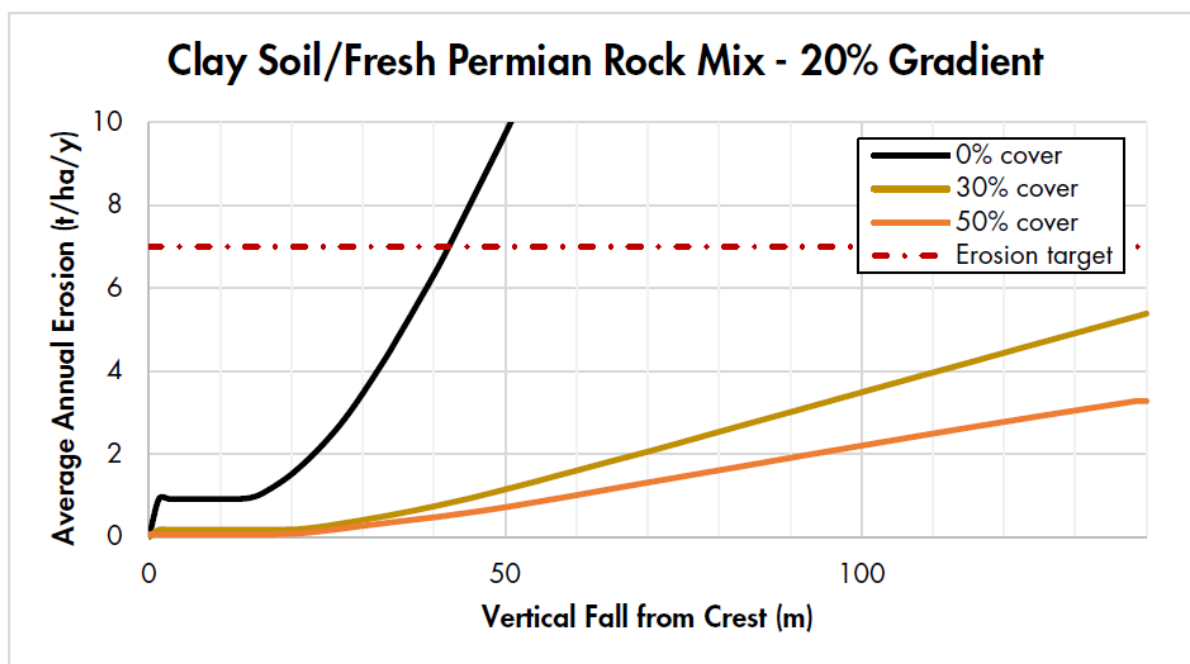


Figure 66 Predicted erosion rates along a 20% gradient batter slope with clay soil/ Fresh Permian rock mix surface and 0% - 50% vegetation cover

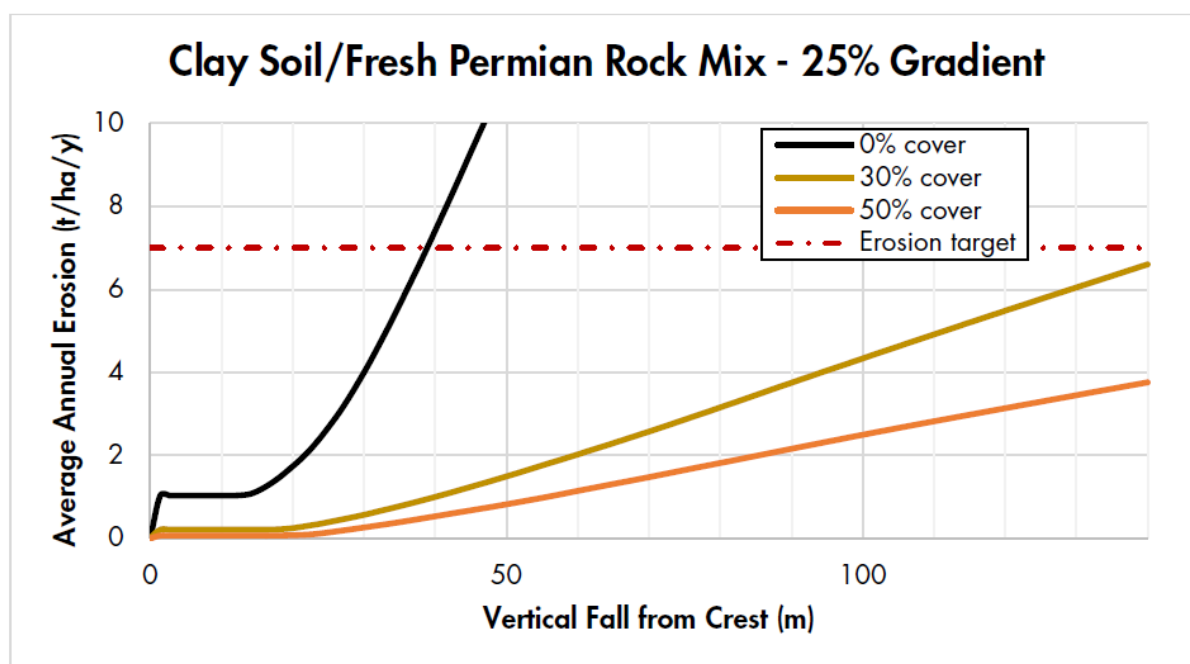


Figure 67 Predicted erosion rates along a 25% gradient batter slope with clay soil/ Fresh Permian rock mix surface and 0% - 50% vegetation cover

Long-term Landform Stability

The runoff and erosion simulations using the WEPP model and the landform evolution simulations using the SIBERIA model indicate that the proposed dumps and slope profiles at PTM can be expected to be stable over the long-term, provided the target levels of vegetation cover are achieved.

The results from the SIBERIA modelling predict the long-term development of channels and hillslopes in the landform catchments, considering runoff, erosion, and deposition. The model was run for 300 years, with outputs provided between 50 years and 300 years. At each output year, visualisations of the rate of erosion and gully development are provided, along with a table that includes rates for each material on the landform (Landloch, 2024).

The modelling predicted erosion rates and gully depths for the grazing PMLU and woodland PMLU areas are shown in [Table 52-Table 51](#). Consistent with the WEPP simulations, the SIBERIA results indicate that:

- At a vegetative cover level of 80%, predicted erosion rates of the grazing PMLU areas capped with clay soil are below the target erosion level of 5t/ha/y and has been adopted for this PMLU.
- At a vegetative cover level of 50%, predicted erosion rates of the woodland PMLU areas capped with clay soil mixed with fresh Permian rock are below the target erosion level of 5t/ha/y, however the WEPP results indicate erosional stability at 30% cover. Accordingly, a 30% groundcover criteria has been adopted for this PMLU, with 50% preferable if the rock mix and topsoil layer can support this level of cover.
- Cumulative predicated erosion at 300 years is <0.5m, which indicates the 1.9-2.0m fresh Permian layer underlying the growth media layer is sufficient to mitigate long-term erosion risk.

Figure 68 shows the overall modelled landform erosion rates for 300 years and demonstrates that the adopted erosion criteria limit is met across the Landform. It should be noted that as the 3D landform DEM is conceptual, minor adjustments were required to account for artifacts inherent in a design completed at this level of engineering maturity.

Table [525251](#) Predicted Erosion Rates and Maximum Gully Depths

Simulation Year	Maximum Gully Depth (m)	Maximum Average Annual Erosion (t/ha/y)	Cumulative Erosion (mm)
Grazing PMLU Areas (80% cover)			
50	-	3.5	13
100	-	3.1	25
200	0.3	2.9	36
300	0.3	2.9	48
Woodland PMLU Areas (50% cover)			
50	-	3.5	13
100	-	3.0	25
200	0.3	2.8	36
300	0.3	2.8	46

As the predicted erosion rates provided in [Table 52-Table 51](#) are based on an assumed ground cover, there is inherent uncertainty regarding both the validity and achievement of the maximum average annual erosion rate. Further collection of erosion monitoring data is required to calibrate the erosion rates shown in- [Table 52-Table 51](#). On this basis, the rehabilitation milestone criteria proposed to demonstrate acceptable erosion of high-risk landforms is based on the erosion classification framework (RM6), referenced in Appendix 7 of the PRC Plan Schedule.

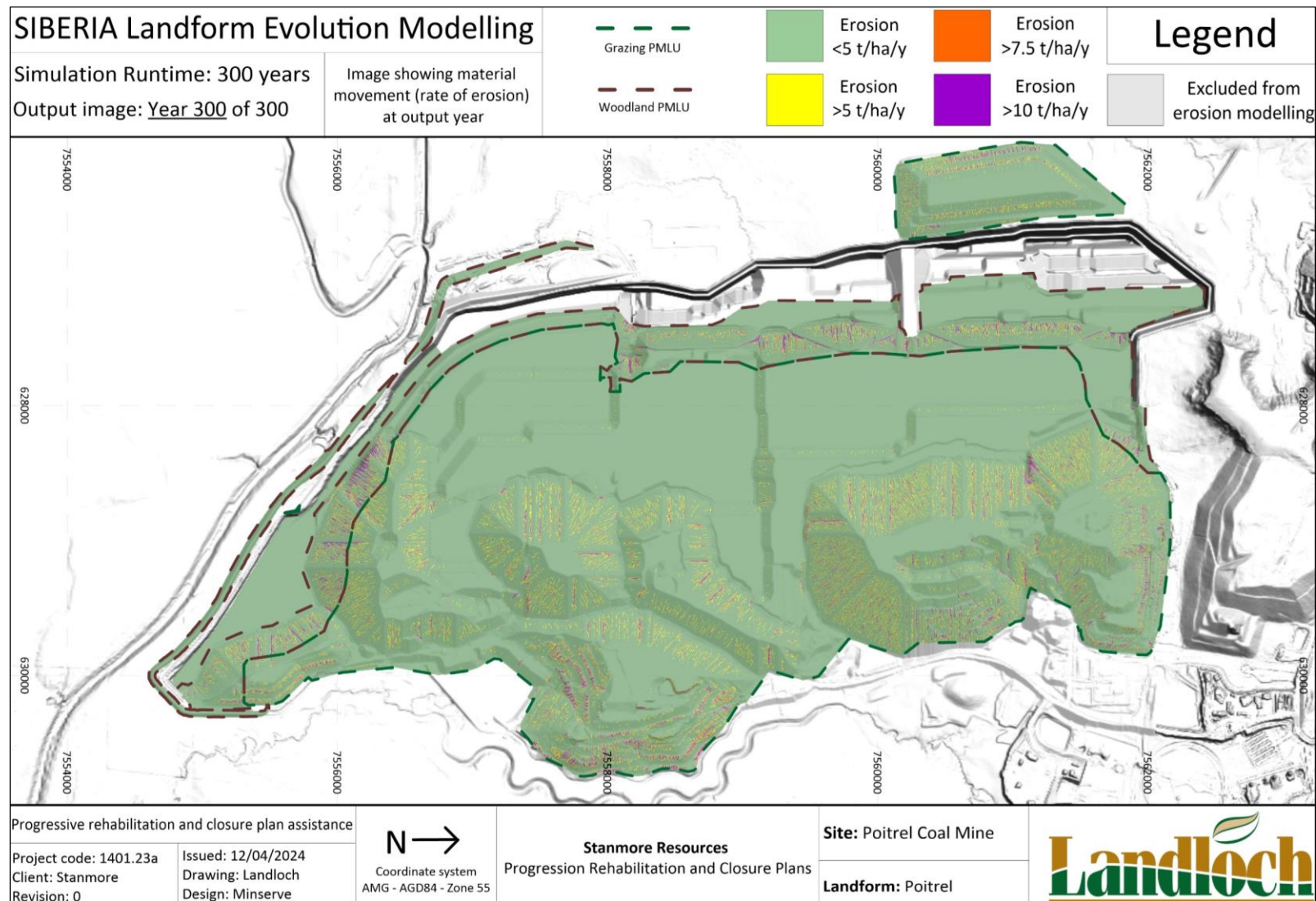


Figure 68 Predicted erosion rates of the PTM landform after 300 years.

3.6.1.5.6 Method of Construction

In alignment with the rehabilitation milestone criteria, relevant infrastructure will be removed, then the landform will be reprofiled to be consistent with design requirements. Dump areas will be reshaped using typical earthmoving equipment. Where required, temporary drainage controls will be designed and constructed to ensure erosion of the final landform is minimised.

Following landform profiling (with the requisite fresh Permian layer established), topsoil and graded fresh Permian rock (in the case of Woodland PMLU) will be imported, with shallow ripping to facilitate consistent mixing. Ameliorants and seeding will be applied using appropriately specialised machinery. Deep ripping along the contour for surface water management will be conducted.

3.6.1.5.7 Quality Assurance/Quality Control

Construction methodologies applied to landforms will be appropriately designed by a SQP, to ensure success in achieving the proposed completion criteria. Records of the method applied in construction of final landforms will enable objective assessment and monitoring against proposed rehabilitation milestones, as well as inform any corrective actions and changes to methodologies required to support success.

Typically, reshaping activities should achieve the design geometries $\pm 0.2\text{m}$ vertical height measured over a maximum distance of 50m, allowing for some greater variation in microrelief caused by blockiness of the wastes (i.e. some rocks or larger particles may protrude from an otherwise suitably level surface).

It is critical that flow concentration on the batter slopes is minimised following construction, and temporary erosion and sediment controls, such as contour banks may be installed temporarily to facilitate revegetation and to protect bare surfaces. Cross ripping of the landform surface to $\sim 500\text{mm}$ deep is also recommended to reduce the effects of sheet flow on landforms.

The key controls to manage the landform risks associated with achieving the PMLUs are discussed in the PRC Plan Risk Assessment (Section 3.7). Quality assurance and quality control activities are built into all necessary execution and verification activities of these controls. Construction monitoring and reporting records will verify controls and ensure that controls are executed effectively.

3.6.1.5.8 Trial Methodology

Assessments and modelling undertaken as part of PRC planning has indicated that as the landform rehabilitation will be executed as a single project, and accordingly trials on individual slopes may not be a viable option. If specific landform areas can be identified as appropriate for selected trials, these may be considered to confirm current milestone criteria can be achieved (including confirming preferred soil/rock ratio in the case of the Woodland PMLU). Maintenance and ongoing monitoring following construction will verify if the landforms are trending toward milestone criteria, or whether corrective actions, maintenance or change to the rehabilitation methodology is required.

3.6.1.5.9 Limitations and Assumptions

The key limitations and assumptions of the final landform design at the current conceptual level of engineering maturity include:

- Landforms designs are conceptual and have not been finalised and may be optimised during detailed design within acceptable design parameters as the knowledge base maturity is progressively improved.
- The final landform is dependent on the mining schedule, which can change due to increased geological knowledge, market factors and technology. These changes may result in differences to the landform, but the key considerations to ensure long-term stability, such as slope profiles and materials, will be maintained in the final closure landform design.
- Contaminated land assessments undertaken in RM2 (Section 3.1.4) will not impact this stage of the engineering design.
- All landforms are assumed to be track compacted during construction and internally reshaped with uniform soil/capping application. Accordingly and settlement over the long-term is expected to be consistent across the landform and does not require specific management.
- The fresh Permian overburden is used as a cover over the less suitable Tertiary overburden.

- The fresh Permian overburden poses a low risk and acid, metalliferous and saline drainage, such that the intent of the cover is for management of erosion and promotion of vegetation growth.
- Fresh, benign, rocky Permian overburden can be sourced in sufficient quantities to achieve the required cover.
- Vegetation groundcover levels of >30% can be sustainably achieved for the woodland PMLU.
- Vegetation groundcover levels specifically considers contact cover of vegetation on the surface. Practically, this means a combination of grass cover and anchored (not readily moved) surface litter.
- Considerations of surface cover do not include rock. Where rocky materials have had erodibility measured experimentally and those parameters are used in WEPP simulations, then effects of the rock are already accounted for within the parameters used.
- The erosion modelling assumes:
 - No uncontrolled discharge of runoff from landform tops onto outer batter slopes.
 - That batter slopes will not be formed with excessive flow-concentrating profiles (e.g. variations in surface elevation such that there is cross-slope concentration of flow into consistent depressions running downslope).
 - Any cross-slope ripping will be carried out strictly on the contour.
 - Soil management (including stripping, stockpiling, replacement, amendment, and fertilisation) will be carried out effectively to maximise early and continuing plant growth.
 - Despite a blending 4:1 ratio being adopted for the modelling, other blending ratios could be considered in future modelling. It is possible that different blending ratios would also achieve acceptable long-term erosion rates.
- The landform shape supplied represented a dozer push plan to a final rehabilitation shape. As such, the design is not representative of a final design in that there are sections that will likely be modified as further design work and refinement occurs. However, the landforms have the overall conceptual 3D rehabilitation shape and modelling of long-term erosion of this design is useful insofar as it:
 - Assesses the suitability of the overall batter geometry being adopted.
 - Demonstrates aspects of the rehabilitation design that should be avoided in future refinement of the design.
 - The final landform will be overall water-shedding. However, specific detailed surface water management features have not yet been integrated into the current design. It is expected that further refinements would need to include integration of those features.
 - The landform is not lined as the waste stored is considered geochemically benign.
- Waste management and scheduling will be sufficiently aligned with eventual closure requirements to enable material to be incorporated into the upper layers of the final design.

3.6.1.6 Cover Design

PRC Plan Guideline (Section 3.6.1)

A cover design is required for the surface treatment of a mine landform or other waste material. Hence, the cover system design must be appropriate for the type(s) of waste the project will generate and reflect a risk-based approach. Where waste has the potential for AMD, neutral mine drainage or saline mine drainage, an appropriate cover system must be designed.

The cover design should include:

- identification and specification of the objectives of the cover system
- a detailed description of the design including the thickness of each layer
- a detailed description of construction methodology including any proposed staging of the cover system
- a quantitative assessment that identifies the location and quantity of proposed capping material available on-site
- proposed QA/QC for the construction of the cover system including the timely implementation of corrective actions where deviations from the design are identified.

Cover systems are typically required in mine waste storage facilities to provide a stable, reliable and sustainable constructed interface between the receiving environment and the mine waste, and to promote vegetation growth. Where mined waste material has the potential to cause AMD, Neutral Mine Drainage (NMD) or SD, store and release, barrier or engineered cover systems may be required to manage geochemical risks.

As part of PRC Planning, the risk of movement/migration of AMD, NMD and SD causing failure to achieve the PMLU was assessed, considering the geochemical characteristics of waste stored in the landform (Appendix 4 and 9). The study found that the waste materials had low potential for AMD, NMD or SD generation or elevated metal and/or sulphate concentration in surface waters or groundwaters (consistent with findings in Section 3.6.1.3). Accordingly, the recommended cover design is an erosion protection system only to manage erosion risks and promote vegetation establishment in line with milestone criteria. The soil and capping design, including justification for the use of the growth medium is presented in Section 3.6.1.4.

3.6.1.7 Water Management

PRC Plan Guideline (Section 3.6.1)

The rehabilitation planning part must include a description of the following:

- a description of the contaminants that pose a risk to environmental values of the receiving environment
 - source, pathway and fate of contaminants that have the potential to impact environmental values
 - infiltration and seepage intervention and collection controls
 - surface water diversions and long-term management requirements
 - dewatering requirements
- ongoing water management and reduction requirements (i.e., treatment).

Management of water during operations is conducted in accordance with the PTM Water Management Plan. The WMP was developed by addressing the conditions of the EA and aims to protect receiving environments, particularly those within the Upper Isaac River sub-catchment. This is done so via water management infrastructure, consisting of a clean water diversion and a mine affected water (MAW) system consisting of dewatering and water transfer infrastructure, drains dams.

Water management for closure including controls, diversions, long-term management and dewatering requirements is summarised below, including identification and mitigation of risks to proposed PMLUs and the receiving environment. The proponent will also develop a Closure Water Management Plan (CWMP) prior to closure, addressing specific pre-closure, closure and post-closure water management requirements, monitoring, and maintenance.

The design of the closure landform for PTM aims to create landforms that satisfy the specified PMLU and NUMA milestone criteria, eliminating the necessity for continuous water management or dewatering post-closure. The evaluation of ongoing water management post-mining takes into account key considerations, outlined in detail in the relevant sections of this PRC Plan, including:

- The closure landform surface is intended to be free draining to prevent ingress into voids or ponding in the rehabilitated landform, with runoff flowing to the surrounding watercourses.
- Some dams will be retained (RA3) where they will have a demonstratable benefit to support the grazing PMLU. All others will be rehabilitated through decommissioning and removal (RM1).
- Contaminated land investigations will be undertaken (RM2) at the completion of mining where required, and any identified remediation/management requirements to render the site suitable for the nominated PMLUs will be undertaken.
- The final residual void would remain as a groundwater sink and groundwater would not flow from the residual void off-site.

3.6.1.7.1 Potential Contaminants

ERAs are authorised under the PTM EA. ERAs have the potential to release emissions and contaminants that can impact the environment and surrounding land users, causing environmental harm. PTM operations, to which ERAs pertain, encompass heavy industrial activities responsible for maintaining processing facilities, vehicles, and equipment necessary for coal extraction and processing. These operations involve the storage, utilisation, and disposal of various hazardous materials. Due to the nature of the activities at PTM, contaminants associated with the above activities can mobilise and become present in soil, surface water and groundwater. Upon completing mining operations, a contaminated land investigation (RM2) will evaluate the area for potential contamination, in accordance with the PRC Plan Schedule.

A summary of the potential contamination sources, the type of contamination and mechanism of contamination is presented in [Table 53](#).~~Table 52.~~

Table 535352 Summary of Potential Contamination Sources (BHP, 2019)

Potential Source	Potential Contaminants	Mechanisms of Contamination
Runoff from disturbed land (pre-rehabilitation)	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic spoils (elevating pH), acid generating rejects (lowering pH).
Runoff from rehabilitated land (contaminant loading expected to be significantly lower than disturbed areas)	Suspended Solids (Turbidity), Dissolved Solids, +/- pH, Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic spoils (elevating pH).
Release of recycled waters, dams, sewage treatment plants and industrial areas, etc.	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, hydrocarbons, pathogenic microorganisms, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, spills, acid generating rejects (lowering pH) ineffective sewage treatment, release from sewage ponds
Release of waters from pits and storages	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, etc.
Release of waters from sediment dams	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	By wash, capacity reduced due to sedimentation.
Spilt or leaking flammable and combustible liquids and chemicals	Hazardous or toxic products, +/- pH, metals.	Contamination of land and surface runoff causing impact to regional water systems.

3.6.1.7.2 Contaminant Pathways

Water is a primary pathway of potential contamination to the receiving environment. At closure, dams and other infrastructure within the MAW management system will be assessed for potential contaminants, remediated (where required) and (excluding RA3) decommissioned and reshaped to achieve free draining conditions.

MAW has a higher potential to become acidic and metalliferous through contact with activities associated with the management and subsequent storage of mine waste. However, Section 3.6.1.3 suggests that this risk is low. Nonetheless, contaminants from spoil dumps and infrastructure areas have the potential to be mobilised via surface water runoff, and contribute to the generation of AMD, sediment laden water and/or saline drainage and then impact surface and groundwater receptors. Therefore, spoil dumps will be progressively rehabilitated and reshaped to form a free-draining landform designed to limit excess runoff and prevent the mobilisation of contained contaminants to downstream receptors. Where identified, higher risk material will be used to backfill the mining pits, or selectively encapsulated within spoil dumps to ensure that surface and ground water cannot become contaminated.

The post-closure hydrogeological technical report integrates a particle tracking analysis to inform migration/flow pathways for contaminants and residual voids, accessing potential particle migration routes. The findings predict that the water particles within the potential contaminant source areas of the mining leases, and within the voids themselves, will either migrate towards the residual voids and remain on the mining leases post-closure or remain within the voids on the mining leases post-closure.

Modelling confirmed that groundwater exchange in the void is expected to stabilise after mine closure; the residual void will operate wholly as a groundwater sink, with no water seepage into the natural environment (WSP, 2024). Therefore, there are no dedicated infiltration of seepage collection controls required. However, monitoring of groundwater will still occur (Section 3.8.5).

Further to this, flood modelling has demonstrated that the closure landform embankment (RA4), along with the permanent New Chum Creek diversion (RA7 and RA9), maintain a hydraulic regime that limits interaction with the residual void and closure landform, and subsequently the mobilisation of contaminants in floodwaters.

3.6.1.7.3 Surface Water Diversions and Long-Term Management

PTM has one existing surface water diversion within New Chum Creek (details in- [Table 54](#)~~Table 53~~), which was designed and constructed to enable open-cut mining. A diversion assessment framework was developed (Engeny, 2020) that analysed the licenced creek diversion at PTM against industry standard performance criteria and objectives and found that:

- New Chum Creek Diversion (WL401913): Aligns with the defined assessment objectives for post-mining land use rehabilitation requirements related to watercourses. Consequently, in a closure state for PTM, the diversion will remain in its current alignment. The assessment findings include:
- The diversion either achieves or will progress towards achieving water license relinquishment objectives.
- In PTM's closure state, the land around the diversion will be used for grazing, ensuring the diversion's water quality, hydraulic, and sediment transport align with the natural upstream and downstream watercourse reaches.
- Monitoring and rehabilitation programs for the diversion will be sustained throughout PTM's operational phase (Section 3.8.3).
- The final land use of the diversion itself shall be 'watercourse'.

The PTM creek diversion information, including water licenses, assessment result, and commitments for relinquishment, is provided in- [Table 55](#) ~~Table 54~~. Forward work for the New Chum Creek diversion will involve rehabilitation efforts (removal of rock RA9) to ensure the creek diversion achieves a stable condition, facilitating its transition to a relinquishable state, not requiring long-term management.

Table [54](#)~~5453~~ PTM Creek Diversion (New Chum Creek) Specifications (Source: Engeny, 2019)

Name	Stream Order	Water Licence No.	River Catchment	Total Length	Catchment Area	Construction Date
New Chum Creek	3	401913	Isaac River	4500m	25km ²	2007-2008

Table [55](#)~~5554~~ PTM Surface Water Diversion Details and Forward Work Plan

Details	New Chum Creek Diversion
Water Licence	WL401913
Drainage Basin	Fitzroy River
Diversion Assessment Outcome	Diversion in its existing alignment is meeting or will continue progressing towards achieving the EA watercourse PMLU goals. Diversion will be relinquished in its existing alignment with a PMLU of Watercourse.
Operational Phase	Routine monitoring and maintenance of the diversion during the operational phase of the mine.
Rehabilitation Milestones	Removal and rehabilitation of any current or future mine infrastructure near the diversion including: • Removal of the rock armouring at the downstream limit of the diversion reach. • Removal of the upstream road crossing (Poitrel Mine Road). Review of design specifications and annual monitoring to determine if diversions are suitable or need repair/redesign in order to meet relinquishment criteria.

3.6.1.7.4 Dewatering

The only dewatering required will be associated with any dams to be decommissioned. All water within these storages will be dewatered back to the voids or other mine water storages if decommissioning occurs during operations or used for dust suppression during rehabilitation phase.

There are no other dewatering requirements with the final proposed landform and associated PMLUs/NUMA.

3.6.1.7.5 Ongoing Water Management

Based on the proposed rehabilitation strategy for PTM, once rehabilitation milestones are met and PMLUs have been achieved, no further water management are expected, including infiltration and seepage interventions, dewatering, and active reduction requirements due to:

- Any retained dams must not exceed the trigger values for livestock drinking water defined in ANZECC & ARMCANZ 2000 (RM6 of the PRC Plan Schedule).
- All other water storages, that were created for or by the mining operations, will be decommissioned and rehabilitated.
- Contamination will have been investigated, remediated and/or appropriately managed (RM2 of the PRC Plan Schedule).
- Residual void will generally continue to act as long-term sinks capturing and containing any groundwater seepage from the site, and will not overtop or interconnect with groundwater aquifers.
- The New Chum Creek Diversion will remain stable within its current alignment.
- Routine creek diversion performance monitoring is completed as part of the operations. The monitoring will continue throughout the LoA as part of the operations and closure.
- Upon relinquishment of WL associated with the diversion, and the subsequent closure of the mine, it is anticipated that there will be no requirement for ongoing, extended-term management of diversions at PTM.

3.6.1.8 Revegetation

PRC Plan Guideline (Section 3.6.1)

The revegetation plan must propose activities that will establish self-sustaining vegetation communities that are appropriate for the intended PMLU (e.g., natural ecosystems, grazing, forestry, and some agricultural and other land uses). Revegetation should, therefore, not only establish a ground cover, but also, in some domains, establish associated fauna habitat and other ecological services.

3.6.1.8.1 Revegetation Objectives

Rehabilitation methods adopted at PTM are considerate of the disturbed soil condition, such as depleted seed bank and increased susceptibility to weed growth. In particular, revegetation of disturbed land at PTM seeks to establish vegetation consistent with the proposed PMLU by comparing against established analogue sites and revised PRC Plan RE Benchmarks, with milestone timing that reflects a prolonged regeneration of the target ecological community.

The plan is aimed at establishing a safe, stable, and non-polluting landform, with a self-sustaining vegetation cover consistent with the proposed PMLUs. The revegetation plan does not aim to completely mimic conditions of the target REs in their remnant or undisturbed state.

Revegetation activities for the woodland habitat and watercourse PMLUs will focus on the establishment of groundcover to facilitate stability and topsoil retention, and shrub and tree cover to re-establish fauna habitat. Native seed mixtures will contain a variety of perennial grass, shrub, and tree species introduced by direct seeding to establish a self-sustaining woodland ecosystem.

Revegetation activities for the grazing PMLU will focus on establishment of a stable and productive pasture to facilitate stability and topsoil retention, and to enable the return of grazing and fauna habitat.

Cattle Grazing Objectives

Lower gradient disturbed areas where there was significant clearing prior to mining, are proposed to have a cattle grazing PMLU. The objectives related to revegetation for this PMLU include:

- To ensure cattle grazing pasture with land suitability class ≤ 3 or not different from pre-mining if ≥ 4 .
- To ensure pasture condition rating ≤ 3 , based on the Pasture Condition Assessment Table as per "Stocktake: Balancing Supply and Demand" (Developed by FutureBeef – futurebeef.com.au).
- Leucaena stem density < 250 stems > 2 m per ha (1 per 40m²) mean total area.
- Certification from an AQP that rehabilitation is resilient to fire and grazing pressures.

Woodland Habitat Objectives

The objectives of the Woodland Habitat PMLU is to establish habitat characteristics consistent with revised RE (11.10.1) Benchmark Criteria when assessed by an appropriately qualified person using the methodology outlined in the Queensland Herbarium's BioCondition Assessment.

Watercourse Objectives

Watercourses rehabilitated to a Watercourse PMLU will seek to establish watercourse riparian vegetation with equal or greater conditions compared to upstream or downstream values, using Riparian Index Indicators (IDC method).

NUMA

Rehabilitation objectives for NUMAs are focused on ensuring they remain safe, stable, and non-polluting.

3.6.1.8.2 Species of Conservation Significance

Species of conservation significance are listed in Section 3.1.2.8.1. PTM has no specific obligations to include these species in revegetation activities, however the proposed woodland habitat and watercourse PMLUs will include habitat elements that support existing undisturbed vegetation and habitat values. Additionally, areas rehabilitated to a watercourse PMLU will connect existing riparian habitat values for potential conservation significant species.

3.6.1.8.3 Fauna Habitat and Use Requirements

Watercourse and woodland revegetation will provide connectivity and movement opportunity for threatened fauna species identified in field surveys in 2021 (BAAM,2022) including the Ornamental Snake and Southern Greater Glider, as well as for other species that occur or are likely to occur within the PTM MLs, such as the Koala, Squatter Pigeon and Grey Falcon.

3.6.1.8.4 Surface Preparation and Topsoil Quality to Support Vegetation Establishment and Management

Final rehabilitation will be undertaken progressively on disturbed areas as mining operations progress. The general sequence of works during each progressive rehabilitation campaign includes:

- Reshape disturbed areas when disturbance has been completed and the mine pit has progressed. Reshape to the final design shape (Section 3.6.1.5) (RM3).
- Identify and conduct sampling of the topsoil to be applied, to confirm soil ameliorant requirements (RM4).
- Rip surface to approximately 0.5m to reduce compaction and allow adequate water and root penetration into this layer.
- Spread growth medium at a minimum depth of 0.1m.
- Apply ameliorants (e.g., fertiliser) as required based on the sampling completed.
- Scarify the topsoil to incorporate soil ameliorants but not to a depth that will bring any waste material to the surface.
- Apply seed and till on the contour with a tyned implement, with tyne spacing no greater than 0.5m.
- Complete supplemental hand planting of trees and shrubs as required.

Topsoil Quality

Based on material characterisation (Landloch, 2022), topsoil properties to support the desired PMLU will have:

- Cation exchange capacity of above 14meq/100g for clays and 6meq/100g for loams.
- Major macronutrient concentrations in root zone (0–0.3m):
- Total nitrogen (N) above 1000 mg/kg.
- Available phosphorus (P) above 10 mg/kg.
- Potassium (K) above 160 mg/kg.
- Total organic carbon (TOC) above 1%.
- pH_w range of soil is between 6.0–9.0 to at least 0.3m.
- Primary growth media (0–0.3m) salinity (EC_{1:5}) is less than 0.75dS/m.

Prior to application, soil should be assessed by an appropriately qualified person, with amendments recommended as required. This is reflected in RM4.

3.6.1.8.5 Plant Species

Cattle Grazing Species

The recommended revegetation species mix for cattle grazing PMLU is based on preferred, palatable and productive (3P) pasture species and legumes cognisant of grazing best management practice. Suitable pasture species are provided in [Table 56](#)~~Table 55~~. These species have been recommended based on a combination of 3P species recorded during PTM baseline surveys, as well as a selection of 3P species suitable for the dominant clay and/or loam topsoils at the mine.

Table 56 Recommended Species to be Established in the Cattle Grazing PMLU

Common Name	Scientific Name	Sowing Rate (kg/ha)	Comments
Rhodes grass	<i>Chloris gayana</i> cvv. <i>Callide</i> ¹	3*	3P grass Tolerate a range of soils
	cvv. <i>Katambora</i> ¹	4*	3P grass Tolerate a range of soils Salt tolerant
Bisset Creeping Bluegrass	<i>Bothriochloa insculpta</i> cvv. <i>Bisset</i>	4*	3P grass Drought tolerant
Qld Blue grass	<i>Dicanthium sericeum</i>	2	3P grass Suitable for clay soils
Bambatsi panic	<i>Panicum coloratum</i> cvv. <i>makarikariense</i>	3*	3P grass
Purple pigeon	<i>Setaria incrassata</i>	2	3P grass
Burgundy bean ²	<i>Macroptilium bracteatum</i>	2	Legume requires specific rhizobium inoculum strain CB1717
Stylo ²	<i>Stylosanthes seabrana</i> cvv. <i>caatinga</i>	2	Legume requires specific rhizobium inoculum strain CB3481
Shirohie millet	(e.g., <i>Echinochloa esculenta</i> ¹)	5	Cover crop for soil protection
Total		27	

Woodland Habitat Species

The species selected for the Woodland Habitat PMLU (presented in ~~Table 57~~ ~~Table 56~~) expands from RE 11.10.1 to include as species from the relevant broad vegetation group (BVG). The relevant BVG for RE 11.10.1 located on the anthropogenic rocky landform is BVG 10a.

The total recommended seeding rates for upper-story tree species, mid and lower story tree and shrub species, and ground cover, is 5kg/ha.

Table 57 Recommended Species to be Established for the Woodland Habitat PMLU

BVG	Upper-Storey Tree Species	Mid and Lower Storey Tree and Shrub Species	Groundcover Species
10a	<i>Corymbia citriodora</i>	<i>Alphitonia excelsa</i>	<i>Cymbopogon refractus</i>
	<i>Eucalyptus crebra</i>	<i>Acacia leiocalyx</i>	<i>Themeda triandra</i>
	<i>Eucalyptus fibrosa</i>	<i>Acacia cretata</i>	<i>Eremochloa bimaculate</i>
	<i>Corymbia hendersonii</i>	<i>Acacia longispicata</i>	<i>Arundinella nepalensis</i>
	<i>Corymbia clarksoniana</i>	<i>Petalostigma pubescens</i>	<i>Panicum effusum</i>
	<i>Angophora leiocarpa</i>	<i>Breynia oblongifolia</i>	<i>Desmodium varians</i> ,
	<i>thozetiana</i>	<i>Capparis canescens</i>	<i>Brunoniella australis</i>
	<i>Eucalyptus cambageana</i>		<i>Cyanthillium cinereum</i>
	<i>Eucalyptus crebra</i>		<i>Chrysocephalum apiculatum</i>
	<i>Acacia harpophylla</i>		<i>Eustrephus latifolius</i>
	<i>Acacia cambagei</i>		<i>Dianella revoluta</i>
	<i>Casuarina cristata</i>		<i>Phyllanthus virgatus</i>
			<i>Evolvulus alsinoides</i>

BVG	Upper-Storey Tree Species	Mid and Lower Storey Tree and Shrub Species	Groundcover Species
			<i>Lomandra confertifolia</i> subsp. <i>Pallida</i> <i>Lomandra multiflora</i> subsp. <i>Multiflora</i> <i>Glossocardia bidens</i>

Watercourse Habitat Species

Previous ecological studies/diversion monitoring conducted at PTM indicate that watercourse habitat species within RA7 are consistent with RE 11.3.25. The species selection for the Watercourse PMLU for RM9 expands on the RE 11.3.25 species list to include as many species as possible from BVG 16a.

Generally, riparian vegetation includes species that are adapted to upper, mid, and lower banks (revegetation zones) as illustrated in Figure 69. The total recommended seeding rates for all these zones is 5kg/ha, with species outlined in [Table 58](#), [Table 57](#).

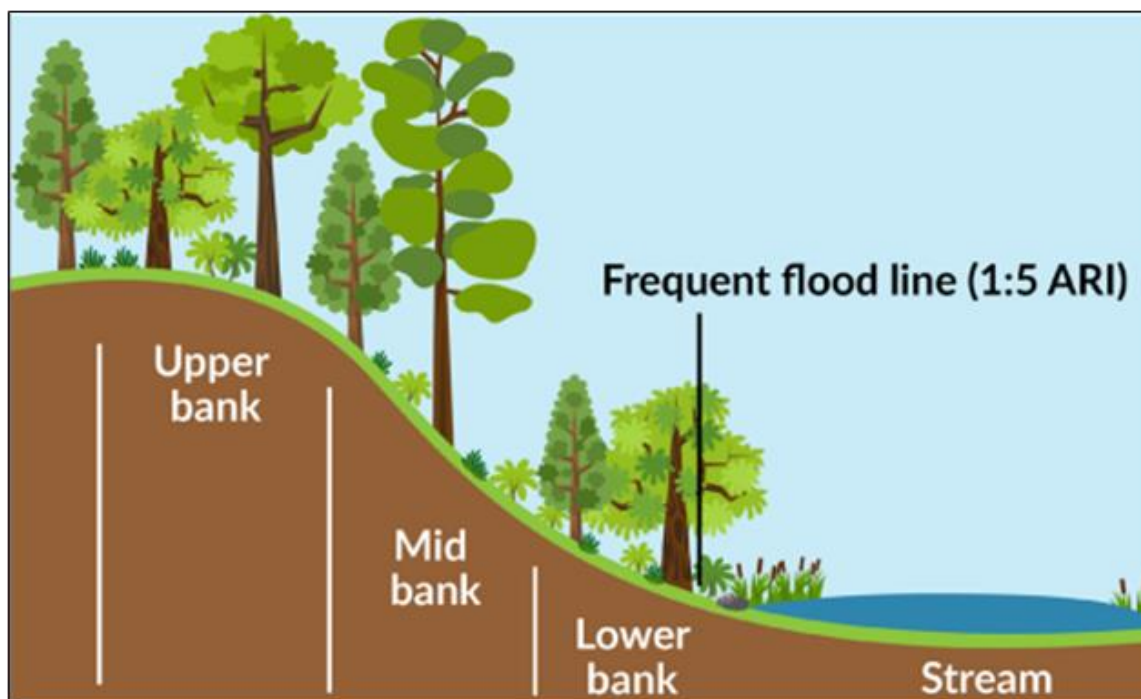


Figure 69 Typical Riparian Revegetation Planting Zones (BCCA, 2014)

Table [58](#) Recommended Species to be Established in the Watercourse PMLU

BVG	Upper-Storey Tree Species	Groundcover Species
16a	<i>Eucalyptus camaldulensis</i> <i>Eucalyptus tereticornis</i> <i>Eucalyptus coolabah</i> <i>Melaluca sp.</i> <i>Corymbia tessallaris</i> <i>Angophora spp.</i> <i>Casuarina cunninghamiana</i>	<i>Heteropogon contortus</i> <i>Themeda triandra</i> <i>Chrysopogon fallax</i> <i>Imperata cylindrica</i> <i>Eulalia aurea</i> <i>Cyanthillium cinereum</i> <i>Phyllanthus virgatus</i> <i>Eustrephus latifolius</i> <i>Brunoniella australis</i> <i>Crotalaria montana</i> <i>Rostellularia adscendens</i> <i>Evolvulus alsinoides</i> <i>Sida spp</i>

Planting Rates and Timing

A contingency of +20% should be applied to the seeding rates specified, to account for plant mortality.

