Water Management Plan

for the

Dargues Gold Mine

Water Management Plan

for the

Dargues Gold Mine

Big Island Mining Pty Ltd
ABN: 12 112 787 470

Level 17, 144 Edward Street
BRISBANE QLD 4000
Telephone: 1800 732 002

Email: dgm.community@aureliametals.com.au

Document Title	***Water Management Plan***				
Document Number	DGM-0405-0813- WMP				
Document Owner	Sustainability Manager				
Revision	**Company**	**Date**	**Originator**	**Reviewed**	**Approved**
Original	R.W. Corkery	13/02/2012	Mitchell Bland	Mitchell Bland	AJ Saverimutto
Revision 1	R.W. Corkery	04/04/2012		Mitchell Bland	AJ Saverimutto
Revision 2	R.W. Corkery	09/05/2012		Mitchell Bland	James Dornan
Revision 3	R.W. Corkery	30/01/2013	Mitchell Bland	James Dornan	James Dornan
Revision 4	Unity Mining	30/11/2014		James Dornan	
Revision 5	DMPL		James Dornan	SEEC / Len Sharp	
Revision 6	DMPL	09/07/2018	James Dornan / Len Sharp	SEEC	DPE
Revision 7	R.W. Corkery	22/08/2019	Jack Flanagan	James Dornan	
Revision 8	DMPL	17/01/2020	James Dornan	Jack Flanagan / Mitchell Bland	
Revision 9	DMPL	23/04/2020	James Dornan	Chase Dingle Andrew Jackson Shannon Green	DPIE
Revision 10	BIM	1/09/2022	Chase Dingle	Enzo Guarino Angus Wyllie Jonathan Thompson	DPE (Pending)
Revision 11	GHD	13/12/2022	Tyler Tinkler	Enzo Guarino Angus Wyllie	DPE (Pending)
Revision 12	GHD	14/02/2023	Tyler Tinkler	Cassandra Johnston Abigail Saunders	DPE (Pending)
Next Review Due	Within 3 months of: • the submission of an annual review under Condition 5(3); • the submission of an incident report under Condition 5(6); • the submission of an audit report under Condition 5(8); and • any modification to the conditions of MP10_0054.				

CONTENTS

Page

APPENDICES

FIGURES

TABLES

1. INTRODUCTION

Dargues Gold Mine (the Mine) is an underground metalliferous mine owned by Big Island Mining Limited, a wholly owned subsidiary of Aurelia Metals Limited (the Company). Dargues Gold Mine Is located approximately 60 km southeast of Canberra, 13 km south of Braidwood and immediately north of the village of Majors Creek. The Mine consists of an underground gold mine, a run-of-mine (ROM) pad, waste rock emplacement, processing plant, tailings storage facility and associated infrastructure and ancillary activities. The Mine is approved under Project Approval (PA) 10_0054 (the Project).

The Project is fully described in the following documents and no further background information is provided in this document.

- *Environmental Assessment* dated September 2010 and associated documentation prepared to support the application for Project approval.
- Mining Operations Plan dated May 2017.
- Environmental Assessment – Modification 1 dated April 2012.
- Response to Government Agency and Public Submissions for the Dargues Reef Gold Project - Modification 1 dated June 2012.
- Environmental Assessment – Modification 2 dated July 2013.
- Response to Government Agency and Public Submissions for the Dargues Reef Gold Project - Modification 2 dated September 2013.
- Environmental Assessment – Modification 3 dated August 2016.
- Response to Government Agency and Public Submissions for the Dargues Reef Gold Project - Modification 3 dated November 2015.
- Statement of Environmental Effects for the Dargues Gold Mine – Modification 4 dated November 2018.
- Response to Submissions for the Dargues Gold Mine – Modification 4 dated January 2019.
- AGE (2021) Report on Dargues Reef Gold Mine Groundwater Model Update
- GHD (2022a) Dargues Gold Mine: Ambient water quality assessment
- GHD (2022b) Dargues Gold Mine: 180 ML Water Management Dam Detail Design
- EGI (2022) Dargues Mine TSF Irrigation Sustainability Assessment
- Modification Report for the Dargues Gold Mine – Modification 5 dated August 2022

- Submissions Report for the Dargues Gold Mine – Modification 5 dated November 2022
- Response to Request for Additional Information – Modification 5 dated December 2022

1.1 PURPOSE OF THIS PLAN

This document is the twelfth revision of the Plan and has been prepared in satisfaction of *Conditions 3(26)* to *3(31)* of Modified Project Approval (MP) 10_0054 MOD5 (the Project Approval).

1.2 PREPARATION OF THE PLAN

A range of specialist consultants contributed to the preparation of the original version of this Plan. Relevant specialists, their area of expertise and the principal sections they contributed to are as follows.

- Mr Andrew Macleod and Mr Mark Passfield of SEEC (surface water – **Sections 5**, **6** and **7**).
- Dr Peggy O'Donnell of Cardno Ecology Lab (aquatic ecology – **Section 8**).
- Mr James Tomlin and Mr Errol Briese of Australasian Groundwater and Environmental Consultants Pty Ltd (groundwater – **Section 9**).
- Dr Ross Smith of Hydrobiology, by way of advice.

The appointment of each of these specialists, with the exception of Dr Smith whose contribution was by way of advice only, has been approved by the Secretary of the Department of Planning and Environment (DPE).

The Company engaged GHD Pty Ltd (GHD) to assist in the update of revision 11 and 12 of the Plan.

1.3 OBJECTIVES AND OUTCOMES

Table 1.1 presents the objectives and key performance outcomes for the Plan and the Mine.

Table 1.1 Objectives and Key Performance Outcomes

OBJECTIVES	KEY PERFORMANCE OUTCOMES
Water	
To ensure compliance with all relevant Project approval and Environment Protection Licence criteria and reasonable community expectations.	Compliance with all relevant criteria and reasonable community expectations, as determined in consultation with the relevant government agencies.
To ensure sufficient water is available during all phases of the life of the Project for environmental and operation purposes.	Sufficient water is available for all Project-related purposes, including for environmental and operational purposes.
To ensure that appropriate sediment and erosion control measures are implemented and maintained.	All water management structures constructed and maintained in accordance with Landcom (2004) and DECC (2008).
To ensure that appropriate chemical and hydrocarbon management is implemented and maintained.	All chemicals and hydrocarbons stored and used in accordance with manufactures instructions, Material Data Safety Sheet requirements and Australian Standards in a manner that ensures the risk of water contamination is reduced to an acceptable level.
To ensure that the permeability of the floor and embankment of the Tailings Storage Facility complies with the requirements of MP 10_0054.	Seepage from the Tailings Storage Facility is less than the identified criteria.

OBJECTIVES	KEY PERFORMANCE OUTCOMES
To ensure that water within the Project Site is used in an efficient and environmentally responsible manner.	Water resources are managed in a manner that maximises environmental flows and minimises the potential for adverse impacts to water resources.
To ensure that appropriate aquatic ecology and stygofauna monitoring programs are implemented through the life of the Project.	Aquatic and groundwater ecological monitoring programs are sufficiently robust to detect any adverse impacts associated with the Project.
To ensure that an appropriate surface water and groundwater monitoring program is implemented throughout the life of the Project.	Water monitoring programs are sufficiently robust to detect any adverse water quality or quantity impacts associated with the Project to allow appropriate adaptive management measures to be implemented.
To ensure that appropriate contingency and emergency management plans are in place and regularly reviewed.	Contingency and emergency management plans are prepared for all relevant contingencies and regularly reviewed and upgraded.
To implement an appropriate incident reporting program, if required.	Incidents (if any) are reported in an appropriate manner.
To ensure that all relevant water-related information is made available in a timely and accessible manner.	All water-related information is available in a timely manner on the Project website.

2. CONSULTATION

Section 2 of each of the previous revisions of this document described the consultation undertaken for that revision. In summary, consultation has been undertaken with the following agencies (including their predecessors and successors) for all revisions:

- Eurobodalla Shire Council (ESC).
- Queanbeyan-Palerang Regional Council (Council).
- Environment Protection Authority (EPA).
- Department of Primary Industries – Fisheries (Fisheries).
- Department of Planning and Environment – Water (DPE Water)

The following presents consultation undertaken during preparation of Revision 10. A draft copy of Revision 10 of this document was provided to the EPA, Council, ESC, DPE Water, Fisheries and the Community Consultative Committee (CCC). All feedback from the above stakeholders was taken into consideration when preparing and finalising this Revision 11 of this document. Feedback was received from the EPA, DPE Water and the CCC and the nature of the feedback is outlined below:

- Environment Protection Agency – requested the Plan be revised to ensure irrigation be conducted on an emergency one-off basis to restore the environmental containment freeboard. The Plan also need to be updated carry out ongoing water quality monitoring if irrigating with TSF water occurs in future events. The Plan should also state that dust suppression activities should consider soil and water impacts associated with the use of TSF water for dust suppression and ensure that the activity is undertaken in areas where storm water runoff will be captured in appropriate basins.
- Eurobodalla Shire Council – No edits or changes suggested.
- Queanbeyan Palerang Shire Council – No edits or changes suggested.
- Department of Planning and Environment (Water) – Comments and responses are summarised in Table 2.1.
- Department of Primary Industry (Fisheries) – No edits or changes suggested.
- CCC – support for irrigation initiative which will have the effect of reducing the likelihood of off-site water release or mine flooding. Support for the inclusion of monitoring.

Table 2.1 Responses to consultation comments

Comment	Response
NSW Department of Planning, Industry and Environment (25 July 2022)	
1.0 General Comments Update references to consultation agencies for the water group to the Department of Planning and Environment – Water (the department)	Section 21.3 has been revised to refer to DPE – Water.
2.0 Water Licensing In consultation with the licensing and approvals unit in the department, verify that all groundwater access licenses and works are appropriately defined and linked, the works are assigned to the correct water source and there is correct modelled extraction volumes informing the licensing requirements. The licensing and approvals unit can be contacted at waterlicensing.servicedesk@dpie.nsw.gov.au	The current status of the water access licences and works approvals as published on NSW Water Register are summarised in Section 3.3. For groundwater in fractured and porous rock, the relevant water source is the Lachlan Fold Belt Groundwater Source. The Company will consult with the licensing and approvals unit in the department to verify the details.
Ensure all future reports clearly present the actual versus forecast annual usages against each work and access license.	Section 1010 has been updated to reflect the reporting requirement as part of the site water balance.
3.0 Water Balance Update the water balance by: a. clearly differentiating the predicted groundwater demand and take via each licensed work and relating each to specific access licences for each project year until complete post-operational groundwater recovery,	The updated water balance is presented in Section 5.8.3. Only passive take via the Mine workings 10WA119513 and WAL39281 is expected until complete post-operational groundwater recovery. The predicted take from AGE (2021) are used in the model and presented in Section 5.6
b. using the most recent data available up to the date of the latest water sharing plan revision, including the use of meteorological data from the Majors Creek and Braidwood weather stations, and the most recently updated baseflow modelling and Modflow USG modelling following their review by the department.	The meteorological data from the Majors Creek and Braidwood are used in the model and presented in Section 4.1 The predicted take from AGE (2021) are used in the model and presented in Section 5.6
4.0 Groundwater Monitoring and Data Management Include or address the following in a revised WMP, based on relevant standards and guidelines where applicable: **a.** appropriate quality-assurance procedures for data verification, validation, and usability assessment,	Section 910 has been updated to include discussion that errors and outliers will be identified by comparison of monitoring data against historical data, climate data and mining progression.
b. procedures for establishing, updating and reporting baselines, natural variability (range, trends and changes),	Section 9 has been updated to include discussion that the Annual Review will report on trends in water monitoring data, including comparison of data against historical data, mining progression and climatic data. This will enable trends and variability in data to be attributed to either climatic drivers, or mining activity.

Comment	Response
c. consistent and correct monitoring site names and co-ordinates,	Monitoring bore TSFWB has been removed from Section 9.3 . All names of TSF monitoring bores updated throughout plan for consistency. Figure **9.2** and Figure 9.3 have been updated to ensure consistency with coordinates in tables.
d. neighbouring bores previously excluded from the external water users trigger action response plan, including sites referred to as bores 6, 15, 16, 17, 18 and 20 in EA (2010) as well as the two bores ESID141090 and GW110858 (ESID64416) approved since the 2010 water-bore census	Section 9.3 discusses that a number of the non-registered bores identified in the Environmental Assessment (2010) could not be located, had collapsed or landholders refused permission to monitor. Information on the WaterNSW Bores Map was reviewed to identify stock and domestic bores approved since the Environmental Assessment. These bores are listed in Section 9.3 with details provided in Table 9.1.
e. additional bores installed for monitoring potential acid rock drainage, including at least one bore nest immediately downslope of the waste rock emplacement sediment basin 1 and at least one bore nest immediately downslope of the tailings storage facility	All TSF bores are located within approximately 100 m to 200 m downslope of the toe of the TSF. TSFMB01A/B nested bores are located 190 m downslope of the waste rock sediment basin. Refer to Section 9.3.
f. procedures for future model reviews and the refinement and reporting of the results of model verification.	The WMP has been updated to include procedures for future model reviews and the refinement and reporting of the results of model verification in Section 9.6.1.
5.0 Groundwater Trigger Action Response Plan Include or address the following in a revised WMP: a. process for defining trigger levels and adopted values,	Section 9.7 has been updated to reflect the basis for the trigger levels.
b. process for identifying impacts, in relation to groundwater level, qualities and baseflow	Section 10 discusses that all water related monitoring data will be compared against trigger values on a monthly basis. Section 9.6.1 discusses that groundwater levels and baseflow will be compared against predictions of the groundwater model on a six-monthly basis in accordance with EPBC 2010/5770 Approval Conditions. The investigation will include comparison of groundwater levels, mining progression and climate data to identify the potential cause of groundwater level or baseflow trends. Should the review indicate that impacts from mining are greater than predicted, the hydrogeological model will be updated. The results of any review of the groundwater model will be presented in the Annual Review.

Comment	Response
c. detailed procedures for managing all types of trigger exceedances and unpredicted impacts.	Impacts on groundwater quality are managed by water storage and management. As outlined in Section 5.2.3, raw, dirty and contaminated water at the site is managed in MWSD01, RWP01 and PWP01. These water storages have been constructed as lined earth structures with a compacted soil liner and a HDPE liner. As discussed in Section 5.2.4, the potential for the TSF causing water quality trigger exceedances is managed by using a basin liner, using seepage minimisation systems and early detection (via the groundwater monitoring network). Potential impacts on baseflow will be managed by compensatory flow as outlined in Section 5.4 and the Majors Creek Base Flow Actions and Response Plan outlined in Section 7.9.

2.1 TRIGGER ACTION AND RESPONSE PLANS

Trigger, Action and Response Plans (TARPs) have been prepared as part of this Plan. All TARPs have the same base elements, which are included in the following subsections, and are designed to allow proactive management of environmental risks in a clear and easily understood format.

These TARPs have been prepared generally in accordance with the requirements of Condition 3(31) of MP 10_0054.

2.1.1 Event Level

Table 1.1 shows the four Event Levels that are used in the TARPs at the Mine.

Table 2.2 Event Levels and Description

Event Level	Description
Normal	Event level is equivalent to steady state operations at the Site and only minor review or course of action is anticipated.
Level 1	Indicates a change from steady state operations and that review or course of action will likely be required.
Level 2	A significant departure from steady state operations that requires implementation of the planned actions, additional monitoring and further resources to be applied. Notification of Senior Onsite Management personnel is mandatory.
Level 3	Immediate action is required to minimise potential impacts to the environment and human health. Notification of relevant regulatory agencies is mandatory.

2.1.2 Notification List

Table 2.3 provides a notification list for the various contact groups referred to in the TARPs.

Table 2.3 Notification List

Type	Contact
Regulatory Agency	Department of Planning and Environment (DPE)
	Environment Protection Authority (EPA)
	Queanbeyan Palerang Regional Council (QPRC)
	Eurobodalla Shire Council (ESC)
Dargues Gold Mine	General Manager
	Mine Manager
	Process Plant Manager
	Sustainability Manager
Big Island Mining	Directors
Community	Downstream Water Users Register
	Community Consultative Committee
	Social Media

3. REGULATORY CONTEXT

3.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The Project was granted Project Approval (PA) 10_0054 on 2 September 2011 pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act). Following two appeals to the Land and Environment Court, the Court subsequently granted project approval with revised conditions on 7 February 2012. Project Approval (PA) 10_0054 has been modified five time:

- Modification 1 for the use of paste fill at the Project Site was subsequently approved on 12 July 2012 (MP 10_0054 MOD1).
- Modification 2 to regularise changes to the layout of the project was subsequently approved on 24 October 2013 (MP10_0054 MOD2).
- Modification 3 for an extension of the mine life and increase in the resource extracted was subsequently approved on 10 August 2016 (MP10_0054 MOD3).
- Modification 4 for the relocation of the approved heavy vehicle crossing of Spring Creek and the reinstatement of the previously approved access track from the Site Access Road to the Tailings Storage Facility was subsequently approved on 23 May 2019 (MP10 0054 MOD4).
- Modification 5 for the construction and use of a Water Storage Dam and increase in the approved processing rate from 355 000 tpa to 415 000 tpa was subsequently approved on 20 December 2022 (MP10 0054 MOD5).

The Modified Project Approval stipulates the required criteria that the construction and operational activities of the Project must comply with and sets out the core requirements for this Plan. Relevant water-related conditions associated with this approval are reproduced in **Table 3.1.**

Table 3.1 Water Related Conditions (MP10_0054 MOD5)

SOIL AND WATER	
3(19)	**Water Licences** The obtain all necessary water licences for the project under the *Water Act 1912* or the *Water Management Act 2000*.
3(20)	**Water Supply** The Applicant must ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations to match supply of water, to the satisfaction of the Secretary.
3(21)	**Water Discharges** The Applicant must ensure that all surface water discharges from the site comply with section 120 of the POEO Act, unless an EPL authorises otherwise.
3(22)	**Baseflow Offsets** The Applicant must offset the combined loss of any baseflow to Majors and Spring Creeks caused by the project to the satisfaction of the Secretary. This condition does not apply if the Secretary subsequently determines that the loss of baseflow is negligible. *Note: The proposed discharge point for the baseflow offset must be as identified in the Water Management Plan.*
3(23)	**Compensatory Water Supply**

SOIL AND WATER	
	The Applicant must provide a compensatory water supply to any owner of privately-owned land whose water entitlements are adversely impacted (other than an impact that is negligible) as a result of the project, in consultation with DPE Water, and to the satisfaction of the Secretary. The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent to the loss attributed to the project. Equivalent water supply must be provided (at least on an interim basis) within 24 hours of the loss being identified. If the Applicant and the landowner cannot agree on whether the loss of water is attributed to the project or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution. If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide alternative compensation to the satisfaction of the Secretary. *Notes:* • *The Water Management Plan (see condition 26) is required to include trigger levels for investigating potentially adverse impacts on water supplies.* *The burden of proof that any loss of surface water or groundwater access is not due to mining impacts rests with the Applicant.*
3(24)	The Applicant must ensure that: (a) the permeability of the tailings storage facility is designed to meet the requirements of the *Environmental Guidelines – Management of Tailings Storage Facilities* (VIC DPI, 2004) and that the permeability of the walls, floor and final capping of the tailings storage facility is designed to be equivalent to 600mm clay of permeability <1 x 10^{-8}m/s; (b) the design of the tailings storage facility conforms to: • DSC3A – Consequence Categories for Dams (Dams Safety Committee of New South Wales); and • DSC3F – Tailings Dams (Dams Safety Committee of New South Wales); and (c) the latest meteorological data from both the Majors Creek and Braidwood weather stations is used during the design of the tailings storage facility and that the design is adjusted, as required to meet the requirements of the Dams Safety Committee of New South Wales, based on whichever dataset provides the worst case scenario. *Note: An alternative permeability standard may be acceptable following completion of an appropriate risk assessment undertaken in accordance with the Environmental Guidelines – Management of Tailings Storage Facilities (VIC DPI, 2004) to the satisfaction of EPA and the Secretary.*
3(25)	The Applicant must ensure that the Mine Water Settlement Dam and Tailings Storage Facility Seepage Collection Pond are suitably lined to be equivalent to 1000mm clay of permeability < 1 x 10^{-9} m/s.
3(25A)	The clean water diversion around the northern side of the tailings storage facility must be designed, constructed and maintained to prevent the probable maximum flood from the catchment upstream of the facility from entering the facility. *Note: The general layout of the project is shown in Appendix 2 of MP10_0054 MOD5.*

Table 3.2 presents the requirements arising from the conditions in MP 10_0054 for Plan and where each is addressed in this document. In addition, **Table 3.3** identifies the requirements for this Plan embodied in the Statement of Commitments presented as Appendix 5 of MP 10_0054 MOD5.

