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 authority[1] in accordance with section 754 of the *Environmental Protection Act 1994* (EP Act).

Before completing this application form it is recommended that you:

- Read the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964[2]), 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).

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.

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[1] The Department of Environment and Science 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**.

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	
(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)	
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 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 *State Development and Public Works Organisation Act 1971*, 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 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 existing 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:	EPML00561913

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* BHP Mitsubishi Alliance (BMA)	TRADING NAME (*IF AN ORGANISATION) BMA
REGISTERED BUSINESS ADDRESS / RESIDENTIAL ADDRESS (NOT A POST OFFICE BOX) * Level 14, 480 Queen Street BRISBANE CITY Queensland 4000 Australia	POSTAL ADDRESS (*WHERE DIFFERENT) See registered business address
ABN / ACN (*IF AN ORGANISATION) TBD	NAME OF APPLICATION CONTACT* Trudy Mazucco
EMAIL* trudy.mazucco@bhp.com	TELEPHONE* 0475 300 433

☒ 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	☒ No – Provide details below.
	☐ Yes – Go to next section.

you like to use the details on the environmental application form?		
Provide the website address for the application notice and application documents.	www.bhp.com	
Provide details of the contact person if technical assistance is required.	NAME Trudy Mazucco	TELEPHONE 0475 300 433
	EMAIL trudy.mazucco@bhp.com	

Section 4 – Non-use management areas (new EA 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.

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

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 *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.*			
Describe the following:			
• each resource tenure, including the area of each tenure, to which the application relates;	Yes	1.1.2	-
• the relevant activities to which the application relates;	Yes	1.4.1	-
• the likely duration of the relevant activities	Yes	1.1.4	-

Include a detailed description, including maps, of how and where the relevant activities are to be carried out.	Yes	1.3	-
Consultation			
Include details of the consultation undertaken by the applicant in developing the proposed PRC plan.	Yes	2.1 2.2	-
Include details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.	Yes	2.2 2.3	-
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 with the outcome of consultation with the community in developing the PRC plan.	Yes	3.2	-
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	3.3	-
Non-use management area *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.*			
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	4.3	-

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	4.4	-
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).	NA	4	As outlined in Section 754 (3) of the EP Act and Section 6.3.2 of the PRCP 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 DNM due to the residual voids being authorised under Schedule E (Condition E9) of the LOD. BMA has transitional arrangements for residual voids as pre-approved NUMAs.
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.	NA	4	The EA is the LOD for Daunia Mine and it is included in the PRCP as Appendix A (Part C of DNM PRCP)
Rehabilitation and management methodology *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.*			
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	6	-
For each non-use management area, state the applicant's proposed methodology for achieving best practice management of the area to	Yes	6	-

support the management milestones under the proposed PRCP schedule for the area.			
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	7	-
PRCP Guideline			
Include any other information prescribed by the administering authority in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964).	Yes	8	Monitoring and maintenance
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	10	Spatial data submitted as per requirements
Other information			
Include the other information the administering authority reasonably considers necessary to decide whether to approve the PRCP schedule.	Yes	Part C: Appendices	Supporting studies and information included in Part C: Appendices

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	10	Summarised in Section 10, but also submitted separately in the PRCP schedule template
Include maps showing all of the land mentioned in the PRCP schedule, as it relates to being progressively rehabilitated.	Yes	10	-

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? *	As outlined in Section 754 (3) of the EP Act and Section 6.3.2 of the PRCP 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 DNM due to the residual voids being authorised under Schedule E (Condition E9) of the LOD. BMA has transitional arrangements for residual voids as pre-approved NUMAs. As per the PRCP Guideline, if a NUMA has already been identified in a LOD, 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

[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**.

	approved NUMAs. However, DNM is still required to meet the legislative requirements under Section 126C(1)(d) of the EP Act. As the LOD does not state the area or the location of the proposed NUMAs, the PRCP Guideline (in terms of s754(4) of EP Act) also requires this PRC Plan to include detail on how the total area will be minimised and/or how the location of the proposed NUMAs will minimise risk to the environment. See Section 4.2 for specific details on minimising the extent of the NUMAs.
If the location is not identified – how will the EA holder ensure the location of the land to which the outcome relates minimises risks to the environment? *	See comment above and Section 4.2 for specific details on the final location and extent of the NUMAs, and how these will not present an unacceptable risk of environmental harm outside of the tenure boundary.

Section 8 – Transitional PRC plan requirements (transitional applications only)

In accordance with transitional provisions in the EP Act, an applicant with an existing EA 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		
EA Table E1: Woodland habitat	RA1	RM3,RM5, RM8, RM11, RM14	☒	☒	EPML00561913	In EA: 14-18
EA Table E1: Cattle Grazing	RA2	RM3, RM4, RM7, RM10, RM13	☒	☒	EPML00561913	In EA: 14-18

Watercourse	RA3	RM1, RM3, RM6, RM9, RM12, RM15	☐	☐	-	-
EA Table E1: Cattle Grazing	RA4	RM10, RM16	☒	☒	EPML00561913	In EA: 14-18
EA Table E1 Cattle Grazing	RA5	RM1, RM2,RM3, RM4, RM7, RM10, RM13	☒	☒	EPML00561913	In EA: 14-18
Each land outcome document must be submitted with this approved form						
☒ All land outcome documents identified above have been attached to this approved form.						

EA condition 9 Residual voids as a pre-approved NUMA	IA1	MM1, MM2, MM3	☒	☒	EPML00561913	In EA: 18
Insert.	Insert.	Insert.	☐	☐	Insert.	Insert.
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.						

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 *Environmental Protection Act 1994* to give to the administering authority or an authorised person a document containing information that I know is false, misleading or incomplete 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 *Right to Information Act 2009* and the *Evidence Act 1977*.
- I will comply with all conditions and milestones of my approved PRCP schedule as well as any relevant provisions in the *Environmental Protection Act 1994*.
- 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	POSITION	COMPANY / ORGANISATION
BHP Mitsubishi Alliance (BMA)	-	BMA

APPLICANT'S SIGNATURE	DATE
Ditton, Susan — Digitally signed by Ditton, Susan DN: cn=Ditton, Susan, o=BHP Billiton Group Operations Pty Ltd, ou=MULTI-ALLOWED Date: 2023.06.08 10:49:58 +10'00'	8/06/2023

Joint holder(s) signature if applicable

NAME, POSITION AND COMPANY NAME	SIGNATURE	DATE
Insert.		Select.
NAME, POSITION AND COMPANY NAME	SIGNATURE	DATE
Insert.		Select.

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 and Science 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**
2. **Table of contents**
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.
   - 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.
   - 3.4. **Non-use management areas (if applicable)**: This section will include the justification for the NUMA and details of each nominated NUMA.
   - 3.5. **Rehabilitation management methodology**: This section will include information describing how the proposed rehabilitation and management methodology have been develop and will be implemented.
   - 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.
   - 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.
4. **Appendices and attachments**: The completed PRCP schedule and any relevant required reports/plans are to be included in this section.

A PRC plan must contain a cover page including the following information:

- Title of the project
- Document title
- Version number
- Document ID number
- Date of submission
- Tenure number(s)
- EA holder name
- EA holder contact details

A PRC plan must contain a table of contents including the following information:

- Sections of PRC plan
- Sub-sections of PRC plan
- Figures, tables and maps (as applicable)

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 EA)

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)

Table 2: Schema for PRC plan

Field Name	Type	Length	Definition	Domain Values[4]	Domain Value Description	Mandatory/ Optional
FID	Object ID	N/A	The unique identifier for the spatial feature.			Mandatory
SHAPE	Geometry	N/A	Allowed Geometry: Polygon			Mandatory
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 PRCP schedule proposes or changes a non-use management area
				IMPRV_AREA	Improvement area	Mandatory if the PRCP schedule proposes or changes a non-use management area
				FOOTPRINT	Maximum disturbance footprint over mine life	Mandatory
				SR	Sensitive receptor	Mandatory

[4] If blank, populate based on Attribute type and definition.

Field Name	Type	Length	Definition	Domain Values[4]	Domain Value Description	Mandatory/ Optional
				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.	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_	DATE	dd/mm/ yyyyy	Date of submission. This field identifies the date the spatial information was submitted.			Mandatory
SOURCE	TEXT	5	This field identifies the source of the spatial information and the capture methodology for the spatial information provided.	DIG	Digitising (Tracing over Ortho Imagery)	Mandatory
				GPSD	GPS Differential Survey	

Field Name	Type	Length	Definition	Domain Values[4]	Domain Value Description	Mandatory/ Optional
				GPSND	GPS Non Differential Survey	
				RTK	Real-Time Kinematic (RTK) Survey	
				UK	Un Known	
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

BHP Mitsubishi Alliance

Progressive Rehabilitation and Closure Plan

Daunia Mine

Status: Proposed

Version: 0 (1 July 2023)

Business Owner: Daunia Mine

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Tenure Number(s)

ML1781, ML70115 and ML70116 (part)

EA holder name(s)

QCT MINING PTY. LTD.
Mitsubishi Development Pty Ltd
BHP COAL PTY LTD
QCT Resources Pty Limited
QCT INVESTMENT PTY. LTD.
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Glossary of terms and abbreviations

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

Term / Abbreviation	Description
3P	Perennial, productive and palatable (3P) grasses
Administrating authority	Department of Environment and Science (Queensland)
AEP	Annual exceedance probability
AHD	Australian height datum
AMD	Acid and metalliferous drainage (AMD). Includes acid/acidic drainage (AD), pH-neutral metalliferous drainage (NMD) and sulphide-derived saline drainage (SD) – and/or any combination of these
ANC	Acid neutralising capacity
AQP	Appropriately qualified person (AQP): a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature
AR&R	Australian Rainfall and Runoff guideline
BBAC	Barada Barna Aboriginal Corporation
BMA	BHP Mitsubishi Alliance
BOM	Bureau of Meteorology
CCP	Community Consultation Plan
CEC	Cation exchange capacity
CHPP	Coal handling and preparation plant
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DEM	Digital elevation model
DES	Department of Environment and Science (Queensland) (the administrating authority)
DM	Dry matter (with reference to vegetation)
DNM	Daunia Mine
DoR	Department of Resources (Queensland) (previously referred to as the Department of Natural Resources, Mines and Energy)
EA	Environmental Authority (in terms of the *Environmental Protection Act 1994*, Queensland)
EC	Electrical conductivity
EP Act	*Environmental Protection Act 1994* (Queensland)
EPP (Water)	Environmental Protection (Water) Policy 2009
ERA	Environmentally relevant activities (in terms of the *Environmental Protection Act 1994*, Queensland)
ERC	Estimated Rehabilitation Cost

Term / Abbreviation	Description
ERD	Effective rooting depth
ESA	Environmentally sensitive area
ESP	Exchangeable sodium percentage
Fine rejects	More commonly known as tailings. Disposed within tailings storage facilities (TSFs)
FoS	Factor of safety
GDE	Groundwater dependant ecosystems
GED	General environmental duty
GMA	Groundwater management area
HVR	High value regrowth
IA	Improvement area "…for a NUMA, means an area of land in the NUMA to which a management milestone for the NUMA relates" (PRCP Guideline, 2023)
IDC	Index of Diversion Condition
Interburden	Mineral (mining) waste located between mined coal seams.
IPCC	Intergovernmental Panel on Climate Change
IRC	Isaac Regional Council
LGA	Local Government Area
LOD	Land outcome document
LSA	Land suitability assessment
MERFP Act	*Mineral and Energy Resources (Financial Provisioning) Act 2018* (Queensland)
MIA	Mine industrial area
Milestone criteria	"…for a management milestone or a rehabilitation milestone, means a requirement that must be met to achieve the milestone" (PRCP Guideline, 2023)
Mine waste	Material comprising overburden, ± tailings, ± rejects, ± waste coal. Sometimes called 'mineral waste' or 'mining waste'
ML	Mining lease
MM	Management milestone "…for a NUMA, means 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)" (PRCP Guideline, 2023)
MPA	Maximum potential acidity
MPR	Mixed plant rejects
MSES	Matter of state environmental significance
NAF	Non-acid forming
NC Act	*Nature Conservation Act 1992* (Queensland)
NMD	Neutral and metalliferous drainage
NUMA	Non-use management area

Term / Abbreviation	Description
Overburden	Mineral (mining) waste located above coal seams
PAF	Potentially acid forming
PFAS	Perfluoroalkyl and Polyfluoroalkyl Substances
PMF	Probable maximum flood
PMLU	Post-mining land use "…for land, means the purpose for which the land will be used after all environmentally relevant activities carried out on the land have ended (section 112 of the EP 1994)" (PRCP Guideline, 2023)
PRC Plan	Progressive Rehabilitation and Closure Plan "…for land the subject of an ineligible mining activity, means a progressive rehabilitation and closure plan for the land that consists of two parts - • the rehabilitation planning part – PRC Plan, and • the approved part - PRCP Schedule that includes milestones and conditions" (PRCP Guideline, 2023)
PRCP Guideline	Progressive Rehabilitation and Closure Plan Guideline (April 2023) (DES, Queensland)
Qld	Queensland
QR	Queensland Rail
RA	Rehabilitation area "…for a PMLU, means an area of land in the PMLU to which a rehabilitation milestone for the post-mining use relates" (PRCP Guideline, 2023)
RCM	Rangal Coal Measures
RCP	Representative Concentration Pathway
RE	Regional ecosystems
Rejects	Coarse sand to cobble-sized rock material produced during coal processing
Residual void	An open pit resulting from the removal of ore and/or waste rock that will remain following the cessation of all mining activities and completion of rehabilitation processes
RM	Rehabilitation milestone "…for the rehabilitation of land, means each significant event or step necessary to rehabilitate the land to a stable condition (section 112 of the EP Act)" (PRCP Guideline, 2023)
ROM	Run-of-mine
RRR	Residual risk rating (with reference to the risk assessment)
SD	Saline drainage
SMART	Specific, measurable, achievable, reasonable/relevant, time-specific
SMP	Site Management Plan
SMU	Soil mapping unit
Spoil	Rock material overlying and between 'target' coal seams, which will report as waste

Term / Abbreviation	Description
Spoil dumps	Landform containing mine waste or mineral waste. Also may be referred to as waste rock dumps
SPR	Source-pathway-receptor
SQP	Suitably qualified person (SQP): for performing a regulatory function, means a person who has qualifications and experience relevant to performing the function. A regulatory function may only be performed by a suitably qualified person.
SRTM	Shuttle Radar Topography Mission
STAC	Smart Transformation Advisory Council
Tailings	Very fine to medium grained sand, silt and clay-sized material produced during coal washing
TDS	Total dissolved solids
TLO	Train load-out
Transitional PRC Plan	"…means the holder of an existing EA for an ineligible mining activity relating to a mining lease that is transitioning into the new PRC Plan framework" (PRCP Guideline, 2023)
TSF	Tailings Storage Facility
VL	Vermont Lower coal seam
VM Act	*Vegetation Management Act 1999* (Queensland)
Waste coal	Sub-economical coal that reports to the spoil dumps as waste
WBNM	Watershed Bounded Network Model
WEPP	Water erosion prediction program
WQO	Water quality objectives

INTRODUCTION

Daunia Mine (DNM), operated by BHP Mitsubishi Alliance (BMA) as agent, is a metallurgical coal mine located in the Bowen Basin, Queensland.

This transitional Progressive Rehabilitation and Closure Plan (PRC Plan) has been prepared for DNM 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 (PRCP Guideline) (DES, 2023).

Environmentally relevant activities (ERA) at DNM are chemical storage, sewage treatment, resource recovery and transfer facility, mineral processing and mining black coal. They are undertaken under the conditions of the site's Environment Authority (EA) EPML00561913, provided in Appendix A.

Environmental Authority Holder:	**QCT MINING PTY. LTD; Mitsubishi Development Pty Ltd; BHP COAL PTY LTD; QCT Resources Pty Limited; QCT INVESTMENT PTY. LTD; Umal Consolidated Pty Ltd; BHP Queensland Coal Investments Pty Ltd.**
Environmental Authority Number:	**EPML00561913 (30 June 2022)**
Land description	**ML1781, ML70115, ML70116 (part)**

This PRC Plan comprises two parts:

- Section A: Rehabilitation planning part - provides information about the site, details the rehabilitation methodologies and techniques, and includes evidence and justification to support the development of the proposed PRCP Schedule; and
- Section B: PRCP Schedule - includes maps of rehabilitation and closure outcomes for the site, and tables of time-based rehabilitation milestones.

This PRC Plan also includes Section C: Appendices, providing specialist studies and technical assessments used to support the development of the PRC Plan.

TRANSITIONAL PROVISIONS

Part 27, Chapter 13 of the EP Act sets out the transitional provisions following the commencement of the MERFP Act. In particular, BMA is a 'mining EA holder' for the purposes of the transitional provisions on the basis that, on commencement of the MERFP Act, BMA was "*the holder of an environmental authority* (EPML00561913) *for a mining activity relating to a mining lease authorising operations*" at DNM (section 750, EP Act).

Furthermore, Section 6 of the PRCP Guideline makes provision for "*existing EA holders who must transition into the new PRC Plan framework*". As DNM has an approved EA, the site falls under the ambit of the requirements of a transitional PRC Plan.

Based on the requirements of Section 6 of the PRCP Guideline, the following underpin this PRC Plan:

- In accordance with transitional provisions (section 750, EP Act), the DNM EA (EPML00561913) is an approved land outcome document (LOD).
- A Transition Notice for DNM was issued to BMA by the administrating authority, dated 25 November 2020 (Appendix B). This Transitional Notice requires submission of the DNM PRC Plan and PRCP Schedule by 01 July 2023.
- The Transitional Notice was issued following a pre-notification meeting held between the administrating authority and BMA, on 25 November 2020. This PRC Plan is based on the key aspects agreed on by the

administrating authority during these meetings, as documented in the PRCP BMA – Daunia Mine memorandum dated 11 November 2020, provided in Appendix C.

- Prior to the PRC Plan submission, pre-lodgement discussions were held between the administrating authority and BMA between 4 May 2023 and 12 June 2023 to present the draft Plan and PRCP Schedule and identify any notable gaps or refinements needing to be addressed prior to the final submission.

Aligned to the above, and the PRCP Guideline requirements, the following process for transitioning rehabilitation and closure outcomes from the DNM EA into the site's PRCP Schedule has been followed:

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

KNOWLEDGE BASE REFINEMENT

Compilation of this PRC Plan has been supported by the rehabilitation and closure-related knowledge base for DNM at the time of submission of this PRC Plan (01 July 2023). Relevant studies contributing to this knowledge base have been referenced throughout this PRC Plan, with key resources provided in Part C: Appendices.

As highlighted by the International Council of Mining and Metals in the Integrated Mine Closure Good Practice Guide, 2nd Edition (2019), "*the collection, updating, use and review of the knowledge base is considered an ongoing and iterative process over the mine life, and will be used to inform iterative refinement and improvement of the rehabilitation and closure planning process over time*". As the rehabilitation and closure knowledge base for DNM develops over the life of the operation, it will be used to inform ongoing refinement of the plans for rehabilitation and closure, as well as this PRC Plan as required.

A: REHABILITATION PLANNING

1 PROJECT PLANNING

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.*

PRCP 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 PRCP Schedule. The spatial information must show the locations of the rehabilitation and improvement areas for a 10-year period (minimum).

1.1 Project description

1.1.1 Geographic location

DNM is metallurgical coal resource located approximately 25km east, south-east of the town of Moranbah in the Bowen Basin, and approximately 170km south-west of Mackay (Queensland) (Figure 1).

The mine is directly to the east of the Poitrel Mine (owned by Stanmore Resources Limited (Stanmore)) and south of the Millennium Mine (owned by MetRes Pty Ltd).

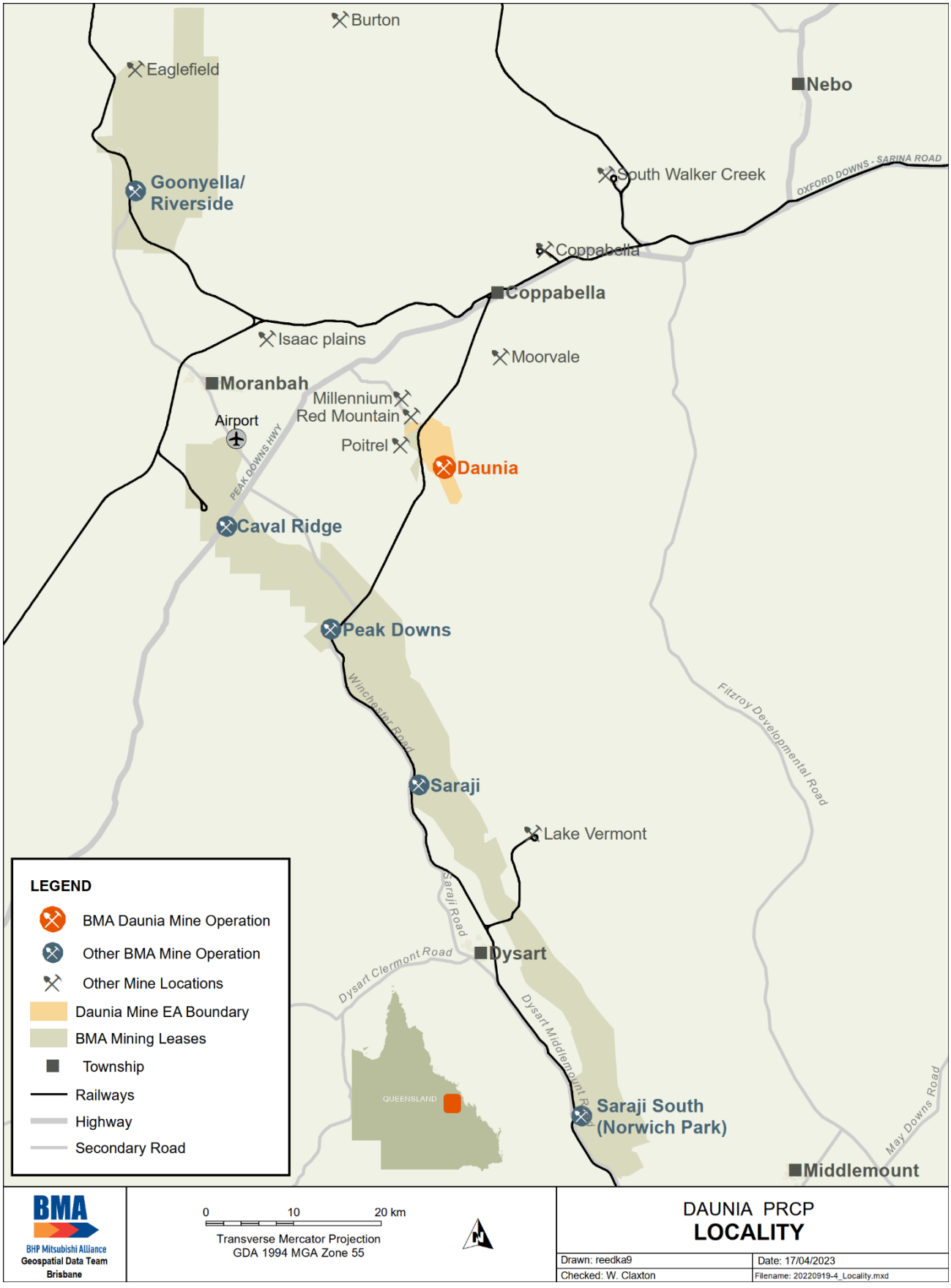

Figure 1: DNM location map

1.1.2 Mining tenements

DNM operates on the mining leases (MLs) provided in Table 1 and illustrated in Figure 2. The DNM EA covers 2,816 hectares (ha). Coal mining activities occur on ML70115, ML1781 and ML70116. The coal handling and preparation plant (CHPP) is located on ML70116. ML70116 is a joint ML that is subject to a Joint Tenement Agreement between BMA and Stanmore. The DNM EA (EPML00561913) and the Poitrel Mine EA (EPML00963013) both refer to ML70116. The DNM PRCP covers the portion of the ML reflected in Figure 2. This is consistent with the treatment of ML70116 in the Estimated Rehabilitation Cost (ERC) calculation that was approved by the administering authority on 24 February 2023 for DNM.

Table 1: DNM mining tenements

Lease number	Name	Date granted
ML1781	Daunia	22 Dec 1983
ML70115	Daunia East	28 Aug 1997
ML70116 (part)	Red Mountain	08 July 2004

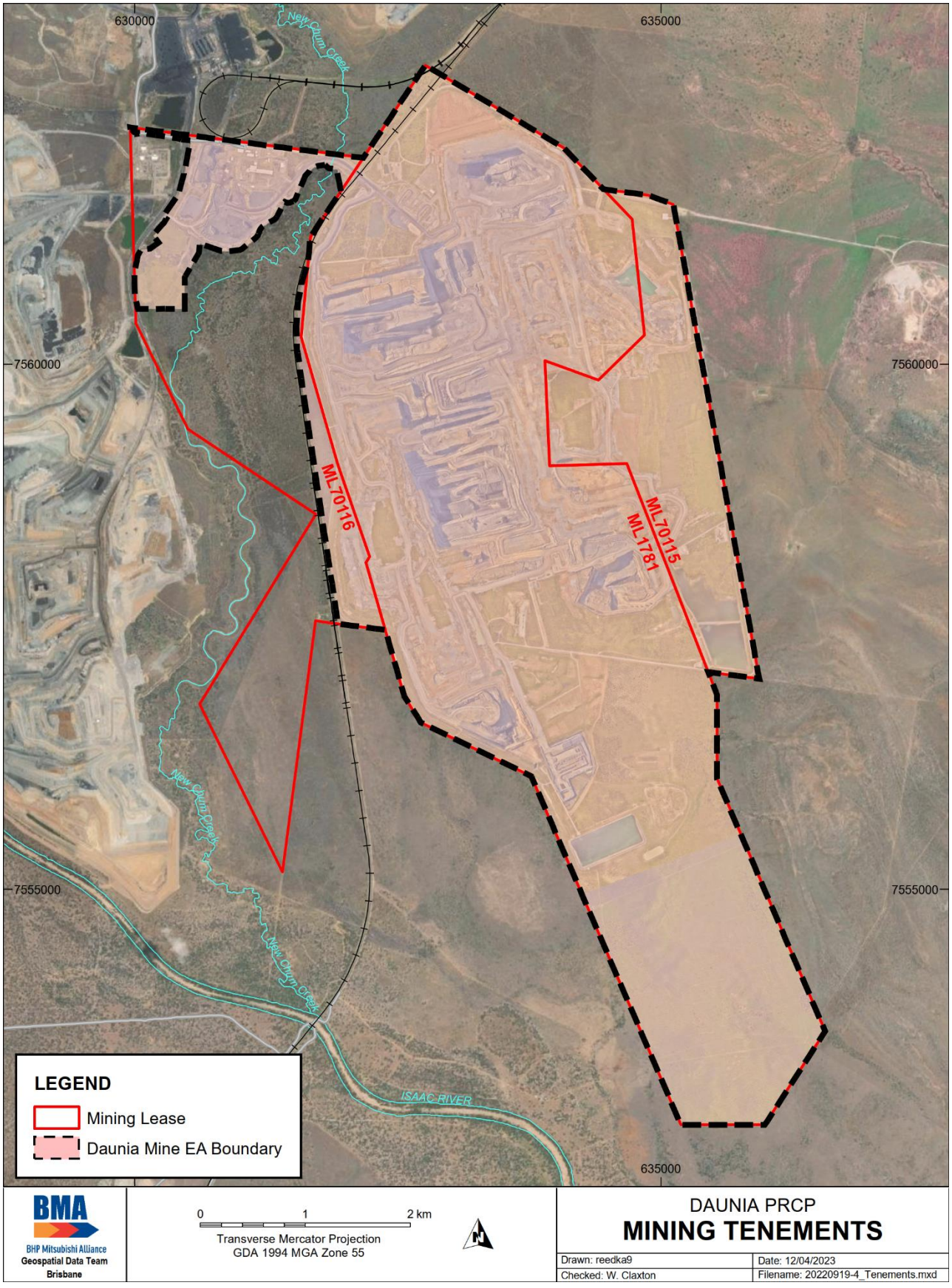

Figure 2 DNM mining tenements

1.1.3 Primary mine features and infrastructure on-site

The current primary features and infrastructure at DNM are summarised in Table 2. The current site layout is shown in Figure 3.

Table 2: Primary mine features and infrastructure at DNM

Mine domain	Mine feature name
Pits and spoil dumps	• Atlas West/East[1] • Calypso Central[1] • Skoll[1] • Titan North/Central/West[1]/East • Pandora
Stockpiles	• Run-of-mine (ROM) coal stockpiles • Coal stockpiles • Topsoil stockpiles • Rock stockpiles
Dams	• Mine water dams • Raw water dams • Sediment dams
Processing infrastructure	• Coal handling and preparation plant (CHPP) • Conveyors and transfer stations • Stackers and reclaimers • Surge bins and hoppers • Tunnels
General infrastructure	• Administration, crib, warehouse and various buildings • Workshop • Fuel, oil, chemical and water storage • Fuel and wash bays • Sewage treatment plant • Pipes and pumps • Power lines • Switchyard and substations • Communications and lighting towers • Fences
General disturbance	• Laydown areas

[1] These pits will be progressively backfilled during operations with no remaining residual void at closure.

Mine domain	Mine feature name
	• Access roads • Haul roads • Drains • Exploration
Rail infrastructure	• Rail line (owned by Queensland Rail (QR))

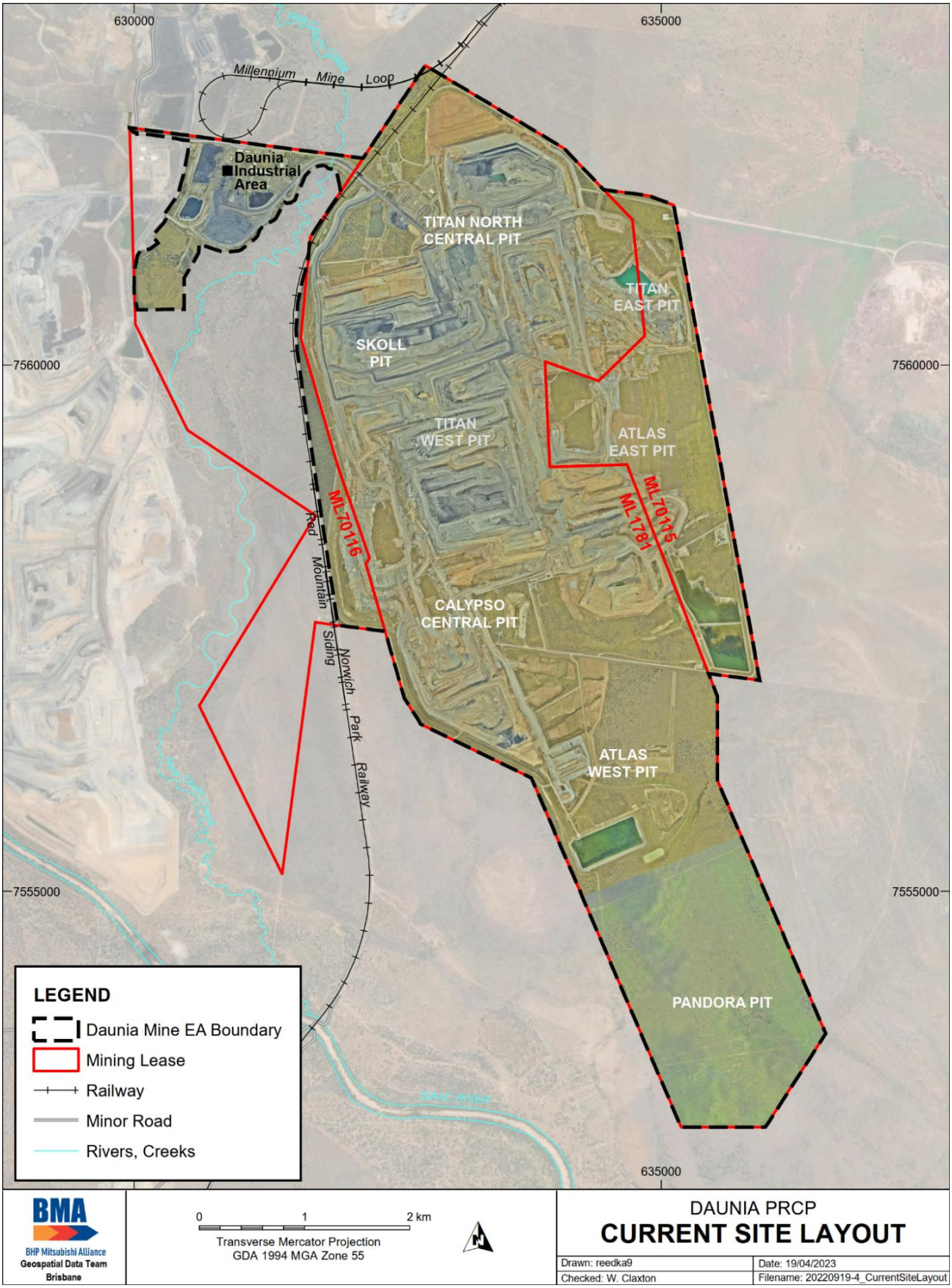

Figure 3: DNM current site layout

DNM is an open cut strip mine using truck and shovel and dozer fleets. Due to the formation of the coal deposit, strips are orientated and progress in multiple directions.

Mining activities at DNM involve the removal and stockpiling of topsoil, drilling and blasting of overburden and interburden, mining of overburden and interburden by truck and shovel fleets, and mining of the coal by truck and shovel fleets. The majority of the overburden and interburden is placed in spoil dumps within the mined out void of the previous strips.

Coal is hauled from the pits to the CHPP ROM area, or to designated stockpiles. The coal is processed at the CHPP and the product coal is conveyed to the train load-out (TLO) on the adjacent Red Mountain Infrastructure (RMI) site (Stanmore). Fine rejects from the CHPP are dewatered via belt press filters. The fine and coarse rejects are hauled and co-disposed within the spoil dumps.

Product coal is transported by rail to the Hay Point Coal Terminal for export.

1.1.4 Proposed duration of the operation

Operations at DNM commenced in 2013. The approved areas within the EA are planned to be mined at current mining rates until 2051. Variations to the planned mining rates due to business or market conditions, or refined resource information may change the proposed duration of the operation, and as a result, when necessary, a PRCP amendment would be submitted to Department of Environment and Science (Queensland) (DES).

1.2 Baseline information

PRCP 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 PRCP 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.

1.2.1 Site topography

DNM lies within the northern area of the Queensland Bowen Basin. The topography of DNM is generally of low relief and dominated by flat to gently undulating rural plains. Elevations across DNM ranges from approximately 240m Australian Height Datum (AHD) in the north to 190m in the south, grading southwest towards New Chum Creek and the Isaac River.

The regional topography of the Bowen Basin is dominated by flat to gently sloping landforms and low rolling hills, flanked by the Cherwell Range in the west and the Connors Range in the east.

1.2.2 Climate

DNM is located in a semi-arid climatic zone, which is characterised by high summer temperatures, warm dry winters and a distinct wet and dry season. Weather data was collected at the Moranbah Water Treatment Plant (Station No. 034038) between 1972 and 2012; and since 2012 it has been collected at the Moranbah Airport (Station No. 034035) (BoM, 2021).

1.2.2.1 Temperature

Maximum average temperatures range from 24°C in June/July to 34°C in December/January, with minimum average temperatures ranging from 10°C in July to 22°C in January.

1.2.2.2 Rainfall

Although rainfall occurs throughout the year, it is more prevalent in the summer months (December, January and February) (Table 3).

Table 3: Moranbah monthly average rainfall for station no. 034038 and station no. 034035

Month	Station no. 034038 (mm)	Station no. 034035 (mm)
January	103.8	88.0
February	100.7	100.5
March	55.4	92.6
April	36.4	23.8
May	34.5	30.1
June	22.1	16.7
July	18.0	28.0
August	25.0	9.0
September	9.1	8.3
October	35.7	24.0
November	69.3	38.3
December	103.9	55.3
Annual	**614.2**	**514.6**

1.2.2.3 Evaporation

The evaporation rate is highest in the summer months - mean daily rate of 8.5mm in December; and lowest in the cooler months - mean daily rate of 3.5mm in June. The annual average rate of evaporation is approximately 2,300mm, which greatly exceeds the annual rainfall, a characteristic of semi-arid environments.

1.2.2.4 Wind

Wind records for Moranbah for January-April show an easterly predominance of moderate strength (1 - 20km/h), with easterlies dominating in May-July with some south-easterly influence. Easterly winds predominate for August-December which tends north to north-easterly from October to December.

1.2.2.5 Long-term climate projections

To account for potential future climate uncertainties within hydrologic designs and mine water planning, this PRC Plan and supporting technical studies have utilised the BHP Guideline for Climate Change Adaptation in Mine Water Planning and Hydrologic Assessments (BHP, 2020). This guideline was developed specifically for the locations containing BHP Queensland coal assets to provide a consistent approach to the adoption of future climate variables. The approach and baseline data, on which the guideline was based, has been derived from Commonwealth Scientific and Industrial Research Organisation (CSIRO), Bureau of Meteorology, DES and other published sources, and is aligned with the published projection database and methods including Consistent Climate Scenarios Projection Data and High-Resolution Projection Data (http://longpaddock.qld.gov.au/qld-future-climate/data-info/tern/).

1.2.3 Geological setting

DNM is located on the western limb of the northern Bowen Basin. The Bowen Basin (at DNM) is characterised by a relatively thin accumulation of sediments, gentle easterly dips and minor to moderate deformation. DNM lies near the western boundary of one of the sedimentary troughs, the Taroom Trough, which was filled by a thick accumulation of mainly terrestrial sediments during the Permo-Triassic period. DNM occurs within a shallow basinal structure immediately east of the New Chum Fault, which separates DNM from the Poitrel Mine deposit to the west. New Chum Creek, which flows from north to south between DNM and Poitrel Mine, broadly follows the fault line.

The coal bearing sequences at DNM are the late Permian-age Rangal Coal Measures (RCM), comprising the following seam groups in stratigraphic order, from youngest to oldest:

- Leichhardt Seam: L1, L2 and L3 plys (when combined L1 and L3 plys together are referred as L13 ply)
- Lower Leichhardt Seam: L4 ply
- Upper Vermont Seam: V1, V2 and V3 plys (when combined V2 and V3 plys together are referred as V23 ply. V23 is sub-economic and not mined)
- Lower Vermont Seam: Vermont Lower (VL) ply (not mined)

Non-coal Permian sediments consist of moderately weak to strong sandstones, siltstones, minor mudstones and carbonaceous mudstones. Sandstone units are commonly greater than 2m thick. Interbedded and interlaminated siltstone occurs within some sandstone units. The Yarrabee Tuff ‘marker horizon’ is widespread throughout the RCM and at DNM is located immediately above the VL ply.

Due to the eastward dip of the seams, the location of the weathered zone ranged from above the Leichhardt seam at the start of mining operations to the current location (at the highwall) above the Vermont seam in Titan North/Central Pit and Titan East Pit.

Geological cross-sections are provided in Figures 4-6.