Care should be taken to not overseed tree and shrub species, as this may cause undesirable densities of trees and shrubs to establish. Excess trees and shrubs can hinder and/or limit the establishment of groundcover species that are critical for limiting erosion of the final landform.

Revegetation activities will occur in the late summer or early autumn when soil moisture is high, and temperatures are milder.

Seed Collection and Procurement

If required, and where possible, native seed could be collected from populations on or near PTM to maintain endemic tolerance. Seed collection could occur in the years prior to commencement of rehabilitation, and then on an ongoing basis as rehabilitation occurs progressively through to the end of mining.

In the case where seed collection cannot supply sufficient seed (e.g., future dry periods that reduce seed set), species planted from seed may need to be purchased from local suppliers up to six months in advance, in quantities sufficient to undertake direct seeding operations. Seed shall be stored appropriately on-site once received and/or collected.

3.6.1.8.6 Vegetation Establishment and Management Methods

Seeding

Direct seeding will be preferred to achieve an even, continuous cover of vegetation for the Grazing, Woodland and Watercourse PMLUs. Seeding may be undertaken using conventional broadcast seeding equipment (e.g., combine seeder, spread with harrows or spinner).

In most cases, *Acacia* spp. seeds have a hard coat which is impermeable to water and germination will not normally occur unless some sort of pre-treatment is conducted. In nature this hard coat leads to seed dormancy until it is broken down over time or by the heat of bushfire. Approximately half of the hard-coated *Acacia* spp. seeds should be scarified prior to sowing. This will allow scarified seeds to imbibe and germinate. By only scarifying half of the seeds additional reserve are maintained in the soil seed bank. Seed scarification can be required from the supplier prior to delivery however needs to be sown as soon as possible after scarification.

Weed Control

Establishment of a self-sustaining ecosystem with comparable management requirements to similarly regional ecosystem will require weed management. It is suggested that:

- Weed density and diversity will not exceed 110% of baseline survey results.
- No declared weeds are to be present in rehabilitation.

Weed management methods include:

- Conduct employee weed and feral pest awareness training in scheduled tool-box talks.
- Provision of, and requirements for plant and vehicle wash down facilities.
- Wash down bays will collect seeds that are washed from the vehicles to prevent ingress to drainage lines.
- Regular weed monitoring and control programs.

Planting Success

Monitoring of newly seeded rehabilitation will commence immediately after planting and continue until plants have established. Plant health and mortality will be recorded, and any damaged or distressed plants will be attended to (e.g., watered, fertilised). If the mortality rate exceeds 30% of total plants, supplementary planting will be undertaken.

Fauna Control

Over grazing activity from native animals (e.g., kangaroos and wallabies), livestock (cattle, sheep, etc), and feral pests (e.g., pigs, goats, and mice) have the potential to impact rehabilitation success.

Grazing activity that impacts rehabilitation will be recorded during annual rehabilitation monitoring assessments. Where damage exceeds acceptable levels, grazing reduction treatments are to be engaged. Feral pest controls (e.g., trapping and shooting) will be instigated if they are found to be damaging revegetated areas. Damage from other animals may need to be managed through the establishment of exclusion areas (e.g., fencing) until rehabilitation has recovered.

3.6.1.8.7 Revegetation Monitoring

Monitoring is an integral part of the overall management strategy, enabling early detection of risks to rehabilitation and an indicator to commence effective risk management actions.

Key objectives of the monitoring program are to:

- Track the progress of rehabilitation activities with respect to milestones and benchmarks for comparable communities (at analogue sites).
- Identify problems affecting the progress or success of rehabilitation, which can then be addressed through management actions.
- Identify key site-specific success factors for successful rehabilitation and apply these more broadly throughout PTM.
- Collect data to objectively assess compliance with the PTM PRC Plan Schedule, relating to the creation of ecological values that are self-sustaining.

The timescales over which rehabilitation activities will be conducted can be expected to vary considerably between woodland and grazing communities. The establishment of functional woodland ecosystems may take decades, due to the slow growth rates of canopy vegetation. However, a range of incremental benefits in habitat value for ecosystem services can be expected throughout this period. In contrast, grazing pastures can be expected to form functional ecosystems over shorter timeframes of 10-15 years. The shorter timeframes for rehabilitation relate to the fast growth rate of grasses.

A summary of key stages expected in the rehabilitation of woodland and grazing ecosystems at PTM is provided in [Table 59](#).

Table 59 Summary of Key Stages Expected in the Rehabilitation of Woodland and Grazing Ecosystems

Revegetation Phase	Definition	Anticipated Timeframe	
		Woodland Habitat	Cattle Grazing
Initiation and Establishment	Preparation of rehabilitated landform (topsoil, surface preparation and ameliorants) and seeding. The period required for rehabilitation to become self-reliant in normal seasonal conditions. Maintenance works may be required to maintain weeds and replace vegetation losses.	5 years	5 years
Maintenance	The period of growth post establishment until the time that the rehabilitation becomes dominant and self-sustaining on site.	10 years	10 years
Completion	Final vegetation community and associated fauna habitats establish.	15 years	10 years

The monitoring program allows for assessment of ecological values through time. In this way the assessment can track trends in ecological values with the intent that values trending towards those present in analogue

sites or consistent with published benchmarks but that may take long periods to reach (30+ years) can be used to demonstrate revegetation success in shorter periods of time (not less than 5 years).

Comparisons of ecological indicators will be made with those at analogue sites and/or with respect to published benchmarks for relevant ecosystem indicators (e.g., RE benchmarks and water quality guidelines). In addition to ecological indicators, soil indicators are also to be assessed against those present in analogue sites or those consistent with published benchmarks or suitability targets.

Watercourse monitoring will be conducted at PTM to assess the performance of the rehabilitated diversion disturbed by mining activities (New Chum Creek, RA7 and RA9). The purpose of the monitoring is to assess the performance of the rehabilitated watercourse in achieving watercourse stability requirements (RM6), final PMLU milestone criteria (RM9) and in accordance with the diversion water licence requirements (WL401913) for relinquishment.

Watercourse monitoring will be undertaken in accordance with the Index of Diversion Condition (IDC) methodology which is outlined in the Monitoring and Evaluation Program for Bowen Basin River Diversions (ID&A, 2001). The IDC is a quantitative monitoring method used to measure the geomorphic and riparian condition of diversions. In this aspect, it can be utilised to monitor the condition and existing rehabilitation associated with the New Chum Creek diversion.

The rehabilitation monitoring methodology for PTM, including rehabilitation success indicators and reporting requirements is provided in the attached PRC Plan Schedule and outlined further in Section 3.8.

3.6.1.8.8 Analogue Reference Sites

Vegetation analogue sites were established at PTM during initial rehabilitation monitoring assessments to provide comparable data for rehabilitated sites. These vegetation analogue sites were chosen based on their representative features of the respective land disturbances such as topography, soil characteristics and vegetation type and structure. Analogue sites were also selected based on their representation of the REs surrounding PTM. ID and co-ordinates of the analogue sites are included in- [Table 60](#), [Table 59](#), and images in [Figure 70](#) [Figure 70](#) and [Figure 71](#) [Figure 71](#). The location of these sites is presented in [Figure 72](#) [Figure 72](#).

Table [60](#) [60](#)59 Rehabilitation Monitoring – Analogue Site Locations

Site ID	Easting GDA94	Northing	Period	Status
PTM07	630297.9	7554733.7	~10 years	Current
PTM08	627125.2	7560461.6	~10 years	Current



Figure 70 Analogue Site - PTM07 (Eco Logical 2023)



Figure 71 Analogue Site - PTM08 (Eco Logical 2023)

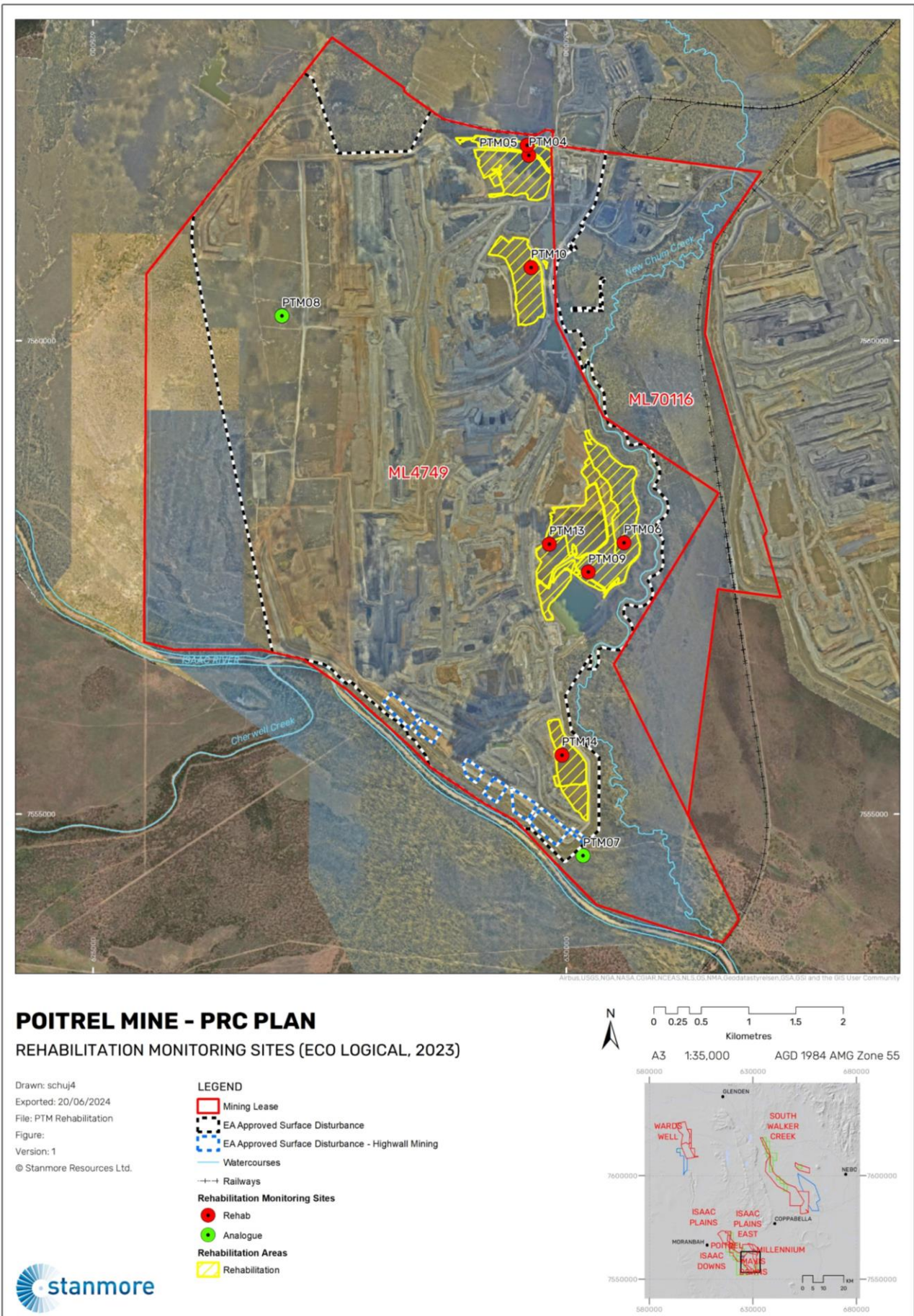


Figure 72 Rehabilitation Monitoring Sites

3.6.1.8.9 Revegetation Milestones and Objectives

Grazing

Pasture rehabilitation will be assessed by an AQP to certify that pasture meets a pasture condition rating of class ≤ 3 , based on the Pasture Condition Assessment Table outlined in “*Stocktake: Balancing Supply and Demand*” (developed by FutureBeef –futurebeef.com.au) and provided in- [Table 61](#), [Table 60](#). A summary of key assessable attributes includes:

- Certification that pasture achieves a condition rating class ≤ 3 .
- Preferred pasture species (3P grasses) diversity of ≤ 2 species.
- Preferred pasture (3P grasses) % dry matter yield $\leq 10\%$.
- Annual grass species dry matter yield $< 70\%$.
- Grasses other than 3P grasses and other weeds dry matter yield $< 80\%$.
- Crown cover (3P grasses) – at worst, moderate to low density and some plants dead.
- Leucaena stem density < 250 stems per ha (1 per 40m^2).
- Land suitability class ≤ 3 or not different from pre-mining if $\geq 4^A$.
- Certification from an AQP that rehabilitation is resilient to fire and grazing pressures.

Table [61](#)~~60~~ Pasture Condition Assessment

Condition Rating	Condition Indicators				
	Preferred Pasture Species		Annual Grass % DM Yield	Undesirable Grasses and Other Weeds % DM yield	Preferred Pasture Species Diversity
	% DM Yield	Crown Cover			
1	$> 80\%$	Dense and plants healthy	$< 20\%$	$< 20\%$	> 5 species
2	60 – 80%	High to moderate density and some plants unhealthy	20 – 40%	20 – 30%	3 – 5 species
3	10 – 60%	Moderate to low density and some plants dead	40 – 70%	30 – 80%	2 – 3 species
4	$< 10\%$	Sparse and many plants dead	$> 70\%$	$> 80\%$	0 or 1 species

Woodland Habitat RE Benchmarks

Woodland rehabilitation will be assessed against representative published RE benchmark data with considerations given for the revegetation potential of reconstructed soil profiles at PTM.

Proposed assessable attributes and weightings for deriving the final BioCondition score are outlined in [Table 62](#)~~Table 61~~ for RA4 and RA5 and [Table 63](#)~~Table 62~~ for RA8. Proposed rehabilitation completion criteria that incorporates BioCondition scoring is as follows:

- For RA4, RA5 and RA8, the BioCondition assessment demonstrates achievement of 50% of total maximum BioCondition score of undisturbed regional ecosystem 11.10.1.
- [Table 62](#)~~Table 61~~ and [Table 63](#)~~Table 62~~ contain BioCondition benchmark data for the nominated Regional Ecosystems that represent the native woodland planted for RA4, RA5 and RA8. Data is derived from Queensland Government BioCondition benchmark database. A revised PRC Plan benchmark is identified from the remnant vegetation benchmark, and only a subset of BioCondition assessable attributes are used, as some (i.e., large trees, coarse woody debris) would not be achievable in the timeframe from revegetation to achievement of the post-mining land use.
- It is noted that [Table 62](#)~~Table 61~~ and [Table 63](#)~~Table 62~~ do not contain BioCondition benchmark scores for mid story (shrubs) species. This is consistent with the Queensland Government Website

which states that shrubs may form a conspicuous layer. This is also consistent with the departments BVG 10a description which states, 'that a shrub layer is very sparse'.

Table ~~626261~~ Representative RE Benchmark Criteria for Woodland Rehabilitation (>15% slope)

Regional Ecosystem	11.10.1 Benchmark	11.10.1 Revised Benchmark
Short Description	<i>Corymbia citriodora</i> +/-Eucalyptus crebra +/- <i>Corymbia clarksoniana</i> woodland	<i>Corymbia citriodora</i> +/-Eucalyptus crebra +/- <i>Corymbia clarksoniana</i> woodland
Recruitment	100%	100%
Non-Native Plant Cover	0	≤ 10%
Tree Species Richness	4	≥ 3 (inc. <i>Corymbia citriodora</i>)
Native shrub species richness	4	≥ 3
Native grass species richness	9	≥ 4
Native forb other species richness	17	≥ 5
Tree canopy cover	30%	≥ 15%
Shrub canopy cover	13%	N/A
Native perennial grass	16%	≥ 10%
Litter grid cover	50%	≥ 10%

Table ~~636362~~ Representative RE Benchmark Criteria for Woodland Rehabilitation (>15% slope)

Regional Ecosystem	11.10.1 Benchmark	11.10.1 Revised Benchmark
Short Description	<i>Corymbia citriodora</i> +/-Eucalyptus crebra +/- <i>Corymbia clarksoniana</i> woodland	<i>Corymbia citriodora</i> +/-Eucalyptus crebra +/- <i>Corymbia clarksoniana</i> woodland
Recruitment	100%	100%
Non-Native Plant Cover not including pasture grasses species	0	≤ 10%
Tree Species Richness	4	≥ 3 (inc. <i>Corymbia citriodora</i>)
Native shrub species richness	4	≥ 3
Native grass species richness	9	≥ 4
Native forb other species richness	17	≥ 5
Tree canopy cover	30%	≥ 15%
Shrub canopy cover	13%	N/A
Native perennial grass and pasture grass species	16%	≥ 10%
Litter grid cover	50%	≥ 10%

Watercourse

Watercourse monitoring will be undertaken in accordance with the IDC methodology outlined in the Monitoring and Evaluation Program for Bowen Basin River Diversions (ID&A, 2001). The IDC is a quantitative monitoring method used to measure the geomorphic and riparian condition of diversions.

The IDC methodology encompasses:

- Visual inspection of the rehabilitated watercourse, upstream and downstream reaches (i.e., reference sites).
- Assessment of geomorphic index and riparian vegetation index at nominated monitoring points within the rehabilitated watercourse, upstream and downstream reaches.
- Determination of reach-averaged geomorphic index, riparian vegetation index and overall IDC scores for the rehabilitated watercourse, upstream and downstream reaches.
- Comparison of the geomorphic index, riparian vegetation index and overall IDC scores for the rehabilitated watercourse reaches to the relative upstream and downstream reaches.

The purpose of the IDC methodology is to compare the condition of the rehabilitated (diverted) watercourse with reference sites (i.e., upstream and downstream) and ensure that the diversion is continuing to track towards relinquishment. Monitoring locations for New Chum Creek have already been determined and will continue to be utilised for rehabilitation monitoring. Upstream and downstream reaches used for comparison are included in Section 3.8.3.

The IDC method utilises a suite of monitoring parameters to ensure the diversion can sustain an agreed PMLU of watercourse (Refer to Section 3.8.3).

3.6.2 Tailings

PRC Plan Guideline (Section 3.6.2)

The tailings require characterisation to determine the geochemistry, rheology and geotechnical parameters that influence the rehabilitation or management strategies and the capacity of the site to support revegetation.

There are no tailings storage facilities located at PTM therefore this chapter is not applicable.

3.6.3 Voids

PRC Plan Guideline (Section 3.6.3)

The information requirements of this domain are dependent on the nature of the proposed PMLU or NUMA for the void. For mine sites with voids, the rehabilitation planning part must include a void closure plan, which includes options for minimising final void area and volume; final void dimensions; pit wall geotechnical and geochemical stability, final slope angles, void hydrology, groundwater modelling, water balance and predicted long-term water quality.

A geotechnical report should focus on how the void will achieve post-closure slopes that will exhibit stability characteristics consistent with the planning and design of the post-closure mine void.

If floodwaters are likely to move over backfilled material, an assessment of the hydraulic properties must be conducted to assess whether instability may occur.

The rehabilitation and management strategies in the plan must include the supervision, verification and auditing of engineering works carried out to achieve the post-closure void landform, to ensure construction is consistent with the geotechnical design.

The rehabilitation and management strategy must also include confirmation that the post-closure landform demonstrates the level of stability as specified by the design.

A residual void is defined in the EA as “an open pit resulting from the removal of coal and waste rock that will remain following the cessation of all mining activities and completion of rehabilitation processes”. The PTM final landform, following cessation of mining, will comprise of Ramp 10,20,30,40 and 50 pits forming one final residual void/NUMA, herein referred to as the PTM residual void.

The presence of a residual void at PTM is authorised under Schedule E (Condition E6 and E7) of the EA. The land outcome described for residual voids (Condition E6) is considered consistent with a NUMA. Therefore, the PTM residual void is taken to be pre-approved NUMA (refer Section 2 and Section 3.4).

A Void Closure Plan has been developed to support the improvement measures for the PTM residual void NUMA discussed in this PRC Plan (Appendix 8). Technical studies including flood modelling (Appendix 5 and 10), geotechnical stability assessments (Appendix 11), residual void water balance modelling and hydrogeology assessments (Appendix 3) have also informed the development of the Void Closure Plan. The technical studies were undertaken through an iterative approach to optimise the closure landform, resulting in the adoption of partial backfill of the void, and works to reduce the contributing catchment. This optimisation has resulted in a residual void design that is stable, and one that minimises the risk of environmental harm. A summary of the technical findings of the Void Closure Plan is provided below.

3.6.3.1 Void Hydrology

3.6.3.1.1 Flooding Interaction

Flooding assessments were completed by SLR (2022) and Engeny (2024). The SLR (2022) Voids in a Floodplain Assessment demonstrated that the PTM residual void is located within the Isaac River floodplain.

The Rehabilitation Flooding Assessment undertaken by Engeny (2024), demonstrated that the closure landform, including a final landform embankment between the Isaac River and R40/R50 portion of the residual void, provided 0.1% AEP flood immunity to the residual void. Consideration of flooding risk is discussed further in Section 3.6.1.2 but the modelling confirmed a low risk of scouring and/or erosion from flood events up to and including the 0.1% AEP.

3.6.3.1.2 Void Water Balance

A dedicated void water balance model (WBM) (WSP, 2024) – based on the closure landform was completed for the period from 2036 – 2199 (164 years) to understand residual void lake behaviour (including climate change considerations and groundwater interactions) within the residual void over time (Refer to Appendix 8 VCP for more details on model set up and assumptions).

In accordance with the PRC Plan Guideline, the WBM aimed to assess the following:

- Long-term water balance, formation of lakes, and predicted water levels in the residual voids.
- Potential for residual void lakes to interact with regional groundwater aquifers (creating sources or through-flow systems).
- Potential for overflow from the residual voids and subsequent release to surface water catchments.

Key findings are summarised in [Table 64](#)~~Table 63~~ and Figure 73.

Key findings show that after 2120, mean water levels start to stabilise for the PTM residual void, with simulated mean inflow being very similar to mean outflow. This indicates that the mean water balance has reached an equilibrium by the end of the simulation period.

The void water level remains below the residual void spill point for the residual void for the duration of the simulation. Therefore, there is a very low risk of overtopping.

With sustained equilibrium water level below groundwater levels in residual void, acting as sinks, the minimal risk of groundwater flow beyond tenure boundaries eliminates the need for void hydrology-specific management activities.

Table ~~64~~[646463](#) Summary of PTM Water Balance Model Findings

Residual Void	Spill Level (mAHD)	Mean Water Flows (year)		Long-Term Mean Void Lake Level Range (mAHD)
		Inflows (ML/yr)	Outflows (ML/yr)	
PTM Residual Void	197	Year 2120		165 - 172
		1903	1906	

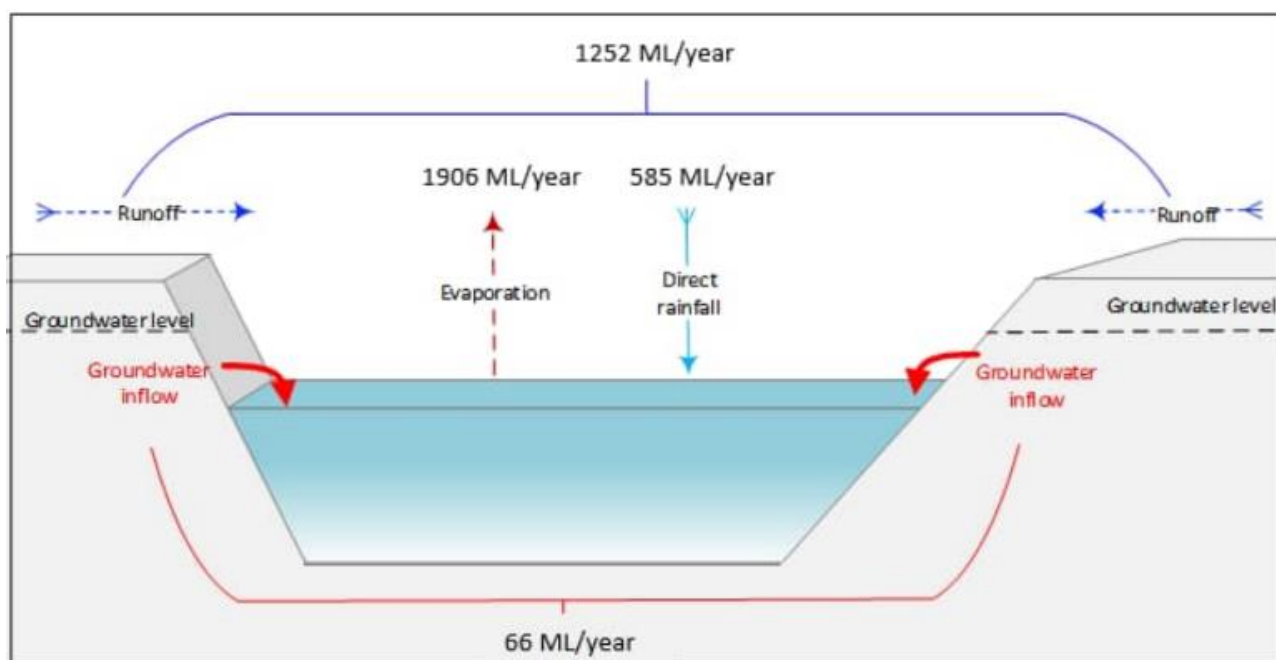


Figure 73 Average Inflows/Outflows Simulated for Period from 2180 to 2199 – PTM Residual Void

The risk of the residual void overtopping was found to be low, given that throughout the 164-year simulation period, water levels remained below the residual void spill point. Further to this, the modelled equilibrium water level within the residual void remains below interpreted and predicted groundwater levels. This means there is minimal risk of groundwater outflow from the residual void beyond tenure boundaries.

These findings did not prompt any additional change to the proposed closure landform, or adoption of hydrology-specific management measures. However, to manage the low risk presented, it is essential that the final design of closure landforms includes an update to hydrological models to verify that the residual void's catchment is being reduced to an area consistent with the long-term water balance model. It is also important that floodwater entry is prevented to ensure equilibrium inflow and outflow is maintained post-closure.

The review and update of void water balance modelling should incorporate any changes to the final mine closure landform, spill point elevation, rainfall, evaporation, surface water runoff, groundwater inflows, and climate projections. Additionally, certification from an appropriately qualified person should be obtained to ensure that the residual void will not cause environmental harm beyond the tenure boundary.

3.6.3.1.3 Geotechnical Stability

Geotechnical stability assessments (included in Appendix 8 and Appendix 11) have been completed to demonstrate that, post-closure, the PTM residual void high-walls and low-walls will all exhibit long-term geotechnical stability. Further, the assessment demonstrates that the presence of the residual void as a NUMA will not adversely impact nearby woodland and grazing PMLUs for at least the modelled period of 50 years (Henderson Geotech, 2024).

High-wall cross-sections through each void were selected to capture the greatest depth of weathering and Tertiary, and where creek channels occur close to the residual void crests (Henderson Geotech, 2024) (Figure 74).

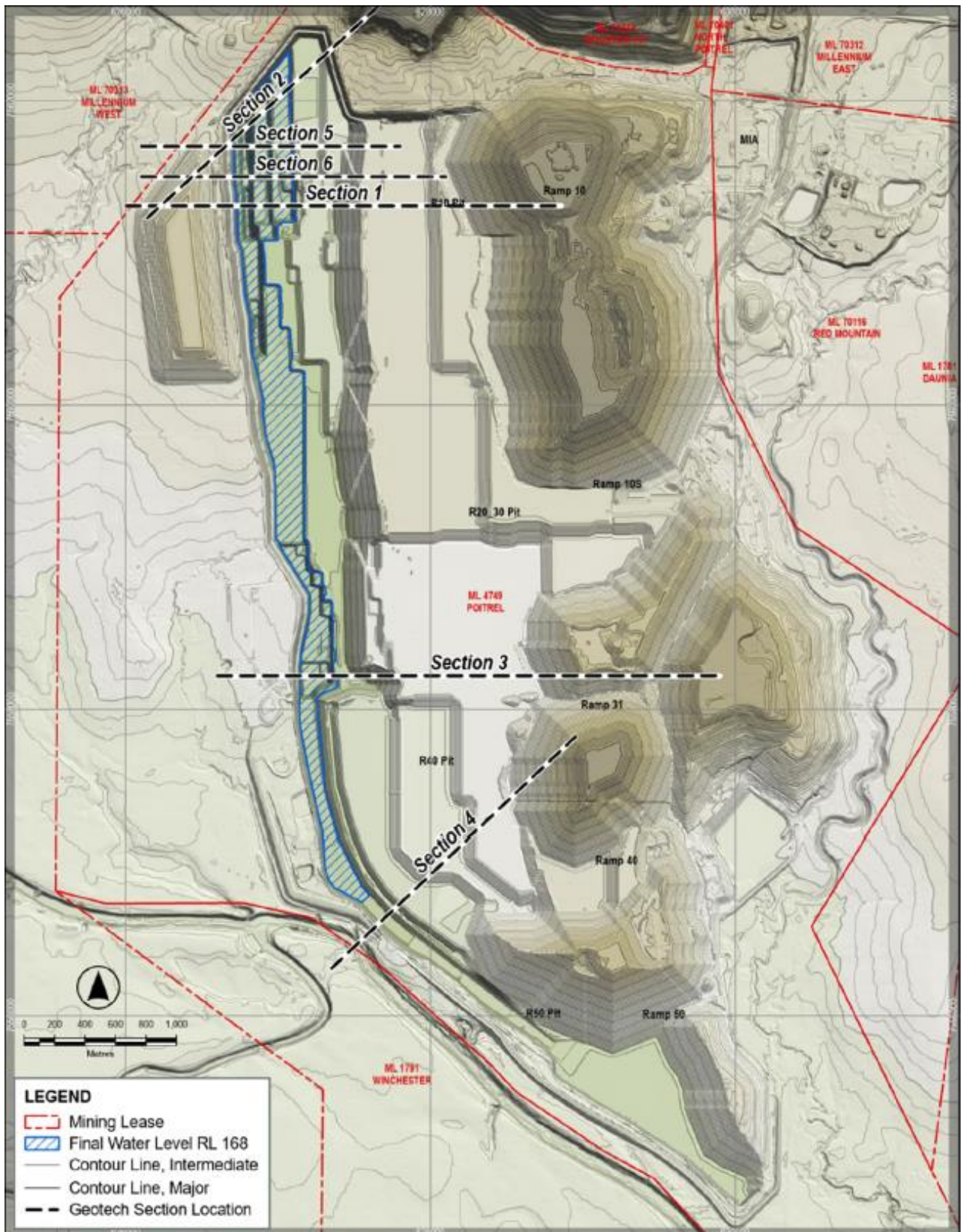


Figure 74 Cross-section locations for the PTM residual void high-wall geotechnical assessment

These cross-sections were then analysed using Slide2 Modeler, two-dimensional (2D) Limit Equilibrium Analysis for Slopes to determine the FoS. Three scenarios were modelled for each high-wall cross-section, the first assuming a 'dry' void at the end-of-mining, the second and interim pit lake, and the third adopting the long-term average equilibrium residual void lake levels from the water balance modelling (WSP, 2024).

The consequences of instability were determined by assessing the zone of instability, whereby instability contained wholly in the NUMA was considered a negligible risk (Appendix 11). From this classification, the following design acceptance criteria in [Table 65](#) was adopted.

Table [65](#) Design Acceptance Criteria

Scenario	Minimum Factor of Safety
Instability extending into grazing PMLU	1.5
Instability extending to watercourses or flood protection structures	1.5
Instability extending into woodland PMLU	1.35
Instability contained within NUMA	1.25

The results of the high-wall geotechnical assessment are presented in- [Table 66](#).

Table [66](#) High-Wall Geotechnical Stability Assessment Results for the Sections of the PTM Residual Void

Section	Residual Void Water Level	Minimum FoS	Setback Distance to Achieve Design FoS
1	End of Mining	1.30	FoS >1.35 22m behind crest FoS >1.5 39m behind crest
	Interim pit lake	1.36	FoS >1.5 34m behind crest
	Final residual void lake	1.44	FoS >1.5 36m behind crest
2	End of mining	1.41	FoS >1.5 at crest
	Interim pit lake	1.37	FoS >1.5 36m behind crest
	Final residual void lake	1.47	FoS >1.5 15m behind crest
3	End of mining	1.94	
	Interim pit lake	1.93	
	Final residual void lake	1.94	
4	End of mining	2.35	
	Interim pit lake	2.36	
	Final residual void lake	2.41	
5	End of mining	1.32	FoS >1.35 16m behind crest FoS >1.5 19m behind crest
	Interim pit lake	1.34	FoS >1.35 18m behind crest FoS >1.5 25m behind crest
	Final residual void lake	1.43	FoS >1.5 at crest
6	End of mining	1.42	FoS >1.5 14m behind crest
	Interim pit lake	1.44	FoS >1.5 26m behind crest
	Final residual void lake	1.52	

Based on the assessment results:

- All sections achieved the minimum FoS for NUMAs (>1.25).
- Where the void depth was greater than 120m (Sections 1 and 6), the minimum FoS for Woodland (>1.35) was achieved with a setback 25m behind the crest.
- Along the northern portion of the residual void, the FoS for grazing was met within 40m behind the highwall crest.

WSP (2024) assessed five (5) low-wall sections for geotechnical stability (using Slide2 Modeler) by selecting areas of the residual void low-wall where spoil material batters or slopes had a relatively high angle (Figure 75). The assessment concluded that, for the mine closure landform, the nominated design acceptance criterion was met, with each section having a minimum FoS greater than 1.5 ([Table 67](#)~~Table 66~~).

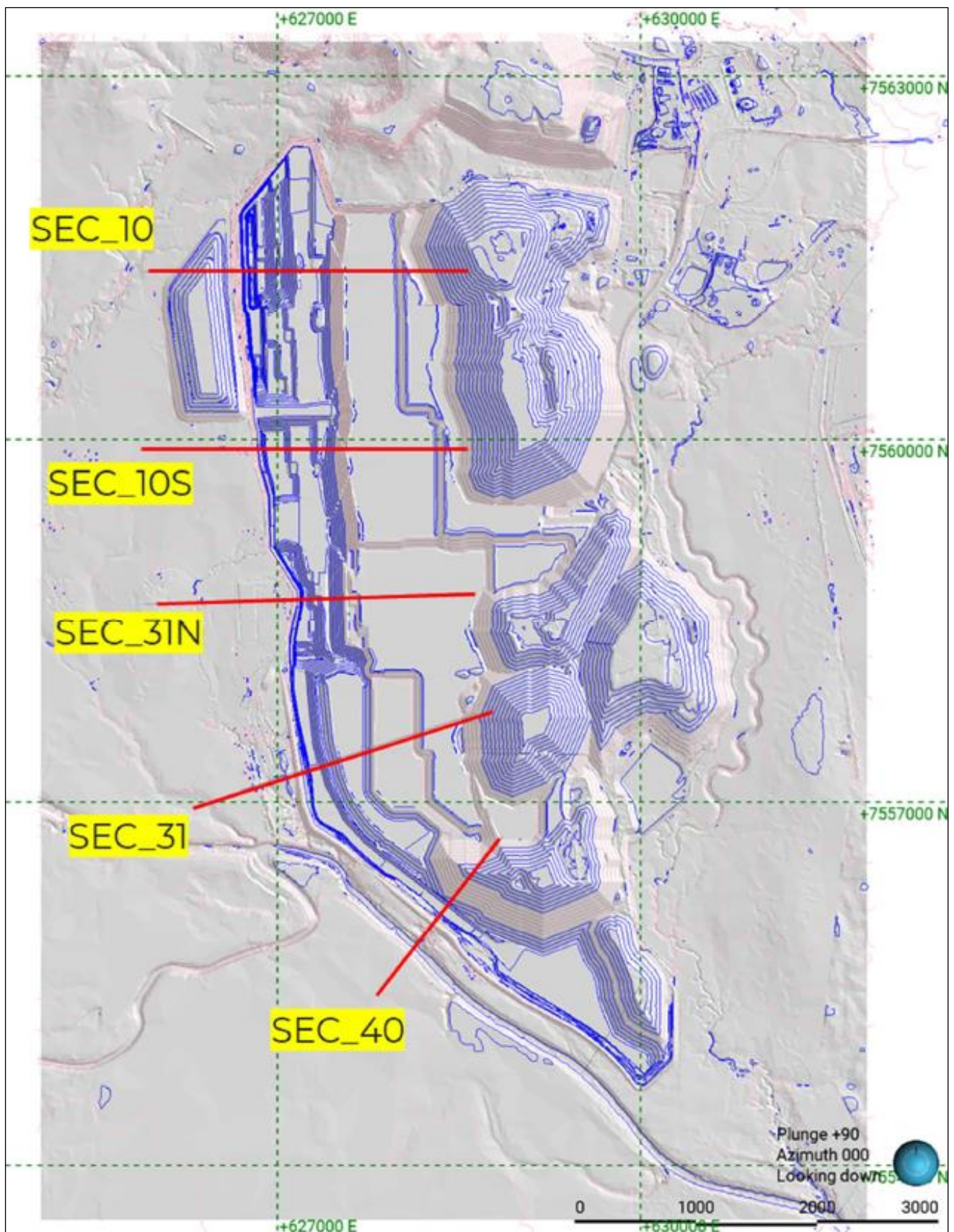


Figure 75 Cross-section locations for the PTM residual void low-wall geotechnical assessment

Table 6766 Low-Wall Geotechnical Stability Assessment Results for the Sections of the PTM Residual Void

Section	Minimum FoS
SEC_10 (Ramp 10 pit)	2
SEC_10S (Ramp 10 pit-south)	2.4
SEC_31N (Ramp 30 pit-north)	2.1
SEC_31 (Ramp 30 pit)	2.4
SEC_40 (Ramp 40 pit)	1.8

The results of the stability assessment were used to define the extent of the NUMA and define an appropriate boundary between the NUMA and grazing and woodland PMLUs. In summary:

- Wherever the highwall or endwall is deeper than 120m (crest to exposed toe), the NUMA extent should extend at least 25m behind the wall crest.
- In the northern portion of the residual void, grazing PMLU should not be defined closer than 15m behind the wall crest.

3.6.3.2 Groundwater Modelling

Calibrated numerical groundwater modelling was undertaken to evaluate the potential groundwater-related impacts of the closure landform, including the residual void. The assessment incorporated the conceptual closure landform and adopted all projected inflows, outflows, and recharge rates from the closure WBM. The objectives of this modelling were as follows:

- Simulate the water level and rate of recovery of the residual void lake, and the water level and rate of recovery from mining-related groundwater drawdown in the groundwater system surrounding the void.
- Assess groundwater inflow to the final residual void.
- Identify areas of potential environmental or anthropogenic risk, such as impacts to private water supply bores or GDEs, where groundwater impact mitigation/control measures may be necessary post-closure.
- Assess the potential for migration/flow pathways for contaminants and residual void water through particle tracking.

The proposed closure landform was replicated in the model, and the predicted end-of-mining groundwater head levels were applied as the starting head levels for the post-closure simulation. The model simulation period commenced at the end-of-mining and ran for 2309 years, with a total of 82 stress periods.

Climate-related boundary conditions for recharge and evapotranspiration (ET) were set constant for the duration of the model simulation period. Recharge and ET were not applied in the numerical groundwater model to the residual void itself, as the water balance model accounts for these boundary conditions.

Over the first 50 years post-mining, the groundwater model predicted variable inflows and outflows for the PTM residual void. During this period, groundwater levels in the spoil and natural formations are recovering from mine dewatering and remain below the residual void lake level, as indicated by the WBM. Groundwater fluxes to the residual void are mainly driven by the difference between the void lake level and groundwater levels in the spoil. The void lake levels fluctuate based on climatic conditions applied to the WBM, and the translation of daily water balance results to the simplified stress periods in the groundwater model.

Model results show that, initially, outflows from rainfall captured in the residual void flow to the in-pit spoil surrounding the void lake, as groundwater levels in the spoil and natural geological formations gradually recover from mining. By the end of the simulation, groundwater inflows and outflows to/from the residual void stabilise, with net inflows to the void continuing throughout the simulation period.

3.6.3.3 Void Water Quality

The Void Closure Plan (Appendix 8) includes long-term water quality predictions of the void lake. The geochemical model was run for major cations, anions, and metal(loid)s where data was available. The results were calculated using the geochemical modelling code PHREEQC (Parkhurst, 2013) with the Minteq.v4 thermodynamic database, derived from the MINTEQA2 version 4 database (US EPA, 1998). The results were presented for two scenarios, one with and one without geochemical controls/reactions (i.e., mineral precipitation, sorption, and gas exchange). The water quality modelling builds directly on the void water balance assessment, including predictions over the same period of 164 years post-closure (from 2036 to 2199).

In closure, the geologic materials and associated mine waste materials (spoil and rejects) within the catchment of the residual void may react with water and release or immobilise solutes, according to their geochemical characteristics. Three main lithological groupings: coal, carbonaceous overburden, and non-carbonaceous overburden were derived for the residual void high-walls, low-walls and end-walls using drill-core data. Further geochemical source terms were extracted from the proponent's PTM groundwater and environmental geochemistry databases and included results from drill core analyses and solubility testwork on additional drill cores. The groundwater monitoring database includes data from 15 monitoring bores over 15 years (from February 2008) across three main aquifer types, with no differentiation between aquifers or bores in deriving the groundwater source term. The source term derivation data is summarised in [Table 68. Table 67](#).