Table 3.2 Development Approval Requirements

Requirement	Section
Water Management Plan	
Condition 3(26)	
The Applicant must prepare a Water Management Plan for the project to the satisfaction of the Secretary. This plan must:	This plan
(a) be prepared in consultation with ESC, Council, EPA, DPE Water, Water NSW and DPI Fisheries by suitably qualified and experienced persons whose appointment has been approved by the Secretary;	Section 1.3 Section 1.2
(b) be submitted to the Secretary for approval prior to the commencement of construction; and	Completed
(c) include:	-
• a Site Water Balance;	Section 5.8
• an Erosion and Sediment Control Plan;	Section 6
• a Surface Water Monitoring Program;	Section 7 Section 8
• a Groundwater Monitoring Program; and	Section 9
• a Surface and Ground Water Response Plan;	Section 7.8 Section 7.9 Section 8.6 Section 9.7 Section 9.8
(d) include detailed design of the Spring Creek heavy vehicle crossing[1];	Complete
(e) be targeted to deal with the particular stages of the project that are being implemented; and	Entire document
(f) remain in place for the life of the project, from the commencement of construction until the rehabilitation of the site is complete.	Section 1.1
Note: The effectiveness of the Water Management Plan is to be reviewed and audited in accordance with requirements in Schedule 5. Following this review and audit, the plan is to be revised to ensure it remains up to date (see Condition 4 of Schedule 5).	
Condition 3 (26A)	
The Applicant must revise and submit to the Secretary for approval the Water Management Plan, prior to constructing any of the following project components: eastern waste rock emplacement, tailings dam, waste rock haulage roads or the Spring Creek heavy vehicle crossing.	Complete
Condition 3 (26B)	
The Applicant must implement the approved Water Management Plan	Note
Condition 3(27)	
The Site Water Balance must:	
(a) include details of:	
• sources and security of water supply;	Section 5.8.1 Section 5.8.4
• water use on site;	Section 5.8.2
• water management on site, including transfers between all water storage infrastructure (including clean water dams, sediment dams, mine process water storages, underground workings and the tailings storage facility) and relevant design criteria;	Section 5.2

Requirement	Section
• off-site water discharges (including uncontrolled discharges from sediment dams), including volume, timing and release point infrastructure requirements;	Section 5.2.7.1 Section 5.4.3
• reporting procedures; and	Section 10
(b) describe what measures would be implemented to minimise potable water use on site.	Section 5.5
Condition 3(28)	
The Erosion and Sediment Control Plan must:	
(a) be consistent with the requirements of the *Managing Urban Stormwater: Soils and Construction Manual* (Landcom 2004, or its latest version);	Section 6.1
(b) identify the size and management of sediment dams for construction and operational stages to satisfy the requirements of Condition 21 of Schedule 3, including an assessment of discharges against NSW water quality objectives for the receiving waters;	Section 6.1
(c) include a program for undertaking regular auditing of the performance of the erosion and sediment control measures on the site (including audits following major construction milestones and/or rainfall events);	Section 5.2
(d) identify activities that could cause soil erosion and generate sediment;	Section 6.3
(e) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;	Section 6.4.2
(f) describe the location, function, and capacity of erosion and sediment control structures; and	Section 6.4.2 Section 5.2.7
(g) describe what measures would be implemented to maintain the structures over time.	Section 6.4.7
Condition 3(28A)	
The auditing program referred to in 28(c) above must:	
(a) be prepared and undertaken by a suitably qualified and experienced independent expert in surface water management approved by the Secretary;	Complete
(b) assess the performance of the erosion and sediment control system, including whether it is complying with the Water Management Plan, the EPL or Mining Lease; and	Complete
(c) include provisions for reporting the outcomes of the audit findings to the Department, EPA and DPI and implementing any recommendations made by the independent expert.	Complete
The auditing program must be undertaken during the construction of the eastern waste rock emplacement, tailings dam, waste rock haulage roads and the Spring Creek heavy vehicle crossing and until such time as the expert is satisfied that the erosion and sediment control system is performing effectively and can be maintained during operations, or as otherwise agreed by the Secretary.	Complete
Condition 3(29)	
The Surface Water Monitoring Program must include:	
(a) detailed baseline data on surface water flows and quality in creeks and other waterbodies that could be affected by the project (including Majors and Spring Creeks);	Section 7.3
(b) stream health assessment criteria that includes representative baseline survey of aquatic life in Majors Creek, upstream and downstream (to the confluence of Majors Creek) of the mine site prior to commencement of construction and annually thereafter until all mining and rehabilitation activities are completed (Note: The design of the survey must be in consultation with Fisheries NSW and the results must be included in the annual review. The frequency of future annual surveys may be amended by the Secretary);	Section 8.6
(c) surface water quality criteria for a range of parameters, including salinity, heavy metals, suspended sediment, pH, hardness and biological oxygen demand;	Section 7.8

Requirement	Section
(d) a program to undertake monthly monitoring of:	
• surface water flows, quality, and impacts on water users;	Section 7.5 Section 7.4
• potential acid rock drainage, including suitable monitoring both within and downstream of the tailings storage facility;	Section 7.7
• potential leakage or spillage from tailings, mineral concentrate or effluent pipelines;	Section 7.6
• potential seepage / leachate from waste rock material on the surface, including the monitoring of pH levels;	Section 7.7
(e) a program to undertake bi-annual monitoring of stream health and channel stability in Spring and Majors Creeks using AusRivAS or equivalent methodology; and	Section 8.5
(f) a program for the ongoing verification and refinement of the surface water model; and	Section 10
(g) reporting procedures for the results of the monitoring program and model verification.	Section 10
Condition 3(30)	
The Groundwater Monitoring Program must include:	
(a) detailed baseline data of groundwater levels, yield and quality in the region, and particularly any groundwater bores, springs and seeps that may be affected by the Project;	Section 9.2
(b) test bores downstream of the site, including test bores located down-gradient of the tailings storage facility to monitor seepage;	Section 9.3
(c) groundwater assessment criteria for both groundwater levels and quality including privately-owned bores;	Section 9.7
(d) a program to monitor:	
• impacts on the groundwater supply of potentially affected landowners;	Section 9.4 Section 9.5
• impacts on springs or groundwater dependent ecosystems;	BMP[3]
• the volume of groundwater inflow into the underground mine workings;	Section 7.5
• regional groundwater levels and quality in all potentially affected aquifers;	Section 9.4 Section 9.5
• potential groundwater quality impacts from paste fill operations.	Section 9.5
• potential acid rock drainage;	Section 7.7 Section 9.5
• the seepage/leachate from tailings dams;	Section 7.7 Section 9.5
(e) a program for the ongoing verification and refinement of the groundwater model; and	Section 9.6
(f) reporting procedures for the results of the monitoring program and model verification.	Section 10
Condition 3(31)	
The Surface and Ground Water Response Plan must include:	
(a) trigger levels for investigating any potential adverse surface water, stream health and groundwater impacts of the project, and taking action to avoid exceedances of the relevant criteria in the surface water and groundwater monitoring program;	Section 7.8 Section 7.9 Section 8.6 Section 9.7
(b) a protocol for the investigation, notification and mitigation of any exceedances of the surface water, stream health, and groundwater assessment criteria;	Section 7.8 Section 7.9 Section 8.6

Requirement	Section
	Section 9.7
(c) a protocol for investigating, evaluating and providing the baseflow offsets required under condition 22 above;	Section 5.4
(d) measures to mitigate and/or compensate potentially affected landowners in accordance with the compensatory water supply requirements in condition 23 above;	Section 1.3 Section 9.8
(e) a protocol for providing advance warning and water supply measures for landowners of privately-owned land that are predicted to exceed the surface and groundwater impact assessment criteria at some stage during the project life; and	Section 1.3 Section 9.8
(f) the procedures that would be followed to determine any appropriate action to be taken to mitigate or offset any surface or groundwater impacts caused by the project that constitute material harm to the environment.	Section 7.8 Section 9.7
Management Plan Requirements	
Condition 5(2)	
The Applicant must ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
(a) detailed baseline data;	Section 7.4 Section 8.4 Section 9.3
(b) a description of:	
• the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 3
• any relevant limits or performance measures/criteria;	Section 3
• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 7.8 Section 7.9 Section 8.6 Section 9.7
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 5
(d) a program to monitor and report on the:	
• impacts and environmental performance of the project;	Section 7.4 to Section 7.7 Section 8.5 Section 9.4 Section 9.5
• effectiveness of any management measures (see c above);	Section 10
(e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 7.8 Section 7.9 Section 8.6 Section 9.7
(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 16
(g) a protocol for managing and reporting any:	
• incidents;	Section 15

Requirement	Section
• complaints;	Section 11
• non-compliances with statutory requirements; and	Section 10
• exceedances of the impact assessment criteria and/or performance criteria; and	Section 10
(h) a protocol for periodic review of the plan.	Section 16
Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.	
Note 1: Detailed design of the Spring Creek heavy vehicle crossing can be located in the Statement of Environmental Effects for the Dargues Gold Mine, Modification 4, dated November 2018. Note 2: The Independent sediment and erosion control expert would be engaged following consultation with the Secretary of the Department of Planning and environment. Note 3: The audit program referred to in Condition 3(28)(c) would be prepared by an independent expert in sediment and erosion control based on the detailed design for the Waste Rock Emplacement and Tailings Storage Facility. Note 4: BMP refers to the *Dargues Gold Mine – Biodiversity Management Plan*	

Table 3.3 Requirements Identified in the Statement of Commitments

	Requirement	Section
Groundwater		
6.3	Release water sourced primarily from the harvestable rights dams at the rates identified in **Table 4.20** of the *Environmental Assessment* into Majors Creek at the confluence of Majors and Spring Creeks. These environmental discharges are to continue from the commencement of mining operations until the loss of baseflow is negligible, as determined under condition 22 in schedule 3 of the Project Approval.	Section 7.9
6.4a	Ensure that water extracted from the historic workings is used for mining-related and compensatory release purposes only. Any release of water from the historic workings for the purpose of compensatory release will comply with the trigger levels identified in the protocol referred to in condition 31(a) in schedule 3 of the Project Approval that is required to be contained in the Surface and Ground Water Response Plan.	Section 7.9
6.4d	Undertake, in consultation with NOW, a pump test to confirm the assumed hydrological parameters used in the groundwater model. The pump test should be in the vicinity of the mine where the fracture density and hydraulic conductivity is likely to be high.	Section 9.6
6.4e	Undertake a review of the numerical groundwater model, including:	Section 9.6
	• further detailed baseline data inputs, as required by the conditions of the approval;	
	• a statistical comparison of the Braidwood and Majors Creek rainfall data to determine the significance of choice of input;	
	• rain fall data from the weather station within the project site (if determined to be relevant):	
	• pumping tests of relevant bores;	
	• a comprehensive sensitivity and uncertainty analysis of groundwater model outputs;	
	• measurement of baseflow in Majors and Spring Creeks; and	
	• investigation of the water quality arising from the mine backfilling including modelling of dissolution associated with changes in hydrology, groundwater flow and the nature of the aquifer matrix.	
In the event that the actual impacts are significantly greater than those presented in AGE (2010), then the Applicant would consult with NOW [now DPE Water and NRAR] in relation the revised modelling results and would develop appropriate management and mitigation measures to address those impacts.		Note

	Requirement	Section
Surface Water		
General Management and Mitigation Measures		
7.2	Ensure that the site access road is treated using chemical dust suppressants or similar to ensure that regular watering is not required.	Section 5.3.1
Water Quality Measures		
7.19	Ensure that no low grade ore material is used to construct the ROM Pad or is stored in areas where potentially low-pH leachate may flow to natural drainage.	Complete
7.20	Ensure waste rock material to be used during site establishment operations is tested for acid generation potential and any potentially acid generating material is appropriately managed.	Complete
7.21	Ensure that all water with the potential to contain processing reagents, hydrocarbons, other chemicals or lowered pH is contained within a bunded Contaminated Water Management Area and that all surface waters within the that area retained and pumped to the Process Water Tank for use within the processing plant.	Section 5.2
Environmental Monitoring		
Groundwater		
15.7	Monthly monitoring in the laboratory of groundwater in the bores, exploration holes and workings identified in **Table 4.21** of the *Environmental Assessment* for the following parameters.	Section 9.5
	• Alkalinity.	
	• Major cations and anions.	
	• Nutrients – (ammonia, nitrate, nitrite).	
	• Metals – (iron, lead, chromium, cadmium, zinc, arsenic, copper and nickel).	
	• Collection of those samples for laboratory analysis will reasonably coincide with the surface monitoring as described in commitment 15.12.	
15.11A	The monitoring program to be prepared as part of the Groundwater Monitoring Program pursuant to condition 30(d) in schedule 3 of the approval is to be a monitoring program during the life of the project and until the conclusion of rehabilitation, where appropriate.	Noted
Surface Water		
15.12	Undertake monthly surface water monitoring at the following locations (**Figure 4.3** of the EA).	
	• Location 1 – Majors Creek upstream of the confluence of Spring and Major's Creek.	Section 7.4 Section 7.5 Section 8.5
	• Location 2 – Majors Creek downstream of the confluence of Spring and Major's Creek.	
	• Location 3 – downstream of the tailings storage facility. It is noted that this sampling location would be incorporated into the Tailings Management Plan.	
	• Location 4 – Spring Creek downstream of main Project infrastructure and sediment basin outlets.	
	• At a range of locations downstream of the Majors Creek State Conservation Area.	Section 7.5 Section 8.5
	• Discharge point for the compensatory flows (sampling to be undertaken initially daily for the first three months of the program, with the frequency to be increased in consultation with the relevant government agency after that period).	
15.12A	The monitoring program to be prepared as part of the Surface Water Monitoring Program pursuant to condition 29(d) in schedule 3 of the approval is to include a program to monitor pH and electrical conductivity, in real time, from at least three locations, including locations within and downstream of the tailings storage facility.	Section 7.5
15.12B	Install two gauging stations on Majors Creek, one upstream and one downstream of the confluence with Spring Creek, capable of continuous measurement of stream flow.	Section 7.5
15.12C	The Water Management Plan should include provision for:	
	• the installation of a V-notch weir on Spring Creek downstream of the mine and below the confluence with a major gully coming in from the east (approximate coordinates 749275E, 6064175N (MGA, Zone 56));	Section 7.5

	Requirement	Section
	• the investigation of the hydrogeology of the tailings storage facility and the installation of monitoring bores around the tailings storage facility;	Section 9.3 Section 9.4 Section 9.5
	• the installation of a monitoring bore to the south-east where the sensitivity analysis indicates a possible extension of the 1m drawdown contour (approximate coordinates: depending on landholder approval – 750900E, 6064100N (MGA, Zone 56), or alternative location within the project site – 750350E, 6064550N (MGA, Zone 56));	Section 9.3
	• the installation of monitoring bores DRWB 09 and DRWB 10;	Section 9.3
	• the installation of a pair of bores adjacent to Spring Creek at the mapped intersection of the dominant lineament (fault) trending south east towards and along Majors Creek (approximate coordinates 749350E, 6064175N (MGA, Zone 56)).	Section 9.3
15.13A	The monitoring program to be prepared as part of the Surface Water Monitoring Program pursuant to condition 29(d) in schedule 3 of the approval is to be a monitoring program during the life of the project and until the conclusion of rehabilitation, where appropriate.	Noted
Notification		
15.13B	The protocol for the investigation, notification and mitigation of any exceedances of the surface water, stream health and groundwater assessment criteria, which is to be included in the Surface and Ground Water Response Plan (condition 31(b) in schedule 3 of the approval), is to include provision for the notification of ESC of any such exceedances within 7 days of the exceedance being detected, and subsequently, once an appropriate response has been identified with the relevant government agencies, any other water user downstream of the Project Site who registers their interest to be notified.	Section 11
Water Management Plan (incorporating Surface Water Monitoring Program, Groundwater Monitoring Program and Surface and Ground Water Response Plan)		
15.13C	The objectives of the abovementioned programs and plans which are required under the approval, are to generally include, but are not limited to:	
	• ensuring that the disposal of material in the tailings storage facility, and management of that facility, does not cause material harm to the environment;	Table 1.1
	• taking all necessary measures to protect the quality of the water, as drinking water, for existing downstream users, including the water supply for the Eurobodalla Shire; and	Table 1.1
	• implementing appropriate monitoring and response measures to ensure that action is taken to promptly mitigate any adverse impacts of the project on surface water and groundwater so that drinking water of acceptable quality continues to be available to downstream users, including Eurobodalla Shire.	Table 1.1
Note: BMP refers to the *Dargues Gold Mine – Biodiversity Management Plan*		

The Mine has two approvals under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC ACT). The conditions related to water management are included in **Table 3.4**.

Table 3.4 EPBC Approval Conditions

No.	Requirement	Section
EPBC 2010/5770		
3.	To avoid any residual downstream risk to matters of national environmental significance (i.e. the Araluen Gum *Eucalyptus kartzoffiana*), the proponent must develop and implement an adaptive surface water and groundwater monitoring and modelling program that at a minimum:	Section 9

No.	Requirement	Section
	a) specifies details of preliminary groundwater monitoring that must be undertaken within and surrounding the project site;	
	b) uses groundwater data collected through existing monitoring bores and other project activities to feed back into the existing groundwater model;	Section 9
	c) specifies measures to confirm the accuracy of the groundwater model against data collected during the project life. This assessment must occur prior to commencement of mining operations and then every six months after that date;	Section 9.6
	d) specifies actions to be implemented should the assessment required for condition 3c indicate significant divergence between the predicted and observed groundwater impacts;	Section 9.6
	e) specifies detailed baseline data on surface water flows and quality in creeks and other water bodies that could be affected by the project (including Majors and Spring Creeks);	Section 7.8 Section 7.9
	f) is undertaken in a manner relevantly consistent with items 6, 7, 15 and 16 of the proponent's Statement of Commitments;	Whole Document
	g) includes the final parameters to be included in the monitoring program including a rationale for the trigger levels developed from the baseline data (based on ANZECC guidelines);	Section 7.8 Section 7.9 Section 8.6 Section 9.7
	h) specifies mechanisms for the continuous monitoring of seepage and leachate from the tailings storage facility;	Section 7.4 Section 9.5
	i) specifies measures for the early detection of surface water and groundwater pollution, particularly as a result of any leaching from the tailings storage facility;	Section 7.4 Section 9.5
	j) specifies measures for the immediate remediation of polluted surface and groundwater.	Section 7.8 Section 9.7
4.	At a minimum, the surface water monitoring program must include the following; a) pH, turbidity, total suspended solids, total dissolved solids, total nitrogen, total phosphorus, dissolved oxygen, salinity and temperature data;	Section 7.4
	b) toxicant data such as heavy metals and metalloids (at least arsenic, iron, manganese and zinc);	Section 7.4
	c) macroinvertebrate species assemblages, compositions and assessment results;	Section 8.5
	d) data averages, standard deviation and number of samples;	Section 10
	e) test and reference site locations;	Section 7.2 Section 8.2
	f) sampling and analytical methods; and	Section 7 Section 8
	g) quality control and quality assurance data.	Section 7 Section 8
6.	The proponent must offset the reduction in base flow to the Moruya Catchment by releasing water to Majors Creek as described in section 2.10.2.6 of the Environmental Assessment. Prior to the commencement of mining operations, the proponent must also prepare and implement a surface water and groundwater response protocol. This protocol must be provided to the department on request. At a minimum, the protocol must:	Not triggered Section 7.8 Section 7.9 Section 8.6 Section 9.7

No.	Requirement	Section
	a) specify investigation and response procedures in the event that baseline surface water offsets required in this condition are unlikely to be met;	
	b) response procedures to be followed if any impacts on surface or groundwater are detected during the project;	Section 7.8 Section 7.9 Section 8.6 Section 9.7
	c) specify notification procedures to the department in the event that impacts on surface or groundwater are detected during the project.	Section 2.1
EPBC 2015/7539		
2	For the protection of downstream listed threatened species and communities, the person taking the action must prepare a Construction Environmental Management Plan (CEMP). The person taking the action must not commence construction until the CEMP has been approved by the Minister. Once approved, the approved CEMP must be implemented. The CEMP must: a. be prepared by a **suitably qualified expert**	Section 1
	b. include measurable performance indicators and limits for protecting, conserving, and managing **listed threatened species and communities** from **sedimentation impacts** from **construction** activities	CEMP 2.4, 2.5 and Table 6.1
	c. include management actions and measures to be implemented, including those in the **sediment and erosion control plans**	CEMP Appendix 3
	d. be consistent with the Surface Water Assessment (Strategic Environment and Engineering Consulting, 2015a) and **New South Wales Sedimentation and Erosion Guidelines**	Whole document and CEMP
	e. include contingency responses, corrective actions and remediation actions that will be implemented should performance indicators and limits not be achieved	CEMP 2.4 and 2.5
	f. include a monitoring program that measures **sediment loads** in Spring Creek and Majors Creek during **construction** activities. The monitoring program must: **i.** include methods, **control sites**, baseline data, and frequency of sampling **ii.** be designed to detect any changes to **sediment loads** within 24 hours of a **significant rainfall event** **iii.** be designed to inform adaptive management.	CEMP 2.4, 2.5 and 6
	g. include a self-audit program that evaluates and reports on the monitoring program, achievement of the objectives, the effectiveness of management actions, and contingency responses and corrective actions	CEMP 6 and Appendix 1
	h. specify the timing and frequency of management actions, reporting and implementation of contingency responses and corrective actions, and the person/s responsible.	CEMP 2.4, 2.5 ad 6

No.	Requirement	Section
3	For the protection of downstream **listed threatened species and communities**, the person taking the action must prepare a Water Management Plan (WMP). The person taking the action must not **commence operation** until the plan has been approved by the **Minister**. Once approved, the approved WMP must be implemented. The WMP must: a. be prepared by a **suitably qualified expert**	Section 1
	b. include measurable performance indicators and limits for protecting, conserving, and managing **listed threatened species and communities** from **sedimentation impacts**	CEMP 2.4, 2.5 ad 6
	c. include management actions to be implemented, including those in the **sediment and erosion control plans**	CEMP Appendix 3
	d. ensure all measures, equipment and facilities specified in the **sediment and erosion control plans** are maintained to be fully effective for the life of the mine, including during mine decommissioning and site rehabilitation	*Mine Operations Plan* Table 14
	e. be consistent with the Surface Water Assessment (Strategic Environment and Engineering Consulting, 2015a) and **New South Wales Sedimentation and Erosion Guidelines**	CEMP whole document
	f. include indicative contingency responses, corrective actions and remediation actions that will be implemented should performance indicators and limits not be achieved	Section 7.8, Section 8.6 CEMP Table 6.1
	g. include a monitoring program that measures **sediment loads** in Spring Creek and Majors Creek during **operation** activities. The monitoring program must: **i.** include methods, **control sites**, baseline data, and frequency of sampling **ii.** be designed to detect ongoing **sediment loads** within Spring Creek and Majors Creek (including any changes to **sediment loads** following **significant rainfall events**) **iii.** be designed to inform adaptive management. The monitoring program must be undertaken over a minimum of two (2) years from the period of which **operation** activities begin. After two (2) years, the person taking the action may apply to the Minister for approval to cease the monitoring program if the monitoring program demonstrates that management actions are effective, as measured against the approved performance indicators	Section 7.4 and CEMP 2.4 and 2.5
	h. include a self-audit program that evaluates and reports on the monitoring program, achievement of the objectives, the effectiveness of management actions, and contingency responses and corrective actions	CEMP Appendix 1
	i. specify the timing and frequency of management actions, monitoring, auditing, reporting and implementation of contingency responses and corrective actions, and the person/s responsible	Section 10, Section 12, Section 13 and CEMP 6

3.2 PROTECTION OF ENVIRONMENT OPERATIONS ACT 1997

The Protection of the Environment Operations Act 1997 (POEO Act) is administered by the EPA. The objectives of the POEO Act are to protect, restore and enhance the quality of the environment.