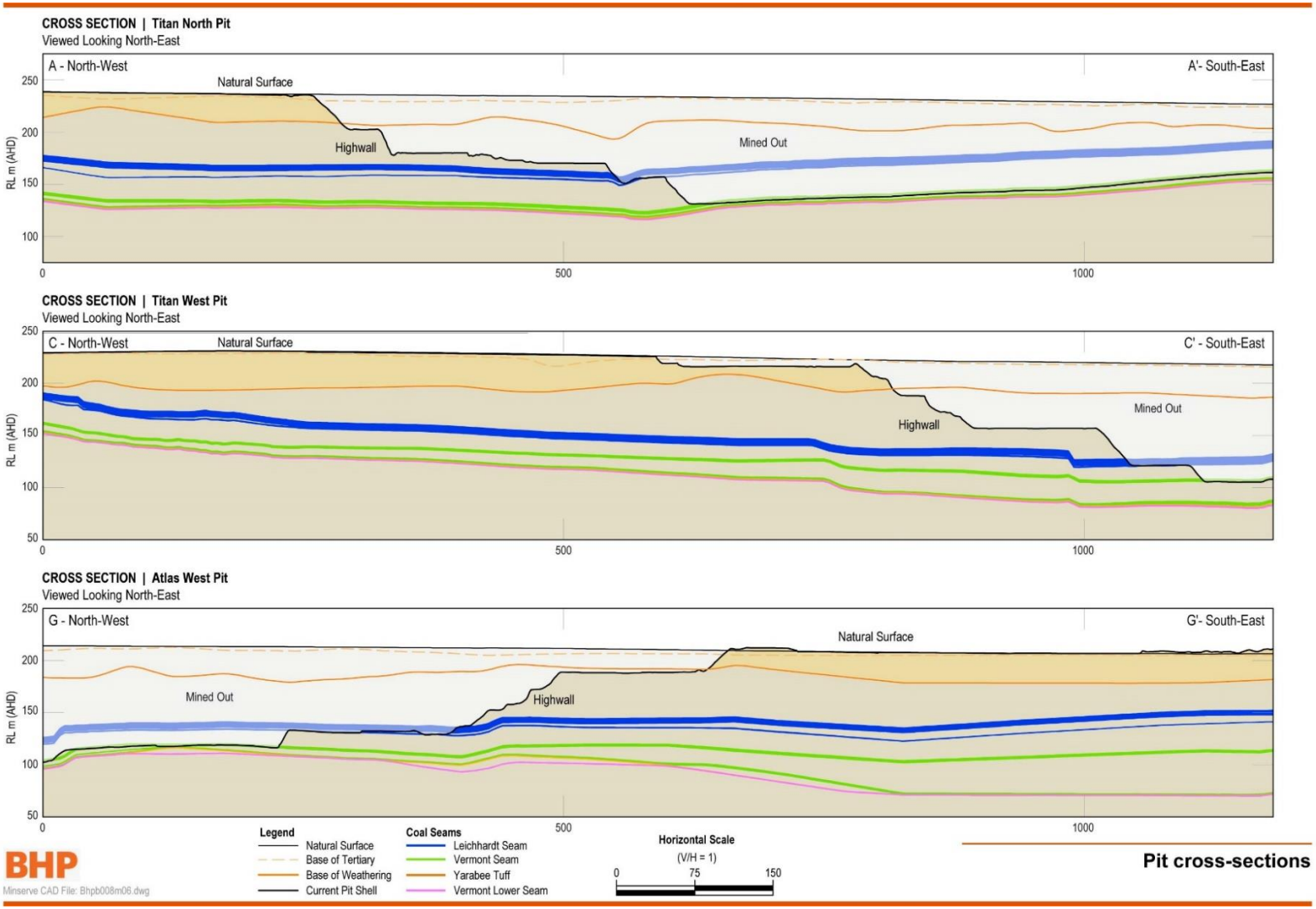

Figure 4: Geological cross-section of DNM - Titan North, Titan West and Atlas West pits

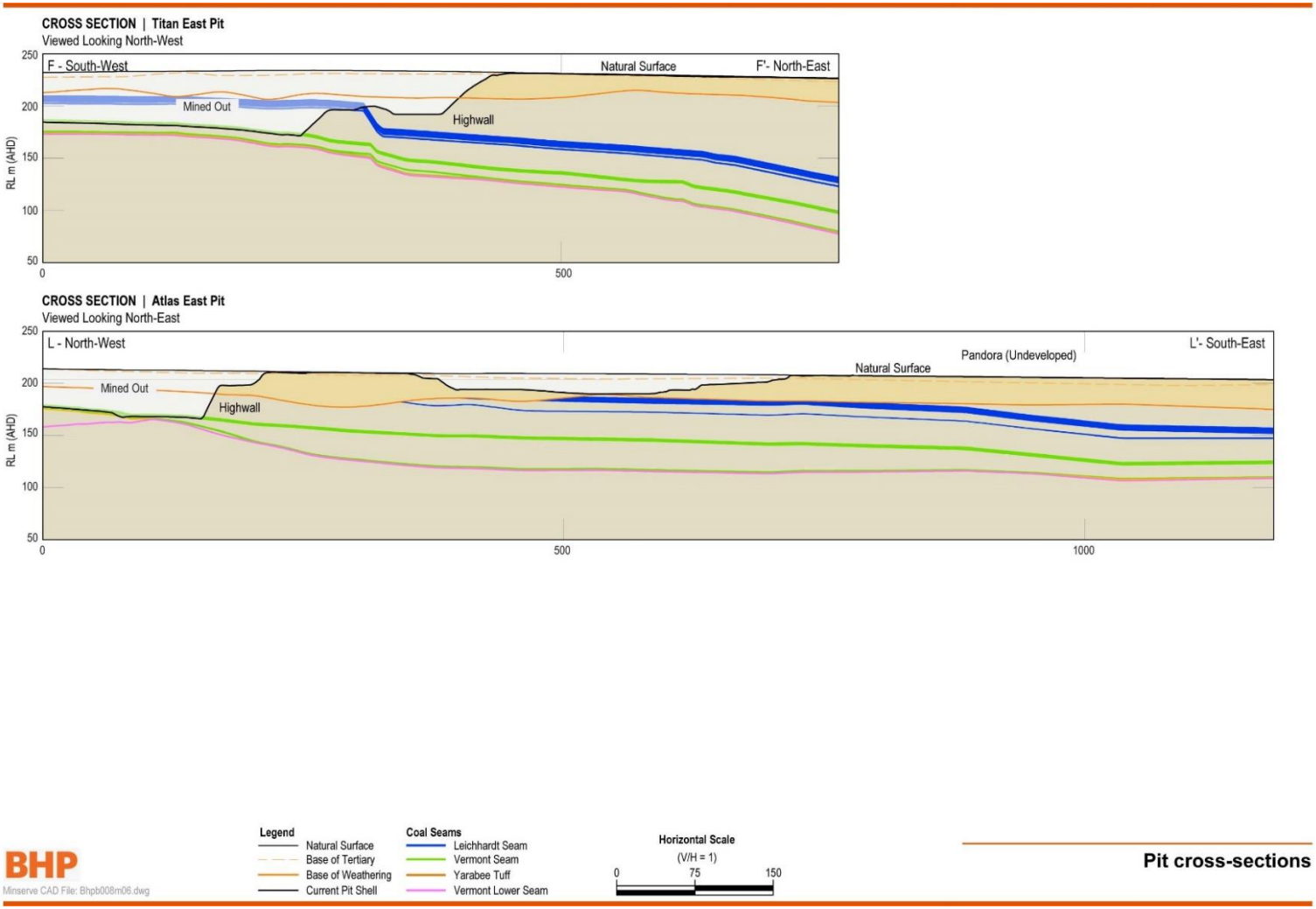

Figure 5: Geological cross-section of DNM –Titan East and Atlas East pits

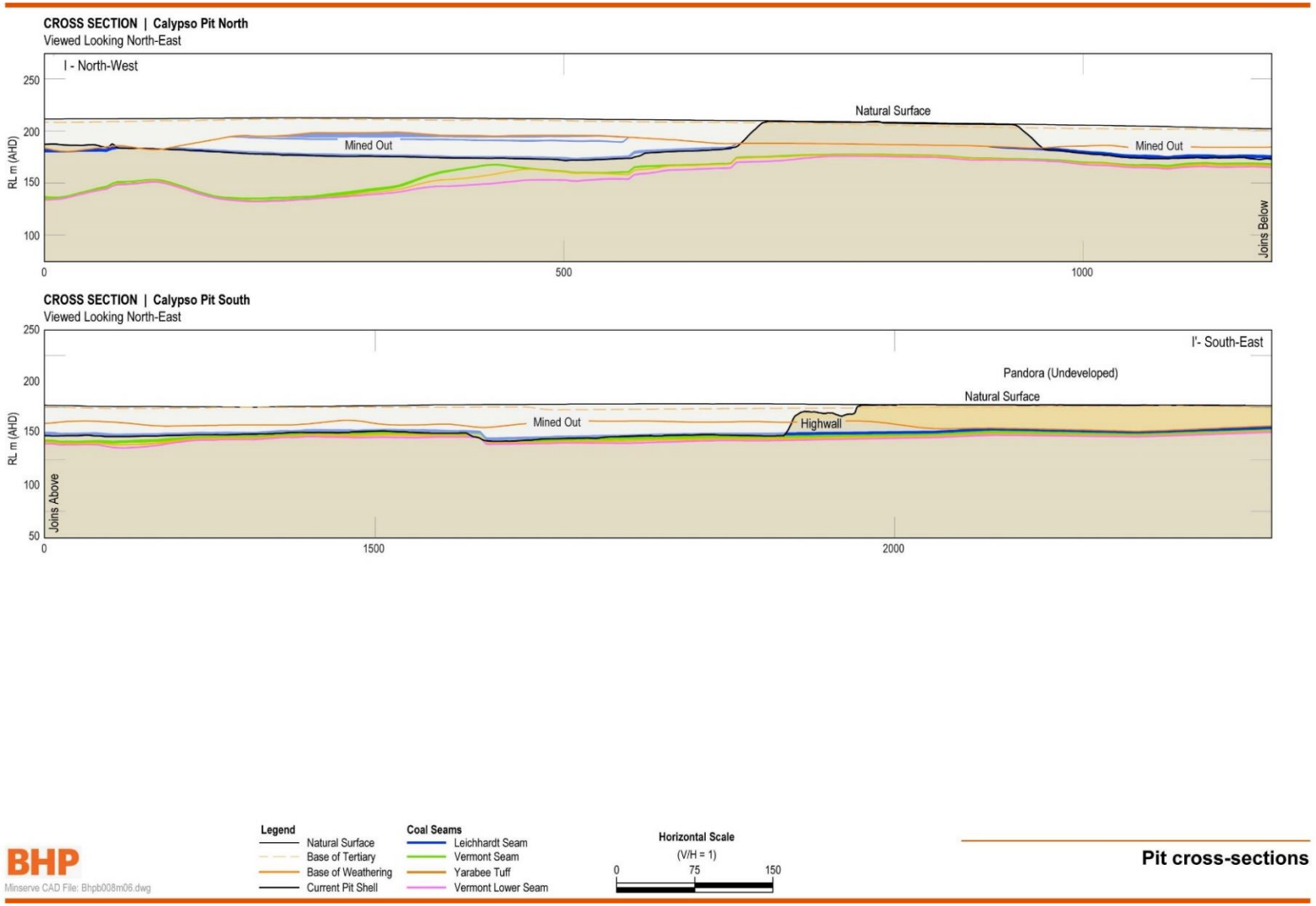

Figure 6 Geological cross-section of DNM – Calypso North and Calypso South pits

1.2.4 Site hydrology and fluvial networks

DNM is located within the Isaac River Sub-basin within the Fitzroy Basin, with the Isaac River located approximately 1km to the west at its closest point from the western boundary of ML1781. The area covered by the EA is in the Upper Isaac River catchment and the Isaac Northern Tributaries sub-catchment.

The Isaac River Sub-basin has a total area of approximately 22,327km^2 and the total Fitzroy Basin has an area of approximately 142,482km^2. From a broad regional context, the area covered by the DNM operations (~28km^2) represents approximately 0.12% of the Isaac River Sub-basin.

The Isaac Northern Tributaries sub-catchment is covered under the *Environmental Protection (water and wetland biodiversity) Policy 2019*, Department of Environment and Heritage Protection (2011) Isaac River Sub-basin Environmental Values and Water Quality Objectives Basin No. 130 (part), including water of the Isaac River Sub-basin (including Connors River) (DEHP, 2011). The nominated environmental values of the sub-catchment are summarised in Table 4.

Table 4: DNM surface water Environmental Values

Sub-catchment	Aquatic ecosystems	Irrigation	Farm supply/ use	Stock water	Aquaculture	Human consumer	Primary recreation	Visual recreation	Drinking water	Industrial use	Cultural and spiritual value
Isaac Northern Upland Tributaries	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Illustrated in Figure 7 is the location of the operations and the receiving watercourses and drainage lines. The mine voids and spoil dumps (mining areas) at DNM are located between New Chum Creek to the west, North Creek to the east and the Isaac River to the south. The DNM operated mine industrial area (MIA) and CHPP area is located at the northern end of the joint ML70116 with New Chum Creek immediately to the east. The MIA and CHPP areas are connected to the mining areas via a haul road over New Chum Creek. Pre-mining, surface water flows from the majority of the mining area was transported to the Isaac River via drainage lines and other unnamed and *Water Act 2000* unmapped watercourses. The northern most mining area, and the location of the Titan East residual void, is at the headwaters of an unnamed and *Water Act 2000* unmapped watercourse that drains to the east and into North Creek.

Overland flows within mining disturbed areas are captured and managed through on-site dams. Captured water is utilised within the operations or released as required under the conditions specified in the EA.

The Isaac River flows into the Mackenzie River approximately 130km to the south. The Mackenzie River in turn flows into the Fitzroy River, which discharges into the Coral Sea at Rockhampton.

The watercourses and drainage lines in the proximity of DNM are ephemeral and only flow for short periods after rainfall. Except for the Isaac River, the watercourses do not support semi-permanent or permanent waterholes. The only major hierarchy waterway within proximity of DNM is the Isaac River, which does support a regionally important Quaternary alluvial groundwater aquifer.

The watercourses and drainage lines in the immediate proximity of DNM are summarised within Table 5.

Table 5: Watercourses and key drainage lines within and immediately surrounding DNM

Watercourse	Perennially	Hierarchy	Strahler stream order	Comment
Isaac River	Non-Perennial	Major	6	Flows in a south easterly direction past the southern end of DNM approximately 1km from the mining leases at its closest point.
New Chum Creek	Non-perennial	Minor	3	Flows past the Millennium Mine and through RMI ML to the north before passing under the DNM haul road. Flowing through the Poitrel Mine immediately to the west. A diversion around the Poitrel mining operation is present before its confluence with the Isaac River.
North Creek	Non-perennial	Minor	4	Flows in a north south direction approximately 3km to the east of DNM. Northern areas in the proximity of Titan East residual void drain through unnamed tributaries to North Creek.
Unnamed watercourse	Non-perennial	Minor	1-2	*Water Act 2000* unmapped and unnamed tributary of the Isaac River. Pre-mining this drainage line received the majority of overland flow from the mining area. The drainage line has a confluence with the Isaac River to the south of DNM.
DNM drainage feature	Non-perennial	Minor	1-2	Unnamed drainage line that is a defined drainage feature under the *Water Act 2000*. Headwaters located in the northern portion and to the east of DNM. Drains across the southern portion of DNM within the future Pandora mining area, before flowing into the unnamed watercourse listed above.
DNM east drainage feature	Non-perennial	Minor	1-2	Unmapped and unnamed watercourse between northern DNM and North Creek.

As part of the DNM mining operations, BMA currently holds a water licence permitting taking of underground water (Table 6).

Table 6: Water licence applicable to DNM

Authorisation number	Authorisation activity	Authorised purpose	Approval date (most recent update)	Expiry date
603817	Taking of underground water – dewatering	Take water	10/11/2010	30/06/2111

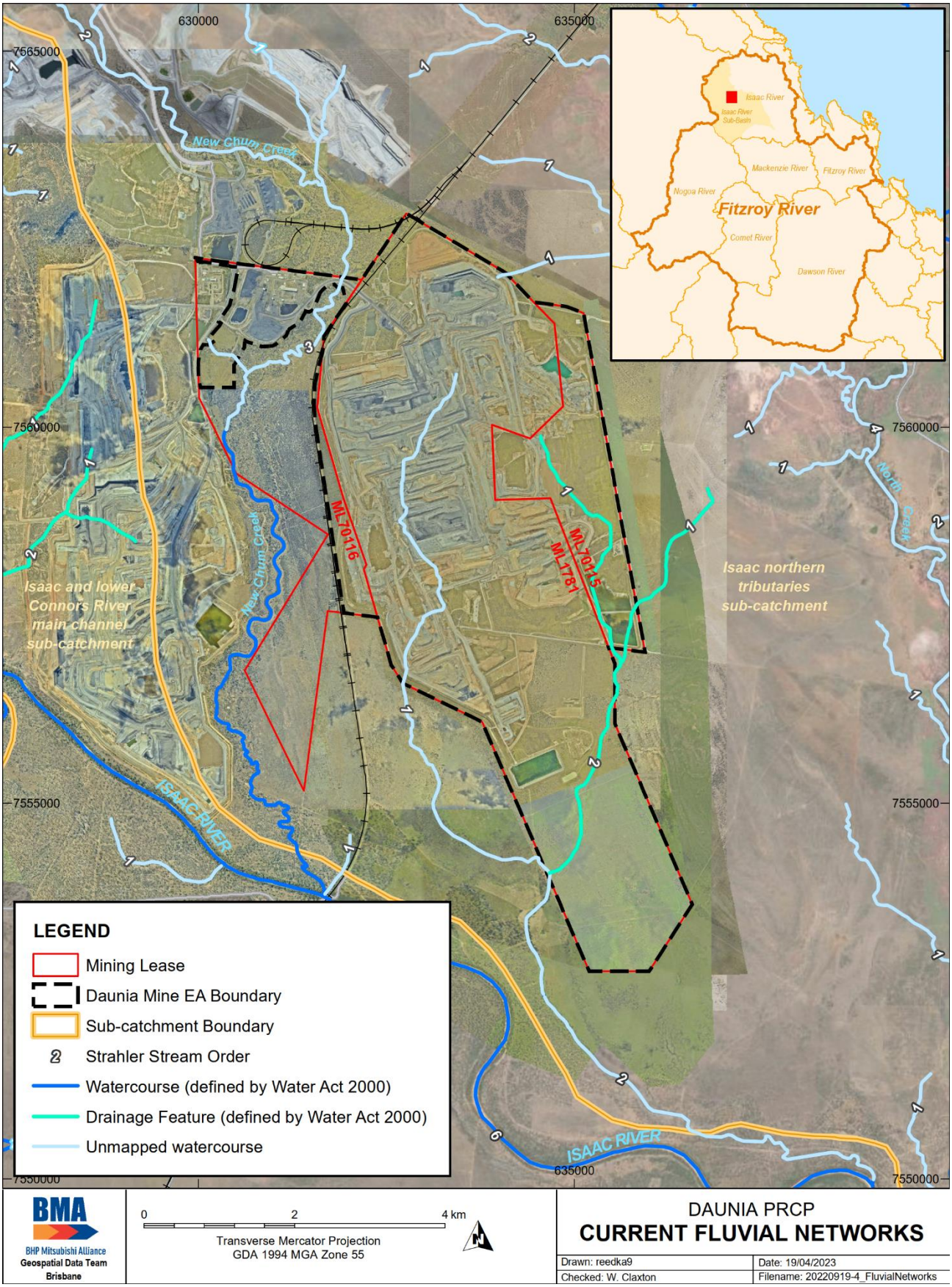

Figure 7: DNM current fluvial network

1.2.5 Hydrogeology

A hydrogeological assessment, including conceptual and numerical modelling, has been undertaken to support the development of this PRC Plan. The detailed report - *Daunia Mine Transitional PRC Plan Hydrogeology Assessment* is provided in Appendix D.

DNM lies within the Isaac Connors Groundwater Management Area (GMA – Zone 34) of the Fitzroy Basin under the State of Queensland *Water Act 2000 Water Plan (Fitzroy Basin) 2011* (State of Queensland, 2022b). Within the GMA, alluvial groundwater is managed as Groundwater Unit 1, and water within the hard rock aquifers as Groundwater Unit 2 (sub-artesian aquifers). Volumetric limits apply to extraction of groundwater within the GMA for uses other than for stock and domestic purposes. The objectives for groundwaters within the GMA – Zone 34 management area of the *Water Plan (Fitzroy Basin) 2011* are for sustainable management to maintain ecological values and enable maintenance and ongoing use of the resources through water allocations and licencing.

1.2.5.1 Groundwater environmental values

DNM is located within the Isaac groundwater environmental values area and the groundwater chemistry zone of 'sodic sequence', which is saline, sodium (Na) and chloride (Cl^-) dominated (DEHP, 2011). Table 7 summarises the Isaac groundwater environmental values.

Table 7: DNM groundwater environmental values

Groundwater zone	Aquatic ecosystems	Irrigation	Farm supply/use	Stock water	Aquaculture	Human consumer	Primary recreation	Secondary Recreation	Visual recreation	Drinking water	Industrial use	Cultural and spiritual value
Isaac groundwaters	✓	✓	✓	✓	-	-	✓	-	-	✓	-	✓

1.2.5.2 Hydrogeological units

The predominant hydrogeological units present at DNM include:

- Quaternary and Tertiary sediments:
  - Quaternary alluvium – unconfined aquifer (water-bearing strata of permeable rock, sand or gravel) localised along Isaac River and North Creek
  - Quaternary to Tertiary colluvium and weathered units (regolith) – unconfined and largely unsaturated unit bordering alluvium
- Triassic Rewan Group – aquitard overlying Permian coal measures in places across DNM and more generally in areas north and west of DNM
- Permian coal measures:
  - Low permeability interburden units with aquitard properties
  - Coal seams that exhibit water bearing properties associated with secondary porosity through cracks and fissures

Faulting associated with the Jellinbah Thrust System occurs in the proximity of DNM. Assessments of the faulting's influence on the regional groundwater system have indicated the faults have been cemented with calcite and siderite. Therefore, the faults, which would have initially increased the permeabilities in parallel with the fault plane, have healed and are effectively acting as barriers to groundwater flow perpendicular to the faults. Therefore, the major faults to both the west and east of DNM have resulted in hydrogeological compartmentalisation of the Permian groundwater system.

The coal seams within the RCM are the primary aquifer units within the DNM area. These seams are characterised as confined fractured rock aquifers, with the Leichardt Seam and combined Vermont Seams and immediately underlying strata being the main aquifer units. The overburden above the Leichardt Seam acts as an aquitard and is typically dry, or very low yielding.

Quaternary-Tertiary sediments

The unconsolidated alluvial sediments of the Isaac River, other Quaternary-Tertiary sediments, and weathered regolith are generally considered to function as one interconnected hydrogeologic unit. However, significant heterogeneity is present throughout the unit given the variable lithology and stratigraphy.

Monitoring bores installed in 2021 within unconsolidated Quaternary-Tertiary sediments at DNM have remained dry since installation, while monitoring data from the Isaac River Alluvium at the Poitrel Mine to the west of DNM identified sporadic saturation of the alluvial groundwater unit. More regionally, bores have recorded the groundwater within the Isaac River Alluvium ranging from 171mAHD to 179mAHD with the interpreted alluvium being up to 14m thickness at the monitored locations. Water levels within the Isaac River Alluvium are shown to follow the flow direction of the Isaac River, with general south-easterly flow gradients.

The heterogeneous nature of the alluvial sediments is reflected in the hydraulic conductivity, which regionally ranges from 10^{-2} metres per day (m/day) to almost 10^{1}m/day. Hydraulic testing of the alluvium within the proximity of DNM found hydraulic conductivity to be within this scale, with values ranging from 0.09m/day to 1.25m/day.

The Quaternary to Tertiary colluvium and weathered units present in the proximity of DNM are largely unsaturated, with the presence of water restricted to lower elevation areas along the Isaac River and the lower reaches of its tributaries. Flow within the regolith, where it is saturated, reflects topography.

Recharge of the alluvium is predominantly from stream flow/flooding (i.e. loosing streams), and direct precipitation, while the non-alluvial regolith materials, that comprises of low hydraulic conductivity strata (i.e. clay and claystone), restricts recharge. Recharge rates of the Quaternary and Tertiary sediments, estimated using chloride mass balance calculations based on regionally available water quality data, are as follows:

- Isaac River Channel Alluvium – 3mm/yr
- Isaac River Flood Plain Alluvium – 1.3mm/yr
- Other alluvium – 1.3mm/yr
- Tertiary sediments – 0.1mm/yr

The Quaternary and Tertiary sediments are primarily discharged via evapotranspiration from riparian vegetation, short term baseflow after significant rainfall and extraction via privately-owned bores within the alluvium. As the alluvium is predominantly underlain by low hydraulic conductivity stratigraphy (i.e. claystone, siltstone and sandstone), limited downward discharge to the underlying formations is expected in areas where the natural lithology has not been disturbed.

Permian coal measures

Groundwater within the Permian coal measures is confined and sub-artesian. The coal seams within the Permian unit generally support higher hydraulic conductivity than the interburden/overburden. The coal seams have dual porosity, with a primary matrix porosity and secondary (dominant) porosity provided by fractures (joints and cleats).

Historical testing of the bores at DNM reported the following horizontal conductivity ranges:

- 1.92 – 2.05m/day for the Leichhardt Seam
- 0.00076 – 0.25m/day for the combined Vermont Seams
- 0.0011 – 0.45m/day where bores are screened across the Leichardt Seam, Vermont Seams and interburden seams
- 0.002 – 0.035m/day for non-coal Permian units (interburden)

The hydraulic conductivity of the Permian coal measures generally declines with depth, due to increasing overburden pressure reducing the aperture of secondary porosity features.

Groundwater investigations prior to the commencement of mining (2012 to 2013) at DNM identified groundwater elevations in the Permian coal measures ranging from approximately 191.5mAHD in the northeast of DNM to approximately 170.5mAHD in the south. This suggests a pre-mining general north-south groundwater gradient.

Ongoing monitoring of groundwater elevations in Vermont Seam shows differing responses related to proximity to active mining operations, however groundwater heights have shown limited correlation with rainfall. A general north to south hydraulic gradient is evident, with highest groundwater elevations of approximately 200mAHD recorded to the north of the DNM area, and lowest elevations of approximately 170mAHD recorded to the south of the DNM area.

Groundwater level data for the Leichhardt Seam is limited to one monitoring bore, which has remained relatively stable fluctuating between approximately 179mAHD and 180mAHD.

RCM and Fort Cooper Coal Measures interburden monitoring bores are predominantly located to the north and in proximity to the active DNM mining voids. Depth to the groundwater over the monitoring period has remained relatively stable in the monitoring bores, which reported interburden groundwater elevations ranging from 170mAHD and 202mAHD. Groundwater monitoring to the east of DNM shows the greatest groundwater elevation variation within the interburden with elevations decreasing from 186.5mAHD in 2010 to 180mAHD in 2022.

The general lack of response within the Permian groundwater monitoring bores to mining activities indicates there is limited hydraulic conductivity within the aquifer and/or compartmentalisation of the groundwater system created through cemented faults restricting groundwater flows.

A potentiometric surface for the Permian coal measures, utilising available regional data, is presented in Appendix D, Figure 4-9. The general groundwater flow direction within the Permian is from the north-west to the south-east.

Recharge to the Permian coal measures occurs where the unit occurs at subcrop. Due to the low hydraulic conductivity of the interburden material, groundwater largely flows horizontally within the coal measures, along the bedding plane of the coal seams.

Groundwater discharge predominantly occurs via pit void faces in mining operations.

1.2.5.3 Groundwater quality and type

Quaternary-Tertiary sediments

As groundwater bores within the Cainozoic sediments/alluvium at DNM have been dry since installation, no groundwater quality information specific to DNM is available. Interpretation of groundwater type and quality of the alluvial aquifers have been taken from alternate bores located within the region and from surrounding mining projects.

The alluvial groundwater monitoring bore at the Poitrel Mine has reported a Na-Cl water type. However, more regional monitoring of the Isaac River Alluvium indicates a mixture of water types are present, which suggest some degree of compartmentalisation, heterogeneity of the unit and variable influences on the alluvial waters throughout the catchment.

Regionally, water within the alluvium is fresh to moderately saline with an average Total Dissolved Solid (TDS) of 556 milligrams per litre (mg/L) and ranges between 10mg/L and 5,620mg/L. Where water is present within the regolith material, the salinity ranges from brackish to highly saline, with an average TDS of 7,101mg/L and ranging between 1,110mg/L and 18,600mg/L.

Groundwater within the alluvium regionally generally meets stock water supply and short-term irrigation criteria. However, the alluvial groundwater was found to generally exceed criteria for drinking water, freshwater aquatic systems, and long-term irrigation. The alluvial groundwater also recorded concentrations of total and dissolved iron (Fe) and manganese (Mn) above the Fitzroy Plan Water Quality Objectives for Zone 34 (shallow) (DEHP, 2011). Where water was present within the regional Tertiary sediments, it exhibited poorer quality compared to the alluvium and generally exceeded guideline criteria for livestock, irrigation, drinking water or aquatic ecosystems.

Permian

Water within the coal seams at DNM is predominantly a Na-Cl water type. Some variation in water type is noted in the shallower bores within the Vermont Seam in the southern portion of DNM with water quality results identifying higher portions of magnesium (Mg) ions, which is potentially linked to the overlying unconsolidated Quaternary to Tertiary deposits. Water quality data from bores drawing from the interburden identified a Na-Cl-HCO_3 water type.

Coal seam hosted groundwater is generally saline, and within the interburden, groundwater is moderately saline to saline. Coal seam units of the RCM record an average TDS of 7,598mg/L, ranging between 720mg/L and 24,704mg/L. The interburden units of the Permian coal measures record an average TDS of 5,349mg/L, ranging between 1,520mg/L and 9,126mg/L. The average salinity of the Permian hosted groundwaters exceeds stock watering criteria.

Water quality results for the DNM monitoring bores indicate the RCM (interburden and coal) exceed stock water, irrigation, drinking water and aquatic ecosystems criteria. The DNM groundwater data also exceeds the Fitzroy Plan Water Quality Objectives (DEHP, 2011) for aquatic ecosystem protection for the following:

- Zone 34 deep - Na (Vermont Seams)
- Zone 34 shallow – electrical conductivity (EC) (Leichhardt Seam), chloride (Leichhardt Seam), Ca (Vermont Seams) and Mg (Vermont Seams)
- Zone 34 shallow and deep – EC (Vermont Seams), alkalinity (Vermont Seam), Na (Vermont Seams), chloride (Vermont Seams), dissolved Fe (Vermont Seams) and bicarbonate (Vermont Seams)

1.2.5.4 Groundwater use

The Queensland Government's Groundwater Bore Database and the Bureau of Meteorology's National Groundwater Information System lists 70 registered bores within 5km of DNM. The bore uses listed on the databases are summarised in Table 8.

Table 8: Summary of registered groundwater bore use

Registered groundwater bore use	Count	%
Groundwater monitoring (mine monitoring, water resource investigation etc.)	57	81
Water Supply	4	6
Unknown	9	13
Total	**70**	**100**

Bore surveys completed in the region for surrounding mining projects have identified the following:

- In 2008, prior to commencement of mining at DNM, 12 private groundwater bores (nine in use) were identified within the proximity of DNM with the closest active supply bore to DNM located 14km to the north-west
- Bore surveys conducted between 2017 and 2020 identified:
  - Six Isaac River Alluvium bores between 1.1km and 6.3km south/south-west of DNM used for stock watering and domestic supply
  - The closest non-alluvial supply bore was 4.2km east of DNM and was installed within the Permian coal measures
  - The density of third-party supply bores was found to increase in the proximity of the Isaac River, suggesting the non-Permian groundwaters were the primary groundwaters extracted in the region

The Bureau of Meteorology Groundwater Dependent Ecosystems (GDE) Atlas (BoM, 2017) identifies the following based on national scale assessment methodologies in the proximity of DNM outside of the mine's disturbance footprint:

- Riparian vegetation associated with the Isaac River, North Creek and New Chum Creek and an unnamed watercourse are mapped as being potential terrestrial GDEs
- Aquatic habitat associated with the Isaac River, North Creek and an unnamed watercourse are mapped as being potential aquatic GDEs

Local GDE studies completed in the proximity of DNM were reviewed as part of the hydrogeological assessment (Appendix D). These targeted studies identified the following in relation to potential groundwater usage:

- Remote sensing terrestrial GDE assessment, using the Australian Government Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development remote sensing approach, identified no potential terrestrial GDEs in the immediate vicinity of DNM, with the closest potential terrestrial GDE mapped approximately 7.3km to the southeast of DNM at the confluence of North Creek and the Isaac River.
- A survey at the Poitrel Mine in 2018 indicated a low confidence terrestrial GDE located to the northwest of the DNM area, associated with New Chum Creek.
- The GDE Atlas mapped high confidence aquatic GDE associated with Isaac River, to the west of DNM, is inferred not to interact with groundwater due to the depth to groundwater (10m to 20m) in the vicinity of Isaac River.
- GDE studies undertaken for the nearby Winchester South Project, which extend to the southern boundary of DNM identified the following:
    - The aquatic in-stream ecosystems associated with the Isaac River are largely not dependent on the surface expression of groundwater
    - Riparian vegetation along the Isaac River has a moderate to high potential to meet the definition of a terrestrial GDE, but any dependency on groundwater in the Quaternary alluvium is likely to be facultative
    - The depth to groundwater beneath the palustrine wetlands (refer to wetlandinfo.des.qld.gov.au for details) adjacent to the Isaac River ranges from 10m to 20m, meaning that the aquatic ecosystem associated with the wetlands do not receive groundwater discharge, and therefore do not support aquatic GDEs. The terrestrial vegetation associated with wetlands do have a moderate potential to meet the definition of a terrestrial GDE, but any dependency on groundwater is likely to be facultative
    - Terrestrial vegetation on the Isaac River floodplains (outside of wetlands) has a moderate potential to meet the definition of a terrestrial GDE, but any dependency on groundwater is likely to be facultative
    - No stygofauna species were recorded from bores sampled during field surveys

1.2.5.5 Conceptual site model – extent of mining

A hydrogeological conceptual site model representing the PRC Plan extent of mining and approved activities, at the last day of mining at DNM, is illustrated in Figure 8. The key hydrogeological features present at the end of mining that are relevant to the discussion of potential groundwater impacts post-mining are:

- Groundwater drawdown within the RCM, associated with passive dewatering into the DNM mine pit voids, results in inwards hydraulic flow gradients in the coal measures
- Fault displacement of Permian sequences has potentially formed hydraulic barriers, resulting in compartmentalisation within hydrostratigraphic units
- Mine pit voids capture seepage from spoil emplacements
- Little to no impact on surficial aquifers including the Isaac River alluvium
- Little to no impact on environmental receptors
- No likely impact on anthropogenic receptors

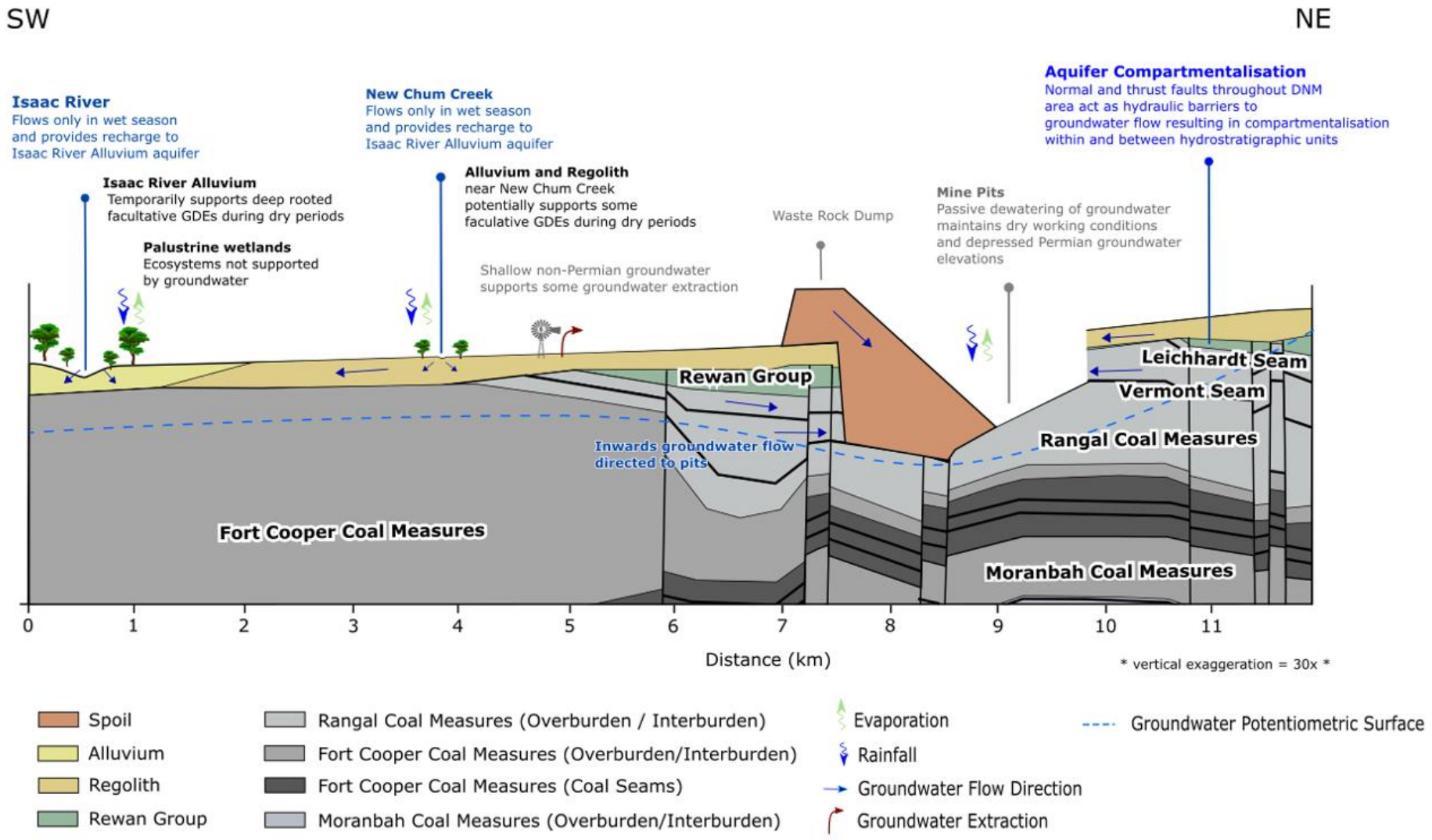

Figure 8: DNM hydrogeological conceptual model (extent of mining)

1.2.6 Soil types, properties and productivity

1.2.6.1 Soil context

Three baseline soil surveys have been undertaken during the life of DNM (Bourne & Tuck, 1993; BMA, 2008; GT Environmental Services, 2012). A total of 11 soil mapping units (SMU) have been identified. A summary of the Australian Soil Classification corresponding to the SMUs and a description of soil types at DNM is included in Table 9. The soil mapping according to the Australian Soil Classification is shown in Figure 9. Further detail is provided in *Daunia Mine Material Characterisation Study* - Appendix E.

The pre-mining land suitability class of DNM site was assessed in accordance with the Guidelines for *Agricultural Land Evaluation in Queensland* (DSITI & DNRM, 2015) classification system. This system allows for land to be allocated into five possible classes (with land suitability decreasing progressively from Class 1 to Class 5) which are derived from limitations that include soil type. The DNM pre-mining land suitability classes for grazing were predominately Class 2 to 3 with some small areas of Class 4, as provided in Table 9.

Based on the soil characteristics, one soil management group has been identified for rehabilitation, red/brown clay soil with a neutral pH, and high buffering capacity and total organic carbon content. Table 10 summarises the chemical parameters of the representative undisturbed soil management group at DNM. The sample locations in Table 10 are shown in Figure 9.

Table 9: Summary of DNM soil types

SMU code	Australian Soil Classification	Land Suitability Class	Additional notes
DB1	Vertosol, Dermosol	3	Hard setting uniform clays with brigalow with coarse structured subsoils on hard sandstone below 90cm. Minor variants include surface laterite gravels and fractured sandstone throughout the profile
DB2	Vertosol, Dermosol	2	Cracking and non-cracking clays. Brigalow, bauhinia, poplar box and Dawson's gum
DB3	Vertosol	2	Alluvial clay plains on grey cracking brigalow clays
DB4	Vertosol	2	Little or no gilgai
DB5	Gravelly Dermosol	4	Similar to DB1 but much shallower and rockier. Prominent surface gravels and occasional sandstone outcrops
DB6	Vertosol	3	Tall poplar box with scattered brigalow on cracking clays with silty clay loam veneer surface
DE1	Vertosol, Dermosol	2	Mountain coolibah uplands with brown clay on sandstone and other sediments
DD1	Vertosol	2	Broad lower elevation alluvial areas
A2	Chromosol, Sodosol	4	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
B4	Vertosol	2	Deep well-structured black cracking clay with granular surface mulch
B4v	Vertosol, Dermosol	2	Fine granular non-cracking red/brown brigalow scrub soil

Table 10: Chemical properties of the soil management group (0-10cm) of DNM (BMA, 2008)

Analysis (unit)	Soil management group and sample ID			
	Red/brown clay soil			
	3	18	30	44
Soil pH (H_20)	6.8	7.6	7.3	7.8
Soil EC (dS/m)	0.13	0.14	0.13	0.14
Total organic carbon (%)	3.7	3.6	3.6	3.5
Cation exchange capacity (CEC) (meq/100g)	23.44	34.07	33.05	39.14
Exchangeable sodium percentage (ESP) (%)	1.2	1.2	2.2	1.1
Ca/Mg (ratio)	2.64	3.96	3.23	4.55
Clay content (%)	33	53	61	49

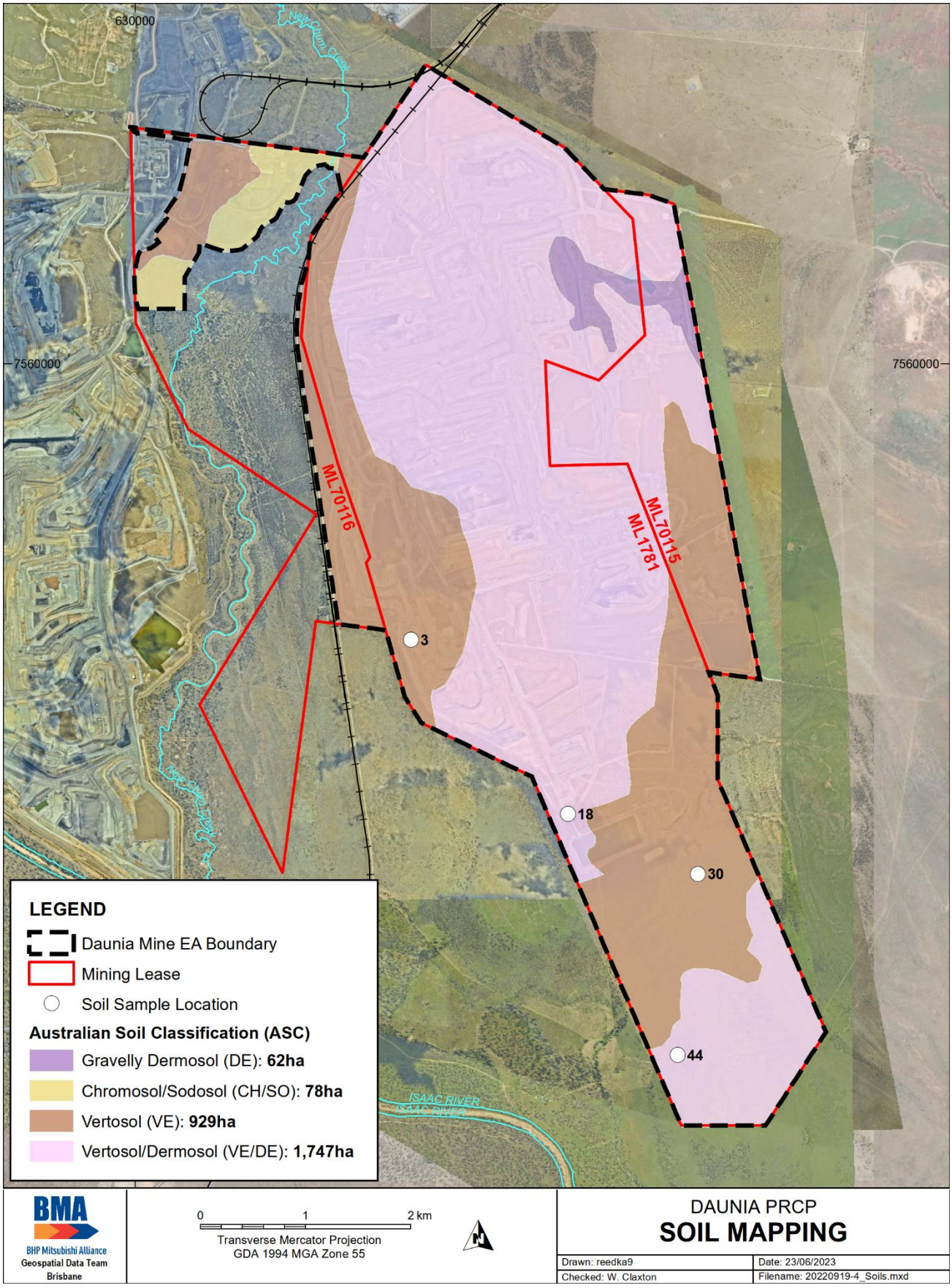

Figure 9: DNM soil mapping units (Australian Soil Classification)

1.2.7 Land stability

The pre-mining topography at DNM was generally flat to undulating, consistent with the regional landscape. During the DNM soil surveys in 2004 and 2008, little evidence of erosion was observed under a grazing use, although the site was considered prone to erosion degradation caused by overstocking pressure (BMA, 2008).

1.2.8 Vegetation communities and ecological data

A number of previous ecological studies relating to vegetation communities and ecological values (i.e. regional ecosystems, threatened flora and fauna species and their habitats) have been undertaken within the DNM site. An initial baseline flora and fauna survey was conducted across the DNM site in 2008 (SKM, 2008). Several additional smaller project-based terrestrial ecological assessments have also been undertaken, including:

- Daunia Mine Endangered Regional Ecosystem Ecological Assessment Report (DNM ERE Assessment) (ELA, 2015)
- Daunia Mine Project Skoll Matters of State Environmental Significance Assessment (ELA, 2016)
- Daunia Mine Calypso Ecological Assessment (ELA, 2019)

The results of the previous ecological studies and the following Queensland Government ecological database searches have been reviewed to determine the baseline vegetation communities and ecological values of the DNM site, as well as the fauna presence and habitats as discussed in Section 1.2.9:

- Regional ecosystem mapping (DES, 2022b)
- Matters of state environmental significance mapping (MSES) (DES, 2022c)
- Maps of environmentally sensitive areas (DES, 2022d)
- WildNet records conservation significant species (DES, 2022e)

It is important to note that vegetation clearing and disturbance activities approved within the DNM site may have occurred since previous ecological assessments.

1.2.8.1 Regional Ecosystems

The majority of the vegetation communities and regional ecosystems (REs) on the DNM site were cleared prior to development of the existing mine site (SKM, 2008). The results of the initial flora and fauna surveys confirmed the majority of the DNM site supported non-remnant cleared grasslands dominated with buffel grass (*Cenchrus ciliaris*) with or without brigalow (*Acacia harpophylla*) and/or poplar box (*Eucalyptus populnea*) regrowth (SKM, 2008).

More recent field surveys undertaken as part of the DNM Project Skoll (ELA, 2016) and DNM ERE Assessment (ELA, 2015) verified smaller areas of remnant and high value regrowth (HVR) REs occurring along the north western edge of the DNM site (Figure 10).

The remaining ground-truthed REs previously recorded on DNM are listed in Table 11 with their *Vegetation Management Act 1999* (VM Act) class and biodiversity status, and are mapped in Figure 10 (SKM, 2008; ELA, 2015; ELA, 2016).

Table 11: Ground-truthed regional ecosystems recorded during ecological assessments at DNM

Community description	RE	Remnant/ HVR	RE VM Act class	RE Biodiversity status
Acacia harpophylla shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	11.4.9	Remnant HVR	Endangered	Endangered
Eucalyptus populnea and/or *E. melanophloia* and/or *Corymbia clarksoniana* on Cainozoic sand plains and/or remnant surfaces	11.5.3	Remnant HVR	Least concern	No concern at present

Community description	RE	Remnant/ HVR	RE VM Act class	RE Biodiversity status
Acacia harpophylla and/or *Casuarina cristata* open forest to woodland on fine grained sedimentary rock.	11.9.5	Remnant HVR	Endangered	Endangered

1.2.8.2 Environmentally Sensitive Areas

Category B environmentally sensitive areas (ESAs) are defined under Schedule 19 of the *Environmental Protection Regulation 2019* to include Endangered REs based on the biodiversity status identified in the 'Regional ecosystem description database'.

At the time of the ecological assessment (ELA, 2015), the following ground-truthed REs with an Endangered biodiversity status were associated with Category B ESAs (Figure 10):

- RE 11.4.9 - *Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains
- RE 11.9.5 - *Acacia harpophylla* and/or *Casuarina cristata* open forest to woodland on fine-grained sedimentary rocks

1.2.8.3 State significant flora species

No threatened flora species listed under *Nature Conservation Act 1992* (NC Act) have been recorded within the DNM site based on previous baseline ecological surveys and desktop searches (SKM, 2008; ELA, 2015; ELA, 2016; ELA, 2019; DES, 2022d).