Table ~~68~~~~67~~ Summary of PTM Water Balance Model Findings

Water Inflow	Data Source	Comment
Initial void lake	-	It is assumed that no water is present in the PTM residual void at closure.
Rehabilitated catchment/in-pit spoil runoff	PTM drill-core database	It is assumed that non-carbonaceous interburden will be specified as cover material for final landform. Spoil runoff is, therefore, represented by leachate data from fresh non-carbonaceous drill core samples.
High-wall runoff	PTM drill-core database	The PTM drill core databases were used to derive source terms for each lithological domain/grouping.
Groundwater inflow	PTM drill-core database	Median water quality from PTM groundwater database.
Direct Rainfall	-	Pure water equilibrated with atmospheric carbon dioxide (CO ₂).

Following definition of the source terms, the geochemical model was run as follows:

- Source terms were mixed for annual timesteps, with inflow/outflow proportions calculated from the water balance model (WSP, 2024).
- Modelling was incremental, with the output for the void lake from the previous timestep being used as the input for the next time step.
- Geochemical reactions, such as mineral precipitation/dissolution, gas exchange and sorption were considered.

The key findings of the modelling were as follows:

- Acidic conditions are not expected to establish within the PTM residual void lake. The main geochemical control is CO₂ degassing which raises pH, resulting in carbonate precipitation and reducing pH. These geochemical processes are driven by the input of dissolved inorganic carbon, from runoff and groundwater inflow to the void lake.

- TDS concentrations will continue to increase over time but remain below the EA-derived trigger value until around 2190, regardless of geochemical controls. The increase is mainly due to the evapoconcentration of residual void lake water. Minor differences in TDS concentrations with geochemical controls are due to the removal of some metals/metalloids through precipitation. An equilibrium state for TDS concentrations, where TDS levels remain constant, is not reached.
- Steep sides, void depths, and elevated TDS present favourable conditions for stratification within the PTM residual void. Hydrodynamic/limnological analysis is required to assess the potential for thermal/chemical stratification to occur, and the importance of seasonal mixing processes and groundwater mixing inputs. However, as the residual void lake is considered a NUMA and modelled as a groundwater sink, further stratification assessment is not warranted.

As the residual void lake stabilises and remains a groundwater sink over time, it does not present an unacceptable risk of environmental harm beyond the tenure boundary, with all potential contaminants contained within the residual void itself.

3.6.3.4 Options for Minimising Final Void

Technical studies, including the water balance and hydrogeology modelling, have been undertaken through an iterative approach with the development of the mine closure landform design. These iterations have resulted in a mine closure landform design incorporating residual void partial backfill, catchment reduction and changes to surrounding landforms to minimise environmental harm from the residual void.

Further detail including a void minimisation options assessment is described in Section 3.4.3.

3.6.3.5 Final Void Dimensions

The residual void extents are defined by the high-wall, end-wall, and low-wall crests at natural ground level. Proposed final dimensions of the void are presented in Section 3.4.

3.6.3.6 Rehabilitation Strategies

The PTM residual void will be retained as a NUMA, and will become available for improvement once mining of each pit is complete and reshaping of the low-wall spoil dump outside of the NUMA area is complete (IA1). This is for safety reasons to eliminate the risk of any injury or damage within the NUMA area from the reshaping and rehabilitation activities.

The rehabilitation management strategies developed to inform the adopted MMs outlined in Section 3.4.4 and ultimately achieve PTM closure objectives, are summarised in [Table 69](#) ~~Table 68~~.

Table ~~696968~~ PTM Residual Void Management Strategies

Residual Void Closure Aspect	Closure Objective			Residual Void Closure Context	Rehabilitation Management Strategies
	Safety	Stability	Non-Polluting		
Geotechnical Stability	x	x	-	Stability outside of the NUMA extent = FoS $\geq$ 1.5. Extents of PTM residual void has been defined by geotechnical analysis and data available at the time of the analysis.	Develop geotechnical parameters that are specific to PTM for spoil and other materials to apply to the geotechnical modelling. As mining approaches the final limits, re-assess the geotechnical stability of the high- and low-walls based on the latest available data, including the developed site-specific geotechnical parameters. Use a minimum FoS $\geq$ 1.5 as a guidance for ongoing void closure planning. (This may be refined over the mine life should industry research provide optimised guidance on observational methods and consequence assessment).
Void Hydrology	x	x	x	Based on rehabilitation flood modelling completed: The residual void in the current mine closure landform is not subject to inundation from floodwaters for the 0.1% AEP event. Floodwaters interact with the mine closure landform associated with the residual void, but do not exceed velocities greater than 1.5m/s. The long-term mean void lake level is predicted to remain below the interpreted and modelled groundwater levels, largely due to evaporative effects on the residual void lake. This results in a void that acts as a groundwater sink. After 2120, water levels in the residual void start to equilibrate, with simulated mean inflows of	Residual void catchment is minimised as far as practicable. The closure landform will continue to consider spoil dumping and landform design to exclude floodwaters entering the residual void. If necessary, identify and implement mitigation measures for appropriate protection works of landforms where floodwaters from watercourses interact with the closure landforms. At cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the void closure landforms, spill point elevation, rainfall and evaporation, surface water runoff, groundwater inflows, and climate projections.

Residual Void Closure Aspect	Closure Objective			Residual Void Closure Context	Rehabilitation Management Strategies
	Safety	Stability	Non-Polluting		
				1,934ML/year being equal to mean outflows of 1,935ML/yr.	Obtain certification from an appropriately qualified person that the residual void will not cause environmental harm beyond the tenure boundary.
Void Hydrogeology	-	-	x	Mining-related dewatering activities have lowered groundwater levels that will result in continued suppression of the water table centred on the PTM residual void. Void lakes are predicted to form in the residual void post-mining. Water levels in the void lake are modelled to remain below the interpreted and modelled groundwater levels due to evaporative effects on the residual void lake. The PTM residual void remains as groundwater sinks post-closure or any minor groundwater outflows remain within the mine closure landform and do not leave the tenure. Modelling, including particle tracking, indicates that infiltration of rainfall through the spoil and other areas around the void within the tenure will migrate towards, and be captured within the residual void. Groundwater flow is not expected to flow off-tenure toward the receiving environment, minimising the risk of environmental harm due to the proposed final mine closure landform.	At cessation of mining activities, review and update the groundwater modelling, incorporating updated void WBM outputs and in-field groundwater sampling data, as required. Obtain certification from an appropriately qualified person that, upon completion of mining, residual void does not present an unacceptable risk of environmental harm.
Void Water Quality	-	-	x	Acidic conditions are not expected to establish within the PTM residual void. TDS concentration in the PTM residual void will continue to increase over time.	At cessation of mining activities, review and update the void geochemical assessment including additional or refined data from in-pit surface water samples, surface- and groundwater samples, and biochemical modelling.

Residual Void Closure Aspect	Closure Objective			Residual Void Closure Context	Rehabilitation Management Strategies
	Safety	Stability	Non-Polluting		
				In addition to the above, the PTM residual void does not present an unacceptable risk of environmental harm beyond the void itself as it: Will remain as a NUMA post closure. Acts as a groundwater sink, ensuring any contaminants from the void or surrounding landform report to the void.	Obtain certification from an appropriately qualified person that the residual void will not present an unacceptable risk of environmental harm.
Void Access Control	x	-	-	Access to the residual void will be restricted for humans and livestock.	Following cessation of mining activities: Construct a safety bund at the setback distance determined by geotechnical analysis. Erect fencing and signage (where required) around the perimeter of the safety bund. Obtain certification from an appropriately qualified person that the residual void is safe to humans and livestock.

3.6.4 Underground Mining

PRC Plan Guideline (Section 3.6.4)

For underground mining operations, the rehabilitation planning part must include:

- a geotechnical study
- an assessment of groundwater interactions and potential lowering of groundwater levels
- the development of a hydrogeological conceptual model
- subsidence analysis and modelling and a subsidence vegetation/habitat impact assessment
- consideration of how potential entries to underground workings will be sealed (i.e., through some form of capping or back filling)
- how surface ponding and cracking will be mitigated
- identification of post-closure stabilisation of underground workings in order to manage the potential for unplanned surface subsidence and unplanned ground collapse such as sinkholes and pot holing.

Not applicable, as there is no underground mining at PTM.

3.6.5 Built Infrastructure

PRC Plan Guideline (Section 3.6.5)

The administering authority's expectation of rehabilitation relating to built infrastructure is that it will be decommissioned, demolished, salvaged and/or disposed of unless it is being formally retained by the landholder to achieve an appropriate PMLU.

The rehabilitation planning part must include:

- a. Identification of infrastructure that will be decommissioned and the methods for decommissioning.
- b. A description of infrastructure that will remain post rehabilitation and the identification of ongoing maintenance requirements.
- c. Evidence of agreement for any infrastructure that will have ownership transferred.

In accordance with EA condition E15 - All infrastructure constructed by, or for the EA holder during the mining activities including water storage structures, must be removed from the site prior to surrender, except where agreed in writing by the post-mining landowner/landholder (unless the landowner / landholder is also the environmental authority holder).

[Table 70](#)~~Table 69~~ details the infrastructure associated with the mining activities at PTM.

The proponent surface infrastructure not beneficial to the PMLU will be removed in accordance with EA conditions. Surface infrastructure that may be retained to support the PMLUs will have a demonstratable benefit and may include a selection of the following: fencing; access tracks; services related infrastructure; sheds and buildings; hardstand areas/transport logistics areas; and water related infrastructure. Any infrastructure proposed to be retained to support the PMLUs will have written agreement from the post mining landholder (at the time) prior to commencement of rehabilitation milestones.

Priority will be to repurpose, salvage or recycle any infrastructure to be removed. Demolition and disposal will only be undertaken when alternatives are deemed by the proponent not to be viable. This approach is in line with the waste and resource management hierarchy outlined in the Queensland Waste Management and Resource Recovery Strategy created under the *Queensland Waste Reduction and Recycling Act 2011*.

Table [70](#)~~7069~~ Infrastructure Associated with the Approved PTM Mining Activities

Category	Infrastructure
Built Infrastructure Steel Concrete and Brick Infrastructure	• MIA (e.g. administration, crib rooms, workshop, warehouse, storage and sheds. • Fuel, oil, and chemical storage. • Fuel and wash bays. • Communications towers. • Fences.
Supporting Services	• Pipes and pumps. • Switchyard and substations. • Communication and lighting towers. • Concrete pads and bitumen. • Culverts.
Offsite Infrastructure	• Rail and train loadout and related infrastructure. • Power lines.
Water Infrastructure	• Process water dams. • Raw water dams. • Drains and pipelines.

The timing of the decommissioning and removal of the infrastructure is based on the proposed timing of the PTM operation and rehabilitation activities.

Any public infrastructure associated with roads, power, water and communications supply to landowners or townships is not included in this PRC Plan or Schedule.

Further detail on the rehabilitation stages after decommissioning of the infrastructure, such as landform reshape, surface preparation, revegetation, and monitoring, are covered in the relevant sections of this PRC Plan.

3.6.5.1 Decommissioning Built Infrastructure

Decommissioning of the built infrastructure with no beneficial use to the PMLU will include:

- Disconnecting services (e.g., dismantle power feeds, water, or communication-related feeder lines).
- Buildings are demolished and removed.
- All mine roads and access tracks are removed.
- All pipelines are drained and removed.
- All waste removed from site.
- All exploration drill holes and pads have been rehabilitated in accordance with the eligibility criteria and standard conditions for exploration and mineral development projects – V2 (DEHP, 2016).

3.6.5.2 Decommissioning Water Infrastructure

Decommissioning of the water infrastructure with no beneficial use to the PMLU will include:

Removing any remaining water from the water infrastructure to the residual voids, or in accordance with:

- EA condition F27: “Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party for the purpose of: a) supplying stock water subject to compliance with the quality release limits specified in Table F9 (Stock Water Release Limits); or b) supplying irrigation water subject to compliance with quality release limits in Table F10 (Irrigation Water Release Limits); or c) supplying water for construction and/or road maintenance in accordance with the conditions of this environmental authority”.
- EA condition F28: “Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as dams or tanks, for the purpose of supplying water to any operation licensed for either ERA13 (mining black coal) or ERA31 (mineral processing). The volume, pH and electrical conductivity of water transferred must be monitored and recorded”.
- EA condition F29: “If the responsibility for mine affected water is given or transferred to another person in accordance with conditions F27 or F28: a) the responsibility for the mine affected water must only be given or transferred in accordance with a written agreement (the third party agreement); and b) the third party agreement must include a commitment from the person utilising the mine affected water to use it in such a way as to prevent environmental harm or public health incidents and specifically make the persons aware of the General Environmental Duty (GED) under section 319 of the Environmental Protection Act 1994, environmental sustainability of the water disposal and protection of environmental values of waters; and c) the third party agreement must be signed by both parties to the agreement”.
- Investigation and remediation (if required, RM2) of contaminated sediments, as determined by a suitability qualified person (SQP).
- Removal and disposal of geosynthetic liners (if applicable).
- Removal of embankments and reshaping of the area to make it free-draining (RM3).

3.6.5.3 Contaminated Land Assessment

In accordance with EA conditions E13, F1 and F43, contaminants must not be released in a manner that constitutes serious environmental harm, and spillage of any waste, contaminants or other materials must be cleaned up as quickly as practicable, stored in accordance with relevant standards, and handled in a way that prevents environmental harm.

At completion of mining operations and after infrastructure decommissioning (RM1) but prior to landform establishment, surface preparation and revegetation, a contaminated land investigation will be undertaken for selected RAs in accordance with RM2 and will include:

- a. A contaminated land investigation, completed by an SQP in accordance with the *Environmental Protection Act (1994)*:
 - i. If identified, contaminated and hazardous material will either be remediated in-situ or removed / transported to an approved landfill for disposal and waste tracking information recorded and submitted. Following this, validation testing will be undertaken to confirm that contaminated and hazardous materials have been removed or remediated successfully.
- b. If required, a contaminated land investigation document (CLID) including a site suitability statement will be prepared and submitted in accordance with the provisions of Chapter 7, Part 8 of the EP Act. The site suitability statement from an SQP will confirm that the uses or activities for which the land is suitable aligns to the approved PMLU.

3.7 Risk Assessment

Legislative Requirement

In accordance with section 126C(1)(f) of the EP Act, the rehabilitation planning part of the PRC Plan must identify the risks of a stable condition for land described as a post-mining land use not being achieved, and how the applicant intends to manage or minimise the risks.

3.7.1 Identifying, Assessing and Treating Risks

PRC Plan Guideline (Section 3.7)

As per section 126C(1)(j) of the EP Act, the administering authority considers it necessary for the proposed PRC Plan to contain a risk assessment of all proposed NUMAs. The risk assessment must be carried out to identify the risks of the NUMA causing environmental harm and not being safe and structurally stable and detail how the applicant intends to manage and minimise the identified risks.

The *AS ISO 31000:2018 Risk Management – Guidelines* (Standards Australia, 2018) describes risk assessment as the overall process of risk identification, risk analysis, risk evaluation and risk treatment. Each of these aspects must be included in the risk assessment in the rehabilitation planning part.

Information requirements in this section apply to all applicants whether or not they are an existing EA holder. Existing holders may have the required information available from previously submitted plans/reports/applications that, if still valid, can be used in the PRC Plan.

3.7.2 Risk Methodology

A risk-based approach to the PTM PRC Planning has been undertaken in term of the method described in Figure 76.

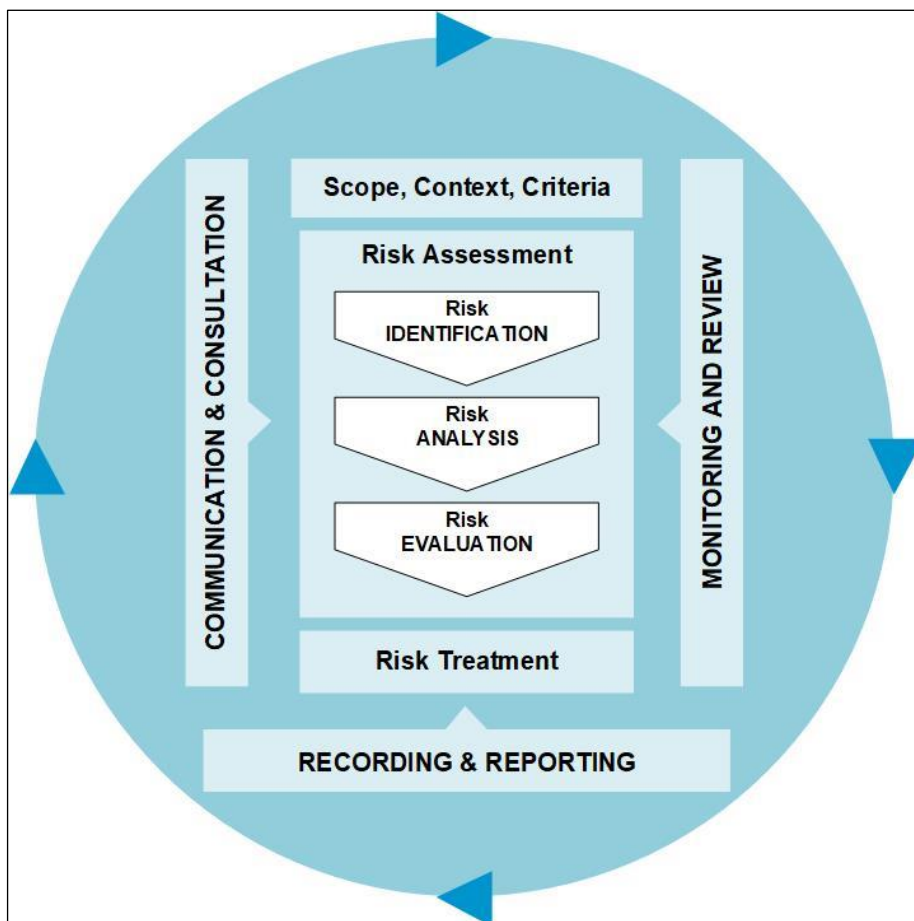


Figure 76 ISO 31000-Compliant Risk-Based Approach Followed for the PTM PRC Plan

3.7.3 Risk Identification

The risk event - a stable condition for land described as a post-mining land use not being achieved was assessed per ISO 31000 methodology described in Figure 76 above (the full risk assessment is included in [Table 75](#) ~~Table 74~~ where stable condition is defined as per section 111A of the EP Act:

- The land is safe and structurally stable.
- There is no environmental harm being caused by anything on or in the land.
- The land can sustain a PMLU.

For PTM the PMLUs being assessed are cattle grazing, woodland habitat and watercourse (Section 3.3).

A number of scenarios were identified in the risk identification process related to a stable condition for the land described as the PMLUs not being achieved:

- Contaminated land impacting on environmental receptors, rehabilitation and attainment of PMLU.
- Alteration of hydrogeological conditions.
- Alteration of local hydrologic conditions.
- Insufficient volume of material available or unsuitable quality for rehabilitation activities.
- Inadequate vegetation cover and establishment.
- Impact of extreme weather events prior to final landform establishment leads to instability of final landforms.
- Landform establishment inconsistent with milestone criteria.

Additionally, the risk of NUMAs not meeting a stable condition consistent with milestone criteria was assessed.

3.7.3.1 Risk Analysis, Evaluation and Relevant Treatments

[Table 75](#) ~~Table 74~~ provides the full detail of risk analysis, risk evaluation and risk treatment for these scenarios. Worst case outcomes were assessed for each scenario, preventative and mitigating controls identified and from there a residual risk rating was calculated. The likelihood and severity tables, as well as the outcomes of the residual risk rating (RRR) heat map ratings matrix are provided in [Table 71](#), [Table 72](#) ~~Table 70~~, [Table 71](#) and [Table 73](#) ~~Table 72~~ respectively. [Table 74](#) ~~Table 73~~ details necessary risk treatments identified to achieve a stable condition for the PMLUs.

Table [71](#) ~~7170~~ Risk Likelihood Table

Likelihood Table			
Uncertainty	Frequency	Likelihood Factor	Guidance
Highly Likely	Likely to occur within a 1-year period	3	Event is expected to occur >80% of the time during a 5-year planning cycle
Likely	Likely to occur within a 1 - 5-year period	1	Event is expected to occur 60% to 80% of the time during a 5-year planning cycle
Probable	Likely to occur within a 5 - 20-year period	0.3	Event is expected to occur 30% to 60% of the time during a 5-year planning cycle
Unlikely	Likely to occur within a 20 - 50-year period	0.1	Event is expected to occur 10% to 30% of the time during a 5-year planning cycle
Highly Unlikely	Not likely to occur within a 50 year period	0.03	Event is expected to occur <10% of the time during a 5-year planning cycle

Table [727271](#) Risk Severity Table

Severity Table		
Severity Level	Descriptor	Severity Factor
5	Severe impact to the environment and where recovery of ecosystem function takes 10 years or more.	1000
4	Serious impact to the environment, where recovery of ecosystem function takes between 3 and up to 10 years.	300
3	Substantial impact to the environment, where recovery of ecosystem function takes between 1 and up to 3 years.	100
2	Measurable but limited impact to the environment, where recovery of ecosystem function takes less than 1 year.	30
1	Minor, temporary impact to the environment, where the ecosystem recovers with little intervention.	10

Table [737372](#) Residual Risk Rating (RRR) Heat Map

			Severity Level	S1	S2	S3	S4	S5
			Severity Factor	10	30	100	300	1000
	Likelihood	Likelihood Factor	Timeframe	Residual Risk Calculation (With Controls in Place and Effective)				
Likelihood	Highly Likely	3	Within 1 year	30	90	300	900	3000
	Likely	1	Within 1-5 years	10	30	100	300	1000
	Probable	0.3	Within 5-20 years	3	10	30	90	300
	Unlikely	0.1	Within 20-50 years	1	3	10	30	100
	Highly Unlikely	0.03	Within 50 years	0.3	1	3	10	30

With controls in place and implemented effectively, the RRR for the identified risk scenarios of this risk event is deemed to be medium (RRR of 10).

Table [747473](#) Necessary Risk Treatments to Achieve a Stable Condition for the PMLUs

Aspect	Risk Treatment
Risk Event 1 - Contaminated land impacting on environmental receptors, rehabilitation, and attainment of PMLU	
Reasons for selecting treatment options	Conservatively, additional works are required to reduce contaminated land risks and to achieve a stable condition for the proposed final landform
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Suitably qualified person (SQP) to undertake contaminated land investigations and oversee ongoing monitoring requirements

Aspect	Risk Treatment
	Sample collection, laboratory analysis, and engineering controls
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	SQP reporting as per PRC Plan milestones
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule
Risk Event 2 - Insufficient volume of material available or unsuitable quality for rehabilitation activities	
Reasons for selecting treatment option	Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Topsoil inventory Laboratory testing Survey Equipment capabilities Rehabilitation monitoring data AQP to undertake growth media assessment
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	Rehabilitation monitoring
Risk timing and scheduling	Alignment with PRC Plan milestone and schedule
Risk Event 3 - Inadequate vegetation cover and establishment	
Reasons for selecting treatment option	Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Topsoil inventory Survey Equipment capabilities Rehabilitation monitoring data AQP to undertake growth media assessment
Performance measures and constraints	Alignmen with PRC Plan milestones
Reporting and monitoring	Rehabilitation monitoring
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule
Risk Event 4 - Alteration of hydrogeological conditions	
Reasons for selecting	Studies and analysis performed show that these treatments minimise and/ or prevent impacts
Responsibility for plan: - Approval. - Implementation.	The proponent

Aspect	Risk Treatment
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Monitoring bores maintained and monitoring undertaken
Performance measures and constraints	Alignment with PRC Plan milestone criteria
Reporting and monitoring	Monitoring at defined frequency Reporting under existing EA requirements
Risk timing and scheduling	Alignment with PRC Plan milestone criteria and schedule
Risk Event 5 - Alteration of local hydrological conditions	
Reasons for selecting	Studies and analysis performed show that these treatments minimise and/ or prevent impacts
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Undertake surface water monitoring
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	Monitoring when surface water flows are available Reporting under existing EA requirements
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule
Risk Event 6 - Impact of extreme weather events prior to final landform establishment leads to instability of final landforms	
Reasons for selecting treatment option	Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	AQP to undertake monitoring of final landforms post flood events Rehabilitation monitoring program Emergency response procedures
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	Rehabilitation monitoring
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule
Risk Event 7 - Landform establishment inconsistent with milestone criteria	
Reasons for selecting treatment option	Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: - Approval. - Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Data from waste characterisation In-situ geochemical monitoring data

Aspect	Risk Treatment
	Construction QA
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	Rehabilitation monitoring Waste Characterisation sampling and analysis Surface and Groundwater Monitoring
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule
Risk Event 8 - NUMA does not meet stable condition consistent with milestone criteria	
Reasons for selecting treatment option	Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: • Approval. • Implementation.	The proponent
Proposed actions	Refer to Table 75 Table 74
Resource requirements	Rehabilitation monitoring data Surface and groundwater monitoring AQP to undertake certification
Performance measures and constraints	Alignment with PRC Plan milestones
Reporting and monitoring	Rehabilitation monitoring
Risk timing and scheduling	Alignment with PRC Plan milestones and schedule

Table 7574 Risk Register

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
Landform does not reach stable condition consistent with selected PMLU.	RM7, RM8, RM9	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA9	- Erosional instability (including due to high erosion risk of spoil material). - Geotechnical instability. - Geochemical instability. - Insufficient or incorrect construction methods. - Inadequate vegetation cover and establishment (see separate risk event). - Insufficient volume of rehabilitation materials or unsuitable materials used (see separate risk event). - Extreme or significant weather events (see separate risk event). - Low pasture productivity/diversity. - Contaminated land impacting on environmental receptors, rehabilitation, and attainment of PMLU (see separate risk event).	- Unable to relinquish mining lease. - Extended period required to remediate landform. - Loss or degradation of cover materials. - Poor landform design (capping depth, materials, and thickness). - Ineffective monitoring and inspection program.	Probable (0.3)	3	Medium (30)	- Adopt setbacks to achieve geotechnical stability as a management measure, to ensure the risk of the NUMA not achieving stable conditions is managed. - Construction management, technical supervision, and QA/QC of final landforms and covers will be done by a SQP. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. - Cattle grazing (RA1, RA2, RA3, RA6) Landforms reshaped with maximum 15% slope. - Cattle grazing (RA1, RA2, RA3, RA6) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5. - Woodland Habitat PMLU (RA4, RA5, RA8) Areas $>15\%$ to be assessed by an AQP as being stable long term, with rock mulch applied as required. - Woodland Habitat PMLU (RA4, RA5, RA8) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5 unless an alternative is justified by an AQP. - Updated hydraulic flood modelling using drainage designs. - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use. - The geochemical assessment has shown that the wastes are not anticipated to pose a significant risk in terms of acid, neutral metalliferous, or saline drainage, or elevated metal and/or sulphate concentration in surface waters or groundwaters. As a result, the recommended cover design is an erosion protection system only to manage erosion risks and promote vegetation establishment in line with milestone criteria. - Implement rehabilitation monitoring program. - Maintain dams, perimeter drainage and erosion and sediment control systems during establishment. - Monitoring of rehabilitated areas to be completed in accordance with monitoring criteria and identify re-work areas as applicable. - No evidence of erosion for all RA's excluding RA7, RA9 is classified as 'minor' 'moderate' or 'severe' as defined by PRC Plan Schedule Appendix 7: Erosion classification framework. - Assessment report completed by an AQP certifying that the diversion (RA7, RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition. - Geomorphic index (IDC method) used to verify that Rehabilitation for (RA7, RA9) is erosionally stable. - Certification by an AQP that pasture meets a pasture condition rating suitability is class ≤ 3, based on the Pasture Condition Assessment Table as per "Stocktake: Balancing Supply and Demand" (developed by FutureBeef – futurebeef.com.au), as provided in PRC Plan Schedule Appendix 5: Pasture condition assessment. - A BioCondition assessment at RA4, RA5, and RA8 is completed by an AQP using the methodology outlined in the latest version of the Queensland Herbarium's BioCondition Assessment Manual. - The BioCondition assessment required for RA4, RA5, and RA8 demonstrates achievement of the PRC Plan Benchmark for each assessable attribute for the relevant regional ecosystem as per PRC Plan Schedule Appendix 6: Representative RE benchmark criteria for woodland habitat rehabilitation at RA4, RA5, and RA8.	Unlikely (0.1)	3	Medium (10)

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
								- Contaminated land investigation completed by a suitability qualified person (SQP) in accordance with the Environmental Protection Act (1994). - A site suitability statement from a SQP confirms the uses or activities for which the land is suitable and aligns to the approved PMLUs for the site. - Vegetation establishment per proposed rehabilitation criteria. - Earthworks timed to avoid periods of heavy predicted rainfall. - Protection from un-approved livestock access. - Only approved seed mixes to be used and seeding to occur at optimal timing for favourable weather conditions. - See also – controls for inadequate vegetation cover and establishment, insufficient volume of rehabilitation materials or unsuitable materials used and extreme or significant weather events.			
Contaminated land impacting on environmental receptors, rehabilitation, and attainment of PMLU.	RM2, RM3	RA2, RA3, RA5, RA6, RA8	- Erosional instability of landforms resulting in sediment mobilisation and exposure of encapsulated waste. - Unsuitable materials used in rehabilitation or as capping. - Potential contamination sources not adequately investigated and/or remediated. - Incorrect placement of geochemically unstable waste materials. - Seepage from MAW sources or residual voids.	- Contamination of soil, surface water and groundwater above selected thresholds / guidelines. - Migration of contaminants from source to sensitive receptors.	Probable (0.3)	3	Medium (3)	- Contaminated land investigation with a site investigation report prepared by an appropriately qualified person (AQP). - Removal and appropriate disposal of contaminated materials. - Conduct validation testing to confirm that contaminated materials have been removed or remediated. Certification from an AQP that all contaminated land has either been remediated or removed. - Landform and cover design technical specifications must include a QA/QC program. - Construction management, technical supervision, and QA/QC of final landforms and covers will be done by a SQP. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. - Cattle grazing (RA2, RA3, and RA6) landforms reshaped with maximum 15% slope. - Cattle grazing (RA1, RA2, RA3, and RA6) landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5. - Woodland Habitat PMLU (RA4, RA5, and RA8) Areas $>15\%$ to be assessed by an AQP as being stable long term, with rock mulch applied as required. - Woodland Habitat PMLU (RA4, RA5, and RA8) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5 unless an alternative is justified by an AQP. - Updated hydraulic flood modelling using drainage designs. - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use. - No evidence of erosion for all RAs excluding RA7 and RA9 is classified as 'minor' 'moderate' or 'severe' as defined by PRC Plan Schedule Appendix 7: Erosion classification framework. - Assessment report completed by an AQP certifying that the diversion (RA7 and RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition. - The residual void is expected to continue to act as a groundwater sink in closure. - Environmental monitoring and reporting as per the EP Act 1994 and existing EA requirements. - Implement rehabilitation monitoring program.	Unlikely (0.1)	3	Medium (10)
Insufficient volume of material available or unsuitable quality	RM3, RM4, RM5	RA2, RA3, RA4, RA5, RA6, RA8, RA9	Poor planning and management of rehabilitation materials	Insufficient quantities of capping and cover materials to achieve rehabilitation of final	Unlikely (0.1)	4	Medium (30)	Sufficient quantities of growth material estimated to be sourced from site for construction of final landform.	Highly Unlikely (0.03)	4	Medium (10)

					Risk Analysis						Residual Risk Ranking		
					Likelihood	Consequence	Risk				Likelihood	Consequence	Risk
Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description				Controls Mitigation					
for rehabilitation activities.			(soil, seed) leading to degradation. - Insufficient characterisation of soil and waste material. - Inadequate amelioration does not prepare soil for target vegetation impacting PMLU. - Inadequate amelioration does not prepare soil for target vegetation impacting PMLU.	landform to support PMLU. - Potential for acid mine drainage or saline mine drainage to reduce water quality in groundwater and surface water. - Insufficient quality of capping and cover materials to achieve rehabilitation of final landform to support PMLU. - High cost of remediation.				- Waste management and scheduling will be sufficiently aligned with eventual closure requirements to enable material to be incorporated into the upper layers of the final design - Soil sampling of stockpiles prior to placement to refine amelioration fertilizer rates. - Growth medium placed at a minimum depth of 100mm - An assessment of growth media characteristics is completed by an AQP that identifies amelioration and other treatments required to achieve the following primary growth media quality targets^: a. pH (1:5) 6.0–9.0 (0- 0.3m) b. Electrical Conductivity - EC (1:5) ≤ 0.75dS/cm ((0- 0.3m) c. ESP = ≤6% d. CEC and major macronutrient (N, P, K, and organic C) concentrations in root zone (0–0.3m) at least 80% of those measured at comparable reference sites. - Rip across slope.					
Inadequate vegetation cover and establishment.	RM5, RM6, RM7, RM8, RM9	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8 RA9	- Inadequate amelioration does not prepare soil for target vegetation impacting PMLU. - Weed and pest species infestation(s). - Soil / growth media not managed or applied as per required specifications. - Insufficient or incorrect construction methods. - Inadequate and/or inappropriate revegetation not in accordance with milestone criteria. - Seed unavailability or poor quality. - High erosion risk of spoil material. - Placement of unsuitable tertiary waste within 2m of the surface. - Poor introduction of livestock due to inadequate fencing or deviation from schedule.	- Excessive erosion of rehabilitated areas. - Extended period required to remediate landform. - Loss or degradation of cover materials. - Premature grazing could lead to poor seeding establishment or destruction of establishing vegetation. - Loss or degradation of cover materials.	Probable (0.3)	4	Medium (90)	- Waste characterisation to be undertaken when entering new un-tested areas. - Ongoing testing of mine-affected water throughout operations. - Primary growth media quality targets listed in PRC Plan Schedule are achieved based on a number of representative samples as determined by AQP. - Selection of appropriate vegetation species, seed species and their rates. - Soil sampling of stockpiles prior to placement to refine amelioration fertilizer rates. - Implement rehabilitation monitoring program. - Document growth media depth. Document ameliorants and physical treatments applied. - Document seed mix and source/s. Document seed application rates/density, planting timing and areas. - Appropriate topsoil stockpile management. - Provision of surface roughening such as dozer tracking (up and down slope) or ripping (across slope), to minimise rapid run off. - Growth medium placed at a minimum depth of 100mm - Management of topsoil stripping and application during rehabilitation in accordance with TMP and RMP. - Ameliorants and fertiliser applied per approved ratio. - Appropriate equipment to be utilised during activities. - Seeding at optimal time of year with respect to favourable rainfall conditions. - Monitoring of rehabilitated areas in accordance with monitoring schedule to identify reduced germination early. - Re-seeding where required in critical situations. - Variable seed criteria to allow for seasonal variation and availability. - Where applicable, additional ESC measures to be implemented. - Continual improvement through annual review of completed rehabilitation activities. - Only authorised vehicles and persons to access rehabilitated areas. - Fencing surrounding PTM is to be maintained to control external livestock access when required. - Monitoring to identify any erosion initiation and early rectification of erosion.	Unlikely (0.1)	4	Medium 30		

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
Alteration of hydrogeological conditions	RM1, RM2, RM3, RM4, RM5, RM6, RM7, RM8, RM9	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA9	- Insufficient or incorrect landform design or construction methods. - Incorrect placement of geochemically unstable waste materials. - Seepage from MAW sources or residual voids.	Adverse impacts to the receiving groundwater environment including contamination of groundwater above selected thresholds/guidelines.	Unlikely (0.1)	4	Medium (30)	- Construction management, technical supervision, and QA/QC of final landforms and covers will be done by a AQP. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. - Cattle grazing (RA1, RA2, RA3, and RA6) Landforms reshaped with maximum 15% slope. - Cattle grazing (RA1, RA2, RA3, and RA6) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5. - Woodland Habitat PMLU (RA4, RA5, and RA8) Areas >15% to be assessed by an AQP as being stable long term, with rock mulch applied as required. - Woodland Habitat PMLU (RA4, RA5, and RA8) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥ 1.5 unless an alternative is justified by an AQP. - Updated hydraulic flood modelling using drainage designs. - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use". - The geochemical assessment has shown that the wastes are not anticipated to pose a significant risk in terms of acid, neutral metalliferous, or saline drainage, or elevated metal and/or sulphate concentration in surface waters or groundwaters. As a result, a specific cover design to address these risks is not required. - No evidence of erosion for all RA's excluding RA7, and RA9 is classified as 'minor' 'moderate' or 'severe' as defined by PRC Plan Schedule Appendix 7: Erosion classification framework. - Assessment report completed by an AQP certifying that the diversion (RA7 and RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition. - Geomorphic index (IDC method) used to verify that Rehabilitation for RA7 and RA9 is erosionally stable. - Contaminated land investigation with a site investigation report prepared by an AQP. - Removal and appropriate disposal of contaminated materials. - Conduct validation testing to confirm that contaminated materials have been removed or remediated. Certification from an AQP that all contaminated land has either been remediated or removed. - Document (map) locations where mining wastes will be stored during mining operations. - Water balance assessment was undertaken (WSP, 2024) and concluded that post-closure, PTM residual void will continue to act as sinks. - Landform embankment provides immunity up to a 0.1% AEP. - Implement rehabilitation monitoring program including groundwater quality monitoring. - All imported hazardous materials to be stored and used in accordance with relevant standards and removed from site on completion of operations. - Water quality in retained dams is not expected to cause degradation of adjacent or downstream surface or ground water resources, although testing will be carried out to establish whether water quality meets the water quality criteria in accordance with the PRC Plan schedule (RM6). - Particle tracking modelling confirms that residual voids will act as sinks and even if water levels rise, contaminants will report back to residual voids.	Highly Unlikely (0.03)	4	Medium

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
								- Groundwater monitoring to be undertaken in accordance with section 3.8.5 groundwater monitoring. - Appropriate management, placement/encapsulation, and monitoring of waste (spoil and rejects) during operations.			
Alteration of local hydrologic conditions	RM1, RM2, RM3, RM4, RM5, RM6, RM7, RM8, RM9	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA9	- Insufficient or incorrect landform design or construction methods including not completing landform embankment design for PMF immunity. - Erosional instability of landforms resulting in sediment mobilisation into receiving environment. - Inadequate surface preparation or vegetation cover establishment. - Surface water contamination from unsuitable waste rock material. - Failure of ESC structures post establishment leading to loss of sediment offsite. - Interactions with the flood plain and final landform. - High velocities in landform drainage leading to erosion instability.	Adverse impacts to the receiving surface water environment including contamination of surface water above selected thresholds/guidelines.	Probable (0.3)	4	Medium (90)	- Construction management, technical supervision, and QA/QC of final landforms and covers will be done by a SQP. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. - Cattle grazing (RA1, RA2, RA3, RA6) Landforms reshaped with maximum 15% slope. - Cattle grazing (RA1, RA2, RA3, RA6) Landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥1.5. - Woodland Habitat PMLU (RA4, RA5, and RA8) Areas >15% to be assessed by an AQP as being stable long term, with rock mulch applied as required. - Woodland Habitat PMLU landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥1.5 unless an alternative is justified by an AQP. - Updated hydraulic flood modelling using drainage designs. - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use". - No evidence of erosion for all RA's excluding RA7 and RA9 is classified as 'minor' 'moderate' or 'severe' as defined by PRC Plan Schedule Appendix 7: Erosion classification framework. - Assessment report completed by an AQP certifying that the diversion (RA7 and RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition. - Geomorphic index (IDC method) used to verify that Rehabilitation for RA7 and RA9 is erosionally stable. - Implement rehabilitation monitoring program including water quality monitoring. - All imported hazardous materials to be stored and used in accordance with relevant standards and removed from site on completion of operations. - Landforms will be designed with appropriate erosion protection for any areas with flood interactions. - Monitoring of retained dams to ensure suitability for supporting grazing PMLU. - Surface water monitoring to be undertaken in accordance with EA conditions and monitoring requirements. - Rehabilitation of disturbed areas will be undertaken as soon as practicable after land becomes available in accordance with PRC Plan Schedule. - Monitoring of the PTM diversion undertaken to ensure trajectory to achieving rehabilitation milestones. - Appropriate management, placement, and monitoring of waste (spoil and rejects) during operations. - Landforms designed and constructed to minimise the potential for flooding of the residual voids. Flood modelling confirms no ingress to residual voids up to and including the 0.1% AEP. - Schedule works outside of high erosion risk periods (i.e., December - February). - Implement rehabilitation monitoring program.	Unlikely (0.1)	4	Medium (100)