Under the POEO Act, an EPL is required for premises at which a 'scheduled activity' is conducted. The Company hold EPL 20095 for activities identified as crushing, grinding, separation and mining for minerals. EPL 20095 specifies monitoring requirements for surface and groundwater that are reflected in the monitoring programs described in this plan.

3.3 WATER MANAGEMENT ACT 2000

The Water Management (WM) Act 2000 is the main legislation for water licences and approvals, replacing the Water Act 1912. The aim of the WM Act is to ensure that water resources are conserved and properly managed for sustainable use. The WM Act as it applies to the Mine is administered by DPE and the Natural Resources Access Regulator (NRAR). Under the WM Act, water sources in NSW are managed via Water Sharing Plans (WSPs). For the Mine:

— For surface water source and water contained in all alluvial sediments below the surface of the ground, the primary relevant water source is the Araluen Water Source Water Source under the WSP for the Deua River Unregulated and Alluvial Water Sources 2016. A minor part of the Mine north of the access road forms part of the Shoalhaven River Water Source under the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011.

— For groundwater in fractured and porous rock, the relevant water source is the Lachlan Fold Belt Groundwater Source under the NSW Murray Darling Basin (MDB) Fractured Rock Groundwater Sources. The Company hold water access licenses and works approvals at four licenced groundwater extraction points, as summarised in Table 3.5. The Company also hold various Water Act 1912 licences for monitoring bores (refer to Table 9.1).

Table 3.5 Works approvals and water access licences

Relevant works approvals and water access licence	Location	Share components (ML)	Details / Comments
10WA119513 and WAL39281	Lot 102, DP 1170553	320	Dargues Gold Mine
10WA119515 and WAL39282	Lot 210, DP 755934	39	Snobs
10WA119519 and WAL39287	Lot 104, DP 1170553	16	United Miners
10WA119517 and WAL39292	Lot 104, DP 1170553	24	Stewart and Mertons
10WA121685 and WAL37848	Lot 102, DP 1170553	1	Dargues Production Bores

3.3.1 Excluded works

Under the Water Management Regulations (2018) dams solely for the capture, containment and recirculation of drainage and/or effluent (consistent with best management practice or required by a public authority to prevent the contamination of a water source, that are located on a minor stream) are classified as 'excluded works' and do not require a works approval and water access licence are not required. All dams, except for the Harvestable Rights Dam and existing farm dams are excluded works.

3.3.2 Harvestable rights

As a landholder, the Company has a conditional entitlement to capture, store and use a proportion of the rainfall runoff from their landholding, known as 'harvestable rights'. The Harvestable Rights (coastal-draining catchments) Order 2022 entitles landholders to capture up to 30% of the average annual runoff by means of a dam or dams, subject to certain conditions. Dam are classified as:

- A Type 1 dam is defined as a harvestable rights dam of a capacity up to and including 10% of the average annual regional rainfall runoff, excluding dams classified as Type 2. Water captured by Type 1 dams may be taken and used for any purpose. Water cannot be moved from a Type 1 dam to an excluded work or to any other dam on the landholding.
- A Type 2 dam is defined as a harvestable rights dam of a capacity exceeding 10% of the average annual regional rainfall runoff, and less than or equal to 30% of the average annual regional rainfall runoff. Water captured and stored in Type 2 dams may be taken and used for the purpose of domestic consumption, stock watering and extensive agriculture.

The Company is consulting with DPE Water and NRAR with respect to the classification of Harvestable Rights Dam at the Mine.

4. ENVIRONMENT

4.1 CLIMATE

SILO patched point data were obtained for the Majors Creek (Larmer Street) Station (BOM station number 70061), which is located approximately 2.5 km south-west of the Mine. Point data were obtained from the Scientific Information for Landowners (SILO) database operated by the Queensland Department of Science, Information Technology and Innovation. SILO patched point data is based on historical data from a particular Bureau of Meteorology (BOM) station with missing data 'patched in' by interpolation from nearby stations.

The Company provided site-specific rainfall data observed at Dargues Automatic Weather Station (AWS) from 2009 to 2022. The meteorological station that records rainfall is located within the Mine.

Figure 4.1 presents the historical annual SILO point rainfall data between 1889 and 2021. The annual statistics associated with the SILO data presented in Figure 4.1 are:

- Minimum rainfall total – 455 mm in 2019
- Median rainfall total – 827 mm
- Average rainfall total – 891 mm
- Maximum rainfall total – 1776 mm in 1978

The total annual site-specific rainfall recorded at Dargues AWS for 2021 was 1470 mm, which is above the 90th percentile of the historical record. A comparison between the site rainfall at Dargues AWS, Majors Creek (Larmer Street) Station, and Braidwood (Wallace Street) Station is shown in Figure 4.1. The match between the site rainfall at Dargues AWS and the Majors Creek (Larmer Street) Station indicates that it is an appropriate source of long-term rainfall data for the site, conservative for periods of water excess. Total average annual evaporation is approximately 1200 mm, compared to the average annual rainfall total of 891 mm. This gives an annual deficit (difference between annual rainfall and annual evaporation) of approximately 309 mm.

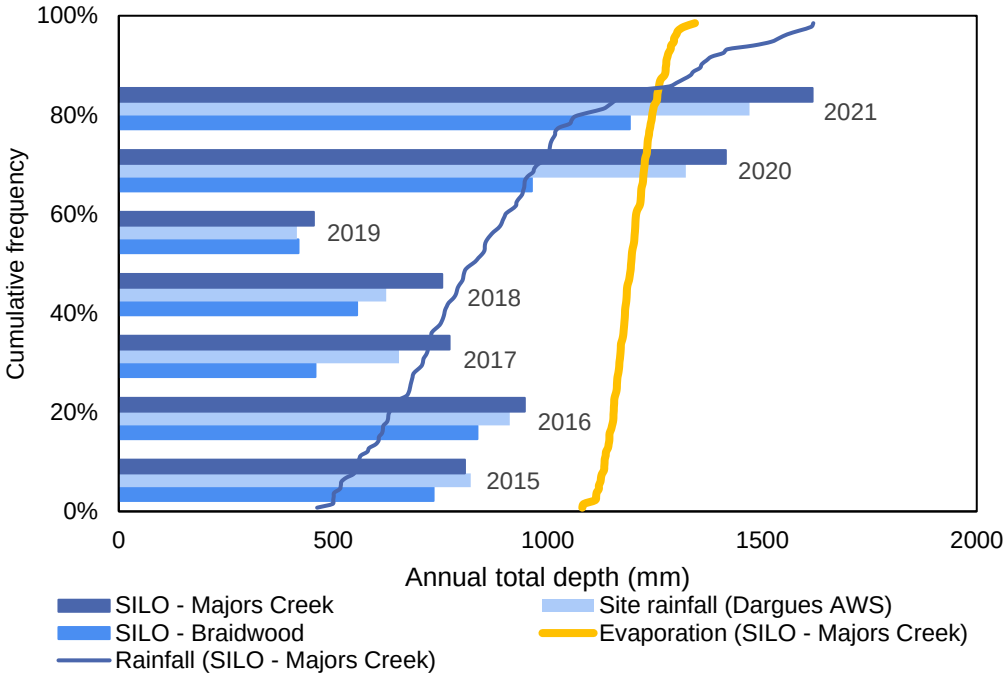


Figure 4.1 Historical annual rainfall record

Average daily rainfall and evaporation rates per month determined from the historical SILO data obtained from Majors Creek (Larmer Street) Station between 1889 and 2021 are presented in Figure 4.2. Figure 4.2 shows that evaporation varies seasonally, having higher records in summer compared to winter. The site has an average monthly net rainfall deficit in all parts of the year except during May, June and July.

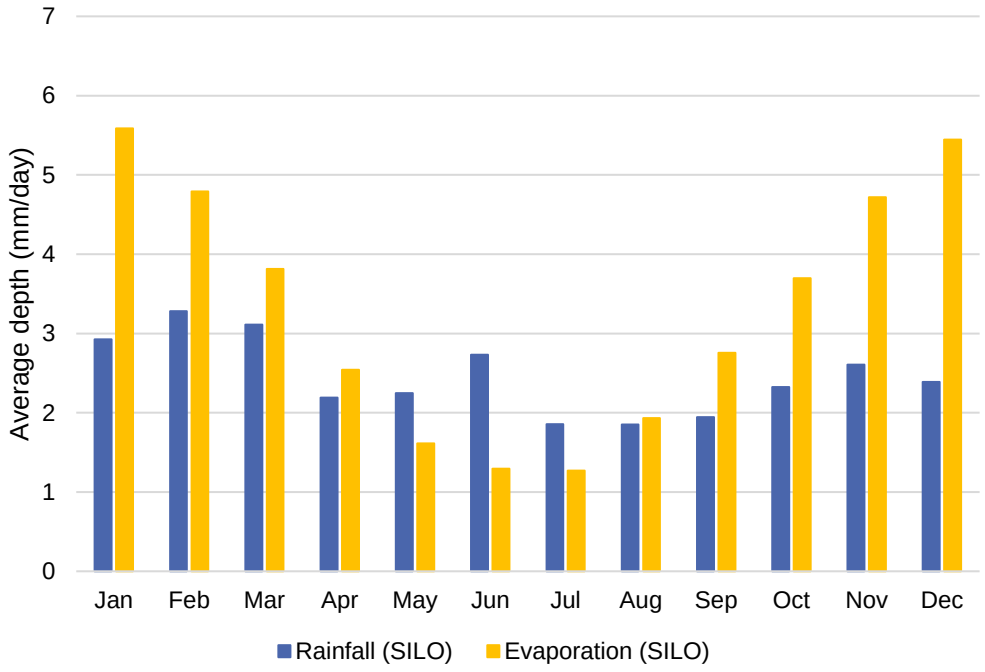


Figure 4.2 Average daily rainfall and evaporation rates

5. WATER MANAGEMENT SYSTEM

5.1 INTRODUCTION

This section provides a description of water use, treatment, storage and management within the Mine, including:

- Sources of water
- Mine-related demands and uses for water.
- Management of water, including its recovery, treatment, reuse and disposal. This also includes volumes, timing and release point infrastructure requirements.
- Monitoring and reporting of water use within the Mine.
- Water security and contingencies for managing any shortfall in water availability.
- Potable water use and methods to minimise the use of such water.

5.2 WATER STORAGE AND MANAGEMENT

A range of water management structures are installed or will be installed as required within the Site. These include the following:

- Harvestable Rights Dams (HRDs).
- Raw Water Pond.
- Process Water Pond.
- Tailings Storage Facility.
- Seepage Collection Pond.
- ROM Collection Basin.
- Sediment Basins and Diversion Structures.
- Water Storage Dam.

This sub-section includes a description of each of the identified structures, as well as the pumps, pipelines and flow meters that will be installed in order to manage them.

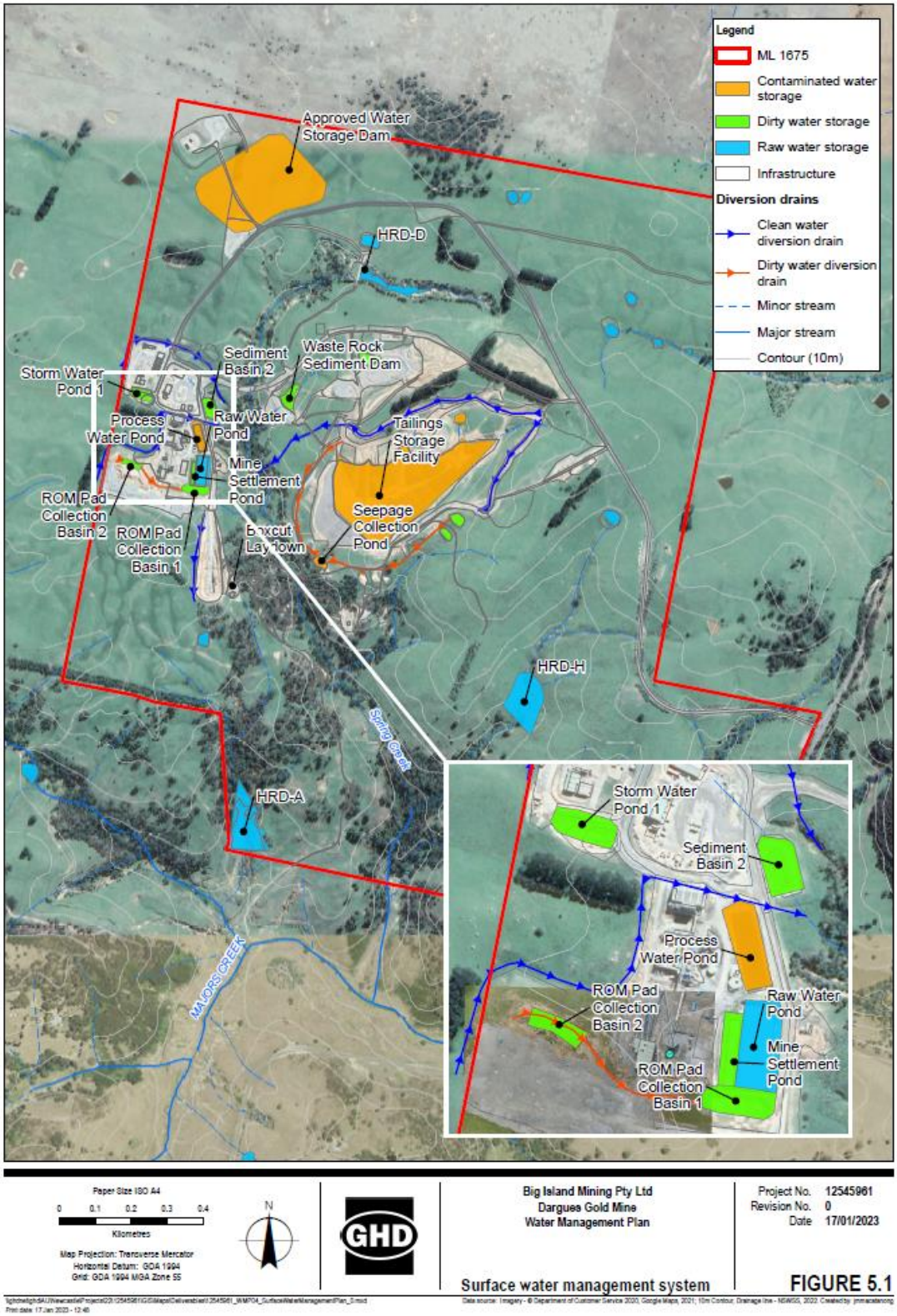
5.2.1 Water Storages

Surface water environment at Mine consists of four water types: clean, dirty, raw, and contaminated (or process) water. Surface water flow paths and storages around the operation are shown in Figure 5.1. Information relating to each surface water storage at Mine is summarised in Table 5.1**.**

Table 5.1 Water Storages

Source	ID	Water Quality	Metered	Capacity (m^3)
Sediment Basins				
Sediment Basin 2	SB02	Dirty	No	2,146
Storm Water Pond 1	SWP01	Dirty	No	1,340
ROM Pad Collection Basins 1 and 2	RCB01, RCB02	Dirty	No	2,625
Waste Rock Emplacement	WRESB01	Dirty	No	10,153
TSF Sediment Basin	TSFSB01	Dirty	No	1,860
Tailings Storage Facility				
Tailings Storage Facility 1	TSF01	Contaminated	Yes	Varies
Seepage Collection Pond 1	SCP01	Contaminated	Yes	800 (nominal)
Water Storage Dam	WSD	Contaminated	No	183,600
Storage Area				
Raw Water Pond 1	RWP01	Raw	Yes	6,000
Mine Water Settlement Dam 1	MWSD01	Dirty	Yes	900
Process Water Pond	PWP01	Contaminated	Yes	3,000
Harvestable Rights Dams				
HRD-A	HRD-A	Raw	Yes	26,648
HRD-D	HRD-D	Raw	Yes	7,253
HRD-H	HRD-H	Raw	Yes	11,217
Mining				
Boxcut	Boxcut	Raw	No	500
Mine Water Tank 01	MWT01	Raw	Yes	40
Rainwater				
Site Office Rain Water Tank	RWT01	Potable	No	40

Figure 5.1 Surface water management system



5.2.2 Harvestable Rights and Existing Dams

5.2.2.1 Introduction

Three harvestable rights dams have been constructed. Other harvestable rights dams are approved to be, but are not planned to be, constructed. Some of the existing farm dams with the Mine site have been removed. Removing dams is achieved by breaching the existing earth walls of the dams and reconstructing a stable drainage line that is unlikely to be subjected to erosion in the long-term.

Harvestable rights dams were designed to include a spillway sized to safely pass a 100-year average recurrence interval (ARI) flow. Table 5.2 presents the design details for each of the harvestable rights dams in accordance with the requirements of Landcom (2004) and DECC (2008). In managing the harvestable rights dams, the Company will ensure the following, in accordance with SEEC (2010b):

- All harvestable rights dams will have a freeboard of at least 1 000mm from the invert of their spillway to the top of the earth wall.
- Individual dams will not to be drawn down by more than 0.3 m per day to minimise the risk of structural damage to the dam walls.
- Gypsum or hydrated lime will be ripped or incorporated into the upstream side of earth walls to reduce failure risk, subject to geotechnical testing and advice during construction.

Table 5.2 Harvestable Rights Dams – Designed Spillway Sizes

Dam	Calculated 100-yr ARI flow (m^3/s)	Base width (m)	Depth (m)	Side batters (H:V)	Top width (m)	Lining
HRD-A	5.785	5	0.65	1:3	8.9	Loose rock (50 kg each) or dense grass cover
HRD-D	4.039	2.5	0.69	1:3	6.64	Loose rock (50 kg each) or dense grass cover
HRD-H	6.453	6	0.63	1:3	9.78	Loose rock (50 kg each) or dense grass cover

5.2.3 Mine Water Settlement Dam, Raw Water Pond and Process Water Pond

The Mine Water Settlement Dam 01 (MWSD01), Raw Water Pond 01 (RWP01) and Process Water Pond 01 (PWP01) have been constructed as an integrated water management system for the treatment of Raw, Dirty and Contaminated water at the Mine.