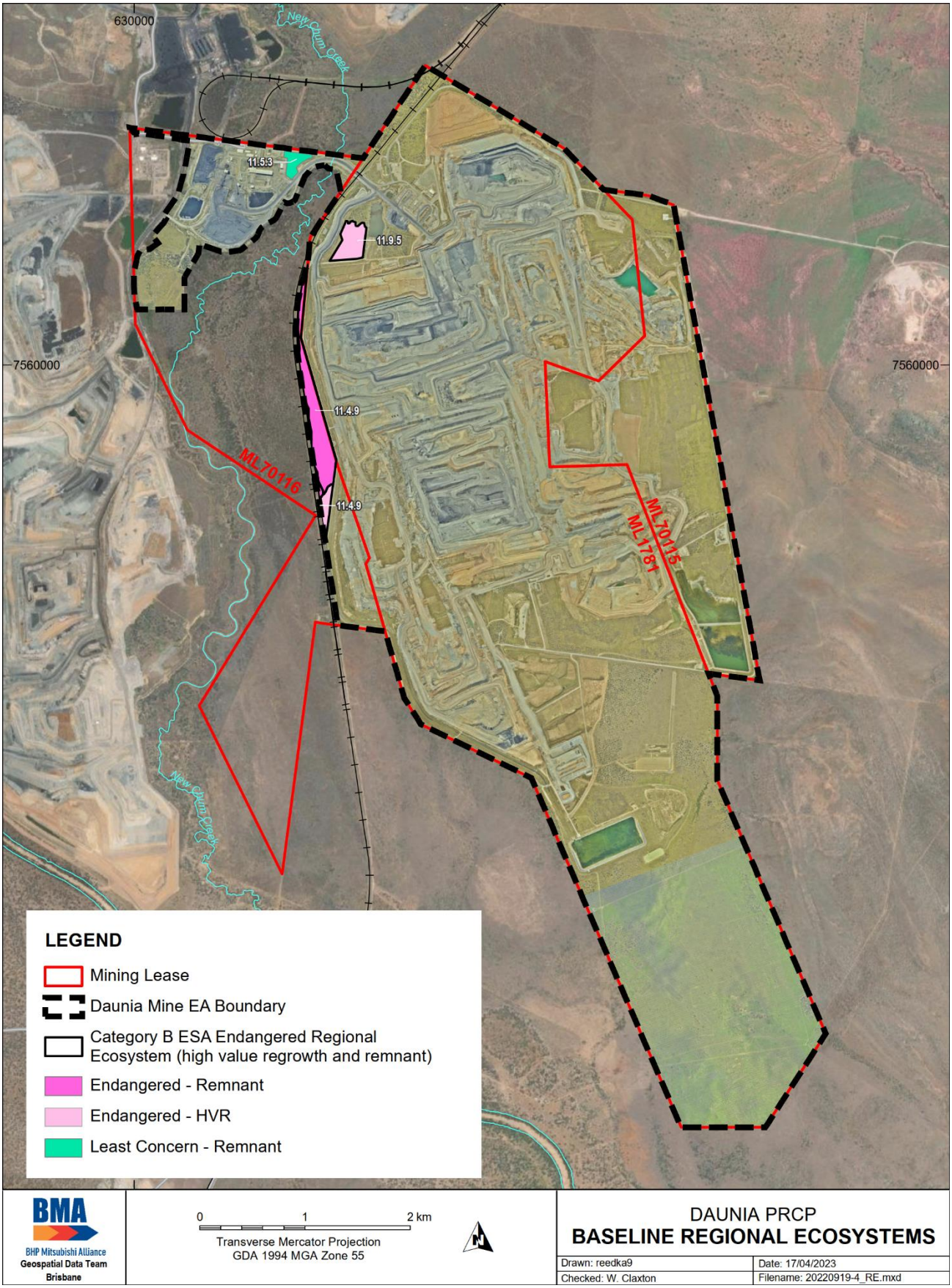

Figure 10: DNM baseline regional ecosystems and environmentally sensitive areas (ESA)

1.2.9 Fauna presence and populations

1.2.9.1 State significant fauna species

The following threatened fauna species listed under the NC Act are known to occur on DNM based on the results of pervious ecological surveys:

- Ornamental snake (*Denisonia maculata*) (Vulnerable NC Act) (ELA, 2015)
- Short-beaked echidna (*Tachyglossus aculeatus*) (Special least concern NC Act) (ELA, 2015)
- Rufous fantail (*Rhipidura rufifrons*) (Special least concern NC Act) (ELA, 2015)

Ornamental snake was recorded during spotlighting searches within brigalow woodland habitat containing ephemeral gilgais (ELA, 2015). This habitat has a highly structural complex ground layer consisting of large amounts of woody debris and soil cracks, as well as containing ephemeral gilgais (ELA, 2015). Ornamental snake habitat has been mapped in areas of remnant and regrowth brigalow associated with REs 11.4.9 and 11.9.5 (Figure 11).

Echidna was recorded within the brigalow woodland habitats containing ephemeral wetlands in the north-western portion of the DNM site (ELA, 2015). Although not observed in other habitats, it is expected the echidna has potential to occur in all terrestrial habitats in the DNM site except intensively managed farmland (ELA, 2015).

The rufous fantail was recorded within mature brigalow regrowth associated with RE11.9.5 (ELA, 2015) (Figure11). Although the species was recorded on DNM site, the species preferred habitat includes wet sclerophyll forest and rainforest, which is not supported within the DNM site.

The squatter pigeon (*Geophaps scripta scripta)* (Vulnerable NC Act) has also been determined as likely to occur on DNM site based on the presence of suitable foraging and dispersal habitat and the occurrence of nearby records within 1km of the DNM site (DES, 2022e). Suitable foraging habitat for the squatter pigeon is associated with the mature brigalow regrowth and poplar box regrowth communities within 3km of permanent water associated with REs 11.4.9, 11.9.5 and/or 11.5.3 (ELA, 2015) (Figure 11). The woodland and riparian habitats outside of the DNM site to the south along the Isaac River also provide potential breeding habitat for this species particularly when water is abundant.

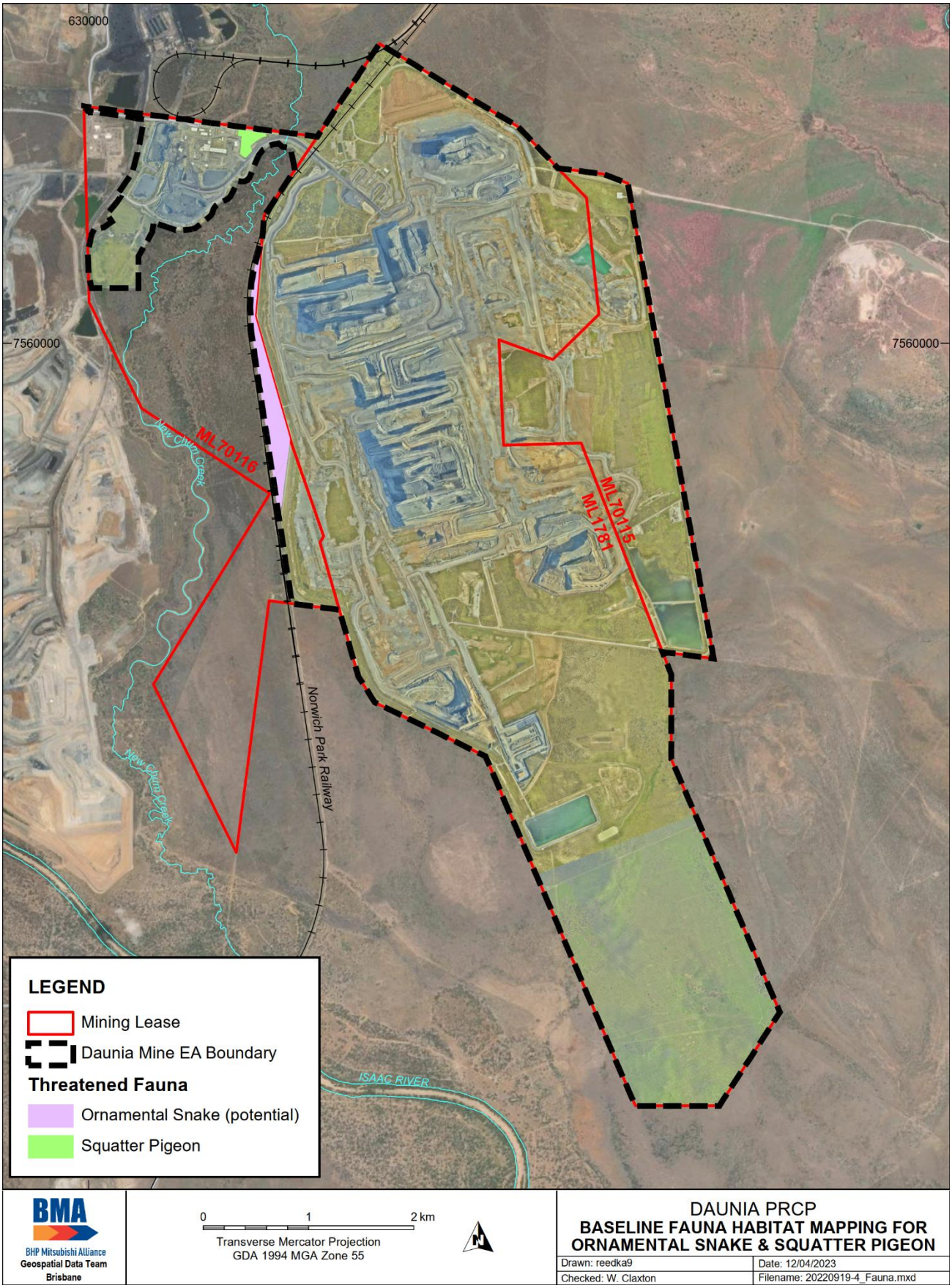

Figure 11: DNM baseline fauna habitat mapping for ornamental snake and squatter pigeon

1.2.10 Pre-mining land use

Prior to mining, DNM had been largely cleared of native vegetation and was being utilised for cattle grazing pastures, resulting in extensive cover of buffel grass. Small areas of remnant vegetation in very poor condition remained as fragmented patches (SKM, 2008).

1.2.11 Contaminated land

Assessment of contaminated land risks, completed as part of the project's baseline studies, identified the project site prior to mining was largely cleared and utilised for cattle grazing. There were no homestead sites, cattle dips, chemical storage, fuel storage or waste disposal areas identified within DNM. Built infrastructure identified was limited to fences, access tracks and small stock watering dams. The underlying properties were also not listed on the Queensland Environmental Management Register or Contaminated Land Register.

Since the commencement of mining at DNM, operations have included heavy industrial type activities and supporting infrastructure including:

- Drilling/exploration
- Extraction and processing of coal
- Chemical storage and formulation
- Waste storage and disposal
- Sewage treatment
- Operation of a variety of plant/equipment workshops and scrap yards
- Petroleum product storage and dispensing
- Explosive production, storage and use
- Operation of regulated structures such as mine affected water dams

The nature of these types of operations, which include the storage, handling, use and disposal of hazardous materials have the potential to result in the contamination of land.

The current DNM EA provides for the conditional on-site disposal of various wastes including:

- Rejects
- Bulk rubber
- Inert waste
- Poly-pipe and other plastic
- Fibreglass
- Treated and untreated timber
- Asphalt
- Asbestos
- Treated sewage effluent
- Co-mingled hydrocarbons

Current management of contaminated land is undertaken in accordance with the *EP Act 1994* and the EA conditions that require the reporting of releases of hazardous contaminants and monitoring of surface water, sediment and groundwater on a regular basis. However, due to the operational heavy industrial nature of the site, it is anticipated land contamination will require assessment, remediation and/or management upon completion of mining operations.

1.2.12 Underlying landholders

Land holding within the DNM site comprises the following:

- BMA freehold land (i.e. owned by BHP Coal and Others, held on behalf of BMA): ML70115 (100%), ML1781 (portion) and ML70116 (portion)
- BMA leasehold land (i.e. leased by BMA from the State): ML1781 (portion) and ML70116 (portion)
- Freehold land owned by J.D. and J.L. Lloyd: ML1781 (portion)
- Freehold land owned by B.A. Nielsen: ML70116 (portion)
- Freehold land owned by Stanmore Resources Limited: ML1781 (portion)
- Freehold land owned by A.G.H. Williams: ML1781 (portion)
- Freehold land owned by Queensland Rail (QR) and held as Lands Lease: ML1781 (portion) and ML70116 (portion)
- Freehold land owned by Isaac Regional Council (IRC) (unnamed road reserve): ML1781 (portion)

The underlying landholders for DNM are shown in Figure 12.

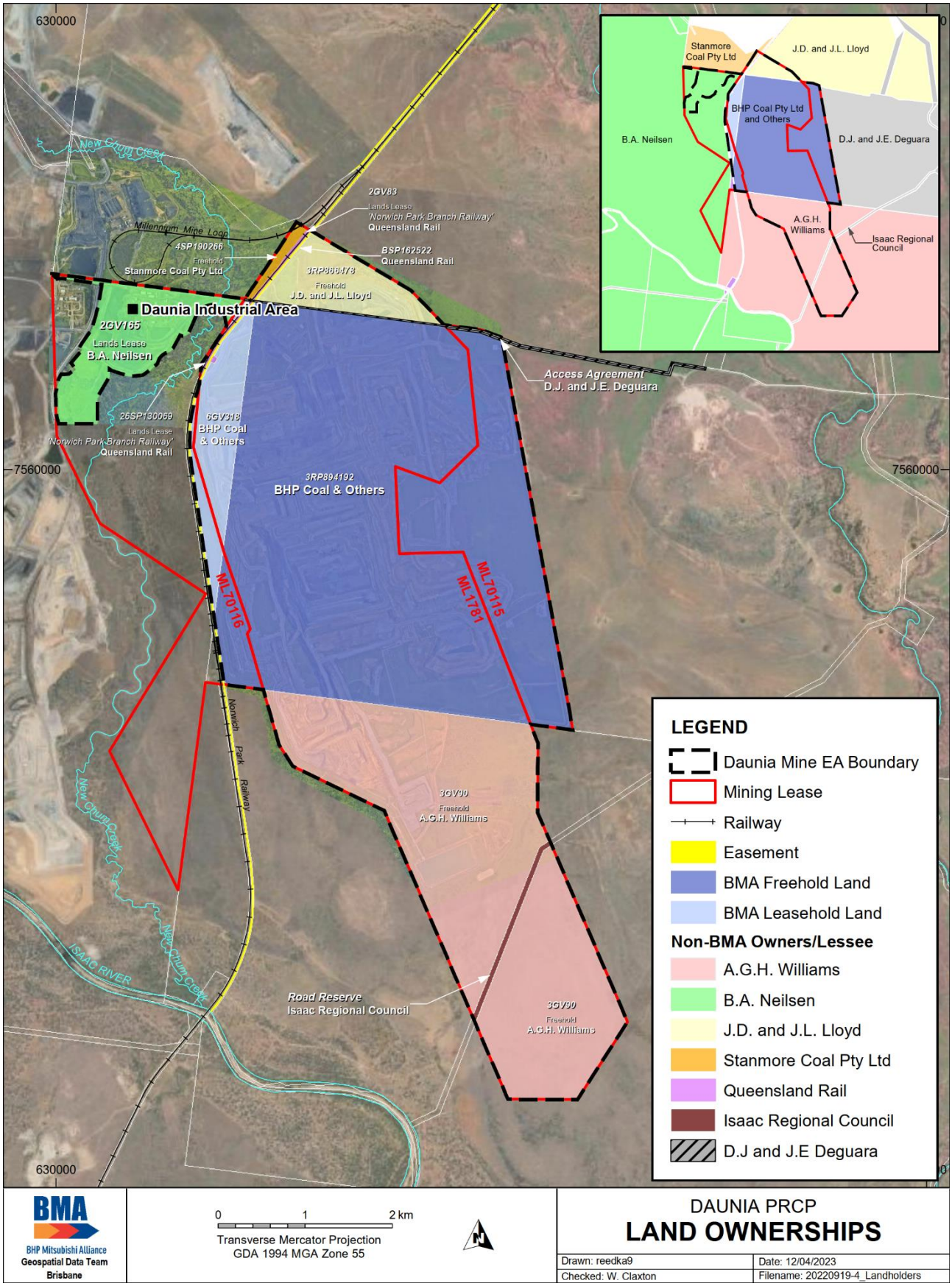

Figure 12: DNM land ownerships

1.3 Design for closure

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

However, this PRC Plan has been developed to manage progressive rehabilitation of the DNM site, aiming to minimise long-term management requirements as well as associated closure costs. Importantly, a focused design for closure underpins all sections of this plan, including:

- Engagement with relevant stakeholders to define suitable PMLUs and NUMAs
- Defining and implementing rehabilitation practices based on identified risks that could influence achievement of milestone criteria
- Demonstrating a successful rehabilitation trajectory towards achievement of these milestone criteria by ongoing site monitoring and maintenance.

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.*

PRCP 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.*

1.4.1 Relevant activities requiring rehabilitation

The relevant activities at DNM that will require rehabilitation, the predicted duration and availability for progressive rehabilitation, are provided in Table 12. Any infrastructure that is beneficial to the PMLU may be retained and will not be available for rehabilitation.

Table 12: Relevant activities requiring rehabilitation at DNM

Relevant activity	Predicted duration	Availability for progressive rehabilitation
Spoil dumps	Varying: utilised from the start of the PRCP Schedule until the end of mining	Progressive rehabilitation has commenced Available for progressive rehabilitation as dump areas reach final position and they are no longer required for associated infrastructure or access requirements Progressive rehabilitation is maximised by scheduling rehabilitation as soon as practicable after land becomes available

Relevant activity	Predicted duration	Availability for progressive rehabilitation
		Low-wall areas become available once mining in each pit is complete
CHPP and associated infrastructure; coal stockpiles	Utilised until the end of coal processing	Available for rehabilitation once coal processing is complete
Workshop; buildings and other infrastructure areas	Varying: with the latest utilised until the end of rehabilitation activities	Dependent on the use and location, or unless deemed suitable to be retained for the PMLU: the majority will be available for rehabilitation at the end of the major rehabilitation activities; some areas may be available earlier, such as at the end of mining or coal processing
Roads; laydown and general disturbance	Varying: with the latest utilised until the end of rehabilitation activities	Dependent on the use and location, or unless deemed suitable to be retained for the PMLU: typically areas will be available for rehabilitation either at the end of mining or coal processing or after the major rehabilitation activities are complete
Exploration	Throughout the operational life	Available for rehabilitation within six months after exploration activities are complete
Mine dams	Varying: with the latest utilised until the end of rehabilitation activities	Available for rehabilitation when no longer required for water management
Watercourse crossing	Utilised until the end of rehabilitation activities	Available for rehabilitation when the major rehabilitation activities are complete
Residual voids	Utilised until the end of mining	Available for improvement once the PMLU low-wall spoil rehabilitation is complete for each pit

1.4.1.1 EA progressive rehabilitation conditions

The DNM EA includes the following conditions regarding the commencement of progressive rehabilitation:

- E4: "*Progressive rehabilitation for all areas except for Skoll Pit must commence within two (2) years of when areas become available within the mining leases*."
- E5: "*Rehabilitation of Skoll Pit must be carried out in accordance with Table E2 (Rehabilitation of Skoll Pit)*."

All areas are included in the PRCP Schedule for rehabilitation as soon as practicable after land becomes available. For infrastructure and general disturbance areas, rehabilitation is scheduled the year after the land becomes available to allow for final planning. Spoil dump areas are scheduled within two years after land becomes available to allow for final settlement, planning and availability of resources.

As part of the 2017 EA amendment approval to mine Skoll Pit, a rehabilitation schedule was proposed for Skoll Pit based on the mine plan at the time. The rehabilitation schedule, included as Table E2 in the EA and referred to in condition E5, is for the rehabilitation of the Skoll Pit spoil dumps within ML1781, and came into effect once mining of overburden commenced within Skoll Pit (2018). Table E2 refers to total cumulative established rehabilitation area, which at the time of development of this schedule and following discussions with DES in 2017, included completion of landform reshaping, topsoiling and seeding rehabilitation activities.

Mining in the Skoll Pit area has advanced slower than planned in the 2017 EA amendment. The Skoll Pit rehabilitation schedule was based on the mining sequence and indicative timing included in the EA amendment application, shown in Figure 13(a).

Figure 13(b) shows actual mining progress as at the end of FY23, compared to the 2017 plan. Mining at the end of FY23 is slightly past what was originally planned to be mined in FY20, meaning mining is close to three years behind the 2017 plan. The slower mining rate has therefore resulted in delays to the planned progressive rehabilitation of Skoll Pit.

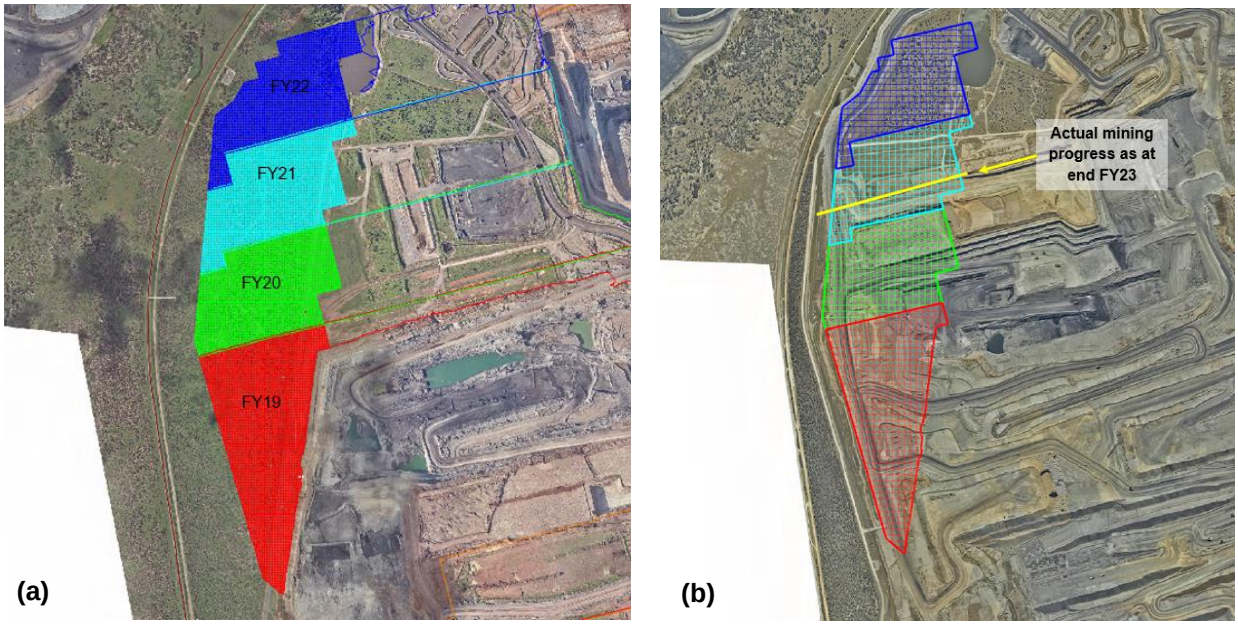

Figure 13: Skoll Pit - (a) Planned mining progress (EA amendment); (b) Actual mining progress

The revised progressive rehabilitation of Skoll Pit spoil dump areas, based on the actual mining progress and the latest mine plan, is included as part of the rehabilitation schedule for Rehabilitation Area 1 (RA1).

1.4.2 Rehabilitation areas and milestones

The rehabilitation areas (RA) and rehabilitation milestones (RM) included in the PRCP Schedule for DNM are referred to throughout this PRC Plan.

A RA is defined in the PRCP 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",* and a RM is *"each significant event or step necessary to rehabilitate the land to a stable condition* (section 112 of the EP Act)".

The DNM RAs, as well as the relevant activities associated with each RA, are detailed in Table 13 and the RMs are detailed in Table 14.

Table 13: Rehabilitation areas, associated PMLUs and relevant activities for DNM

Rehabilitation Area (RA)	PMLU	Relevant activity
RA1	Woodland habitat	• Spoil dumps
RA2	Cattle grazing	• Spoil dumps
RA3	Watercourse	• Watercourse crossing
RA4	Cattle grazing	• Spoil dumps – existing rehabilitation
RA5	Cattle grazing	• CHPP and associated infrastructure

Rehabilitation Area (RA)	PMLU	Relevant activity
		• Administration, crib, warehouse, and various buildings • Workshop, fuel, oil and chemical storage • Coal stockpiles • Mine dams and drains • Roads • Laydown areas • General disturbance

Table 14: Rehabilitation milestones for DNM

Rehabilitation Milestone (RM)	
RM1	Infrastructure decommissioning and removal
RM2	Remediation and/or management of contaminated land
RM3	Landform development and reshaping
RM4	Surface preparation (cattle grazing)
RM5	Surface preparation (woodland habitat)
RM6	Surface preparation (watercourse)
RM7	Revegetation (cattle grazing)
RM8	Revegetation (woodland habitat)
RM9	Revegetation (watercourse)
RM10	Achievement of surface requirements (cattle grazing)
RM11	Achievement of surface requirements (woodland habitat)
RM12	Achievement of surface requirements (watercourse)
RM13	Achievement of post-mining land use to a stable condition (cattle grazing – RA2, RA5)
RM14	Achievement of post-mining land use to a stable condition (woodland habitat – RA1)
RM15	Achievement of post-mining land use to a stable condition (watercourse – RA3)
RM16	Achievement of post-mining land use to a stable condition (cattle grazing, existing rehabilitation – RA4)

1.4.3 Improvement areas and milestones

The improvement areas (IA) and management milestones (MM) included in the PRCP Schedule for DNM are referred to throughout this PRC Plan.

An IA is defined in the PRCP Guideline as 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)".

The DNM IAs and associated relevant activities are detailed in Table 15 and the MMs are detailed in Table 16.

Table 15: Improvement areas and relevant activities for DNM

Improvement Area (IA)	NUMA	Relevant activity
IA1	NUMA	Residual voids

Table 16: Management milestones for DNM

Management Milestones (MM)	
MM1	Achievement of structural stability
MM2	Achievement of surface requirements
MM3	Achievement of sufficient improvement

1.4.4 Existing rehabilitation

DNM has commenced approximately 130ha of progressive rehabilitation between 2013 and 2022, with the majority of these areas seeded to achieve a cattle grazing PMLU. The PRCP Schedule includes 102ha of existing rehabilitation as progressed. Some smaller areas of existing rehabilitation have been excluded from the PRCP Schedule as they are likely to be re-disturbed by various mining activities. These areas are scheduled to be rehabilitated once they are no longer required for mining activities or infrastructure.

The 102ha of existing rehabilitation progressing towards achievement of a PMLU are included in the PRCP Schedule at the following rehabilitation milestones:

- 17.4ha of woodland habitat PMLU is progressing to RM5 in RA1
- 84.5ha of cattle grazing PMLU is progressing to RM10 in RA4

Routine rehabilitation monitoring will continue to be implemented to identify any maintenance/corrective actions required to enable the rehabilitated areas to achieve the milestone criteria.

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

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.*

PRCP 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.

A community consultation plan (CCP) and community consultation register have been compiled to support the development of this PRC Plan. The complete plan and register - *Daunia Mine PRCP Community Consultation Plan and Community Consultation Register* is provided in Appendix F.

2.1 Consultation to date

Initial consultation and engagement relating to DNM was undertaken during 2008-2009 when obtaining the EA. Since then, the following rehabilitation and closure-related engagement has taken place for DNM:

- During 2018, BMA engaged with DES on the PMLUs and associated acceptance criteria within the EA. These PMLUs and acceptance criteria were included in the 18 November 2019 DNM EA amendment, reflected as Table E1 (Rehabilitation Requirements).
- Since 2021, BMA has been providing regular PRC planning briefings to the IRC as part of bi-annual and special purpose meetings. This has included briefing the IRC on the commencement of the DNM PRCP process (November 2022 and January 2023).
- Since 2021, BMA has also undertaken ongoing consultation with the Barada Barna Aboriginal Corporation (BBAC), who represent the Barada Barna People as Traditional Owners. Consultation to date has included various aspects related to rehabilitation. BBAC's feedback has included a request to work together with BMA to understand how they can get involved in rehabilitation execution activities over time, as guided by the PRCP Schedules to be submitted for approval.

BMA continues to engage with neighbouring landholders on land management, lease/license conditions, and operational matters, as required.

As part of development of the DNM PRC Plan ongoing consultation has occurred, which includes letters via email to:

- IRC
- BBAC
- Underlying owners of land within the DNM MLs
- Adjacent and nearby landowners who accommodate nominated access routes to DNM
- QR, Aurizon and Ergon Energy as the owners of utilities within DNM
- Smart Transformation Advisory Council (STAC) members representing community members, groups and businesses in Moranbah and Dysart
- Authorised Holder Representatives of adjacent mining operations and petroleum licenses
- Department of Resources (Queensland) (DoR)

Information has also been provided to BMA employees, the community and groups though the online Coal Connect newsletter (a weekly newsletter to all internal coal personnel) and the Community Connect newsletter which is a hard copy and electronic bi-monthly newsletter distributed to more than 15,000 community members' letterboxes throughout the Bowen Basin.

2.2 Community consultation register

The community consultation register provided in Appendix F is compliant with section 126C(1)(c)(iii) of the EP Act and includes:

- Identification of each community member/stakeholder
- Previous engagement 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
- Decision/outcomes of engagement
- Commitments made by BMA

The stakeholders identified as part of this register are considered as having a genuine, demonstrable and legitimate interest in the ongoing rehabilitation and closure planning at DNM. Table 17 summarises these identified stakeholders, the current BMA relationships, as well as potential areas of interest with respect to the site's PRC Plan.

Table 17: DNM identified stakeholders, details on current BMA relationships and potential PRC planning areas of interest

Stakeholder	Existing BMA relationship	Potential areas of interest
Traditional Owners		
• Barada Barna Peoples, represented by BBAC	• BMA has a constructive working relationship with Barada Barna Peoples and meets with them regularly. • Barada Barna Peoples' Native Title to areas of land within the Isaac, Central Highlands and Mackay local government areas (LGAs) was determined by the Native Title Tribunal in June 2016. • BMA reviewed its Cultural Heritage Management Plans in 2016 following determination of the BBAC's Native Title claim. BMA has also undertaken negotiations with the Barada Barna People on a comprehensive Indigenous Land Use Agreement. DNM will fall within the proposed agreement area.	• Aspirations around rehabilitation and potential commercial opportunities as a PMLU • How operational management and/or rehabilitation could contribute to future use of the areas • Recognition and management of cultural heritage impacts • Native Title and land acquisition interests • PMLUs, NUMAs and closure landform/landscape • Future access to and ownership of land • Environmental management/stewardship • Employment and business opportunities in rehabilitation, environmental management, and monitoring

Stakeholder	Existing BMA relationship	Potential areas of interest
Underlying and adjacent property owners and licensees		
• Mavis Downs (underlying) • Winchester Downs/Poitrel (underlying) • Olive Downs (underlying) • Moorvale/Daunia (adjacent) • Wotonga (nearby)	• BMA has constructive working relationships, engaging on an as-needs basis with underlying and adjacent property owners, e.g. regarding agistment licenses and access agreements.	• Environmental management/stewardship • PMLUs, NUMAs and closure landforms • PRCP Schedule • Future access to and ownership of land • Water usage, quality and access to groundwater and surface water (e.g. water allocations, water pipelines, etc.) • Potential impacts on land, water, property, and future business value relating to PMLUs, NUMAs and timing of impacts
Utility owners (corporations and government agencies)		
• IRC (road reserve) • QR (rail) • Aurizon (rail) • Ergon Energy (power supply)	BMA has constructive working relationships and engages with utility owners and easement holders as required (issue-specific or transactional engagement). This includes engagement on: • Sections of the Norwich Park Branch Railway (owned by QR and operated by Aurizon), located within ML1781 and within ML70116 • The TLO and rail loop, which are owned by QR and operated by Aurizon, located within the RMI ML70312 (owned by Stanmore) • An unnamed road reserve owned by IRC, which transects ML1781 • Ergon Energy powerlines within ML1781 and ML70116	• Impact on assets/asset value • Remediation of impacts on assets • Any service disruptions and mitigations • Crossing/interface agreements • Timeframe for decommissioning utilities (e.g. rail loop, BMA owned powerlines) • Cost of decommissioning utilities

Stakeholder	Existing BMA relationship	Potential areas of interest
BMA operations		
• DNM workforce	• BMA maintains ongoing communication with its workforce through 'toolbox' talks and a bi-monthly newsletter, Coal Connect	• Timing of closure • Rehabilitation obligations • Employment continuity
Adjoining/nearby resource interests		
• RMI and Poitrel Mine (Stanmore) • Millennium Mine (MetRes) • Moorvale Mine (Peabody Energy) • Olive Downs (Pembroke Resources) • Winchester South (Whitehaven Coal) • Isaac River Project (Coking Coal One Pty. Ltd. / Bowen Coking Coal Ltd) • Arrow Energy (CH4 Pty Ltd) (Petroleum gas interest)	• BMA liaises with adjoining and nearby mining and resource interests on an as-needed basis, in relation to *Mineral and Energy Resources (Common Provisions) Act 2014* (Queensland) requirements for petroleum overlap activities, and as part of industry associations and research partnerships	• Future land use and ownership • Collaboration on good industry rehabilitation and closure practices • Cumulative impacts and opportunities of mine closures • Cessation of use of DNM CHPP, conveyor, CHPP and TLO
Local residents and businesses		
• Moranbah and Dysart community members	• BMA utilises a wide range of communication, consultation and social investment strategies to develop and maintain relationships with Bowen Basin communities	• Local employment and business opportunities, and future jobs • Opportunities to participate in supply chain (e.g. environmental management, rehabilitation) • With closure, loss of jobs and supply opportunities, and changes to demands for services (e.g. childcare and schools)
• Moranbah and Dysart STAC members	• The Moranbah and Dysart STACs are sponsored by BMA and represent a broad cross-section of community and business interests. The STACs meet approximately every two months	

Stakeholder	Existing BMA relationship	Potential areas of interest
		• Potential for cumulative job losses if other mines close in a similar timeframe • Economic transformation (towards post-mining), and industry diversification • Educational and childcare opportunities • Wellbeing and health/healthcare provision • Economic and community sustainability • Environmental management • PMLUs and NUMAs • Community and economic transformation
Local government		
• IRC	• BMA has a long established and cooperative relationship with IRC • BMA and IRC meet at least twice each year. During 2022, BMA had two briefings with Council regarding PRC planning requirements (May 2022 and November 2022). These updates will continue	• Local employment • Effects on Council services and infrastructure • Environmental management/stewardship • Rehabilitation progress and PRCP Schedule • PMLUs, NUMAs and closure landforms • Management of closure impacts on employment and businesses • Alignment of rehabilitation plans with local and regional planning goals, and regional transformation/diversification • Economic transformation (towards post-mining) and community sustainability

Stakeholder	Existing BMA relationship	Potential areas of interest
		• Cumulative impacts of closure of multiple mining assets in a similar timeframe (e.g. job and population losses)
Government departments		
Queensland Government departments: • DoR - Office of the Minister, Deputy Director-General Georesources, Acting Director Native Title Services and Coal Hub, Rockhampton, Executive Director, Minerals and Coal • DES - Office of the Minister, MERPF Act implementation team	• BMA has constructive working relationships with DoR and DES • DoR's Deputy Director-General Georesources has asked to be kept informed on PRC planning • Consultation on the DNM PRC Plan is not expected to be required by other State Government stakeholders, but they are briefed as necessary • BMA Corporate Affairs conducts as-needed engagement with Ministers and Members of Parliament	• Legislative compliance • Resource development • Employment and growth opportunities • Public interest • Environmental management • Economic transformation (towards post-mining) • Financial assurance • Environmental risk management • Future PMLUs, NUMAs and closure landforms • Company responses to stakeholder views • Industry best practice, and innovative future-looking approaches

2.3 Ongoing consultation

2.3.1 Consultation objectives, engagement type and frequency

The dedicated CCP compiled for the DNM PRC Plan (Appendix F), documents the iterative consultation process to be followed to enable ongoing PRC Plan-related engagement with the relevant stakeholders. An overview of this process is presented in Table 18.

Table 18: Process to be followed for ongoing community consultation for DNM PRC planning

Consultation objective	**1. To engage key stakeholders in identifying community objectives and aspirations for post-mining land use and landform, and social value opportunities to be considered in PRC planning**	
Stakeholders	**Engagement type**	**Proposed consultation frequency**
• Underlying landowners • Adjacent landowner • Barada Barna Peoples (BBAC) • IRC • Moranbah and Dysart community members	Advise underlying and adjacent landowners, BBAC and IRC in writing when the PRC Plan is approved	Once-off
	Communicate with underlying landowners during the terms of BMA's leases on their land and seek their inputs on the DNM PRCP Schedule and approved PMLUs and NUMAs	As part of future updates and/or amendments of the DNM PRC Plan
	Meet with underlying landowners, BBAC and IRC to provide an update on the PRC Plan and progress with rehabilitation, and invite their inputs and feedback on: • The approved PMLUs, NUMAs and closure landforms, including any values or opportunities in specific disturbed areas • Rehabilitation methods which would optimise future woodland habitat and/or grazing opportunities, and potential land management requirements • Shared value initiatives, e.g., infrastructure retention, capacity building, environmental management, or research partnerships • Rehabilitation methods, schedule, and progress towards milestones	As requested, or as agreed with representatives
	As part of bi-annual meetings with IRC, and addressing BMA's portfolio rather than individual assets: • Provide an update on the status of the PRC Plans and rehabilitation and forecast upcoming PRC Plan consultation for BMA assets	Bi-annually, or as agreed with IRC

Consultation objective	1. To engage key stakeholders in identifying community objectives and aspirations for post-mining land use and landform, and social value opportunities to be considered in PRC planning	
Stakeholders	**Engagement type**	**Proposed consultation frequency**
	• Seek to understand Council's strategic analysis and planning for Isaac LGA and the DNM mining area • Share information to support understanding of challenges, opportunities, and community aspirations of relevance to mine closure and rehabilitation • Cooperate if advocacy is required to achieve better PRC planning outcomes in the Isaac LGA • Build in consideration of the outcomes of Smart Transformation's projects as relevant, and the IRC's intended transformation approach	
	Participate in Council, community or industry-led initiatives including research partnerships which aim to harness social value from mine closure and rehabilitation planning, and/or work towards economic transformation/transition.	As invited
	In cooperation with BBAC and other First Nations within Isaac LGA, and on a portfolio wide basis: • Communicate the pipeline of opportunities relating to rehabilitation work and land management • Develop a shared understanding of business capabilities relevant to closure and rehabilitation works • Plan and implement an Indigenous business capability development program to match rehabilitation opportunities if this is required	Ongoing engagement process
	Via the Moranbah and/or Dysart STAC, and/or 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	To be supported by BMA-wide consultation, as required
	Provide community updates on the DNM PRCP if there are any substantive changes and associated PRCP amendments required, via Community Connect	As relevant

Consultation objective	2. To support transparent access to information about the DNM PRC planning and implementation, enabling opportunities for BMA personnel and communities within the Isaac LGA to provide feedback on rehabilitation and closure outcomes	
Stakeholders	**Engagement type**	**Proposed consultation frequency**
BMA employees and contractors	Keep the DNM workforce updated (via Coal Connect, a weekly email newsletter to personnel) if there are changes to the PRC Plan	Ongoing engagement process
Moranbah and Dysart community members and groups	Using Community Connect (BMA's bi-monthly community newsletter) and community forums such as interagency meetings, the Moranbah and Dysart STACs, partnership meetings and community and business networks, provide community updates on PRC planning (DNM-specific as relevant, and portfolio wide)	Ongoing engagement process
BMA license holders	Write to agistment licensee/s using BMA land within the DNM MLs to advise of any substantive changes to the DNM PRC Plan	As relevant
Local businesses and BMA suppliers	Provide information about the pending closure of DNM and potential future supply opportunities as part of closure and rehabilitation to local businesses, Traditional Owner businesses and BMA suppliers via C-RES	Five years prior to decommissioning; subsequent consultation to be agreed
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) • Shadow Minister for Resources • Shadow Minister for Environment, Great Barrier Reef, Science and Youth Affairs Resources • Member for Burdekin (Queensland Parliament) • DES PRCP team • Director, Native Title Services and Coal Hub, DoR • Deputy Director-General Georesources, DoR	As requested, or as agreed with representatives

Consultation objective	3. To engage with utility owners, and adjacent mining and energy tenement holders, to provide information about DNM closure planning that supports them to manage their assets and interests	
Stakeholder	**Engagement type**	**Proposed consultation frequency**
QR and Aurizon	Maintain correspondence with QR and Aurizon regarding progressive rehabilitation activities as they affect the Norwich Park Branch Railway (operated by Aurizon Holdings on land owned by QR), and regarding the conveyor from DNM, TLO facilities (and associated services to operate) and rail line	As requested, or as agreed with representatives
Utility owners: • IRC • Ergon Energy	Engage with relevant utility owners to inform them of closure timelines and rehabilitation activities relevant to the land either: • Owned by Council as road reserve (IRC) • Utlised to provide Electricity Services (Ergon)	Initiated three years prior to decommissioning
	Maintain correspondence regarding progressive rehabilitation and undertake consultation regarding crossing/interface agreements, as required if rehabilitation will affect utilities	During the three years prior to decommissioning
Mining tenements:	Engage with Stanmore regarding the schedule for cessation of use of the DNM CHPP, DNM conveyor and TLO facilities	Initiated three years prior to decommissioning

Consultation objective	3. To engage with utility owners, and adjacent mining and energy tenement holders, to provide information about DNM closure planning that supports them to manage their assets and interests	
Stakeholder	**Engagement type**	**Proposed consultation frequency**
• Stanmore – RMI, Poitrel Mine • MetRes - Millennium Mine • Peabody Energy - Moorvale Mine • Pembroke Resources - Olive Downs Project • Whitehaven Coal - Winchester South • Coking Coal One Pty. Ltd. / Bowen Coking Coal Ltd - Isaac River Project Petroleum (gas) tenements: • Arrow Energy/CH4 P/L	• Write to advise adjacent and nearby resource interests if there are any substantive changes to the closure and rehabilitation schedule in future iterations of the DNM PRC Plan • At a business level, BMA will participate in industry and research partnerships of relevance to PRCP and rehabilitation	As requested, or as agreed with representatives/mining operations
DoR	Provide updates on PRCP to the Director Native Title Services, Coal Hub (Rockhampton) and the Deputy Director General (DoR); in writing or through regular meetings	As requested, or as agreed with DoR representatives

Relationship with PRCP Schedule
DNM has transitional provisions and approved land outcomes identified in the EA. Specific community engagement on the proposed PMLUs, NUMAs and rehabilitation approach has been undertaken prior to submission of the transitional DNM PRC Plan, and consultation will continue as per the process documented in the CCP. Achievement of the PMLUs of cattle grazing, woodland habitat and watercourse are in line with engagement completed to date.

3 POST-MINING LAND USES

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.*

PRCP 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 be successfully achieved*

Where a PMLU has been previously addressed in a land outcome document and is able to be transitioned into the PRCP 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 PRCP 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.

3.1 Nominated PMLUs

The PMLUs proposed at DNM include:

- Cattle grazing
- Woodland habitat
- Watercourse

The proposed PMLUs are illustrated in Figure 14 and have been recommended based on the outcomes of the rehabilitation and closure studies supporting this PRC Plan. The PMLUs are underpinned by rehabilitation objectives that focus on achieving a safe, stable, non-polluting and sustainable post-mining landscape (as defined in the EA).