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
								- The proposed PMLU and landform is consistent and similar with existing/surrounding landforms and vegetation that is compatible to a PMLU of grazing and therefore has resilience/tolerability for current weather patterns. - Undertake regular update of hydrological models to ensure that the residual void catchments are minimised as far as practical. - If necessary, identify and implement mitigation measures for appropriate protection works of landforms where floodwaters interact with the final mine closure landforms. - As cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids closure landforms and spill point elevations, rainfall and evaporation, surface water runoff, groundwater inflows and climate projections. - Obtain certification from an appropriately qualified person that the residual voids will not cause environmental harm.			
Impact of extreme weather events prior to final landform establishment leads to instability of final landforms	RM1, RM2, RM3, RM4, RM5, RM6, RM7, RM8, RM9	RA1, RA2, RA3, RA4, RA5, RA6, RA7, RA8, RA9	- Extreme weather such as cyclones, flooding, or uncontrolled fire. - Interactions with the flood plain and final landform.	- Damage to final landform and rehabilitation area. - Increased likelihood of erosion. - Loss or degradation of cover materials. - Extended period required to remediate landform. - Loss of vegetation cover may result in increased erosion and soil loss. - Failure to achieve milestone criteria pertaining to vegetation cover. - Loss or alteration of habitat.	Probable (0.3)	5	High (300)	- Schedule works outside of high erosion risk periods (i.e., December - February). - Implement rehabilitation monitoring program. - The proposed PMLU and landform is consistent and similar with existing/surrounding landforms and vegetation that is compatible to a PMLU of grazing and therefore has resilience/tolerability for current weather patterns. - Emergency response procedures (including fire). - Water cart availability during rehabilitation. - Establishment of vegetation within Watercourse PMLU suitable for the environment and reduces erosion risks. - Landforms will be designed with appropriate erosion protection for any areas with flood interactions. - Undertake regular update of hydrological models to ensure that the residual void catchments are minimised as far as practical. - Update and refine the final mine closure landform to consider spoil dumping and landform design to exclude floodwaters entering the residual void. - If necessary, identify and implement mitigation measures for appropriate protection works of landforms where floodwaters interact with the final mine closure landforms. - As cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids closure landforms and spill point elevations, rainfall and evaporation, surface water runoff, groundwater inflows and climate projections. - Obtain certification from an appropriately qualified person that the residual voids will not cause environmental harm. - Develop revegetation plan that considers vegetation suitability to adverse climatic conditions. Monitor climate and plant responses as part of ongoing monitoring.	Unlikely (0.1)	5	Medium (100)
Landform establishment inconsistent with milestone criteria	RM3, RM4, RM5, RM6, RM7, RM8, RM9	RA2, RA3, RA4, RA5, RA6, RA8, RA9	- Erosional instability. - Placement of unsuitable tertiary waste within 2m of the surface. - Rehabilitated Landforms Result in Alteration of Flood Hydrology Upstream and Downstream.	- Failure to establish proposed vegetative cover and therefore stable PMLU. - Loss or degradation of cover materials. - Adverse impacts to hydrological or hydrogeological system.	Likely (1)	4	High (300)	- Low slope gradient for gazing in landform design to limit capacity for sediment loss. Woodland habitat does not exceed 25%. - Surface preparation and sowing is to take place with regard to optimal weather conditions (no predicted heavy rainfall or extended periods of drought). - Approved seed mix includes rapidly establishing grasses. - ESC measures to be operational during surface preparation and revegetation. - Soil sampling of stockpiles prior to placement to refine amelioration fertilizer rates. - Landforms designed and constructed to minimise the potential for flooding of the residual voids. Flood modelling confirms no ingress to residual voids up to and including the 0.1% AEP.	Unlikely (0.1)	5	Medium (100)

Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Risk Analysis			Controls Mitigation	Residual Risk Ranking		
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
			- Interactions with the flood plain and final landform. - High erosion risk of spoil material. - Insufficient or incorrect landform design or construction methods (including non-conformance to design shape). - Adverse climatic conditions (drought, heat, changing climate). - Insufficient volume of material available or unsuitable quality for rehabilitation activities.					- Undertake rehabilitation monitoring include landform erosion monitoring. Remediate aeras performing poorly with respect to erosion based on erosion monitoring data. - Implement erosion protection measures for appropriate protection works of landforms where floodwaters from watercourses interact with the final mine closure landforms. - As cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids closure landforms and spill point elevations, rainfall and evaporation, surface water runoff, groundwater inflows and climate projections. - Obtain certification from an appropriately qualified person that the residual voids will not cause environmental harm. - Development of a revegetation plan that considers vegetation suitability, seeding/planting methods, primary growth media suitability and a secondary growth media. Plan is to include measurable rehabilitation milestones for landform design, growth media and vegetation. - Construction management, technical supervision, and QA/QC of final landforms and covers will be done by a SQP. - Erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. - Cattle grazing (RA2, RA3, RA4, RA6) landforms reshaped with maximum 15% slope. - Cattle grazing (RA2, RA3, RA4, RA6) landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥1.5. - Woodland Habitat PMLU areas >15% to be assessed by an AQP as being stable long term, with rock mulch applied as required. - Woodland Habitat PMLU landforms design is assessed by an AQP as being geotechnically stable with a factor of safety ≥1.5 unless an alternative is justified by an AQP. - Updated hydraulic flood modelling using drainage designs. - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use". - No evidence of erosion for all RAs excluding RA7 and RA9 is classified as ‘minor’ ‘moderate’ or ‘severe’ as defined by PRC Plan Schedule Appendix 7: Erosion classification framework. - Assessment report completed by an AQP certifying that the diversion (RA7 and RA9) is operating in accordance with, DNRME Guideline: Works that interfere with water in a watercourse for a resource activity — watercourse diversions under the Water Act 2000 (OSW/2019/4599) criteria and is in a stable condition. - Geomorphic index (IDC method) used to verify that Rehabilitation for RA7 and RA9 is erosionally stable. - Develop revegetation plan that considers vegetation suitability to adverse climatic conditions. Monitor climate and plant responses as part of ongoing monitoring.			
NUMA does not meet stable condition consistent with milestone criteria	MM1, MM2, MM3	IA1	- NUMA is not safe. - NUM A is no stable - geotechnical stability: - Stability outside of the NUMA extents of the high walls = FoS>= 1.5. - NUMA causing environmental harm.	- Steep slopes. - Rock falls. - Slope failure. - Residual void extends beyond permitted EA domain limits. - Impacts to adjacent PMLUs.	Likely (1)	4	High (300)	- Surface water management system. - Diversion drains. - Minimal external catchment into pit lake. - Monitoring of slip failure. - Residual void lake levels remain below groundwater levels and the voids act like sinks for the considered closure scenarios. - Groundwater modelling including particle tracking confirms residual voids act as a sink during closure.	Unlikely (0.1)	5	Medium (100)

					Risk Analysis			Residual Risk Ranking			
Risk Event	Rehabilitation Milestone	Rehabilitation Area	Causes	Impact Description	Likelihood	Consequence	Risk	Controls Mitigation	Likelihood	Consequence	Risk
				- Void switches from a sink to a source to the groundwater aquifer. - Safety bunds and setbacks not achieved. - Overtopping.				- Obtain certification from an appropriately qualified person that the residual void is safe to humans and livestock. - Safety bund is constructed, where required, at the geotechnical set-back distance. - Fencing erected around perimeter of safety bund, where required. - Warning signage placed along the fence line (nominally one sign every 100m). - Hazard Assessment conducted to verify safety hazards are not significantly different to surrounding unmined landscapes subject to the same land use. - As mining approaches the final limits, re-assess the geotechnical stability of the low walls based on the latest available data, including the developed site-specific geotechnical parameters. - Use a minimum factor of safety >=1.5 as a guidance for ongoing void closure planning. - If factor of safety extending into the woodland PMLU after re-assessment remains <1.5 following closure, review the risk of instability affecting the ability to achieve the PMLU milestone criteria. - Undertake regular update of hydrological models to ensure that the residual void catchments are minimised as far as practical. - Landforms designed and constructed to minimise the potential for flooding of the residual voids. Flood modelling confirms no ingress to residual voids up to and including the 0.1% AEP. - Implement erosion protection measures for appropriate protection works of landforms where floodwaters interact with the final mine closure landforms. - As cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids closure landforms and spill point elevations, rainfall and evaporation, surface water runoff, groundwater inflows and climate projections. - Obtain certification from an appropriately qualified person that the residual voids will not cause environmental harm.			

3.7.4 Rehabilitation Trials

PRC Plan Guideline (Section 3.7.1)

In accordance with section 126C(1)(j) of the EP Act, if rehabilitation trials are planned, the rehabilitation planning part must state:

- the objective of the trial(s).
- the trial design including, but not limited to, the location, underlying land characteristics and potential issues.
- the details of how the trial(s) will be carried out.
- when the trial(s) will commence.
- the duration of the trial(s).
- how the trial(s) will be assessed for success.
- how the results of the trial(s) will be incorporated into rehabilitation strategies and the development of milestones, and
- where the trials have previously been carried out by the applicant.

The information requirements in this section will apply to all applicants, whether or not they are an existing EA holder, who have planned or commenced rehabilitation trials. Existing EA holders can provide details of any rehabilitation trials that have occurred prior to the submission of the proposed PRC Plan.

Although no rehabilitation trials are currently planned at PTM, rehabilitation trials may be conducted at PTM as part of continuous improvement. Current rehabilitation practices will be executed in line with the PRC Plan rehabilitation and management methodologies outlined for each PMLU.

3.7.4.1 Previous Trials

No previous trials have been carried out at PTM however as referenced in Section 3.1.5, existing rehabilitation monitoring has been ongoing since 2009 and provides key learnings on success factors that can be implemented for future rehabilitation works.

3.8 Monitoring and Maintenance

PRC Plan Guideline (Section 3.8)

Under section 126C(1)(j) of the EP Act, the administering authority considers monitoring and maintenance necessary to decide if the PRC Plan is consistent with the requirements of the legislation. The rehabilitation planning part must contain a monitoring and maintenance program that identifies and describes the monitoring systems that will be carried out in order to demonstrate a milestone and milestone criteria have been achieved. The program must include, where relevant to the milestone and milestone criteria (but is not limited to):

- schedule of monitoring, reporting and review for each milestone.
- description of methodologies and standards, which could include field-based assessments and the application of new remote sensing, GIS, and other relevant emerging technologies.
- monitoring that enables the repeatable collection of relevant statistically valid data.
- monitoring using appropriate quality assurance and data management processes and systems.
- regular analysis of site data including multi-year comparison trends and benchmarking against analogue/reference sites.
- contingency strategies if monitoring data indicates milestone criteria are not being met.
- post-closure monitoring to ensure milestone criteria has been demonstrated.
- intent of monitoring reports, such as provision of results and key findings.

The information requirements in this section will apply to all applicants whether or not they are an existing EA holder. However, existing holders may already have the required information available from previously submitted plans/reports/applications that, if still valid, could be used in the PRC Plan. If there has/is any monitoring or maintenance of areas already rehabilitated, details must be included in the PRC Plan

3.8.1 Rehabilitation Milestone Monitoring

The RMs and associated milestone criteria for PTM are detailed [in Table 76](#) ~~in Table 75~~.

Rehabilitation milestone monitoring and reporting will be undertaken at PTM to demonstrate achievement of the RMs, as they relate to achieving surface requirements and PMLU criteria for cattle grazing, woodland habitat, and watercourses.

A combination of approaches will be used to monitor and report on achievement of RMs. Monitoring and reporting requirements for RM1 to RM9 are listed against each milestone in [Table 76](#) ~~Table 75~~ and will primarily involve documentation and/or inspections and sign off by an appropriately qualified person that milestones have been achieved. Rehabilitation milestone monitoring for achieving the PMLUs will involve ongoing monitoring in accordance with a schedule whereby permanent monitoring sites will be established, and data will be collected in a repeatable manner to enable statistical analysis to assess the performance of rehabilitation. The results of ongoing PMLU monitoring will be used to determine if rehabilitation areas are on track towards achieving the relevant PMLU criteria or if rehabilitation areas may require maintenance, as discussed in Section 3.8.8 to improve their performance.

The approach to monitoring is discussed in more detail for each PMLU as follows:

- Woodland habitat.
- Cattle grazing.
- Watercourse.

Further discussion on the estimated time that has been scheduled for achieving each PMLU is discussed in Section 3.8.6.

Table 767675 Rehabilitation Milestones with Relevant Reporting Requirements

Milestone Reference	Rehabilitation Milestone	Reporting Requirements
RM1	Infrastructure decommissioning and removal	Undertake visual inspections Document inspections
RM2	Identification and or remediation of contaminated land	Documentation by a suitably qualified person confirming the land does not present an unacceptable risk to proposed future land uses or the environment.
RM3	Landform establishment	Survey/LiDAR of landform Analyse final landform against design Documentation of riverine and/or operation works permits or associated exemptions
RM4	Surface preparation	Survey/LiDAR of surface and extent after topsoil is placed Document topsoil depth Document growth media assessment Document growth media ameliorants and physical treatments applied Watercourse - Documentation of riverine and/or operation works monitoring
RM5	Revegetation	Document seed mix, purity information, planting timing, planting rates and areas as per PRC Plan Schedule
RM6	Achievement of stable condition	Undertake rehabilitation monitoring as per Sections 3.8.2 – 3.8.5
RM7	Achievement of cattle grazing PMLU	Undertake rehabilitation monitoring as per Sections 3.8.2 – 3.8.5
RM8	Achievement of woodland habitat PMLU	Undertake rehabilitation monitoring as per Sections 3.8.2 – 3.8.5
RM9	Achievement of watercourse PMLU	Undertake rehabilitation monitoring as per Sections 3.8.2 – 3.8.5

3.8.2 Cattle Grazing and Woodland Habitat Rehabilitation Monitoring

3.8.2.1 Monitoring Locations

For the woodland habitat PMLUs monitoring locations will be identified using the methodology outlined in the latest version of the Queensland Herbarium's BioCondition Assessment Manual.

No reference sites will be included in the rehabilitation monitoring program for cattle grazing as the performance is based on standard methods for assessing pasture condition consistent with industry guidelines.

Nevertheless, reference/analogue sites have previously been identified (Section 3.6.1.8) and will potentially be incorporated into the assessment process of rehabilitation success.

Permanent rehabilitation monitoring sites will be established at the start of the rehabilitation monitoring program (Year 0). The permanent sites will be assessed during all phases of rehabilitation monitoring.

In addition to the using the Queensland Herbarium's BioCondition Assessment Manual permanent field monitoring sites will be selected prior to commencing any field monitoring work and selected using the following criteria:

- Representative of rehabilitation slope.

- Located in a lower slope position to capture maximum hydrologic and erosion processes.
- Accessibility (vehicle access preferred).
- Located on mining lease or proponent owned land.
- Low risk of site being disturbed by mining activity in the future.

3.8.2.2 Monitoring Schedule

At least one permanent rehabilitation monitoring site will be established in each RA.

The woodland habitat and cattle grazing PMLU rehabilitation monitoring program has been designed to demonstrate achievement of surface preparation (RM4) and woodland habitat and cattle grazing PMLUs to a safe, stable, non-polluting, and self-sustaining condition (RM1-RM9) (Section 3.3.1).

The monitoring program follows a phased approach whereby initial monitoring is undertaken to assess the performance of rehabilitation as it relates to achieving initial surface preparation and revegetation requirements at Year 0 and Year 1. This approach allows a timely assessment of the performance of rehabilitation post initial seeding (RM5) and provides critical information to determine if rehabilitation is on track towards achieving initial surface requirements and revegetation or if maintenance may be required (Section 3.6.1.8). Additional rehabilitation parameters are included into the monitoring program commencing year two, and every four years thereafter, to assess the performance and track rehabilitation in relation to achievement of each PMLU (RM7-RM8).

The consistent phased approach of the monitoring program ensures that there is continual monitoring of rehabilitation parameters against milestone criteria up to the point of surrender of the EA.

Table 77776 illustrates the monitoring schedule for cattle grazing and woodland habitat PMLUs and indicates the rehabilitation parameters monitored during each phase of the schedule commencing from Year 0. This allows assessment of the performance and trajectory of the rehabilitation against milestone criteria and accounts for the influence of seasonal variations and extreme weather events over time.

Table 77776 Monitoring Schedule and Measured Rehabilitation Parameters

	Monitoring Schedule				
	Year 0	Year 1	Year 2	Year 6	Year 10+ (4 Yearly Thereafter
All PMLUs					
Landform and erosion	✓	✓	✓	✓	✓
Soil and spoil	✓	x	✓	✓	✓
Groundcover	✓	✓	✓	✓	✓
Invasive plants	✓	✓	✓	✓	✓
Cattle Grazing					
Pasture species diversity	✓	✓	✓	✓	✓
Pasture yield	x	x	✓	✓	✓
Pasture condition	x	x	✓	✓	✓
Grazing Land Suitability Assessment	x	x	x	✓	✓
Water Quality Monitoring for Retained Water Storages	Will commence when the surrounding rehabilitated landform progresses to RM6 and continue at one sampling round for each dam 4 yearly thereafter.				
Woodland Habitat					
Recruitment	x	x	✓	✓	✓
Non-native plant cover	✓	✓	✓	✓	✓

	Monitoring Schedule				
	Year 0	Year 1	Year 2	Year 6	Year 10+ (4 Yearly Thereafter)
Tree, shrub, grass, and forb species richness	✓	✓	✓	✓	✓
Tree and shrub canopy cover	x	x	✓	✓	✓
Native perennial grass	✓	✓	✓	✓	✓
Litter grid cover	✓	✓	✓	✓	✓

3.8.2.3 General Rehabilitation Monitoring Parameters

3.8.2.3.1 Landform and Erosion

Landform and erosion are assessed as part of all monitoring phases.

Prior to commencing the field monitoring work, a desktop assessment using LiDAR data and aerial imagery will be completed to:

- Develop a Digital Elevation Model (DEM) to assess the rehabilitated slope against the landform design (Year 0).
- Identify new areas of potential erosion for field validation.

Field-based erosion monitoring will be conducted at the permanent monitoring sites as well as any new areas identified in the desktop assessment.

The field survey involves establishing an erosion monitoring transect by running a 50m tape perpendicular to the slope and across the erosional activity identified during the LiDAR analysis.

Erosion should then be assessed against the erosion classification framework (Appendix 7 of the PRC Plan Schedule) and classified as minor, moderate or severe.

3.8.2.3.2 Topsoil and Spoil

Soil profile pits or cores within the rehabilitated areas will be established at the permanent rehabilitation monitoring sites during Year 0 monitoring. The parameters detailed in [Table 78](#) are monitored during Year 0, Year 2, and every four years thereafter. Surface sampling refers to the layer at 0 – 10cm; and sub-surface sampling refers to layers at 10 – 30cm, 30 – 60cm and 90 – 100cm.

The surface soil sampling results should be compared to the target suitability characteristics for growth medium in RM4.

Table ~~787877~~ Soil and Spoil Analysis Parameters for the PTM Monitoring Program

Category	Analyte	Purpose of Analyte	Depth		Monitoring Phase	
			Surface	Sub-Surface	Year 0	Year (and 4 Yearly Thereafter)
Acidity / Alkalinity	pH	Identify anomalies that may affect plant growth and sustainability.	✓	✓	✓	✓
Salinity	EC	Identify leaching profile. High salinity can lead to poor vegetation germination and establishment, reduced plant growth and vigour.	✓	✓	✓	✓
	Chloride	Identify leaching profile. High chloride can lead to poor vegetation germination and establishment, reduced plant growth and vigour.	✓	✓	✓	✓
Exchangeable Cations	Cation exchange Capacity (CEC)	Major factor in soil fertility. Controls soil stability, nutrient availability, and buffers soil's chemical properties.	✓	✓	✓	✓
	Exchangeable cations	Exchangeable Calcium is linked to soil stability. High levels of exchangeable Magnesium can cause clay dispersion, instability when wet and hard setting.	✓	✓	✓	✓
	Exchangeable Sodium Percentage (ESP)	ESP is a measure of the dominance of sodium ions on the soil's cation exchange complex. Sodicity in soils can lead to slaking and dispersion which impact soil structure and stability.	✓	✓	✓	✓
Organic Matter	Organic carbon	An indicator of soil nutrient stores and a contributor to improvements in soil structure. Changes through time in organic carbon are a key indicator of rehabilitation success.	✓	x	✓	✓
Major Elements	Total Nitrogen	Indicator of soil nutrient store and is also a major plant nutrient.	✓	x	✓	✓

Category	Analyte	Purpose of Analyte	Depth		Monitoring Phase	
			Surface	Sub-Surface	Year 0	Year (and 4 Yearly Thereafter)
Trace Elements	Extractable Phosphorous (Colwell method)	Indicator of Phosphorous readily available to plants.	✓	x	✓	✓
	Total Phosphorous	Indicator of total store of Phosphorous, some of which is readily available. Key indicator of potential for long-term success or failure of rehabilitation.	✓	x	✓	✓
	Potassium	Important plant nutrient.	✓	x	✓	✓
	Total Sulphur	Indicator of potential for Acid and Metalliferous Drainage processes.	✓	x	✓	✓
	Sulphate	Important plant nutrient and can be an indicator of potential Acid and Metalliferous Drainage processes.	✓	x	✓	✓
	Calcium	Important plant nutrient.	✓	x	✓	✓
	Magnesium	Important plant nutrient.	✓	x	✓	✓
	Manganese	Trace element with minor importance for vegetation success.	✓	x	✓	✓
	Iron	Trace element with minor importance for vegetation success.	✓	x	✓	✓
	Zinc	Trace element important for vegetation success.	✓	x	✓	✓
Metals	Copper	Trace element important for vegetation success.	✓	x	✓	✓
	-	Metals that have been identified as occurring at elevated levels during material characterization analysis should be tested during monitoring.	✓	✓	✓	✓
Physical Parameters	Particle size (PSA)	Soil texture strongly affects water entry and storage. Soil texture will impact erosion and	✓	✓	✓	x

Category	Analyte	Purpose of Analyte	Depth		Monitoring Phase	
			Surface	Sub-Surface	Year 0	Year (and 4 Yearly Thereafter)
Field Analysis		vegetation success and should be considered when planning species mixes for planting.				
	Emerson aggregate test	Indicator of clay dispersion. Should be interpreted in conjunction with ESP and EC data.	✓	✓	✓	x
	Soil profile characteristics	Horizon depths, Field colour, Field texture, Structure, Root density and depth, Soil plant available water capacity (PAWC – initial only).	✓	✓	✓	x

3.8.2.3.3 Groundcover

Groundcover is assessed at the permanent rehabilitation monitoring sites as part of all monitoring phases.

Groundcover type is recorded as either live cover (with species recorded and distinguishing between non-native, native perennial, preferred pasture species and undesirable/weed grass cover), standing dry cover, litter, rock, coal, fallen woody debris or bare ground, and percent cover calculated.

3.8.2.3.4 Invasive Plants

An invasive plant is a prohibited or restricted matter under the Queensland Biosecurity Act 2014, and is defined as a species that has, or is likely to have an adverse impact on a biosecurity consideration because of the introduction, spread or increase in population size of the species in an area. A complete list of invasive plant species is outlined in schedule 4 of the Biosecurity Regulations 2016.

Invasive plants are assessed at the permanent rehabilitation monitoring sites as part of all monitoring phases.

The presence and percent cover of invasive plants, calculated as a percentage of the total vegetation cover, is recorded at each site.

3.8.2.4 Cattle Grazing Rehabilitation Parameters

3.8.2.4.1 Pasture Species Diversity

Pasture species diversity is assessed at the permanent rehabilitation monitoring sites as part of all monitoring phases. [Table 56](#)~~Table 55~~ outlines the recommended species list and sowing rates for the cattle grazing PMLU (RA2, RA3, RA6).

Species diversity is classified into the number of preferred pasture species (identified as perennial grasses that are productive and palatable to stock) (3P), within the pasture including but not limited to those listed in [Table 56](#)~~Table 55~~.

3.8.2.4.2 Pasture Yield

Pasture yield and quality is assessed at the permanent rehabilitation monitoring sites from Year 2. This allows at least two seasons after seeding for pasture species to establish.

Pasture yield is assessed using percentage dry matter (DM) yield in kg/ha for preferred pasture species as well as the proportion of dry matter yield for annual grasses and undesirable grasses or weeds.

3.8.2.4.3 Pasture Condition

Pasture condition is assessed at the permanent rehabilitation monitoring sites from Year 2. This allows at least two seasons after seeding for pasture species to establish. Pasture condition is assessed using preferred species diversity, pasture health and pasture yield. Pasture condition ratings and criteria are shown in [Table 79](#)~~Table 78~~. Pasture condition assessments will also track *Leucaena* stem density.

Table [79](#)~~78~~ Pasture Condition Assessment Table

Condition Rating	Condition Indicators				
	Preferred Pasture Species		Annual Grass % DM Yield	Undesirable Grasses & Other Weeds % DM Yield	Preferred Pasture Species Diversity
	% DM Yield	Crown Cover			
1	> 80 %	Dense and plants healthy	< 20 %	< 20 %	> 5 species
2	60 – 80 %	High to moderate density and some plants unhealthy	20 – 40 %	20 – 30 %	3 – 5 species

Condition Indicators					
Condition Rating	Preferred Pasture Species		Annual Grass % DM Yield	Undesirable Grasses & Other Weeds % DM Yield	Preferred Pasture Species Diversity
	% DM Yield	Crown Cover			
3	10 – 60 %	Moderate to low density and some plants dead	40 – 70 %	30 – 80 %	2 – 3 Species
4	< 10 %	Sparse and many plants dead	> 70 %	> 80 %	0 or 1 species

3.8.2.4.4 Grazing Land Suitability Assessment

A land suitability assessment according to the grazing rule-set (Section 3.3.1.1) is undertaken to track achievement of a PMLU of cattle grazing from the commencement of rehabilitation in Year 6. If the rehabilitation fails to meet the completion criteria according to the grazing rule-set (PRC Plan Schedule), amelioration and maintenance works may be implemented and another assessment will be undertaken during the next scheduled monitoring.

3.8.2.4.5 Retained Water Infrastructure

Any water storages retained that will support the grazing PMLU and have a demonstratable benefit will also have their water quality monitored. The water within the retained water storages will be tested for the trigger values for livestock drinking water (as defined in ANZECC & ARMCANZ 2000).

Water quality monitoring for retained water storages will commence when the surrounding rehabilitated grazing landform progresses to RM6 and continue at a frequency of one sampling round for each dam 4 yearly thereafter.

3.8.2.5 Woodland Habitat Rehabilitation Parameters

Woodland habitat rehabilitation monitoring involves BioCondition monitoring assessments completed by an appropriately qualified person using the methodology outlined in the Queensland Herbarium's BioCondition Assessment Manual. Key parameters are outlined in the sections below and will collect data required to compare to criteria within Appendix 6 of the PRC Plan Schedule.

3.8.2.5.1 Species Richness

Species richness is assessed at the permanent rehabilitation monitoring sites as part of all monitoring phases. Species richness is assessed for native tree, shrub grasses and forbs by recording the number of flora species at each site. If vegetation composition across the rehabilitation appears to have a high degree of spatial variability, it is likely that the monitoring site may not capture a representative species richness for canopy species (trees). In this case, it may be necessary to establish additional vegetation assessment sites across the rehabilitation – these will be identified and included in the monitoring program as rehabilitation monitoring proceeds over time.

3.8.2.5.2 Tree Canopy and Shrub Cover

Tree canopy and shrub cover is assessed at the permanent rehabilitation monitoring sites from Year 2.

Canopy cover is recorded using the line intercept method for tree canopy and shrub canopy at each monitoring site. Each tree (single-stemmed woody plant greater than 2m tall) and shrub (multi-stemmed woody plant or single stemmed woody plant less than 2m tall) crown is recorded and summed as a total canopy distance and converted to a percent cover.

3.8.2.5.3 Recruitment

Recruitment is assessed at the permanent rehabilitation monitoring sites from Year 2.

Recruitment is assessed as the proportion of woody perennial canopy (<10cm diameter at breast height (DBH)) and shrub species that are regenerating. The dominant canopy and shrub species are identified and then the proportion of these species which are observed to be present in a juvenile state are recorded.

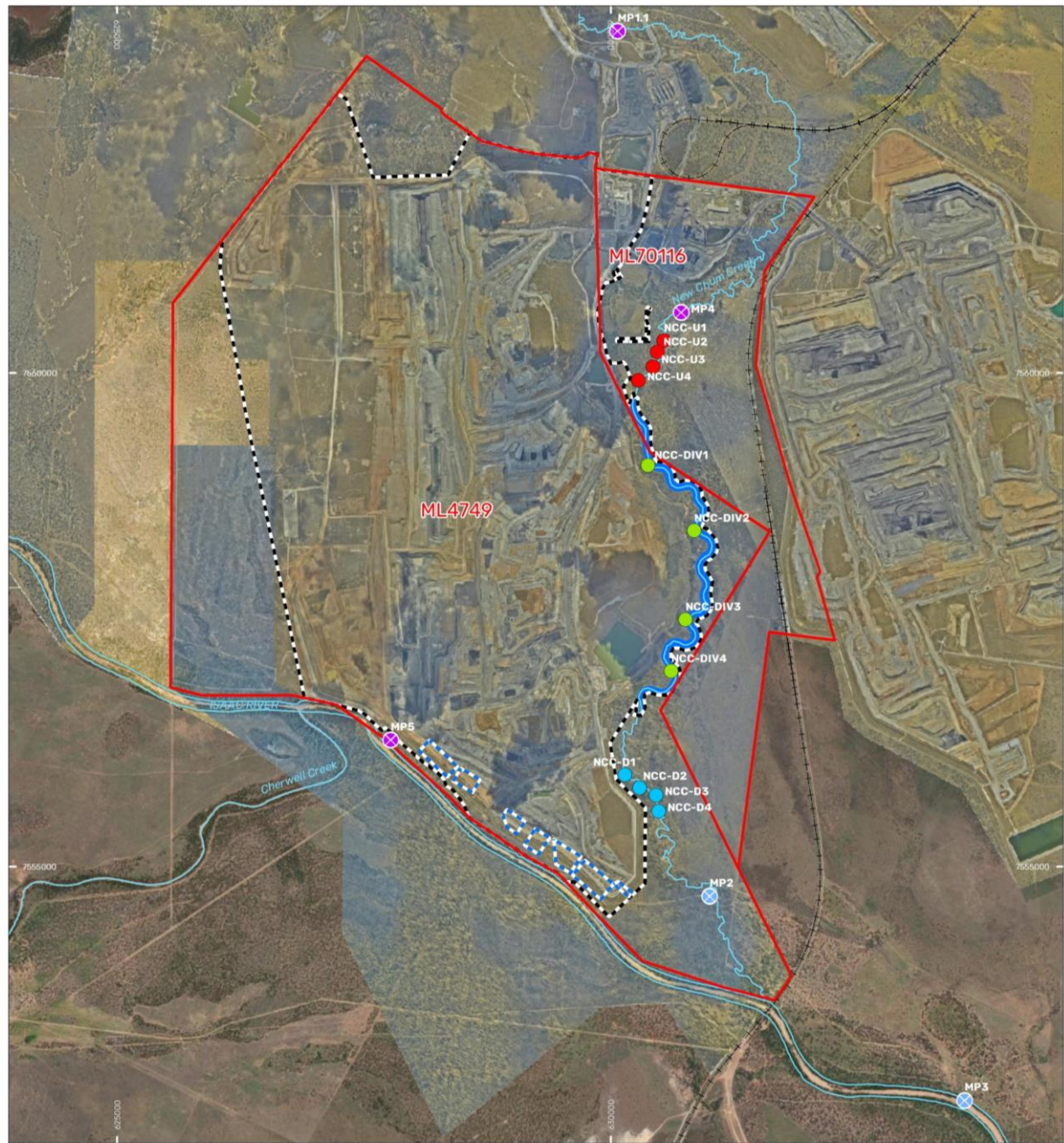
3.8.3 Watercourse PMLU Monitoring

Watercourse monitoring will be conducted at PTM for the New Chum Creek diversion with the Watercourse PMLU to assess the performance of the rehabilitated watercourses and creek diversions disturbed by mining activities. The purpose of the watercourse monitoring is to assess the performance of the rehabilitated watercourse in achieving watercourse surface requirements RM3, RM4 and RM5 (for RA9 only) and RM6 and final PMLU milestone criteria RM9 (for both RA7 and RA9).

The methodology for watercourse PMLU monitoring utilises the IDC methodology which is outlined in the ACARP guidelines for Monitoring and Evaluation Program for Bowen Basin River Diversions (ACARP, 2001).

3.8.3.1 Watercourse Monitoring Locations

Monitoring locations have been established in the existing New Chum Creek Diversion and are shown in [Figure 77](#).



POITREL MINE - PRC PLAN

CREEK DIVERSION AND SURFACE WATER MONITORING POINTS

Drawn: schuj4
Exported: 21/06/2024
File: PTM Creek Diversion
Figure:
Version: 1
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LEGEND

Creek Diversion Monitoring Points

- Diversion Offtake
- Downstream Monitoring Point
- Upstream Monitoring Point

Surface Water Monitoring Points

- ⊗ Downstream Monitoring Point
- ⊗ Upstream Monitoring Point

Creek Diversion

- New Chum Creek Diversion Channel

- Mining Lease

- EA Approved Surface Disturbance

- EA Approved Surface Disturbance - Highwall Mining

- Watercourses

- +— Railways



0 0.25 0.5 1 1.5 2
Kilometres

A3 1:40,000

AGD 1984 AMG Zone 55

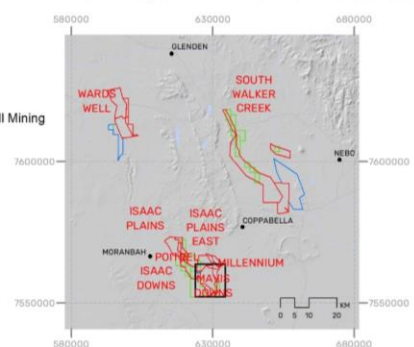


Figure 77 PTM Watercourse Creek Diversion and Surface Water Monitoring Locations

3.8.3.2 Monitoring Schedule

The PTM watercourse monitoring schedule is provided in [Table 80](#) ~~Table 79~~. The monitoring schedule indicates the IDC parameters are measured annually aligned with operational water licence conditions, until relinquishment and achievement of milestone outcomes (RM9).

Table [80](#) ~~8079~~ Watercourse PMLU Schedule and Measured Rehabilitation Parameters

Monitoring Parameters		Monitoring Schedule
Parameter	Monitoring Detail	Annually
Geomorphic Index Parameters	- Groundcover (%). - Width of high flow channel (m). - Width of active channel (m). - Width of low flow channel (m). - Presence of erosion. - Presence of piping on the banks. - Presence of aggradation or degradation within the channel bed. - Proximity of spoil dumps in relation to the monitoring point. - Presence or absence of benches with/without vegetation. - Stability of each identified instream structure.	✓
- Groundcover. - Stream width. - Bank condition. - Piping of banks. - Bed condition. - Spoil piles. - Recovery. - Instream Structures.		
Riparian Vegetation Index Parameters	- Width of riparian zone (m). - Over-storey, understorey, and ground cover (% density). - Presence or absence of regeneration on banks. - Assess the gaps in the riparian vegetation corridor along the banks.	✓
- Riparian zone. - Structural intactness. - Regeneration. - Longitudinal continuity.		

3.8.3.3 IDC Monitoring

The IDC is a quantitative monitoring method used to measure the geomorphic and riparian condition of diversions. The purpose of the IDC methodology is to compare the condition of diversions with the reference (i.e., upstream) condition and flag potential management issues for remediation. The IDC monitoring methodology encompasses:

- Visual inspection of the diversion reach, and upstream and downstream reaches to undertake the IDC assessments.
- Assessment of Geomorphic Index and Riparian Index at nominated monitoring points in the diversion, upstream and downstream reaches.
- Determination of reach-averaged Geomorphic Index, Riparian Index and overall IDC scores for the diversion, upstream and downstream reaches.
- Compare the Geomorphic Index, Riparian Index and overall IDC score for the diversion reach to the relative upstream and downstream reaches. The Geomorphic and Riparian Index of a reach are each given a score out of 10. Overall IDC scores of above 12 are considered 'good' whereas scores less than 8 are considered 'poor' (ACARP, 2014).
- Compare the Geomorphic Index, Riparian Index and overall IDC scores for the diversion, upstream and downstream reaches against the corresponding scores from previous monitoring activities to assess any changes and trends. The value of assessing IDC overtime is to demonstrate how the watercourse PMLU is maintaining or on a trajectory towards achieving the stable and self-sustaining rehabilitation goals.

The IDC method utilises a suite of monitoring parameters to ensure the watercourses are able to sustain an agreed PMLU of watercourse.

3.8.4 Receiving Water Quality Monitoring

Receiving water quality indicators and acceptance criteria are detailed in Table E1 (Rehabilitation Requirements) of the EA. EC, pH and turbidity have been transitioned for the purposes of this PRC Plan. Furthermore, additional monitoring parameters have also been included to ensure a complete assessment. The suite of receiving water quality indicators will include:

- pH.
- EC.
- Turbidity.
- As.
- Mb.
- Se.
- Total recoverable hydrocarbons (C6–C9).
- Total recoverable hydrocarbons (C10–C36).

The rehabilitation acceptance criteria in Table E1 outlines that the surface water quality will not be ‘significantly different to upstream values’. This has been transitioned to the PRC Plan with the following modification to ensure it meets the SMART principals:

- RM6 - The downstream receiving water quality monitoring points (MP2 and MP3) must not be significantly higher (>15%) when compared to the upstream value at MP4 and MP5 for the water quality parameters specified above.

Water quality monitoring will be undertaken in accordance with the Monitoring and Sampling Manual: Environmental Protection (Water) Policy, (DES, 2018).

3.8.4.1 Surface Water Monitoring Schedule

As the watercourses at PTM are ephemeral, the collection of surface water samples and assessment of surface water quality representative of discharges to receiving environments cannot be undertaken on a fixed schedule. Due to the temporal nature of the receiving waters within the ephemeral drainage lines, rehabilitation-related surface water monitoring will need to be undertaken opportunistically during appropriate surface water runoff events.

Opportunistic surface water monitoring will be undertaken for the analytes listed in above. A minimum of five samples per relevant monitoring point will be collected. This sampling will supplement the surface water monitoring completed under the EA conditions that includes the Receiving Environment Monitoring Program and the water release sampling. It is recommended that five additional samples are collected for upstream monitoring locations. For cattle grazing, woodland habitat, and watercourse PMLUs, sampling will be undertaken between completion of revegetation (RM5) and achievement of the nominated PMLUs (RM7, RM8, and RM9) for a minimum period of three years. After three years, results will be assessed against the relevant milestone criteria within the approved schedule and a review of the surface water data will be undertaken by an appropriately qualified person to determine milestone completion.

3.8.4.2 Surface Water Monitoring Locations

Surface water rehabilitation monitoring will be conducted at the monitoring locations outlined in [Table 81](#) and [Figure 77](#).

Table 81 PTM Surface Water Monitoring Locations

Monitoring Point (MP)	Receiving Waters Location	Easting (GDA94)	Northing (GDA94)
Upstream Monitoring Point			

Monitoring Point (MP)	Receiving Waters Location	Easting (GDA94)	Northing (GDA94)
MP5	Isaac River – 4760m upstream of the confluence of New Chum	627831	7556405
Downstream Monitoring Point			
MP3	Isaac River – 3000m downstream of the confluence of New Chum Creek and Isaac River	633694	7552809

3.8.5 Groundwater Monitoring

Groundwater monitoring will be undertaken on the nine existing EA compliance bores (OBS1, OBS2, OBS5, OBS8, OBS10, OBS15, OBS16, OBS 17, OBS18 and OBS19), and any additional monitoring bores deemed required by the proponent to evaluate the site's groundwater condition. Where required, these bores may be decommissioned and are installed to allow final landform establishment.

3.8.5.1 Groundwater Quality

Groundwater monitoring during operations will continue as per the currently approved EA.

For rehabilitation monitoring of groundwater quality in the PTM EA (Table E1 Rehabilitation Requirements) currently specifies:

- EC not significantly different to:
 - The EPP (Water and Wetland Biodiversity) schedule documents water quality objectives for relevant groundwater chemistry zones, or
 - Local water quality objectives developed in accordance with the Queensland Water Quality Guidelines.

In order to comply with SMART principles, the above acceptance criteria has been modified to:

- Groundwater bores specified in Table I1 in EPML00963013 must be monitored for quality and levels at the location specified in Appendix 9 of the PRC Plan schedule: Ground water monitoring points for a period of at least three years with monitoring intervals ≥ 4 weeks and ≤ 16 weeks.
- Ground water quality results for compliance bores must remain within the 95th percentile of the site-specific limits detailed in Table I2 EPML00963013 for a minimum of 36 samples taken at intervals specified in RM6(i).

3.8.5.2 Groundwater Levels

Groundwater levels will be monitored to ensure:

- Groundwater levels for compliance bores specified in Table I1 EPML00963013 must not exceed a drawdown ≥ 2 m from the baseline RL level (refer EA Table I2).

3.8.5.3 Groundwater Monitoring Schedule

During operations, groundwater monitoring will continue per the applicable EA conditions.

Upon completion of surface preparation, post-mining rehabilitation groundwater monitoring will be undertaken in accordance with the PRC Plan schedule (RM6). For cattle grazing, woodland habitat and watercourse PMLUs, groundwater monitoring will be undertaken between completion of revegetation (RM5) and achievement of the nominated PMLUs (RM7 and RM9) for a minimum of three years. After three years of groundwater monitoring results will be assessed against the relevant milestone criteria within the approved schedule and a review of the groundwater data will be undertaken by an appropriately qualified person to determine milestone completion.