The three (3) facilities have been constructed as lined earth structures as follows:

- A Compacted soil liner with a permeability of 1 x 10^{-8} m/s; and

- A two (2) mm thick High Density Polyethylene (HDPE) liner with a permeability of <1 x 10^{-9} m/s.

5.2.3.1 Treatment and Management of Dirty Water

Dirty water within the Site is pumped to the MWSD01 from sediment basins and the underground mine. Coagulant may be used to facilitate settling in the MWSD01 as required. Water pumped to the MWSD01 is settled prior to passing through an oil water separator and being gravity fed to the RWP01.

The RWP01 acts as a storage for Raw Water and receives water from the MWSD01 and other Raw Water sources as described in Table 5.14. As required, Raw Water is pumped to the PWP01 for use within the process plant and for other uses as described in Table 5.15.

5.2.3.2 Treatment and Management of Raw Water

Raw Water is sourced from the MWSD01, licenced water bores and Type 1 Harvestable Rights Dams. Raw water is pumped to the RWP01 to provide water for the operational requirements of the Mine as outlined in Table 5.14.

No treatment of Raw Water is required prior to use. Raw Water sources, with the exception of the MSWD01, are utilised on an as required basis to supplement water sourced from sediment basins and the underground mine.

5.2.3.3 Treatment and Management of Contaminated Water

Contaminated Water results from the processing operation and is primarily stored within the PWP01 and circulated through the process plant and TSF01. The Water Storage Dam is approved to be constructed to provide additional storage of supernatant water from Tailings Storage Facility (TSF).

5.2.4 Tailings Storage Facility

The TSF is constructed in accordance with the requirements of the following.

- NSW Dam Safety Committee [now Dam Safety NSW].
- *Environmental Guidelines – Management of Tailings Storage Facilities* published by the Victorian Department of Primary Industries in 2004.
- ANCOLD Guidelines on the Consequence Categories for Dams.
- Knight Piésold Pty Limited (Knight Piésold) was commissioned to provide an update to the Tailings Storage Facility Final Design 2011 (Knight Piésold (2011)) report prepared for the original Project Approval. The updated report took into account changes in the regulatory environment, project approvals and community expectations since Knight Piésold (2011) was completed. The updated design report titled Tailings Storage Facility Final Design Update 2016

Rev01 (Knight Piésold (2016)) was independently reviewed prior to submission to the Dam Safety Committee.

The following section incorporates information from both Knight Piésold (2011) and Knight Piésold (2016).

5.2.4.1 Design Objectives

The TSF has been designed to minimise its impact on the environment by:

- providing permanent and secure confinement of all solid waste materials. The facility was designed in accordance with the requirements of the NSW Dam Safety Committee guidelines on the safe design and operating standards for tailings storages as a minimum;
- locating the facility on a historically cleared area to avoid unnecessary impacts to flora and fauna within the area;
- minimising the visual impact as the final profile of the TSF (at closure) will resemble a small hill with a cover of light vegetation. The facility will be progressively rehabilitated, and completely rehabilitated soon after de-commissioning. The main focus of the rehabilitation programme will be re-spreading of harvested topsoil, re-vegetation, erosion control (with rock armour protection on the embankment face if required) and stormwater management;
- controlling impact on the local groundwater by:
  - using a basin liner;
  - seepage minimisation systems; and
  - early detection (a series of groundwater quality monitoring stations will be installed);
- implementing a management strategy to minimise seepage, incorporating aspects of design, construction, operations and decommissioning. These seek to control seepage at source by:
  - construction of a cut-off trench, excavated into the foundation soils, that is then backfilled with low permeability fill, to reduce seepage loss under the embankment foundations;
  - constructing a suitable basin lining system for the facility, comprising a combination of in situ soil liner (in the non-critical areas of the basin) and a composite soil liner / HDPE geomembrane in the valley creek lines and the area beneath the supernatant pond;
  - limiting the extent of the supernatant pond on the tailings beach, and thus maximising evaporation potential from the tailings beach surface;

  - capping the TSF, at closure, to reduce the quantity of surface rainfall runoff that infiltrates the facility; and

- Management of water runoff from the vicinity of the capped TSF to ensure that the quality of surface water runoff from the facility is maintained within environmentally acceptable limits.

The final design and final design update were carried out on the Option 2 site as the preferred location of the tailings storage facility but with the following constraints:

- No disturbance can occur within 40 metres of the bank of Spring Creek; and
- A small seepage collection pond must be located at the downstream toe of the TSF embankment. This pond may act as a sediment control basin during construction works.

5.2.4.2 Sub-Surface Conditions

A summary of the sub-surface profile within the TSF footprint is presented in Table 5.3.

Table 5.3 Summary of Ground Conditions – TSF

Depth to base of horizon (m)	Material Description	Consistency / Weathering	Location
0 – 0.3	TOPSOIL	Varied	All
6.8 to 16.5	WEATHERED GRANITE, recovered as sand and gravel, occasionally clayey or clay, pale brown, cream and orange.	Extremely weathered. Assessed as firm to stiff where cohesive and medium dense to dense where non cohesive.	All
0.3 to 3.0	ALLUVIUM, sands and clays with organic or root material occasionally interbedded or lensed, yellow, brown, cream and grey.	Residual soils, soft/loose consistency.	Creek
0.3 to 3.0	COLLUVIUM, gravelly sands and clays.	Residual soils, soft to firm and loose to very dense consistency.	Creek
0.3 to 1.6	MADE GROUND, gravelly sand, yellow.	Not classified.	TP11
Not penetrated	GRANITE, medium coarse grained, black, white, grey, cream, pink, with various zones of alteration.	Slightly weathered, generally of high to extremely high strength.	All

5.2.4.3 In situ Permeability

In situ permeability testing yielded a typical permeability range at depth of between 1.5 x 10^{-7} m/s and 2.3 x 10^{-6} m/s indicating that the sub-surface profile is relatively permeable. Laboratory permeability testing on samples of the near surface soils remoulded to 98% SMDD yielded permeabilities ranging between 8 x 10^{-7} m/s and 6 x 10^{-10} m/s, which indicates that there is potential to re-work the near surface subgrade to form a compacted soil liner.

The combined paste-thickened sample releases approximately 14% of the water in slurry to supernatant in the undrained test, reducing to 5% supernatant in a fully drained scenario with an additional 11% reporting to underdrainage. Again, there is no significant increase in settled density between the drained and undrained tests for the thickened combined sample. There is an increase in settled density from 1.21 t/m^3 to 1.41 t/m^3 when the discharge percent solids increase from 58% to 71%.

5.2.4.4 Design Criteria

Table 5.4 summarises the design criteria which have been adopted for the TSF. Following completion of the *Construction Report* for the TSF, this section will be updated to reflect the as constructed design criteria.

Table 5.4 TSF Design Criteria

Design Criteria	Units	Comment / Quantity
Tailings Dam Construction		
Dam type		Cross-valley storage
Pond liner requirements		Lined
Permeability		Equivalent to 600mm clay of permeability <1 x 10^{-8}m/s
TSF hydraulic design basis		As required for storm surge
Final tailings footprint	ha	8.1
Catchment Area (inside diversion channels)	ha	8.6
Maximum embankment height (final)	m	30
Minimum embankment clearance height (freeboard)	m	0.5
Estimated total embankment volume	m^3	242,000
Tailings dam natural soil permeability • Upper permeability • Lower permeability • Description	m/s	 2.3 x 10^6 1.5 x 10^7 "Relatively Permeable"
Underliner requirements		Underdrainage & monitoring
Basin underdrainage type		Collector drains
Basin underdrainage spacing (at the decant)	m	10
Tailings physical properties		
Plant tailings description (UNC system)		Silty sand with traces of clay (SM)
Percentage Solids	%	58
SG solids		2.71

Design Criteria	Units	Comment / Quantity
SG liquor		1.001
Tailings permeability	m/s	4×10^{-7}
Tailing Properties		
Time to achieve final density	hrs	<24
Final settling density	t/m^3	1.35-1.40
Pond runoff water classification type		Sub Lethal
Tailings Dam Operation		
TSF Capacity; • Final • Initial	T (dry)	 910,000 245,000
Estimated initial dam life (Stage 1)	months	12
Distance to plant (mill area to embankment's centre)	m	480
Water release from tailings after settling • Supernatant Release • Under Drainage Release	%	 22 – 35 5 – 8
Tailings Storage Facility water return • Year 1 • Year 2	%	 0 – 34 0 – 43
Water return method		Gravity flow to decant tower
Tailings deposition method		Sub-Aerial Deposition

5.2.4.5 Return Water Quality

To better understand how TSF water relates to groundwater and surface water in the Site, Piper trilinear diagrams of relative abundance of major ions were produced using data from 2021 and 2022.

Figure 5.2 presents the Piper diagram, with samples grouped by source. These plots show that TSF water composition is relatively stable over time and closely matches regolith groundwater and water in Spring Creek, with the exception of abundance of sulphate and chloride relative to carbonate and bicarbonate. This compositional change is due mainly to relatively higher concentrations of sulphate in the TSF. However, the concentrations of sulphate present are not expected to negatively impact irrigated soils or pasture.

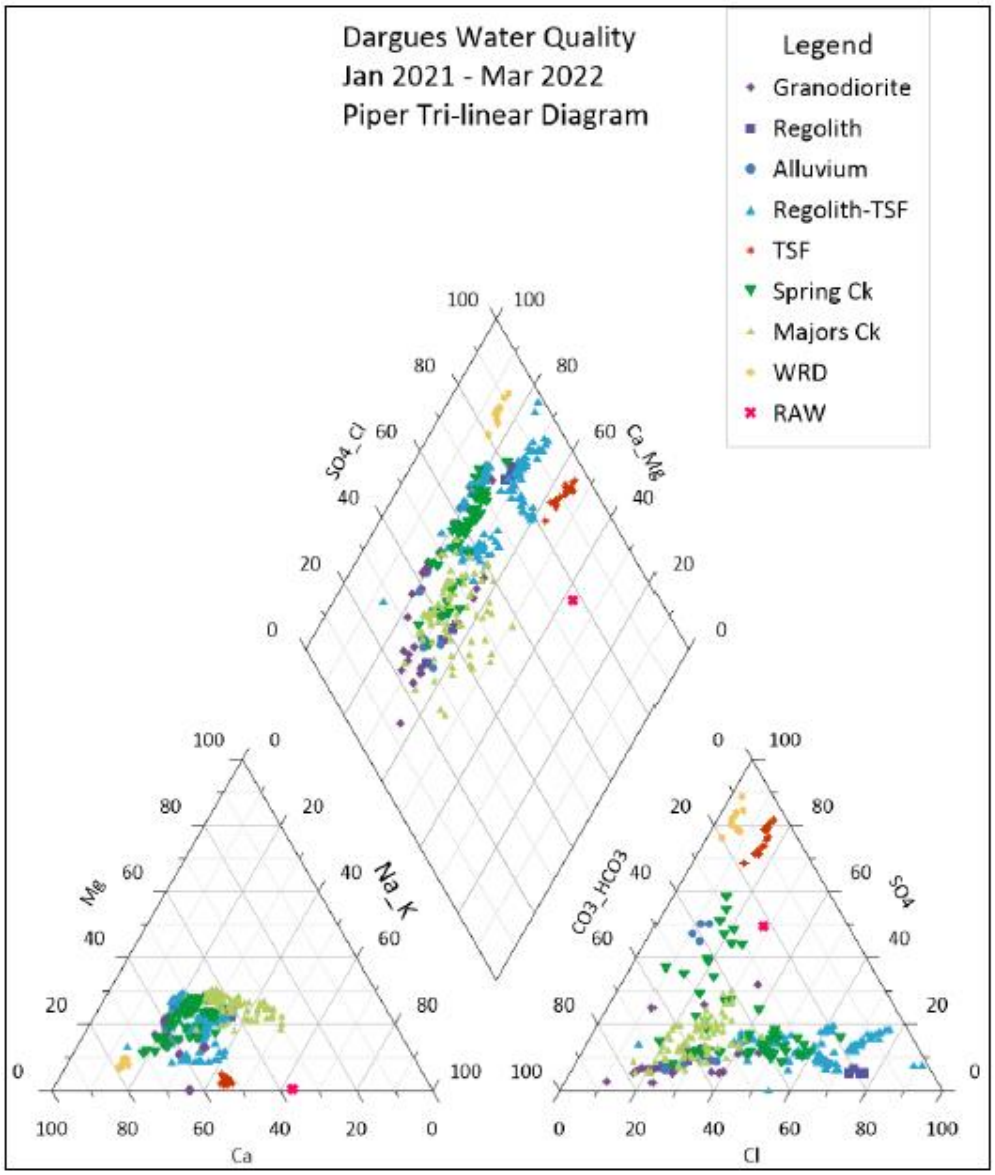


Figure 5.2 Piper diagram – TSF water compared to groundwater and surface water in the Project Site

To assess the suitability of water from the TSF for irrigation, EGI (2022) compared average results for water quality samples collected from groundwater, surface water and TSF in 2010 and 2021 to 2022 to relevant water quality guidelines. EGI (2022) found that:

- Water quality in the TSF is considered low strength under NSW Use of Effluent for Irrigation Guidelines;
- TSF water is slightly more saline that existing raw water, mainly due to minor increase in sodium and sulphate, this is not likely to negatively impact of irrigated soils;
- Water in the TSF is higher in nitrogen than the long term irrigation guideline but is approximately half existing raw water used for irrigation;

- Dissolved metals in TSF water, with the exception of aluminium, copper and chromium are below ANZG (2018) guidelines. Aluminium, copper and chromium in most recent TSF samples are lower than existing raw water and groundwater on site.

Overall, EGI (2022) concluded TSF water quality is similar to existing raw water that is currently authorised for irrigation and there is negligible to zero risk of TSF water used for irrigation negatively impacting soil structure or irrigated pasture health.

Ecotoxicology studies were conducted at an independent, National Association of Testing Authorities (NATA) endorsed toxicity testing facility. The laboratory conducted chronic toxicity testing of TSF water on one species of algae, freshwater Cladocera, freshwater shrimp, duckweed, and rainbow fish. The test methodology involved exposing biota to the test material (TSF water) at 100% concentration. The results of the ecotoxicity testing showed that the TSF water did not Result in acute or chronic toxicity to the five test species. Similarly, a further study found that the TSF showed no signs of stratification horizontally or vertically through the TSF. Furthermore, independent water quality sampling and analysis has found antimony levels in the TSF water to be below the detectable limits.

Based on the above, water within the TSF will be:

- Used for dust suppression within operational areas of the Mine;
- Returned to the Process Water Pond for use in the processing plant; or
- Pumped to the approved Water Storage Dam for storage and thence returned to the Process Water Pond for use in the processing plant; or
- Irrigated to pasture in accordance with Section 5.3.2.3.

The TSF is built across a minor drainage channel. To cater for any potential rainfall runoff, a diversion channel has been constructed around the tailings storage facility basin area.

Runoff is expected to sheet across the landscape rather than from discrete watercourses; hence the diversion channel has been designed to allow runoff to enter along its entire length. This channel is typically 0.5 m deep and 4 m wide, and in general follows the ground slope. Channels have been designed to contain a probable maximum flood average return interval storm event using the Rational Method for peak flow estimation.

5.2.4.6 Seepage Collection Pond and Diversion Structure

The Seepage Collection Pond and diversion structures are constructed downstream of the Tailings Storage Facility embankment and excavated to the base of the regolith to expose the contact between unconsolidated and weathered material and the underlying consolidated, partially weathered material. This diversion structure intercepts any seepage from the Tailings Storage Facility moving along this contact and directs it to the Seepage Collection Pond, thereby minimising the risk of offsite tailings seepage via shallow groundwater.

The Seepage Collection Pond will be a small lined pond with a diesel-powered pump installed. The pond will be fully lined in a manner that would ensure a permeability equivalent to 1000mm clay of permeability $1x10^{-9}$ m/s or equivalent. A construction quality assurance / quality control program will be implemented to ensure that the design permeability is achieved.

The pump pumps water from the pond to the surface of the Tailings Storage Facility. Operation of the pump is on an as required basis with monitoring of the Seepage Collection Pond being conducted in line with the monitoring of the Decant Return Line and Tails Line.

Water recovered from the Seepage Collection Pond will be returned to the Tailings Storage Facility or pumped directly to the Process Water Dam only.

5.2.5 Water Storage Dam

The approved WSD will be a turkey nest-style dam with no natural catchment and a water storage capacity of about 180 ML. Ancillary infrastructure including a perimeter access road, pipelines to various water storages within the Project Site, a pump stand / laydown area and surface water diversion bunds would also be constructed adjacent to the WSD.

The approved WSD will be used for receipt and storage of supernatant water from the TSF, water pumped from underground workings, and raw water from other on-site sources such as the harvestable rights dams via the use of various pipelines. The level of the WSD would be monitored regularly using automated sensors and alarms to maintain the maximum operating level and minimum freeboard to the embankment crest. Water collected by and stored in the WSD would primarily be pumped to the Processing Plant for use in processing operations. Supernatant water from the TSF would be visually monitored for turbidity to minimise the likelihood of the transfer of tailings material to the WSD.

5.2.5.1 Indicative design features

The latest design specifications for the approved WSD, based on the latest design report prepared by GHD (2022b) is summarised in Table 5.5.

Table 5.5 Indicative Water Storage Dam Design Features and Storage Characteristics

Design Criteria	Units	Comment / Quantity
Embankment type	-	Turkeys Nest / Paddock
Total length of embankment	m	840
Batter slopes	-	1V:2.5H Upstream, 1V:3H Downstream
Crest width	m	6
Maximum embankment height	m	8.8 at RL 717.4m AHD
Maximum excavation depth (below existing ground level)	m	3.7
Volume at Maximum Operating Level (MOL)	ML	183.6ML at RL 721.4m AHD
Dam crest level	m AHD	RL 721.8
Freeboard	m	0.5

Design Criteria	Units	Comment / Quantity
Consequence Category Assessment (ANCOLD guidelines 2021/2019), NSW Dams Safety Regulation	-	'Low' for Sunny Day Failure, subject to consultation with Dam Safety NSW
Liner permeability	-	1×10^{-9} m/s over 1 m or equivalent
Note: Design features and storage characteristics are indicative only and are subject to change following finalisation of the final design report.		

A TARP for the management of the WSD is presented in Table 5.6.

Table 5.6 Water Storage Dam – TARP

Water Storage Dam – TARP						
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**	**Reportable to the Regulator**
Level 1	Water level in WSD is below the maximum operating level marker.	Continue monitoring program.	None required.	Sustainability Manager	No	No
Level 2	Water level in WSD is above maximum operating level marker, but below spillway invert.	Stop pumping from TSF. Continue pumping to PWP until water level is at or below the maximum operating level. Water level is to be reduced to the maximum operating level within 14 days. If this is not possible due to insufficient capacity in PWP then engage the pumps to the irrigation fields (Note 2). If it is not possible due to insufficient pump capacity, increase the pump capacity.	Mine Manager Process Plant Manager	Sustainability Manager	No	No
Level 3	Water level in WSD is above maximum operating level marker, but below spillway invert. Water level in increasing due to rainfall or pump failure.	The WSD might soon overflow. Continue pumping at full capacity to PWP (if there is sufficient capacity) and to the irrigation fields (Note 1). Water level is to be reduced to the maximum operating level within 14 days. Notify potential downstream receptors.	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Sustainability Manager	No	No
Level 4	Uncontrolled discharge from WSD via the spillway.	The basin is overflowing. Continue pumping at full capacity to PWP (if there is sufficient capacity) and to the irrigation fields (Note 1). Undertake surface water monitoring at SW-1 to SW-6. Follow the instructions at Section 7.8.	Company Director General Manager Mine Manager Process Plant Manager Government Agencies Downstream water users	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes	Yes

Water Storage Dam – TARP						
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**	**Reportable to the Regulator**
Note:	1. The irrigation field must be managed consistent with **Section 5.4.2**.					

5.2.6 ROM Collection Basins

All surface water drainage within the ROM Pad, processing plant area, excluding bunded areas of the process plant, and related areas will be directed to the ROM Collection Basins (RCB01, RCB02). The upstream pond, RCB02, acts as a sediment trap and the downstream pond, RCB01, as a collection basin. This pond has been clay lined and meets a permeability of $1x10^{-9}$m/s over 900mm or equivalent.

All water within the RCB01 will be pumped to the Mine Water Settlement Dam or be evaporated. In an emergency, any discharges from the RCB01 are directed underground, to be collected by the underground dewatering system and are not discharged to surface drainages.