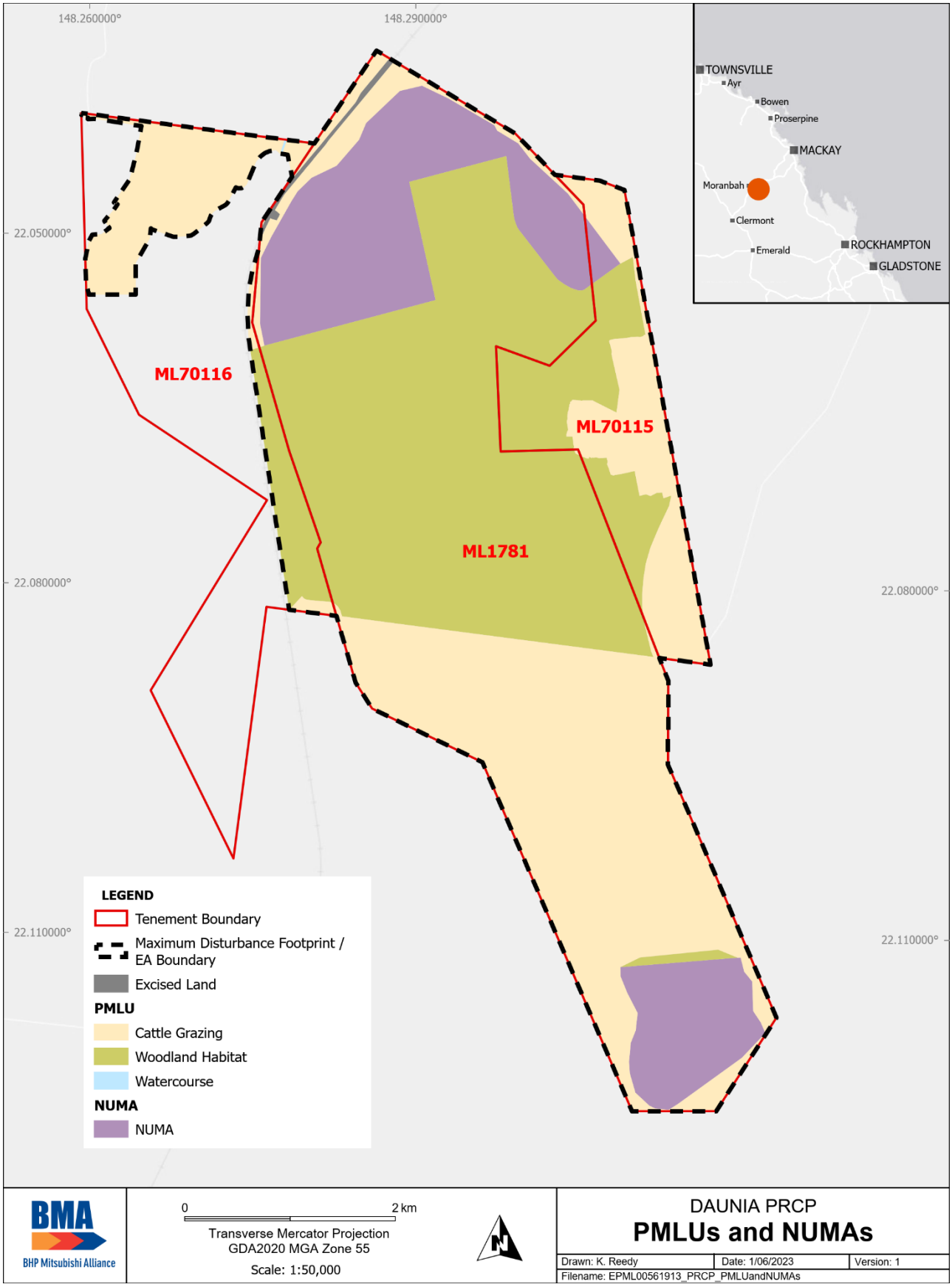

Figure 14: DNM PMLUs and NUMAs

3.1.1 Cattle grazing

3.1.1.1 Planned cattle grazing

The DNM EA objectives, indicators and acceptance criteria for the planned cattle grazing PMLU are listed in Table 19. The relevant EA acceptance criteria has been transitioned to the milestone criteria in the PRCP Schedule for the final milestone of achieving the PMLU to a stable condition for cattle grazing (RM13) for RA2 and RA5.

Cattle grazing PMLU areas were planned considering the closure landform, pre-mining land uses, and areas that require shallow rooted species.

Table 19: PMLU objectives, indicators and acceptance criteria: cattle grazing

Goal	Objective	Indicator	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 (FoS)	≥1.5
	Rehabilitation is erosionally stable	Extent, slope gradient and groundcover	Groundcover >50%, and 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: • The Environmental Protection (Water) Policy 2009 (EPP (Water)) schedule documents water quality objectives for relevant groundwater chemistry zones; or • Local water quality objectives developed in accordance with the Queensland Water Quality Guidelines.
Able to sustain the agreed post-mining land use	Rehabilitation is suitable for sustainable cattle grazing	Land suitability assessment (LSA) for cattle grazing	Land suitability class ≤3 or not different from pre-mining class if ≥4. Assessment completed in accordance with *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 Basin Queensland)* (Short, 2018) 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

The pre-mining land suitability assessment specified in the EA acceptance criteria is based on the five land suitability classes defined under the *Guidelines for Agricultural Land Evaluation in Queensland* (DSITI & DNRM, 2015). Land suitability decreases progressively from Class 1 (suitable land with negligible limitations) to Class 5 (unsuitable land with extreme limitations). The pre-mining land suitability assessment for cattle grazing at DNM was completed as part of baseline studies (Section 1.2.6.1).

The post-mining land suitability assessment for planned cattle grazing is according to *A rule-set for land suitability assessment of sustainable beef cattle grazing on land rehabilitated after open-cut coal mining in the Bowen Basin, Queensland* (referred to as Grazing rule-set), developed by Short (2018) (Table 20). This Grazing rule-set details the land use limitations, considering "*the inherent properties of the land that are used to assess land use requirements (and hence determine land suitability)*" (DSITI & DNRM, 2015) to provide land suitability classification to cattle grazing on Queensland coal mine rehabilitation. Land suitability decreases progressively from Class 1 (suitable - rehabilitation capable of attaining maximum grazing productivity) to Class 5 (unsuitable - rehabilitation that is not suitable for cattle grazing).

Table 20: Grazing rule-set: land suitability class for cattle grazing on rehabilitation (Short, 2018)

Limitation	Indicator	Units	Land Suitability Class				
			1	2	3	4	5
Water availability	Plant Available Water Capacity in effective rooting depth (ERD)	mm/0.6m	>75	75 - 60	<60 - 45	<45 - 30	<30
Nutrient supply	P in 0.1m	mg/kg	>20	20 - 14	<14 - 8	<8 - 4	<4
	pH in 0.1m	pH units	7.3 – 6.6	<6.6. – 6.0 or >7.3 – 8.0	<6.0 – 5.5 or >8.0 – 8.5	<5.5 – 5.0 or >8.5 – 9.0	<5.0 or >9.0
Soil physical factors	Surface soil structure	variable	Fine (peds <10mm)	Coarse (peds >10mm)	Surface crust	Very hard setting	Massive
Salinity	EC in ERD	dS/m	<2	2 - < 4	4 - <10	10 - <16	≥16
Rockiness	Fragments on surface	%	<5	5 - 10	10 - 30	30 - 60	>60
Topography (slope)	Gradient, surface	%	<5	5 - <10	10 - <15	15 - <20	≥20
	Vertical interval, surface	m	Nil ripping furrows	Regular ripping furrows <0.2m	Regular ripping furrows >0.2 – 0.4m	Regular ripping furrows >0.4 – 0.6m	Regular ripping furrows >0.6m
Water erosion, surface soil	Slope (ESP in 0.1m <6)	%	<5	5 - 8	>8 - 12	>12 - 18	>18
	Slope (ESP in 0.1m >6 - <14)	%	<3	3 - 6	>6 - 10	>10 - 12	>12
	Slope (ESP in 0.1m >14)	%	<1	1 - 2	>2 - 4	>4 - 6	>6

Limitation	Indicator	Units	Land Suitability Class				
			1	2	3	4	5
Sub-soil erosion	ESP at 0.5m	%	<7	7 - 14	>14 - 23	>23 - 34	>34
Potentially acid forming materials	pH <4.5	pH units	Not likely to be present within 5m of surface	Not likely to be present within 3m of surface	Not likely to be present within 2m of surface	Present immediately below root zone (0.9 – 0.6m)	Present within root zone (surface 0.6m)

Grazing 'land condition' has been included as an alternative criteria to land suitability class, in the final milestone of achieving the PMLU to a stable condition (RM13) for planned cattle grazing rehabilitation (RA2, RA5).

The capacity of rehabilitation to sustain a cattle grazing PMLU may be assessed against the indicators associated with land condition as described in the *Queensland Reef Protection Regulations Farming in Reef Catchments Grazing Guide* (DES, 2022a).

Land condition means "*the capacity of grazing land to respond to rain and produce useful forage*" (DES, 2022a). Indicators of land condition include "*the proportion of organic ground cover, density of desirable perennial pasture species (i.e. grasses that are perennial, productive and palatable (3P) for cattle), extent of erosion and presence of weeds*" (DES, 2022a).

Land condition is classified into four broad categories under the ABCD Land Condition Framework (DES, 2022a) (replicated in Table 21). For cattle grazing rehabilitation to achieve the PMLU to a stable condition, land condition must be assessed as Good (A) or Fair (B). When land is in a Poor (C) or Degraded (D) condition, maintenance measures are required to improve the land condition.

Table 21: ABCD Land Condition Framework (Figure 3) (DES, 2022a)

Land condition	Land condition features
Good - A	A condition land has all of the following features: • most land types in good condition will typically have at least 50% and often above 70% ground cover at the end of the dry season • good density of perennial grasses dominated by those species considered to be 3P grasses for that land type, little bare ground (less than 30 % in most years) • few weeds and no significant infestations • good soil condition: no erosion, good surface condition
Fair - B	B condition land has at least one or more of the following features, but otherwise is similar to A condition land: • land types will typically have at least 50% ground cover and less than 70% in most years at the end of the dry season • some decline of grasses that are 3P grasses, increase in other species (less favoured grasses, weeds) and/or bare ground (more than 30% but less than 50% in most years) • some decline in soil condition, some signs of previous erosion and current susceptibility to erosion
Poor - C	C condition land has one or more of the following features, but otherwise is similar to B condition land:

Land condition	Land condition features
	• land with poor or degraded condition will typically have less than 50% ground cover at the end of the dry season • general decline of grasses that are 3P grasses, large amounts of less favoured species and/or bare ground (greater than 50% in most years) • obvious signs of past erosion and/or current susceptibility to erosion is high
Degraded - D	D condition land has one or more of the following features: • generally less than 20% ground cover • general lack of any perennial grasses or forbs • severe erosion or scalding, resulting in hostile environment for plant growth • often no long-term ability to carry stock

3.1.1.2 Existing cattle grazing

For areas of existing cattle grazing rehabilitation (RA4), the final milestone of achieving the PMLU to a stable condition (RM16) primarily focuses on assessing the grazing land condition of the rehabilitated lands. Achieving Good (A) or Fair (B) land condition (as per Table 21) requires the pasture to have >50% groundcover and indicates the land has capacity to produce useful forage (i.e. 3P grasses), with/without some decline in soil condition.

3.1.2 Woodland habitat

The DNM EA objectives, indicators and acceptance criteria for PMLU of woodland habitat are listed in Table 22. The relevant acceptance criteria has been transitioned to the milestone criteria in the PRCP Schedule for the final milestone of achieving the PMLU to a stable condition for woodland habitat (RM14) for RA1.

Woodland habitat PMLU areas were planned considering the closure landform, existing vegetation, ecological values and pre-mining land uses. The planned woodland habitat areas will provide connectivity to the existing vegetation adjacent to the New Chum Creek riparian corridor.

Table 22: PMLU objectives, indicators and acceptance criteria: woodland habitat

Goal	Objective	Indicator	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	FoS	≥1.5 unless an alternative is justified by an appropriately qualified engineer
	Rehabilitation is erosionally stable	Groundcover (steep slopes, >15%)	80%
		Groundcover (lesser slopes, ≤15%)	50%

Goal	Objective	Indicator	Acceptance criteria
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: • the EPP (Water) schedule documents water quality objectives for relevant groundwater chemistry zones; or • local water quality objectives developed in accordance with the Queensland Water Quality Guidelines.
Able to sustain an agreed post-mining land use	Native bushland habitat characteristics	Species richness: Trees Shrubs Grasses	 ≥2 ≥3 ≥4
		Tree canopy cover	≥16 %

3.1.3 Watercourse

New Chum Creek is the only watercourse that traverses through DNM (Section 1.2.4). The disturbed area within the New Chum Creek watercourse PMLU is associated with a culvert for the existing haul road (approximately 0.3ha). The rehabilitation of the culvert crossing to a watercourse PMLU will be undertaken at the end of the mine life when the haul road is no longer required.

During the PMLU engagement with DES in 2018 (Section 2.1), a watercourse PMLU was not proposed for the DNM EA, as the PMLU criteria was developed specifically for creek diversions, and it was not envisaged that a PMLU and criteria would be needed for the minor watercourse disturbance on DNM. The BMA EA objectives, indicators and acceptance criteria for a PMLU of watercourse accepted by DES during this engagement for the other BMA sites (Table 23), can be applied to rehabilitation of the disturbed area within New Chum Creek. This watercourse PMLU criteria have been adopted for the milestone criteria in the PRCP Schedule for the final milestone of achieving the PMLU to a stable condition for watercourse (RM15) for RA3.

Table 23: PMLU objectives, indicators and acceptance criteria: watercourse

Goal	Objective	Indicator	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 erosionally 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.

Goal	Objective	Indicator	Acceptance criteria
Able to sustain an agreed post-mining land use	Riparian vegetation	Riparian vegetation index (IDC method)	Greater or equal to upstream or downstream values.

3.2 Community considerations

Achievement of the PMLUs of cattle grazing, woodland habitat and watercourse is in line with consultation completed to date (Section 2).

3.3 Regional planning integration

The PMLUs at DNM consider the pre-mining land use, current adjacent land uses (cattle grazing and coal mining), land ownership and approved EA conditions (Section 3.1).

Under the Isaac Regional Planning Scheme (Isaac Regional Council, 2021), DNM is located in a Rural Area zone. This includes primary production uses (such as cropping, intensive horticulture, aquaculture, grazing, intensive animal industries, animal husbandry and animal keeping), renewable energy facilities and extractive industries, outdoor recreation and small-scale tourism facilities. The purpose of the rural zone includes providing "*for other uses and activities that are compatible with: (i) existing and future rural uses and activities; and (ii) the character and environmental features of the zone…*" (Isaac Regional Council, 2021).

Land use performance outcomes (PO11) for this Rural Area zone include ensuring development:

'*(a) is consistent with the rural character of the locality;*

(b) supports the primary rural function of the zone;

(c) protects rural, natural and scenic values of the locality; and

(d) includes boundary realignments where used to align with mining or petroleum tenements'.

Concurrently, the Queensland Government - via the Mackay, Isaac and Whitsunday Regional Plan (State of Queensland, 2012), maps DNM 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 of these regional plans are consistent with the PMLUs proposed for DNM.

Relationship with PRCP Schedule
The proposed PMLUs for DNM are consistent with pre-mining land uses, current adjacent land uses and PMLUs already approved as part of the site's EA. These PMLUs can also be aligned to future land use development outcomes defined as part of State and regional plans. The PMLU extents consider the closure landform, existing vegetation, ecological values, pre-mining land uses, watercourses and surrounding public infrastructure. The EA acceptance criteria - agreed and approved as part of prior approvals - for cattle grazing, woodland habitat and watercourse, have been refined to reflect site-specific rehabilitation needs and are transitioned to milestone criteria for achieving these PMLUs.

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.*

PRCP 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 PRCP 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 PRCP 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 PRCP 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 PRCP 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*' (DES, 2023). This is the case for DNM due to the residual voids being authorised under Schedule E (Condition E9) of the LOD. BMA has transitional arrangements for residual voids as pre-approved NUMAs.

As per the PRCP Guideline, if a NUMA has already been identified in a LOD, 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. However, DNM is still required to meet the legislative requirements under section 126C(1)(d) of the EP Act.

As the LOD does not state the area or the location of the proposed NUMAs, the PRCP Guideline also requires this PRC Plan to include detail on how the total area will be minimised and/or how the location of the proposed NUMAs will minimise risk to the environment.

4.1 Nominated NUMAs

The DNM NUMAs include the residual voids of Titan North/Central, Titan East and Pandora (Figure 14). The extent of the NUMAs is designed to achieve an area that is safe and structural stability and includes: the residual void below ground level (high-wall, end-walls, low-wall and floor); any associated wall set-backs at natural ground level to achieve a FoS of 1.5; and a safety bund and fence.

The total proposed NUMA area is 503ha. This NUMA area has been minimised by progressive backfill of final voids to completely fill Atlas West, Atlas East, Calypso Central, Skoll and Titan West pits.

The NUMAs will incorporate safety features to prevent access, including:

- A safety bund and fencing constructed at the NUMA extents to prevent human and livestock access
- Signage at regular intervals along the fence

4.2 Minimising environmental impacts

Numerous studies have been undertaken as part of this PRC Plan to assess, refine and optimise the DNM NUMA locations and extent to minimise environmental harm. These studies resulted in the re-iterative refinement of the NUMA design.

The preliminary NUMA locations and extent were used as the basis for the following void studies:

- Void in floodplain modelling (Section 5)
- Water balance modelling (Section 6.3)
- Void water quality modelling (Section 6.3)
- Void geotechnical studies (Section 6.3)
- Groundwater modelling (Section 6.1.1)
- Rehabilitation flood modelling (Section 6.1.2)

The final NUMA locations and extents were minimised based on the outcomes of all the studies. This resulted in the following final modifications:

- Pandora: landform along sections of the western end-wall to mitigate the risk of flooding into the residual void up to the 0.1% Annual Exceedance Probability (AEP) flood level (Section 6.1.2)

The studies presented in this PRC Plan support that the final location and extent of the NUMAs will not present an unacceptable risk of environmental harm outside of the tenure boundary due to:

- Mitigating unacceptable risk of flooding into the residual voids (Section 6.1.2)
- Containing contaminants originating within the spoil dumps and co-disposed rejects within the mining tenements as the residual voids:
  - Act as long-term groundwater sinks (Sections 6.1.1.2 and 6.3.2.3)
  - Do not overtop (release void water to surface waters or the surrounding landscape) as long-term pit water levels remain well below the spill point (Section 6.3.2.3)
- Minimise potential for interconnectivity between the deeper Permian and shallower alluvial aquifers (Section 6.3.2.2)
- The NUMA extents are designed to achieve structural stability, therefore no geotechnical damage is expected beyond the NUMA

To further support minimisation of environmental harm, the NUMA low-walls will be revegetated to within 10m above the modelled maximum residual void lake elevation. The modelling of the residual void lake maximum elevations will be undertaken on establishment of the residual voids and will consider any changes to the catchments, landforms and the results of additional monitoring data. The 10m elevation distance between the vegetation and void lakes provides a buffer for the vegetation from the saline void lakes.

4.3 Community considerations

Residual voids as NUMAs is consistent with the outcomes of community consultation as outlined in Section 2.

4.4 Regional planning integration

The Isaac Region has a strong history and connection with mining and the resources sector, which has positioned the region as a gateway to mining and exploration activities. Both the local Isaac Regional Planning Scheme (Isaac Regional Council, 2021) and the broader Mackay, Isaac and Whitsunday Regional Plan (State of Queensland, 2012) identify mineral and extractive resource industries - in particular, coal and coal seam gas, as significant components of the current and future regional economic development.

Relationship with PRCP Schedule
The proposed NUMAs for DNM are designed to be safe, structurally stable and minimise the risk of environmental harm. Retention of residual voids as pre-approved NUMAs, that are part of the rehabilitated landscape, is consistent with the DNM LOD.

5 VOIDS IN FLOOD PLAINS

Legislative Requirement

In accordance with section 126D(3) of the EP Act, if land the subject of the proposed PRCP 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.

PRCP 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.

A voids in flood plains assessment has been undertaken by an Appropriately Qualified Person (AQP) to support the development of this PRC Plan. The detailed report – *Daunia Mine Transitional PRCP Voids in Flood Plain Assessment* is provided in Appendix G.

5.1 Background

The DNM closure landform includes the residual voids as pre-approved NUMAs (Titan North/Central, Titan East and Pandora) (Figure 16). As the location of these voids is not identified within the LOD, in accordance with the PRCP Guideline transitional PRC Plan provisions, a voids in flood plain assessment has been undertaken.

5.2 Relevant watercourses

A 'relevant watercourse' is defined as (State of Queensland, 2022a):

(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;

(iii) the watercourse as permanently diverted.

The following three watercourses with a Strahler stream order of four or greater are present within the region in which DNM is located, and were reviewed for their relevance to the DNM voids in flood plain assessment:

- Isaac River
- North Creek
- Cherwell Creek

As Cherwell Creek is located on the far side of the Isaac River and DNM is not located within this catchment, it is not considered to be a relevant watercourse applicable to DNM. Also, only the very northern portion of DNM is located within the upper most catchment serviced by an unnamed tributary of North Creek. The DNM area is not impacted by flooding from North Creek. Therefore, the only 'relevant watercourse' modelled as part of the voids in flood plains assessment was the Isaac River.

5.3 Voids in flood plains landform

The intent of the voids in flood plains modelling is to represent the flood plain within the tenement without 'artificial features' as defined by State of Queensland (2022). The landform used for the purpose of voids in flood plains modelling within this PRC Plan was developed using a combination of:

- BMA-available LiDAR data within and immediately surrounding the tenement
- Historical aerial imagery and publicly available one second Shuttle Radar Topographic Mission (SRTM) Hydrological Digital Elevation Model (DEM) topographical data (Geoscience Australia), for areas outside of the available LiDAR data

As required for this assessment, off-tenement artificial features that have the potential to impact the flood plain were assessed for their potential to influence flood hydraulics at DNM, and where appropriate, have been included within the modelled landform. The following off-tenement artificial features were assessed as potentially influencing flooding and have been included in the model:

- Poitrel Mine's residual voids
- Poitrel Mine's spoil dumps
- Poitrel Mine's New Chum Creek diversion
- Norwich Park Railway

The Peak Downs Highway was an artificial feature off-tenement that was assessed as part of the model development, however the highway had no effect on the 0.1%AEP flood levels in the proximity of DNM and was therefore excluded.

As part of the evolution of the landform design, the updated location and extent of the residual voids was within the voids shown in the voids in flood plains assessment (Appendix G).

5.4 Modelling

For the voids in flood plains assessment, hydrologic modelling was undertaken using the Watershed Bounded Network Model Version 2019 (WBNM). WBNM is an industry standard rainfall-runoff routing software package.

The WBNM model developed for DNM was for the identified relevant watercourse, the Isaac River, with the model extent including the catchment area between the Goonyella (130414A) and Deverill (130410A) stream gauges. The modelled catchment area covers approximately 8,300 km^2. This allowed the model to be calibrated against the results of a Flood Frequency Analysis based on the data from both the Goonyella and Deverill stream gauging stations.

The Flood Frequency Analysis, using recorded streamflow data sourced from the two stream gauging locations, produced results that were consistent with the model, and therefore the model was considered suitable for purpose of this assessment.

As part of the voids in flood plains assessment, a hydraulic model of the Isaac River in the vicinity of DNM was developed to assess the pre-mining flood extents. The industry standard hydrodynamic modelling software TUFLOW (Build 2020-10-AA) was utilised to undertake the hydraulic modelling.

To improve the accuracy of the hydraulic model results, the following terrain modifications were made:

- The Poitrel Mine residual voids were assumed to be rehabilitated to a state that provides flood immunity for flood events up to and including the 0.1% AEP event. The modelled terrain was modified to raise ground levels immediately around the perimeter of the Poitrel Mine residual voids.
- Changes to the DEM were made to improve the integration of the more detailed and up to date LiDAR data and the lower resolution publicly accessible data, including:
    - Drainage features were reinforced using gully lines to ensure reasonable conveyance of flows through the drainage lines
    - Publicly sourced topography was lowered by 3.8m to better align with the more accurate LiDAR data

In accordance with the recommendations of Australian Rainfall and Runoff (AR&R) guideline (Ball, et al., 2019), an evaluation of was undertaken to determine the critical storm duration for the proposed void locations. The results identified the 36-hour storm duration was the critical event for the Isaac River in the proximity of DNM.

Further details on the models, their calibration/sensitivity analysis, assumptions and parameters are detailed in Appendix G.

5.5 Results

The results of the DNM voids in flood plain assessment for peak water surface levels and depths for the 0.1% AEP are illustrated in Appendix G. The results identified the following:

- Titan North/Central and Titan East residual voids are located outside the modelled flood plain
- Pandora Pit residual void encroaches into the modelled flood plain of the Isaac River at the north-west extremities of the residual void footprint

The majority of the Pandora residual void footprint is located outside of the void in flood plain extent with encroachment of the flood plain only occurring on the north-western portion of the residual void. A landform to the west of the Pandora residual void (an artificial feature not included within the voids in flood plains modelling) provides flood immunity to the Pandora residual void for the rehabilitation flood modelling up to and including the 0.1% AEP event (Sections 6.1.2 and 6.1.5).

Relationship with PRCP Schedule
The location and extent of the residual voids, combined with other aspects of the landform design, including the set-back from the ML boundary and placement of landforms, provides an appropriate level of protection

Relationship with PRCP Schedule
to the residual voids. Flood protection includes flood events associated with New Chum Creek and the Isaac River up to and including a 0.1% AEP.

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 PRCP 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 PRCP Schedule for the area.*

PRCP 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.

PRCP 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.

6.1 General rehabilitation practices

6.1.1 Hydrogeology

PRCP 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 including conceptual and numerical modelling, has been undertaken to support the development of this PRC Plan. The detailed report – *Daunia Mine Transitional PRC Plan Hydrogeology Assessment* is provided in Appendix G.

The key hydrogeological units present within and immediately surrounding DNM are summarised in Section 1.2.5 and include:

- Quaternary-Tertiary sediments:
  - Quaternary alluvium – unconfined aquifer (water-bearing strata of permeable rock, sand, or gravel) localised along Isaac River and North Creek
  - Quaternary to Tertiary colluvium and weathered units (regolith) – unconfined and largely unsaturated unit bordering alluvium
- Triassic Rewan Group – aquitard overlying Permian coal

- Permian coal measures:
  - Low permeability interburden units with aquitard properties
  - Coal seams

6.1.1.1 Groundwater Modelling

To support the assessment of potential groundwater impacts, numerical groundwater modelling was undertaken utilising BMA's existing regional model. Full details of this numerical model are included within the Saraji East Mining Lease Project Groundwater Modelling Technical Report (SLR, 2023). The model has been developed in accordance with the Australian Groundwater Modelling Guidelines (Barnett, et al., 2012), the Murray Darling Basin Commission Groundwater Flow Modelling Guideline (Aquaterra, 2001), and the Independent Expert Scientific Committee Explanatory Note for Uncertainty Analysis (IESC, 2018).

The numerical model utilises a graphical user interface in conjunction with the modelling software MODFLOW-USG, which is distributed by the United States Geological Survey.

The objectives of the predictive groundwater numerical modelling were to:

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

The groundwater modelling completed for this PRC Plan built upon the existing BMA model that includes regional data from BMA and other mine sites through data sharing agreements. This has allowed the model to better assess regional cumulative groundwater impacts. The groundwater model setup, underlying assumptions/limitations, model performance, calibration and model results are detailed in the hydrogeological assessment (Appendix D).

The groundwater model utilised the second iteration of the closure landform design (the final and third design proposed in this PRC Plan has since been modified based on outcomes of other studies). A review of the final closure landform design along with the revised void water balance model results, confirmed that changes to the closure landform design undertaken post the groundwater modelling do not have a material impact to the groundwater model results.

An assessment of the groundwater model including data inputs, calibration and predictions, using the 2012 Australian Groundwater Modelling Guidelines classification system, identified the model overall, can be classified as primarily a Class 3 "high confidence" model. Therefore, the groundwater model is considered suitable to inform the development of this PRC Plan.

Climate change considerations have been included within the modelling and have been based on the BHP (2020) Coal Technical Document - Guideline for Climate Change Adaptation in Mine Water Planning and Hydrologic Assessments . This included the review of six relevant climate models and the selection of three models (ACCESS1-0Q, GFDL-CM3Q and MPI-ESM-LRQ) for both the 4.5 and 8.5 Representative Concentration Pathways, that provided an envelope over the variability and uncertainty in water level projections. From the climate model review, the following three climate scenarios (Table 24), representative of the modelled maximum reasonable range of influence on the voids, were used to generate three sets of groundwater model predictions.

Table 24: Modelled climate scenarios as part of the groundwater assessment

Climate model	IPCC RCP scenario[#]
ACCESS1-0Q	4.5
ACCESS1-0Q	8.5
MPI-ESM-LRQ	8.5

- Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathway (RCP)

The predominant identified influence from climate change on groundwater was associated with the void lake levels and their effect on groundwater hosted within the in-pit spoil emplacements prior to recovery. Upon stabilisation of the void lakes and groundwater elevations, the modelling identified negligible difference in hydrogeological conditions between the assessed climate scenarios. Therefore, the hydrogeological information presented within the PRC Plan is focused on the mid climate change scenario (ACCESS1-0Q/RCP 8.5). Additional information on the model results for the other climate change scenarios assessed are detailed in the hydrogeological assessment contained in Appendix D.

6.1.1.2 Void Lake and Groundwater Relationship

Void lake levels were included within the groundwater model through an iterative modelling approach between the groundwater model and the void water balance model (Section 6.3). The iterative approach undertaken allowed the groundwater fluxes to the voids to be refined and both the groundwater model and the void water balance models to align to better understand the relationship between the void lakes and surrounding groundwater.

The elevation of the long-term water levels within the residual voids are predicted to remain below the base of the shallow geologic formations adjacent the voids, even considering the temporal fluctuations in predicted void water levels. The lake levels for all voids, and all climate scenarios modelled, remain at least 41m below the base of the shallow geological formations. Therefore, the model results do not identify a potential for a flux of water to leave the residual voids and enter shallow geologic formations.

As a measure of conservatism, the void lake water balance modelling has assumed the residual voids contain water/lakes immediately upon completion of mining. Although this does not represent a reasonably likely scenario for the DNM voids, this conservative approach further stress tests the establishment of voids as long-term groundwater sinks as fluxes to and from the groundwater are largely governed by the void lake levels.

In the first 70 to 80 years post-mining for the Titan North/Central and Pandora voids, and in the first two years post-mining for the Titan East void, the groundwater levels in the proximity of the voids are in the process of recovering from mine dewatering activities. As a result of the suppressed groundwater levels surrounding the residual voids and the conservative assumption that void lakes will be present immediately upon completion of mining, initial outflows from the voids to the groundwater are predicted by the groundwater model. Variability, with periods of outflow are also modelled to occur in the Titan North/Central and Pandora voids in the first 70-80 years post-mining. As shown in Figures 7-4 to 7-6 within Appendix D, the model outflows predominantly occur to the in-pit spoil dumps prior to groundwater recovery and are driven by wet climatic conditions. Once groundwater levels have recovered, particularly within the spoil, the model results indicate sustained groundwater sink conditions within the voids.

Within the first 70 to 80 years post-mining, evapo-concentration effects on the void lake water will have not increased TDS concentrations to above the EA-derived trigger values. The modelled TDS concentrations within the void lakes (see Void Closure Plan, Appendix K) are also within the range of results reported for the Permian hydrogeological units (Section 1.2.5.3). Therefore, modelled outflows from the voids during groundwater recovery, which primarily occur to the in-pit spoil, are not anticipated present an unacceptable risk to surrounding environmental values.

As detailed within the Void Closure Plan (Appendix K), the groundwater inflows to the voids represent approximately 20% to 30% of the total volumetric water inflows to the residual voids once groundwater levels have recovered. The predominant sources for water inflows to the residual voids are from direct precipitation and surface water flows. The groundwater portion of the inflows to the residual voids is predicted to be between 96% and 100% sourced from the spoil in all modelled climate change scenarios. As the closure landform does not retain any dams or diversions on rehabilitated spoil filled areas, the predominant source of groundwater within the spoil is from infiltration from direct precipitation to the spoil dumps.

6.1.1.3 Groundwater Levels

Modelled post-mining equilibrium groundwater levels are illustrated in Figures 7-10 to 7-12 of Appendix D. These hydrographs show the groundwater drawdown occurs during the currently approved mining activities and the closure landform design does not contribute to additional drawdown of the groundwater resources.

Groundwater recovery at DNM is influenced by other mining operations to the north, east and west of the DNM operations and the compartmentalised nature of the Permian hydrogeological unit resulting from the cemented

faults within the area. There are also other proposed extractive industry projects in the area surrounding DNM, which could also influence groundwater recovery at DNM if these projects proceed.

Groundwater elevations in the immediate proximity of the residual voids are predicted to maintain long-term inwards groundwater flow gradients post-mining, with the groundwater elevations remaining below pre-mining levels. The reduction in groundwater elevation is driven by the ongoing groundwater inflows to the residual voids and the loss of water from the void lakes through evaporation.

Steepest water table gradients surrounding the residual voids occur northeast of the DNM adjacent the Titan East void. Gradients north and west of Titan North/Central void and surrounding the Pandora void are generally shallower. Water table depression east of the DNM area extends up to 1km from the edge of the DNM. However, the water table depression west of the DNM area is comparatively limited in what is considered to be a result of the simulated influence of Poitrel Mine. The water table remains close to pre-mining groundwater elevations in the area along the Isaac River where potential GDEs are mapped.

Modelled post-mining groundwater levels for the Leichhardt and Vermont seams of the Permian coal measures indicate that groundwater levels in the Permian sequence are to remain below the pre-mining levels, driven by the groundwater discharge to, and ongoing evaporation from, the residual void lakes. The Leichhardt and Vermont seams in the fringing areas immediately adjacent to the DNM are also predicted to remain 'dry' (unsaturated) in the long-term post-mining.

An assessment of the groundwater levels over time for the Leichhardt and Vermont seams post-mining, just outside the residual voids, indicates the vast majority of groundwater level drawdown in the Permian coal measures occurs during mining operations. Groundwater levels within the coal seams adjacent the Titan North/Central residual void are predicted to increase in the long-term post-closure while little to no increase in groundwater levels are predicted around the Titan East and Pandora residual voids. The assessment of groundwater levels also indicated very little effect on groundwater levels from the residual void inflow flux variability in the early post-closure period. Predicted residual void lake levels remain below predicted groundwater levels at all times, indicating no potential for outwards movement of void water to the Leichhardt or Vermont seams outside the residual voids.

6.1.1.4 Flow path simulation

To assist with the understanding of potential contaminant migration patterns through groundwater, an analysis of the water movement within the closure landform, based on currently available groundwater data, has been undertaken. The simulation was undertaken over a 2,000-year groundwater recovery period post-mining. The simulation was undertaken by placing particles within the model surface in the recovery groundwater model and the mod-PATH3DU code software was used to simulate particle pathways along the groundwater flow field during recovery. The mod-PATH3DU code automatically moves the particles from the model surface to the shallowest saturated layer at the commencement of the simulation.

The predicted movement of water particles in the 2,000-year recovery simulation are shown in Figure 7-17 of Appendix D. The model results indicate that particles located within the shallower groundwater units generally move towards the deeper Permian unit or backfill spoil where the coal measures have been mined out. The modelled flow paths for particles placed within spoil to the east of New Chum Creek and the eastern side of the MIA area, flow towards the residual voids. Particles placed at the commencement of the simulation period within the residual voids remain captured within the voids.

Particles placed in the central and western side of the MIA area do not become captured within the DNM residual voids or spoil dumps over the 2,000-year simulation period. The particles move southwards approximately 1km and leave the DNM operated area and enter the Poitrel Mine operated area of ML70116 (joint ML between DNM and Poitrel Mine). The direction of particle migration in this area is influenced by the Poitrel Mine voids and the cemented north-south fault line. As per RM2, this area will be subject to contaminated land investigations at the completion of mining. Contamination remediation and/or management to render the area suitable for the nominated PMLU will be undertaken.

Overall the particle tracking simulation demonstrates the value for retaining the residual voids as groundwater sinks to contain leachate from areas containing the spoil and co-disposed rejects.

6.1.1.5 Post-mining – Conceptual site model

An evaluation of the source-pathway-receptor (SPR) linkages based on the modelling results for the post-mining environment, where groundwater conditions have stabilised, has identified the following key features:

- Residual void lake formation, with lake levels stabilising below the groundwater elevations and any shallow post-Permian strata regardless of climate scenario modelled, including the base of surficial weathering and shallow hydrostratigraphic units (i.e. alluvium and regolith).
- Residual groundwater drawdown within the RCM resulting from the approved DNM mining operations and ongoing evaporative discharge from the residual void lakes, results in continued inwards hydraulic flow gradients in the coal measures to the residual voids and no outflow in the long term regardless of climate scenario modelled.
- Residual voids continue to capture seepage from spoil emplacements.
- Moderate potential for groundwater beneath the MIA to not be captured by the closure landform due the hydraulic influence of the adjacent Poitrel Mine and cemented faults.
- Little to no additional impact on surficial aquifers, including the alluvial aquifers, caused by the closure landform.
- Little to no additional impact on environmental receptors caused by the closure landform.
- Little to no additional impact on anthropogenic receptors caused by the closure landform.

A visual representation of the post-mining conceptual-site-model is provided in Figure 15.

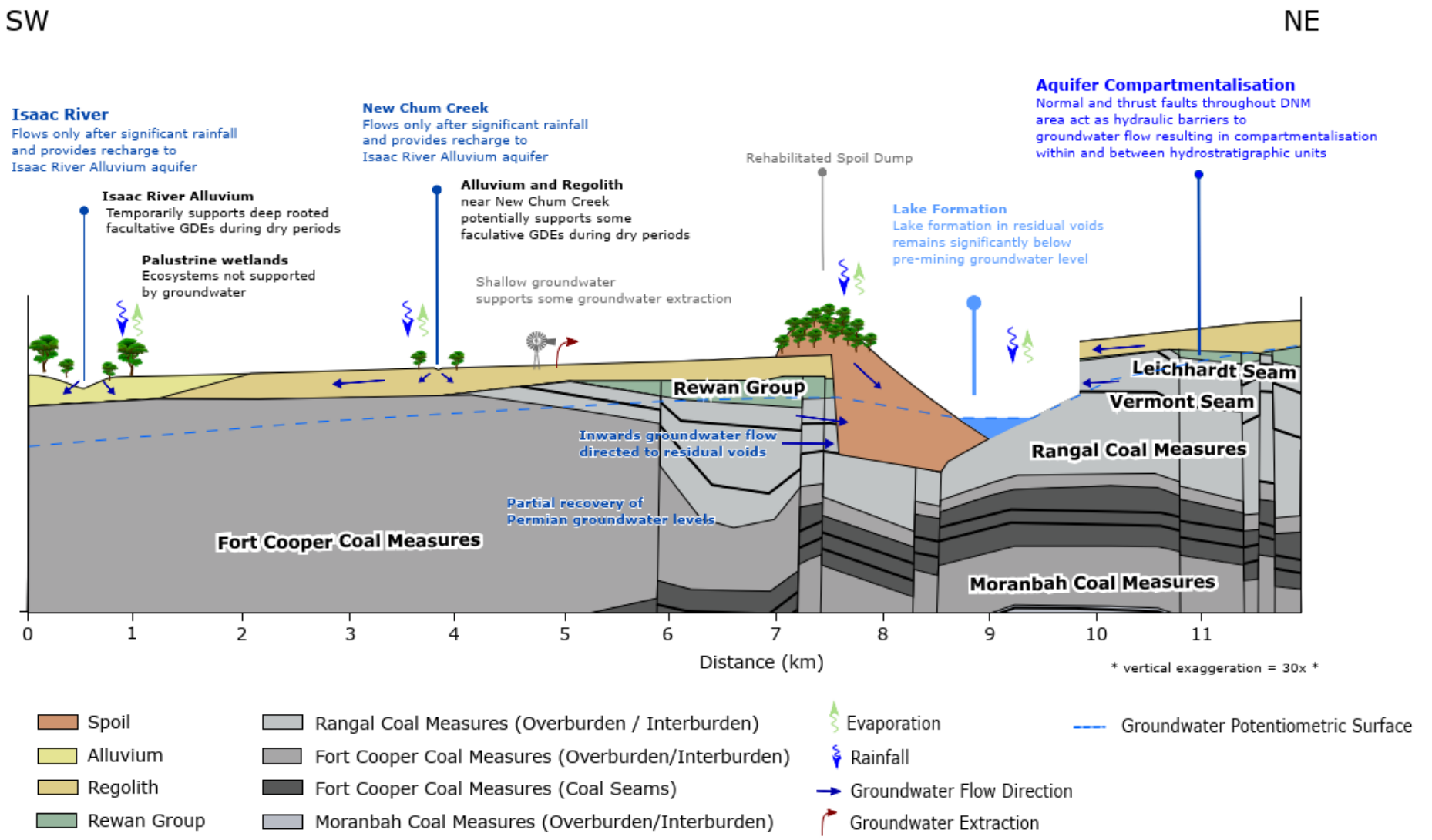

Figure 15: DNM post-mining hydrogeological conceptual model

Relationship with PRCP Schedule
Retention of residual voids within the closure landform will maintain groundwater gradients towards the voids within the area containing the spoil dumps and co-disposed rejects. The voids, once groundwater and void lake levels stabilise, will establish as long-term groundwater sinks. Void lake levels remain below the shallow geological formations and therefore do not provide complete exposure pathways between the void lakes/Permian hosted aquifers with the shallower aquifers such as those hosted within the Quaternary alluvium. The closure landform will have little to no additional impact to environmental or anthropogenic receptors. With the retention of the residual voids in the closure landform, no on-going groundwater management will be required.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4				RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM3	• Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.1.2 Flooding

PRCP 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 domains.

A rehabilitation flood assessment, including consideration of flow alteration, modelling flood levels for a range of design storm events and development of a flooding risk profile, has been undertaken to support the development of this PRC Plan. The detailed report - *Rehabilitation Flood Modelling, Daunia Mine* is provided in Appendix H.

The flood modelling was undertaken on an iterative approach with the closure landform design development. Information from the initial round of rehabilitation flood modelling was used to inform further development of the closure landform design. The amended landform design included refinements comprising of removal of culverts and other infrastructure from watercourses/floodplains, and changes to landforms to provide increased protection from flood waters. Upon finalising the closure landform design, the flood modelling was re-run and the flood risk profile and other interpretations amended to reflect the final closure landform design, which is presented within this PRC Plan.

6.1.2.1 Flood modelling

The hydrologic modelling undertaken to support this PRC Plan was based on and existing model for DNM (WRM, 2019), which had been completed using industry standard software XPRAFTS. A review of the existing model by WMS indicated that it was fit for purpose and provided an appropriate model domain for the Isaac River, inclusive of the DNM mining area.

The total catchment area covered by the model domain was 4,079km^2 and consisted of 116 sub-catchments.

TUFLOW 2D hydraulic models were developed to determine flood behaviour around the closure landforms. TUFLOW (version 2020-10-AD) is an industry standard software hydraulic modelling package. Hydraulic models incorporating the closure landform design were developed for the Isaac River.

As the available LiDAR footprint and closure landform design was limited to the mine area and immediate surrounds, publicly accessible one second SRTM Hydrological DEM topographical data (Geoscience Australia) was used in addition to the LiDAR data to develop the DEM to cover the required area. Due to the lower resolution of the publicly available topographical data and other disparities between the data sets, terrain modifiers were used to create the DEM. The terrain modifiers were used to: align the elevations; prevent flooding of the Poitrel Mine voids; remove culverts associated with RMI operations upgradient; and to ensure that watercourses were appropriately aligned.

To evaluate alteration of flows, hydraulic models were also developed for the pre-mining landforms. The pre-mining landforms utilised were consistent with those developed for the voids in flood plain modelling. The pre-mining DEM was also created using BMA LiDAR and the publicly accessible SRTM data. Terrain modifiers were also read into the model to better define watercourses due to the low resolution of the publicly accessible data.

Climate change considerations, in line with the BHP (2020) Coal Technical Document Guideline for Climate Change Adaption in Mine Water Planning and Hydrologic Assessments, were included within the model through running of the following six climate change scenarios for the 2061 to 2099 period for both the 1% AEP and 0.1% AEP:

- RCP 4.5 10th percentile (5% rainfall intensity increase)
- RCP 4.5 50th percentile (11% rainfall intensity increase)
- RCP 4.5 90th percentile (20% rainfall intensity increase)
- RCP 8.5 10th percentile (8% rainfall intensity increase)
- RCP 8.5 50th percentile (17% rainfall intensity increase)
- RCP 8.5 90th percentile (28% rainfall intensity increase)

Further details on the model set up, assumptions, sensitivity testing, hydraulic roughness, catchments, critical duration assessment, etc. are detailed in Appendix H.

The models were run for the 50%, 10%, 5%, 1%, 0.1% AEP and probable maximum flood (PMF) events.

6.1.2.2 Flood levels and rehabilitation domains

Modelling of the closure landform indicates the Titan North/Central and Titan East residual voids are immune to flood ingress for all modelled events including the 0.1% AEP, and upper climate change scenario RCP 8.5 P90.

Through the iterative landform design approach, a landform to the west of the Pandora residual void has been included within the closure landform. This landform provides protection from flood water ingress from the Isaac River and New Chum Creek up to and including the 0.1% AEP, and the upper climate change scenario RCP 8.5 P90.

Surface water flows from a relatively small catchment on the eastern side of DNM, which currently flows through and unnamed drainage line, are modelled to enter the Pandora void for events at or greater than 0.1% AEP. Modelling indicates that in a 0.1% AEP event, including the upper climate change scenario RCP 8.5 P90, that ingress into the residual void would be approximately 1,835ML. As the available storage capacity between the void lake and the groundwater is modelled to be between 26,800ML to 27,800ML, the ingress of the modelled volumes of floodwaters will not impact on the Pandora residual void's groundwater sink characteristics.