3.8.5.4 Groundwater Monitoring Locations

Groundwater monitoring to support the assessment of closure conditions will be undertaken on bores that provide a geographical distribution across PTM and coverage of the key hydrogeological units. The

groundwater monitoring bore network to assess closure conditions will include selected bores existing at closure and bores installed specifically to close data gaps and to replace bores that may have been lost due to mining disturbances or otherwise are not operational.

The groundwater monitoring network to be utilised for assessment of rehabilitation are illustrated in Figure 78.

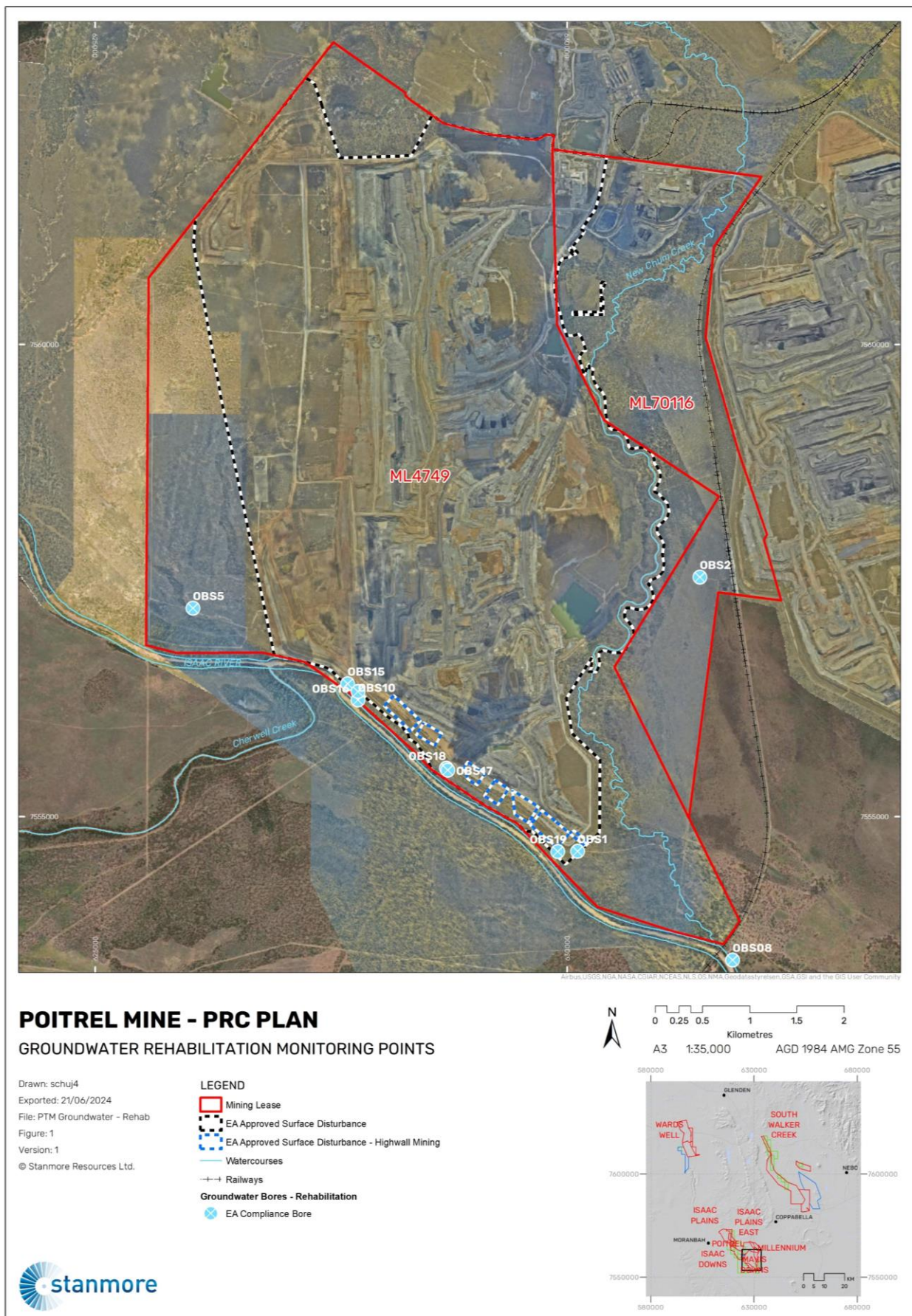


Figure 78 Rehabilitation Groundwater Monitoring

3.8.6 PMLU Achievement Schedule

RM1 to RM9 will be subject to ongoing reporting requirements to ensure achievements of the associated milestone criteria. The timing of the rehabilitation milestones specific to achievement of surface requirements (RM6) and achievement of PMLUs (RM7-RM9), are listed in [Table 82](#) and detailed in the section that follows.

Table [82](#) Time for Achievement of Surface Requirements and PMLU Rehabilitation Milestones

Rehabilitation Milestone Reference	PMLU	Rehabilitation Milestone	Milestone Achievement Timeline After Revegetation (In PRC Plan Schedule)
RM6	Cattle Grazing	Achievement of stable condition	10 years
RM6	Woodland Habitat	Achievement of stable condition	10 years
RM6	Watercourse	Achievement of stable condition	10 years
RM7	Cattle Grazing	Achievement of PMLU	10 years
RM8	Woodland Habitat	Achievement of PMLU	15 years
RM9	Watercourse	Achievement of PMLU	15 years

3.8.6.1 Cattle Grazing

Achievement of stable condition (RM6) for cattle grazing is proposed within a 10-year timeframe from revegetation. There are a number of factors which can influence the successful establishment of pastures on post-mined land including soils and landform, soil management and amelioration species selection, sowing rates, and sowing timing plus rainfall. The revegetation plan has considered these elements and allows a period up to 10 years to achieve a stable condition (RM6) for seasonal rainfall variation to successfully establish a pasture suitable for a PMLU of cattle grazing at PTM.

Achievement of PMLU for cattle grazing (RM7) is proposed within a 20-year timeframe from initial revegetation. This includes the 10 years allowed for achieving (RM6) plus an additional 10 years for achievement of (RM7) (20 years). This will allow for sufficient time to demonstrate the ongoing sustainability of the PMLU for cattle grazing through additional rehabilitation monitoring data associated with landform, erosion, soils, vegetation, pastures, and surface water (Section 3.8.2).

3.8.6.2 Woodland Habitat

Achievement of stable condition (RM6) for woodland habitat is proposed within a 10-year timeframe from revegetation. This allows for comparability to reference sites whereby rehabilitation will require development of multiple tree layers (canopy and shrub) as well as evidence of recruitment comparable to reference sites which would not be possible in <10 years.

Achievement of PMLU for woodland habitat (RM8) is proposed within a 25-year timeframe from revegetation. This includes the 10 years allowed for achieving (RM6) plus an additional 15 years for achievement of (RM8). This allows for initial establishment and successional process, and senescence of *Acacia spp.* and other pioneer species as well as natural recruitment to occur.

3.8.6.3 Watercourse

Achievement of stable condition (RM6) for watercourse is proposed within a 10-year timeframe from revegetation. This allows for comparability to reference sites whereby rehabilitation will require development of multiple tree layers (canopy and shrub) as well as evidence of recruitment comparable to reference sites which would not be possible in <10 years.

Achievement of PMLU for watercourse (RM9) is proposed within a 25-year timeframe from revegetation. This includes the 10 years allowed for achieving (RM6) plus an additional 15 years for achievement of (RM9). This allows for initial establishment and successional process, and senescence of *Acacia spp.* and other pioneer species as well as natural recruitment to occur.

3.8.7 Data Analysis and Reporting

Rehabilitation monitoring data will be collected and analysed by an appropriately qualified person and assessed against the milestone criteria. The data will be analysed to identify changes and trends, as well as map the trajectory of rehabilitation to identify whether it is on track to achieve the milestone criteria or requires remedial actions or maintenance.

The rehabilitation data will be stored and processed within internal geospatial and document management systems.

3.8.8 Maintenance

Maintenance will be implemented when monitoring identifies issues with the rehabilitation, or milestone criteria are not being met. In order to select the most appropriate remedial actions, the likely cause would be assessed. Contributing factors may be related to:

- Climatic conditions (i.e., droughts).
- Weed presence.
- Poor drainage design.
- Insufficient vegetation cover.
- Influence of adjacent land use.
- Soil type.

Required rehabilitation actions are to be entered into the proponent's work management system for actioning.

3.8.9 Quality Assurance and Data Management

Where monitoring assessments indicate rehabilitation is not progressing towards completion milestones contingency steps will be implemented. This quality assurance and quality control process as part of PTM ongoing rehabilitation monitoring is illustrated in Figure 79. The process provides for initial execution of the rehabilitation in accordance with the rehabilitation measures, followed by verification of how this execution was undertaken (again, according to these measures). Based on the verification outcomes, allowance is made for implementation of corrective action and/or maintenance (i.e., contingency strategies), as needed (Section 3.8.8). The rehabilitated areas as well as corrected and/or maintenance areas then undergo further rehabilitation monitoring, and subsequent execution of the rehabilitation measures. This process allows for a repetitive execution-verification-monitoring QA/QC approach, to ensure rehabilitation areas progress on a trajectory towards achievement of milestone criteria and eventual certification.

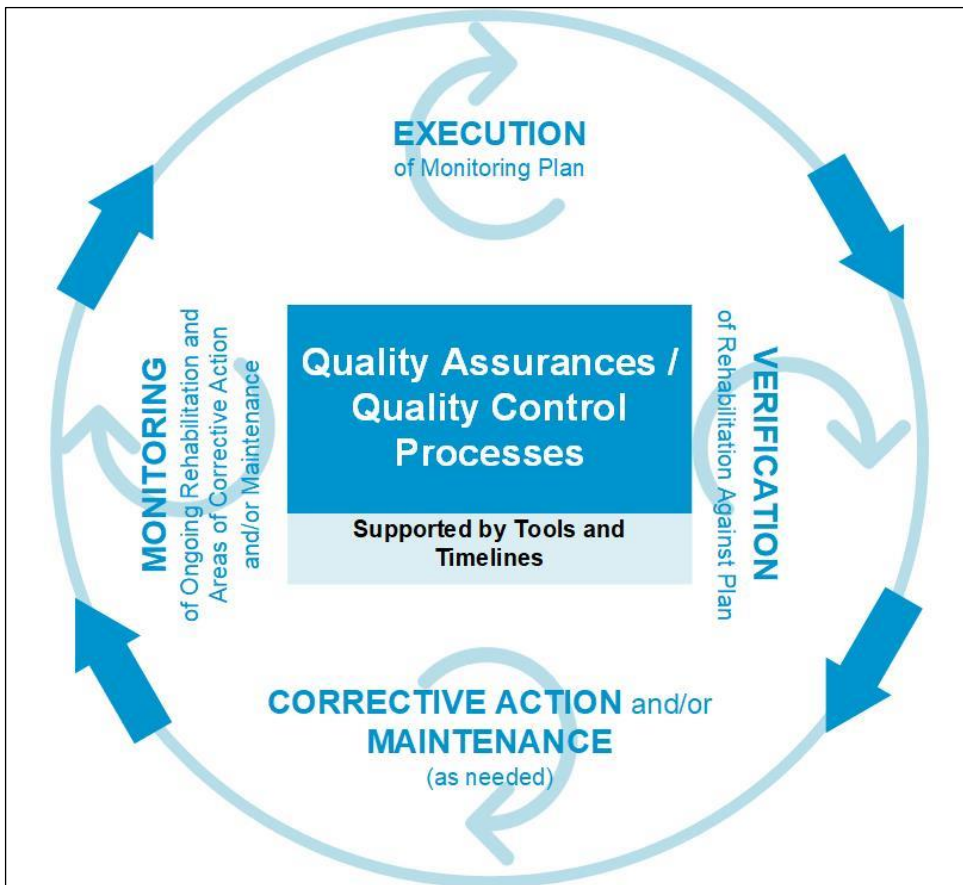


Figure 79 Rehabilitation Monitoring Quality Assurance / Quality Control Process

4. APPENDICES AND ATTACHMENTS

Section B (Attachment 1 EPML00963013 Poitrel Mine PRCP Schedule) is attached to this PRC Plan and includes the PRC Plan Schedule for PTM.

Section C is attached to this PRC Plan and includes any relevant required reports/plans appended to this submission.

Attachment 2 Progressive Rehabilitation and Closure Plan – spatial data submission

Attachment 3 Progressive Rehabilitation and Closure Plan – spatial data submission confirmation email

Attachment 4 EPML00963013 Poitrel Mine PRCP Application Signed

5. REFERENCES

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SECTION B – PRC Plan SCHEDULE

Legislative Requirement

In accordance with section 126D (1) of the EP Act, the PRC Plan Schedule in the PRC Plan must:

- a) describe the area of each resource tenure either a post-mining land use or non-use management area, and
- b) for each post-mining land use state:
 - i. each rehabilitation milestone required to achieve a stable condition, and
 - ii. when each rehabilitation milestone is to be achieved, and
- c) for each non-use management area state:
 - i. each management milestone, and
 - ii. when each management milestone is to be achieved, and
- d) include maps showing the land mentioned in (a), (b) and (c).

Final Site Design

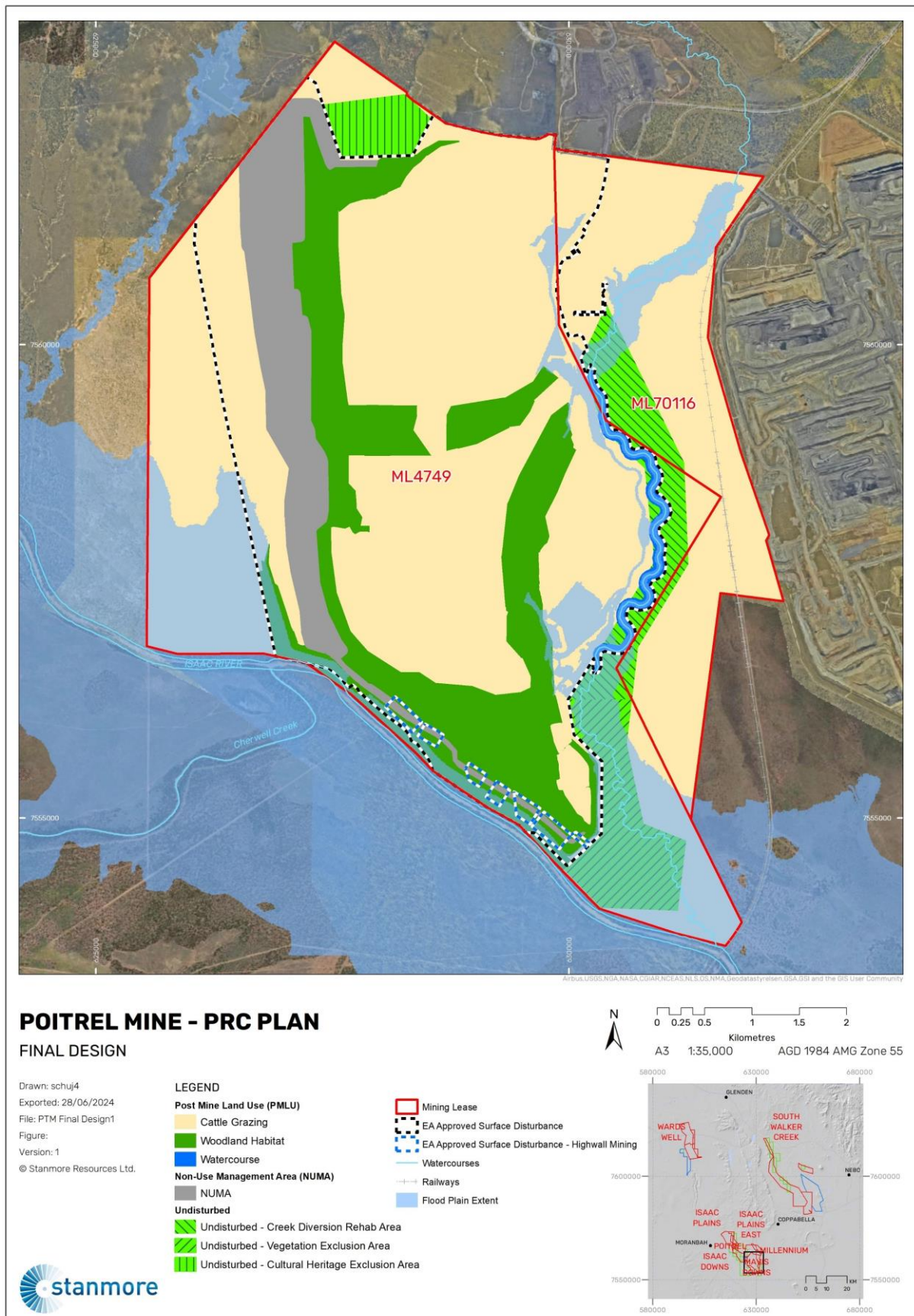


Figure 80 PTM Final Site Design

Reference Map

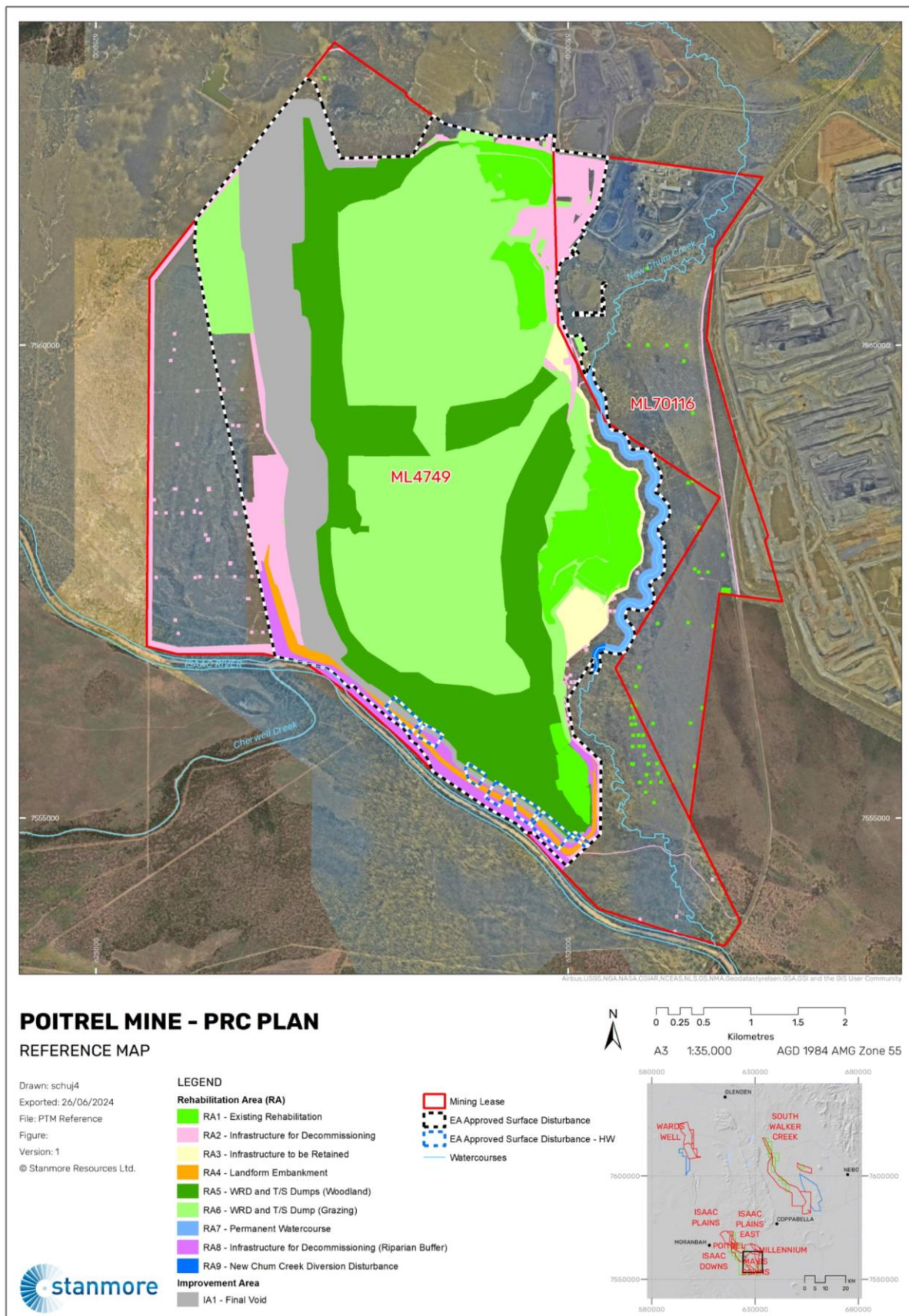


Figure 81 Reference Map

Schedule and Rehabilitation Milestones

Refer to attached PRC Plan Schedule

SECTION C – APPENDICES

Appendix 1	Poitrel Mine Environmental Authority (EPML00963013) (1 March 2024)
Appendix 2	Progressive Rehabilitation and Closure Plan Transition Notice and Extension Notice
Appendix 3	Hydrogeology Assessment (3 May 2024)
Appendix 4	Material Characterisation Study (8 June 2022)
Appendix 5	Voids in Floodplain Assessment (26 April 2022)
Appendix 6	Waste Characterisation (26 June 2024)
Appendix 7	Landform Design (28 June 2024)
Appendix 8	Void Closure Plan (1 July 2024)
Appendix 9	Cover Design (28 June 2024)
Appendix 10	Flooding Assessment (25 June 2024)
Appendix 11	Geotechnical Stability Assessment (June 2024)
Appendix 12	Revegetation Plan (28 June 2024)

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Stanmore Resources Limited

Void Closure Plan

Poitrel Mine

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September 2024

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Void Closure Plan Poitrel Mine

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Rev	Date	Details
A	24/05/2024	Draft for client review
B	24/06/2024	Draft for client review (high-wall geotechnical stability section updated)
B1	26/06/2024	Draft for client review (updates to flooding section)
0	28/06/2024	Final for submission
1	28/08/2024	Final for submission (update following not properly made notice)

	Name	Date	Signature
Prepared by:	Luke Johnston		
Reviewed/approved by:	Raina Hattingh		

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

This document may contain confidential and legally privileged information, neither of which are intended to be waived, and must be used only for its intended purpose.

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Abbreviations

AEP	Annual exceedance probability
AHD	Australian height datum
AWBM	Australian water balance model
CHM	Conceptual hydrogeological model
CHPP	Coal handling and processing plant
CO ₂	Carbon dioxide
CWS	Climate warming sensitivity
DBCT	Dalrymple Bay Coal Terminal
DES	Department of Environment and Science (now known as Department of Environment, Science and Innovation – [DESI])
EA	Environmental authority
EC	Electrical conductivity
ET	Evapotranspiration
FoS	Factor of safety
GCM	Global climate models
GDE	Groundwater dependent ecosystem
GW	Groundwater
ML	Mining lease
ML	Megalitre
NUMA	Non-use management area
PMF	Probable maximum flood
PMLU	Post mine land use
PRCP	Progressive rehabilitation and closure plan
PTM	Poitrel Mine
RCM	Rangal coal measures
RCP	Representative concentration pathway
RFC	Representative future climate
RMI	Red Mountain Infrastructure
ROM	Run of mine
TDS	Total dissolved solids
WBM	Water balance model
WBNM	Watershed bounded network model
WQO	Water quality objectives

1 Introduction

Stanmore SMC Pty Ltd, a subsidiary of Stanmore Resources Limited (Stanmore), owns and operates the Poitrel Mine (PTM), an open-cut coal mine in the central Queensland Bowen Basin. The mine is situated approximately 6535 kilometres (km) east of the township of Moranbah, Queensland. PTM operates under Environmental Authority (EA) EPML00963013 on mining lease (ML) 4749 and ML70116.

Holders of an EA are required to submit a progressive rehabilitation and closure plan (PRCP) that meets requirements under the *Environmental Protection Act 1994*. A transition notice was issued to BHP Mitsui Coal Pty Ltd (as the previous owners of PTM) by the then Department of Environment and Science (DES)¹, requiring that Stanmore (as the current owners of PTM) submits a transitional PRCP for PTM. [The date by which the transitional PRCP was required to be made was extended to 1 July 2024.](#)

This void closure plan presents the outcomes of technical studies completed to support closure planning and achievement of a safe, stable and non-polluting residual void at PTM – specifically the residual void associated with the mining pits of Ramp 10, 20, 30, 40 and 50. This void closure plan is an appendix to the PTM PRCP and is required by the DES *Progressive rehabilitation and closure plan guideline* (version 3.0), hereafter referred to as the ‘PRCP Guideline’, dated 4 April 2023.

The technical studies, including the water balance and hydrogeology modelling, have been undertaken through an iterative approach with the development of the mine closure landform design. These iterations have resulted in a mine closure landform that includes residual void partial backfill and catchment reduction. This void closure plan documents how these refinements contribute [to](#) minimising environmental harm, as it related to the post-closure residual void.

[It is also noted that Condition E7 of the EA requires the site to complete an investigation into residual voids, including at least the assessments provided in Table 1.1. Although the void closure plan does not constitute a record of compliance with Condition E7 of the EA, the supporting documented studies address the requirements of this condition. Management measures for the residual void are also identified to manage the closure of the voids in a way that does not cause environmental harm beyond the area of the relevant resource tenure \(as required in Condition E6\).](#)

Table 1.1 [Investigations required by Condition E7 of the EA and where they are addressed in the void closure plan](#)

Investigations required by EA Condition E7	Section(s) in this void closure plan where addressed	Comments
— E7(a): A study of options available for minimising final void area and volume.	Section 2.2 Post-mining residual void optimisation	The five operational mining pits have been consolidated into one final residual void that is being transitioned as a pre-approved NUMA.
— E7(b): A void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long-term.	Section 3 Void water balance Section 5 Groundwater Section 7 Geochemical stability	-

¹ Now referred to as the Department of Environment, Science and Innovation (DESI).

<u>Investigations required by EA Condition E7</u>	<u>Section(s) in this void closure plan where addressed</u>	<u>Comments</u>
— E7(c): A pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events.	Section 6 Geotechnical stability	—
— E7(d): A study of void capability to support native flora and fauna.	Not applicable.	The proposed residual void is being transitioned as a NUMA.
— E7(e): A proposal(s) for end of mine void rehabilitation success criteria and final void areas and volumes.	Section 2.2 Post-mining residual void optimisation (final void dimensions). Section 5 Void water balance (final void water volumes).	Milestone (success) criteria are included in the PRC Plan and PRCP Schedule.

1.1 Scope and objectives

The PTM proposed mine closure landform design includes seven mining pits consolidated into one final residual void – Ramp 10/20/30/40/50 (herein referred to as the PTM residual void). Post-closure, this residual void is pre-approved as a non-use management area (NUMA).

The objective of this void closure plan is to document the rehabilitation and management approach showing how Stanmore will achieve safe, stable, and non-polluting residual void at closure. This void closure plan will also aid in:

- Minimising risk of the residual void and surrounding areas within the NUMA extents.
- Minimising active management of the residual void post-closure.
- Avoiding unmitigated access to the NUMA by humans and livestock.

The following sections present information as required by sections 3.4 and 3.6.3 of the *PRCP Guideline*, specifically:

- Section 2.2: Post-mining residual void
- Section 3: Groundwater
- Section 4: Flooding assessment
- Section 5: Void water balance
- Section 6: Geotechnical stability
- Section 7: Geochemical stability
- Section 8: Residual void management

1.2 Applicable legislation and guidelines

The following applicable legislation and guidelines have informed the development of this void closure plan:

- *Environmental Protection Act 1994* (QLD).

- EA (EPML00963013) dated 1 March 2024.
- *PRCP Guideline* (version 3.0) dated 4 April 2023.

2 Site overview

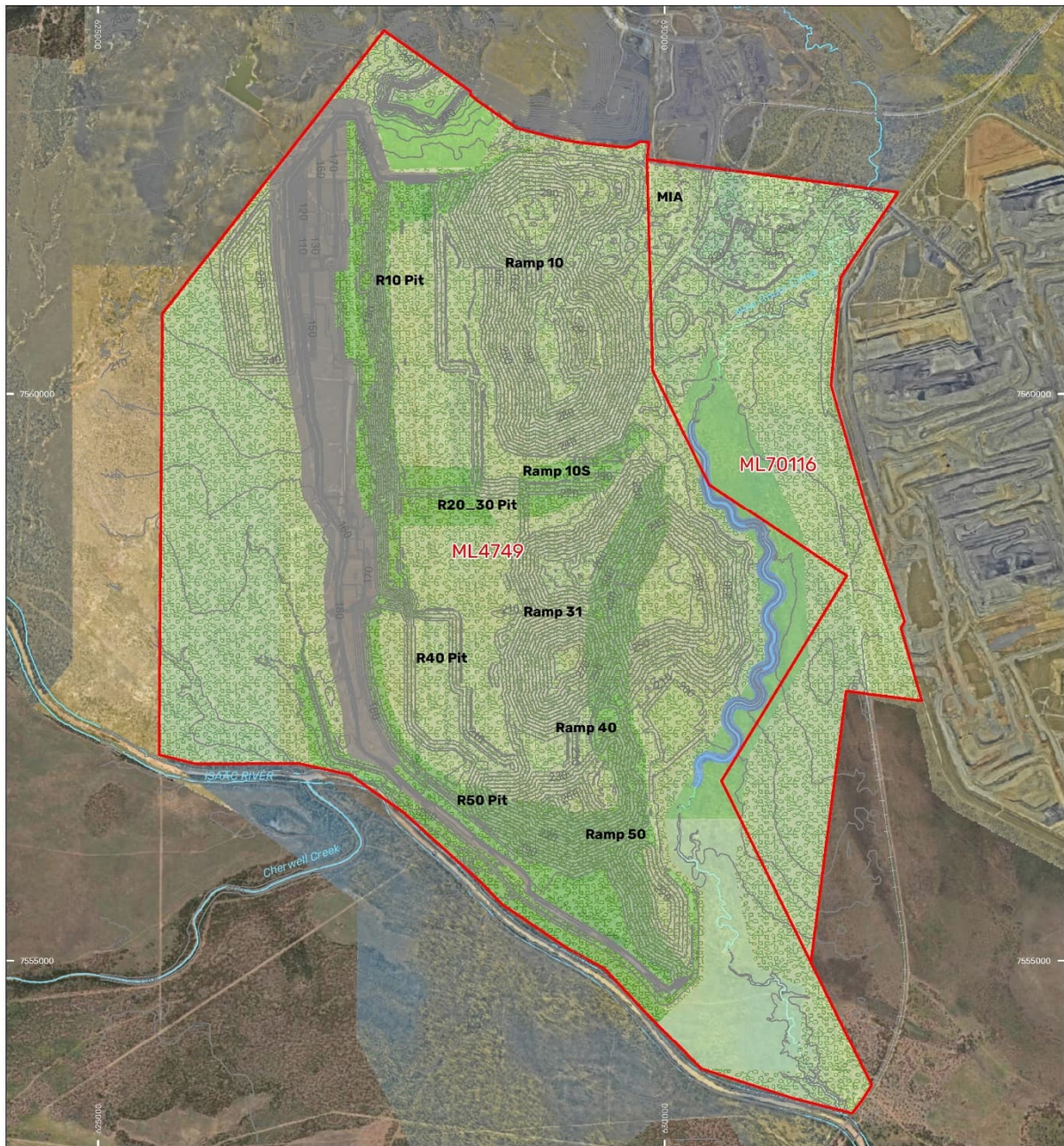
2.1 Mining operations

PTM is open-cut coal mine in the Bowen Basin, located approximately [2035](#) km ~~south~~-east of the township of Moranbah, Queensland.

PTM targets the coal seams of the Rangel Coal Measures (RCM) via removal and stockpiling of topsoil, drilling, and blasting of overburden/interburden and stripping of overburden/interburden via excavator and truck/shovel to expose the coal seams. The overburden/interburden is placed back into the previously mined voids.

Run-of-mine (RoM) coal is transported to the Red Mountain Infrastructure (RMI) Coal Handling and Preparation Plant (CHPP) located on the adjoining ML70312 (which is operated under a separate EA - EPML0081911). Product coal is transported by rail to the Dalrymple Bay Coal Terminal (DBCT) for export. Coarse and fine rejects from the RMI CHPP are disposed of within the mining spoil within previously mined voids.

Mining construction/operations commenced in 2006. There are five mining pits that make up the mining operation - Ramp 10, 20, 30, 40 and 50. The current locations of these pits, overlain on the conceptual mine closure landform are depicted in Figure 2.1.



Airbus, USGS, NASA, CGIAR, NCEAS, NLS, OS, NMA, Geodatasysteisen, ISA, BSI and the GIS User Community

POITREL MINE - PRC PLAN

FINAL LANDFORM

Drawn: schuj4
Exported: 28/06/2024
File: PTM Final Landform
Figure:
Version: 1
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LEGEND

— PRCP Final Landform

Post Mine Land Use (PMLU)

■ Cattle Grazing

■ Woodland Habitat

■ Watercourse

Non-Use Management Area (NUMA)

■ NUMA

Undisturbed

■ Undisturbed - Vegetation Exclusion

■ Undisturbed - Cultural Heritage Exclusion Area

■ Undisturbed - Creek Diversion Rehab Area

■ Mining Lease
— Watercourses



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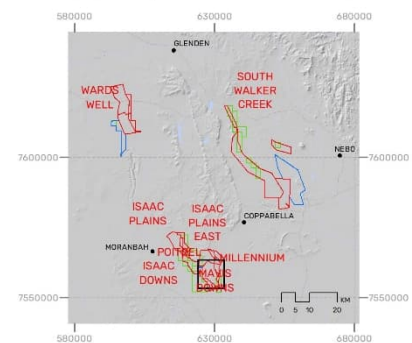


Figure 2.1

Location of current PTM pits in the mine closure landform (Stanmore, 2024)

2.2 Post-mining residual void optimisation

2.2.1 Context

Based on the final mine closure state topography, the five mining pits at PTM have been consolidated as part of PTM's mine closure landform into one residual void - Ramp 10/20/30/40/50 residual void. Consolidation into a single residual void was determined through ~~the early stages of the water balance model (Section 5)~~ an iterative process that considered:

- Current and comprehensive mine scheduling to optimise the life-of-mine and minimise the extent of the final void as a NUMA.
- Surface water catchment areas of the residual void and the resultant establishment of void lakes (Section 5).
- Groundwater modelling including the post-closure recovery of groundwater levels and void lake interaction with groundwater (Section 3).
- Geotechnical stability and any required set-back distances to achieve a physically safe landform (Section 6).
- The financial and environmental implications of achieving the final mine closure landform including resultant delays to timing of when areas may become available for rehabilitation (this section).

2.2.2 Base case

Based on the current mine plan, the closure year for the PTM residual void is 2036.

The presence of a residual void at PTM is authorised under Schedule E (Condition E6 and E7) of the EA. ~~The residual void proposed at PTM and~~ is being transitioned as a pre-approved NUMA in the PTM PRCP.

~~The~~ To optimise resource extraction planning, a base case life-of-mine plan was developed that represented the maximum efficiencies with respect to removal, loading and hauling of overburden material to an optimal location to gain access to the coal resource (Figure 2.2). This base case mine plan also considered the geological models (for overburden quantification) and current coal quality, both of which are subject to ongoing update as further drilling and coal sampling is undertaken.

The base case offered the preferred outcome for Stanmore as it:

- Minimises waste material re-handling and bulk push requirement following removal of the final coal. This subsequently reduces potential environmental impacts (such as additional carbon dioxide (CO₂) emissions) and accelerating areas available for rehabilitation.
- Is expected to result in similar environmental outcomes as the PRCP-proposed residual void option.
- Offers the highest Net Present Value (NPV).

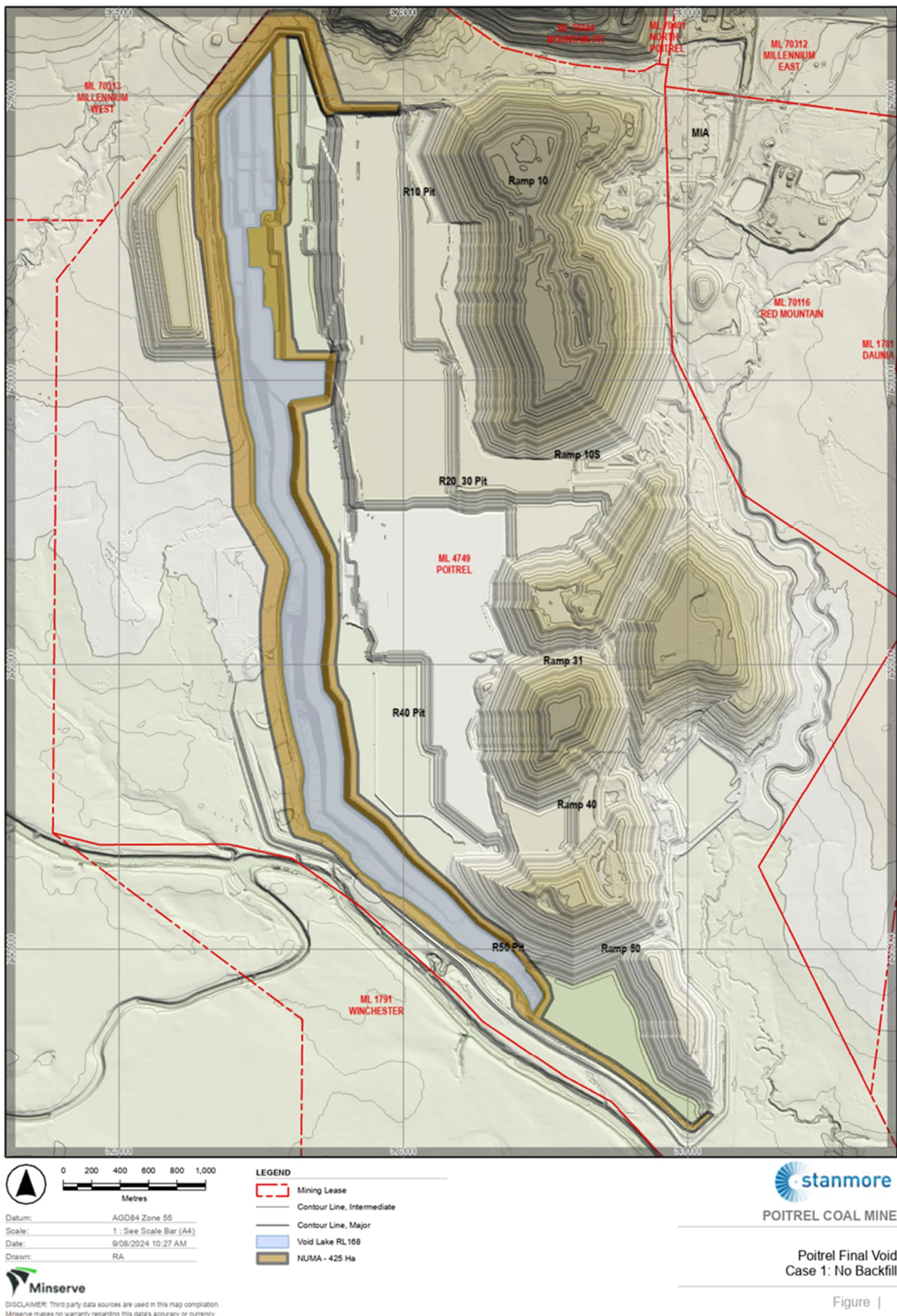


Figure 2.2 Base case life-of-mine plan void option for Poitrel mine (Minserv, 2024a)

2.2.3 Extent optimisation

Refinements to the base case were then considered necessary due primarily to the proximity of the proposed NUMA to the Isaac River in the south. An option to backfill the southern portion of the void (the R40 and R50 pits) was investigated, including a design where the southern voids adjacent to the Isaac River were backfilled to create a free-draining landform suitable for a PMLU (Figure 2.3). However, the following constraints were identified:

- Due to the topography and altered landscape from mining activities, this landform continued to drain to the remaining residual void. The resultant reduction in void volume and retention of catchment area from this landform option indicated, through the WBM, that the void lake levels would establish at a level where there could be interaction between void lakes and groundwater with the potential for environmental harm.
- The southern void section backfill option also resulted in a shortfall of material in the north of the mine with a final (extended) residual void area of 399 hectares (ha). To further reduce the void size for this option, re-handling of large amounts of waste material would be required. This material would need to be sourced from previously deposited material in existing dumps and most likely from material deposited earlier in the mine life, resulting in several hundred hectares of spoil not being available to be progressively rehabilitated until completion of the mine life. The availability of this area for rehabilitation could conceivably be a considerable amount of time after it would typically have become available for rehabilitation if not utilised for backfilling a pit at end-of-mine life. Due to increased haul distances required, this landform design would extend the mine life outside of currently feasible planning boundaries.
- The landform design could potentially sterilise available coal reserves.

Based on the above constraints, this option was not deemed viable for Stanmore's future mine planning or long-term management of environmental harm.