5.2.7 Sediment Basins

Sediment basins will be constructed for both the construction-phase and operational-phase of the Project to receive sediment-laden runoff from disturbed sections of the Project Site. Details of sediment basin sizing, operation and maintenance are contained in the Erosion and Sediment Control Plan presented in Section 6.

Water within the sediment basins will be:

- Moved to the Mine Water Settlement Dam;
- Used for dust suppression or other raw water uses; or
- Irrigated to pasture within the Site.

Sediment basins will be emptied using a combination of the above disposal methods and within different defined time limits depending on whether a basin is used temporarily during construction (in which case they must be emptied within 5 days of rain) or it is used for long-term (operational) water quality purposes (in which case the management period may be extended to 10 or 20 days following rainfall).

The operational areas of the Mine are serviced by four (4) Operational Sediment Basins (Table 5.7).

Table 5.7 Summary of Operational Sediment Basins

Collection Structure	ID	Runoff Coefficient	Capture Area (ha)	Settling Volume (m^3)	Storage Zone (m^3)	Required Capacity (m^3)
ROM Pad	RCB01	0.64	2.2	625	2,000	2,625
Mine Office Area	SWP01	0.79	1.2	140	1,200	1,340
Mine Infrastructure Area	SB02	0.79	1.7	190	1630	1,820

Waste Rock Emplacement	WRESB01	0.79	6.0	8,207	1,946	10,153

Operational sediment basins have been designed to accommodate the 20 day, 90th percentile storm event (106.3 mm), while the Waste Rock Emplacement sediment basin has been designed to accommodate the 10 day, 95th percentile rainfall depth (110.4 mm).

The design of the sediment basins and treatment of their walls and floors will assist with ensuring that as much sediment is settled out as possible. However, in order to further minimise uncontrolled discharges from sediment basins at the Site, TARPs have been put in place (Table 5.9 and Table 5.10).

The water quality in Spring Creek has been shown to have a strong correlation to the amount of rainfall received within the catchment. This is mainly due to Spring Creek being, as the name suggests, a spring fed tributary of the larger Majors Creek catchment. As a result, the Company has undertaken targeted sampling of Spring Creek and Majors Creek at locations in the surface water monitoring program (refer to Section 7) during large storm events (i.e. those that would produce stream conditions consistent with those anticipated during a rainfall event large enough to cause sediment basins to overflow) to compare those results with data collected as part of the standard surface water monitoring program. Table 5.8 provides an overview of key parameters for assessing water quality impacts as a result of a sediment basin overflow event.

Table 5.8 Average Conditions vs. Storm Conditions – Water Quality in Spring Creek

	Electrical conductivity (µS/cm)		pH		Total Suspended Solids (mg/L)	
Sample Point	Average	Storm	Average	Storm	Average	Storm
SW-1	384	44	7.55	6.82	6.36	23
SW-2	650	57	7.74	6.74	17	65
SW-3	698	58	7.76	6.75	3	84
SW-4	223	45	7.68	6.75	2.64	25
SW-5	246	52	7.47	6.73	3.96	29
SW-6	356	48	7.59	6.84	3.17	30
SWP01	-	48	-	6.9	-	137
SB02	-	247	-	7.32	-	101
Note: Average values based on monitoring data available to date (i.e. September 2014 to June 2019).						

Although the suspended solids levels shown it Table 5.8 are raised under storm conditions in Spring Creek, they are still below those expected to be present in the sediment basins. Water discharged from the spillway of the sediment basins would effectively be skimmed off the clearest layer of water at the top, where most of the sediment has settled. Further, the additional water from the spillway of the sediment basin would be a minor fraction of the total volume of water contained in Spring Creek during heavy rainfall and the Company does not expect discharges to have any material impact.

5.2.7.1 Discharge Point Infrastructure

In order to minimise the potential for erosion associated with discharge of water from the identified discharge locations, the following infrastructure will be established:

- Sediment basins – uncontrolled discharge via stabilised spillways during overtopping in large rain events. All discharge volumes will be calculated using the following formula:

$$D = (A \times R \times C)/1000$$

Where:

  - D – Water discharged via the emergency spillway in m^3.
  - A – Collection area reporting to the storage in m^2.
  - R – Rainfall received during the period of time from commencement of discharge to cessation of discharge in mm.
  - C – Runoff Coefficient.

The variables used in this calculation are contained in Table 5.7.

Table 5.9 Temporary (Construction) Sediment Basins - TARP

Construction Sediment Basin[1] - TARP						
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl[2] Reportable**	**Reportable to the Regulator**
Level 1	Water level in a sediment basin is below the green level marker	Check that >60% of the sediment storage volume (green marker) is available. If not remove sediment to a stockpile area.	None required.	Sustainability Manager	No	No
Level 2	Water level in a sediment basin is above green level marker, but below red level marker.	Commence pumping to MWSD01. Continue pumping until water level is at or below the green level. The green level must be achieved within 5 days. If this is not possible due to insufficient capacity in MWSD01 then engage the pumps to the irrigation fields (Note 2). If it is not possible due to insufficient pump capacity, increase the pump capacity.	Mine Manager Process Plant Manager	Sustainability Manager	No	No
Level 3	Water level in a sediment basin is above the red level marker.	The basin might soon overflow. Continue pumping at full capacity to MWSD01 (if there is sufficient capacity) and to the irrigation fields (Note 2). Bring water level down to at least the green marker within 5-days. Undertake surface water monitoring at SW-1 to SW-6 and relevant sediment basin.	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Sustainability Manager	No	No
Level 4	Uncontrolled Discharge from sediment basin via the spillway.	The basin is overflowing. Continue pumping at full capacity to MWSD01 (if there is sufficient capacity) and to the irrigation fields (Note 2). Undertake surface water monitoring at SW-1 to SW-6 and the relevant sediment basin. Follow the instructions at Section 7.8. Confirm that the five-day design rainfall depth (42.4mm) has been exceeded. If not investigate why the basin has overflowed. Follow the instructions at Section 7.8.	Company Director General Manager Mine Manager Process Plant Manager Downstream water users	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes	Yes
Note 1: For short-term, construction, basins only. Note 2: Incontrol is the Event Management Software used by the Mine.						

Table 5.10 Operational Sediment Basins - TARP

Sediment Basin - TARP						
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**	**Reportable to the Regulator**
Level 1	Water levels in sediment basin is below the green level marker.	Check that >60% of the sediment storage volume is available. If not remove sediment to a stockpile area.	None required.	Sustainability Manager	No	No
Level 2	Water levels in sediment basin is above green level marker, but below red level marker.	Commence pumping to MWSD01. Continue pumping until water level is at or below the green level. The green level must be achieved within 10 days. If this is not possible due to insufficient capacity in MWSD01 then engage the pumps to the irrigation fields (Note 2). If it is not possible due to insufficient pump capacity, increase the pump capacity.	Mine Manager Process Plant Manager	Sustainability Manager	No	No
Level 3	Water levels in sediment basin is above the red level marker.	The basin might soon overflow. Continue pumping at full capacity to MWSD01 (if there is sufficient capacity) and to the irrigation fields (Note 2). Bring water level down to at least green marker within 10 days. Undertake surface water monitoring at SW-1 to SW-6 and relevant sediment basin.	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Sustainability Manager	No	No
Level 4	Uncontrolled discharge from sediment basin via the spillway.	The basin is overflowing. Continue pumping at full capacity to MWSD01 (if there is sufficient capacity) and to the irrigation fields (Note 2). Undertake surface water monitoring at SW-1 to SW-6 and the relevant sediment basin. Follow the instructions at Section 7.8. Confirm that the ten day design rainfall depth (110.4 mm) has been exceeded. If not investigate why the basin has overflowed. Follow the instructions at Section 7.8.	Company Director General Manager Mine Manager Process Plant Manager Government Agencies Downstream water users	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes	Yes

Note: 1. Applicable to Sediment Basin 02 (SB02), Storm Water Pond 01 (SWP01), Waste Rock Emplacement Sediment Basin 01 (WRESB01) and any other sediment basins within the Site.

2. The irrigation field must be managed consistent with **Section 5.4.2.**

5.2.8 Clean Water Diversion Drains

5.2.8.1 During Construction

Clean water drains are required upslope of construction areas. Refer to the individual Erosion and Sediment Control Plans (ESCPs) for their locations and sizing. Drains will be inspected regularly to ensure they and their outlets are stable under flow conditions.

5.2.8.2 During Operation

The Mine operates with three clean water diversion drains, not including the diversion around the Tailings Storage Facility. These drains collect Clean Water from upslope of disturbed areas of the Mine and direct it through or around these disturbed areas to discharge into Spring Creek.

The diversion drain design criteria are included below in Table 5.11.

Table 5.11 Clean Water Diversion

Clean Water Diversion	ID	Capture Area (ha)	Design Capacity (m^3/s)	Culvert size (mm)	Storm Event
Upslope of the ROM Pad and Process Plant	CWD1	6.56	1.31	750	1 in 100 year
Up Slope of the Mine Office Area	CWD2	8.0	1.594	750	1 in 100 year
Up Slope of the Boxcut	CWD3	2.4	6.076	-	1 in 100 year

5.3 WATER DISPOSAL METHODOLOGY

This section outlines the management measures required to be undertaken during the removal and treatment of water contained within the TSF and Sediment Basins at the Mine. It is recognised that the uncontrolled discharge to receiving waters is undesirable and the Company has sought to minimise this to the greatest extent possible. As a result, water within the TSF and sediment basins is subject to the following priorities of use.

1. Used for dust suppression.
2. Used within the processing circuit.
3. Irrigated to the grassland.

5.3.1 Dust suppression

Dust suppression is undertaken by applying water to disturbed surfaces to minimise generation of dust. Dust suppression methods will be adapted to the current site water balance:

- During periods of water shortage, treatment using chemical dust suppressants or similar will be used to minimise the requirement for regular watering.
- During periods of water excess, use of chemical dust suppressants or similar will be avoided.

A risk assessment shall be undertaken in operational areas of the project site prior to undertaking dust suppression activities with TSF water. This risk assessment will consider health risks to workers, soil infiltration rates, dispersion and containment and ensure runoff will be captured in the appropriate basins.

Where dust suppression uses TSF water this shall be limited to hard stand mine affected areas where stormwater runoff will be captured in the appropriate basins.

A program of testing of the TSF water quality for human health purposes will be conducted for radionuclides periodically.

Excess water from the Site is disposed of by irrigation to land within the Site. An assessment of sustainability of irrigation, including water from TSF, was undertaken in consultation with EPA (EGI 2022).

The performance objectives of the irrigation are:

- No damage to the soils on which the irrigation will be applied or elsewhere on the Site. EGI (2022) did not identify “any risks that would need to be managed in any other than standard soil deficit strategy and irrigation scheduling methods”.
- No impact on any environmental receptor that might be exposed to water quality changes. EGI (2022) found that “there is negligible to zero risk to the water quality in the receiving waters for groundwater discharge, and therefore, no risk to environmental receptors” and that “TSF water quality is similar to existing raw water that is currently authorised for irrigation”.

5.3.2 Irrigation

Management of the onsite irrigation system includes:

- Recording daily rainfall and evapotranspiration values at the Site’s weather station and available soil moisture measurements or observations.
- Reviewing the daily rainfall of the Majors Creek and Braidwood weather stations.
- Field quality testing of water held in the raw water pond (RWP01) prior to irrigation.

- Monitoring and reporting on irrigated volumes in accordance with Section 7.

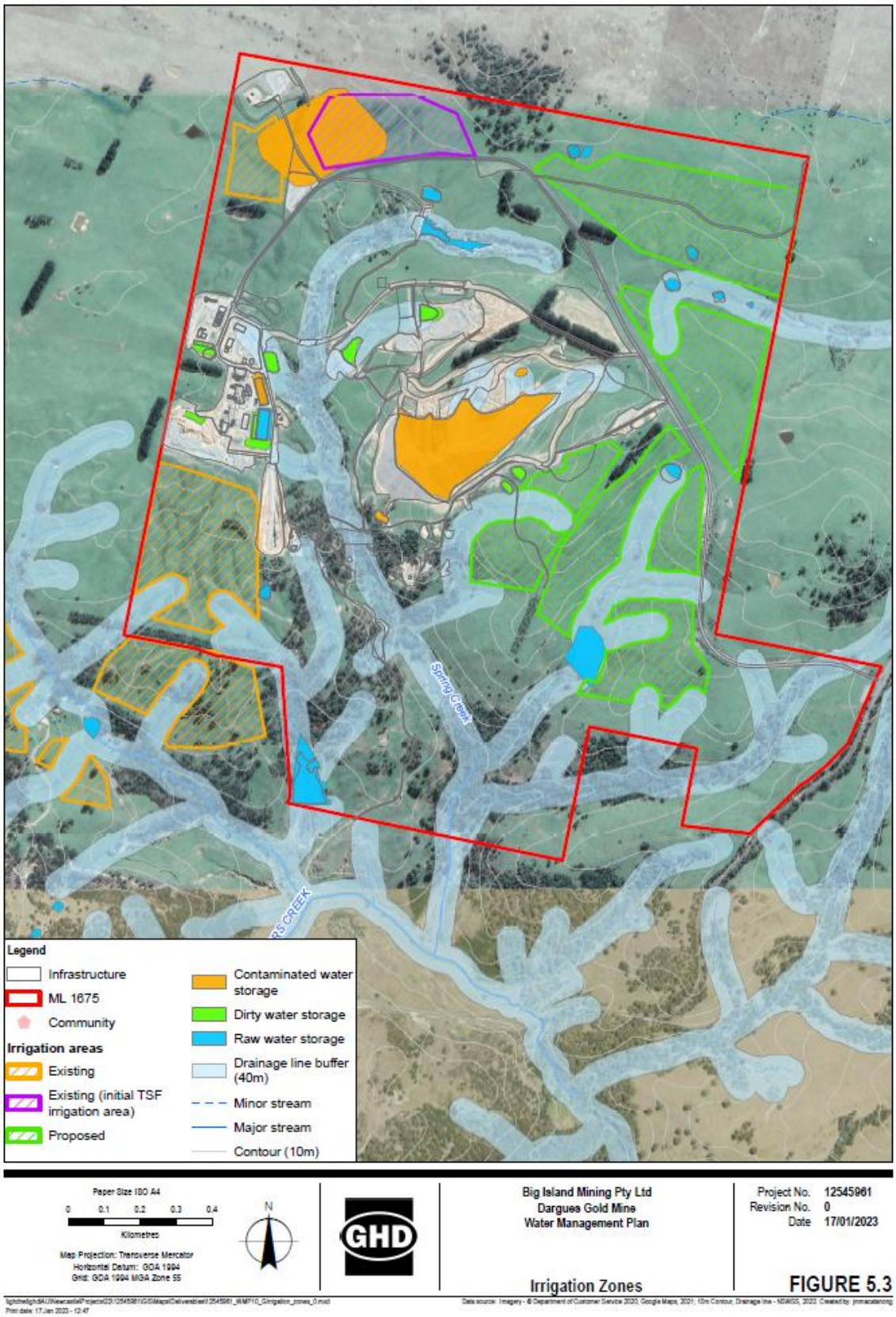
5.3.2.1 Location and Layout

Figure 5.3 presents the location of the irrigation zones. These locations have been selected with consideration to the following factors

- Suitable distance from, and drains away from, the Mine Office Area's effluent treatment system.
- Minimum buffer distance of 40 m from any surface water drainage lines and 100 m from Spring Creek (as recommended by EGI 2022).

The total irrigation layouts cover an area of approximately 795,000 m^2 consisting of an existing and proposed irrigation layout area of approximately 335,000 m^2 and 460,000 m^2 respectively. Water from TSF is initially planned to be irrigated to the area immediately east of the magazine, which is partially within the footprint of the approved WSD.

Figure 5.3 Irrigation Zones



5.3.2.2 Irrigation procedure

Irrigation of water is to be undertaken using the irrigation system described in the preceding section. The irrigation water criteria is provided below in Table 5.12.

Table 5.12 Summary of Irrigation Water Criteria

Location ID	Hydrocarbons (mg/L)	pH	Turbidity (NTU)	TSS (mg/L)
Irrigation	<10	6.5-8.5	9 - 11	<30

The criteria for Turbidity is intended to prevent overdosing of the Sediment Basins with flocculent or coagulant and mobilisation of aluminium.

During the irrigation of water using a pump to move water to the irrigation location, the following should be noted:

- The dosing mechanism is not turned on and no coagulant is added into the line during irrigation.
- The volume of water irrigated is monitored using an inline flow metre.
- The suction point in the RWP01 or the TSF is are near as practical to water surface (supported by a float or similar) to minimise turbidity.
- In-line water quality monitoring will be established for water sourced from the TSF.

5.3.2.3 Irrigation with TSF water

Irrigation with TSF water is as a contingency measure for reinstating the environmental containment freeboard of the TSF. Irrigation from TSF may occur where the volume held in the TSF exceeds 50 ML and only where the water quality of the TSF meets the irrigation water quality criteria (Table 5.12).

As the pollutant concentration and composition of the TSF water may change overtime, ongoing weekly water quality monitoring of the TSF water will continue in line with the water quality monitoring schedule (Table 7.2). The results of the groundwater monitoring program, which includes shallow bores near the irrigation area, will be reviewed as described in Section 9.

5.3.2.4 Trigger Action and Response Plan

Table 5.13 shows the trigger, action and response for irrigation.

Table 5.13 Trigger Action Response Plan

Trigger	Action	Response
Lowered pH in water following treatment with Turbiclear.	Do not irrigate water	Investigate dosage rate of Turbiclear and undertake check sampling prior to release.

Water observed flowing away from Irrigation Area.	Turn off sprinkler system	Allow irrigation area to dry out and observe any runoff. Check the irrigation infrastructure – is it operational across the whole designated irrigation area? Refer to the irrigation balance - check the application rate (L/m^2). Is water being applied above the recommended rate for that day? If the problem is regular it might be necessary to reduce the water depletion value assumed in the irrigation balance (i.e. Adjust the spreadsheet assumptions).
Water quality in RWP01 does not meet irrigation criteria following treatment.	Retreat water	Re-test water.
Deterioration of water quality or sedimentation noticed at SW2.	Stop irrigating water	Treat and re-test water being irrigated to ensure it meets the criteria. Determine reason for water quality change. Implement the Level 3 response of Table 7.5 of the Water Management Plan.
Deterioration of water quality at irrigation surveillance monitoring bores.	Stop irrigating water	Re-test water being irrigated to ensure it meets the criteria. Determine reason for water quality change. Implement the Level 3 response of Table 9.5 of the Water Management Plan.
Runoff at irrigation area	Stop irrigating water	Check sumps and shallow drains Check irrigation schedule Postpone irrigation

5.4 COMPENSATORY FLOW FOR BASEFLOW OFFSET

5.4.1 Location of Discharge Points

Dargues have not identified any loss of baseflow to Majors and Spring Creeks caused by the operation of the Site. No compensatory flow for baseflow offset is planned to be undertaken. In the event the need for compensatory flow for baseflow offset was required, controlled water discharges would occur from one or all of the following locations (Figure 5.1).

- CW-A – from Harvestable Rights Dam A.
- CW-D – from Harvestable Rights Dam D.
- CW-H – from Harvestable Rights Dam H.
- CF-1 – Compensatory flow discharge location.

In the event that water from the harvestable rights dams is not available, water from the water treatment plant may also be used in conjunction with water from the historical workings to achieve the required water quality criteria for the compensatory flow program.

5.4.2 Volume and timing of discharge

Rates of discharge from harvestable rights dams will vary depending on rainfall intensity, duration and the level of the harvestable rights dams. In accordance with SEEC (2010b), individual dams would not be drawn down by more than 0.3 m per day to minimise the risk of damage to earth walls.

5.4.3 Discharge Point Infrastructure

If triggered, discharge would be via a stable energy dissipater made from rock (riprap) or into a deep (>0.5 m) pool in the locations shown in Figure 5.1. All discharges will be monitored through an in line flow metre.

5.5 POTABLE WATER USE

The site is not connected to mains water supply and currently imports potable water via a registered water carter. Potable water within the site may be sourced from rainwater, collected from roofed infrastructure and stored in rainwater tanks, and groundwater sources. All potable water is filtered and chemically treated prior to use so that it meets the Australian Drinking Water Guidelines (2011). A water treatment plant is incorporated in the Process Plant, however is not currently relied on for potable water supply.

Use of potable water will be minimised through the use of water from the Raw Water Dam for ablutions (toilet flushing etc.). Potable water will only be used for drinking or hand and body washing.