Flood waters that spill out of the main channel also have the potential to interact with the spoil dumps in the southern portion of DNM. The contact with the landforms is generally at the extremity of the floodplain where velocities and flood heights are low. Outer landform slopes that interact with flood waters up to a 0.1% AEP will incorporate controls, if required, to minimise potential instability of the landform from interaction with floodwaters.

6.1.2.3 Alteration of Flows

For the assessment of flow alteration downstream of the mine site, peak flows and total volumes for the closure landform and the pre-mining landform scenarios were extracted from a downstream location in each of the hydraulic models. Peak flows and total volumes through the selected downstream locations (Figure 5-2, Appendix H) are summarised in Table 25.

Table 25: Peak flow comparison between the pre-mining condition and closure landform, immediately upstream of void locations

Model	Event	Peak flow % change	Total volume % change
Location 1 (New Chum Creek)	50% AEP	-3.2%	-5.5%
	10% AEP	-3.1%	-3.4%
	5% AEP	-1.9%	-3.2%
	1% AEP	-2.2%	-3.1%
	0.1% AEP CC RCP8.5 P90	-2.8%	-2.9%
	PMF	-3.6%	-2.9%
Location 2 (Isaac River below confluence with New Chum Creek)	50% AEP	-0.4%	-0.6%
	10% AEP	-0.1%	-0.4%
	5% AEP	-0.2%	-0.4%
	1% AEP	-0.2%	-0.3%
	0.1% AEP CC RCP8.5 P90	-0.2%	-0.3%
	PMF	-0.2%	-0.4%
Location 3 (Isaac River downstream of DNM)	50% AEP	-0.2%	-0.5%
	10% AEP	-0.6%	-1.1%
	5% AEP	-0.7%	-1.0%
	1% AEP	-0.7%	-1.0%
	0.1% AEP CC RCP8.5 P90	-0.4%	-0.7%
	PMF	-8.0%	-4.5%

The comparison of flows between the pre-mining conditions and the closure landform shows a decrease in the peak flows and volumes within the closure landform scenario. This is predominantly associated with the reduction in catchment from the residual voids and the top of the spoil dumps.

The reduction in volumes are the largest for New Chum Creek as a result of the relatively smaller catchment size and the reduction in catchment from the Titan North/Central residual void and the spoil dumps. The reduction in volumes within New Chum Creek are less than 5.5% for all modelled events.

Excluding the PMF event where flooding of the Pandora residual void would occur, the modelled reduction in peak flows of less than 0.7% and volumes of less than 1.1% within the Isaac River, occur as a result of the closure landform. In the extremely unlikely case of a PMF event, the peak flows downstream in the Isaac River are reduced by 8% and volumes by 4.5% because of the flood waters entering the residual void. However, due to the significant scale of a PMF type event, which includes peak flows and rainfall which are approximately three times that of a 0.1% AEP event, this relatively small reduction in flow will not adversely impact downstream receptors.

Flows upstream of the mine site are considered unaltered by the final closure landform, noting the removal of culverts that could regulate flows on New Chum Creek.

6.1.2.4 Flood risk profile

A flood risk profile was developed based on the rehabilitation flood modelling results and ISO 31000 methodology. Details of the flood risk profile are contained in Appendix H and the DNM PRC Plan risk assessment summarised in Section 7.

Through the iterative landform and modelling approach, the closure landform was refined to minimise the potential for environmental harm and to create a stable landform. As a result of this process, the flood risk profile identified low risk levels associated with flooding and the closure landform. Therefore, no further critical controls are required.

Relationship with PRCP Schedule
The interaction between flooding and the proposed closure landform presents low risk. The closure landform provides an appropriate level of protection from inundation to the residual voids, flooding does not adversely impact on the stability of the closure landform and cumulative flows from the DNM rehabilitated area are similar to pre-mining conditions.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4				RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM1	• Assessment of mine water dams is completed by an AQP and identified sediment and water management actions are completed • Mine water dams are decommissioned • Watercourse crossings and culverts removed
RM3	• Landforms requiring reshaping are reshaped to be free-draining with maximum 12% slopes (RA2, RA5)

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
	• Disturbed natural watercourse bed and banks returned to a profile similar to the pre-disturbance condition (RA3)
The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM3	• Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.1.3 Waste characterisation

PRCP 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 waste characterisation assessment has been undertaken to support the development of this PRC Plan. The detailed report – *Daunia Mine PRCP Environmental Geochemical Characterisation and Risk Assessment of Mineral Waste* is provided in Appendix I.

6.1.3.1 Background

DNM has two main types of mineral waste. The geochemical characteristics and potential hazards associated with the main types of mineral waste materials include:

- Spoil (overburden and interburden) currently comprises approximately 98.5% of all mineral waste at DNM and includes weathered (Tertiary and Permian-age) and fresh (unweathered, Permian-age) wastes. Approximately 52% of spoil is fresh and the remaining (approximately 48%) is weathered/oxidised. Spoil comprises several subtypes of material, the most relevant from a geochemical perspective being carbonaceous spoil (approximately 6% of all present and future spoil) and non-carbonaceous spoil (approximately 94% of all present and future spoil) subgroups. For the geochemical assessment, spoil samples have been sourced from drillholes (primarily as drill core).
- Rejects are generated (and disposed) as mixed plant rejects (MPR) which comprises approximately 80% coarse rejects and 20% fine rejects mixed together at the CHPP. Rejects comprises approximately 1.5% of all mineral waste at DNM – with this approximated proportion expected for the remaining life-of-mine plan.

Coal is generally not considered mineral waste, with the exception of small quantities of sub-economic coal that may report to the spoil dumps, and remnant coal exposed on residual void highwalls.

Mineral waste (and coal) samples have undergone environmental geochemical characterisation and assessment with regard to their potential to generate acid and metalliferous drainage (AMD), which comprises acid drainage (AD), neutral and metalliferous drainage (NMD) and/or saline drainage (SD) [salinity due to sulphate derived from sulphide oxidation]. Additionally, samples have been assessed with regard to their potential to generate salinity (non-oxidative) and, for spoil materials, their sodicity and dispersion potential. With respect to AD, each sample has been broadly characterised as either non-acid forming (NAF) or potentially acid forming (PAF).

Mine domains representing potential sources of AMD/salinity at DNM, and having a direct relevance to mineral waste characterisation and management at DNM at closure, are pits (and their corresponding residual voids post-closure) and spoil dumps (and rehabilitated final spoil landform post-closure). DNM does not have tailings storage facilities.

6.1.3.2 Geochemical assessment of mineral waste

The geochemical characteristics of each waste type have been assessed with respect to their ability to generate AMD by leveraging on historical geochemical data (defined as pre-2019), augmented with data acquired through an aggressive sampling and analytical program (2019 onwards) designed to close identified knowledge gaps and fulfil the PRCP requirements. Overall, the geochemical data available to assess the geochemical properties of key mineral waste types and associated landform include:

- 609 samples of spoil tested to assess the AMD hazard (coal samples excluded); and 818 samples tested to define the salinity hazard, with a subset of overburden/interburden samples assessed for dispersivity and sodicity;
- 164 samples of rejects collected from the CHPP tested to assess AMD hazard.

The environmental testing protocol included a variety of analytical techniques that are consistent with industry and regulatory accepted guidelines (e.g. GARD Guide (INAP, 2009)). The overburden/interburden samples were selected from drill cores that are representative of the vertical and lateral geological (stratigraphic) variability encountered at DNM.

6.1.3.3 Geochemical classification of mineral waste

The test work results were used to understand the geochemical properties of each individual material type (source) and assign a geochemical classification. This data (and AMD classifications) were then used to infer the geochemical hazard posed by each mineral waste type in their relative proportions within the final spoil landform.

The key findings from the geochemical assessment are:

- Of the 164 rejects samples, approximately 95% of rejects has a low potential to generate AMD as either AD and/or NMD and/or SD, and approximately 5% has a moderate to high potential to generate AMD as either AD and/or NMD and/or SD. As such, as a bulk material, rejects has a low potential to generate AMD as either AD and/or NMD and/or SD. With some exceptions, the total metal and metalloid concentrations from 46 samples tested are generally low compared to average element abundance in soil in the earth's crust. Solubility data indicates that leachate from rejects under freshwater (deionised water) and saline water leaching conditions is expected to contain low concentrations of soluble metals and metalloids.
- Spoil had 11 samples out of 609 classified as PAF (i.e. 2% of all samples) therefore this material is bulk NAF. Overall, spoil as a material type has the lowest total S concentrations and highest acid buffering capacity compared to rejects, with the majority of the spoil samples having excess acid neutralising capacity (ANC). Soluble multi-element results indicated that, under controlled laboratory conditions, leachate from NAF spoil has low concentration of soluble metals and metalloids, while the few PAF samples encountered can mobilise moderate soluble metal concentrations of Aluminium (Al), Arsenic (As), Mn, Molybdenum (Mo), Selenium (Se) and/or Antimony (Sb). If the samples tested are representative of the spoil produced at DNM (current, past and future), as a bulk source material, spoil is expected to have low capacity to generate AMD.
- The overall geochemical nature of the waste (spoil and rejects) is net-acid neutralising. Based on predicted volumes of spoil and rejects classed as NAF and PAF, the geochemical assessment demonstrates that the final landform has excess ANC, which is exemplified by the ratio of ANC divided by maximum potential acidity (MPA) equal to 33 (leading practice suggests that an ANC/MPA ratio >2 is sufficient to maintain neutral conditions in the long term).
- Coal is not regarded as waste because ROM coal remains on-site for a relatively short period of time. However, some minor coal will report directly to spoil as waste, while remnant coal (seams) will be exposed on the highwalls of residual voids at closure. The assessment has shown that coal samples have variable geochemical properties, with approximately 48% of coal samples conservatively classed as PAF. Similar to other source material tested, coal samples with potential for AMD can release moderate concentrations of metals and metalloids in contact with water, under controlled laboratory conditions. Based on the geochemical properties and samples assessed for this report, it expected that as a bulk source material, coal will have a moderate to high capacity to generate AMD.

- Spoil and rejects can generate contact water that is slightly to moderately saline (i.e. EC less than 2,000 µS/cm), largely as the result of non-oxidative processes (i.e. from the dissolution of salts and not oxidation of pyrite). Spoil is also 'sodic to strongly sodic' with potential for dispersion (based on the high sodicity values). Emerson aggregate class testing found that about 51% of the spoil samples tested displayed 'some dispersion' and another 14% of the spoil samples had Emmerson Class 3 suggesting remoulded dispersion. The remaining bulk of the samples had Emerson aggregate class values suggesting the samples were non-dispersive. Sodicity and dispersivity testing was not undertaken on rejects as these materials are not exposed on the closure landform surface.

6.1.3.4 Geochemical risk of final landforms

Final closure domains of relevance to mineral waste, include a rehabilitated spoil dump (final spoil landform) and three residual voids. The final spoil landform is comprised of approximately 98.5% spoil with the remaining 1.5% being rejects, with very minor waste coal. Based on operational practices and life-of-mine waste management, at closure it is expected that:

- Spoil landform will comprise spoil (overburden, interburden) and rejects
- Highwalls will comprise overburden, interburden and coal seams (including seam roof, partings and floor)
- Pit floors will comprise coal (conservatively)

A geochemical source hazard assessment was conducted on the source material types comprising carbonaceous and non-carbonaceous spoil, rejects and coal (where relevant). The source hazard score is a formula devised by the authors that leverages on the geochemical test work results to estimate the propensity (ability) to generate AMD, the AMD capacity (severity) and the quantity (volume/tonnage) of material that could produce AMD within each landform. The AMD score for each landform was then used to estimate the likelihood of each landform to generate AMD.

The potential environmental risk posed by the landform (containing variable proportions of each mineral waste type) was determined using a SPR approach. With this approach, the environmental geochemical risk is determined by taking into account the geochemical source hazard of the landform, the plausible environmental and human health receptors of AMD and salinity from the landform, and the plausible pathways between the source (landform) and the receptor. The outcome of this assessment informed development of appropriate management and rehabilitation measures for the landform at closure.

Potential pathways and receptors for AMD and salinity have been identified for the final landform. Details on the identification of pathways and receptors are found in Section 6.1.1 (Hydrogeology) and Appendix D.

For the purpose of this SPR assessment, the following mechanisms for AMD and salinity to enter plausible pathways and report to plausible receptors have been identified:

- Source - spoil landform:
  - Surface water run-off (pathway) from the final spoil landform reports to a nominated creek (receptor)
  - Seepage from the final spoil landform enters a shallow permeable strata (pathway) and reports to a nominated creek (receptor)
  - Seepage from the final spoil landform enters groundwater (pathway) and reports to a nominated residual void (receptor)
- Source – highwall and floor
  - Run-off from highwall of residual void (pathway) reports to nominated residual void (receptor)

The outcomes of the SPR are summarised below:

- Spoil landform: with respect to AMD, the overall SPR risk rating from the final spoil landform is Low; with respect to non-oxidative salinity, the overall SPR risk from the final spoil landform is rated as Low to Medium.
- Residual voids: The final receptors for seepage from the final spoil landform and run-off from the highwall (of each void) are the three residual voids. The AMD assessment has found that it is unlikely that undiluted salinity or AMD from a flooded post-closure residual void floor (of any of the voids) would impact on residual

void water quality to any significant degree, as other processes such as evapo-concentration are the key drivers of void lake water quality (Section 6.3.2.3). Therefore, the AMD SPR risk rating on the overall water quality of the residual voids is Low for each void.

- Groundwater or surface water reporting to residual voids is expected to remain within the residual voids (excluding evaporative loss). Modelling undertaken (Section 6.1.1) shows that seepage from the pit lake (of each void) into groundwater, if any, would be limited.

6.1.3.5 Management and rehabilitation measures

The geochemical characterisation, SPR, and residual risk assessment conducted in support of this PRCP informed the following mineral waste management and rehabilitation measures with regards to AMD and salinity management:

- Residual voids
  - Titan North/Central void
  - Titan East void
  - Pandora void
- Spoil dumps: no specific AMD management measures are proposed. The small proportion of carbonaceous spoil predicted to be an AMD hazard, will be actively co-mingled and mixed with the bulk of the waste which has excess ANC that is more than adequate to manage carbonaceous waste in-situ. The landform will be reshaped, covered with growth media and seeded.
- Rejects: managed during operations (disposed as MPR within spoil) and progressively covered by spoil. No specific AMD management measures are proposed for the rejects (at closure). For the small proportion of rejects that are likely PAF (0.1% of total spoil landform), operational mixing during co-deposition with net NAF spoil and other NAF rejects allow in-situ neutralisation of any [small] amount of acidity that may be generated by PAF rejects.
- ROM pad and coal stockpiles: remove remnant coal and dispose within spoil. The areas will be reshaped if required, covered with growth media and seeded.

Relationship with PRCP Schedule
The environmental risks posed by the mineral wastes likely to be present at closure are low. As such, no specific AMD management measures (e.g., alkaline amendment or engineered capping systems) are expected to be required to manage mineral waste during rehabilitation and closure.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4			RA5			
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM13	• Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25
RM14	• Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25
The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM3	• Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.1.4 Soil and capping material

PRCP 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 growth media assessment has been undertaken to support the development of this PRC Plan. The detailed report – *Daunia Mine Materials Characterisation Study* is provided in Appendix E. Soil surveys have been conducted for the proposed mining footprint (refer to Section 1.2.6).

6.1.4.1 Quality of available resources

The key chemical and physical properties of the stockpiled topsoil within the soil management group available for rehabilitation at DNM is summarised in Table 26.

Table 26: Key physiochemical properties of stockpiled soil management group

Analysis	Red/brown clay topsoil
Chemical properties	
$pH_{1:5\ (H2O)}$	Neutral to strongly alkaline (7.8 – 8.7)
$EC_{1:5}$ (dS/m)	Low to moderate (0.15 – 0.43)
ESP (%)	Non-sodic to sodic (1.7 – 7.8)
Total N (mg/kg)	Low to moderate (688 – 1,684)
Available P (mg/kg)	Low to moderate (7 – 38)
Available K (mg/kg)	Low (93 – 172)
Organic Carbon (%)	Low to high (0.94 – 1.91)
CEC (meg/100g)	Moderate (13 – 28)
Ca/Mg (ratio)	Low Ca to balanced (2 – 6.5)
Physical properties	

Analysis	Red/brown clay topsoil
Clay content (%)	>30
Rock content (%)	<20
Dispersion (EAT)	Slightly dispersive to stable (3b – 7)
Permeability	Low

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

6.1.4.2 Quantity of available resources

The rehabilitation at DNM requires growth media to support vegetation establishment for the planned PMLUs. There is sufficient quantity of topsoil available on-site for rehabilitation of disturbed areas to cattle grazing, woodland habitat and watercourse PMLUs. The volume of topsoil available for rehabilitation includes the volume of topsoil currently stockpiled at site (4,230,744m^3, as at May 2022) and the future topsoil to be stripped (estimated at 1,183,258m^3 for the future mining areas), totalling 5,413,997m^3. The volume of growth media required for rehabilitation of each PMLU is shown in Table 27. These volumes only include disturbance areas where topsoil has been stripped/is planned to be stripped and needs to be replaced.

Table 27: DNM required growth media volumes for PMLUs

Growth media	PMLU	Area (ha)	Cover depth (m)	Volume required (m^3)
Topsoil	Cattle Grazing	1,034	0.15	1,551,631
	Woodland Habitat	1,185	0.15	1,777,155
	Watercourse	0.3	0.15	428
	Total	**2,219**		**3,329,214**

6.1.4.3 Resource management

During mining operations, topsoil is stripped according to the recommended depths from the pre-mining soil surveys. The topsoil is either used direct on rehabilitation areas or stockpiled progressively for later use in rehabilitation. Existing topsoil stockpiles are located throughout the DNM site which can be accessed for loading and haulage to rehabilitation areas. The location of topsoil stockpiles (as at August 2021) are shown in Appendix E. Stockpile locations and volumes will vary throughout the life of the operation as stockpiled topsoil is used on rehabilitation and new stockpiles are created as mining advances. The spatial location of stockpiles is recorded in a geographic information system and a volume inventory is maintained.

An assessment of the growth media characteristics will be completed by an AQP to determine the amelioration requirements to suit the revegetation plan. The required growth media depth, amelioration options and the surface treatment requirements to support the establishment of vegetation for each PMLU, are shown in Table 28.

Table 28: Growth media ameliorant options and surface treatments for the DNM PMLUs

PMLU	Growth media	Ameliorant options	Surface treatments
Cattle crazing	Topsoil – minimum depth of 150mm is sufficient to store moisture and nutrients to initiate and sustain pasture growth	• Elemental Sulphur • Manures • Urea • Diammonium phosphate • Superphosphate • Fertiliser	• Ameliorate growth media as recommended by an AQP (if required) • Rip on contour • Direct seed as per seed mixes and rates for cattle

PMLU	Growth media	Ameliorant options	Surface treatments
		• Gypsum • Incorporated organic matter • Surface mulching (e.g. hay mulch)	grazing revegetation (Section 6.1.8.5)
Woodland habitat	Topsoil - depth of 100mm to 150mm limits the effects of competition on woodland species due to the potential loads of exotic pasture species	• Elemental Sulphur • Manures • Superphosphate • Fertiliser • Gypsum • Incorporated organic matter • Surface mulching (e.g. hay mulch)	• Ameliorate growth media as recommended by an AQP (if required) • Deep rip on contour to incorporate rock • Direct seed as per seed mixes and rates for woodland habitat revegetation (Section 6.1.8.8)
Watercourse	Topsoil - minimum depth of 150mm to encourage a vegetative cover to provide erosion resistance	• Elemental Sulphur • Manures • Superphosphate • Gypsum • Incorporated organic matter • Surface mulching (i.e. hay mulch)	• Ameliorate growth media as recommended by an AQP (if required) • Rip on contour as required • Direct seed as per seed mixes and rates for watercourse revegetation (Section 6.1.8.8)

Relationship with PRCP Schedule
There is sufficient quantity of topsoil, at acceptable quality, available on-site for use as growth media for rehabilitation of disturbed areas to cattle grazing, woodland habitat and watercourse PMLUs.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4				RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM4	• Topsoil placed at a minimum thickness of 150mm • Assessment of growth media characteristics is completed by an AQP • Ameliorant and physical treatments are applied as identified in RM4 • Rip on contour
RM5	• Topsoil placed at a depth of 100mm to 150mm • Assessment of growth media characteristics is completed by an AQP • Ameliorant and physical treatments are applied as identified in RM5 • Deep rip on contour

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM6	• Topsoil placed at a minimum depth of 150mm • Assessment of growth media characteristics is completed by an AQP • Ameliorant and physical treatments are applied as identified in RM6 • Rip on contour as required

6.1.5 Landform design

PRCP 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.

A landform design assessment has been undertaken to support the development of this PRC Plan. The detailed report – *Erosion and Landform Evolution Simulations to Support Waste Landform Design: Daunia Mine* is provided in Appendix J. Landform design considers the landform development and reshape of all relevant activity areas after the removal of infrastructure, and prior to placement of growth media and seed.

The closure landform design has been refined based on the outcomes of the studies undertaken to support this PRC Plan. The mining limits achieve geotechnical stability of the residual voids (Section 6.3.1), residual voids are mitigated from the risk of flooding (Section 6.1.2) and spoil dump slope angles achieve erosional stability (Section 6.1.5.3).

6.1.5.1 3D design

The conceptual 3D closure landform design for DNM is provided in Figure 16.

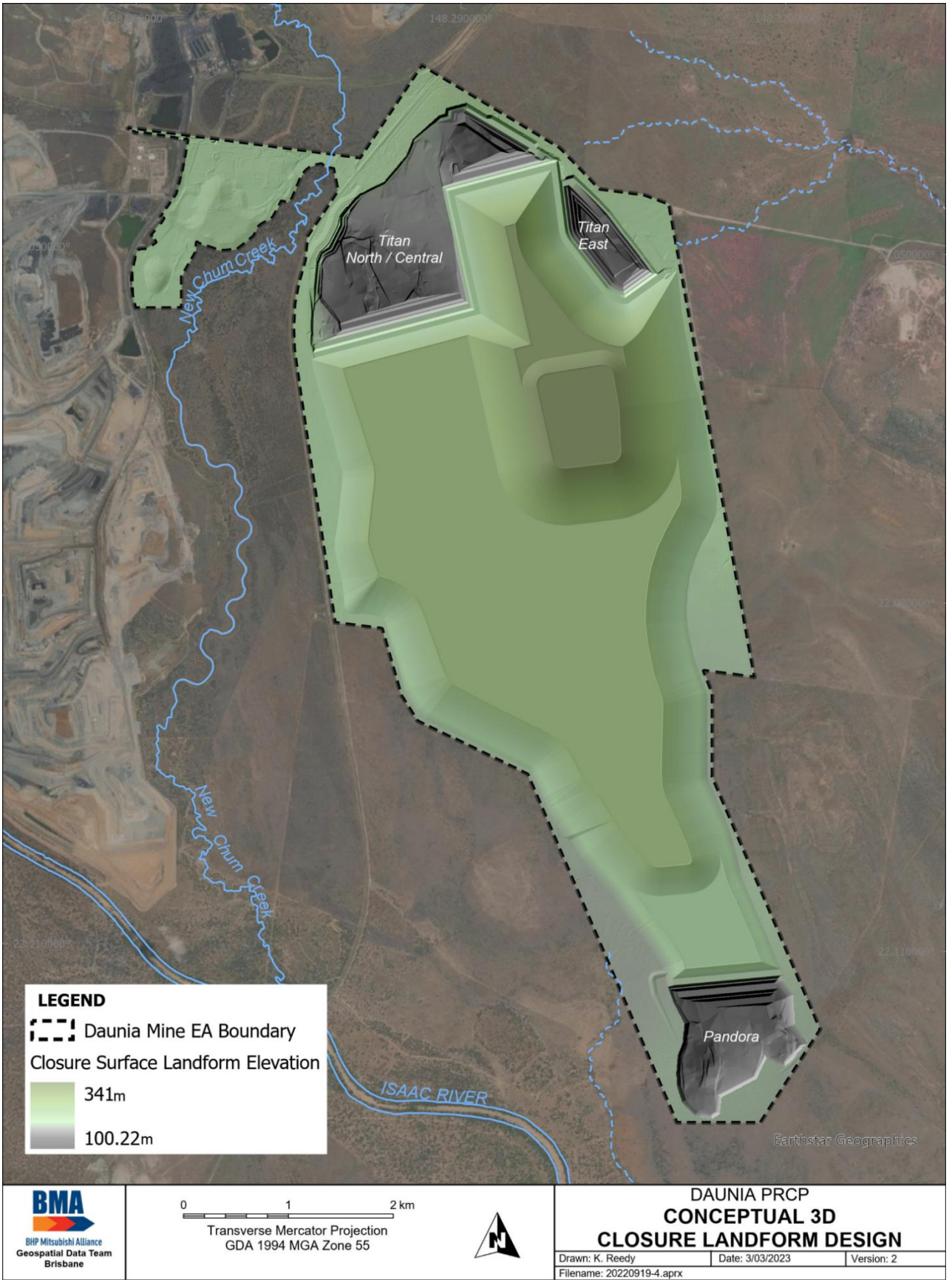

Figure 16: DNM conceptual 3D closure landform design

6.1.5.2 Method of determining landform design

Landform structures

The relevant activities and areas (Section 1.4.1) considered when determining the landform design are detailed in Table 29.

Table 29: Landform structures at DNM and proposed designs

Landform structure	Landform design
Spoil dumps	• Spoil dump height up to 120m above ground level to fit the quantities of mineral waste • 20m dump lift heights • Spoil dump slopes to be reshaped to be free-draining with maximum 15% slopes or up to maximum 25% slopes with rock on the final landform surface (refer to erosion modelling Section 6.1.5.3)
Infrastructure and general areas – CHPP and associated infrastructure, administration, workshop, stockpile areas, laydown areas, roads, mine dams, drains	• Area will be reshaped to be free-draining with maximum 12% slopes
Residual voids	• Set-back of the high-wall and end-wall to achieve structural stability of FoS ≥1.5 within the NUMA extents (Section 6.3.1) • Landforms along the high-wall/end-wall should not be constructed out of dispersive material and will have the same geometry and maintenance requirements as other landforms

Removal of infrastructure (Section 6.5) and contaminated land requirements (Section 6.5.3) will be completed where required, prior to reshaping of the final landform. After reshaping, the required growth media and ameliorants are applied to support the PMLU (Section 6.1.4), the area is seeded (Section 6.1.8), and monitoring and maintenance completed to ensure rehabilitation is tracking to a stable condition (Section 8).

Materials available for landform rehabilitation

The landform at DNM utilises materials available on-site that will achieve the required landform stability. Rock will be utilised on the steeper final landform slopes to improve the erosion resistance (Section 6.1.5.3). Rock will be sourced from the mined overburden and interburden, with sufficient quantity available on-site for the planned rehabilitation. Rock will be used directly on rehabilitation areas or stockpiled when required to ensure sufficient quantity for the planned rehabilitation.

Growth media details to support revegetation are included in Section 6.1.4.

Hydrological and hydrogeological assessments

Except for the catchment into the residual voids, the closure landform will predominately be water shedding. Rehabilitation will include:

- Reshaping of the spoil dumps with no permanent berms or water management on slopes
- Reshaping of the mine dams to be free-draining
- Removal of any road culverts and fill material from within the watercourse extents

A rehabilitation flood assessment, including hydrologic and hydraulic modelling has been completed for the closure landform (Section 6.1.2). The flooding risk profile developed as part of this assessment identified the

risks to the landforms from flooding to be low. A landform will be used to mitigate the risk of flooding up to the 0.1% AEP flood level from the Isaac River and New Chum Creek into the Pandora residual void, as detailed in Table 29. The locations of the Titan residual voids are immune to flooding and no flood protection is required. Landforms used to mitigate flooding risks are permanent structures that will be constructed with the same materials, procedures and geometry as other spoil landforms and require no more maintenance than other rehabilitated areas. These landforms will be designed by an AQP based on the latest flood modelling and materials data prior to construction.

The flood water interaction with the spoil dumps is generally at the extremity of the flooding extent with relatively low velocities and flood heights (Section 6.1.2). Outer landform slopes that interact with flood waters up to a 0.1% AEP will incorporate controls, if required, to minimise potential instability of the landform from interaction with floodwaters.

A hydrogeological assessment (Section 6.1.1), including numerical modelling, and pit lake water balance modelling (Section 6.3) identified that the residual voids, once the pit lakes and groundwater have stabilised, will continue to act as a sinks. Therefore, groundwater gradients in the proximity of the residual voids will maintain groundwater flows to the residual voids and minimise the potential for migration of contaminants off tenement.

6.1.5.3 Long-term landform stability

Material testing, erosion modelling and landform evolution modelling has been completed by Landloch to establish the slope profiles for the materials at DNM to ensure long-term landform stability (Appendix J).

The landform study completed by Landloch included:

- Simulations of runoff and erosion for a range of spoil dump landform options using the Water Erosion Prediction Program (WEPP)
- Derivation of parameters for the SIBERIA landform evolution model
- Landform evolution simulations using SIBERIA for the 3D landform of DNM spoil dumps, which were designed based on the WEPP results

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 (Table 29) at DNM can be expected to be stable over the long-term, provided the target levels of vegetation cover are achieved.

6.1.5.4 Method of construction

The spoil dumps are constructed with haul trucks dumping approximately 20m lifts.

The waste placement strategy will involve topsoil being placed over the spoil, with rocky spoil as well as topsoil being placed on steeper slope areas. Rejects will be covered by spoil as part of operations (Section 6.1.3.5).

6.1.5.5 Quality assurance / quality control

The proposed actions referenced in Table 29 are the key controls that will be put in place to manage the landform risks associated with achieving the PMLUs. Quality assurance and quality control activities are built into all necessary execution and verification activities of these controls. Monitoring and reporting processes will verify controls and ensure that controls are executed effectively (Section 8).

6.1.5.6 Trial methodology

Modelling has indicated the proposed landforms will be stable and monitoring will verify if the landforms are on a trajectory towards achievement of the milestone criteria and eventual certification; or whether corrective actions, maintenance or changes to the rehabilitation methodology is required.

6.1.5.7 Limitations and assumptions

The limitations and assumptions of the closure landform design include:

- The closure landform is dependent on the mining schedule, which can change due to increased geological knowledge as mining progresses, market factors and technology. These changes may result in differences to the landform, such as varying heights, ramp locations or access bridges within the final voids, but the key considerations to ensure long-term stability, such as slope profiles and materials, will be maintained in the final closure landform design.
- The landform has been designed with maximum dump heights to ensure all modelling is conservative. It is not expected that all areas of the spoil dumps will reach these heights.
- A swell factor of 25% has been assumed for the dump scheduling. This is a standard factor based on experience in the Bowen Basin.
- Angle of repose of the spoil dumps is 37°.
- Modelling has been completed for up to 300 years and is based on the best representative materials for the site.
- Due to the size of the dumps and dumping in lifts, the majority of settlement of the 'constructed' landforms is expected to occur during placement with only minor settlement expected after rehabilitation. According to ACARP project C19022 (Williams, 2015), spoil settlement consists of three components: self-weight settlement (80% occurs during placement and decreases exponentially with time); collapse settlement (most occurs during placement); and degradation settlement (variable timeframe depending on material, but most may occur during placement and approaches a limit over time). The landform will be monitored to ensure a free-draining landform is maintained where required.

Relationship with PRCP Schedule
The landform has been designed to conservatively represent the closure landform and minimise risk, with slopes appropriate for the materials available on-site.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4				RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM3	• Landforms reshaped with maximum 25% slopes (RA1) • Rock placed a minimum thickness of 0.5m on >20% slopes (RA1) • Landforms requiring reshaping are reshaped to be free-draining with maximum 12% slope (RA2, RA5) • Disturbed natural watercourse bed and banks returned to a profile similar to the pre-disturbance condition (RA3)
RM13	• Rehabilitation is assessed as geotechnically stable by an AQP with FoS≥1.5, unless an alternative is justified by an AQP (RA2)

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM14	• Rehabilitation is assessed as geotechnically stable by an AQP with FoS≥1.5, unless an alternative is justified by an AQP (RA1)
The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM1	• The required high-wall, end-wall and low-wall set-back to achieve a FoS ≥1.5 is determined by an AQP
MM3	• Certification from an AQP that the residual void is safe to humans and livestock • Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.1.6 Cover design

PRCP 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.*

A cover system is required where there is potential for materials to cause AMD, NMD or SD, to ensure contaminants are not released to the receiving environment.

As detailed in Section 6.1.3, DNM has two main types of mineral waste which includes spoil and rejects (fine and coarse rejects). The spoil is placed predominantly in spoil dumps within the mined-out pit and the rejects are buried within the spoil during operations. Considering the waste materials within the spoil landforms, the quantities and the methods of disposal, the geochemical assessment concluded that no specific AMD management measures are required (Section 6.1.3).

Relationship with PRCP Schedule
The geochemical assessment of the mineral waste materials on-site concluded that no specific AMD management measures are required.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2				RA3			RA4			RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:
• No criteria required

6.1.7 Water management

PRCP 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).*

The closure landform design for DNM is intended to provide landforms that meet the nominated PMLU and NUMA milestone criteria without the need for ongoing active water management or dewatering. The following key considerations, which are discussed in more detail in the relevant sections of this PRC Plan, have been considered in the assessment of ongoing water management requirements post-mining:

- With the exception of the catchment of the residual voids, the closure landform surface will be free-draining where appropriate to prevent impacts, with runoff flowing to the surrounding watercourses (Section 6.1.5)
- All mining-related dams, will be decommissioned and removed, and the rehabilitated areas will be free-draining (Sections 6.1.5 and 6.5)
- Final residual voids will remain as NUMAs and will establish and stabilise into long-term groundwater sinks (Section 6.3)
- Ingress of water from a 0.1% AEP flood event into the eastern side of the Pandora residual void from an unnamed minor drainage line is within the available storage capacity within the void below the groundwater level and will not impact the ongoing groundwater sink properties
- Landforms will provide flood protection for the western side of the Pandora residual void from floodwater originating from New Chum Creek and the Isaac River up to and including a 0.1% AEP flood event (Section 6.1.2)
- No tailings storage facilities (TSFs) are present within the landform. Rejects are co-disposed within the spoil dumps, which have sufficient ANC to buffer any leachate (Section 6.1.3)
- Modelling of flow paths through particle tracking simulations within groundwater over a 2,000-year recovery period, indicate that seepage from spoil dumps will migrate toward the residual voids (NUMAs) and not into receiving environments (Section 6.1.1.4)
- Contaminated land investigations will be undertaken 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
- Conceptual site models that assess SPR linkages have been prepared for relevant technical studies including hydrogeology (Section 6.1.1), waste characterisation (Section 6.1.3) and voids (Section 6.3) and show a low likelihood of complete exposure pathways to off-tenement receptors.

6.1.7.1 Contaminants and sources

The DNM operations include heavy industrial type activities, including operation and maintenance of processing facilities, vehicles and other plant infrastructure required to support the extraction and processing of coal. These heavy industrial type activities include the storage, use and disposal of a variety of hazardous materials. The DNM facilities have and will continue evolving over time with modern engineering and environmental standards; however, the duration and nature of the operations presents a reasonable likelihood for contamination being present at the completion of operations. Therefore, it is considered likely that contaminated land will be present at closure, which will require investigation and some remediation/management. In line with the requirements of the EP Act 1994 and the EA, areas of identified land contamination that present an unacceptable risk to human health or the environment during the operations will be subject to investigation and remediation efforts, where appropriate.

The predominant hazardous materials identified to have a potential to cause contamination at DNM and impact PMLUs and/or the receiving environment include:

- Hydrocarbons: including diesel, oils, greases, methyl isobutyl carbinol and other solvents
- Aqueous Film-Forming Foam: historical use of products containing Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) species of concern
- Nitrogen: associated with explosive formulation
- Carbonaceous materials

Current operational water management includes the segregation of water from mine operational areas from non-mine affected areas. Water from mine operational areas is collected within on-site mine dams and recycled within the mine operations, transferred to other BMA operations, or released under the conditions of the EA. Mine affected water includes pit water, CHPP water and runoff from areas such as the CHPP and MIA. Mine affected water dams have the potential to accumulate impacted water and sediments and therefore are a potential secondary source of contamination. Contaminants of concern within the dams include those potential contaminants listed above, as well as metals and salinity. All mine affected water dams will be assessed for potential accumulation of contaminants and appropriately decommissioned to form free-draining closure landforms.

Geochemical risks from the residual voids and spoil dumps, once pit lakes have established, has been assessed in Section 6.1.3. The spoil at DNM has been identified to contain moderate to high ANC with sufficient capacity to neutralise any acid forming materials within the spoil dumps. In addition, the depth to groundwater and the results of hydrogeological particle tracking indicates that potential contaminated seepage that enters the groundwater in the proximity of the spoil dumps will migrate towards the residual voids (long-term sinks), and hence will remain within the NUMAs. Surface water monitoring - as per the operational EA requirements and Section 8 of this PRC Plan, will identify potential impacts associated with geochemical risks from site and progressively rehabilitated landforms that enter the surface water environments.

Solubility testing to understand potential metal/metalloid mobility (in addition to pH and EC) has been undertaken on a range of mineral waste materials using solvents such as deionised water, saline water and peroxide leach to assess the range of potential post-mining conditions (details provided and discussed in Section 4.4 of the waste characterisation report – Appendix I). The solubility test-work results have indicated the majority of spoil and rejects samples generate contact water that was generally alkaline with low concentrations of soluble metals/metalloids – including arsenic (As), molybdenum (Mo) and selenium (Se). Therefore, spoil landforms in the post-mining environment, are not expected to mobilise metals/metalloids at concentrations of concern.

Contaminated land investigations will be undertaken to assess areas for potential contamination. This investigation will assess the range of potential contaminants that are utilised or generated during operations and will provide an assessment of the risk presented to the PMLUs and the receiving environment.

6.1.7.2 Pathway of contaminants

With the exception of the catchment of the residual voids, the closure landform surface will be free-draining where required. Any contaminants present at the surface of the closure landform have the potential to be mobilised through surface water runoff, generation of airborne particulate and through direct contact. Contaminated land assessments at the completion of mining will inform required remediation works to manage identified unacceptable risks associated with potential pathways to surface contamination.

Prior to rehabilitation, runoff from areas generating mine affected water are captured within the mine water management system. Dams and other infrastructure within the mine water management system will be assessed for potential contaminants, decommissioned and rehabilitated as part of mine closure. The surface of mine dam rehabilitation areas will be free draining.

Modelling of flow paths though groundwater particle tracking indicates that groundwater within the areas containing the spoil dumps to the east of New Chum Creek and the eastern side of the MIA will migrate towards the residual voids post-mining. During the initial stabilisation phase of the groundwater and pit lakes, the more dynamic climate influenced pit lakes (when compared to groundwater) may result in some variability in the flux between groundwaters hosted within the spoil and the pit lakes. Outflows from the voids are into the spoil dumps, prior to the recovery of groundwater within the spoil and occur prior to evapo-concentration of TDS levels above

that observed within the Permian unit. The modelling indicates that these events do not result in loss of groundwaters beyond the tenement. Once stabilised the residual voids will continue to act as sinks post-closure (Sections 6.1.1 and 6.3).

Within the central and western portion of the MIA/CHPP area, particle tracking indicates that particles migrate in a southerly direction and over the 2,000-year simulation period travel approximately 1km into the Poitrel Mine operated portion of the joint ML. The groundwater flows in the Permian units in this area are governed by the Poitrel Mine operations/voids and compartmentalisation of the aquifer resulting from cemented fault lines. The particles over the simulation period do not enter the shallower Quaternary alluvial material associated with the Isaac River and do not leave the ML. Contaminated land investigations, remediation and management works at the completion of operations will consider the groundwater pathways and potential receptors associated within this MIA/CHPP area and will render the area suitable for the intended PMLUs.

6.1.7.3 Fate of contaminants

Any contamination remaining post-mining that presents an unacceptable risk to the nominated PMLUs, or the receiving environment will be subject to investigation, remediation and/or management. Where appropriate, draft Site Management Plans (SMPs) will be prepared in accordance with the requirements of the *EP Act 1994*. The draft SMPs will be submitted to the administering authority for consideration where any ongoing management of contamination is required.

6.1.7.4 Water storages

No water storages that were created for or by the mining operations are proposed to remain as part of the closure landform. All water storages will be investigated and decommissioned to provide free draining landforms.

6.1.7.5 Ongoing water management

On completion of rehabilitation works, ongoing water management/dewatering is not envisaged to be required due to the following:

- No water storages will be present within the closure landform
- Contamination will be remediated and/or appropriately managed
- The residual voids 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 shallow geological units
- No creek diversions are present within the closure landform
- Disturbed areas will be rehabilitated to support suitable vegetation and will be stable

Relationship with PRCP Schedule
The closure landform, with residual voids, will provide a landscape that does not require any ongoing active water management.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2				RA3			RA4			RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM1	• Assessment of mine water dams is completed by an AQP and identified sediment and water management actions are completed • Mine water dams are decommissioned • Watercourse crossings and culverts removed
RM2	• Contaminated Land Investigation Document completed in accordance with the Environmental Protection Act 1994, including: – Site Suitability Statement confirming the suitability of the property for the PMLUs – Audit Certification • Contaminated Land Investigation Document including a Site Investigation Report and, where required, a Validation Report and/or a draft Site Management Plan
RM3	• Landforms requiring reshaping are reshaped to be free-draining with maximum 12% slopes (RA2, RA5) • Disturbed natural watercourse bed and banks returned to a profile similar to the pre-disturbance condition (RA3)
RM13	• Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25
RM14	• Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25
RM15	• Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25
The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM3	• Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.1.8 Revegetation

PRCP 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.

The rehabilitation planning part must include details of the site preparation required for rehabilitation activities.

6.1.8.1 Revegetation objectives

The revegetation objectives of the planned PMLUs of cattle grazing and woodland habitat are consistent with the rehabilitation requirements of the EA.

The DNM revegetation objectives for the relevant PMLUs are:

- Cattle grazing:
  - Groundcover: >50%
  - To establish cattle grazing pasture within land suitability class ≤3 (Table 20), or not different from pre-mining class if ≥4 (DSITI & DNRM, 2015); or land condition assessed as Good (A) or Fair (B) as described in the *Queensland Reef Protection Regulations Farming in Reef Catchments Grazing Guide* – Figure 3 (DES, 2022a) (replicated in Table 21)
- Woodland habitat:
  - Groundcover: ≥50% on rehabilitated slopes ≤15%; ≥80% on rehabilitation slopes >15%
  - To establish woodland habitat with species richness of ≥2 trees, ≥3 shrubs and ≥4 grasses and ≥16% tree canopy cover
- Watercourse:
  - To establish watercourse riparian vegetation with riparian vegetation index ≥ upstream or downstream values

The DNM revegetation objective for the NUMAs is:

- NUMA low-wall (to within 10m above the modelled maximum residual void lake elevation):
  - To establish total vegetation cover of ≥30%

The above revegetation objectives for groundcover consider groundcover to be anything in contact with the soil surface, for example live cover, standing dry cover, organic litter (including leaves, hay, woody debris) or rocks.

No infrastructure is proposed to support the revegetation plan.

6.1.8.2 Species of conservation significance

DNM has no obligations requiring specific inclusion of species of conservation significance in the revegetation planning. Nonetheless, areas adjoining undisturbed Endangered or Of Concern regional ecosystems or threatened species habitats will be rehabilitated to a woodland habitat PMLU, wherever possible.

6.1.8.3 Fauna habitat and use requirements

There are no existing obligations to establish fauna habitat and/or fauna use in the rehabilitation areas for the DNM site. However, areas adjoining undisturbed threatened fauna species habitats will be rehabilitated to a woodland habitat PMLU, wherever possible, and disturbed areas of watercourses will be rehabilitated to a watercourse PMLU. This approach will provide connectivity values between rehabilitated areas and existing vegetation and habitat.

6.1.8.4 Revegetation seed provenance

The provenance (where the seed comes from) is considered important for all species. Seeds will be sourced as locally as possible from natural populations. Although the local provenance boundary locations may differ between species, seed should ideally be obtained from the Brigalow Belt North bioregion.

Proof of provenance will be sought from the seed supplier(s) along with germination and viability certificates for all purchased seeds.

6.1.8.5 Cattle grazing revegetation species and seeding rates

Revegetation to achieve a cattle grazing PMLU is planned for RA2 and RA5. The growth media for cattle grazing will be pre-stripped topsoil, spread over rehabilitated landforms at a depth ≥150mm, and ameliorated if recommended by an AQP (refer to Section 6.1.4).