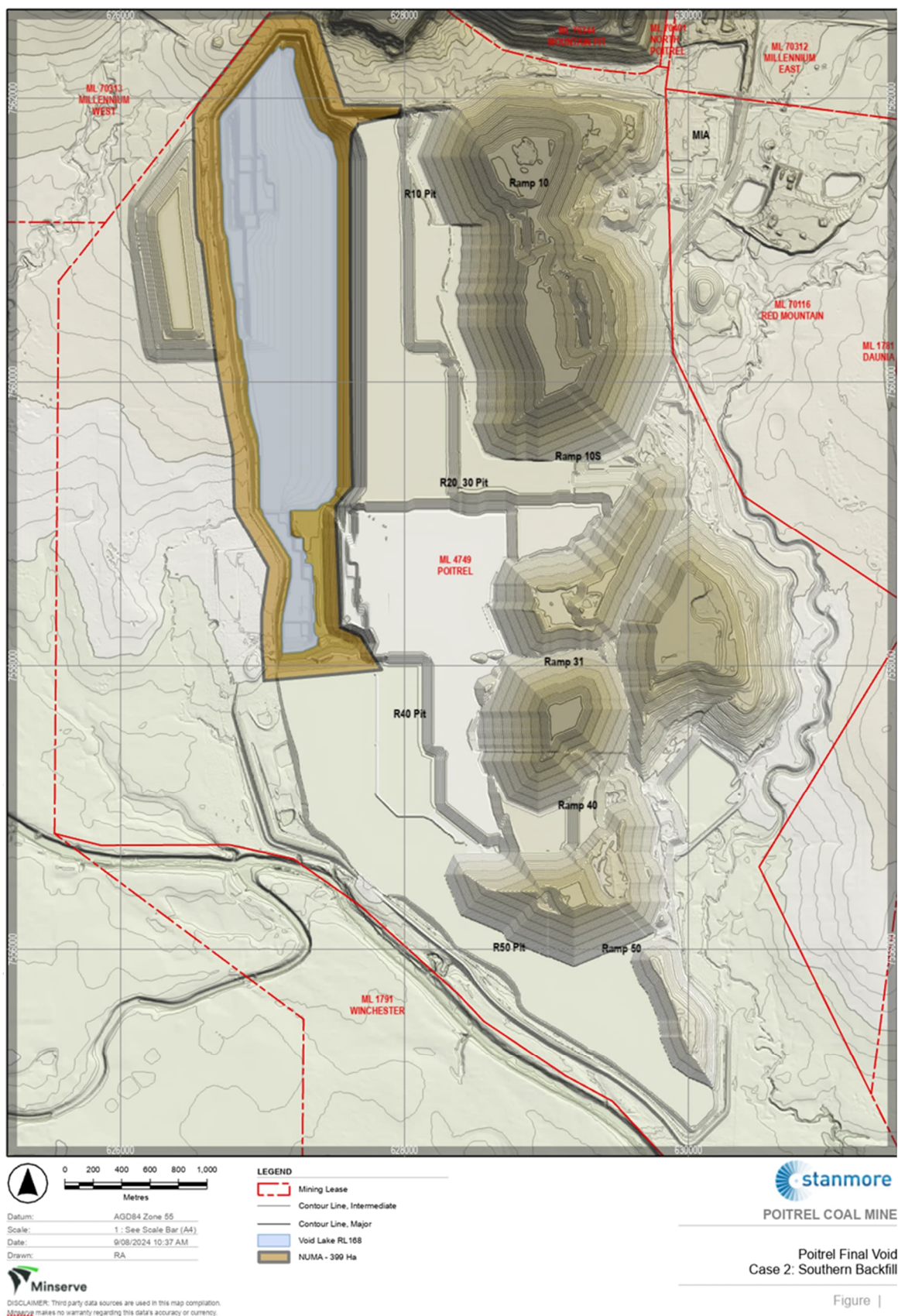


Figure 2.3 Southern void section backfill option for Poitrel mine (Minserve, 2024b)

2.2.4 Optimised residual void design

A summary of the various residual void options assessed and their resultant NUMA areas are presented in Table 2.1.

Table 2.1 Summary of residual void minimisation options for Poitrel mine and resultant NUMA areas

<u>Residual void options considered</u>	<u>Resultant NUMA area (ha)</u>
<u>Base case</u>	<u>425</u>
<u>Southern backfill</u>	<u>399</u>
<u>Partial backfill</u>	<u>316</u>

Based on the above, the planned closure landform for the mine pits includes provision for partial backfilling with spoil. Partial backfilling, spoil placement and drainage design will minimise the extent of the residual void, reduce the catchment area and assist with flood protection such that the potential for inundation of the residual void from floodwaters is greatly reduced (refer to Section 4). The level of backfill within the southern void section was informed by the groundwater assessment (Section 3) and water balance modelling (Section 5), aimed at designing a closure landform that:

- Reduces the likelihood for groundwater interaction with backfilled material in the void; and/or
- Avoids formation of a lake on top of the area where rejects are stored, thereby generating a hydraulic head and creating a likely source of contamination to the groundwater.

The residual void that was designed in the mine closure landform, and that has been included as the proposed option within the PRCP and the studies within this void closure plan has been developed through the above iterations, supported by the technical studies within this void closure plan, and achieves the following:

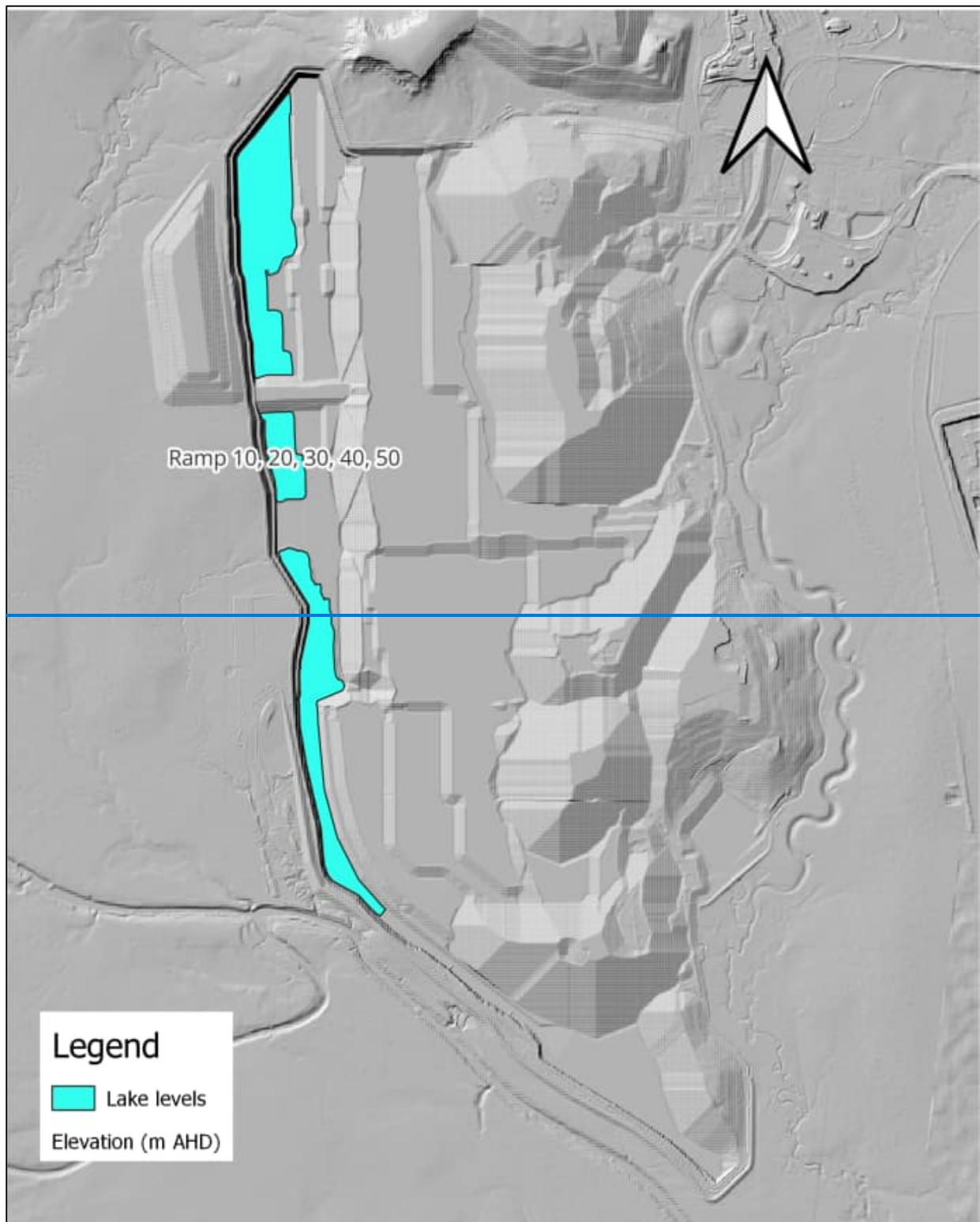
- Backfilling of the southern void section to a level (including capping considerations of reject material) where groundwater interactions are not expected to occur.
- Maximising the area allocated as a PMLU (adjacent to the NUMA extents) while factoring in slope safety and achievement of milestone criteria of the PMLU adjacent to the high-, end- and low-walls.
- Minimising the height and length of the remnant high-wall adjacent to the Isaac River.
- Establishing a residual void that behaves as a groundwater sink in the closure landform.

Due to the long-term closure timeframes, exploration drilling, coal quality and future coal prices will influence the dimensions and final locations of the pits and hence the final mine closure landform. Refinements to geotechnical stability assessments as the mine draws nearer to closure may also result in a reduction in NUMA areas, through refinement of safe set-back distances.

Indicative dimensions for the proposed residual void are presented in Table 2.2. A three-dimensional (3D) void design plan for the residual void, including equilibrium mean void lake level, is presented in Figure 2.4.

Table 2.2 Indicative maximum dimensions of the residual void at PTM

Residual void	Indicative maximum width (m)	Indicative maximum length (m)	Indicative maximum depth (m)
Ramp 10/20/30/40/50	795	12,000	145



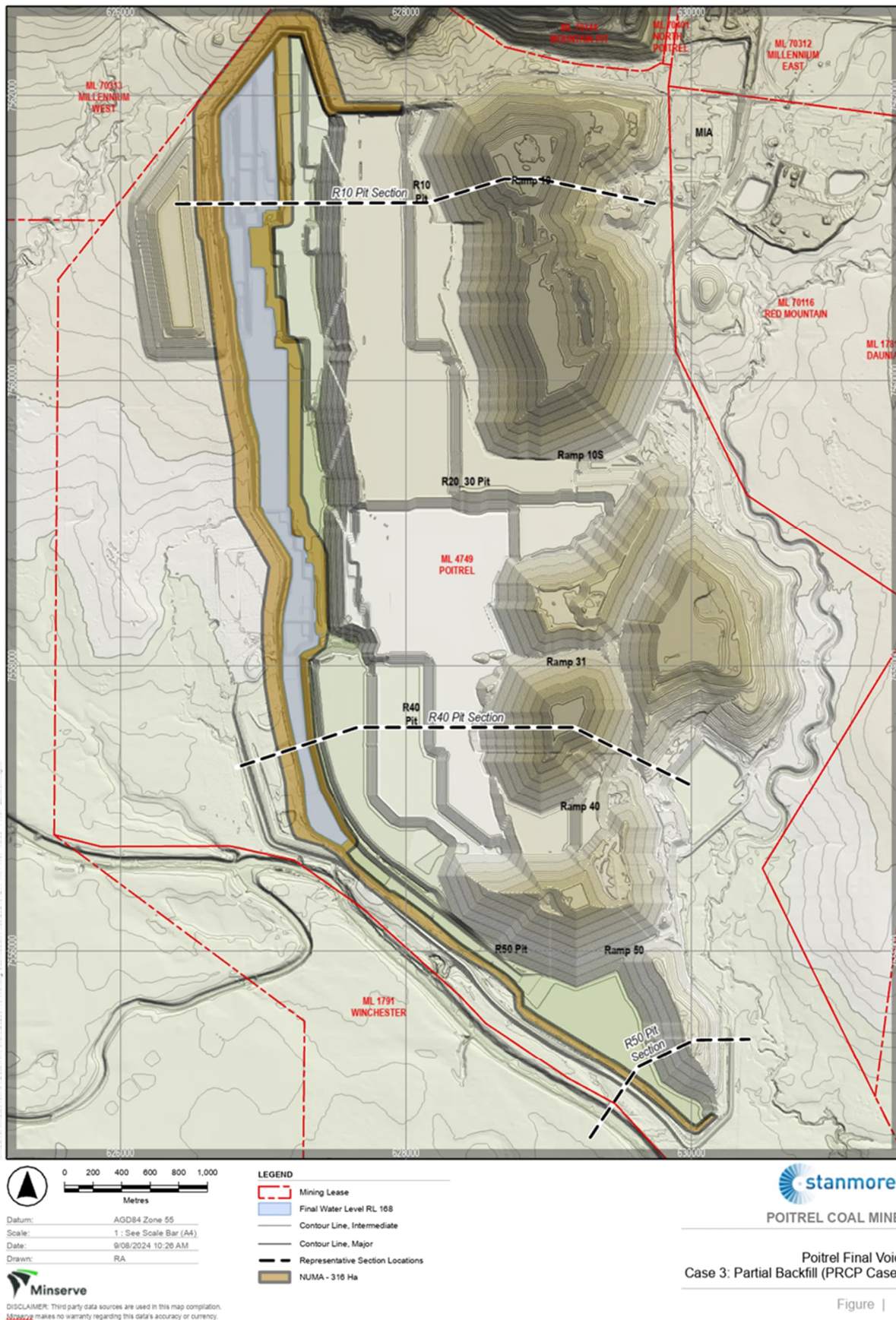


Figure 2.4 3D depiction of PTM residual void and indicative post-mining mean lake levels (Minserve, 2024)

3 Groundwater

A hydrogeological assessment was completed that included conceptual and numerical modelling to understand groundwater interactions with, and the potential for contaminant transport from the PTM residual void (SLR, 2024).

The complete hydrogeological assessment report - including details of the model set-up, calibration, and results is provided as an attachment to the PRCP. This section summarises the relevant context from the hydrogeological report relevant to required rehabilitation and management approaches to achieve safe, stable, and non-polluting residual void at closure.

A post-closure conceptual hydrogeological model (CHM) was developed depicting the groundwater interactions with the mine closure landform including the residual void. A visual representation is presented in Figure 3.1. The CHM key findings, relevant to post-mining groundwater impacts from the closure state landform, are as follows (SLR, 2024):

- Formation of a residual void lake was predicted, with lake water levels stabilising below both pre-mining groundwater elevations and shallow post-Permian strata including the base of surficial weathering and shallow hydrostratigraphic units (i.e., alluvium, Tertiary units and weathered regolith).
- Inward hydraulic flow gradients towards the residual void will be maintained within the RCM upon stabilisation of groundwater and residual void lake levels. This is driven by evaporative losses from the void lake, with no outflows of water to the surrounding hydrostratigraphic units predicted to occur.
- Infiltration of rainfall through in-pit spoil emplacements will continue to be captured in the residual void or remain within the spoil.
- There will be little to no impact on surficial aquifers, including alluvial aquifers beyond what has already been predicted at the time when mining is anticipated to end.
- There will be little to no impact on environmental or anthropogenic receptors.

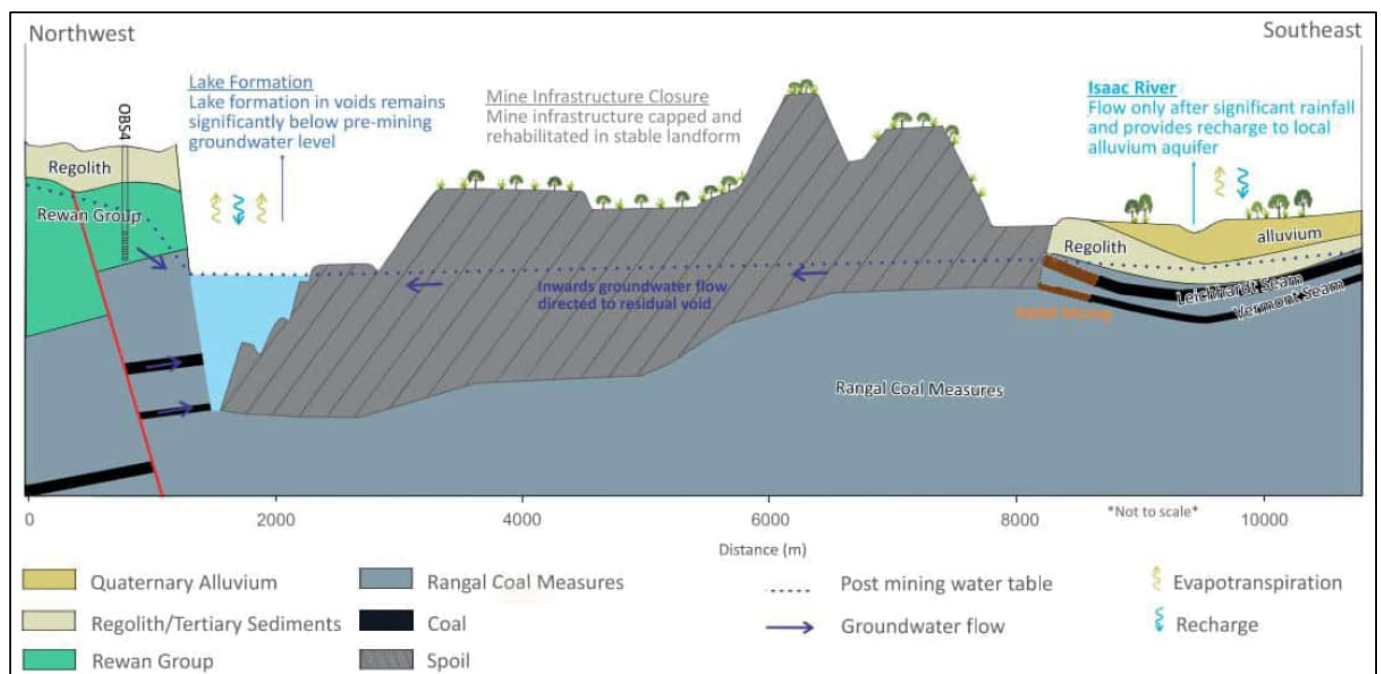


Figure 3.1 Post-closure conceptual hydrogeological model for PTM (SLR, 2024)

Calibrated numerical groundwater modelling and flow path simulation was undertaken to evaluate the potential groundwater-related impacts of the mine closure landform, including the residual void. The objectives of this modelling and simulation were as follows:

- Simulate the water level and rate of recovery of the residual void lake, and the water level and rate of recovery from mining-related groundwater drawdown in the groundwater system surrounding the void.
- Assess groundwater inflow to the final residual void.
- Identify areas of potential environmental or anthropogenic risk, such as impacts to private water supply bores or groundwater dependent ecosystems (GDEs), where groundwater impact mitigation/control measures may be necessary post-closure.
- Assess the potential for migration/flow pathways for contaminants and residual void water through particle tracking.

The proposed mine closure landform was replicated in the model, including the PTM residual void and spoil emplacements that will form part of the landform. The predicted end-of-mining groundwater head levels were applied as the starting head levels for the post-closure simulation. The model simulation period commenced at the end-of-mining and ran for 2309 years, with a total of 82 stress periods.

Climate-related boundary conditions for recharge and evapotranspiration (ET) were set constant for the duration of the model simulation period. Recharge and ET were not applied in the numerical groundwater model to the residual void itself as the water balance model (as described in Section 5) accounts for these boundary conditions.

There are periods of variability in inflows and outflows of groundwater predicted by the groundwater model for the PTM residual void over approximately the first 50 years post-mining. During this initial 50-year period, groundwater levels in the spoil and natural geological formations are recovering from mine dewatering activities and remain below the residual void lake level, as predicted by the WBM (see Section 5). Over this time, modelled groundwater fluxes to the residual void are largely controlled by the difference between the modelled residual void lake level and predicted groundwater levels in the spoil. The void lake levels rise and fall periodically according to the climatic simulation applied to the WBM, as well as how the daily timestep water balance results are translated to the comparatively simplified stress periods set up in the groundwater model.

Model results indicate that over this initial period, outflows derived from rainfall captured in the residual void flows to the in-pit spoil surrounding the residual void lake. This occurs as the groundwater levels in the surrounding in-pit spoil landform (and natural geological formations) slowly recover from mining activities. All predicted outflows from the residual void over this time occur to the spoil with no predicted outflow from the void to the natural geological formations or outside of the mine closure landform. By the end of the post-closure simulation, groundwater inflows and outflows to/from the residual void reach equilibrium (i.e. have stabilised to a constant value), with net inflows to the void occurring throughout the simulation period (Figure 3.2).

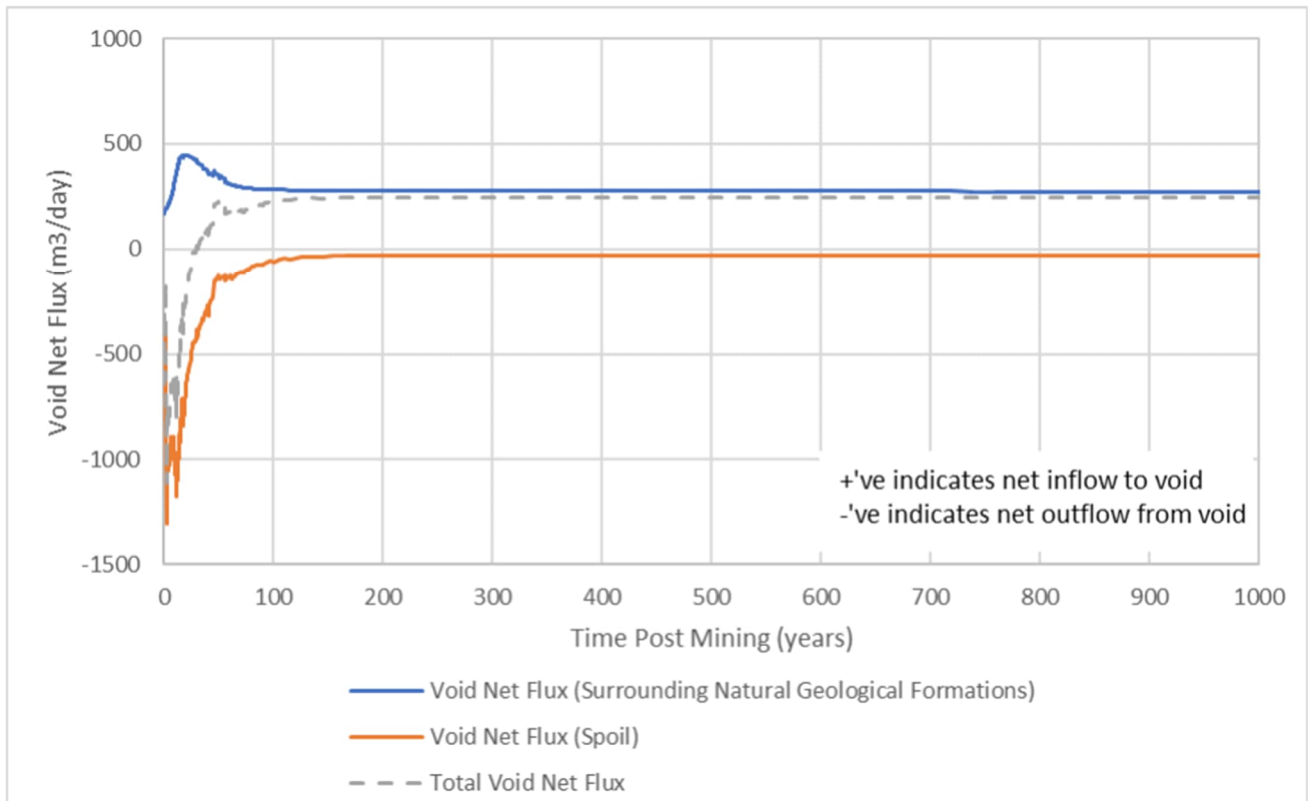


Figure 3.2 Predicted groundwater inflows to the PTM residual void (SLR, 2024)

Post-closure the water table is predicted to remain suppressed in the immediate vicinity of the residual void in the long term, except for the alluvium and regolith that are predicted to remain mostly dry (consistent with mining conditions), (Figure 3.3). Long-term groundwater flow gradients towards the residual void are maintained post-mining driven by the ongoing inflow of groundwater to the residual void lake and governed by the lake elevation itself. The groundwater hydraulic gradient towards the void is steep from the natural geological formations and relatively flat from the spoil towards the void. This is in part due to a larger residual head difference (<10 m) between groundwater in the natural geological formations and the residual void lake compared to the head difference between the spoil area and the residual void lake (<5 m). Hydraulic conductivities of the natural geology compared to the spoil are also lower, contributing to the steeper hydraulic gradient in the natural geological formations.

Figure 3.3 Predicted water table elevation at PTM – post-mining equilibrium (SLR, 2024)

Groundwater levels in the RCM are predicted to mostly remain below pre-mining conditions in the long-term; however, the post mining drawdown is not expected to be greater than that predicted during the operational mining period. Predictive hydrographs for the RCM seams in areas adjacent to the residual void show the change in groundwater levels over time (Figure 3.4 and Figure 3.5).

The hydrographs demonstrate that the vast majority of groundwater level drawdown in the RCM occurs as a result of operational mining activities with recovery of groundwater levels in the deeper coal seams (Vermont and Leichardt) adjacent to the PTM residual void occurring post-closure.

The predicted residual void lake level remains below the predicted groundwater levels for the duration of the modelled period indicating a low potential for outwards movement of void water to the RCM seams. The hydrographs also demonstrate very little effect on groundwater levels from the groundwater flow flux variability to the residual void in the initial 50-year period post-closure as discussed above.

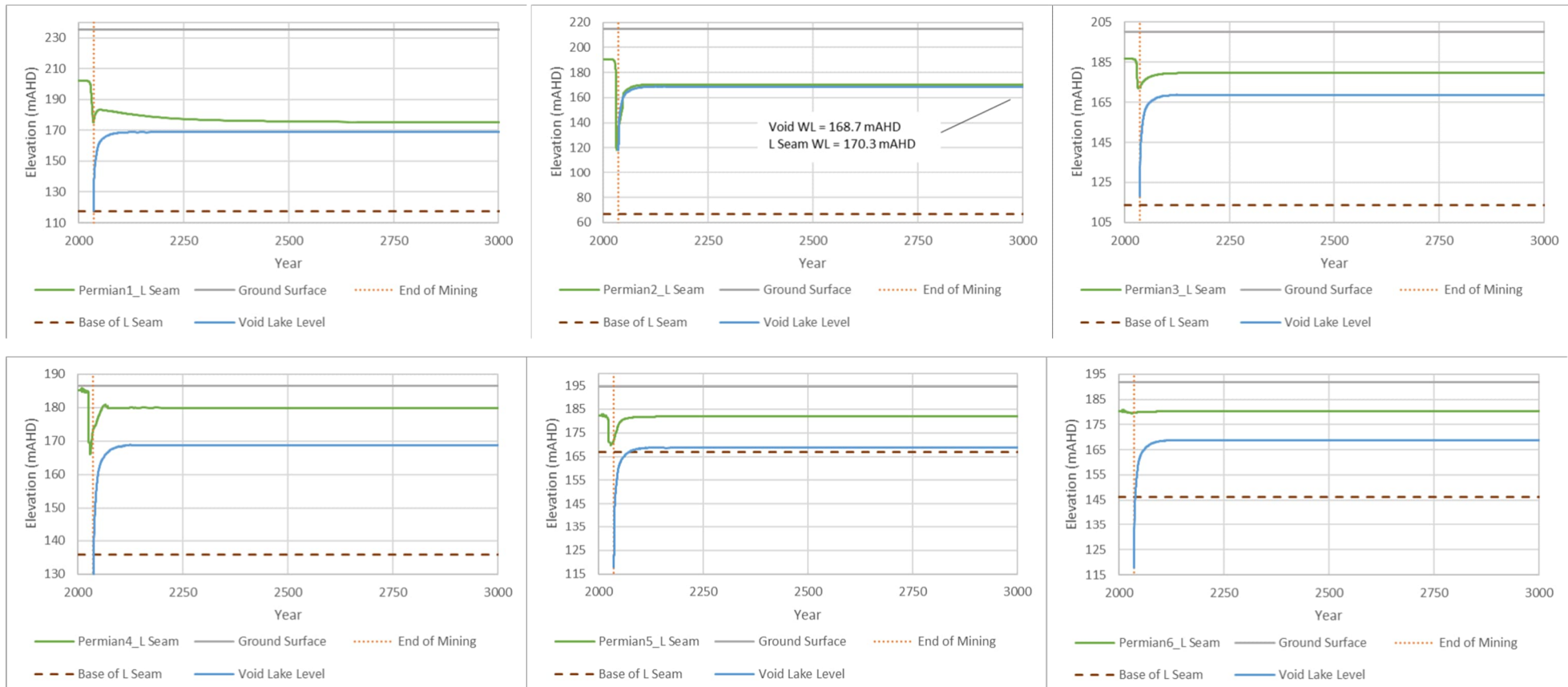


Figure 3.4 Predictive hydrographs for RCM Leichardt seam adjacent to the PTM residual void (SLR, 2024)

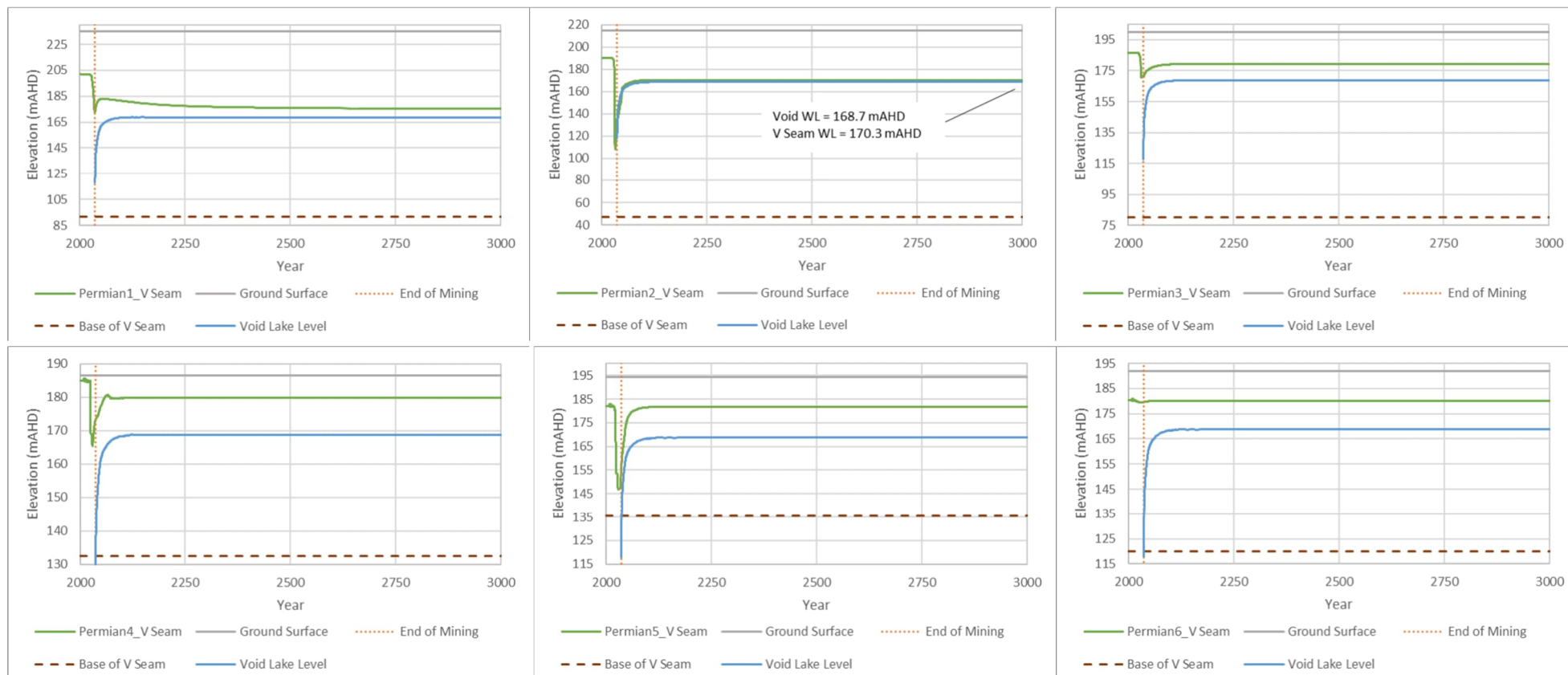


Figure 3.5 Predictive hydrographs for RCM Vermont seam adjacent to the PTM residual void (SLR, 2024)

Using the numerical groundwater model and the 'mod-PATH3DU' code, an analysis of the water movement within the mine closure landform was completed to simulate and assess the movement and fate of water particles through the groundwater system post-mining (SLR, 2024).

The particle movement simulation for particles placed within the residual void (Figure 3.6) indicated that groundwater at PTM will remain within the mine closure landform (i.e., rehabilitated in-pit spoil and residual void) in the long-term (SLR, 2024). This includes the modelled fluxes of water from the residual void to the in-pit spoil of the mine closure landform, with these particles returning to the residual void. The simulation also predicted that the void remains as a groundwater sink and the particles would not flow from the residual void off-site to the receiving environment. The particles placed outside of the residual void at the potential contaminant source, the MIA, are all captured within the residual void or remain within the mine closure landform for the duration of the post-mining simulation.

It is noted that the particle path lines generally follow predicted head gradients; however, at times they appear to be contrary to the head contours shown in the figure. The particle path lines are simulated from the start of the recovery simulation, yet the contours shown in the figure represent the head levels at the end of the recovery simulation period when groundwater levels have reached equilibrium. Hence, the figure shows the particles path during the transient head changes that are occurring throughout the recovery simulation period as void lake levels stabilise and the groundwater system partially recovers post-mining.

Figure 3.6 Predicted movement of particles from particle tracking simulation at PTM (SLR, 2024)

Although fluxes of rainfall-derived water captured in the residual void to the in-pit spoil is predicted to occur, no environmental harm is expected to result beyond that of the void itself from these minor outflows. This is due to the outflows to the in-pit spoil areas remaining within the spoil once groundwater levels and lake levels stabilise and net inward hydraulic gradients are predicted to prevail in the long-term.

This absence of environmental harm is supported by the groundwater modelling, particle tracking simulation, and the absence of third-party bores and GDEs within the spoil areas of the residual void. The water quality model (Section 7) also indicates that the water quality within the void is unlikely to establish acidic conditions, and the electrical conductivity (as Total Dissolved Solids (TDS)) for the residual void lake is not elevated above the EA trigger limit in approximately the first 150 years of the water quality model simulations. As such, any potential outflows to the in-pit spoil areas are considered to pose minimal risk to the environment if they were to eventuate as predicted. The predicted fluxes of residual void water to the in-pit spoil are also not expected to result in the milestone criteria of the spoil area post-mining land use (PMLU) not being achieved due to the expected depth from the spoil surface to the recovered groundwater level within the spoil.

Predictive hydrographs were derived from the groundwater model at the potential GDE sites identified within and adjacent to the PTM mining leases (Figure 3.7). The hydrographs (Figure 3.8) indicate that most water table drawdown in the vicinity of the potential GDEs is predicted to occur prior to the end of mining (i.e., associated with approved PTM mining operations). Any additional drawdown occurring over the post-mining period is predicted to be a result of continuing operational drawdown trends (i.e., a time lag from active mining), rather than new impacts caused by the mine closure landform design.

Figure 3.7 PTM predictive hydrograph locations of potential receptors (SLR, 2024)

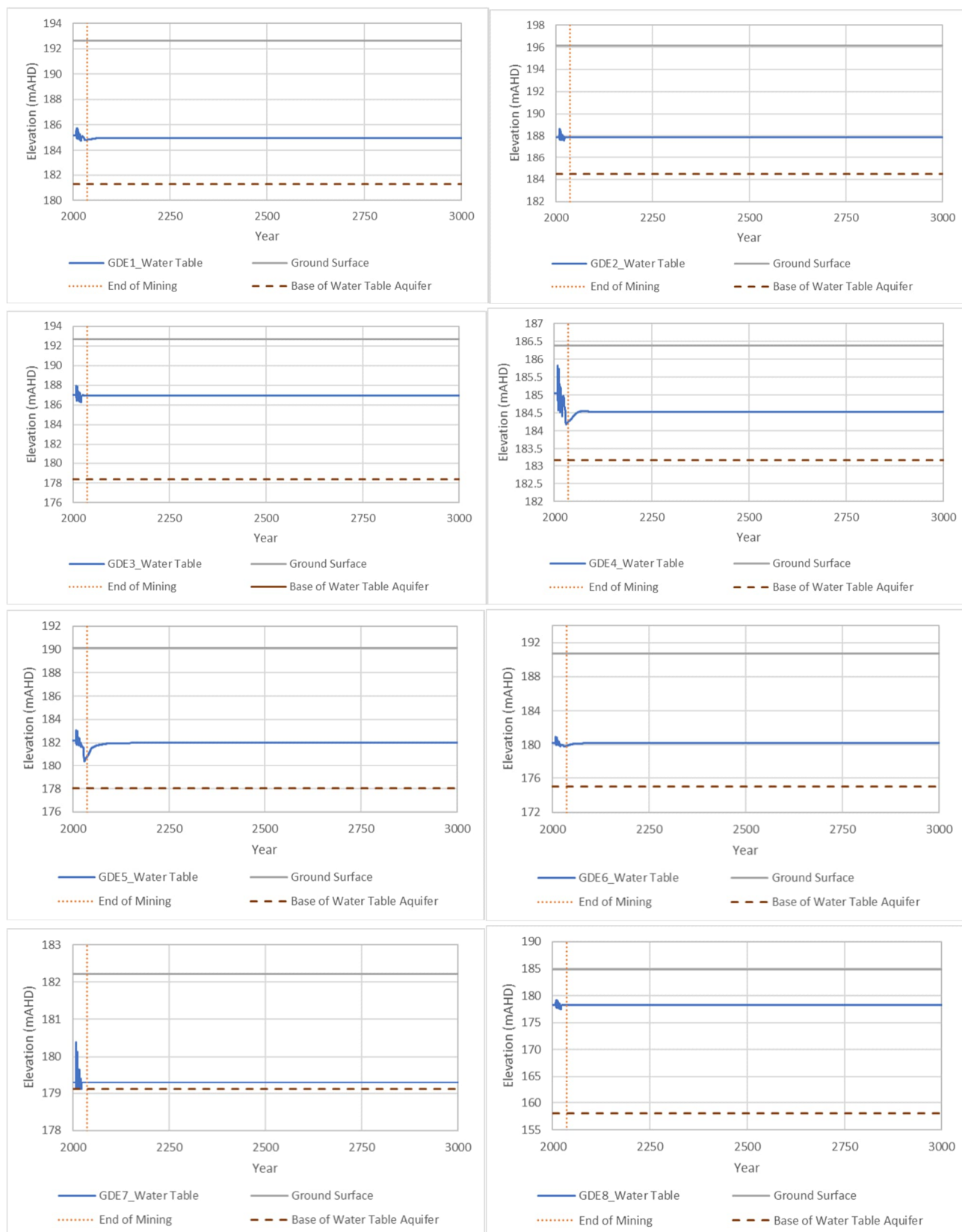


Figure 3.8 Predictive hydrographs for the potential GDE locations (SLR, 2024)

Predictive hydrographs were derived from the groundwater model for the four identified third-party water supply bores with sufficient information to attribute a source aquifer (Figure 3.7). The hydrographs (Figure 3.9) for all bores except 'Bore 9' show recovery of groundwater levels predicted in the post-mining period, i.e. there are no drawdown impacts attributable to the PTM mine closure landform. For 'Bore 9' there is predicted minor post-mining drawdown that is most likely related to continuing operational drawdown trends (i.e., a time lag following active mining ceasing) or regional-scale influences represented in the model (such as other third-party mining activities).