5.6 GROUNDWATER

Groundwater inflows into the underground workings were estimated from hydrogeological modelling developed for the Mine as part of the Dargues Reef Gold Mine – Groundwater Model Update (AGE, 2021). Hydrogeological modelling was undertaken to estimate groundwater seepage into the underground workings and determine groundwater drawdown associated with the Mine. The hydrogeological model from previous assessment (AGE, 2010) was recalibrated for updated groundwater inflow estimates as part of the Dargues Reef Gold Mine – Groundwater Model Update (AGE, 2021).

The recalibrated hydrogeological model was most recently updated to reflect the MODFLOW-USG industry standard code. This included a rebuild from the previous MODFLOW-SURFACT model iteration developed in 2013. The approach taken in the rebuild was to add enhanced detail to sensitive locations through use of a Voronoi mesh, and to provide revised predictions better aligned to observed inflows at the Mine.

The groundwater model predicts an average inflow rate of 2.4 L/s to the underground mine during operations. Mining commenced in 2019 and will continue until the end of 2023. The total predicted groundwater inflows are shown in Figure 5.4. The report (AGE, 2021) described that the variation in inflow occurs due to the lateral and vertical progression of the mine footprint where dewatering is required.

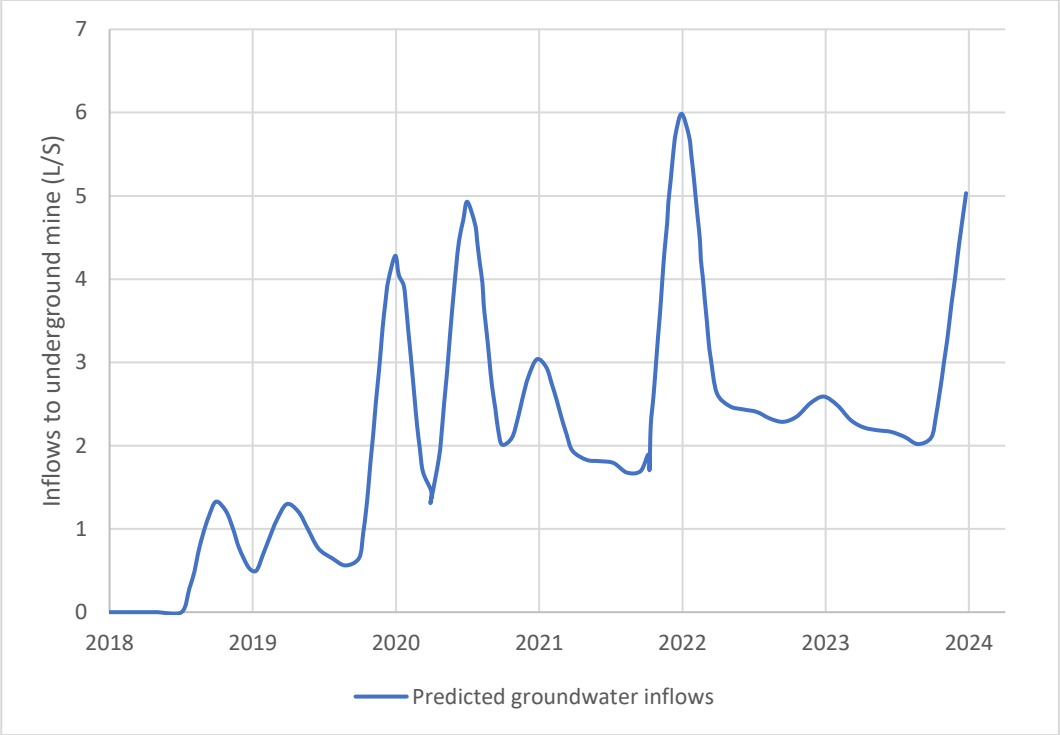


Figure 5.4 Predicted groundwater inflows based on AGE (2021)

The maximum predicted inflow rate is 6.1 L/s occurring in the 2021-22 water year. The 2021-22 water year is the period with greatest estimated annual take arising from the mine equating to 102 ML/yr. The majority of this will be direct take from the Lachlan Fold Belt Coast Groundwater Source with minor passive take also forecast from Araluen Creek Water Source and neighbouring Goulburn Fractured Rock Groundwater Source (AGE 2021).

5.7 INTERNAL WATER FLOW MONITORING

Water movement within the Site will be monitored using continuous, inline flow meters, with data logged and reviewed monthly. Data sourced from flow monitoring is included in the *Annual Review* and is used to amend site water management practices as required.

5.7.1 Pipelines, Pumps and Flow Meters

There are six classes of water pipeline within the Project Site as follows.

- Potable water pipelines - within and between Project Site buildings for drinking and hand washing water purposes.

- Compensatory flow pipelines – from the harvestable rights dams to the compensatory flow discharge point.
- Raw water pipelines – from the Raw Water Dam to the ablutions facilities and the Raw Water Pond.
- Groundwater pipelines – from the Mine and the historic workings to the Raw Water Pond and compensatory flow mixing tank (if required).
- Sediment laden water pipelines – from the sediment basins to the Mine Water Settlement Dam.
- Contaminated water pipelines – to and from the Process Water Pond/Tank, the processing plant, Leachate/Processing Collection Ponds, Tailings Storage Facility, approved Water Storage Dam and Seepage Collection Pond.

The Company works to ensure that no water within each of these classes of pipeline will mix, except as described above. Each of the above classes of pipeline would be constructed of the appropriate material, having regard to the class and volume of water, pressure and flow rate the pipe is designed to carry.

Where appropriate, pipelines are buried and their locations clearly marked with signposts and on mine plans. In the case of the Contaminated Water Pipelines, the pipelines are appropriately bunded and associated pumps fitted with pressure-detecting cut-offs to stop pumping operations in the event of a burst pipe.

Where required, pumps are selected/designed according to the anticipated maximum flow rate requirement.

Monitoring locations with flow meters and recording of results is detailed in Section 7.

5.8 SITE WATER BALANCE

The site water balance of the Mine includes the sources, demands, use and disposal of water. A water cycle schematic for the operations is shown in Figure 5.5. A site water balance model implemented in GoldSim was developed based on the observed flows and climatic conditions at the Mine. The purpose of this water balance is to quantify the water sources, demands and reuse opportunities.

5.8.1 Water sources

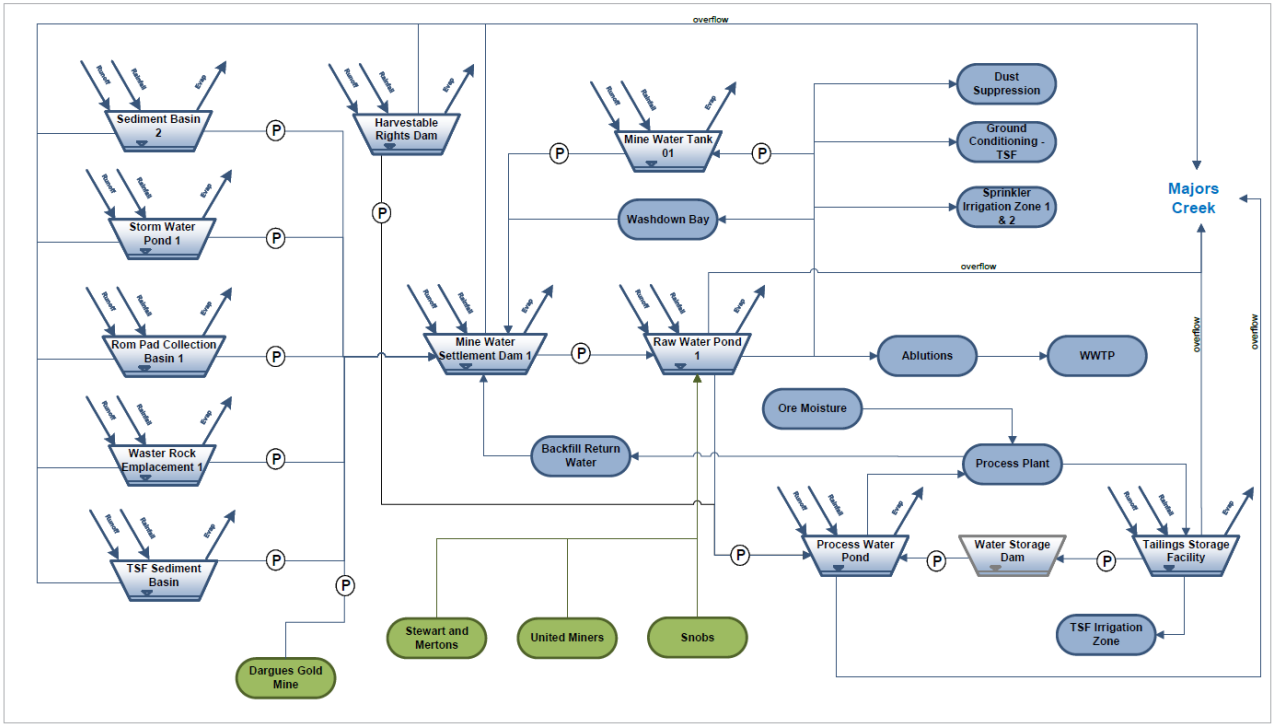
The three principal sources of water are from capturing surface water runoff, capturing rainfall from roofed infrastructure and groundwater. Table 5.14 and Figure 5.5 presents the sources and distribution of water within the Site.

Table 5.14 Water Sources, Storages and Priorities

Source	Nature	Demands (in Priority Order) and Losses	Sink
Harvestable rights dams	Earth-wall dams, positioned on minor streams and similar to typical farm dams. Capture freshwater runoff from their respective catchments.	Compensatory water supply to Majors Creek. Ancillary losses to evaporation.	Compensatory flow to Majors Creek. Note that natural overflows (i.e. in moderate to large rain events) from harvestable rights dams would flow into their respective catchments immediately below the dam wall.
Licenced Water Bores	Groundwater from historical mine workings including Snobs, Stewart and Mertons and United Miners.	Backup compensatory flow to Majors Creek, (only if demand cannot be met from harvestable rights dams). Backup water for processing operations (only if insufficient water is available from dewatering the Mine).	Majors Creek (intermittent). Mine Water Settlement Dam
Rainwater Tanks	Captured from roofs of built infrastructure within the administration area	Drinking water. Ablutions.	Overflows directed to Storm Water Pond 01 and Sediment Basin 02.
Groundwater inflow into the Mine.	Groundwater seepage into mine void.	Pumping to Mine Water Settlement Dam for treatment and stored in the Raw Water Pond prior to use. Losses via: ore/waste rock to surface; ventilation air; and in unrecoverable water retained in the mine (quantity unknown).	Mine Water Settlement Dam.
Raw Water Pond.	Receives water pumped from the Mine and historic workings (i.e. groundwater seepage) via the Mine Water Settlement Dam.	Ablutions. Dust suppression. Make up water for processing operations (either direct to processing plant or via Process Water Pond). Ancillary losses to evaporation.	Dust suppression. Process Water Pond. Pump to irrigation. Mine water.
Process Water Pond.	Receives water recovered from processing operations (thickener, TSF/Water Storage Dam) and makeup water from Raw Water Pond, as required.	Processing. Ancillary losses to evaporation.	Processing Plant.
TSF.	Tailings from Processing Plant and incidental rainfall.	Make up water for processing operations (either direct to processing plant or via Process Water Pond).	No external direct discharge. Recovered water to Water Storage Dam. Dust suppression

Source	Nature	Demands (in Priority Order) and Losses	Sink
		Dust suppression. Ancillary losses to evaporation.	Pump to irrigation directly or via the raw water pond as a temporary contingency measure.
Water Storage Dam (approved)	Receives excess water from TSF	Make up water for processing operations (either direct to processing plant or via Process Water Pond)	Process Water Pond
Seepage Collection Pond.	Seepage from TSF, located immediately downslope of TSF wall.	Return to TSF. Ancillary losses to evaporation.	TSF.
ROM Collection Basin.	Collects runoff from the ROM Pad and non-bunded areas of the process plant.	Pump to Mine Water Settlement Dam.	Mine Water Settlement Dam (or evaporated).
Sediment Basins.	Collect runoff from surface mine infrastructure. Potentially sediment-laden.	Pump to Mine Water Settlement Dam.	Mine Water Settlement Dam (or evaporated).
Mine Water Settlement Dam.	Receives water from sediment basins, the Underground Mine and other dirty water sources.	Treatment of Dirty water to produce Raw Water.	Raw Water Pond.

Figure 5.5 Water management schematic



5.8.2 Project Related Water Demands

Table 5.15 presents the uses and demand for water in priority order within the Project Site.

Table 5.15 Processing Demands for Water

Priority	Demand	Volume	Source (In Priority Order)
1	Compensatory flows to Majors Creek (if triggered)	Variable, depending on monitored/ modelled losses to natural base flows. Estimated at maximum 2.1L/s (66.2ML/yr).	1. Harvestable Rights Dams. 2. Historic workings and Potable Water Plant.
2	Drinking and washing.	Drinking - 18L/person/day. Showers - 80L/person/day.	1. Braidwood Domestic Supply (trucked to site). 2. Onsite tanks filled by rainwater (roof runoff). 3. Potable Water Plant.
3	Ablutions.	27L/person/day.	1. Rainwater Tanks. 2. Raw Water Pond.
4	Dust suppression.	Variable, depending on area exposed and prevailing weather conditions.	1. Raw Water Pond. 2. TSF 3. Harvestable Rights Dams.
5	Processing Operations.	Variable, depending on production, evaporation and processing rates.	1. Recovered water from Processing Plant and Water Storage Dam. 2. Raw Water Pond.
6	Construction Activities	Variable, depending on the stage of the Project and activities being undertaken.	1. Raw Water Pond. 2. Harvestable Rights Dams.

5.8.3 Water Balance Results

The average annual water transfers simulated by the water balance model for July 2022 to June 2023 are summarised in Table 5.16. The summary shown in Table 5.16 excludes the direct rainfall, catchment runoff and evaporation from the harvestable rights dams, as these are considered to be outside of the water management system for the purpose of the site water balance model. Actual dust suppression and irrigation volumes may be higher depending on opportunities to dispose of additional water as per Section 5.3.

Table 5.16 Annual modelled water balance

Water transfer	Annual total (ML/year)
INPUTS	
Direct rainfall into water storages	73
Catchment runoff into water storages	122
Groundwater inflows	31
Ore moisture	21
TOTAL INPUTS	**252**
OUTPUTS	
Evaporation	100
Dust suppression	8
Irrigation	68
Transfers to WTP	0
Concentrate moisture	6
Offsite discharges from sediment basins (simulated)	4
Water retained in hydraulic fill	49
Water retained in tailings	93
TOTAL OUTPUTS	**328**
CHANGE IN STORAGE	
Surface water storages	-76
TOTAL CHANGE IN STORAGE	**-76**
BALANCE	
Inputs – outputs – change in storage	0

5.8.4 Security of Water Supply

The primary sources of water supply for ore processing are rainfall and catchment runoff which are inherently insecure. However considering the volume of water on the TSF during 2022, the Mine is expected to have sufficient water for the remaining approved operations.

Groundwater modelling presented in Section 4.4.4 of the *Environmental Assessment* and Section 4.2 of the *Environmental Assessment – Modification* 1 indicates that sufficient water is available for processing and mining-related purposes. Similarly, surface water modelling presented in Section 4.5.5 of the *Environmental Assessment* indicates that sufficient water is available through the harvestable rights dams to meet the maximum potential compensatory flow requirements of 2.1 L/s on 97% of the 100 year period modelled and that additional water during periods of non-availability of water within the harvestable rights dams may be sourced from the historical workings.

In the event that all Site-related water needs cannot be met, water will not be made available for secondary or tertiary demands unless preceding demands are fully met first. That is, water will be made available for the highest priority uses first, with the needs of subsequent uses being met with remaining water. In the event that a water source cannot meet all of the demand volume requirements on it, supply will be cut off in reverse priority order (i.e. to the lowest priority demand first). It is noted that the compensatory flow program is the highest priority water demand and that water will be provided fully for that purpose before all other water demands are met. This may require modification or reduction in the rate of mining operations if insufficient water is available for processing operations.

Notwithstanding the above, water from sources identified as potentially-contaminated will not be used to supply a demand requiring non-contaminated water such as compensatory flows in Majors Creek, or ablutions.

6. EROSION AND SEDIMENT CONTROL

6.1 INTRODUCTION

This sub-section provides a description of the soils within the Project Site and activities that have the potential to result in erosion and sedimentation. Closure commitments are identified in Table 14 of the *Mine Operations Plan 2017*, which has been included as **Appendix A** for completeness at the request of the Department of the Environment and Energy (DoEE).

Sediment basins have been sized and are managed in accordance with the relevant requirements of the guidelines.

Discharges are assessed by comparing the water quality at downstream surface water monitoring locations against the relevant SSGVs.

6.2 SOILS

The soils assessment (SEEC, 2010b) defined two soil landscapes within the Project Site, namely:

- the Braidwood Soil Landscape; and
- the Brushy Hill Soil landscape.

Both soil types usually have sandy loam topsoil overlying sandy clay subsoil. Nearly all the disturbance will be on the Braidwood Soil Landscape, with the Tailings Storage Facility and associated site access road the only infrastructure within the Brushy Creek Soil Landscape.

For the purpose of the Erosion and Sediment Control Plan, the soils are assumed to be:

- Type D (dispersive);
- highly erodible (K-Factor = 0.06);
- in an area with a moderate R-factor (rainfall erosivity) of 2410; and
- on lands with a Soil Loss Class of Class 3 to 6 depending on the slope gradient

6.3 ACTIVITIES WITH THE POTENTIAL TO CAUSE EROSION AND SEDIMENTATION

Activities with the potential to cause erosion and sedimentation include the following.

- Construction of the approved site infrastructure including the Site Access Road, Tailings Storage Facility, Processing Plant and associated infrastructure, the Boxcut and associated haul roads and the Eastern Waste Rock Emplacement (WRE).
- Ongoing use of unsealed or un-vegetated sections of the Project Site, including the above infrastructure.

- Discharge of water from the various site storages, including the harvestable rights dams and sediment basins.
- Ongoing construction of the final landform prior to establishment of a vegetative cover.
- Ongoing amelioration activities, including weed management (resulting in loss of ground cover) and stabilisation of drainage lines.

6.4 EROSION AND SEDIMENT CONTROL PLANS

Landcom (2004) and DECC (2008) require measures to control erosion and sediment loss and all ESCPs are prepared consistent with these measures. For the purpose of sediment and erosion control within the Site there are two relevant Project stages as follows.

- Site establishment (i.e. building the mine's infrastructure).
- Operation and de-commissioning.

Both stages require slightly different approaches as they have different time scales.

6.4.1 Staging of Works

Work during site establishment is to be staged as follows.

1. Delineate the area to be disturbed using fencing, tape, pegs or similar.
2. Install sediment fences, straw bales and U-traps as required.
3. Establish clean water diversions as required.
4. Construct sediment basins for dirty water storage.
5. Establish dirty water drains, berms or windrows.
6. Commence clearing, stripping and topsoil stockpiling, followed by earthworks. Ensure dirty site water is always directed to a sediment basin or trap.
7. Manage water in the sediment basins.
8. Establish slope breaks whenever rain is falling.
9. Rehabilitate completed areas progressively as they are completed.
10. Transition to the operational phase erosion and sediment controls.

6.4.2 Erosion Control

Erosion control will be undertaken throughout the works programs as detailed on the Erosion and Sediment Control Plans. Often the works will be on moderately steep lands and/or near to Spring Creek and, if so, the Soil Loss Class is identified as Class 6 (Very High).

Works undertaken on these lands through October to March inclusive will require enhanced erosion control during significant rainfall. If there is more than 50% chance of more than 10 mm of rain in 24 hours exposed surfaces will be treated with hydraulic soil binder (e.g. Vital P47 or equivalent) or covered with temporary materials such as organic or synthetic matting (geotextile), plastic etc.).

Whether or not the Soil Loss Class is 6 or less, all lands will be progressively stabilised rather than waiting until the end of works; this will include exposed lands that are inactive for more than 20 days, even though works might continue later (reduced to 10 days on stockpiles and steep batters).

6.4.3 Stockpiling

Stockpiles are to be established on Site as required in accordance with the following conditions:

- All stockpiles are to be on lands at least 40m from watercourses.
- All stockpiles are to be on lands with slopes 10% or less.
- All stockpiles require an effective diversion upslope.
- All Stockpiles require a sediment fence or similar sediment control around the lower edge.
- All stockpiles are to be covered to the equivalent of 60% grass cover within 10 days of formation. Note that this does not apply to an active portion of any stockpile, although it might apply to inactive portions that will not be re-worked within 10 days.
- Stockpile mulch, topsoil and subsoil separately.
- Avoid over working and over compacting stockpiles, especially topsoils.
- Avoid stockpile faces steeper than 3:1 and keep topsoil stockpiles to no more than 2m high.
- Wet down or cover stockpiles as required to minimise dust.