The recommended revegetation species mix for cattle grazing PMLU is based on seeding preferred pasture species and legumes cognisant of grazing best management practice (DES, 2022a; Future Beef, 2022). Preferred pasture species include native and naturalised exotic grass species that are perennial, palatable and productive (3P) grasses (Future Beef, 2022). Preferred pasture species have been recommended based on species known to occur on DNM, as well as a selection of pasture species suitable for the topsoil management group described in Section 6.1.4.

A seeding rate of 16kg/ha of coated pasture seed and 4 – 5 kg/ha of uncoated legume seed is recommended for a cattle grazing PMLU (Table 30). All seed mixes will also include 5kg/ha of Japanese millet (*Echinochloa esculenta*) or similar as a sterile cover crop to protect soils from erosion. The cover crop will establish quickly on the exposed surfaces and work to provide a root system that will stabilise the surface and prevent erosion until new seedlings have established. The roots will also create pores in the surface to allow water to penetrate the ground, allowing infiltration and reducing overland flow on the surface.

Species availability may vary, however at least four preferred pasture grass species and two legumes listed in Table 30 are required. The cattle grazing seed mix composition and seeding rates may be adjusted based on the results of ongoing rehabilitation monitoring.

Pasture seed mixes are recommended to sown in the warmer months of the year from September to March, when the probability of rainfall is highest, thereby assisting germination and sustaining establishment.

No seeding or use of Leucaena (*Leucaena leucocephala*) is proposed at DNM.

Table 30: Recommended species and seeding rates for cattle grazing PMLU

Scientific name	Common name	Seeding rate (kg/ha)
Astrebla lappacea	Mitchell grass	3 - 5[c]
Bothriochloa bladhii subsp. bladhii	forest blue grass	1 - 4[c]
Bothriochloa insculpta cvv. *Bisset**	bisset creeping blue grass	3 - 5[c]
*Cenchrus ciliaris cvv. Gayndah**	Gayndah buffel grass	3 - 5c
*Chloris gayana cvv. Callide**	Rhodes grass	3 - 5[c]
*Chloris gayana cvv. Finecut**	Rhodes grass	3 - 5[c]
Dichanthium sericeum subsp. sericeum	Queensland blue grass	1 - 4[c]
*Panicum coloratum var. makarika riense**	bambatsi Panic	3 - 5[c]
Panicum decompositum	native millet	1 - 3[c]
Panicum queenslandicum	yabila grass	1 - 3[c]
Themeda triandra	kangaroo grass	1 - 3[c]
*Urochloa mosambicensis**	sabi grass	3 - 5[c]
Grass species - Total seed weight coated (kg/ha)		**16**
*Chamaecrista rotundifolia**	Wynn cassia	2
*Macroptilium bracteatum**	burgundy bean	2
*Stylosanthes seabrana var Caatinga**	Caatinga stylo	2
Rhynchosia minima var. minima	rhynchosia	2
Legume species - Total seed weight uncoated (kg/ha)		**4 - 5**

Scientific name	Common name	Seeding rate (kg/ha)
Echinochloa esculenta	Japanese millet	**5**

c Assumes seed is coated. If not coated, use half prescribed rate

**Denotes naturalised exotic preferred pasture or legume species*

6.1.8.6 Cattle grazing reference sites

The current cattle grazing reference site (DNM_CG_Ref1: 635629 E, 7556997 N (GDA1994 zone 55)), established in 2019, will continue to be monitored according to the rehabilitation monitoring program (Section 8) when access is permitted. Additional or alternative cattle grazing reference sites may be established in the future, with the location(s) selected based on the below considerations.

The cattle grazing reference site/s should be located close to rehabilitated areas, on land under cattle grazing regimes with representative soil types and slopes comparable to the rehabilitated areas. Cattle grazing reference sites should be located away from disturbances, such as cattle water points, roads or tracks.

6.1.8.7 Woodland habitat revegetation

Areas of woodland habitat PMLU are planned on rehabilitated landforms associated with the spoil dumps (RA1). The spoil dumps are elevated anthropogenic landforms, comprised of mudstones, claystones, siltstones and sandstones, with slopes and broad flat mesas (Section 6.1.5). These landforms vary from pre-mining landforms and do not align with any specific land zone under the regional ecosystem framework (Wilson & Taylor, 2012).

The growth media for woodland habitat at DNM includes pre-stripped topsoil. Woodland habitat growth media will be ameliorated, if recommended by an AQP, prior to deep ripping and seeding (Section 6.1.4). The topsoil depth will be 100mm to 150mm to limit the effects of competition on woodland species due to the potential loads of exotic pasture species (i.e. buffel grass) and to provide the best chance of successful establishment of woody species (Emmerton et al., 2016b).

The approach to woodland habitat revegetation strongly considers the selection of key framework tree, shrub and grass species that are adapted to the growth media and rehabilitation landforms from representative regional ecosystems. As the majority of the vegetation communities and regional ecosystems were cleared prior to the development of DNM (SKM, 2008), the woodland habitat revegetation species have been selected from mapped pre-clearing representative regional ecosystems that occurred within or surrounding DNM, that best align with the woodland habitat growth media and rehabilitation landforms (DES, 2022b; SKM, 2008). The revegetation species have been selected from the following representative regional ecosystems:

- RE 11.5.3 – *Eucalyptus populnea* and/or *E. melanophloia* and/or Corymbia clarksoniana on Cainozoic sand plains and/or remnant surfaces
- RE 11.5.9b *Eucalyptus crebra, E. tenuipes, Lysicarpus angustifolius* +/- *Corymbia* spp. woodland. on Cainozoic sand plains and/or remnant surfaces
- RE 11.9.2 - *Eucalyptus melanophloia* +/- *E. orgadophila* woodland to open woodland on fine-grained sedimentary rocks (dominant)
- RE 11.9.5 - *Acacia harpophylla* and/or *Casuarina cristata* open forest to woodland on fine-grained sedimentary rocks

A number of native grass species have also been included in the woodland habitat revegetation species mix taken from RE 11.9.3 (*Dichanthium* spp., *Astrebla* spp. grassland on fine-grained sedimentary rocks) which has been mapped as a subdominant pre-clearing regional ecosystem on DNM (DES, 2022b).

Woodland habitat revegetation species have been derived from the dominant representative regional ecosystems (i.e. RE 11.5.3 and RE 11.9.2) and supplemented with additional species from the representative subdominant regional ecosystems based on their listing in the relevant Regional Ecosystem Technical Descriptions (Queensland Herbarium, 2018). This approach will likely result in woodland habitat revegetation with both characteristics of the representative regional ecosystems, as well as species that are better adapted

to macro climatic (i.e. drought, fire, flooding rains, climate change) and micro climatic factors (i.e. growth media, physical and chemical variation, variation in slope, aspect, altitude).

The species selection for the woodland habitat revegetation areas has also considered ecological functional groupings according to the role or function they perform in both rehabilitation and non-mined environments (Emmerton et al., 2016a and 2016b) (Table 31). Short lived Acacia spp. (i.e. wattles) have been excluded from the species mix, with seed of intermediate lifespan Acacia spp. reduced, and these species replaced by increased quantities of key framework tree species and shrubby understorey species to provide longer-term ecosystem resilience, structure and function (Emmerton et al., 2016b). Competitive pasture species have also been excluded from the seed mix and only non-aggressive and native grass species have been recommended (Emmerton et al., 2016b). It is important to note that the woodland habitat seed mix composition and seeding rates may be adjusted based on the results of ongoing woodland habitat rehabilitation monitoring.

Table 31: Life form and functional groups assigned to species based on their structural form or ecological function

Life form and functional group	Code	Explanatory notes
Framework trees		
Eucalypt/ Bloodwood (Corymbia) species	E/C	*Eucalyptus, Corymbia,* occasionally *Angophora* species (of any height) which can form an upper storey and often form recognisable vegetation communities but may exist within other communities
Non-eucalypt, non-acacia species	NE/NA	Non-eucalypt, non-wattle species (of any height) which can form recognisable communities, or which may exist in isolation and can become part of the upper storey
Long lived acacias	LLA	Wattle species which may form recognisable communities or exist as part of the upper storey in other communities (e.g. *Acacia shirleyi, Acacia rhodoxylon*)
Woody understorey components		
Shrubby understorey	SU	A shrub is defined as: a woody plant that is multi-stemmed from the base (or within 200 mm from ground level) up to 8 m in height or if single stemmed, less than 2 m tall (Eyre, et al., 2015). Therefore an understorey shrub may include species that are sometimes regarded as small trees
Groundcover shrubs	GCS	Shrubs which form a groundcover
Vines/creepers	V/C	Vines or creepers that are perennial and have a woody component
Intermediate lifespan acacias	ILA	Sub-dominant wattles (*Acacia* spp.) which do not form a community in undisturbed natural ecosystems but can become dominant in rehabilitation areas
Short lifespan wattles	SLA	Wattles prevalent as an understorey in eucalypt communities with some level of disturbance and relatively short lived (≤10 years)
Introduced woody perennials	IWP	Introduced woody species potentially becoming weeds in some circumstances
Groundcover components		
Competitive pasture grasses	CPG	Aggressive introduced pasture grass species (considered to detract from ecosystem values)
Introduced grasses	IG	Less competitive naturalised species (less aggressive than the CPG group)
Native grasses	NG	Perennial and annual native grasses. Includes grass like plants (e.g. genera include: *Cyperus, Dianella* and *Lomandra*)

6.1.8.8 Woodland habitat seed species and seeding rates

The recommended woodland habitat species and seeding rates are listed in Table 32 along with the associated life form and functional group.

The woodland habitat revegetation plan includes of 6kg/ha of framework tree species, 4kg/ha of woody understory species and 7kg/ha of grasses. Planting will also include the addition of a sterile cover crop (e.g. Japanese millet or similar) seeded at 5kg/ha to provide initial groundcover. Seed availability may vary; however, seed mixes should ensure that at least six species from each of the main revegetation groups listed in Table 32, including framework tree species, woody understorey species and grasses, are sown at the overall recommended rate to achieve the required species richness.

The preferred seeding timing for woodland habitat is either April/May or September/early October when there is sufficient soil moisture in the profile. Sowing in cooler months offers longer periods of surface moisture resulting from rain events, as well as reduced grass competition.

Table 32: Recommended species and seeding rates for woodland habitat PMLU

Species name	Common name	Life form and functional group code	Seed rates (kg/ha - uncoated weight)
*Acacia harpophylla**	brigalow	LLA	0.2 – 0.5
Acacia rhodoxylon	rosewood	LLA	0.2 – 0.5
Acacia shirleyi	lancewood	LLA	0.2 – 0.5
Alphitonia excelsa	red ash	NE/NA	0.2 – 0.5
Atalaya hemiglauca	whitewood	NE/NA	0.2 – 0.5
*Casuarina cristata**	belah	NE/NA	0.2 – 0.5
*Corymbia citriodora subsp. citriodora**	lemon scented gum	E/C	0.2 – 0.5
Corymbia dallachiana	Dallachy's gum	E/C	0.6 - 1
Corymbia erythrophloia	red bloodwood	E/C	0.6 - 1
Corymbia trachyphloia	brown bloodwood	E/C	0.2 – 0.5
Eucalyptus cambageana	Dawson's gum	E/C	0.2 – 0.5
Eucalyptus crebra	narrow-leaved ironbark	E/C	0.2 – 0.5
Eucalyptus melanophloia	silver leafed ironbark	E/C	1 - 2
Eucalyptus orgadophila	mountain coolibah	E/C	0.2 – 0.5
Eucalyptus populnea	poplar box	E/C	1 - 2
Lysiphyllum carronii	red bauhinia	NE/NA	0.2 – 0.5
Lysiphyllum hookeri	white bauhinia	NE/NA	0.2 – 0.5
Terminalia oblongata	yellowwood	NE/NA	0.2 – 0.5
Framework tree species - Total seed weight uncoated (kg/ha)			**6**
Acacia excelsa	ironwood wattle	ILA	0.2 – 0.5
Acacia decora	Western Silver Wattle	SU	0.2 – 0.5
Alectryon diversifolius	scrub boonaree	SU	0.2 – 0.5
Alstonia constricta	bitterbark	SU	0.2 – 0.5

Species name	Common name	Life form and functional group code	Seed rates (kg/ha - uncoated weight)
Capparis lasiantha, C. arborea, C. mitchellii	wait-a-while	V/C/SU	0.2 – 0.5
Carissa ovata	currant bush	GCS	0.2 – 0.5
*Cassia brewsteri**	Leichhardt bean	SU	0.2 – 0.5
*Dodonaea viscosa**	sticky hop bush	SU	0.3 – 0.5
*Eremophila mitchellii**	false sandalwood	SU	0.2 – 0.5
Geijera parvifolia	wilga	SU	0.2 – 0.5
Grevillea striata	beefwood	SU	0.2 – 0.5
Grewia latifolia	dogs balls	SU	0.3 – 0.5
Hakea lorea	bootlace oak	SU	0.3 – 0.5
Jasminum didymum	native jasmine	V/C	0.2 – 0.5
Petalostigma pubescens	quinine	SU	0.3 – 0.5
Senna artemisioides	sliver cassia	SU	0.2 – 0.5
Woody understory species - Total seed weight uncoated (kg/ha)			**4**
Astrebla lappacea	curly Mitchell grass	NG	1 - 2
Aristida spp (i.e. A. calycina, A. latifolia, A. ramosa, A. caput-medusae, A. jerichoensis, A. personata)	wire grasses	NG	0.5 - 1
Bothriochloa decipiens var. decipiens	pitted blue grass	NG	0.5 - 1
Bothriochloa ewartiana	desert bluegrass	NG	0.5 - 1
Bothriochloa bladhii subsp. bladhii	forest blue grass	NG	1 - 2
Cymbopogon refractus	barbwire grass	NG	1 - 2
*Cynodon dactylon var. dactylon**	couch	IG	2
Dichanthium sericeum subsp. sericeum	Queensland bluegrass	NG	1 - 2
Eulalia aurea	silky brown top	NG	0.5 - 1
Panicum queenslandicum	Yabila grass	NG	0.5 - 1
Paspalidium distans	shot grass	NG	0.5 - 1
Themeda triandra	kangaroo grass	NG	1 - 2
Grass species - Total seed weight uncoated (kg/ha)			**7**
Echinochloa esculenta	Japanese millet	Cover crop	**5**

**Species adapted to moderate to high salinity tolerance* (DERM, 2011)

6.1.8.9 Woodland habitat reference sites

A woodland habitat reference site (DNM_WH_Ref1 - indicative location: 631499 E, 7561913 N (GDA1994 zone 55)) will be established during the next scheduled rehabilitation monitoring period and will be monitored according to the rehabilitation monitoring program (Section 8). Additional or alternative woodland habitat reference sites may be established in the future, with the location(s) selected based on the below considerations.

Woodland habitat reference site/s should be located in vegetation communities on land systems that are similar to the rehabilitated areas. This includes areas that have similar environmental conditions to the rehabilitated area, such as the same landscape conditions (soil, slope, position in the landscape, geology), vegetation community, and natural disturbance (drought, cyclone impacts or fire history) (Neldner, 2022).

Selected woodland habitat reference sites should ideally be located:

- On steeper elevated landforms preferably on Landzone 9 (Wilson & Taylor, 2012) with slopes >10%
- In woodland communities within or surrounding the DNM site dominated by Eucalyptus spp. (i.e. REs 11.5.3 and 11.9.2) with no extensive chemical or mechanical disturbance
- where minimal modification through timber harvesting, grazing, fire, erosion, dieback, flood, and/or weed infestation has occurred
- At least 50m from a roadside, track, fence line or other major disturbance
- Away from artificial water source (e.g. trough, dam)

6.1.8.10 Watercourse revegetation

A small section of New Chum Creek will require rehabilitation and revegetation activities to establish riparian vegetation associated with a watercourse PMLU.

The revegetation zones for natural watercourses (Figure 17) are defined as follows:

- Upper bank: defines the lateral limits of both sides of the watercourse or diversion. It does not include the land adjacent. The upper bank generally extends down the riparian profile and is dominated by taller Eucalyptus spp, with a mixed woody and grassy understorey.
- Mid bank: occurs between the upper and lower banks and will vary in size depending on the watercourse geomorphology or diversion design. The mid bank may include benches created from high flow events. The vegetation on the mid bank comprises a mix of species including scattered Eucalyptus spp., as well as species that are more adapted to periodic inundation of water and can withstand some disturbance from floods (i.e. *Melaleuca* spp).
- Lower bank (including bank toe): commences at the edge of the low flow channel or stream bed and extends up the bank to the area affected by more regular lower flows. The vegetation in the lower bank is dominated by scattered trees adapted to wetter environments (i.e. *Melaleuca* spp) and a high ground cover of grasses, reeds, sedges and rushes.

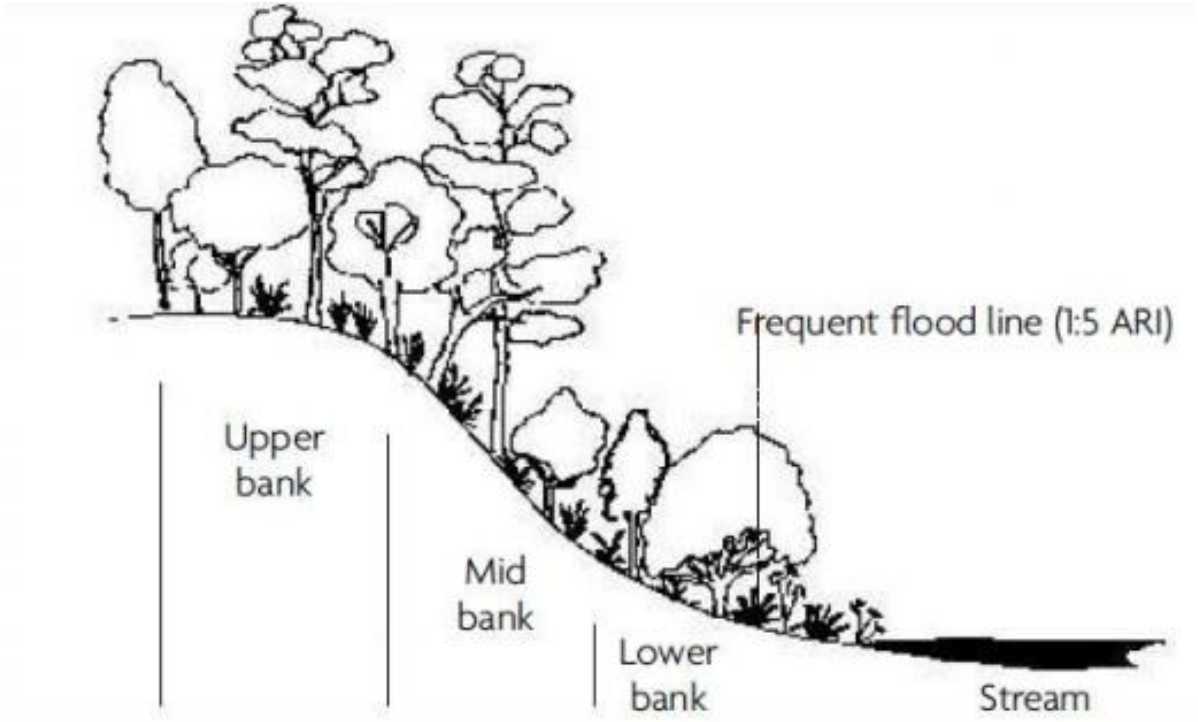

Figure 17: Typical riparian revegetation plantings zone (Vegetation Matters, 2014)

The growth media for watercourse will be pre-stripped topsoil, spread over rehabilitated landforms at a depth ≥150mm, and ameliorated if recommended by an AQP (refer to Section 6.1.4).

6.1.8.11 Watercourse revegetation species and seeding rates

The watercourse revegetation species are based on selecting framework trees, woody understorey and groundcover species associated with the following regional ecosystems occurring along New Chum Creek (DES, 2022b):

- RE 11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

The recommended watercourse revegetation species and seeding rates are listed in Table 33. The planned seeding rate for upper and mid banks is 17kg/ha comprised of 7kg/ha uncoated framework tree, 3kg/ha woody understorey species and 7kg/ha uncoated grasses and other groundcover species. The planned seeding rate for lower banks is 15kg/ha comprised of 5kg/ha uncoated framework tree and 10kg/ha uncoated ground species. The revegetation on the lower banks has been designed to establish a higher percentage of ground cover species, including grasses and rushes. Competitive pasture species have been excluded from the seed mix and only non-aggressive grass species are recommended. Short lived wattle species have also been excluded in the seed mix.

Planting in all revegetation zones will also include the addition of a sterile cover crop (e.g. Japanese millet) or similar seeded at 5kg/ha.

The preferred seeding timing for watercourse revegetation is August to October. There is low chance of frost and less likelihood of significant rainfall in this period allowing the best opportunity for vegetation to establish in a relatively non-erosive period.

Table 33: Recommended species and seeding rates for watercourse PMLU

Species name	Common name	Life form and functional group code	Seed rate (kg/ha - uncoated weight)
Upper and mid banks			
Angophora floribunda	rough barked apple	E/C	0.5 - 1
*Casuarina cunninghamiana**	river she oak	NE/NA	0.5 - 1
*Corymbia tessellaris**	Moreton Bay ash	NE/NA	0.5 - 1
Eucalyptus camaldulensis subsp. *obtusa**	river red gum	E/C	1 - 2
Eucalyptus coolabah subsp. *coolabah*	coolabah	E/C	1 - 2
Eucalyptus tereticornis subsp. *tereticornis**	Queensland blue gum	E/C	0.5 - 1
Lysiphyllum hookeri	white bauhinia	NE/NA	0.5 - 1
*Melaleuca bracteata**	black tea tree	NE/NA	0.5 - 1
Terminalia oblongata	yellowwood	NE/NA	0.5 - 1
Framework tree species - total seed weight uncoated (kg/ha)			**6**
Carissa ovata	current bush	GCS	0.5 - 1
Eremophila mitchellii	false sandalwood	SU	0.5 - 1
Erythroxylum australe	cocaine tree	SU	0.5 - 1
Ficus coronata	creek sandpaper fig	SU	0.5 - 1
Ficus fraseri	white sandpaper fig	SU	0.5 - 1
Ficus opposita	sandpaper fig	SU	0.5 - 1
Petalostigma pubescens	quinine	SU	0.5 - 1
Woody understorey species - total seed weight uncoated (kg/ha)			**4**
Bothriochloa bladhii	forest blue grass	NG	0.5 - 1
*Cynodon dactylon**	couch	IG	2
Dichanthium sericeum subsp. sericeum	Queensland bluegrass	NG	0.5 - 1
Lomandra longifolia	mat rush	NG	0.2 - 0.5
Panicum effusum	hairy panic	NG	0.2 - 0.5
Paspalidium distans	shot grass	NG	0.2 - 0.5
Rhynchosia minima	Rhynchosia	V/C	0.2 - 0.5
Themeda triandra	kangaroo grass	NG	0.5 - 1
Lower banks and bank toe			
*Casuarina cunninghamiana**	river she oak	NE/NA	0.5 -1
*Melaleuca bracteata**	black tea tree	NE/NA	0.5 -1

Species name	Common name	Life form and functional group code	Seed rate (kg/ha - uncoated weight)
*Melaleuca leucadendra**	broad-leaved tea tree	NE/NA	0.5 -1
*Melaleuca viminalis**	red bottlebrush	NE/NA	0.5 -1
Framework tree species - total seed weight uncoated (kg/ha)			**5**
Dichanthium sericeum subsp. sericeum	Queensland bluegrass	NG	1 - 2
Themeda triandra	kangaroo grass	NG	0.5 -1
Bothriochloa bladhii subsp. bladhii	forest blue grass	NG	1 - 2
Lomandra longifolia	spiny-headed mat rush	NG	2 - 3
Eustrephus latifolius	wombat vine	V/C	0.5 - 1
*Cyperus spp. (C. gracilis, C. polystachyos)***	sedge	NG	2 - 3
*Cynodon dactylon**	couch	IG	2 - 3
Ground species - total seed weight uncoated (kg/ha)			**10**
Echinochloa esculenta	Japanese millet	Cover crop	5

** Species adapted to moderate to high salinity tolerance (DERM, 2011)*

*** Bank toe area only*

6.1.8.12 Watercourse reference sites

New Chum Creek requires a reduced number of reference sites (compared to the Index of Diversion Condition (IDC) method (ID&A, 2001)) due to the reduced impact and revegetation area. Suitable watercourse reference site(s) will be established when watercourse rehabilitation activities commence. Reference sites should be located in a relatively unmodified upstream section of New Chum Creek (Section 8.3.1).

6.1.8.13 NUMA low-wall revegetation

Revegetation within the NUMA is planned on the low-walls to within 10m above the modelled maximum residual void lake elevation. The 10m elevation distance between the vegetation and void lakes provides a buffer for the vegetation from the saline void lakes. The low-walls will predominately be Permian age mudstones, claystones, siltstones and sandstones.

Due to the lack of vehicular access and the steep terrain of the NUMA low-walls, the approach to revegetation will likely be via aerial seeding (e.g. drones).

The preferred seeding timing for NUMA low-wall revegetation will be after sufficient rainfall (e.g. >50mm) preferably either April/May or September/early October.

6.1.8.14 NUMA low-wall seed species and seeding rates

The revegetation species for the NUMA low-walls are focussed on tree and shrub species with known tolerances for moderate salinity, sodicity and low nutrients, as well low rainfall and/ or drought conditions.

The NUMA low-wall revegetation species are listed in Table 34 along with their associated life form, ecological functional group and recommended seeding rates. The low-wall revegetation plan includes 10kg/ha of tree and shrub species with ≥50% of the mix to be comprised of *Casuarina* and *Allocasuarina* species. The remainder of species mix is to include long lived *Acacia* species and other shrub species to support diversity and early colonisation as well as *Eucalyptus* and *Corymbia* species for longer term ecological structure and function.

Table 34: Recommended species and seeding rates for NUMA low-wall

Species name	Common name	Life form and functional group code	Seed rate (kg/ha - uncoated weight)
Acacia catenulata	bendee	LLA	1 - 2
Acacia rhodoxylon	rosewood	LLA	1 - 2
Acacia shirleyi	lancewood	LLA	1 - 2
Allocasuarina littoralis	black she oak	NE/NA	1 - 2
Allocasuarina luehmannii	bull oak	NE/NA	1 - 2
Alphitonia excelsa	red ash	NE/NA	0.2 - 0.5
Capparis lasiantha, C. canescens, C. loranthifolia.	wait-a-while	V/C	0.2 - 0.5
Carissa ovata	currant bush	GCS	0.2 - 0.5
Casuarina cristata	belah	NE/NA	2 - 3
Dodonaea viscosa	sticky hop bush	SU	0.2 - 0.5
Eremophila mitchelli	false sandlewood	SU	0.2 - 0.5
Corymbia citriodora subsp. Citriodora	lemon scented gum	E/C	1 - 2
Corymbia dallachiana	Dallachy's gum	E/C	0.2 - 0.5
Erythroxylon australe	cocaine tree	SU	0.2 - 0.5
Eucalyptus cambageana	Dawsons gum	E/C	0.2 - 0.5
Eucalyptus crebra	narrow leafed ironbark	E/C	0.2 - 0.5
Eucalyptus exserta	Queensland peppermint	E/C	0.2 - 0.5
Eucalyptus populnea	poplar box	E/C	0.2 - 0.5
Grevillea striata	beefwood	SU	0.2 - 0.5
Grewia latifolia	dogs balls	SU	0.2 - 0.5
Petalostigma pubescens	quinine	SU	0.2 - 0.5
Senna artemisioides	silver cassia	SU	0.2 - 0.5
Tree and shrub species - total seed weight uncoated (kg/ha)			**10**

Relationship with PRCP Schedule
The revegetation approach for the PMLUs focuses on selection and establishment of suitable species based on the growth media and rehabilitated landforms. Woodland habitat and watercourse rehabilitation strongly considers the inclusion of framework tree species, woody understorey and grass species from pre-clearing regional ecosystems occurring within or surrounding DNM on similar landforms and substrates. The recommended species will best support achievement of the cattle grazing, woodland habitat and watercourse PMLUs and the NUMA low-wall revegetation objectives.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2			RA3			RA4				RA5		
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM2	MM3

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM7	• Completed seeding in accordance with recommended species mix and seeding rates in Table 30 of the Daunia PRC Plan, 1 July 2023, v1
RM8	• Completed seeding in accordance with recommended woodland habitat species mix and seeding rates in Table 32 of the Daunia PRC Plan, 1 July 2023, v1
RM9	• Completed seeding in accordance with recommended watercourse species mix and seeding rates in Table 33 of the Daunia PRC Plan, 1 July 2023, v1
RM10	• Groundcover: >50%
RM11	• Groundcover: – >15% slopes ≥80% – ≤15% slopes ≥50%
RM12	• Groundcover: – >15% slopes ≥80% – ≤15% slopes ≥50%
RM13	• Groundcover: >50% • Land suitability class ≤3 (as per Table 20 of the Daunia PRC Plan, 1 July 2023, v1), or not different from pre-mining class if ≥4 (DSITI & DNRM, 2015); or land condition assessed as Good (A) or Fair (B) as per DES (2022a) Figure 3 • Leucaena >2m high: stem density is <250 stems per hectare (1 per 40m^2) mean total area
RM14	• Groundcover:: – >15% slopes ≥80% – ≤15% slopes ≥50% • Species richness: trees ≥2; shrubs ≥3; grasses ≥4 • Tree canopy: cover ≥16%
RM15	• Riparian vegetation index score: greater than or equal to upstream or downstream values (modified IDC method)

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM16	• Groundcover: >50% • Land condition: assessed as Good (A) or Fair (B) as per DES (2022a) Figure 3 • Leucaena >2m high: stem density is <250 stems per hectare (1 per 40m^2) mean total area
The following Milestone Criteria will contribute to achievement of sufficient improvement:	
MM3	• NUMA low-walls down to 10m above the modelled maximum residual void lake elevation: total vegetation cover ≥30%

6.2 Tailings storage facilities

PRCP 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.

The design for a TSF must include relevant elements:

- *lining of TSF (i.e. embankments and base of structure)*
- *leak detection systems*
- *cellular design of TSF*
- *seepage collection systems*
- *design storage allowance*
- *spillway location*
- *designing TSF for progressive rehabilitation.*

Not applicable, as there are no TSFs at DNM.

6.3 Voids

PRCP 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 Void Closure Plan has been compiled to support the development of this PRC Plan. The detailed plan – *Daunia Mine Void Closure Plan* is provided in Appendix K.

As per the EA, a residual void is "*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*". Therefore, for this PRC Plan, a residual void is considered to be the remaining mined out pit below ground level after backfill.

For DNM, there are three residual voids in the closure landform:

- Titan North Pit and Titan Central Pit (combined in the closure landform)
- Titan East Pit
- Pandora Pit

These residual voids are pre-approved as NUMAs (Section 4). The NUMA extents achieve an area that is safe and structurally stable and include additional set-backs from the void low-wall, high-wall and end-wall crests if required to achieve wall geotechnical stability (FoS=1.5), and a safety bund and fence.

6.3.1 Geotechnical stability

The Void Closure Plan (Appendix K) includes a geotechnical stability analysis of the proposed residual void high-walls, end-walls and low-walls. The analysis determined the FoS of the walls and the set-back distances for long-term pit wall stability for the high-walls, end-walls and low-walls if required to meet the minimum FoS of 1.5.

Set-backs are included within the NUMA extent to ensure stability and that no assets (BMA, third-party, or of significant environmental value) are within this boundary at closure.

The low-wall analysis results are shown in Table 35. The as-dumped design of the residual void low-walls meets the minimum FoS for all residual voids with no additional set-back.

Table 35: Summary of DNM residual void low-wall stability analysis

Pit	Low-wall spoil height (m)*	Low-wall floor dip (°)**	Minimum FoS		Additional set-back at NUMA boundary (m)
			Overall slope (global stability)	Slope outside NUMA (local stability)	
Titan North/Central	143	-2	2.6	3.4	0
Titan East	186	6	3.3	2.8	0

Pit	Low-wall spoil height (m)*	Low-wall floor dip (°)**	Minimum FoS		Additional set-back at NUMA boundary (m)
			Overall slope (global stability)	Slope outside NUMA (local stability)	
Pandora	110	-3	4.2	5.4	0

*Spoil height is the full low-wall from toe of low-wall to the spoil dump crest (includes NUMA and RA1 low-wall area)

** On low-wall floor dip: Negative dip denotes dip direction away from high wall (favourable), positive dip denotes direction towards high wall (unfavourable).

The high-wall and end-wall analysis results are shown in Table 36. The as-mined design of the residual void walls meet the minimum FoS for all residual voids, therefore no additional set-back is required from the wall crest.

Table 36: Summary of DNM residual void high-wall and end-wall stability analysis

Pit	Depth of Tertiary/ Weathered (m)	Depth of Fresh Permian (m)	Average wall angle in Fresh Permian (°)	Factor of Safety at crest	Set-back from toe of wall (m)
Titan XS1 - NW	22	54	23	3.4	Wall crest
Titan XS2 - NNW	27	15	10	1.8	Wall crest
Titan XS3 - NNE	33	85	28	3.3	Wall crest
Titan XS4 - NE	31	73	28	3.1	Wall crest
Pandora XS1 - E	20	73	19	3.9	Wall crest
Pandora XS2 - SSE	27	20	5	1.9	Wall crest
Pandora XS3 - W	22	41	10	1.8	Wall crest

6.3.2 Void hydrology

6.3.2.1 Water balance

A dedicated void water balance model – based on the closure landform design (Section 6.1.5), was completed for the period 2051 to 2199 (149-years) to understand water balance behaviour (including climate change considerations) within the residual voids over time (Appendix K). Water balance model findings are summarised in Table 37.

Key findings show that after 2199 mean water levels start to stabilise for all voids, with simulated mean inflows being very similar to mean outflows. This indicates that the mean water balance has reached an equilibrium.

As the water levels remain below the groundwater levels for all residual voids (and well below the voids' spill points), the voids will not overtop; and environmental harm beyond the tenure boundary is not expected. Therefore, no management activities are required.

Table 37: Summary of DNM water balance model findings

Pit	Spill level (mAHD)	Mean water flows (2199)		Long-term mean void lake level range (mAHD)
		Inflows (ML/yr)	Outflows (ML/yr)	
Titan North/Central	208	437	436	130 - 137

Pit	Spill level (mAHD)	Mean water flows (2199)		Long-term mean void lake level range (mAHD)
		Inflows (ML/yr)	Outflows (ML/yr)	
Titan East	208	148	148	128 - 133
Pandora	193	196	195	118 - 112

6.3.2.2 Groundwater modelling

Numerical groundwater modelling (Section 6.1.1 and Appendix D) shows establishment of sustained inward hydraulic flow gradients to the voids. The hydraulic gradient is established by dewatering during mining operations and maintained by the evaporative discharges from void lakes. The void lakes for all climate scenarios modelled stabilise to a height that is below the modelled groundwater elevations and below the shallow hydrogeological units, (i.e., Quaternary and Tertiary).

Therefore, once the void lakes and groundwater levels have stabilised, the model results indicate the residual voids will continue to act as groundwater sinks, will not interconnect the Permian hosted aquifers and void lakes with shallower groundwater units and will not overtop.

Flow path simulation modelling undertaken in conjunction with the numerical groundwater modelling indicates the residual voids, which act as groundwater sinks, will collect and retain groundwater from the spoil dump areas. Therefore, the residual voids will retain potential contaminated seepage from the spoil dumps and co-disposed rejects. This will minimise the potential for environmental harm beyond the mining tenement boundary. Validation of the flow path simulation will be undertaken through monitoring of groundwater and void lakes at the completion of mining.

6.3.2.3 Water quality

The Void Closure Plan (Appendix K) includes an analysis of the voids' water quality (geochemical stability), and identifies the following key findings across the residual voids:

- Evapo-concentration processes will drive water quality.
- Acidic conditions are unlikely to form as there are no significant sources of acid generation associated with DNM's closure-related surface water hydrology.
- TDS concentrations increase over time, resulting in predicted brackish to mildly saline conditions.
- Preliminary, high-level screening base on predicted TDS levels suggest that all three residual void lakes are not likely to become stratified.

As all three residual voids generally stabilise as groundwater sinks over time, they do not present an unacceptable risk of environmental harm beyond the residual void itself or the tenure boundary.

6.3.3 Options for minimising final void

The pits will be progressively backfilled during the operation to minimise the number of residual voids remaining at closure and the extents. The final mining strips of the final residual voids are shallow. Further backfill of the remaining Titan North/Central, Titan East and Pandora voids will be dependent on the mining sequence of the final strips which may change during the remaining operational period as new geological data becomes available and market factors change and will be refined over the life of the operation.

6.3.4 Final void dimensions and wall angles

Outcomes of the void geotechnical and geochemical stability analyses, void water balance modelling, site-wide hydrogeological and rehabilitation flood modelling have resulted in optimisation of the residual void dimensions towards minimising the extent and location of the NUMAs.

The residual void extents are defined by the high-wall, end-wall and low-wall crests at natural ground level. The average void dimensions and wall angles, measured from the wall toe to the wall crest at ground level, are shown in Table 38.

Table 38: Proposed final void dimensions and overall wall angles

Void	Average depth (m)	Indicative maximum length (m)	Indicative maximum width (m)	High-wall overall slope	End-wall overall slope	Low-wall overall slope
Titan North/Central	54	2,800	1,600	43°	34°	21°
Titan East	95	1,450	500	30°	21°	21°
Pandora	46	1,300	1,200	37°	27°	21°

The residual void high-wall and end-wall profiles will remain as the final excavated as-mined wall profile, with numerous mining benches of varying face angles and heights. Each mining bench is offset with a berm of varying widths, reducing the overall final walls to approximately 21 to 43°. These wall angles may vary with the final geotechnical design which will be developed as mining approaches the final pit limits, to ensure it is based on the latest material and geotechnical data.

The final low-wall profile within the NUMA area will remain as the final as-dumped profile, with truck dump lifts within the NUMA area remaining at angle of repose with offsets between each dump lift reducing the overall low-wall angle to approximately 21°. This overall wall angle may vary with the final geotechnical design which will be developed as mining approaches the final pit limits, to ensure it is based on the latest material, pit floor and geotechnical data.

6.3.5 Improvement and management strategies

The residual voids become available for improvement once mining of each pit is complete and reshaping of the spoil dump low-wall outside of the NUMA area is complete (RA1). This is for safety reasons to eliminate the risk of any injury or damage within the NUMA area from the reshaping and rehabilitation activities. All three residual voids will be retained as NUMAs.

To support attainment of residual voids that are safe and do not present an unacceptable risk of off-tenure environmental harm, the improvement and/or management strategies provided in Table 39 will be undertaken.

Table 39: Improvement and/or management strategies for the DNM residual voids

Residual void closure aspect	Closure objective			Improvement and/or management strategy
	Safety	Stability	Non-polluting	
Geotechnical stability	✓	✓	-	• As mining approaches the final limits, re-assess the wall designs and any required geotechnical setbacks based on the latest available data • Review and adjust the mine plan and closure landform, if needed, to account for any revised set-back requirements • Use a minimum FoS≥1.5 as a guidance for ongoing void closure planning. (This may be

Residual void closure aspect	Closure objective			Improvement and/or management strategy
	Safety	Stability	Non-polluting	
				refined over the mine life should industry research provide optimised guidance on observational methods and consequence assessment)
Void hydrology	-	-	✓	• Residual void catchments are minimised as far as practicable and predominantly include only the low-wall areas • At cessation of mining activities, review and update the void water balance modelling, incorporating identified changes to the voids' closure landform and spill point elevations, rainfall and evaporation, surface water runoff and groundwater inflows, and climate projections • Although not identified in current modelling, if future modelling identifies an unacceptable risk of environmental harm outside the tenure boundary, then management strategies will be implemented • Obtain certification from an AQP that the residual voids will not cause environmental harm beyond that of the void itself • If necessary, identify and implement mitigation measures for appropriate protection works of landforms where floodwaters from watercourses interact with the closure landform
Void hydrogeology	-	-	✓	• At cessation of mining activities, review and update the groundwater modelling, incorporating updated void Water Balance Model outputs and in-field groundwater sampling data, as required • Although not identified in current modelling, if future modelling identifies an unacceptable risk of environmental harm outside the tenure boundary, then management strategies will be implemented • Obtain certification from an AQP that, upon completion of mining, residual voids do not present an unacceptable risk of environmental harm beyond that of the void itself • Undertake groundwater and residual void lake level monitoring to confirm the voids are progressing towards acting as sinks
Void water quality	-	-	✓	• 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			Improvement and/or management strategy
	Safety	Stability	Non-polluting	
				• Although not identified in current modelling, if future modelling identifies an unacceptable risk of environmental harm outside the tenure boundary, then management strategies will be identified and implemented • Obtain certification from an AQP that the residual voids will not present an unacceptable risk of environmental harm beyond that of the void itself
Void access control	✓	-	-	• On cessation of mining activities: ▪ Construct a safety bund at the geotechnical set-back distance ▪ Erect fencing and signage (where required) around the perimeter of the safety bund
Vegetation cover	-	✓	✓	• When the NUMA becomes available for improvement activities, revegetate the NUMA low-wall down to 10m above the modelled maximum residual void lake elevation to establish vegetation cover

Relationship with PRCP Schedule
The three DNM residual voids will be managed as NUMAs. Long-term geotechnical stability of low-walls, end-walls and high-walls is achieved within the NUMA extents. The residual voids will not overtop and will stabilise to be ongoing groundwater sinks post-mining and will not present an unacceptable risk of environmental harm outside of the tenure boundary. The geotechnical stability and safety requirements, as well as water levels and water quality will be managed in terms of the management milestones specified in the PRCP Schedule.

The information in this section is relevant to the following highlighted IAs and MMs in the PRCP Schedule		
IA1		
MM1	MM1	MM3

Milestone criteria identified below will contribute to achievement of PMLU to a stable condition	
MM1	• The required high-wall, end-wall and low-wall set-back to achieve a FoS ≥1.5 is determined by an AQP
MM2	• Safety bund (minimum 2m height and 4m base width) 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)

Milestone criteria identified below will contribute to achievement of PMLU to a stable condition	
MM3	• NUMA low-walls down to 10m above the modelled maximum residual void lake elevation: total vegetation cover ≥30% • Certification from an AQP that the residual void is safe to humans and livestock • Certification from an AQP that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

6.4 Underground mining

PRCP 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 DNM.

6.5 Built infrastructure

PRCP 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:

- *Identification of infrastructure that will be decommissioned and the methods for decommissioning.*
- *A description of infrastructure that will remain post rehabilitation and the identification of ongoing maintenance requirements.*
- *Evidence of agreement for any infrastructure that will have ownership transferred.*

In accordance with the DNM EA condition E19: "*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*." However, the EA further notes that "*this is not applicable where the landowner/landholder is also the environmental authority holder*", which is relevant for parts of DNM (Section 1.2.12).

Table 40 details the infrastructure associated with the mining activities at DNM. BMA owned surface infrastructure not beneficial to the PMLU will be decommissioned and removed in accordance with EA conditions. Surface infrastructure that may be retained to support the PMLUs will have a demonstrable benefit and may include selected: fencing; access tracks; services related infrastructure; sheds and buildings; hardstand areas/transport logistics areas; and water related infrastructure.

Infrastructure not constructed for the purpose of mining, such as dams used for grazing, gates, cattle grates, stock handling/watering areas, access tracks, fire breaks etc., will not be removed as part of rehabilitation works.

Priority will be to repurpose, salvage or recycle any infrastructure to be removed. Demolition and disposal within the mining voids or spoil dumps will only be undertaken when repurpose, salvage or recycle alternatives are deemed by BMA 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 40: Infrastructure associated with the approved DNM mining activities

Category		Infrastructure
Built infrastructure	Steel, concrete and brick infrastructure	• CHPP • Conveyors and transfer stations • Stackers and reclaimers • Surge bins and hoppers • Tunnels • Various buildings e.g. administration, crib rooms, warehouse, laboratory, storage, sheds • Workshops • Fuel, oil, chemical and water storage • Fuel and wash bays • Fences
	Supporting services	• Pipes and pumps • Power lines • Switchyard and substations • Communication and lighting towers • Concrete pads and bitumen • Culverts
Water infrastructure		• Mine water dams • Raw water dams • Sediment dams • Drains

The timing of the decommissioning and removal of the infrastructure is based on the proposed timing of the DNM operation, processing of the final coal and rehabilitation activities.