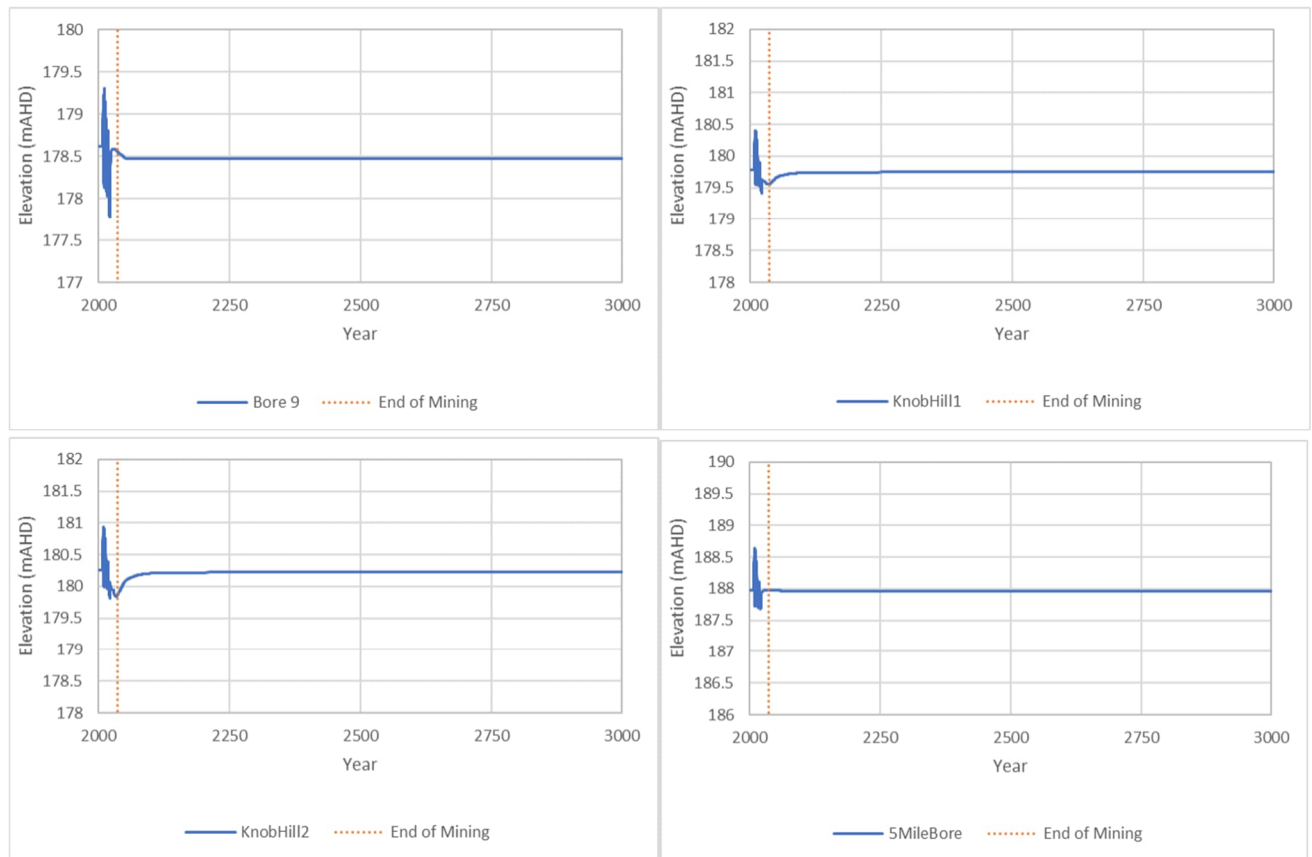


Figure 3.9 Predictive hydrographs for the potential GDE locations (SLR, 2024)

4 Flooding assessment

Flooding assessments were completed [(Engeny, 2024) (SLR, 2022)] to model the drainage and flooding behaviour of surface water in the vicinity of the PTM residual void (Ramp 10/20/30/40/50). This section presents the assessment findings, as relevant to void closure at PTM.

The complete flooding assessment reports - including details of the model set-up and results are provided as an attachment to the PRCP. This section summarises the relevant context from the flooding assessment reports relevant to required rehabilitation and management approaches to achieve safe and stable residual void at closure.

4.1 Voids in floodplains

In accordance with the DES PRCP Guideline transitional provisions, an assessment of voids in flood plains for the voids associated with the pre-approved NUMA of PTM was undertaken (SLR, 2022).

The floodplain assessment of the pre-mining landform identified that the pits would be located within the floodplains of the Isaac River (SLR, 2022).

For the mine closure landform, the extents of the residual voids modelled within the floodplain assessment will be reduced and refined through spoil placement, drainage design and placement of landforms/embankments to reduce the extent of void and flooding interactions.

4.2 Mine closure landform flooding

For the mine closure landform, rehabilitation flood modelling was undertaken on design storm events for a range of Annual Exceedance Probabilities (AEPs) including 1%, 0.1%, and Probable Maximum Flood (PMF) in accordance with the DES PRCP Guideline. This modelling and assessment predict the flood event inundation extent, depths and velocities for post-mining conditions.

Hydrographs generated from the hydrological model developed using Watershed Bounded Network Model (WBNM) were used to inform hydraulic modelling undertaken using TUFLOW software (Engeny, 2024).

The hydraulic modelling undertaken predicted the 1.0%, 0.1%, AEP and PMF event inundation extent, velocity, and depth of floodwaters within the mine closure landform (Engeny, 2024). The modelling has been interpreted to assess the flooding risk profile of the proposed mine closure landform.

Floodwaters from the Isaac River (to the west) as well as the approved New Chum creek diversion (to the east) are not modelled to interact with the current proposed mine closure landform associated with the residual void during a 0.1% AEP event. The flood assessment predicts that ingress of floodwaters is to occur into the southern end of the PTM residual void from the Isaac River (adjacent to the Ramp 40/50 pit) only during a PMF event (Figure 4.3) (Engeny, 2024). Floodwater ingress will require consideration during final design of exclusion bunding/embankments around the residual void high-walls in this location.

Flood velocities from the Isaac River floodwaters during PMF events that interact with the mine closure landform may contribute to scouring and/or erosion of the landform (Figure 4.4) (Engeny, 2024). Appropriate protection at locations where floodwaters of high velocities may interact with the mine closure landform will be considered and incorporated into the mine closure landform as the PTM residual void approaches closure.

Figure 4.1 Modelled peak flood depths for streams at PTM (0.1% AEP) (Engeny, 2024)

Figure 4.2 Modelled peak flood velocities for streams at PTM (0.1% AEP) (Engeny, 2024)

Figure 4.3 Modelled peak flood depths for streams at PTM (PMF) (Engeny, 2024)

Figure 4.4 Modelled peak flood velocities for streams at PTM (PMF) (Engeny, 2024)

5 Void water balance

A water balance model (WBM) was completed by WSP to understand the possible hydrological closure risks associated with the PTM residual void. In accordance with the PRCP Guideline the WBM aimed to assess the following:

- Long-term water balance, formation of lakes, and predicted water levels in the residual void.
- Potential for residual void lakes to interact with regional groundwater aquifers (creating sources or through-flow systems).
- Potential for overflow from the residual void and subsequent release to surface water catchments.

The WBM also sought to inform separate assessments relating to geotechnical and geochemical stability of the residual void (findings from these separate assessments are presented in Sections 6 and 7, respectively).

5.1.1 Water balance model

The WBM was developed to estimate water volume fluctuation in the PTM residual void over time in response to changes in water inflows and outflows. Based on a conceptual understanding of the long-term hydrological behaviour of the residual void, possible water inflows were considered to include direct rainfall, surface water runoff and groundwater inflow (as either inflow or throughflow). Water outflows from the residual void included evaporation and outflows to groundwater.

The GoldSim software package was used to develop the WBM. The following conditions were included in the model set up:

- a daily time-step
- a model duration of 164 years (from 2036 to 2199)
- mine closure landforms achieved by end of 2035
- cessation of all mining operational processes (i.e., dewatering and pumping/transfers of water).

To estimate volumetric fluctuations in water in the residual void, the WBM adds all identified inflows and calculates the possible outflows for each time-step over the duration over the modelled period.

5.1.2 Catchment areas

Catchment areas were delineated for the PTM residual void (Figure 5.1) by generating elevation contours from the conceptual mine closure landform and calculating the drainage networks of each area. The selection of a single residual void was determined through the early stages of catchment delineation of the PTM mine closure landform. The smaller sections of the PTM residual void would spill to the other sections, hence forming one residual void at equilibrium.

Catchments for the residual void were subdivided into land use zones by analysing a slope map generated in the QGIS software package. The designated land use zones were as follows:

- ‘Natural’ zone: areas that will remain undisturbed throughout the mine life (based on the projected mine closure landform and the current topography of the area).
- ‘Void’ zone: the area of the residual void itself at the spill level (197 m AHD).
- ‘Rehabilitated’ zone: remaining catchment area for each residual void.

The resultant catchment areas are provided in Table 5.1.

Overtopping risk for the residual void was also assessed based on the generated elevation contours. The spill level of the PTM residual void is estimated as 197 m AHD.

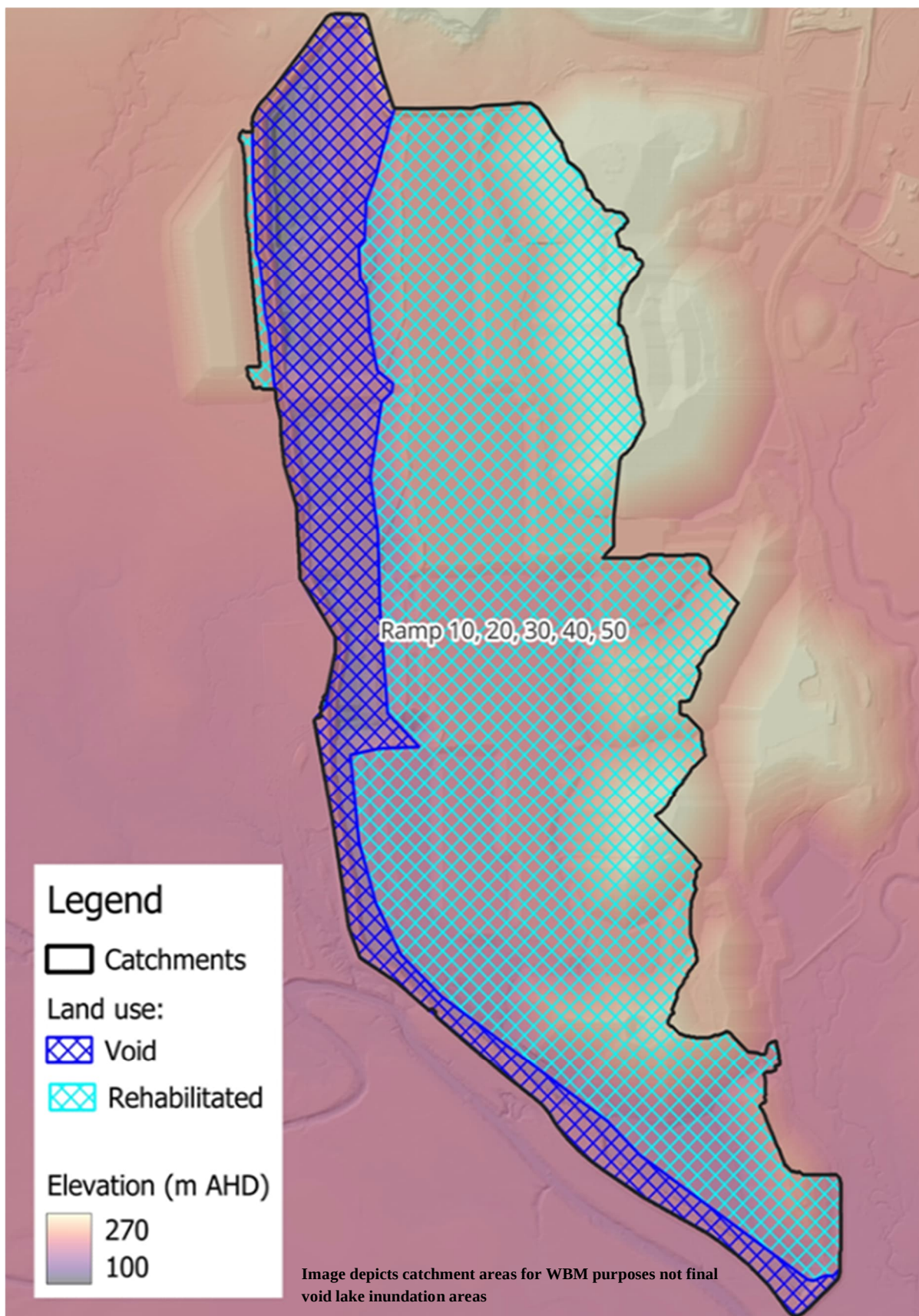


Figure 5.1 Catchment delineation for each land use zone applied to the water balance models for the PTM residual void catchment areas

Table 5.1 Catchment areas for each land use zone of the PTM residual void

Residual void	Natural (ha)	Void (ha)	Rehabilitated (ha)	Total catchment area (ha)
Ramp 10/20/30/40/50	0	333	1,109	1,442

Stage-storage relationships were derived using the mine closure landform to understand the correlation between the lake surface elevation and both storage volume and surface area of the residual void lake (Figure 5.2). Water levels in the residual void were assumed to be zero at the start of the simulations (i.e., dry conditions at cessation of mining). The results of this assessment were used in the WBM to estimate dimensions of the residual void lakes for each time-step modelled.

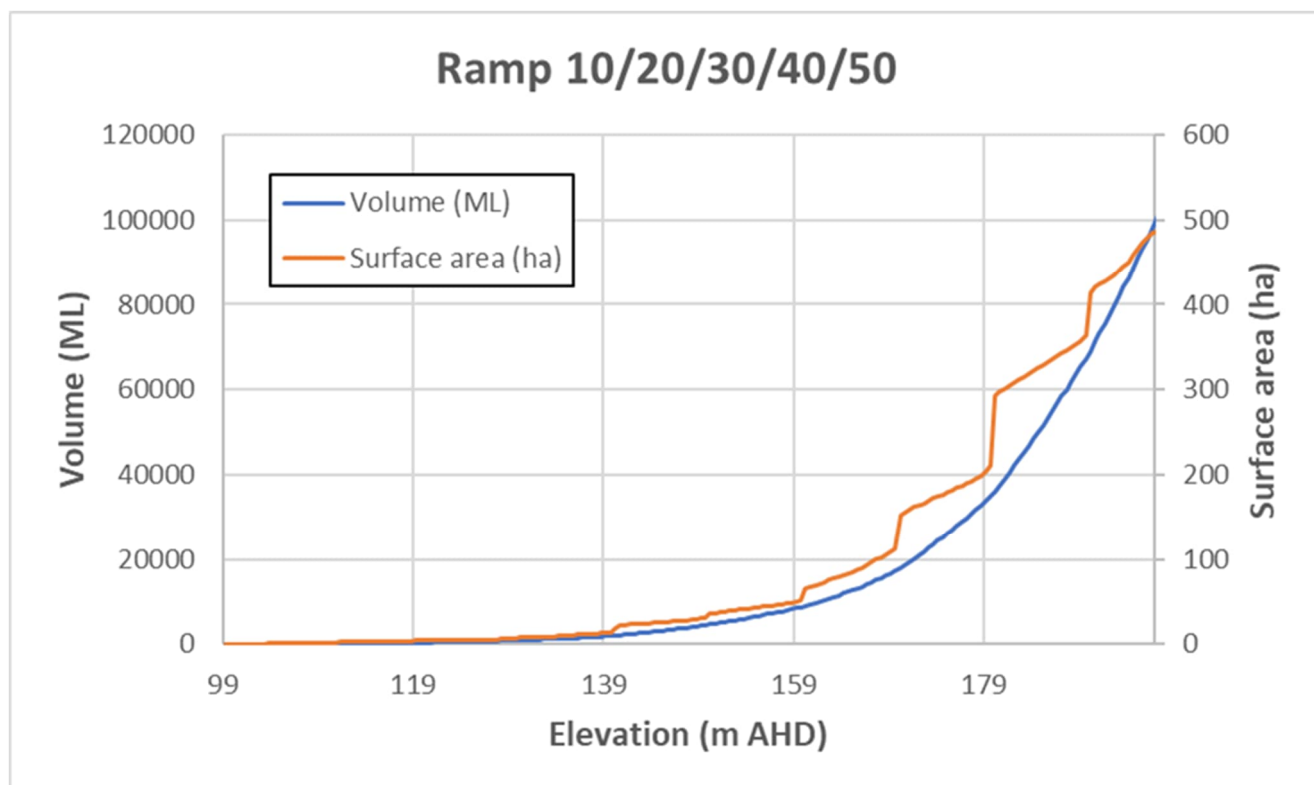


Figure 5.2 PTM residual void stage-storage relationship

5.1.3 Surface run-off

Runoff coefficients estimated from the PTM Australian Water Balance Model (AWBM) were used to understand the contribution of surface water runoff from each land use zone resulting from precipitation.

The runoff coefficients estimated from the AWBM are included in Table 5.2 as a percentage of rainfall.

Table 5.2 Runoff coefficients adopted in the WBM for the PTM residual void

Land use zone	Runoff coefficient (%)
Natural	15
Void	30
Rehabilitated	15

Surface water runoff does not include effects of high intensity and short duration events, and instead considers flows as daily average flows.

5.1.4 Climate change considerations

To enable a reasonable representation of future climate conditions, three synthetic climate projections were considered in the WBM, as follows:

- Representative Concentration Pathways (RCP): Projections of greenhouse gas and aerosol concentrations (pathways) and, together with land use change, are consistent with a set of broad climate outcomes adopted by the Intergovernmental Panel on Climate Change and used by the climate modelling community. RCP 4.5 and RCP 8.5 were considered.
- Global Climate Models (GCMs) grouped into four Representative Future Climate (RFC) categories: HI, HP, WI and WP, according to the global warming sensitivity and East Indian x West Pacific Ocean temperatures responses. The four RFC categories were considered for this analysis.
- Climate Warming Sensitivity (CWS): Estimates the sensitivity of the global temperature in response to carbon dioxide concentrations and are grouped into three ranges: Low (L), Medium (M) and High (H). All three ranges were considered.

Rainfall and evaporation time series data for the combination of the different climate projections were obtained from the Queensland Future Climate Portal (Queensland Government, 2023) for three pivotal projection years that were available at the time of the assessment (2030, 2050, and 2070). Historical data from 1960 to 2022 was also obtained.

The pivotal years represent the future average climate of a decade centred on the pivotal year - for example, the pivotal year of 2030 projects the climate from 2020 to 2039. As the data does not extend past the 2070 pivotal year, for the years from 2080 to 2199, the projections from the pivotal year 2070 were applied. The pivotal projection years were selected to project climate variation for the WBM simulation period.

The data presents the expected change in rainfall and evaporation based on the historical baseline period between 1960 and 2022. In total, combining the three different climate change considerations (RCP, GCM, and CWS), 24 scenarios for each pivotal year were assessed (total of 72 scenarios).

To simplify the WBM analytical processes, a single representative climate scenario for each pivotal year was identified. RCP8.5_M_HI5 was identified as the most representative of the 24 scenarios as the approximate middle point of the 24 available scenarios for each pivotal year.

Daily rainfall

The rainfall data from the three available pivotal year projections that were considered in the assessment for the simulation period are shown in Table 5.3.

Table 5.3 Rainfall data used for each simulated period in the PTM WBM

Scenario	Start date	End date	Period duration (years)
RCP8.5_2030_M_HI5	01-01-2036	31-12-2039	4
RCP8.5_2050_M_HI5	01-01-2040	31-12-2059	20
RCP8.5_2070_M_HI5	01-01-2060	31-12-2079	20
	01-01-2080	31-12-2199	120

The annual mean rainfall for the identified representative climate scenario for each pivotal year identifies an expected decrease in rainfall for this specific location considering the effects on climate change (Table 5.4).

Table 5.4 Annual mean rainfall data for historical data (1960 to 2022) and each pivotal year

Month	SILO Historical data	Pivotal year 2030	Pivotal year 2050	Pivotal year 2070
Annual mean (mm)	576	564	552	539

For the WBM simulations, probabilistically generated estimates of daily rainfall were applied using 100 realisations of stochastic rainfall for forecast modelling, from 2036 (expected closure year for the final pit within the PTM residual void) through to 2199 (the end of the simulation period). Figure 5.3 presents the daily maximum rainfall considered in the WBM simulations.

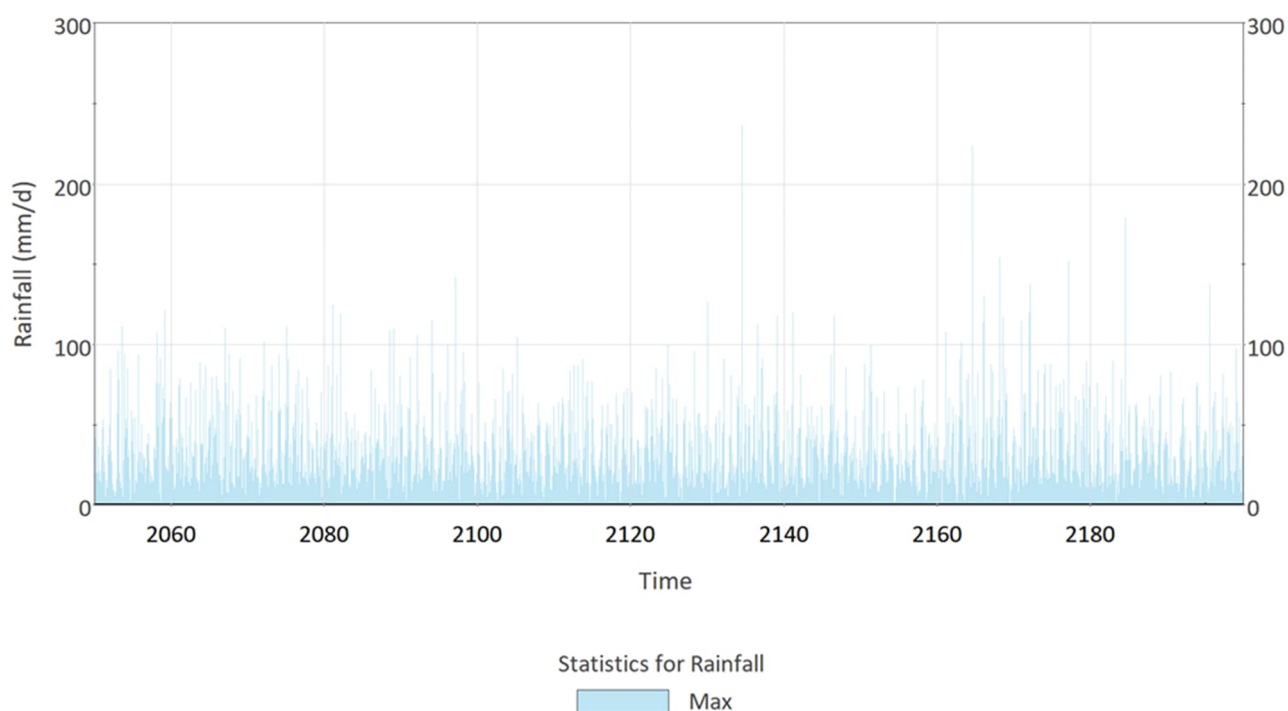


Figure 5.3 Daily maximum rainfall presented in the PTM WBM

In this way, the WBM allows estimates of the water elevation accounting for a level of uncertainty associated with the input rainfall.

Evaporation

The evaporation inputs for the WBM were considered as the percentage change of average monthly evaporation between the climate change time series data and the historical data from 1960 to 2022. The percentage change (increase) of evaporation obtained for each pivotal year is presented in Table 5.5. The percentage increase in evaporation is applied to the historical data to generate evaporation inputs to the WBM that account for climate change.

Table 5.5 Percentage change of average monthly evaporation for each pivotal year applied to the PTM WBM

Month	2030	2050	2070
January	3.3%	6.9%	11.3%
February	3.4%	7.0%	11.4%
March	3.6%	7.5%	12.3%
April	2.2%	4.7%	7.7%
May	2.2%	4.1%	6.8%
June	1.3%	3.3%	5.5%
July	0.8%	2.4%	4.0%
August	0.5%	1.6%	2.8%
September	1.9%	3.9%	6.4%

Month	2030	2050	2070
October	1.9%	4.0%	6.4%
November	3.0%	6.1%	9.9%
December	2.3%	4.9%	7.9%

As presented in Table 5.4 and Table 5.5, on average the expected effects on climate change consist of an increase in evaporation and decrease in rainfall for this specific location.

5.1.5 Groundwater flows

Groundwater inflows to the residual void, as discussed in Section 3, are predicted to equate to approximately 3% of the total volumetric inflow (SLR, 2024). Surface water fluxes act as the dominant driver on final void water levels. The modelled groundwater inflow rates used as inputs to the WBM are presented in Figure 3.2.

5.2 Water balance model outcomes

Following the WBM set-up and inputs, the WBM simulation generates a probability distribution of possible void lake levels and volumes for a 164-year simulation period generating 100 sets of unique results. The results for all realisations are assessed to provide probabilistic results for the applied climate scenario.

The results present the following statistics for the simulation period:

- Minimum: Lowest value out of the entire dataset.
- 50th percentile: 50% likelihood of values being greater or less.
- Maximum: Highest value out of the entire dataset.

For the projected climate scenario, the WBM results indicate:

- After the year 2120, the mean void water levels start to stabilise, reaching a mean void water elevation of 169 m AHD (Figure 5.4) and a mean void water volume of 16,248 ML (Figure 5.5) (considering all realisations). This is approximately 11 m below the interpreted groundwater level (180 m AHD), indicating that the void is expected to act as a sink.
- The long-term mean void lake levels over the final 20 years of the simulation range between 165 m AHD and 172 m AHD which is 8 to 15 m below the groundwater level (180 m AHD). This reflects an available storage capacity of between 15,871 ML and 23,308 ML for the void to continue acting as a sink.
- The void water levels remain below the residual void spill point (197 m AHD) for the duration of the simulation. Therefore, there is a very low risk of overtopping.
- The mean annual inflow to the PTM residual void is 1,934 megalitres per year (ML/year) and the mean annual outflow is 1,935 ML/year (Figure 5.6), calculated for the last 20 years of simulation (2180 and 2199). This indicates the inflows and outflows reach equilibrium by the end of the simulation period.

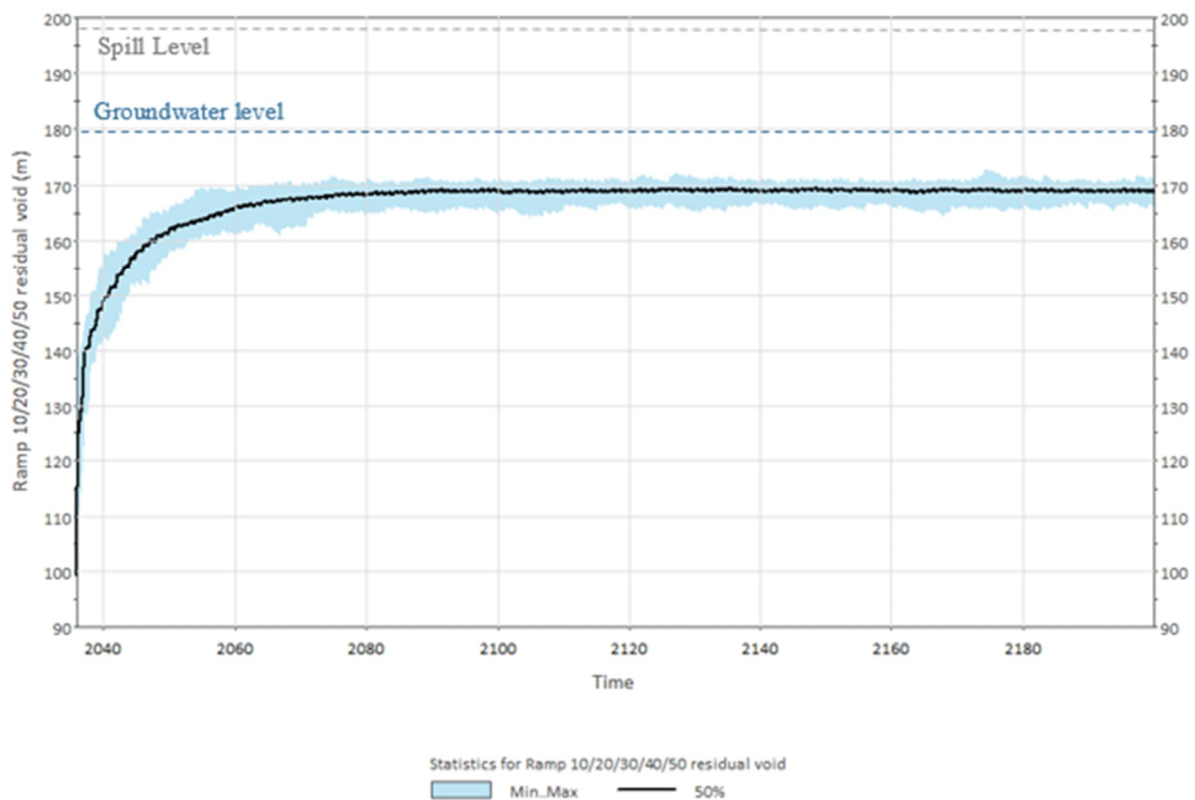


Figure 5.4 Modelled void water level compared to spill level and interpreted surrounding groundwater level for the PTM residual void

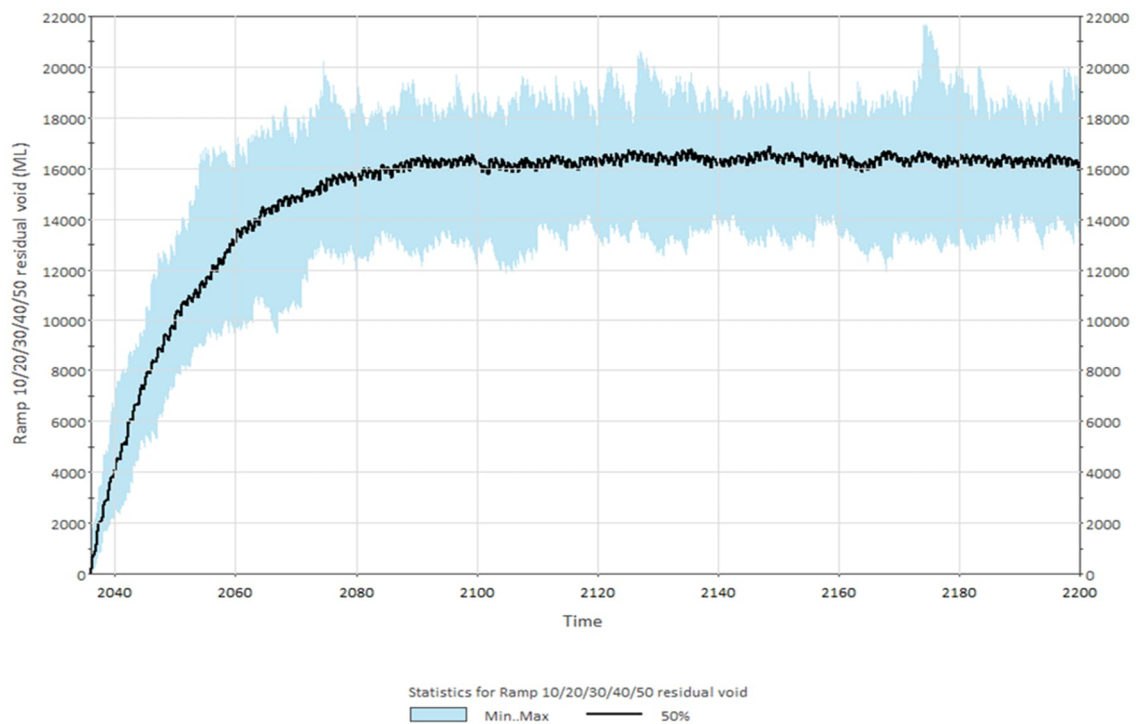


Figure 5.5 Modelled water volumes for the PTM residual void

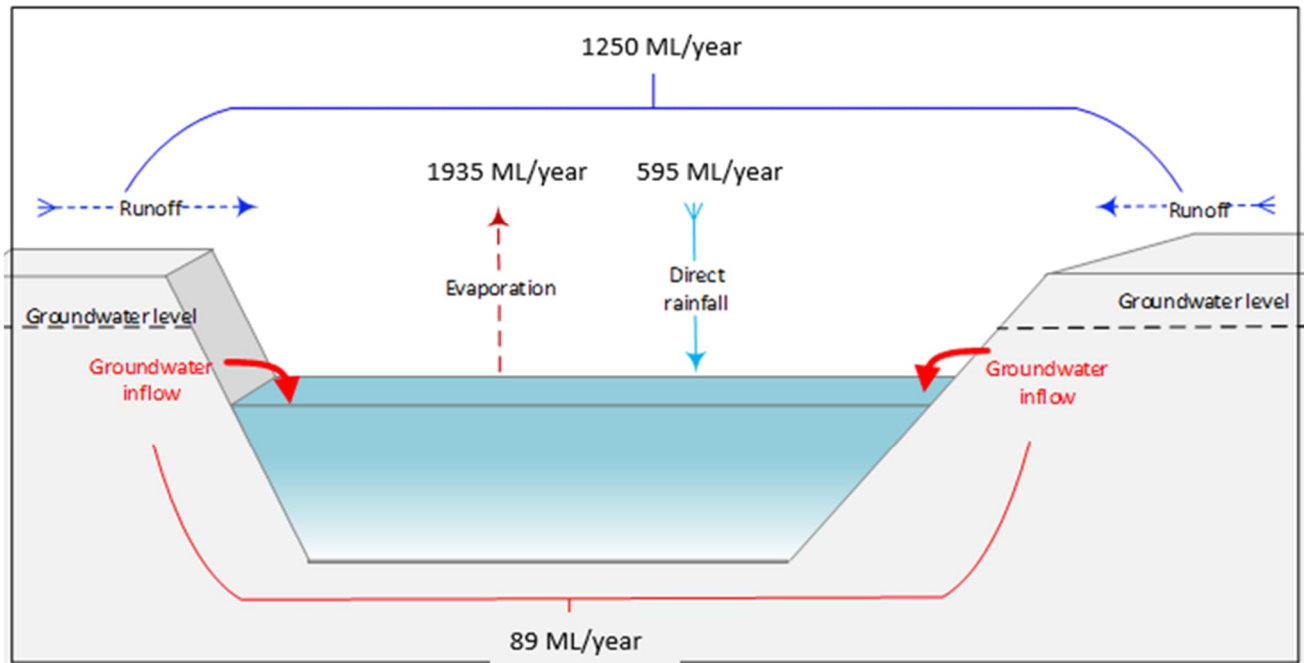


Figure 5.6 Schematic of average inflows/outflows simulated for period from 2180 to 2199 – PTM residual void

6 Geotechnical stability

Geotechnical stability assessments have been completed to demonstrate that, post-closure, the conceptual void high-wall and low-wall slopes will all exhibit long-term geotechnical stability for the PTM residual void. This section presents the assessment findings relevant to void closure at PTM.

6.1 High-wall and end-wall stability assessment

The high-wall geotechnical assessment was undertaken to assess the conceptual void high-wall slope and demonstrate that the slopes will not adversely impact nearby woodland and grazing PMLU for at least the modelled period of 60 years (Henderson Geotech, 2024). This section summarises the assessment findings relevant to the required rehabilitation and management approaches to achieve safe residual void high- and end-walls at closure.

6.1.1 *Inputs*

From the PTM site geological model - the base of weathering, coal seam roofs and floors, and Yarrabee Tuff layer (a dominant structural feature present within the void) were extracted along with indicative stratigraphy. This information, together with the final mined pit levels and the mine closure landform surface, were incorporated into the geotechnical assessment (Henderson Geotech, 2024).

Six cross-sections were selected to capture the greatest void depth relative to highwall crest (section 1), the highest low-wall spoil (section 2), a smaller void/deep section to the south (Section 3), a location where the Isaac River was closest to the high-wall crest (section 4), and two sections in the northern section to further investigate conditions of marginal highwall stability (sections 5 and 6) (Henderson Geotech, 2024).

The section locations corresponding to the voids (Figure 6.1) are as follows:

- Section 1: Ramp 10 void
- Section 2: Ramp 10 void
- Section 3: Ramp 20/30 void
- Section 4: Ramp 40 void
- Section 5: Ramp 10 void
- Section 6: Ramp 10 void

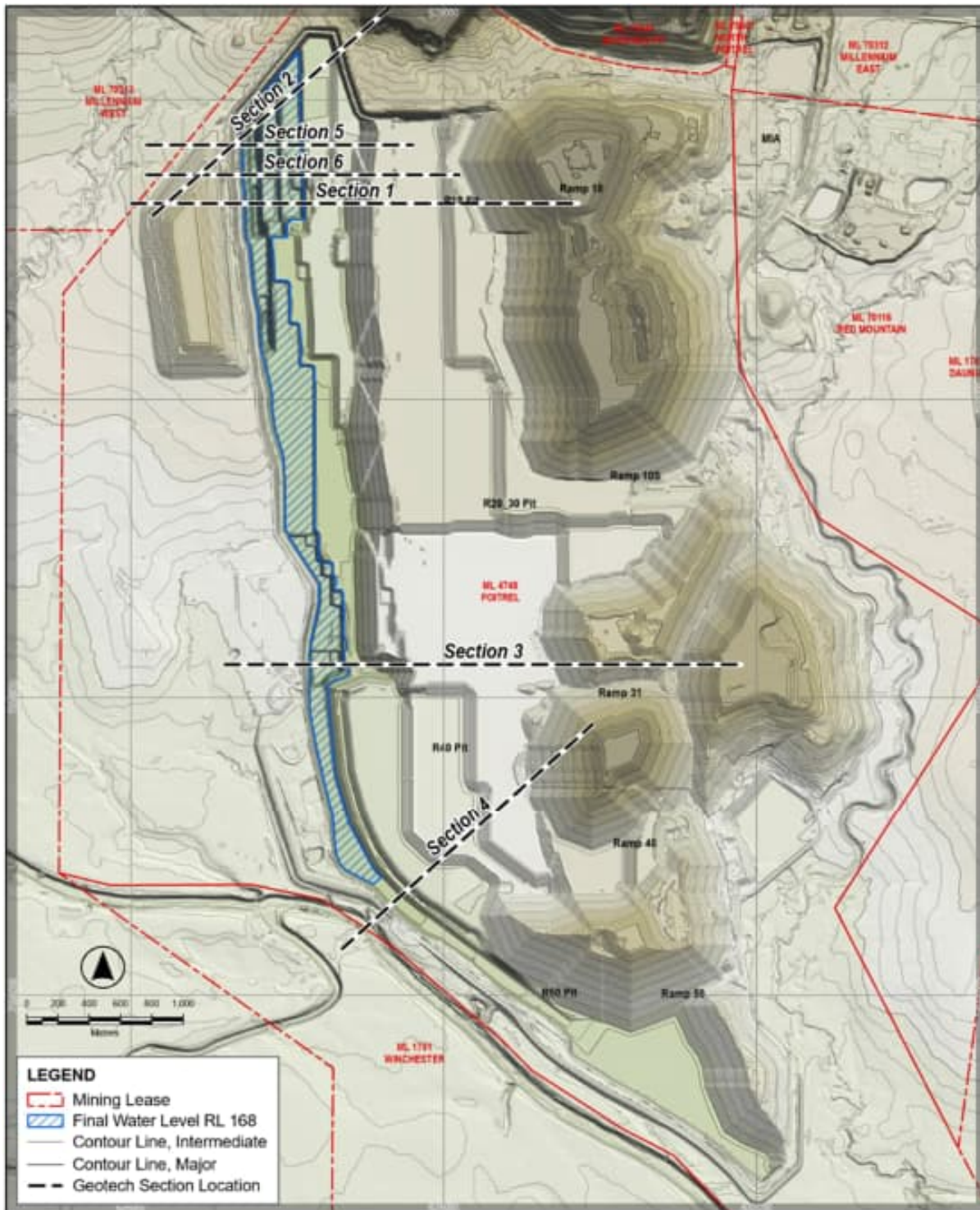


Figure 6.1 Cross-section locations for the PTM residual void high-wall geotechnical assessment (Henderson Geotech, 2024)

The selected cross-sections were analysed using Slide2 Modeler, two-dimensional (2D) Limit Equilibrium Analysis for Slopes to determine the Factor of Safety (FoS). 2D circular and non-circular slip surfaces were considered, with circular slips typical of spoil and sedimentary rock masses while non-circular slips might be dictated by the:

- Yarrabee Tuff and coal seams in the high wall and end-wall
- Yarrabee Tuff below the pit floor
- Interface between saturated and unsaturated spoil in the low-wall.

Table 6.1 Geotechnical parameters applied to PTM geotechnical analyses (Henderson Geotech, 2024)

Material	Weight (kN/m ³)	Cohesion (kPa)	Friction angle (degree)	Coefficient of permeability (m/s)	Vertical to horizontal permeability ratio (kv/kh)
Boxcut spoil	18	30	28	1e-7	0.5
Down dip spoil (unsaturated)	18	40	30	5e-6	0.4
Down dip soil (saturated)	20	23	25	5e-5	0.4
Tertiary overburden	20	50	30	2.78e-6	0.083
Weathered Permian overburden	24	75	30	2.78e-6	0.083
Fresh Permian over/interburden	24	450	4	1.16e-8	0.1
Fresh coal	15	30	35	1.74e-7	0.067
Yarrabee Tuff	24	0	15	1e-7	1

The effects of severe hydrological events were not considered in the geotechnical stability assessment as the residual void is either outside the modelled floodplain and/or the mine closure landform design will incorporate measures to prevent floodwater ingress to the residual voids.

Groundwater head levels considered in the assessment were interpolated from hydrogeological modelling contour maps (refer to Section 3). Residual void lake levels were incorporated from the residual void water balance modelling (refer to Section 5).