6.4.4 Slope Lengths

During construction, ensure slope lengths on disturbed lands are reduced to 80m whenever rain is imminent or falling. This can be achieved by pushing up basic berms or cutting in small drains across the slope.

6.4.5 Sediment Fences, Straw Bales and U-Traps

- Install sediment fences, U-Traps or straw bales in accordance with best practice.
- Ensure sediment traps are firmly embedded in the ground for their entire length.

Clean out traps as required and repair them as soon as possible if they are damaged.

6.4.6 Sediment Basins

Sizing of sediment basins during construction.

- 5 day, 85th percentile rainfall depth (42.4 mm).
- Volumetric runoff coefficient (C_v) = 0.9 (conservative).

Sizing of sediment basins during operation.

- 20 day, 90th percentile rainfall depth (106.3 mm).
- Volumetric runoff coefficient (C_v) = 0.79.

Waste Rock Emplacement sediment basin.

- 10 day, 95th percentile rainfall depth (110.4 mm).
- Volumetric runoff coefficient (C_v) = 0.9 (conservative).

6.4.7 Inspections and Maintenance

- Inspections are to be carried out consistent with Section 2.3 of the *Construction Environmental Management Plan.*
- Maintenance would be carried out consistent with the requirement of the relevant ESCP. It is expected that maintenance items would be identified during each inspection, with the timing for rectification and the responsible person identified as part of the maintenance plan.

7. SURFACE WATER MONITORING PROGRAM

7.1 INTRODUCTION

This sub-section was originally prepared in consultation with SEEC and provides a description of the surface water monitoring locations within the Project Site and existing surface water flow and quality within and surrounding the Project Site. This sub-section also describes the surface water monitoring that would be undertaken throughout and following the life of the Project.

A detailed description of the aquatic ecology program is provided in Section 8.

7.1.1 Objectives of the Surface Water Monitoring Program

SEEC (2010a) and RW Corkery (2010) identified that the Project has the potential to impact on water quantity and quality in local drainage lines. As such, a surface water monitoring program will be undertaken throughout and following the life of the Project to achieve the following objectives.

- Establish baseline (i.e. existing) patterns and volumes of water flow in local drainage lines.
- Establish baseline (i.e. existing) water quality in local drainage lines.
- Monitor water quantities and flow volumes, primarily baseflow, in local drainage lines during and after mining operations.
- Monitor water quality in local drainage lines during and after mining operations.

7.2 MONITORING LOCATIONS

Surface water monitoring locations are presented on Figure 7.1 and are described in Table 7.1. These monitoring locations have been selected in order to:

- provide comparative data from areas not expected to be impacted by the Project for comparison against areas that could potentially be impacted;
- determine the extent of any impacts that may result from the Project; and
- provide data that can support or reject claims from stakeholders regarding impacts associated with the Project.

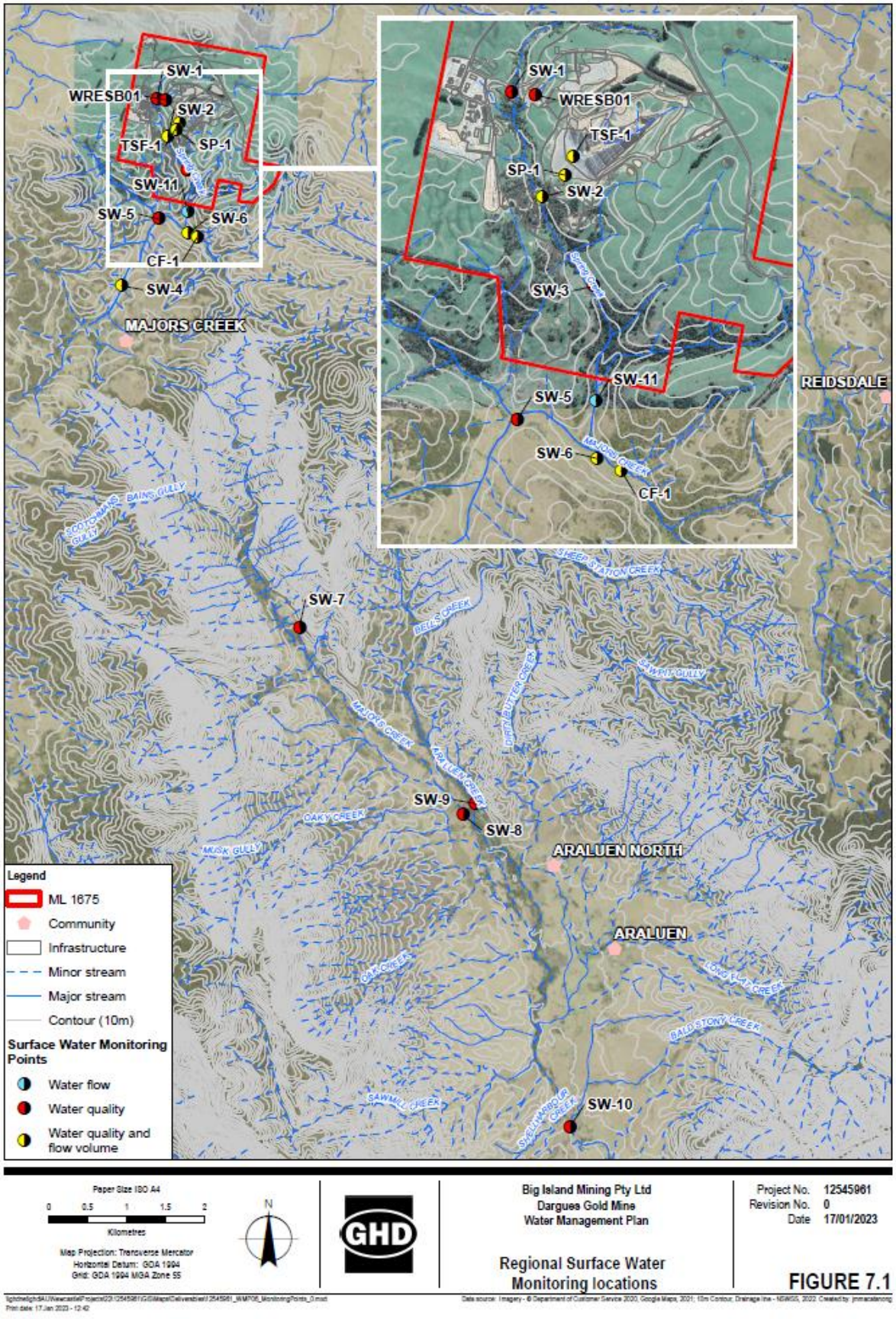


Figure 7.1 Regional Surface Water Monitoring Locations

Table 7.1 Surface Water Monitoring Locations

Identifier	Location			Monitoring parameters	Infrastructure
	Location	Northing[1]	Easting[1]		
CF-1	Compensatory flow discharge point (if triggered)	749355	6061723	Water quality and flow volume	Meter, real-time water quality monitor
SP-1	Seepage Pond	749089	6063114	Water quality and flow volume	Pump, meter and in-line water quality monitor
SW-1	Spring Creek upstream of all Project disturbance	748837	6063502	Water Quality	Nil
SW-2	Spring Creek V-notch weir	748981	6063010	Water quality and flow volume	V-notch weir and continuous water level logger
SW-3	Spring Creek downstream of all site infrastructure	749224	6062591	Water quality	Nil
SW-4	Majors Creek – inflow to Project Site.	748388	6061103	Water quality and flow volume	V-notch weir and continuous water level logger
SW-5	Majors Creek downstream of historical workings and upstream of the confluence of Spring and Majors Creek	748866	6061960	Water Quality	Nil
SW-6	Majors Creek downstream of site infrastructure	749242	6061779	Water quality and flow volume	V-notch weir and continuous water level logger
SW-7	Majors Creek – below escarpment	750668	6056711	Water quality	Nil
SW-8	Majors Creek – upstream of confluence with Bells Creek	752773	6054308	Water quality	Nil
SW-9	Bells Creek	752923	6054450	Water quality	Nil
SW-10	Majors Creek – downstream of Araluen	754150	6050293	Water quality	Nil
SW-11	Spring Creek – downstream of Tributary 3	749235	6062047	Water flow	V-notch weir and continuous water level logger
TSF-1	Discharge to Tailings Storage Facility	749128	6063200	Water quality and flow volume	Tailings spigots
WRESB01	Waste Rock Emplacement Sediment Basin 01	748948	6063492	Water Quality	Nil

Note 1: Datum = MGA94 Zone 56

7.3 EXISTING SURFACE WATER ENVIRONMENT

7.3.1 Introduction

This sub-section provides an overview of surface water quality and flow upstream of, within and downstream of the Project Site. Detailed information regarding the existing surface water environment can be found on the Project website.

- Surface water data is provided in an excel spreadsheet to allow detailed investigation of the results to occur (http://divminerals.com.au/dargues-gold-mine/environment/monitoring/water/).
- Annual Reviews provide detailed information on the monitoring data for the preceding 12 months (http://divminerals.com.au/dargues-gold-mine/environment/reporting/annual-environmental-management-report/).

All monitoring data is held in ESdat Environmental Management Software which can be accessed by Company personnel.

7.3.2 Summary of Existing Surface Water Quality

Water quality in existing watercourses has been measured consistent with this plan since 2012. Full results of the monitoring program are presented on the Project website (www.divminerals.com.au), with results for pH and electrical conductivity (i.e. salinity) presented graphically. The data may be summarised as follows.

- pH is variable but typically between 6.5 and 8.0.
- Electrical conductivity is variable within the Project Site. In summary, however, the following comments can be made.

– Water at locations SW-2 and SW-3 within Spring Creek have a higher conductivity than water at all other monitoring locations, possibly reflecting the contribution of groundwater to Spring Creek in the vicinity of the Dargues Reef Shaft.

– Water at location SW-6 within Majors Creek has a higher conductivity than water at location SW-5, which in turn generally has a higher conductivity than water at SW-4. This may reflect the progressively increased proportion of groundwater contribution to the flow of Majors Creek downstream of SW-4.

– Water in Spring Creek has a higher conductivity than water in Majors Creek.

– Water in Spring Creek consistently has a higher conductivity than the ANZECC (2000) trigger value of 350µS/cm. Water within Majors Creek at locations SW-4 and SW-5 typically has a conductivity less than the ANZECC (2000) trigger value, however, water at location SW-6 typically has a conductivity in excess of the trigger value.

- Total suspended solids varies from 5mg/L to 1 890mg/L, with significant fluctuations between sampling locations and sampling events.
- Heavy metals, including As, Cd, Cr, Cu, Pb, Ni, Zn and Bi, are typically below or close to detection limits.
- All measured parameters are highly influenced by both water flow and date of collection.

7.3.3 Summary of Existing Surface Water Flows

Flow rates have been measured at V-Notch weirs on Spring Creek (locations SW2 and SW11) and Majors Creek (locations SW4 and SW6)**.** Data from these monitoring locations is available for the period December 2012 to January 2020. That data indicates that Spring Creek has an approximate average base flow of between 0.2L/sec and 0.5L/sec and a flow ranging between 0.0L/sec and 30L/sec during periods of drought and following rainfall events respectively. Majors Creek has an approximate average base flow of between 3L/sec and 4L/sec, with flow ranging between 0.0L/sec and 75L/sec during periods of drought and following rainfall events respectively.

7.4 WATER QUALITY MONITORING PROGRAM

Table 7.2 presents the surface water quality monitoring and frequency of monitoring that would be undertaken within and surrounding the Project Site. It is noted that targeted sampling will be undertaken, at the discretion of the Sustainability Manager, in order to characterise water quality during high rainfall events.

The following procedures would be implemented during all surface water monitoring operations.

- All field monitoring equipment will be calibrated according to the manufacturer's instructions at the commencement of the monitoring program.
- Laboratory samples will be collected by appropriately trained personnel:
  - from a shallow depth in the centre of the stream, using an extendable sampling arm if required;
  - using bottles provided by the testing laboratory; and
  - correctly labelled, preserved and transported to the laboratory within the appropriate Technical Holding Time under a chain of custody protocol to the laboratory.

The results of all water quality testing will be:

- recorded in the Project's environmental database and analysed on receipt as described in Section 10;

- published, once verified, on the Project website; and
- included in the Annual Review for the Project.

Table 7.2 Surface Water Monitoring Program

Monitoring Location	Monitoring Frequency[1]	pH	Electrical Conductivity (EC)	Dissolved Oxygen (DO)	REDOX[2]	Temperature	Biological Oxygen Demand	Turbidity	Total Suspended Solids (TSS)	Major cations[2]	Major anions[2]	TKN[2]	TON[2]	Ammonia Nitrogen	Phosphorus[2]	Metals[2]	Xanthates (Carbon Disulphide)	Oil and Grease	Alkalinity ($CaCO_3$)	Hardness	Flow Rate
CF-1	Monthly (if triggered)	R/C, L	R. L	F	F	F	L		L	L	L	L	L	L	L	L	L	L	L	L	M
SP-1	Weekly when pumping	R/C, L	R. L	F	F	F	L		L	L	L	L	L	L	L	L	L	L	L	L	M
SW-1	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-2	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	D
SW-3	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-4	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	D
SW-5	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-6	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	D
SW-7	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-8	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-8	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-9	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-10	Monthly	F, L	F, L	F	F	F	L	F	L	L	L	L	L	L	L	L	L	L	L	L	
SW-11	-																				D
TSF-1	Weekly	R/C, L	R. L	F	F	F			L	L	L	L	L	L	L	L	L	L	L		M
WRESB01	Monthly / Weekly (F)	F, L	F, L	F	F	F	L		L	L	L	L	L	L	L	L	L	L	L	L	

Note 1: Initially as described, with the frequency of monitoring to be reviewed in consultation with the relevant government agencies 12 months after the commencement of construction operations. Where practicable, groundwater and surface water quality monitoring is to be undertaken at the same time.

Note 2: REDOX = Oxygen reduction potential
Major cations = sodium, potassium, calcium,
Major anions = chloride and sulphate,
TKN = Total Kjeldahl Nitrogen.
TON = Total Oxidised Nitrogen,
Phosphorous = total phosphorus and reactive phosphorus,
Metals = Al, As, Cd, Cr, Co, Cu, Fe, Hg, Mg, Mn, Ni, Pb, Zn (dissolved, total)

Note 3: F = Field measurement
L = Laboratory measurement
R/C = Real time/continuous measurement
M = Meter
D = Data logger

7.5 WATER FLOW MONITORING PROGRAM

Surface water flows within natural drainages will continue to be monitored at the locations identified in Table 7.1, namely at locations SW-2, SW-4, SW-6 and SW-11 using a V-notch weir. It is acknowledged that peak flows will overtop the v-notch weirs, but as the Project has the potential to adversely impact on base flows, with limited potential to impact on peak flows, the monitoring program has been designed to target base flows. The following data collection and analysis procedures will be implemented during surface water flow monitoring at locations SW-2, SW-4, SW-6 and SW-11.

Flow rates at each location will be monitored continuously using a data logger. The data is published to the Company's website and is reviewed with the water quality monitoring program and the results analysed in conjunction with rainfall data from the automatic weather station.

Flow monitoring at locations CF-1 and SP-1 will be undertaken using an in-line meter. Flow monitoring at location TSF-1 will be undertaken using a methodology suitable for monitoring slurries with very high solids content.

7.6 TAILINGS PIPELINE MONITORING PROGRAM

Principal pipelines with the potential to cause environmental harm in the event of an unplanned rupture are the Tailings and Decant Return Pipelines. Both these pipelines are fully enclosed within a secondary pipe and flow leak detection.

Finally, the pipeline corridor will be inspected each shift (every 12 hours) for evidence of leakage or discharge of tailings or supernatant water. The management of potential leakages or spillage from tailings material is managed and monitored in accordance with the *Dargues Gold Mine – Tailings Storage Facility 01 – Operating Manual.*

7.7 ACID ROCK DRAINAGE MONITORING PROGRAM

As indicated in Table 7.2, water quality at locations TSF-1 and WRESB01 will be monitored for pH at weekly intervals. This monitoring program will detect any decrease in pH that may indicate acid generation within the Tailings Storage Facility or Waste Rock Emplacement to enable an appropriate management plan to be implemented in accordance with the Triggers and the action and response plan identified in Section 7.7.1.

7.7.1 Trigger Values – Acid Rock Drainage

Table 7.3 presents the TARP that would be implemented throughout the life of the Project for waters within TSF-1, SP-1 and WRESB01. The purpose of the TARP is to determine the onset of oxidation of sulphides and generation of acidic leachate and to provide an appropriate response.

Table 7.3 Acid Rock Drainage TARP

Acid Rock Drainage - TARP					
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**
Level 1	Water quality pH values between 6.5 and 8.5.	Continue monitoring program	None required.	Sustainability Manager	No
Level 2	Water quality pH values between 6.0 and 6.5, or a downward trend (acidifying) is seen in the monitoring data.	Undertake check sampling for field pH and laboratory sampling for full suite of analytes.	Mine Manager Process Plant Manager	Sustainability Manager	No
Level 3	Water quality pH values less than 6.0.	Undertake check sampling for field pH and laboratory sampling for full suite of analytes. Check mine reconciliation reports for ore and waste rock sources. Pump water from relevant basin to the MWSD01 on a continual basis.	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Mining Geologist Sustainability Manager	No
Level 4	Water quality pH values less than 6.0, confirmed by laboratory check sampling.	Continue pumping to MWSD01. Undertake an investigation to find the source of the low pH material and remediate as required. Submit report following completion of the investigation to government agencies.	Company Director General Manager Mine Manager Process Plant Manager Government Agencies	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes

Note:
1. Applicable to Waste Rock Emplacement Sediment Basin 01 (WRESB01), Tailings Storage Facility 01 (TSF01) and Seepage Collection Pond 01 (SPC01).

7.8 SURFACE WATER QUALITY - TRIGGERS, ACTIONS AND RESPONSE PLAN

7.8.1 Trigger Values - Discharge of Surface Water

If triggered, water discharged as part of the compensatory flow program will be required to meet the water quality trigger values set as part of the ambient water quality assessment required under Environment Protection Licence 20095. That assessment will be undertaken in consultation with the EPA, prior to the compensatory flow program commencing.

As identified in Section 5.4, the Company will ensure that water discharged from CF-1 (Figure 7.1) is sourced principally from the harvestable rights dams when water is available within those dams. SEEC (2010b) identified that, based on 100 years of rainfall data from Braidwood, water will be available within those dams on 97% of the modelled days. When water is not available within the harvestable rights dams, water for the compensatory release program will be sourced from the historical workings and the water treatment plant, associated with the processing plant, with the proportion of water from each source adjusted to ensure compliance with the relevant trigger values.

7.8.2 Trigger Values - Surface Water Quality

Table 7.4 presents the trigger values for surface waters in natural drainages upstream of, within and downstream of the Project Site, recommended by GHD (2022). These are site-specific guideline values (SSGVs) that are based on the lowest applicable water quality objective (WQOs), except for analytes for which the 80th percentile concentration at background site SW-4 (as representative of the background water quality) was higher.

Where the water quality at downstream locations (SW-2, SW-3, SW-11, SW-6, SW-7, SW-8, SW-10) exceeds the trigger values included in Table 7.4 the Surface Water Quality TARP (Table 7.5) would be implemented.