Any public infrastructure associated with roads, power, water and communications supply to landowners or townships, or not owned by BMA, is not included in this PRC Plan or PRCP 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.

6.5.1 Built infrastructure

Decommissioning of the built infrastructure with no beneficial use to the PMLU will follow the resource management hierarchy and will include:

- Disconnecting services
- Removing surface built and service infrastructure through salvage or recycling activities, or demolishing and burying in the mining voids or spoil dumps

- Removing below-ground built and service infrastructure to a depth of 0.5m below the surface and recycling, or burying in the mine void or spoil dumps, or covering to a minimum depth of 0.5m to enable establishment of the PMLUs
- Removing concrete to a depth of 0.5m below the surface and recycling, or burying in the mine void or spoil dumps, or covering to a minimum depth of 0.5m to enable establishment of the PMLUs
- Removing bitumen and recycling, or burying in the mining voids or spoil dumps
- Disposing of demolition-related putrescible and hazardous wastes at an appropriately licenced facility

6.5.2 Water infrastructure

Decommissioning of the water infrastructure constructed for the mining activities with no beneficial use to the PMLU will involve:

- Removing any remaining water from the water infrastructure to the residual voids, or in accordance with:
  - EA condition F23: "*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: supplying stock water subject to compliance with the quality release limits specified in Table F7 (Stock Water Release Limits); or supplying irrigation water subject to compliance with quality release limits in Table F8 (Irrigation Water Release Limits); or supplying water for construction and/or road maintenance in accordance with the conditions of this environmental authority*".
  - EA condition F24: "*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 F25: "*If the responsibility for mine affected water is given or transferred to another person in accordance with conditions F23 or F24: 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*".
- Disposing of mine dam sediment according to the results of an assessment by an AQP
- Removing any mine dam liners
- Breaching mine dam walls and reshaping of the area to make it free-draining

6.5.3 Contaminated land assessment

In accordance with the EA conditions, contaminants must not be released in a manner that constitutes environmental harm, and spillage of any wastes, 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 prior to landform reshaping, surface preparation and revegetation, a contaminated land assessment will be undertaken in accordance with the National Environment Protection (Assessment of Site Contamination) Measure. The contaminated land investigation will assess the site for the presence of contamination with the potential to adversely impact the nominated PMLUs and/or environmental values. Should land contamination be identified, the potential risks will be assessed and, where required,

remediation will be undertaken and/or a Site Management Plan developed to allow the ML area to be safely utilised for the nominated PMLUs (Section 3).

Relationship with PRCP Schedule
Surface infrastructure not beneficial to the PMLU will be decommissioned and removed. Below ground infrastructure will be removed if required to a depth of 0.5m or covered to enable establishment of the PMLU. A contaminated land assessment will be undertaken at the completion of operations and prior to final landform development and shaping. Remediation and/or management of any identified contamination that has the potential to present unacceptable risks to the nominated PMLU or environmental values, will be undertaken.

The information in this section is relevant to the following highlighted RAs and RMs in the PRCP Schedule															
RA1			RA2				RA3			RA4				RA5	
RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8	RM9	RM10	RM11	RM12	RM13	RM14	RM15	RM16

The following Milestone Criteria will contribute to achievement of PMLU to a stable condition:	
RM1	• Services with no beneficial PMLU re-use disconnected • Built and service surface infrastructure with no beneficial PMLU re-use removed • No below-ground built or service infrastructure within 0.5m of the final landform surface • No concrete or bitumen within 0.5m of the final landform surface • Demolition waste removed from the final landform surface • Assessment of mine water dams is completed by an AQP and sediment and identified water management actions are completed • Mine water dams are demolished • Watercourse crossings and culverts removed
RM2	• Contaminated Land Investigation Document completed in accordance with the *Environmental Protection Act 1994*, including: - Site Suitability Statement confirming the suitability of the property for the PMLUs - Audit Certification • Contaminated Land Investigation Document including a Site Investigation Report and, where required, a Validation Report and/or a draft Site Management Plan

6.6 Summary of key rehabilitation and management practices

The key rehabilitation activities and associated rehabilitation milestones are shown in Table 41 and the key management/improvement activities and associated management milestones are shown in Table 42.

Table 41: Key rehabilitation activities and rehabilitation milestones for DNM

Rehabilitation area	Relevant activities	Rehabilitation activities	Commencement of rehabilitation timing	Rehabilitation milestones
RA1	• Spoil dumps	• Reshape the landform with maximum 25% slopes • Slopes >20% to be covered in 0.5m of rock • Spread topsoil to a thickness of 100mm to 150mm • Assess growth media characteristics to determine ameliorant and other treatment requirements • Apply ameliorants and other treatments (if required) • Deep rip on contour • Seed as per recommended seed mix and rates • Undertake monitoring and maintenance to demonstrate achievement of a woodland habitat PMLU	• Progressive rehabilitation has commenced • Progressive rehabilitation of spoil dump areas as soon as practicable • Rehabilitation of spoil dump low-wall area will commence once mining in each pit is complete	• RM3 • RM5 • RM8 • RM11 • RM14
RA2	• Spoil dumps	• Reshape the landform with maximum 12% slopes • Spread topsoil a minimum thickness of 150mm • Assess growth media characteristics to determine ameliorant and other treatment requirements • Apply ameliorants and other treatments (if required) • Rip on contour • Seed with recommended seed mix and rates • Undertake monitoring and maintenance to demonstrate achievement of a cattle grazing PMLU	• Progressive rehabilitation of spoil dump areas as soon as practicable	• RM3 • RM4 • RM7 • RM10 • RM13
RA3	• Watercourse crossing	• Remove watercourse crossings and culverts • Reshape the disturbed watercourse bed and banks to a profile similar to the pre-disturbance condition • Spread topsoil a minimum thickness of 150mm	• The watercourse crossing is required until final rehabilitation of the site	• RM1 • RM3 • RM6

Rehabilitation area	Relevant activities	Rehabilitation activities	Commencement of rehabilitation timing	Rehabilitation milestones
		• Assess growth media material characteristics to determine ameliorant and other treatment requirements • Apply ameliorants and other treatments (if required) • Rip on contour as required • Seed as per recommended seed mix and rates • Undertake monitoring and maintenance to demonstrate achievement of a watercourse PMLU		• RM9 • RM12 • RM15
RA4	• Spoil dumps – existing rehabilitation	• Undertake monitoring and maintenance to demonstrate achievement of a cattle grazing PMLU	• Progressive rehabilitation has commenced	• RM10 • RM16
RA5	• CHPP and associated infrastructure • Administration, crib and general buildings • Workshop, fuel, oil and chemical storage • Coal stockpiles • Mine dams • Roads • Laydown areas • Exploration • General disturbance	• Disconnect services • Remove surface built and service infrastructure where there is no beneficial use to the PMLU • Remove below ground built and service infrastructure within 0.5m of the surface or cover to a minimum depth of 0.5m where there is no beneficial use to the PMLU • Remove concrete and bitumen within 0.5m of the surface or cover to a minimum depth of 0.5m where there is no beneficial use to the PMLU • Remove demolition waste • Assess mine dam water and sediment and dispose appropriately • Undertake assessment for contaminated land and, where appropriate, remediate impacted areas, and/or implement management controls and/or develop a SMP • Reshape the landform to be free-draining with maximum 12% slopes	• Dependent on the use and location in relation to mining and closure activities: coal stockpiles and coal processing infrastructure are available at the end of mining and coal processing; with all other infrastructure, such as administration, crib buildings, workshops, available at the end of the major rehabilitation activities, including low-wall reshape • Rehabilitation of exploration areas is within six months after exploration activities are complete	• RM1 • RM2 • RM3 • RM4 • RM7 • RM10 • RM13

Rehabilitation area	Relevant activities	Rehabilitation activities	Commencement of rehabilitation timing	Rehabilitation milestones
		• Spread topsoil a minimum thickness of 150mm • Assess growth media characteristics to determine ameliorant and other treatment requirements • Apply ameliorants and other treatments (if required) • Rip on contour • Seed with recommended seed mix and rates • Undertake monitoring and maintenance to demonstrate achievement of a cattle grazing PMLU		

Table 42: Key management/improvement activities and management milestones for DNM

Improvement area	Relevant activities	Management/improvement activities	Improvement timing	Management milestones
IA1	• Residual voids	• Re-assess geotechnical wall designs and set-backs, as required • Review and update groundwater and void-related modelling, as required • Construct safety bunds at FoS ≥ 1.5, where required, to restrict access • Erect fencing and signage around the perimeter of the bund • Revegetation of the NUMA low-walls down to 10m above the modelled maximum residual void lake elevation • Undertake monitoring to demonstrate achievement of sufficient improvement	• Available for improvement once the PMLU low-wall spoil reshaping is complete for each residual void	• MM1 • MM2 • MM3

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.

PRCP 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.

7.1 Identifying, assessing and treating risks

7.1.1 Risk methodology

A risk-based approach to the DNM PRC planning has been undertaken in term of the method described in Figure 18.

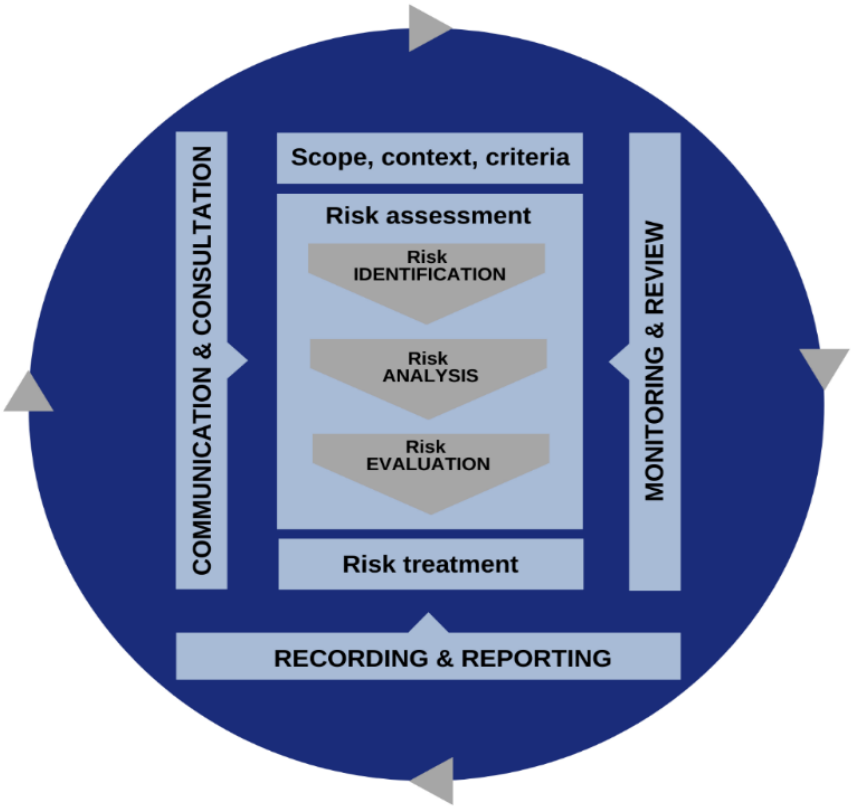

Figure 18: ISO 31000-compliant risk-based approach followed for the DNM PRC Plan

7.1.2 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 18 above, where stable condition is defined as per section 111A of the EP Act:

- The land is safe and structurally stable, and
- There is no environmental harm being caused by anything on or in the land, and
- The land can sustain a PMLU

For DNM the PMLUs being assessed are cattle grazing, woodland habitat and watercourse (Section 3).

In addition, the risk event - NUMA does not achieve safe, structurally stable condition or causes environmental harm - was also assessed.

The full risk assessment - *Daunia Mine PRCP Risk Assessment Matrix* is included in Appendix L.

7.1.3 Risk analysis, evaluation and relevant treatments

The table included in Appendix L 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 then a residual risk rating was calculated. The BHP likelihood and severity tables, as well as the outcomes of the residual risk rating (RRR) heat map ratings matrix are provided in Table 43, Table 44 and Table 45 respectively.

Table 43: BHP 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 44: BHP 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

Severity table		
Severity level	**Descriptor**	**Severity factor**
2	Measureable 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 45: BHP 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 low (RRR of 9). The risk treatments for each scenario that are necessary for achieving a stable condition for the land described as the PMLUs are shown below in Table 46.

Table 46: Necessary risk treatments identified to achieve a stable condition for the PMLUs

Aspect	**Risk treatment**
Risk event: Stable condition (safe, stable, non-polluting and sustainable) for land described as a post-mining land (reference DNM EA Table E1 - cattle grazing, woodland habitat, watercourse) use is not achieved	
PMLU Scenario 1. Landform failure	
Reasons for selecting treatment option	• Material testing and modelling indicate these treatments achieve a stable condition for the proposed final landform
Responsibility for plan: • Approval • Implementation	• Mine planning • Site operations
Proposed actions	• Materials characterisation • Growth media assessment by an AQP to determine ameliorant and physical treatment requirements

Aspect	Risk treatment
	• Landform designed for materials available onsite and what can be achieved based on their properties • PMLU selected based on what is most appropriate for landform and materials • Groundcover of vegetation and rock to provide erosion resistance • Rehabilitation monitoring and maintenance
Resource requirements	• Available material inventory • Erosion modelling • Equipment capabilities • Survey • Rehabilitation monitoring data • AQP to undertake growth media assessment
Performance measures and constraints	• Comparison against design • Tracking against milestone criteria
Reporting and monitoring	• Rehabilitation monitoring
Risk timing and scheduling	• From commencement of rehabilitation activities to final achievement of PMLU
PMLU Scenario 2. Alteration of hydrogeological conditions	
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	• Site operations • Environment team
Proposed actions	• All imported hazardous materials are to be stored and used in accordance with relevant standards and removed from site at completion of mining • At the completion of operations, all stored hazardous materials and infrastructure within the MIA and CHPP, that have the potential to release contaminants to groundwater, will be appropriately recycled or disposed • Contaminated land investigation to be undertaken at the completion of operations to identify contamination that has the potential to cause impacts to groundwater • Implementation of remediation and/or management plans as required to reduce potential groundwater impact risks • Mine affected water dams to be decommissioned (including investigation for potential contamination and groundwater impacts) • Groundwater monitoring to be undertaken in accordance with EA conditions

Aspect	Risk treatment
	• Appropriate management, placement, and monitoring of waste (spoil, rejects) during operations • Landforms constructed to minimise the potential for flooding of the residual voids
Resource requirements	• Monitoring bores maintained and monitoring undertaken
Performance measures and constraints	• Operational EA condition for groundwater contaminant trigger levels
Reporting and monitoring	• Monitoring at defined frequency • Reporting under existing EA requirements
Risk timing and scheduling	• From establishment of landforms with sampling as per PRCP monitoring program
PMLU Scenario 3. Alteration of surface water systems	
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	• Site operations • Environment team
Proposed actions	• All imported hazardous materials to be stored and used in accordance with relevant standards and removed from site on completion of operations • Mine affected water dams to be decommissioned and areas rehabilitated • Surface water monitoring to be undertaken in accordance with EA conditions • Rehabilitation of disturbed areas will be undertaken as soon as practicable after land becomes available • Rehabilitation and monitoring of the disturbed reach of New Chum Creek undertaken • Appropriate management, placement, and monitoring of waste (spoil, rejects) during operations • Landforms constructed to minimise the potential for flooding of the residual voids
Resource requirements	• Undertake surface water sampling • Sampling equipment and infrastructure to allow collection of samples during runoff events
Performance measures and constraints	• Surface water (rainfall runoff) milestone criteria and water quality objectives (WQO)
Reporting and monitoring	• Monitoring when surface water flows are available

Aspect	Risk treatment
	• Reporting under existing EA requirements
Risk timing and scheduling	• During runoff events
PMLU Scenario 4. Contaminated land impacting on environmental receptors, rehabilitation and attainment of PMLUs	
Reasons for selecting treatment option	• Studies and analysis performed show that 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	• Site operations
Proposed actions	• Environmental monitoring and reporting as per the EP Act 1994 and existing EA requirements • Contaminated land investigation at time of closure
Resource requirements	• Suitably qualified person (SQP) to undertake contaminated land investigations and oversee ongoing monitoring requirements • Sample collection, laboratory analysis and engineering controls
Performance measures and constraints	• Attainment of surface water milestone criteria and a site suitability statement
Reporting and monitoring	• Contaminated land investigation report and reporting of water quality as per EA
Risk timing and scheduling	• Contaminated land Investigation at closure and water sampling as per PRCP monitoring program
PMLU Scenario 5. Flooding influences on rehabilitation and 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	• Site operations
Proposed actions	• Removal of infrastructure from watercourse, decommissioning of dams and remediation/management of contaminated material where required • Design of landforms within flood extents that are safe and stable • Establishment of vegetation suitable for the environment and reduces erosion risks • Undertake monitoring for potential landform risks and undertake rectification works to attain milestone criteria
Resource requirements	• AQP to undertake monitoring of final landforms post flood events

Aspect	Risk treatment
Performance measures and constraints	• No flooding damage to landforms up to a 0.1% AEP event
Reporting and monitoring	• Rehabilitation monitoring
Risk timing and scheduling	• As per PRCP monitoring program
PMLU Scenario 6. Rehabilitated landforms result in alteration of flood hydrology upstream and downstream	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments achieve a stable condition for the proposed final landform. Flood modelling indicated some variability when compared to pre-mining flows.
Responsibility for plan: • Approval • Implementation	• Site operations
Proposed actions	• Removal of infrastructure within watercourse alignments (e.g. culverts) that could adversely impact flows and decommissioning of dams • Establishment of landforms that are stable • Undertake monitoring and maintenance works where required to maintain landforms • Provide appropriate level of flood protection through landforms for the residual voids
Resource requirements	• AQP to undertake monitoring of final landforms post flood events
Performance measures and constraints	• No unacceptable damage to infrastructure or ecosystems as a result of final landform
Reporting and monitoring	• Not required
Risk timing and scheduling	• Not required
PMLU Scenario 7. Insufficient or inappropriate growth media and rock resources required 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	• Technical Services • Environment team • Site operations
Proposed actions	• Management of topsoil and rock stockpiling • Management of rehabilitation material application • Review of the growth media and rock resource quantities periodically during operations

Aspect	Risk treatment
	• Growth media assessment by AQP to determine ameliorant and surface treatment requirements • Application of ameliorants and surface treatment as per assessments • Rehabilitation monitoring
Resource requirements	• Topsoil inventory • Burden model • Survey • Equipment capabilities • Rehabilitation monitoring data • AQP to undertake growth media assessment
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Rehabilitation monitoring
Risk timing and scheduling	• From planning of soil stripping to final achievement of PMLU
PMLU Scenario 8. Insufficient management of mineral waste	
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	• Environment team • Engineering team • Site operations
Proposed actions	• Waste characterisation during operations • Surface and groundwater monitoring during operation • Ongoing sampling during operations • Reject material appropriately placed and co-disposed in spoil dumps • In-situ geochemical monitoring of landforms • Rehabilitation monitoring
Resource requirements	• Data from waste characterisation • In-situ geochemical monitoring data
Performance measures and constraints	• Tracking against surface water and groundwater milestone criteria
Reporting and monitoring	• Rehabilitation monitoring • Waste characterisation sampling and analysis • Surface and groundwater monitoring
Risk timing and scheduling	• Throughout operations to final achievement of PMLU

Aspect	Risk treatment
PMLU Scenario 9. Inadequate and/or inappropriate revegetation	
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	• Environment team • Site operations
Proposed actions	• Growth media assessment by AQP to determine ameliorant and surface treatment requirements for the PMLU • Management of seed selection, provenance and quality • Rehabilitation monitoring
Resource requirements	• Rehabilitation monitoring data • Seed • AQP to undertake growth media assessment
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Rehabilitation monitoring
Risk timing and scheduling	• From rehabilitation seeding to final achievement of PMLU
PMLU Scenario 10. Deterioration of built infrastructure conditions	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments are what is recommended to achieve a stable condition for the proposed final landform
Responsibility for plan: • Approval • Implementation	• Environment team • Site operations
Proposed actions	• Undertake a preliminary contaminated land assessment prior to the completion of the approved activities, conduct a detailed site investigation and develop remediation plan if required • Rehabilitation monitoring
Resource requirements	• Rehabilitation monitoring data • SQP to undertake contaminated land investigations and oversee ongoing monitoring requirements
Performance measures and constraints	• Tracking against contaminated land milestone criteria
Reporting and monitoring	• Rehabilitation monitoring

Aspect	Risk treatment
Risk timing and scheduling	• Throughout operations to final achievement of PMLU

The risk treatments for each scenario that are necessary for achieving a safe and structurally stable NUMA are shown below in Table 47.

Table 47: Necessary risk treatments identified to achieve a safe and structurally stable NUMA that does not cause environmental harm

Aspect	Risk treatment
Risk event: NUMA does not achieve safe, structurally stable condition or causes environmental harm	
NUMA Scenario 1. Void walls do not achieve geotechnical stability	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments achieve a safe and structurally stable condition for the NUMA
Responsibility for plan: • Approval • Implementation	• Mine planning • Site operations
Proposed actions	• Geotechnical assessment to be completed by AQP • Wall designs based on geotechnical assessment • Pit floor treatments as required during operations to improve low-wall stability • Geotechnical monitoring during operations • Updated geotechnical assessment to be completed as mining approaches final limits and wall design and NUMA extent adjusted if required • NUMA extents designed to include the required FoS limit • Bunding, fencing and signage placed at FoS limit
Resource requirements	• Geotechnical assessment
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Geotechnical monitoring
Risk timing and scheduling	• From final mining to relinquishment
NUMA Scenario 2. Uncontrolled access to NUMA	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments achieve a safe and structurally stable condition for the NUMA
Responsibility for plan: • Approval	• Site operations

Aspect	Risk treatment
• Implementation	
Proposed actions	• Safety bund, fencing and signage placed at FoS limit where required to restrict access
Resource requirements	• Monitoring and maintenance
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Document visual inspection
Risk timing and scheduling	• From final mining to relinquishment
NUMA Scenario 3. Uncontrolled flooding into residual voids	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments achieve a safe and structurally stable condition for the NUMA
Responsibility for plan: • Approval • Implementation	• Mine planning • Site operations/dam engineer
Proposed actions	• Flood modelling completed by AQP • Flood mitigation (partial backfill and/or landforms) designed to correct flood event • Flood mitigation installed
Resource requirements	• Flood modelling
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Document visual inspection
Risk timing and scheduling	• From final mining to relinquishment
NUMA Scenario 4. Water in the void causes environmental harm outside of the mining tenure	
Reasons for selecting treatment option	• Studies and analysis performed show that these treatments achieve a safe and structurally stable condition for the NUMA
Responsibility for plan: • Approval • Implementation	• Mine planning • Site operations
Proposed actions	• Modelling completed by AQP • Flood mitigation designed to provide protection for a 0.1% AEP event • Groundwater quality and level monitoring

Aspect	Risk treatment
	• Water quality monitoring until relinquishment
Resource requirements	• Groundwater and void lake water balance modelling
Performance measures and constraints	• Tracking against milestone criteria
Reporting and monitoring	• Groundwater level and quality monitoring • Water quality monitoring
Risk timing and scheduling	• From final mining to relinquishment

Relationship with PRCP Schedule
A risk-based approach has been adopted to develop the milestones in the PRCP Schedule. This is primarily driven by a RRR. Should a risk event materialise, the additional proposed actions identified in this risk section will be implemented and, where necessary, adjusted accordingly (in line with the risk treatment identified in this section).

7.2 Rehabilitation trials

PRCP 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 DNM, rehabilitation trials may be conducted at DNM 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.

8 MONITORING AND MAINTENANCE

PRCP 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 bench-marking 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.

8.1 Rehabilitation monitoring

Rehabilitation milestone monitoring will be undertaken at DNM to demonstrate achievement of the rehabilitation milestones, as they relate to achieving the PMLUs of cattle grazing, woodland habitat or watercourse. The RMs and associated milestone criteria for DNM are detailed in Section 1.4.2 and Section 10.3. A combination of monitoring, reporting and data analysis approaches will be used to demonstrate the achievement of the RMs as detailed in Table 48.

Table 48: Rehabilitation milestones with relevant reporting requirements

Milestone reference	Rehabilitation milestone	Reporting requirements
RM1	Infrastructure decommissioning and removal	• Undertake and document visual inspections
RM2	Remediation and/or management of contaminated land	• Contaminated Land Investigation Document including a site suitability statement completed by a SQP confirming the land does not present an unacceptable risk to proposed future land uses or the environment
RM3	Landform development and reshaping	• Survey/LiDAR of landform • Analyse final landform against design
RM4	Surface preparation (cattle grazing)	• Document growth media depth • Document growth media assessment

Milestone reference	Rehabilitation milestone	Reporting requirements
		• Document ameliorants and physical treatments applied
RM5	Surface preparation (woodland habitat)	• Document growth media depth • Document growth media assessment • Document ameliorants and physical treatments applied
RM6	Surface preparation (watercourse)	• Document growth media depth • Document growth media assessment • Document ameliorants and physical treatments applied
RM7	Revegetation (cattle grazing)	• Document seed mix, purity information, planting timing, seed application rates and areas
RM8	Revegetation (woodland habitat)	• Document seed mix, purity information, planting timing, seed application rates and areas
RM9	Revegetation (watercourse)	• Document seed mix, purity information, planting timing, seed application rates and areas
RM10	Achievement of surface requirements (cattle grazing)	• Undertake and report rehabilitation monitoring as per Sections 8.2
RM11	Achievement of surface requirements (woodland habitat)	• Undertake and report rehabilitation monitoring as per Sections 8.2
RM12	Achievement of surface requirements (watercourse)	• Undertake and report rehabilitation monitoring as per Sections 8.3
RM13	Achievement of post-mining land use to a stable condition (cattle grazing – RA2, RA5)	• Undertake and report rehabilitation monitoring as per Sections 8.2 and 8.4
RM14	Achievement of post-mining land use to a stable condition (woodland habitat – RA1)	• Undertake and report rehabilitation monitoring as per Sections 8.2 and 8.4
RM15	Achievement of post-mining land use to a stable condition (watercourse – RA3)	• Undertake and report rehabilitation monitoring as per Sections 8.3 and 8.4
RM16	Achievement of post-mining land use to a stable condition (cattle grazing, existing rehabilitation – RA4)	• Undertake and report rehabilitation monitoring as per Section 8.2

The rehabilitation monitoring parameters and methodologies detailed in Sections 8.2 and 8.3 apply to both rehabilitation and reference sites.

8.1.1 Remote sensing and technology

The current rehabilitation monitoring program is highly dependent on the capture and analysis of field data. Future advances in monitoring could include developments in remote sensing, technology and/or digital data capture which may be incorporated into the program, wherever practical.

8.2 Cattle grazing and woodland habitat monitoring

8.2.1 Monitoring schedule

The monitoring program follows a phased approach whereby initial monitoring is undertaken on an annual basis for the first three-years to assess the performance of rehabilitation as it relates to vegetation establishment and achieving initial surface requirements (Table 49). This approach allows a timely assessment of the performance of rehabilitation post initial seeding and provides critical information to determine if rehabilitation is on track towards achieving surface requirements or if maintenance is required.

Additional rehabilitation parameters are included into the monitoring program in years three, five, 10 and five-yearly thereafter, to assess and track the performance of rehabilitation in relation to milestones achievement of surface requirements (RM10 and RM11) and achievement of PMLU to a stable condition (RM13, RM14 and RM16). The phased approach of the monitoring program enables regular analysis of rehabilitation monitoring data, including multi-year comparison of trends.

Monitoring of cattle grazing and woodland habitat reference sites will be undertaken for the parameters listed in Table 49 and will be implemented as per the monitoring schedule from Year 3.

Table 49: Cattle grazing and woodland habitat PMLU monitoring schedule and measured rehabilitation parameters

Rehabilitation parameter	Monitoring schedule				
	Year 1	Year 2	Year 3	Year 5	Year 10+ (5 yearly thereafter)
Cattle grazing and woodland habitat PMLUs					
Landform and erosion	✓	✓	✓	✓	✓
Soil and spoil	✓	-	✓	✓	✓
Groundcover	✓	✓	✓	✓	✓
Invasive plants	✓	✓	✓	✓	✓
Cattle grazing PMLU					
Land suitability assessment	✓	-	✓	✓	✓
Land condition	-	-	✓	✓	✓
Woodland habitat PMLU					
Species richness	✓	✓	✓	✓	✓

Rehabilitation parameter	Monitoring schedule				
	Year 1	Year 2	Year 3	Year 5	Year 10+ (5 yearly thereafter)
Tree canopy cover	-	-	✓	✓	✓
Recruitment	-	-	✓	✓	✓

8.2.2 Rehabilitation monitoring sites

Permanent rehabilitation monitoring sites will be established as part of the initial rehabilitation monitoring (Year 1) and assessed during all phases of rehabilitation monitoring. The permanent field monitoring sites should be selected using the following criteria:

- Representative of rehabilitation slope
- Accessible (vehicle access preferred)
- Low risk of site being disturbed by mining activity in the future

Selection of suitable reference sites for cattle grazing, woodland habitat and watercourse PMLUs are discussed in Sections 6.1.8.6, 6.1.8.9 and 6.1.8.12.

8.2.3 General rehabilitation monitoring parameters

8.2.3.1 Landform and erosion

Landform and erosion will be assessed as part of all monitoring phases Table 49). Prior to commencing the field monitoring work, a desktop assessment using LiDAR data and aerial imagery will be completed to develop a DEM to assess the rehabilitated slope against the landform design (Year 1), and the ongoing monitoring of the landform and slopes.

The desktop analysis will identify potential areas of major ponding of water due to dump settlement and areas of deposition (where the ground level has increased over time), as well as the progression of erosion features such as developing gullies.

Field-based erosion monitoring will be conducted at the permanent monitoring sites, as well as any new areas identified in the desktop assessment. If erosion is present, an erosion monitoring transect will be established by running a 50m tape perpendicular to the slope and across the erosional activity identified by the LiDAR analysis.

The following aspects will be recorded per erosion transect:

- Erosion severity
- Erosion type
- State of erosion

8.2.3.2 Soil and spoil

The parameters detailed in Table 50 will be analysed at all monitoring events for soils and spoils. Soil profile pits or cores will be located within close proximity to the permanent rehabilitation monitoring sites. Surface sampling depth refers to the layer at 0 – 10cm; and sub-surface sampling depth refers to layers at 10 – 30cm, 30 – 60cm and 90 – 100cm (sampling down to refusal).

Table 50: Soil and spoil analysis parameters for rehabilitation monitoring

Category	Analyte	Purpose of analyte	Depth	
			Surface	Sub-surface
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.	✓	✓
Exchangeable cations	CEC	Major factor in soil fertility. Controls soil stability, nutrient availability and buffers soil's chemical properties.	✓	✓
	ESP	ESP is a measure of the dominance of Na 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. Increases in organic carbon is a key indicator of rehabilitation success?	✓	-
Major elements	Total Nitrogen	Indicator of soil nutrient store and is also a major plant nutrient.	✓	-
	Extractable Phosphorous (Colwell method)	Indicator of phosphorous readily available to plants.	✓	-
	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.	✓	-

8.2.3.3 Groundcover

Groundcover will be assessed at the permanent rehabilitation monitoring sites as part of all monitoring events. Groundcover type is recorded as either live cover (with species recorded), standing dry cover, organic litter (including leaves, hay and woody debris (i.e. logs or dead timber)), rocks, or bare ground. The percentage of total groundcover (anything in contact with the soil surface) is calculated.

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 listed in schedule 4 of the *Biosecurity Regulation 2016*.

Invasive plants will be assessed at the permanent rehabilitation monitoring sites and reference sites as part of all monitoring phases. The presence and percent cover of invasive plants, calculated as a percentage of the total vegetation cover, will be recorded at each site.

8.2.4 Cattle grazing specific rehabilitation parameters

8.2.4.1 Land suitability assessment

A land suitability assessment according to the Grazing rule-set (Table 20) will be undertaken at Year 1 to assess if ameliorants are working or if further treatments may be required. Ongoing grazing land suitability assessments will be undertaken as part of monitoring events from Year 3. Based on the monitoring data, land suitability class will be rated 1 to 5 as per the soil limitations and land attributes in Table 20.

8.2.4.2 Land condition

Grazing 'land condition' will be assessed at the permanent cattle grazing rehabilitation monitoring sites from Year 3. This allows at least two seasons after seeding for pasture species to establish. Land condition will be assessed and rated as Good (A), Fair (B), Poor (C) or Degraded (D) as described in the *Queensland Reef Protection Regulations Farming in Reef Catchments Grazing Guide* (DES, 2022a) (Table 21).

Land condition requires monitoring the following aspects:

- Groundcover – calculated as the percentage of soil surface covered by live cover, standing dry cover and organic litter (including leaves, hay and woody debris)
- Pasture condition – including estimated percent dry matter (DM) yield of preferred pasture species, annual grasses, undesirable grasses and other weeds as per Table 51
- Soil condition and erosion – assessed as per Section 8.2.3.1 and rated as per Table 21

8.2.4.3 Pasture condition

Pasture condition will be assessed at the permanent rehabilitation monitoring sites from Year 3.

The density and coverage of 3P grasses (perennial, productive, palatable) is a key indicator of pasture condition (DES, 2022a). Pasture condition monitoring will be undertaken in accordance with the Stocktake GLM method (Department of Agriculture and Fisheries, 2021). The assessment includes an estimate of the percentage DM yield in kg/ha comprised of 3P pasture species versus the percentage DM yield in kg/ha of annual and undesirable grasses. Based on the monitoring data, pasture condition will be rated per the condition indicators in Table 51.

Table 51: Pasture condition assessment table

Condition rating	Condition indicators			
	Preferred pasture species		Annual grass % DM yield	Undesirable grasses and other weeds % DM yield
	% DM yield	Crown cover		
Excellent (A) - 1	> 80 %	Dense and plants healthy	< 20 %	< 20 %
Good (B) - 2	60 – 80 %	High to moderate density and some plants unhealthy	20 – 39 %	20 – 29 %
Poor (C) - 3	10 – 59 %	Moderate to low density and some plants dead	40 – 70 %	30 – 80 %
Very poor (D) - 4	< 10 %	Sparse and many plants dead	> 70 %	> 80 %

8.2.5 Woodland habitat specific rehabilitation parameters

8.2.5.1 Species richness

Species richness will be assessed at the permanent rehabilitation monitoring sites as part of all monitoring phases. Species richness is assessed for tree, shrub, grasses (native and exotic) and other ground species by recording the number of flora species at each site.

8.2.5.2 Tree canopy cover

Tree canopy cover will be assessed at the permanent rehabilitation monitoring sites from Year 3. Canopy cover is recorded using the line intercept method at each monitoring site. The crown of each tree (single-stemmed woody plant greater than 2m tall) (Eyre, et al., 2015) is recorded and summed as a total canopy distance and converted to a percent cover.

8.2.5.3 Recruitment

Recruitment will be assessed at the permanent rehabilitation monitoring sites from Year 3. 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 in a juvenile state are recorded.

8.3 Watercourse monitoring

Watercourse monitoring will be conducted at DNM to assess the performance of the rehabilitated watercourses disturbed by mining activities (i.e. New Chum Creek). The purpose of the monitoring is to assess the performance of the rehabilitated watercourses in achieving watercourse surface requirements (RM12) and final PMLU milestone criteria (RM15).

Watercourse monitoring will be undertaken in accordance with the 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; however, it can be utilised for both diverted and rehabilitated reaches of watercourses.

The DNM watercourse monitoring schedule is detailed in Table 52. The monitoring schedule indicates the IDC parameters measured over time from Year 1, Year 2, Year 5 and then 5 yearly thereafter.

The purpose of the IDC methodology is to compare the condition of portions of rehabilitated watercourses with reference site (i.e. upstream or downstream) conditions and identify potential maintenance requirements.

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

Suitable watercourse monitoring locations for New Chum Creek will be selected when rehabilitation activities commence.

Table 52: Watercourse PMLU monitoring schedule and measured rehabilitation parameters

Monitoring parameters		Monitoring schedule			
Parameter	**Monitoring detail**	**Year 1**	**Year 2**	**Year 5**	**Year 10+ (5-yearly thereafter)**
Groundcover					
Groundcover	Groundcover (%)	✓	✓	✓	✓
Geomorphic index parameters					
Stream width	Width of high flow channel (m) Width of active channel (m) Width of low flow channel (m)	✓	✓	✓	✓
Bank condition	Presence of erosion	✓	✓	✓	✓
Piping of banks	Presence of piping on the banks	✓	✓	✓	✓
Bed condition	Presence of aggradation or degradation within the channel bed	✓	✓	✓	✓
Spoil piles	Proximity of spoil dumps in relation to the monitoring point	✓	✓	✓	✓
Recovery	Presence or absence of benches with/ without vegetation	✓	✓	✓	✓
Instream structures	Stability of each identified instream structure	✓	✓	✓	✓
Riparian index parameters					
Riparian zone	Width of riparian zone (m)	✓	✓	✓	✓
Structural intactness	Over-storey, understorey and ground cover (% density)	✓	✓	✓	✓
Regeneration	Presence or absence of regeneration on banks	-	✓	✓	✓
Longitudinal continuity	Assess the gaps in the riparian vegetation corridor along the banks	✓	✓	✓	✓

8.4 Surface water monitoring

In line with the DNM EA Table E1, surface water monitoring will be undertaken for pH, EC and turbidity and the milestone criteria will be 'not significantly different to upstream values'. Appendix M provides guidance on the statistical methods and approach to be used for evaluation of the surface water results to the milestone criteria.

Water quality monitoring will be undertaken in accordance with the DES *Monitoring and Sampling Manual: Environmental Protection (Water) Policy* (DES, 2018).

8.4.1 Surface water monitoring schedule

As the watercourses at DNM 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 surface 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 the DNM EA Table E1. 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 (RM7 – RM9) and achievement of the nominated PMLUs (RM13 – RM15).

8.4.2 Surface water sample locations

The preferred approach for surface water monitoring is to collect samples from relevant upstream and downstream monitoring points. The location of the selected surface water monitoring points are consistent with the existing surface water monitoring points except where they are required to be moved downstream to capture the extent of future mining operations. The surface water monitoring locations are summarised in Table 53 and illustrated in Figure 19.

The surface water monitoring locations may be amended as required to account for changes to upstream land uses/stream dynamics or to improve the effectiveness of the monitoring program to measure progressive rehabilitation areas.

Table 53: Rehabilitation surface water sample locations

Monitoring point ID	Approximate location (GDA 1994 MGA Zone 55)	Monitoring location description
MP1	7562013N 631902E	Upstream New Chum Creek, existing monitoring point.
MP2	7560788N 630825E	Downstream of MIA New Chum Creek, existing monitoring point.
MP4	7553698N 631843E	Isaac River up-stream, existing monitoring location. Down-stream of Poitrel Mine and Caval Mine discharges to Isaac River and upstream of unnamed watercourse that services the western portion of DNM.
MP19	7547615N 642720E	Isaac River down-stream, existing monitoring location. Downstream of the confluence of North Creek and the unnamed watercourse servicing much of the DNM area. At the Queensland Government Isaac River Deverill Monitoring Station.
New Location 01	7553998N 634674E	Unnamed watercourse western lease boundary, downstream of Pandora spoil dumps.
New Location 02	7556441N 635542E	Unnamed drainage line upstream of Pandora spoil dumps on eastern lease boundary.

As a consequence of progressively rehabilitating spoil dumps, downstream watercourse monitoring locations may not always be representative of the rainfall runoff from the discrete rehabilitated land subject to the milestone criteria. Therefore, it may be more representative to collect rainfall runoff samples directly down gradient of the rehabilitated land (i.e. toe of slope or drainage feature) utilising a water collection device (such as a bucket or flue). The pH, EC and turbidity of the rainfall runoff from rehabilitated land will be compared to

the water quality values of the relevant upstream monitoring point (as listed in Table 53). The method of rainfall runoff sample collection and/or the water collection device may change as required to account for improved technologies, or to improve the effectiveness of the monitoring program.

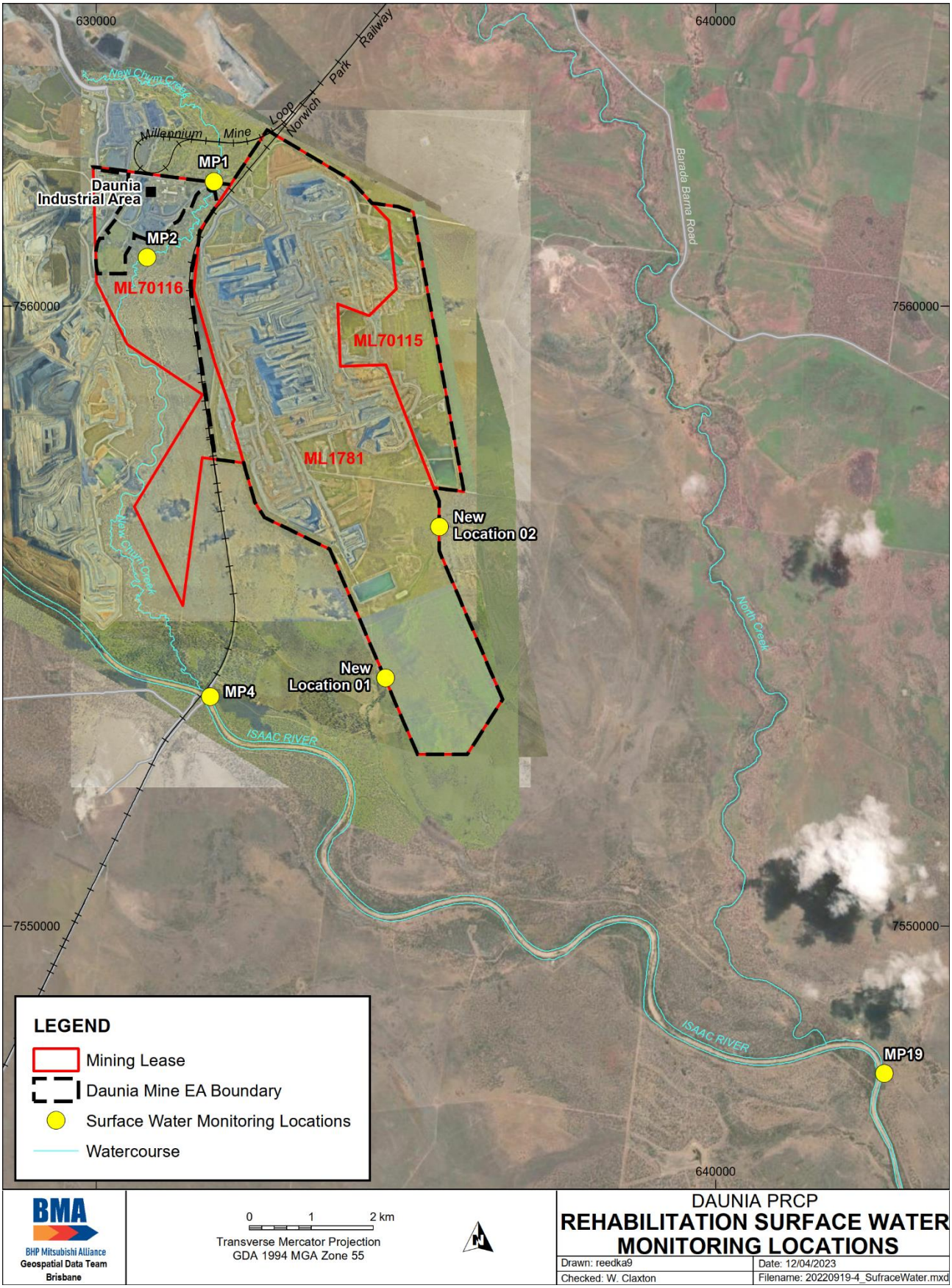

Figure 19: DNM rehabilitation surface water monitoring locations

8.5 Groundwater monitoring

8.5.1 Groundwater quality

In line with the *Guideline progressive certification for resource activities*, deep drainage water quality will be "*addressed holistically for a site at surrender"* (DES, 2022f). The objective and acceptance criteria for groundwater is not considered relevant to progressive rehabilitation of discrete packages of rehabilitated land due to the scale and nature of groundwater aquifers. Therefore, deep drainage acceptance criteria for rehabilitation will be transitioned and applied only at the completion of mining operations and applied holistically for the entire DNM area. Groundwater monitoring during operations will continue as per the applicable LOD conditions.

However, groundwater quality monitoring will be undertaken at surrender of the DNM EA in accordance with the EA Table E1:

- *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*

Appendix M provides guidance on the statistical methods and approach to be used for evaluation of the groundwater results to the criteria applicable at surrender.