Hydraulic properties, primarily saturated coefficients of permeability, were selected to be broadly consistent with hydrogeological modelling and to provide the relative permeability observed in practice – for example, spoil is observed to be more permeable than in situ weathered Permian overburden (Henderson Geotech, 2024).

The assessment, undertaken by an appropriately qualified person, assigned the associated geotechnical modelling a reliability score ranking of High Uncertainty (Henderson Geotech, 2024) - the assessed consequences of geotechnical instability are provided in Table 6.2.

Table 6.2 Consequence assessment of geotechnical instability at PTM (Henderson Geotech, 2024)

Scenario	Consequence of geotechnical instability ¹
High-wall instability that extends beyond crest into grazing PMLU	Medium
High-wall instability that extends beyond crest to creek channels or flood protection structures	Medium
High-wall instability that does not extend outside NUMA	Negligible
Low-wall instability that extends into grazing PMLU	Low
Low-wall instability that extends into woodland PMLU	Low
Low-wall instability that does not extend outside of NUMA	Negligible

¹ As assessed by an appropriately qualified person

Based on consideration of the High Uncertainty ranking and the consequences tabled above, Table 6.3 identifies the adopted design acceptance criteria as determined by the appropriately qualified person undertaking the assessment.

Table 6.3 Adopted design acceptance criteria for PTM geotechnical assessment (Henderson Geotech, 2024)

Scenarios	Minimum Factor of Safety criteria ¹
Instability extending into grazing PMLU	1.5 (also imposed by pre-existing EA conditions)
Instability extending to watercourses or flood protection structures	1.5
Instability extending into woodland PMLU	1.35
Instability contained within NUMA	1.25

¹ As assessed by an appropriately qualified person

6.1.2 Results

The results from the scenarios for the geotechnical assessment for a dry void at the end-of-mining and for when the residual void lake reaches the long-term average water level are presented in Table 6.4.

Table 6.4 Geotechnical stability assessment results for the sections of the PTM residual void (Henderson Geotech, 2024)

Section	Residual void water level	FoS – NUMA (target 1.25)	Management measure required to achieve FoS ≥ 1.5
1	Dry	1.30	Nil – dry void not anticipated in closure landform
1	Final pit lake	1.44	15 – 40 m set-back distance
2 – high-wall	Dry	1.41	Nil – dry void not anticipated in closure landform
2 – high-wall	Final pit lake	1.47	15 – 40 m set-back distance
2 – low-wall	Dry	1.37	Nil – dry void not anticipated in closure landform

Section	Residual void water level	FoS – NUMA (target 1.25)	Management measure required to achieve FoS ≥ 1.5
2 – low-wall	Final pit lake	1.52	Nil
3	Dry	1.94	Nil
3	Final pit lake	1.94	Nil
4	Dry	2.35	Nil
4	Final pit lake	2.41	Nil
5	Dry	1.32	Nil – dry void not anticipated in closure landform
5	Final pit lake	1.43	Nil – FoS >1.5 achieved at crest
6	Dry	1.42	Nil – dry void not anticipated in closure landform
6	Final pit lake	1.52	Nil

Based on the assessment outcomes, the analysed sections achieved a high-wall FoS of greater than ($>$) 1.25 and therefore met the nominated design acceptance criterion for instability contained within a NUMA. However, to achieve the nominated design acceptance criterion for instability extending into a grazing PMLU, additional set-back distances of between 15 and 40 metres are required. These set-back distances will inform the NUMA boundary and positioning of exclusion bunding and fencing will factor in these distances also.

6.2 Low-wall stability assessment

The geotechnical stability of low-walls has been assessed for the PTM residual void with the purpose of demonstrating that, post-closure, void low-wall slopes will exhibit long-term geotechnical stability.

A stability analyses of the low-wall final closure state landform for the PTM residual void was undertaken using the 2D limit equilibrium analysis software Slide2 (version 9.027). Five cross-sections were selected that provide representative geometries of the final landform with a focus on areas where the spoil material batters or slopes have a relatively high angle in the low-wall. The section locations for the analysis are presented in Figure 6.2 and the corresponding sections are identified as:

- Section 10 (Ramp 10 pit)
- Section 10S (Ramp 10 pit-south)
- Section 31N (Ramp 30 pit-north)
- Section 31 (Ramp 30 pit)
- Section 40 (Ramp 40 pit).

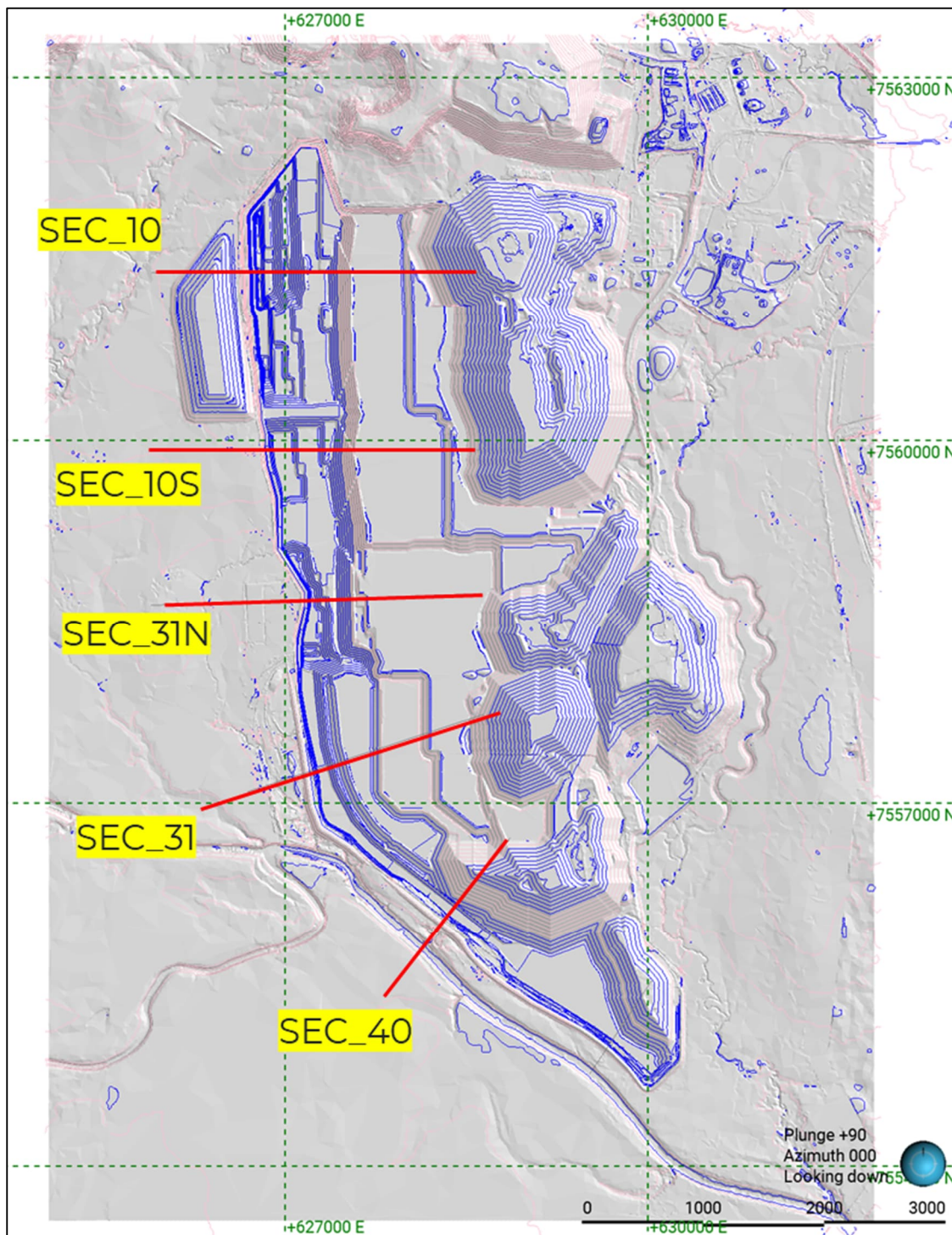


Figure 6.2 Cross-section locations for the PTM residual void low-wall geotechnical assessment

For each of the analysed sections, the minimum FoS failure surface along the slope (global minimum) was identified (Table 6.5) and the position of the global minimum failure surface is shown on the low-wall slope in Figure 6.3 to Figure 6.7.

The geotechnical stability assessment for the PTM residual void sections concluded that, for the mine closure landform, the minimum FoS for all low-wall slopes was greater than 1.5. Based on this assessment, the stability requirements of the low-wall slopes have been met.

Table 6.5 Summary of low-wall geotechnical stability analysis results for the PTM residual void

Section	Minimum FoS (global minimum)
10	2
10S	2.4
31N	2.1
31	2.4
40	1.8

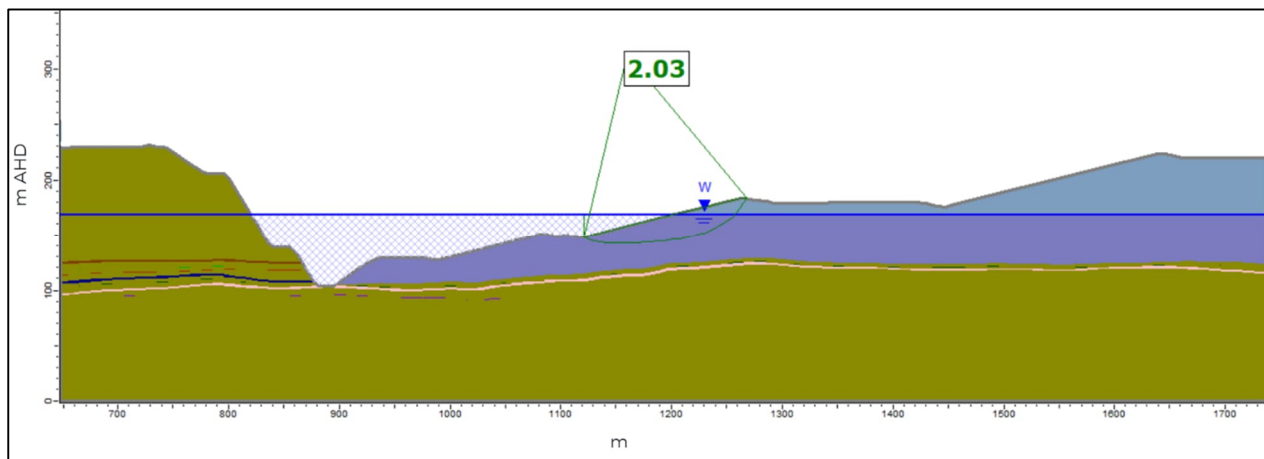


Figure 6.3 Location of global minimum failure surface in section 10 of the PTM residual void

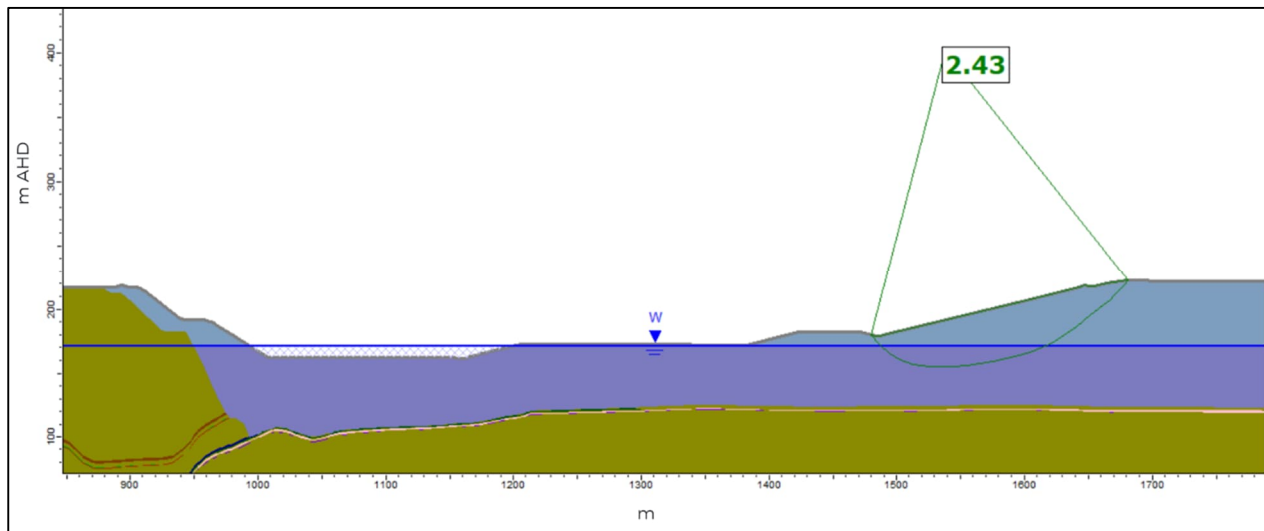


Figure 6.4 Location of global minimum failure surface in section 10S of the PTM residual void

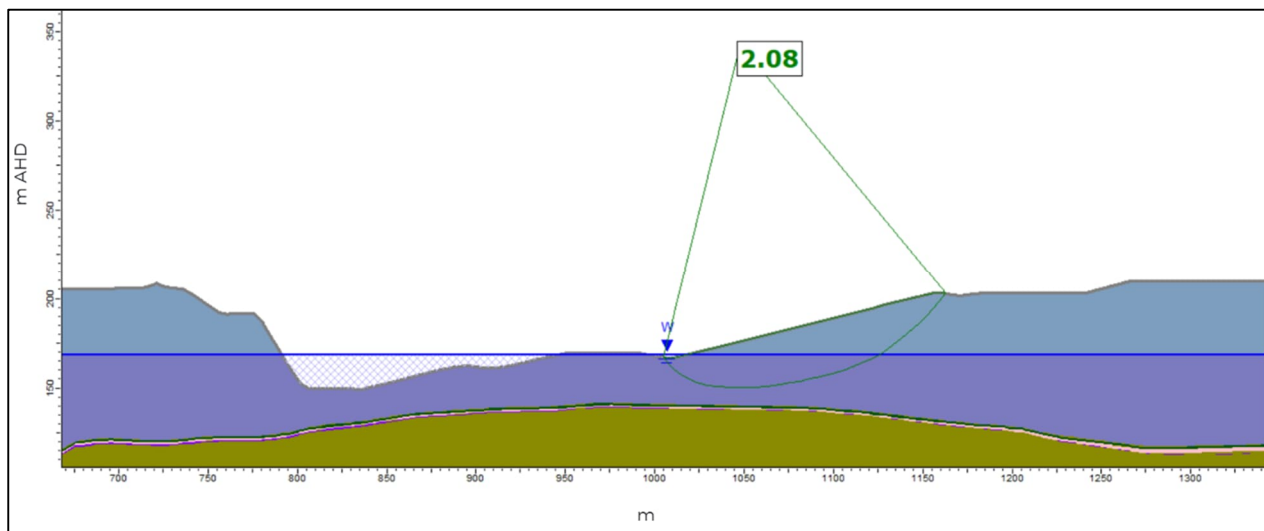


Figure 6.5 Location of global minimum failure surface in Section 31N of the PTM residual void

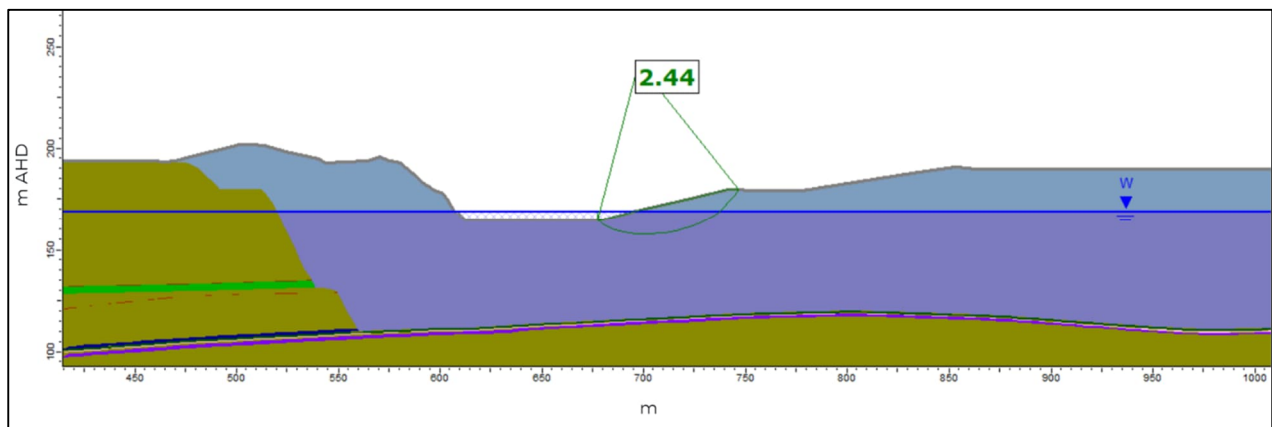


Figure 6.6 Location of global minimum failure surface in Section 31 of the PTM residual void

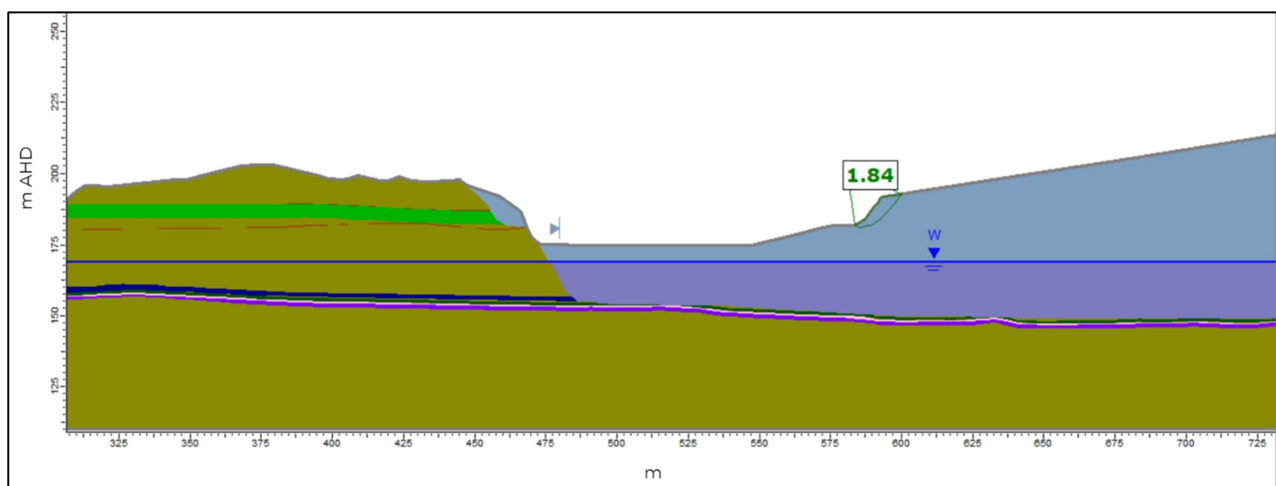


Figure 6.7 Location of global minimum failure surface in Section 40 of the PTM residual void

7 Geochemical stability

A geochemical assessment has been undertaken by WSP to:

- identify the geochemical characteristics of remaining high-wall material and mine waste materials (spoil and rejects)
- model the resulting effects on long-term water quality of the void lake within the mine closure landforms for the PTM residual void.

The objectives of the geochemical assessment were to:

- predict the changes in water quality of the PTM residual void in a long-term closure scenario
- determine, at a conceptual level (by comparison to EA groundwater trigger values), whether the predicted void lake water quality may impact the surrounding environment in a closure setting
- determine, at a conceptual level, if stratified conditions are likely to develop within the void.

This geochemical assessment builds directly on the void water balance assessment undertaken for the PTM residual void (see Section 5) for the same period 164 years post-closure (from 2036 to 2199) for the residual void. Within these timeframes, the water level in the void lake reaches an equilibrium.

7.1 Water quality model

7.1.1 *Geological materials*

The geologic materials and associated mine waste materials (spoil and rejects) may react with water and release or immobilise solutes, according to their geochemical characteristics. Material interactions considered in the water quality model include:

- Highwall lithologies interacting with rainfall/runoff.
- In-pit spoil/rejects covered with non-carbonaceous interburden interacting with rainfall/runoff (infiltration of rainfall through the spoil/rejects was not included).

The relative proportions of each lithological group on the PTM residual void highwalls were derived from the stratigraphic distribution (meterage) of each material within drill holes. Material with no lithological classification (classified as unknown) was reallocated to carbonaceous and non-carbonaceous domains using the ratio of carbonaceous to non-carbonaceous materials. A similar redistribution was also undertaken for tertiary units, which were not identified within the drill core database. The resulting simplification gives three main lithological groupings: coal, carbonaceous overburden, and non-carbonaceous overburden (Table 7.1). The subdivision of coal materials into specific seams was not considered given the low proportional area of remnant coal exposed on the highwall compared to the overburden.

Table 7.1 Proportions of lithologies in excavated PTM residual void high-walls

Highwall lithology grouping		Normalised high-wall exposure (%)
Non-carbonaceous	Fresh	35.8
	Weathered	44.5
Carbonaceous	Fresh	3.7
	Weathered	6.2
Coal	Fresh	5.9
	Weathered	3.2
Total:		99.2

7.1.2 Geochemical source terms

The geochemical source terms were derived from the PTM groundwater and environmental geochemistry databases provided by Stanmore.

The environmental geochemistry database (“PTM_New Drillhole Results_WORKING.xlsx”) includes the results of analyses undertaken on drill core material collected at PTM. Solubility test work results from two additional drill cores were compiled into the provided working database for the derivation of source term chemistry. Drill core results were filtered based upon lithology. The median of compiled data for each lithological grouping was used to derive the source term for the respective lithology group. Where analytical results were below the limit of reporting (LOR) the entry was substituted with half the LOR.

The groundwater database includes data from February 2008 for 15 monitoring bores across three main aquifer types (Cainozoic, Permian and Rewan aquifers). No distinction was made between aquifers or bores when deriving the groundwater source term, and a median of all available data is taken.

The data used for the derivation of these source terms are summarised in Table 7.2.

Table 7.2 Summary of data used to derive geochemical source terms for the PTM residual void

Water inflow	Data source	Comment
Initial void lake	-	It is assumed that no water is present in the PTM residual void at closure.
Rehabilitated catchment/in-pit spoil runoff	PTM drill-core database	It is assumed that non-carbonaceous interburden will be specified as cover material for final landform. Spoil runoff is, therefore, represented by leachate data from fresh non-carbonaceous drill core samples.
High-wall runoff	PTM drill-core database	The PTM drill core databases were used to derive source terms for each lithological domain/grouping.
Groundwater inflow	PTM groundwater database	Median water quality from PTM groundwater database.
Direct Rainfall	-	Pure water equilibrated with atmospheric carbon dioxide (CO ₂).

7.1.3 Modelling approach and development

The geochemical model was run for major cations, anions, and metal(loid)s where data was available. Further discussion is focused on TDS (as a proxy for Electrical Conductivity (EC)) as identified in the rehabilitation requirements of the EA (EPML00963013). Discussion has also been included for pH.

The results for each timestep were calculated using the geochemical modelling code PHREEQC (Parkhurst, 2013)) with the Minteq.v4 thermodynamic database, derived from the MINTEQA2 version 4 database (US EPA, 1998).

The geochemical model was run as follows:

- source terms were mixed for annual timesteps, with inflow/outflow proportions calculated from the GoldSim water balance
- modelling was incremental, with the output for the void lake from the previous timestep being used as the input for the next time step
- geochemical reactions, such as mineral precipitation/dissolution, gas exchange and sorption were considered.

The following assumptions apply to the geochemical model:

- At all times, the void lake is fully mixed, geochemical reactions occur to equilibrium within the modelled timestep and are not kinetically controlled. Mineral precipitates are retained within the void lake.
- Solute release from high-wall rock and spoil does not occur below the lake water level.
- The release of coal bed methane caused during the dewatering of coal seams does not drive groundwater or lake chemistry towards more reducing conditions.
- There is no infiltration of rainfall or groundwater through the in-pit waste to the void lake.
- Stratification is assessed at a conceptual level based on a TDS threshold. Seasonal temperature, wind patterns, and other impacts on mixing are not considered.
- The geochemical model does not account for biological processes.

A model sensitivity test was performed to highlight the role of geochemical controls on predicted water quality. The two simulations are summarised in Table 7.3 and were performed for the mean water balance scenario for the residual void.

Table 7.3 Model sensitivity simulations

Simulation	Atmospheric CO ₂ equilibrium	Mineral precipitation	Surface adsorption
Base case	Equilibrium at 10 ^{-3.38} (420 ppm)*	Equilibrium	Adsorption onto ferrihydrite
No geochemical controls	No equilibrium	No equilibrium	No sorption

Note: *420 parts per million (ppm) is representative of 2024 atmospheric CO₂ concentrations. Variation with time (i.e., geochemical climate change scenarios) is not included in current model scenarios.

A conceptual level assessment of potential chemical stratification was conducted based on the evolution of TDS, which can be used to approximate the fluid density of the fully mixed void lake. A discussion of the stratification assessment is provided in Section 7.2.

7.2 Residual void water quality outcomes

The following sections present the results of the geochemical modelling for the residual void lake at PTM for pH and TDS. The results are presented for both the with and without geochemical controls/reactions (i.e., mineral precipitation, sorption, and gas exchange) scenarios.

The PTM residual void is classified as a NUMA and elevated modelling results should be considered in the context of the void being classified as a NUMA for the PRCP.

The model results are summarised as follows:

pH

Acidic conditions are unlikely to develop in the PTM residual void lake, with alkaline conditions developing through the modelled period (Figure 7.1). Whether geochemical controls are considered or not, the pH begins and remains above the EA upper limit for the modelled period. The simulation with geochemical controls results in a higher pH than the simulation without geochemical controls. The main likely geochemical control is CO₂ degassing which raises pH, resulting in carbonate precipitation and reducing pH. These geochemical processes are driven by the input of dissolved inorganic carbon, from runoff and groundwater inflow to the void lake.

TDS

TDS concentrations increase over the model duration. However, the predicted TDS concentrations are not elevated above the EA derived trigger value until the end of the simulation (after approximately 2190) regardless of whether geochemical controls are considered or not (Figure 7.1).

The increase in TDS concentration is primarily driven by evapoconcentration of residual void lake water.

Minor differences in TDS concentrations in simulations with geochemical controls are due to removal via precipitation of some metals/metalloids that contribute to the TDS concentrations. An 'equilibrium' state for TDS concentrations (i.e., constant TDS) is not reached.

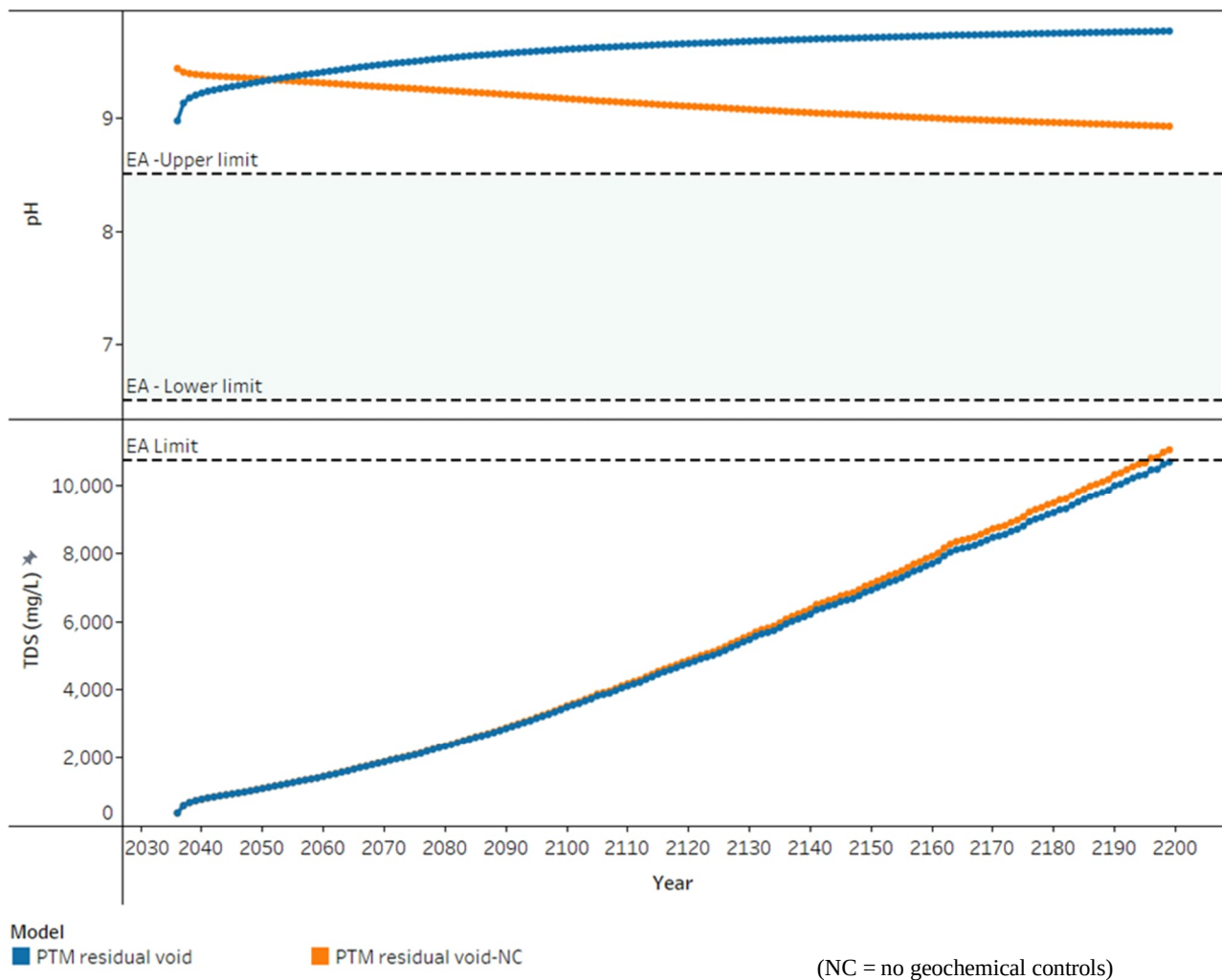


Figure 7.1 Predicted pH conditions and TDS concentrations for the PTM residual void over the modelled period

Stratification

Steep sides, void depths and elevated TDS present favourable conditions for stratification within the PTM residual void. The water of higher density (cooler or more saline) has the potential to become isolated at depth.

Hydrodynamic/limnological analysis is required to assess the potential for thermal/chemical stratification to occur, and the importance of seasonal mixing processes and groundwater mixing inputs. However, as the residual void is considered a NUMA and modelled as a groundwater sink, further stratification assessment is not warranted.

7.2.1 Qualifications

The following caveats and limitations apply to the water quality model, in relation to the TDS and pH modelling, for the PTM residual void:

- Available data at the time of modelling was used to represent relevant geochemical interactions. Availability of additional data in future may result in alternative model outputs.
- Water movements are based on complementary studies (groundwater and water balance). These studies constrain the model duration and the water sources.
- Screening was performed against EA criteria for groundwater contaminant trigger values. The criteria for TDS were derived from the EA EC value using a 0.67 factor that is considered acceptable for freshwater.

8 Residual void management

A summary of the key findings from the technical studies (presented in Sections 3 to 7) used to inform the development of residual void management measures are presented below:

Groundwater

- By the end of the post-closure simulation, groundwater inflows and outflows for all PTM residual voids reach equilibrium with net positive inflows occurring throughout the simulation period. Groundwater levels recover with a groundwater hydraulic gradient maintained towards the PTM residual voids.
- The minor modelled outflows from the residual void to the surrounding in-pit spoil do not move beyond the spoil or mining leases as a result of the modelled hydraulic gradient centred on the PTM residual void.
- Peak lowering of groundwater at locations of potential GDE sites identified near to PTM is predicted to occur at the end of PTM mining with minimal ongoing drawdown occurring in the post-closure environment while groundwater levels recover and stabilise.
- Minor ongoing lowering of groundwater levels post-closure occurs in one third-party water supply bores before the water levels equilibrate. This is likely a result of a lag in mining related draw-down or regional-scale influences represented in the model rather than drawdown associated with the mine closure landform. There is no additional post-closure lowering of groundwater levels at all other locations of potential groundwater users identified near to PTM.
- The particle tracking simulation predicts that the water particles within the potential contaminant source areas of the mining leases, and within the voids themselves, will either migrate towards the residual voids and remain on the mining leases post-closure or remain within the voids.

Flooding

- The floodplain assessment of the pre-mining landform identified that the PTM pits would be located within the floodplains of the Isaac River. For the mine closure landforms, the extents of the residual voids modelled within the floodplain assessment will be reduced and refined through spoil placement, drainage design and placement of landforms/embankments to reduce the extent of void and flooding interactions.
- Floodwaters from the Isaac River and the approved New Chum creek diversion are modelled to interact with the current proposed mine closure landform associated with the residual void. The flood assessment predicts that ingress of floodwaters is modelled to occur into the southern end of the PTM residual void from the Isaac River (adjacent to the Ramp 50 pit) during a PMF event. Floodwater ingress will require consideration during final design of exclusion bunding/embankments around the residual void high-walls in this location.
- Flood velocities from the Isaac River floodwaters during PMF events that interact with the mine closure landform may contribute to scouring and/or erosion of the landform. Appropriate protection at locations where floodwaters of high velocities may interact with the mine closure landform will be considered and incorporated into the mine closure landform as the PTM residual void approaches closure.

WBM

- WBM results indicate the formation of a void lake in the PTM residual void. Void lake levels are modelled to equilibrate and remain below the interpreted and modelled groundwater levels due to evaporative effects on the residual void lakes.
- WBM outcomes predict that the PTM residual void achieves mean void water levels and volumes at the end of the simulation that are well below the spill elevation for the residual void. Therefore, there is a very low risk of the residual void overtopping to the receiving environment.

Geotechnical stability

- High-wall FoS for all sections analysed in the residual void were > 1.25 and therefore met the nominated design acceptance criterion for instability contained within a NUMA.
- To achieve the high-wall FoS nominated design acceptance criterion for instability extending into a grazing PMLU, additional set-back distances of between 15 and 40 metres from the crest of the slope are required. The NUMA boundary and positioning of exclusion bunding and fencing will factor in these distances.
- The mine closure landforms have been designed such that the geotechnical stability for the low-walls achieved a $FoS \geq 1.5$. Therefore, the low-walls of the mine closure landforms can be considered stable.

Geochemistry

- Water quality modelling of the residual void predicts the development of alkaline water quality in the void lake and increasing salinity over time. There may be potential for beneficial post-closure uses of the void water prior to the water quality deteriorating beyond the EA trigger values. Extractive uses of this water may also alter the chemistry and dissolved solid accumulation within the void that occurs via evapoconcentration. Further investigation into potential options for use of void lake water post-closure, including review of the WBM and water quality assessment of the residual void, could be carried out.

Management and monitoring

The PTM residual void will be retained as a NUMA. The management considerations presented in Table 8.1 will be implemented to support attainment of a NUMA that is safe and does not present an unacceptable risk of off-tenure environmental harm.

Monitoring of the residual void will be undertaken as part of monitoring of the NUMA extents (see relevant monitoring and maintenance section in the PTM PRCP). Monitoring will have the objective of demonstrating achievement of sufficient improvement in accordance with the NUMA management milestones that enables certification from an appropriately qualified person that the residual void:

- Does not present an unacceptable risk of environmental harm outside of the tenure boundary
- Is safe to humans and livestock.

Table 8.1 PTM residual void closure aspects, context and management considerations

Residual void closure aspect	Closure objective			Residual void closure context	Management consideration
	Safety	Stability	Non-polluting		
Geotechnical stability	✓	✓	-	— Stability outside of the NUMA extents of the high-walls (including set-back distances where necessary) = $FoS \geq 1.5$. — Stability of the low-walls outside of the NUMA extents = $FoS \geq 1.5$. — Extents of all PTM residual voids have been defined by geotechnical analysis based on currently available information.	— Develop geotechnical parameters that are specific to PTM for spoil and other materials to apply to the geotechnical modelling. — As mining approaches the final limits, re-assess the geotechnical stability of the high- and low-walls based on the latest available data, including any developed site-specific geotechnical parameters. — Use a minimum $FoS \geq 1.5$ as a guidance for ongoing void closure planning for NUMA boundary. (This may be refined over the mine life should industry research provide optimised guidance on observational methods and consequence assessment).

Residual void closure aspect	Closure objective			Residual void closure context	Management consideration
	Safety	Stability	Non-polluting		
Void hydrology	✓	✓	✓	Based on rehabilitation flood modelling completed: — The residual void in the current mine closure landform are not subject to inundation from floodwaters for the 0.1% AEP event. — Flood velocities may interact with the mine closure landform associated with the residual void. — As the water levels remain below the recovered groundwater levels for all the residual void (and well below the void spill point), the void will not overtop and environmental harm beyond that of the void itself is not expected. Therefore, no management activities required. — The long-term mean void lake levels for the residual void are modelled to remain below the interpreted and modelled groundwater levels due to evaporative effects on the residual void lakes. An available storage capacity remains for the voids to keep acting as long-term sinks. — The mean water balance for the residual void reaches equilibrium. — After 2120, mean water levels the residual void start to stabilise, with simulated mean inflows of 1,934 ML/year being equal to mean outflows of 1,935 ML/yr.	— Undertake regular update of hydrological models to ensure that residual void catchment is minimised as far as practicable. — Update and refine the final mine closure landform to consider spoil dumping and landform design to exclude floodwaters entering the residual void. — If necessary, identify and implement mitigation measures for appropriate protection works of landforms where floodwaters from watercourses interact with the final mine closure landforms at elevated velocities. — At cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids' final mine closure landform and spill point elevation, rainfall and evaporation, surface water runoff, groundwater inflows, and climate projections. — Obtain certification from an appropriately qualified person that the residual void will not cause environmental harm beyond the tenure boundary.
Void hydrogeology	-	-	✓	— Mining-related dewatering activities have lowered groundwater levels that will result in continued suppression of the water table centred on the PTM residual void.	— At cessation of mining activities, review and update the groundwater modelling, incorporating updated

Residual void closure aspect	Closure objective			Residual void closure context	Management consideration
	Safety	Stability	Non-polluting		
				— Void lakes are predicted to form in the residual void post-mining. Water levels in the void lake are modelled to remain below the interpreted and modelled groundwater levels due to evaporative effects on the residual void lake. — The PTM residual void remains as groundwater sinks post-closure or any minor groundwater outflows remain within the mine closure landform and do not leave the tenure. — Modelling, including particle tracking, indicates that infiltration of rainfall through the spoil and other areas around the void within the tenure will migrate towards, and be captured within the residual void. Groundwater flow is not expected to flow off-tenure toward the receiving environment, minimising the risk of environmental harm due to the proposed final mine closure landform.	- void WBM outputs and in-field groundwater sampling data, as required. — Obtain certification from an appropriately qualified person that, upon completion of mining, residual void does not present an unacceptable risk of environmental harm beyond the tenure boundary.
Void water quality	-	-	✓	— Acidic conditions are not expected to establish within the PTM residual void. — TDS concentration in the PTM residual void will continue to increase over time but may be suitable for use for approximately 150 years following closure. In addition to the above, the PTM residual void does not present an unacceptable risk of environmental harm beyond that of the void itself as it: — is a NUMA. — remains as a groundwater sink over time or any minor groundwater outflows remain within the PTM mine closure landform. Void water quality should be interpreted in this context.	— At cessation of mining activities, review and update the void geochemical assessment including additional or refined data from in-pit surface water samples, surface- and groundwater samples, and biochemical modelling. — Obtain certification from an appropriately qualified person that the residual void will not present an unacceptable risk of environmental harm beyond the tenure boundary.
Void access control	✓	-	-	Access to the residual void will be restricted for humans and livestock.	Following cessation of mining activities:

Residual void closure aspect	Closure objective			Residual void closure context	Management consideration
	Safety	Stability	Non-polluting		
					— Construct a safety bund at the relevant geotechnical setback distance for each residual void high-wall. — Erect fencing and signage (where required) around the perimeter of the safety bund. — Erect fencing and signage around the perimeter of the woodland PMLU (where required). — Obtain certification from an appropriately qualified person that the residual void is safe to humans and livestock.

9 Conclusion

This void closure plan provides outcomes of technical studies completed to support closure planning and achievement of a safe, stable and non-polluting residual void at PTM and the suggested management measures. This void closure plan is an appendix to the PTM PRCP and has been compiled in terms of the requirements of the PRCP Guideline.

The documented technical studies – including water balance, hydrogeological, rehabilitation flooding, geochemical and geotechnical stability modelling, have been undertaken through an iterative approach with the development of the mine closure landform design. These iterations have resulted in a mine closure landform design that minimises the area of the void, provides protection from flood water, and contributes to minimising environmental harm as it relates to the final PTM residual void.

This plan (and associated supporting technical studies) may be required to be updated should amendments to the site's PRCP be required.

10 References

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Spatial information

GIS data associated with this application is available upon request to the Department of Environment and Science.

Information on how to make a request is available at:

<https://www.qld.gov.au/environment/pollution/licences-permits/public-register>