8.5.2 Groundwater levels

Monitoring of groundwater levels will focus on the relationship between the Permian groundwater level recovery and the void lake levels. Groundwater level/gradient trends over time will be assessed against the more dynamic pit lake levels to demonstrate that residual voids are progressing to a stabilised state, where they will act as ongoing sinks for the Permian hosted groundwater and thus minimising the potential for an unacceptable risk of environmental harm off tenement (MM3).

Due to the timeframes involved for the stabilisation of the void lakes and groundwater levels surrounding the mining voids, the intention of the groundwater level monitoring is to show progress towards development of long-term sinks and not to confirm the attainment of long-term sinks. Demonstrating the progress towards development of long-term sinks is to be done through assessment of trends and comparison to groundwater and void lake water balance model predictions by an AQP.

8.5.3 Groundwater monitoring schedule

During operations, groundwater monitoring will continue per the applicable EA conditions.

Upon completion of surface preparation (RM4 to RM6) post-mining, rehabilitation groundwater monitoring will be undertaken quarterly, and will include:

- Groundwater quality monitoring, with at least one monitoring event representative of the dry season and one monitoring event representative of the wet season each year
- Groundwater level and void lake height

The above will be undertaken for the first 5-years after attainment of surface preparation for all areas of RA1, RA2 and RA5. Thereafter, the groundwater data will be assessed to determine if there is a need to continue groundwater monitoring and what an appropriate frequency for future monitoring would be.

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 DNM 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 provided in Table 54 and illustrated in Figure 20.

Table 54: DNM rehabilitation groundwater monitoring locations

Hydro-geologic unit	Monitoring location ID	Approximate location (GDA 1994 MGA Zone 55)	Monitoring location description	Ground-water quality	Ground-water level
Quaternary -Tertiary Sediments	DNMMB02_01	7561307N 635773E	East of the Titan East residual void.	✓	
	MB20DNM05A	7554012N 634703E	Western lease boundary adjacent to Pandora spoil dumps. Existing bore.	✓	
	New bore 01	7558545N 635601E	Eastern side of lease, near current operational dam and drainage line.	✓	
	MB02A	7552876N 635409E	Southern end of DNM. Existing bore.	✓	
	New Bore 02	7561137N 630512E	South of MIA/CHPP area down hydraulic gradient.	✓	
	MB211	7562095N 630549E	North-eastern corner of MIA/CHPP area. Existing bore.	✓	
Permian coal measures	PZ02	7560233N 635302E	Eastern boundary of ML70115 and south-east of the Titan East residual void. Existing and current EA bore.	✓	✓
	PZ05	7561916N 632574E	Northern portion of ML1781 adjacent to Titan North/Central residual void. Existing and current EA bore.	✓	✓
	PZ06	7561217N 631774E	North-western boundary of ML1781 adjacent to Titan North/Central residual void. Existing and current EA bore.	✓	✓
	PZ07	7559719N 631741E	Western boundary of ML1781 adjacent to Titan spoil dumps. Existing and current EA bore.	✓	✓
	MB01P	7554000N 634698E	Western boundary of ML1781 adjacent to Pandora spoil dump. Existing and current EA bore.	✓	✓
	MB02P	7552878N 635415E	Southern end of DNM. Existing well.	✓	✓

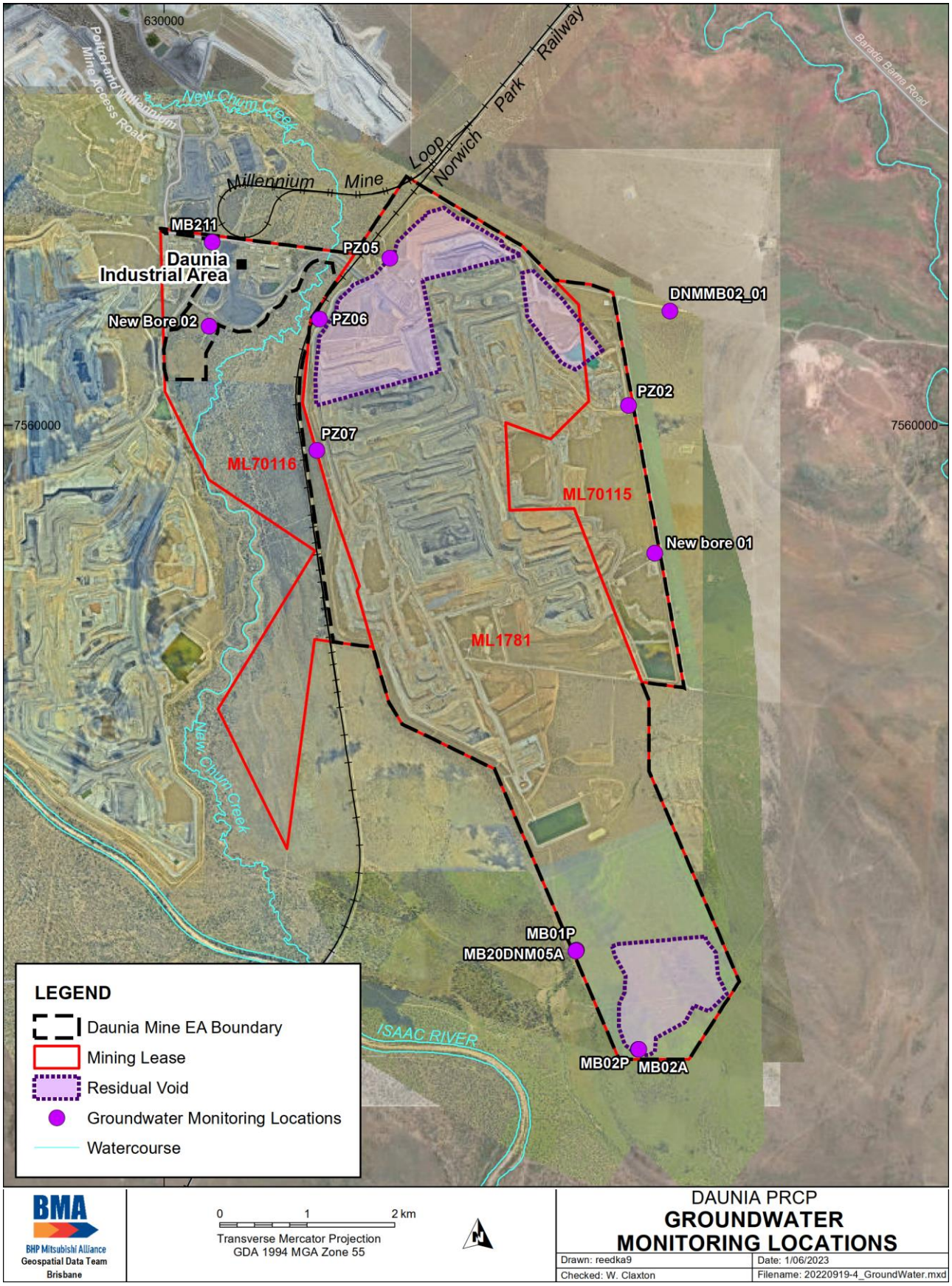

Figure 20: DNM rehabilitation groundwater monitoring bores

8.6 NUMA milestone monitoring

Management milestone monitoring will be undertaken at DNM to demonstrate achievement of the MMs as they relate to achieving sufficient improvement. The MMs and associated milestone criteria for DNM are detailed in Section 1.4.3 and Section 10.4. A combination of monitoring and reporting approaches will be used to demonstrate the achievement of the MMs as detailed in Table 55.

Table 55: Proposed monitoring for management of NUMAs

Management milestone	Reporting requirements	Frequency					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 10+ (5-yearly thereafter)
MM1 Achievement of structural stability	Undertake geotechnical monitoring	✓	-	-	-	✓	✓
MM2 Achievement of surface requirements	Undertake and document visual inspections	✓	-	✓	-	✓	✓
MM3 Achievement of sufficient improvement	Undertake and document monitoring of the NUMA low-wall total vegetation cover and monitoring of groundwater levels, EC and pH, void water levels and void water quality*	✓	✓	✓	✓	✓	✓

*Aligned to the groundwater monitoring schedule in Section 8.5.3 (quarterly, per year; in 5-year increments as needed)

8.6.1 Low-wall revegetation monitoring

NUMA low-wall vegetation monitoring will likely be undertaken via remote sensing and associated aerial imagery analysis to derive key vegetation parameters as per Table 55. Total vegetation cover will include the combined total crown cover or projective foliage cover of the tree canopy and sub-canopy layer, shrub layer and ground layers if present, ignoring overlaps between stratum (Walker & Hopkins, 1990; Neldner, 2022).

8.7 Achievement schedule

8.7.1 PMLUs

The timing of the rehabilitation milestones specific to achievement of surface requirements and achievement of cattle grazing, woodland habitat and watercourse PMLUs are listed in Table 56.

Achievement of surface requirements for cattle grazing (RM10) is proposed within a five-year timeframe from revegetation and a further 10-years for achievement of PMLU to a stable condition for cattle grazing (RM13 and RM16). There are a number of factors which can influence the successful establishment of pastures on post-mined land including landform, soil management and amelioration, species selection, seeding rates and seeding

timing, plus rainfall. This will allow for sufficient time to demonstrate the ongoing sustainability of the PMLU for cattle grazing through rehabilitation monitoring data associated with land condition and pastures.

Achievement of surface requirements for woodland habitat (RM11) and watercourse (RM12) are proposed within a five-year timeframe from revegetation. A further 15-years is allowed for initial establishment and successional processes and natural recruitment to occur, prior to achievement of the PMLUs to a stable condition (RM14 and RM15).

Table 56: Time for achievement of surface requirements and PMLUs rehabilitation milestones

Rehabilitation milestone reference	Rehabilitation milestone	Milestone achievement timeline after revegetation (in PRCP Schedule)
RM10	Achievement of surface requirements (cattle grazing)	5-years
RM11	Achievement of surface requirements (woodland habitat)	5-years
RM12	Achievement of surface requirements (watercourse)	5-years
RM13	Achievement of post-mining land use to a stable condition (cattle grazing – RA2, RA5)	Up to 15-years
RM14	Achievement of post-mining land use to a stable condition (woodland habitat – RA1)	Up to 20-years
RM15	Achievement of post-mining land use to a stable condition (watercourse – RA3)	Up to 20-years
RM16	Achievement of surface requirements (cattle grazing, existing rehabilitation – RA4)	Up to 15-years

8.7.2 NUMAs

The timing of the management milestones specific to achievement of sufficient improvement (MM3) is listed in Table 57.

Table 57: Time for achievement of sufficient improvement for NUMA management milestones

Milestone reference	Management milestone	Milestone achievement time (in PRCP Schedule)
MM3	Achievement of sufficient improvement	Aligned with achievement of neighbouring PMLUs (RM13, RM14 or RM15) to ensure maximum monitoring period

8.8 Data analysis and reporting

Rehabilitation monitoring data will be collected and analysed by an AQP 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 corrective actions or maintenance.

The rehabilitation data will be stored and processed within internal geospatial and document management systems.

8.9 Maintenance

Maintenance will be implemented when monitoring identifies issues with the rehabilitation, or when milestone criteria are not being met. In order to select the most appropriate corrective actions, rehabilitation monitoring data will be analysed to identify the likely cause(s). Required maintenance/corrective actions will be entered into BMA's work management system for actioning and record management.

To support ongoing operations, temporary and/or minor disturbance activities may be required within rehabilitated areas in some circumstances. This temporary and/or minor disturbance will occur without a PRCP amendment and rehabilitation will be managed as part of maintenance works. Temporary and/or minor disturbance can occur within rehabilitated areas to the extent reasonably necessary for roads, fences, underground services, low-impact telecommunications facilities, electrical sub-stations, transmission grid works and supply network works, storage depots, pipelines, groundwater bores, monitoring and investigations, exploration, or similar minor infrastructure and ancillary facilities for any of the listed minor infrastructure. Maintenance works will be planned and executed as soon as practicable and within at least six months of the completion of the temporary and/or minor disturbance within rehabilitated areas. Maintenance works may include removing infrastructure, reshaping the area, re-spreading stripped topsoil, applying seed mix aligned to the PMLU, weed control or managing erosion. These rehabilitated areas will continue to be monitored as per Section 8.

8.10 Quality assurance and quality control

The quality assurance and quality control (QA/QC) process to be followed as part of DNM ongoing rehabilitation monitoring is illustrated in Figure 21. The process provides for initial execution of the rehabilitation in accordance with the rehabilitation plan, followed by verification of the execution against the rehabilitation plan. Based on the verification outcomes, allowance is made for implementation of corrective actions, as needed. All rehabilitated areas then undergo rehabilitation monitoring; and subsequent execution of maintenance actions identified through the monitoring (Section 8). This process allows for a repetitive execution-verification-corrective action-monitoring QA/QC approach, to ensure rehabilitation areas progress on a trajectory towards achievement of milestone criteria and eventual certification.

Figure 21: Rehabilitation monitoring quality assurance / quality control process

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B: PRCP SCHEDULE

10 PRCP SCHEDULE

Legislative Requirement

In accordance with section 126D(1) of the EP Act, the PRCP 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).

PRCP 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 bench-marking 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.

10.1 Final site design

The DNM final site design is provided in Figure 22.

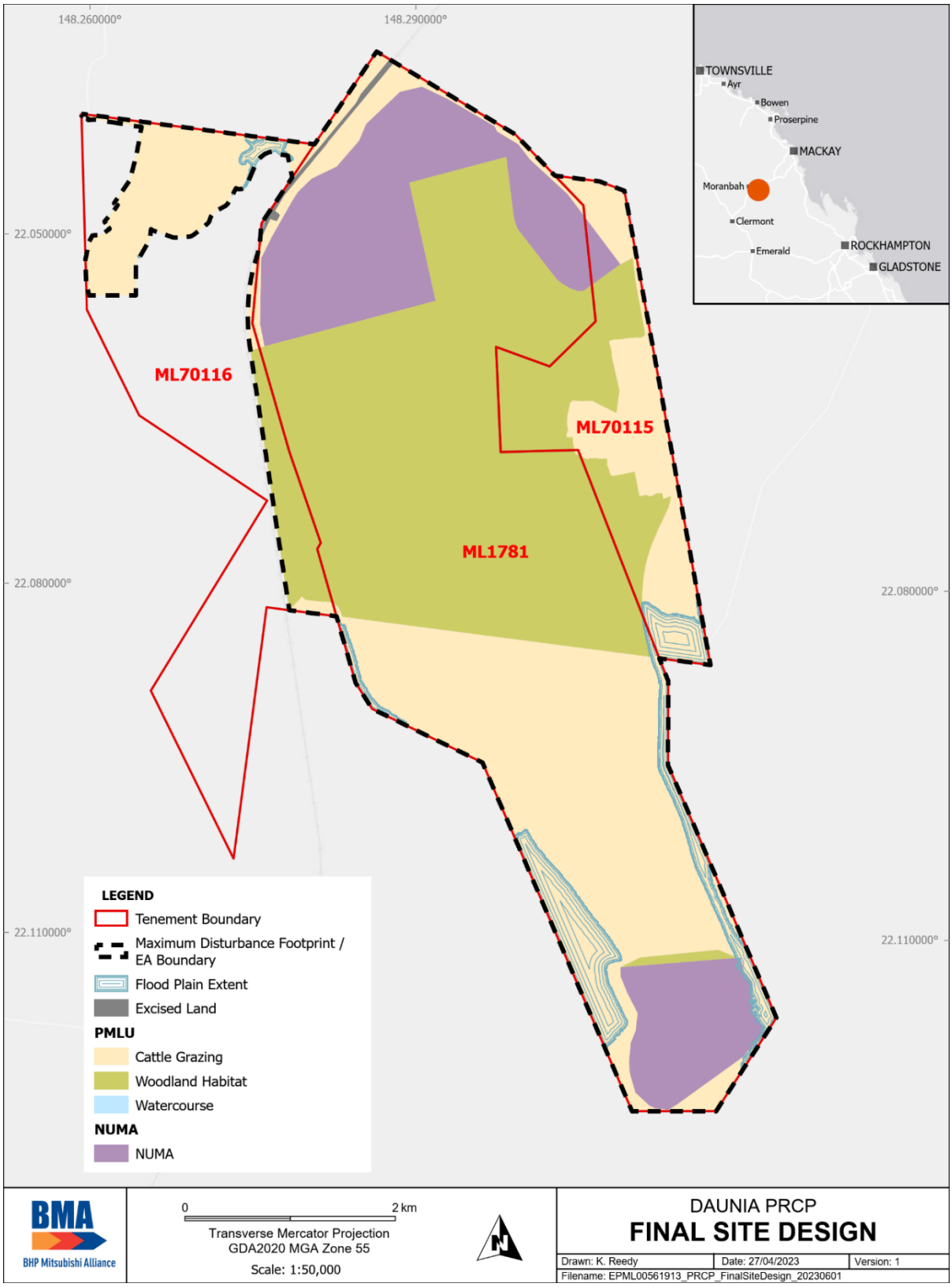


Figure 22: Final site design

10.2 Reference map

The DNM reference map is provided in Figure 23.

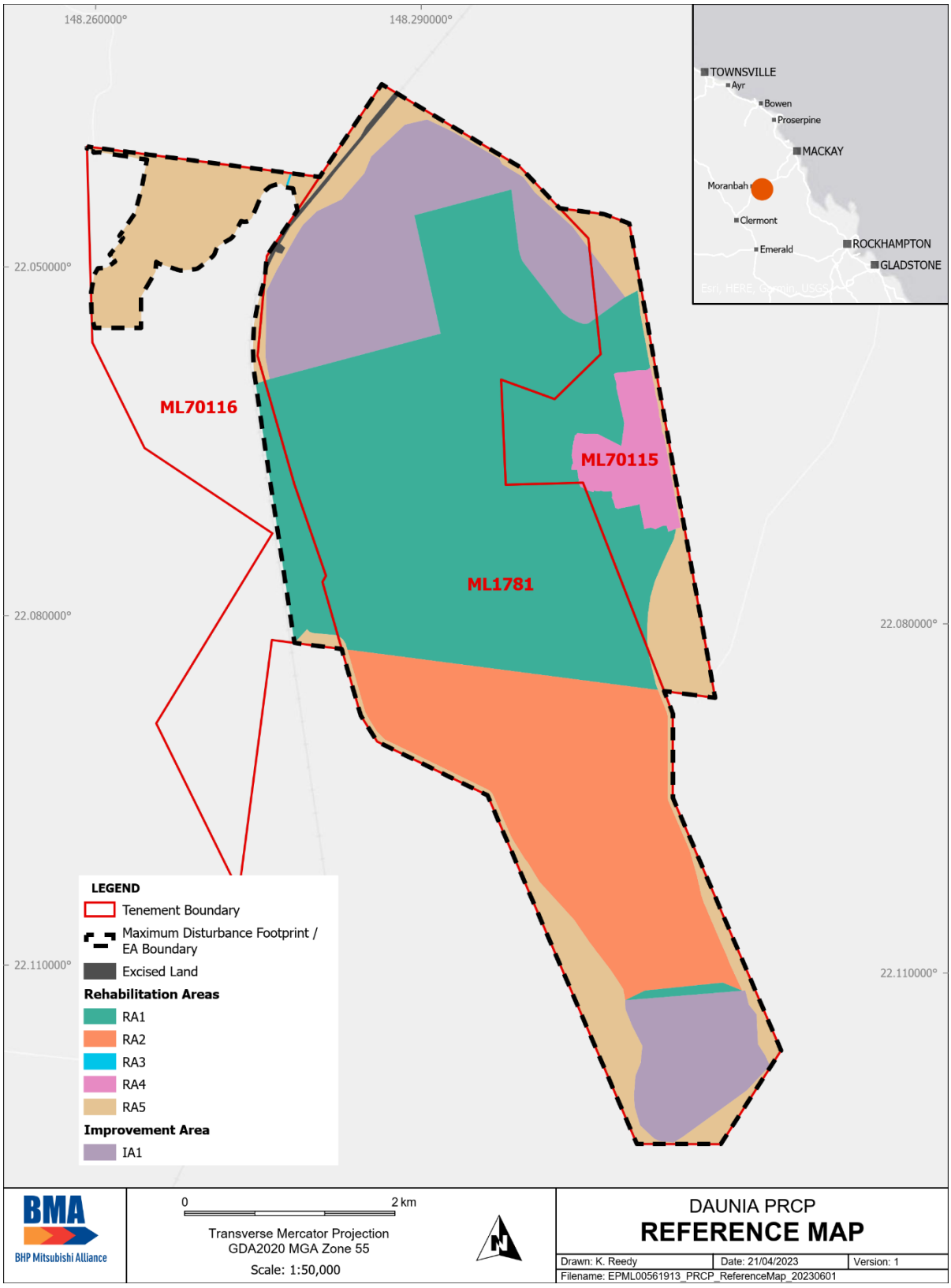


Figure 23: DNM reference map

10.3 Rehabilitation milestones

The rehabilitation milestones and milestone criteria for DNM are shown in Table 58.

Table 58: DNM rehabilitation milestones and milestone criteria

Milestone reference	Rehabilitation milestone	Milestone criteria
RM1	Infrastructure decommissioning and removal	a) Services with no beneficial PMLU re-use disconnected b) Built and service surface infrastructure with no beneficial PMLU re-use removed c) No below-ground built or service infrastructure within 0.5m of the final landform surface d) No concrete or bitumen within 0.5m of the final landform surface e) Demolition waste removed from the final landform surface f) Assessment of mine water dams is completed by an appropriately qualified person (AQP)[1] and identified sediment and water management actions are completed g) Mine water dams are decommissioned h) Watercourse crossings and culverts removed [1]***Appropriately qualified person***: *a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature*
RM2	Remediation and/or management of contaminated land	a) Contaminated Land Investigation Document completed in accordance with the *Environmental Protection Act 1994*, including: i. Site Suitability Statement confirming the suitability of the property for the PMLUs ii. Audit Certification b) Contaminated Land Investigation Document including a Site Investigation Report and, where required, a Validation Report and/or a draft Site Management Plan
RM3	Landform development and reshaping	a) Landforms reshaped with maximum 25% slopes (RA1) b) Rock placed a minimum thickness of 0.5m on >20% slopes (RA1) c) Landforms requiring reshaping are reshaped to be free-draining with maximum 12% slopes (RA2, RA5) d) Disturbed natural watercourse bed and banks returned to a profile similar to the pre-disturbance condition (RA3)
RM4	Surface preparation (cattle grazing)	a) Topsoil placed at minimum depth of 150mm b) Assessment of growth media characteristics is completed by an AQP[1] c) Ameliorant and physical treatments are applied as identified in RM4(b) d) Rip on contour

Milestone reference	Rehabilitation milestone	Milestone criteria
RM5	Surface preparation (woodland habitat)	a) Topsoil placed at depth of 100mm to 150mm b) Assessment of growth media characteristics is completed by an AQP[1] c) Ameliorant and physical treatments are applied as identified in RM5(b) d) Deep rip on contour
RM6	Surface preparation (watercourse)	a) Topsoil placed at minimum depth of 150mm b) Assessment of growth media characteristics is completed by an AQP[1] c) Ameliorant and physical treatments are applied as identified in RM6(b) d) Rip on contour as required
RM7	Revegetation (cattle grazing)	a) Completed seeding in accordance with recommended species mix and seeding rates in Table 30 of the Daunia Mine PRC Plan, 1 July 2023, v1
RM8	Revegetation (woodland habitat)	a) Completed seeding in accordance with recommended woodland habitat species mix and seeding rates in Table 32 of the Daunia Mine PRC Plan, 1 July 2023, v1
RM9	Revegetation (watercourse)	a) Completed seeding in accordance with recommended watercourse species mix and seeding rates in Table 33 of the Daunia Mine PRC Plan, 1 July 2023, v1
RM10	Achievement of surface requirements (cattle grazing)	a) Groundcover[2]: >50% [2] ***Groundcover***: *anything in contact with the soil surface, for example, live cover, standing dry cover, organic litter (including leaves, hay, woody debris) or rocks*
RM11	Achievement of surface requirements (woodland habitat)	a) Groundcover[2]: i. >15% slopes ≥80% ii. ≤15% slopes ≥50%
RM12	Achievement of surface requirements (watercourse)	a) Groundcover[2]: i. >15% slopes ≥80% ii. ≤15% slopes ≥50%
RM13	Achievement of post-mining land use to a stable condition (cattle grazing – RA2, RA5)	a) Hazard assessment completed by an AQP[1] to confirm safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use b) Rehabilitation is assessed as geotechnically stable by an AQP[1] with FoS≥1.5, unless an alternative is justified by an AQP[1] (RA2) c) Groundcover[2]: >50% d) Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream

Milestone reference	Rehabilitation milestone	Milestone criteria
		values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25 e) Land suitability class ≤3 (as per Table 20 of the Daunia Mine PRC Plan, 1 July 2023, v1), or not different from pre-mining class if ≥4 (DSITI & DNRM, 2015); or land condition assessed as Good (A) or Fair (B) as per DES (2022a) Figure 3 f) Leucaena >2m high: stem density is <250 stems per hectare (1 per 40m^2) mean total area
RM14	Achievement of post-mining land use to a stable condition (woodland habitat – RA1)	a) Hazard assessment completed by an AQP[1] to confirm safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use b) Rehabilitation is assessed as geotechnically stable by an AQP[1] with FoS≥1.5, unless an alternative is justified by an AQP[1] (RA1) c) Groundcover[2]: i. >15% slopes ≥80% ii. ≤15% slopes ≥50% d) Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25 e) Species richness: trees ≥2; shrubs ≥3; grasses ≥4 f) Tree canopy cover: ≥16%
RM15	Achievement of post-mining land use to a stable condition (watercourse – RA3)	a) Hazard assessment completed by an AQP[1] to confirm safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use b) Rainfall runoff from rehabilitated areas that reports to the receiving environment is not significantly different to upstream values for the following: pH, EC and turbidity, as per Daunia Mine PRC Plan, 1 July 2023, v1, Appendix M, Figure 25 c) Geomorphic index score: greater than or equal to upstream or downstream values (IDC method[3]) d) Riparian vegetation index score: greater than or equal to upstream or downstream values (IDC method[3]) [3]***Rehabilitated watercourse*** *- Modified IDC method with a reduced number of monitoring points within each reach*
RM16	Achievement of post-mining land use to a stable condition (cattle grazing, existing rehabilitation – RA4)	a) Hazard assessment completed by an AQP[1] to confirm safety hazards in rehabilitation are not significantly different to surrounding unmined landscapes subject to the same land use b) Groundcover: >50% c) Land condition: assessed as Good (A) or Fair (B) as per DES (2022a) Figure 3 d) Leucaena >2m high: stem density is <250 stems per hectare (1 per 40m^2) mean total area

10.4 Management milestones

The management milestones and milestone criteria for DNM are shown in Table 59.

Table 59: DNM management milestones and milestone criteria

Milestone reference	Management milestone	Milestone criteria
MM1	Achievement of structural stability	a) The required high-wall, end-wall and low-wall set-back to achieve a FoS ≥1.5 is determined by an AQP[1]
MM2	Achievement of surface requirements	a) Safety bund (minimum 2m height and 4m base width) is constructed, where required, at the geotechnical set-back distance b) Fencing erected around perimeter of safety bund, where required c) Warning signage placed along the fence line (nominally one sign every 100m)
MM3	Achievement of sufficient improvement	a) NUMA low-walls down to 10m above the modelled maximum residual void lake elevation: total vegetation cover ≥30% b) Certification from an AQP[1] that the residual void is safe to humans and livestock c) Certification from an AQP[1] that the residual void will not present an unacceptable risk of environmental harm outside of the tenure boundary

10.5 Schedule

The DNM PRCP Schedule is provided below.

Post-mining land uses (PMLU)											
Rehabilitation area	RA1										
Relevant activities	Spoil Dumps										
Total rehabilitation area size (ha)	1185										
0	10/12/2023										
PMLU	Woodland Habitat										
Date area is available	10/12/2023	10/12/2027	10/12/2030	10/12/2032	10/12/2035	10/12/2037	10/12/2040	10/12/2042	10/12/2045	10/12/2047	10/12/2050
Cumulative area available (ha)	9	61	81	304	478	598	681	831	941	941	941
Milestone completed by	10/12/2027	10/12/2030	10/12/2032	10/12/2035	10/12/2037	10/12/2040	10/12/2042	10/12/2045	10/12/2047	10/12/2050	10/12/2052
Milestone Reference	**Cumulative area achieved (ha)**										
RM3	9	61	81	304	478	598	681	831	941	941	941
RM5	27	78	98	322	495	615	698	848	958	958	958
RM8	27	78	98	322	495	615	698	848	958	958	958
RM11	0	0	27	78	98	322	495	615	698	848	958
RM14	0	0	0	0	0	0	0	0	27	78	98

Date area is available	10/12/2052	10/12/2055								
Cumulative area available (ha)	1055	1169								
Milestone completed by	10/12/2055	11/12/2056	12/12/2057	12/12/2060	12/12/2061	12/12/2062	12/12/2065	12/12/2067	12/12/2075	12/12/2076
Milestone Reference	**Cumulative area achieved (ha)**									
RM3	1055	1169								
RM5	1072	1185								
RM8	1072	1185								
RM11	958	958	958	1072	1185					
RM14	322	445	495	615	650	698	848	958	1072	1185

Post-mining land uses (PMLU)													
Rehabilitation area	RA2												
Relevant activities	Spoil Dumps												
Total rehabilitation area size (ha)	564												
Commencement of first milestone: RM3	10/12/2044												
PMLU	Cattle Grazing												
Date area is available	10/12/2044	10/12/2047	10/12/2050	10/12/2052	10/12/2055	10/12/2056	10/12/2057	10/12/2060	10/12/2061	10/12/2062	10/12/2065	10/12/2067	
Cumulative area available (ha)	35	145	239	464	564								
Milestone completed by	10/12/2047	10/12/2050	10/12/2052	10/12/2055	10/12/2056	10/12/2057	10/12/2060	10/12/2061	10/12/2062	10/12/2065	10/12/2067	10/12/2070	11/12/2071
Milestone Reference	**Cumulative area achieved (ha)**												
RM3	35	145	239	464	564								
RM4	35	145	239	464	564								
RM7	35	145	239	464	564								
RM10	0	0	35	145	189	239	464	564					
RM13	0	0	0	0	0	0	0	0	35	145	239	464	564

Post-mining land uses (PMLU)										
Rehabilitation area	RA3									
Relevant activities	Watercourse									
Total rehabilitation area size (ha)	0.3									
Commencement of first milestone: RM1	10/12/2053									
PMLU	Watercourse									
Date area is available	10/12/2053									
Cumulative area available (ha)	0.3									
Milestone completed by	10/12/2056	10/12/2061	10/12/2076							
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	0.3									
RM3	0.3									
RM6	0.3									
RM9	0.3									
RM12	0.0	0.3								
RM15	0.0	0.0	0.3							

Post-mining land uses (PMLU)										
Rehabilitation area	RA4									
Relevant activities	Existing Rehab									
Total rehabilitation area size (ha)	85									
Commencement of first milestone: RM10	10/12/2023									
PMLU	Cattle Grazing									
Date area is available	10/12/2023									
Cumulative area available (ha)	85									
Milestone completed by	10/12/2028	10/12/2038								
Milestone Reference	**Cumulative area achieved (ha)**									
RM10	85									
RM16	0	85								

Post-mining land uses (PMLU)										
Rehabilitation area	RA5									
Relevant activities	Infrastructure Areas - CHPP, MIA, workshop, dams, coal stockpiles, roads and general infrastructure									
Total rehabilitation area size (ha)	470									
Commencement of first milestone: RM1	10/12/2052									
PMLU	Cattle Grazing									
Date area is available	10/12/2052									
Cumulative area available (ha)	470									
Milestone completed by	10/12/2056	10/12/2059	10/12/2061	10/12/2066	10/12/2071	10/12/2073	10/12/2076	10/12/2078	10/12/2088	
Milestone Reference	**Cumulative area achieved (ha)**									
RM1	470									
RM2	0	323	323	323	470					
RM3	0	0	323	323	323	470				
RM4	0	0	323	323	323	470				
RM7	0	0	323	323	323	470				
RM10	0	0	0	323	323	323	323	470		
RM13	0	0	0	0	0	0	323	323	470	

Non-use management area (NUMA)										
Improvement area	IA1									
Relevant activities	Void									
Total size (ha)	503									
Commencement of first milestone: MM1	10/12/2037									
NUMA	NUMA									
Date area is available	10/12/2037	10/12/2052								
Cumulative area available (ha)	364	503								
Milestone completed by	10/12/2039	10/12/2054	10/12/2060	10/12/2088						
Milestone Reference	**Cumulative area achieved (ha)**									
MM1	364	503								
MM2	364	503								
MM3	0	0	364	503						

C: APPENDICES

Appendix A: Daunia Mine Environment Authority (EPML00561913) (30 June 2022)

Appendix B: DES (25 November 2020) - Progressive Rehabilitation and Closure Plan Transition Notice. Ref. EPML00561913

Appendix C: BHP (11 November 2020) - Progressive Rehabilitation and Closure Plan BMA Daunia Mine - DES Pre-Notification Memo

Appendix D: SLR (2023) - Daunia Mine Transitional PRC Plan Hydrogeology

Appendix E: Landloch (2022) - Daunia Mine Material Characterisation Study

Appendix F: BHP (2023) - Daunia Mine Community Consultation Plan and Community Consultation Register

Appendix G: SLR (2023) - Daunia Mine Transitional PRCP Voids in Floodplain Assessment

Appendix H: WMS (2023) – Rehabilitation Flood Modelling: Daunia Mine

Appendix I: BHP (2023) – Daunia Mine PRCP Environmental Geochemical Characterisation and Risk Assessment of Mineral Waste

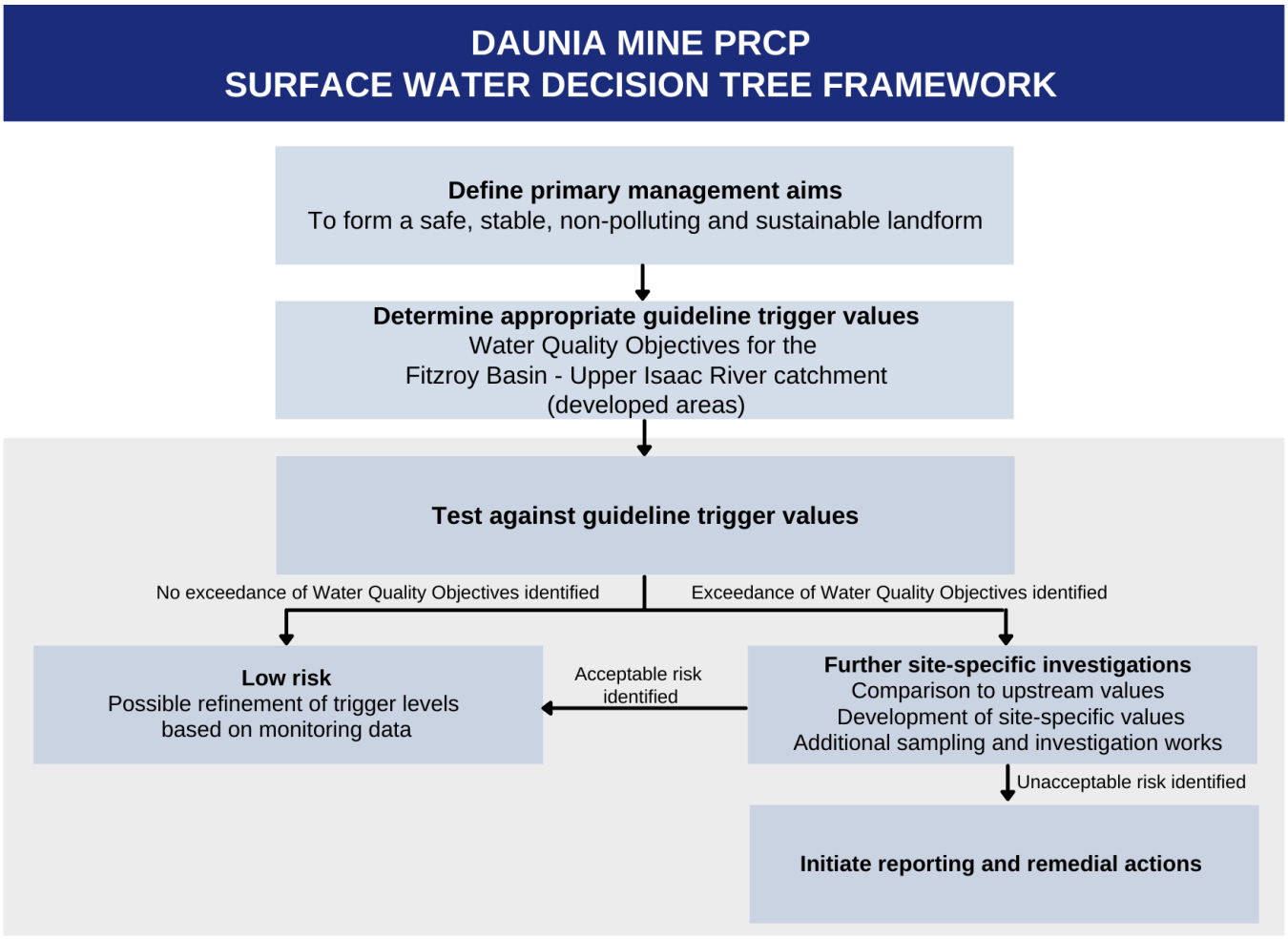
Appendix J: Landloch (2022) - Erosion and Landform Evolution Simulations to Support Waste Landform Design: Daunia Mine

Appendix K: WSP (2023) - Daunia Mine Void Closure Plan

Appendix L: BHP (2023) - Daunia Mine PRCP Risk Assessment Matrix

Appendix M: Approach to Evaluating Water Milestone Criteria

Appendix M **Approach to Evaluating Water Milestone Criteria**



Source: Adapted from Figure 3.3 ANZECC/ARMCANZ 2000 Volume 1

Figure 24: Water decision tree framework (Adapted from ANZECC/ARMCANZ, 2000)

To evaluate compliance with the water quality related milestone criteria and to assist with the application of SMART principles, the following three step water data evaluation process will be undertaken.

Data Evaluation Step 1

This step will compare receiving environment/down gradient water monitoring results against the EPP Water Quality Objectives (WQOs) for the following:

- For surface water, the for the Fitzroy Basin, Isaac River Sub-Basin, Upper Isaac River Catchment; and
- For groundwater, the Fitzroy Basin, Isaac Groundwater Zone.

Sampling of surface waters will need to be undertaken opportunistically as outlined in Section 8.3.1. Should climatic conditions over extended periods prevent the collection of surface water samples due to insufficient flows at the nominated receiving environment sample locations, the site will not be in breach of the milestone criteria, as no significant surface water discharges would have occurred.

Surface water quality variability within the temporal waters is anticipated due to factors outside of the control of BMA, such as: weather patterns; upstream land user activities; frequency/magnitude of surface water flows; and condition of groundcover up gradient and within the catchment. Therefore, further evaluation of collected surface water data may be required in the form of Step 2 outlined below.

Groundwater monitoring is to be undertaken at the frequency and methodologies outlined within Section 8 of the PRC Plan for the EA rehabilitation acceptance criteria of electrical conductivity. Where groundwater monitoring results indicate an exceedance of the WQO, further evaluation of the collected data may be required in the form of Step 2 outlined below.

Data Evaluation Step 2

This step will compare the independent populations of the receiving and background/up gradient environments. The evaluation will be undertaken through statistical evaluation to determine if the mean results of the independent populations are significantly different. For the purpose of determining significantly different, the following statistical approach shall apply:

- Independent Populations: up gradient mean and down gradient mean (over a maximum monitoring period of five years, sample locations shown in Figure 19).
- Null Hypothesis: up gradient mean = down gradient mean.
- Alternative Hypothesis: up gradient mean ≠ down gradient mean.
- Significance level: 0.1
- The statistical method to be utilised will account for the sample population size and the distribution of the data.

Where Data Evaluation Step 2 identifies a potentially significant difference between the up gradient mean and down gradient mean results, further evaluation may be deemed required in the form of Step 3 outlined below.

Data Evaluation Step 3

In accordance with the ANZECC/ARMCANZ water decision tree framework and the preferential approach to the derivation of site-specific toxicant guideline values, Step 3 includes additional investigation and development of site-specific criteria where a statistical significant difference between up gradient mean and down gradient environment sample locations is identified.

The development of surface water site-specific criteria will be undertaken using the Commonwealth of Australia guidance: Assessing and managing water quality in temporary waters[2]. The development of groundwater site-specific criteria will be undertaken using the latest version of the Queensland Water Quality Guidelines.

The aim of Step 3 is to take into consideration the specific environment in which the site is located including a more thorough investigation of the receptors and potential risks associated with any identified exceedance. This step will require suitable data sets and to be undertaken by AQP.

Figure 25 provides a flow diagram of the approach to surface water data evaluation.

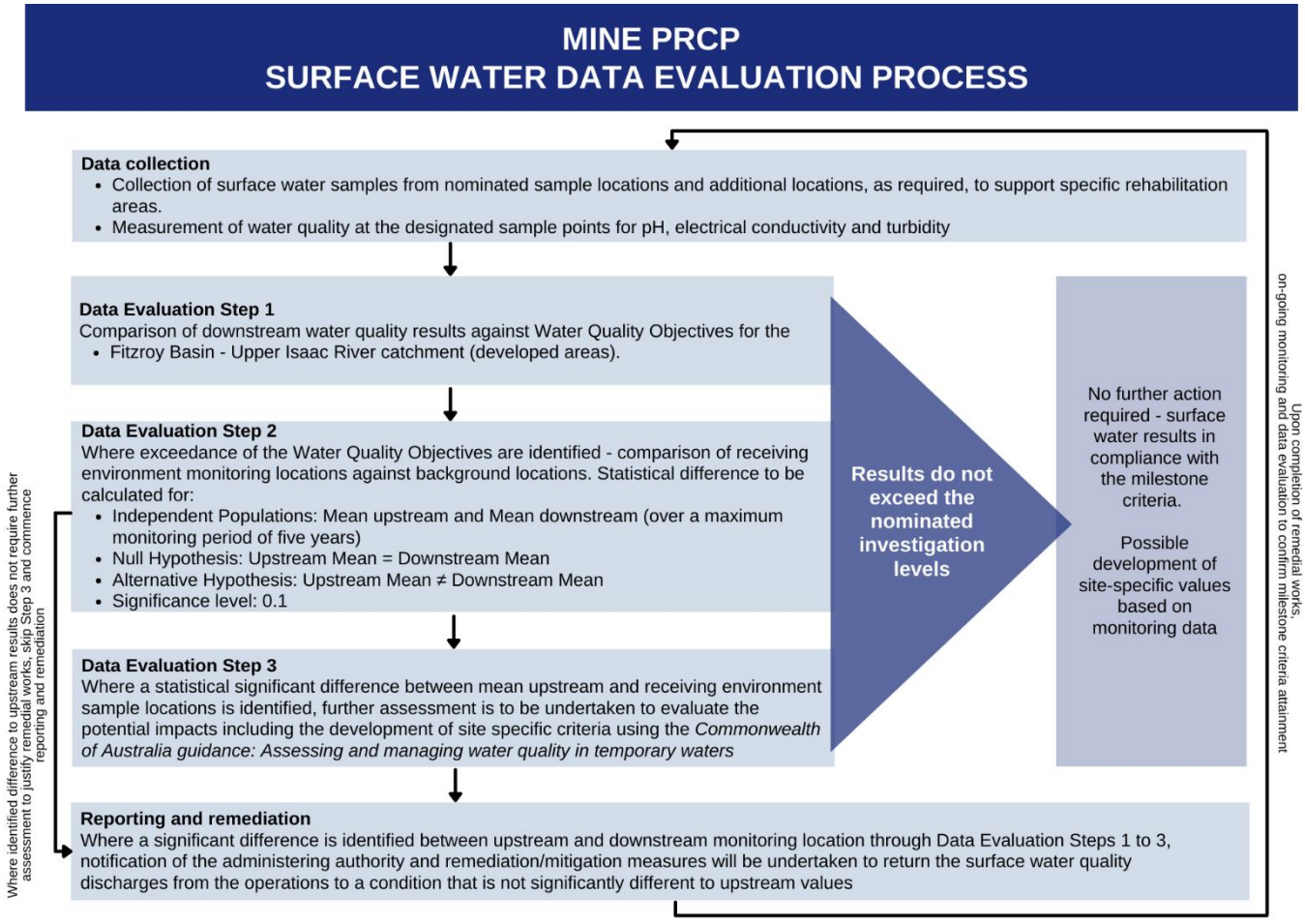


Figure 25: DNM water data evaluation flow diagram

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