Table 7.4 Surface Water Quality Trigger Values – Surrounding Waters

Analyte	Assessment criteria	Justification
Physico-chemical parameters		
EC (µS/cm)	350	ANZECC (2000) upland river physical and chemical stressor
pH (pH unit) (lower)	6.5	ANZECC (2000) upland river physical and chemical stressor
pH (pH unit) (upper)	8.4	Background site SW-4 80th percentile value
Dissolved oxygen (% saturation)	90-110	ANZECC (2000) upland river physical and chemical stressor
Total dissolved solids	1000	ANZECC (2000) recreation guideline
Turbidity (NTU)	27.6	Background site SW-4 80th percentile value
Metals (dissolved)		
Aluminium	0.264	Background site SW-4 80th percentile value
Antimony	0.003	Australian drinking water guidelines - health value
Arsenic	0.01	Australian drinking water guidelines - health value
Beryllium	0.06	Australian drinking water guidelines - health value
Boron	0.5	ANZECC (2000) irrigation long-term trigger value
Cadmium	0.0002	ANZG (2018) DGV (95% species protection value)
Chromium	0.001	ANZG (2018) DGV (95% species protection value)
Cobalt	0.05	ANZECC (2000) irrigation long-term trigger value
Copper	0.0014	ANZG (2018) DGV (95% species protection value)
Iron	0.868	Background site SW-4 80th percentile value
Lead	0.0034	ANZG (2018) DGV (95% species protection value)
Manganese	0.1	ANZECC (2000) recreation guideline
Mercury	0.00006	ANZG (2018) DGV (99% species protection value)
Molybdenum	0.01	ANZECC (2000) irrigation long-term trigger value
Nickel	0.011	ANZG (2018) DGV (95% species protection value)
Selenium	0.005	ANZG (2018) DGV (99% species protection value)
Silver	0.00005	ANZG (2018) DGV (95% species protection value)
Uranium	0.01	ANZECC (2000) irrigation long-term trigger value
Zinc	0.008	ANZG (2018) DGV (95% species protection value)
Nutrients		
Ammonia	0.01	ANZECC (2000) recreation guideline
Nitrate	10	ANZECC (2000) recreation guideline
Nitrite	1	ANZECC (2000) recreation guideline
Total nitrogen	1.08	Background site SW-4 80th percentile value
Total phosphorus	0.04	Background site SW-4 80th percentile value
Reactive phosphorus	0.02	Background site SW-4 80th percentile value
Other parameters		
Chloride	400	Australian drinking water guidelines – health values
Fluoride	1	ANZECC (2000) irrigation long-term trigger value
Sodium	300	ANZECC (2000) recreation guideline
Sulfate	400	ANZECC (2000) recreation guideline
Water hardness	500	ANZECC (2000) recreation guideline

Table 7.5 Surface Water Quality Trigger Action and Response Plan

Surface Water Quality – TARP					
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**
Level 1	Water quality sampling results equal to or less than prescribed trigger values.	Continue monitoring program as prescribed in the *Water Management Plan.*	None required.	Sustainability Manager	No
Level 2	Water quality sampling results outside trigger values.	Compare the result with historical sampling data and upstream data to determine whether the exceedance is related to seasonal variation, flow conditions in Majors Creek or Spring Creek, or sampling error.	Mine Manager Process Plant Manager	Sustainability Manager	No
Level 3	Exceedance not comparable to historical data and/or higher than background site.	Undertake check sampling to confirm initial results. Commence investigation to determine possible causes of the exceedance.	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Mining Geologist Sustainability Manager	No
Level 4	Check sampling confirms exceedance.	Immediate implementation of appropriate management measures pending further investigation; and Engagement of a suitably qualified and experienced expert, in consultation with government agencies, to further investigate and report on the exceedance(s), including potentially undertaking biological or aquatic ecology sampling, providing advice in relation to the significance of the exceedance(s) and recommending amelioration measures to be implemented.	Company Director General Manager Mine Manager Process Plant Manager Government Agencies	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes

Note:
1. All surface water quality sampling.

7.9 MAJORS CREEK BASE FLOW - TRIGGERS, ACTIONS AND RESPONSE PLAN

7.9.1 Trigger Values – Majors Creek Base Flow

Table 7.6 presents the Majors Creek base flow trigger value that would initially be implemented throughout the life of the Project. This trigger value has been determined based on a combination of monitoring of base flow prior to the commencement of mining operations, as well as groundwater modelling presented in AGE (2010). It is acknowledged that further monitoring and groundwater remodelling will be undertaken throughout the life of the Project. As a result, the initial base flow trigger value will be reviewed annually based on pre-mining monitoring results and revised groundwater monitoring.

Table 7.6 Base Flow Trigger Values

Parameter	Unit	Initial Trigger Value[1]
Majors Creek Base Flow (Including compensatory flow program).	L/s	<3.2
Note 1: To be reviewed annually based on pre-mining monitoring results and revised groundwater modelling.		

7.9.2 Actions and Response Plan

Following receipt of all base flow monitoring results, the Company will, within three business days, review that data against the trigger value identified in Table 7.6. In the event that the measured flow rate together with the compensatory flow program is lower than the trigger value, the Company will immediately arrange for further check sampling to be undertaken to confirm the initial monitoring result.

It is noted that the check sampling will be required to be undertaken following a period of no rainfall to ensure that base flows only are being measured.

Should the check sampling indicate that Majors Creek base flow volumes are higher than the trigger value identified in Table 7.6, no further action will be taken.

Should the check sampling indicate that Majors Creek base flow volumes remain lower than the trigger value identified in Table 7.6, the Company will immediately increase the rate at which water is discharged as part of the compensatory flow program to achieve the identified base flow trigger value. In addition, the Company will contact the agencies listed in Section 2.1.2 to advise them of the result of the check sampling and determine, in consultation with those agencies, appropriate management actions. These would include, but not be limited to, engagement of a suitably qualified and experienced expert, in consultation with the above agencies, to further investigate the base flow and provide advice in relation to the significance of the lower base flow and recommended amelioration measures to be implemented, including whether further groundwater monitoring is warranted. A copy of any resulting experts report will be provided to relevant government agencies identified in Section 2.1.2, registered water users and placed on the Project's website.

8. AQUATIC ECOLOGY MONITORING PROGRAM

8.1 INTRODUCTION

The information provided in this sub-section has been drawn from a document entitled *Dargues Reef Gold Project – Aquatic Ecological Assessment – November 2011* prepared by Cardno Ecology Lab and hereafter referred to as Cardno (2011). A copy of this report is available from the Project's website () along with subsequent reports completed on an annual basis.

This sub-section includes the following.

- Aquatic ecology monitoring locations within and surrounding the Project Site.
- An overview of the methodology that will be employed to monitor aquatic ecology at each of the identified monitoring locations.
- A description of the existing aquatic ecology environment.
- An outline of the monitoring program that will be undertaken during the life of the Project.

8.2 AQUATIC ECOLOGY MONITORING LOCATIONS

Figure 8.1 and Table 8.1 present the locations of the aquatic ecology monitoring locations. In summary, the monitoring locations were selected to ensure the following.

- Suitable habitat, including riffle and pool edge habitat, is present within a single 100 m reach of the creek. It is noted that no riffle habitat was observed within Spring Creek. As a result, the assessment of Spring Creek included an assessment of pool edge habitat only. In addition, the habitat is required to include fish habitat that is suitable for sampling with bait traps and a backpack electrofisher.
- Suitable water flow and water quality measurements samples to be collected.
- Suitably accessible in a timely and safe manner.
- A wide distribution of sites within and downstream of the Project Site.

Based on the above criteria, six sites were selected by Cardno (2011), with a further two sites selected during subsequent surveys. Section 5.1 and Appendix B of Cardno (2011) provides a description of each of the monitoring locations and the coordinates (as shown in Table 8.1) for each respectively.

Table 8.1 Aquatic Ecology Monitoring Locations

Monitoring Location	Easting	Northing
AE-1	750661	6056543
AE-2	750510	6056814
AE-3	749904	6061061
AE-4	749669	6061390
AE-5	749167	6062666
AE-6	748845	6063537
AE-7	748567	6061356
AE-8	748157	6060705
Note 1: Datum = MGA94 Zone 56		

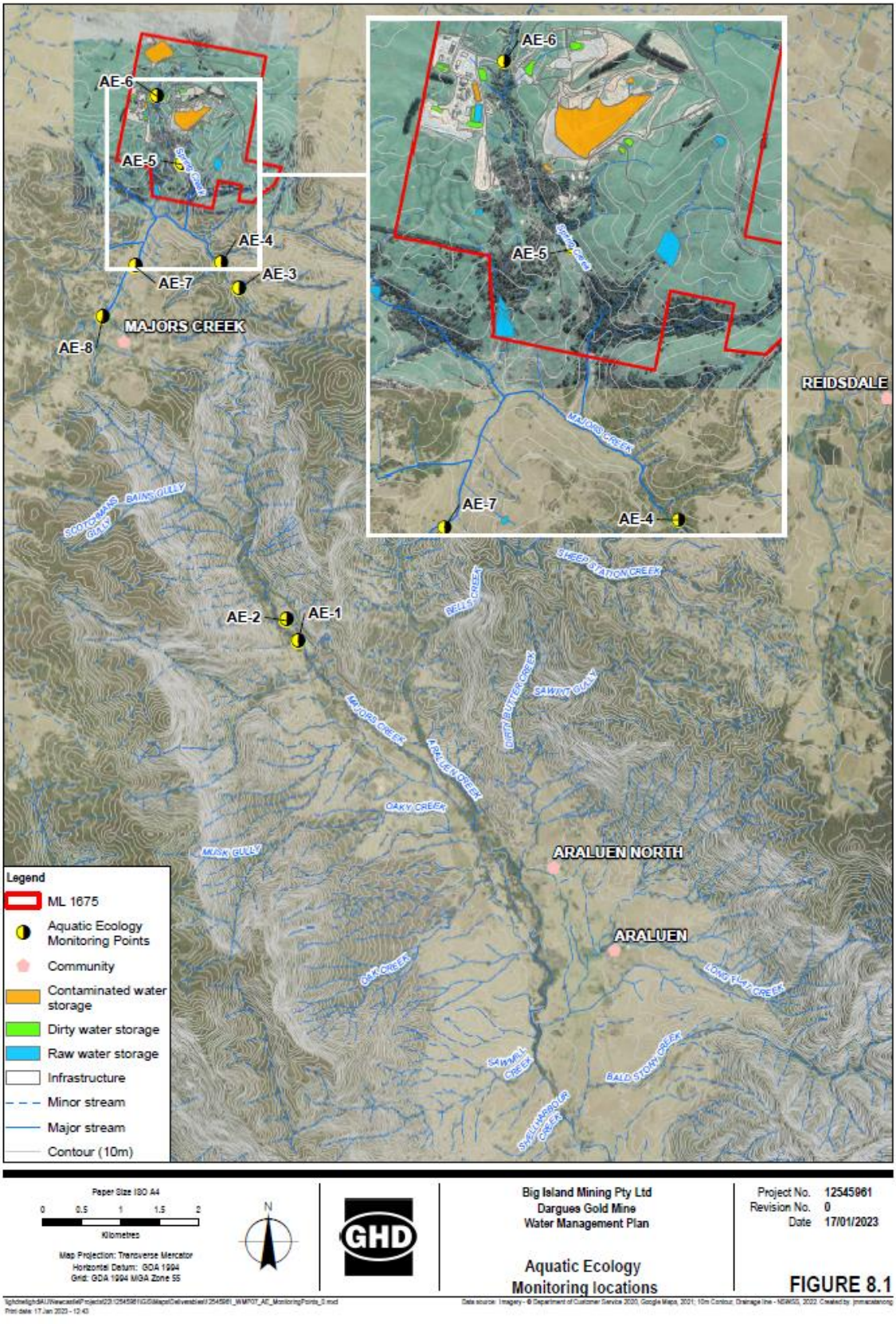


Figure 8.1 Aquatic Ecology Monitoring Locations

8.3 AQUATIC ECOLOGY MONITORING METHODOLOGY

The aquatic ecology monitoring methodology used by Cardno (2011) was the AusRivAS methodology supplemented with an assessment of fish fauna. This methodology is described in Section 4 of Cardno (2011) and includes an assessment of the following.

- A standardised description of the adjacent land and the condition of riverbanks, channel and bed.
- An assessment of water quality.
- Sampling for macroinvertebrates and fish using nets, bait traps and electrofishing.

This methodology will continue to be used to monitor aquatic ecology during the life of the Project.

8.4 EXISTING AQUATIC ECOLOGY ENVIRONMENT

Section 5 of Cardno (2011) presents the existing aquatic ecology environment within and downstream of the Project Site and may be summarised as follows.

- The quality of fish habitat was considered moderate in Majors Creek, with the exception of AE-3 which was classified as marginal. Within Spring Creek the fish habitat was classified as minimal to unlikely.
- Water quality was poorer in Spring Creek than Major Creek, with water quality generally improving downstream in both cases. Electrical conductivity was typically higher than the ANZECC (2000) trigger level of 350 µS/cm.

Macroinvertebrate assemblage diversity associated with both edge and riffle habitat in Majors Creek was slightly better (for edge habitat) and slightly worse (for riffle habitat) than the expected reference condition. By contrast, macroinvertebrates associated with edge habitat in Spring Creek (there was no observed riffle habitat) was notably worse than expected compared to reference conditions.

8.5 AQUATIC ECOLOGY MONITORING PROGRAM

In accordance with the recommendations of Cardno (2011), the aquatic ecology monitoring program will be undertaken using the AusRivAS methodology at locations AE-1 to AE-8 during Spring and Autumn each year.

Following each 12 month monitoring period, during operation of the Project, the frequency of the monitoring program will, in consultation with the relevant government agencies, be reviewed.

8.6 STREAM HEALTH - TRIGGERS, ACTIONS AND RESPONSE PLAN

A stream health assessment is undertaken bi-annually by a suitably qualified, experienced and independent aquatic ecology expert whose appointment has been approved by the Director-General of the Department of Planning and Infrastructure. That assessment is undertaken consistent with Schedule 3, Condition 29(e) and compares the health of Majors and Spring Creeks at the locations identified in Figure 8.1 against the baseline assessment described in Section 8.

The trigger for further investigation will be a finding by the independent expert that there has been a non-negligible Project-related reduction in stream health. In the event that this trigger level is achieved, the Company would implement the following.

- Notify the relevant government agencies (Table 2.3).
- Ensure that the expert is provided with the resources to further investigate the issue to:

– identify the causes of the reduction in stream health;

– provide corrective actions to remediate any impacts; and

– provide a range of recommendations to manage the issue.

Following receipt of the expert's report, the Company would review the recommendations and determine, in consultation with the relevant government agencies, which recommendations would be implemented and the relevant timeframes.

9. GROUNDWATER MONITORING PROGRAM

9.1 BACKGROUND

This sub-section has been prepared by Australasian Groundwater and Environmental Consultants, and updated by the Company.

The geological setting within and surrounding the Project Site is described in Section 4.1.4 of the *Environmental Assessment* and is summarised below.

The Project Site and surrounds are underlain by Devonian-aged Braidwood Granodiorite, an intrusive pluton consisting of multiple intrusions and occupying an area of about 1 000km^2**.** The Braidwood Granodiorite intruded the early Devonian-aged Long Flat Volcanics to the west of the Project Site and Ordovician-aged sediments to the east.

The Braidwood Granodiorite is cut by a number of north-west / south-east trending, steeply dipping faults. The granodiorite is also cut by a second suite of structures striking to the north-northeast (Figure **9.2**).

The groundwater assessment for the project (AGE, 2010) indicates that the hydrogeological regime of the Project Site and surrounds consists of:

- a highly disturbed, shallow alluvial aquifer averaging about 100m wide and 2m to 3m deep along Majors Creek;
- a regolith (weathered granodiorite) aquifer extending to between 8m and 15m below the surface; and
- a fractured granodiorite aquifer characterized by “tight” massive granodiorite and localised permeable fracture systems (Figure 9.1).

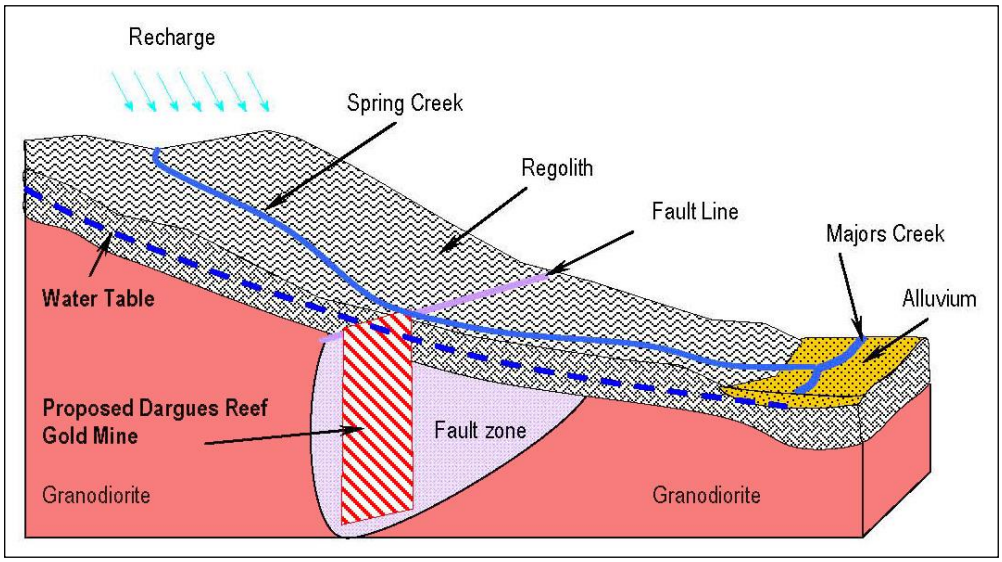


Figure 9.1 Conceptual Groundwater Model

In addition, predictive numerical modelling for the Project estimates the following.

- Groundwater inflow to the Mine will vary between 2 L/s and 12 L/s during the initial two years of mining as the decline is driven to total depth. During the remaining years of mining operations, namely Years 3 to 5, inflow will decrease to approximately 7 L/s.
- Extraction of groundwater from the historical Snobs, Stuart and Mertons and United Miners workings at a modelled rated of 2.5 L/s or 78.9 ML/yr would result in drawdown of water levels within the workings of approximately 70 m, 28 m and 23 m respectively.
- The Project would result in drawdown of the piezometric surface or groundwater levels within and surrounding the Project Site, with the limit of that drawdown, as defined by the 1 m drawdown contour, being a maximum of approximately 2.5 km from the Dargues Reef Mine.
- The lowered groundwater levels would result in reduced rate of discharge from groundwater to Majors and Spring Creeks varying from nil to approximately 2.1 L/s. This lost base flow would be replaced through the compensatory flow program during and following the life of the Project.
- There would be no impact on groundwater dependent ecosystems, ground water supply in the village of Majors Creek or groundwater quality as a result of the Project.
- Four bores would be located within or close to the 1 m drawdown contour and the Company will monitor water levels within those bores and negotiate appropriate arrangements with the owners of those bores, if required.
- Groundwater levels are expected to have largely recovered within 2 years of the cessation of mining operations, with the remaining last few metres of groundwater level recovery expected to occur within 10 years of the cessation of mining operations.

In addition, AGE (2010) notes that groundwater from the granodiorite and regolith aquifers is not embargoed. However, the predictive modelling indicates that there will be a reversal of groundwater flow over a very small area of Majors Creek where groundwater in alluvium will leak to the underlying bedrock at a rate of approximately 0.1 L/s (3.2 ML/year). This water is embargoed and mitigation measures include full compensation for water lost through the compensatory flow program (Section 5.4).

9.2 EXISTING GROUNDWATER QUALITY ENVIRONMENT

9.2.1 Introduction

This sub-section provides an overview of groundwater levels and quality within and surrounding the Project Site.

9.2.2 Groundwater Level

Groundwater levels are presented from the Company's website and provides water level data from January 2017 to present. Groundwater levels at the mine show very little variation over time, season or rainfall, with groundwater levels between zero metres and 25 m below surface. Deeper water levels are seen in the granodiorite aquifer and shallower water levels seen in the regolith and alluvial aquifers.

9.2.3 Groundwater Quality

Section 4.4.2.3 and Table 4.19 of the *Environmental Assessment* present groundwater quality data within the Project Site. Initial groundwater quality monitoring was undertaken in November and December of 2011.

Additional groundwater quality data from monitoring undertaken since 2014 is presented on the Company's website (www.divminerals.com.au). In summary, groundwater quality recorded at dedicated monitoring bores generally falls within nominated trigger levels for parameters including pH, electrical conductivity and heavy metals including arsenic and lead. Values recorded at one bore, DRBW03, consistently exceed the nominated trigger values. It is suggested that that this bore has unique chemistry and that, as no activities with the potential to adversely impact groundwater quality have been undertaken within the Project Site, the nominated trigger values may not be appropriate for establishing future impacts.

The Company continue to review annual groundwater monitoring data against historical monitoring results in order to establish more appropriate trigger values for individual monitoring locations, in consultation with the relevant government agencies.

9.3 MONITORING LOCATIONS

The groundwater monitoring program has been designed to provide timely warning of any unpredicted or adverse impacts so that remedial actions can be taken. In addition, the program will also provide information that will be used to refine the groundwater model during the life of the Project. Figure **9.2** to Figure 9.3 and Table 9.1 to Table 9.2 present the locations of monitoring bores within and surrounding the Project Site. These include the following.

- 13 dedicated monitoring bores.

- One monitoring location near the base of the active workings, currently identified as MW01. This monitoring location will be relocated as mine development progresses until the full depth of the approved workings is achieved.
- Six Tailings Storage Facility (TSF), monitoring bores which are to be installed following a hydrogeological investigation of the TSF site and construction of the TSF.
- Three bores accessing historical workings.
- Two shallow monitoring wells that will initially be used for the TSF irrigation area and will also be used to monitor groundwater levels within the embankment and around the WSD.

It is noted that of the original 16 private bores in the vicinity of the Project Site identified for monitoring in the *Environmental Assessment*, 10 could not be located, had collapsed or landholders refused permission to monitor. Dargues will undertake consultation of landholders of private bores that have been constructed since the original *Environmental Assessment.* This includes GW110858, GW111630, GW110886, GW112287, GW110919 and GW110752 as shown on the WaterNSW Bore Map (WaterNSW, 2022).

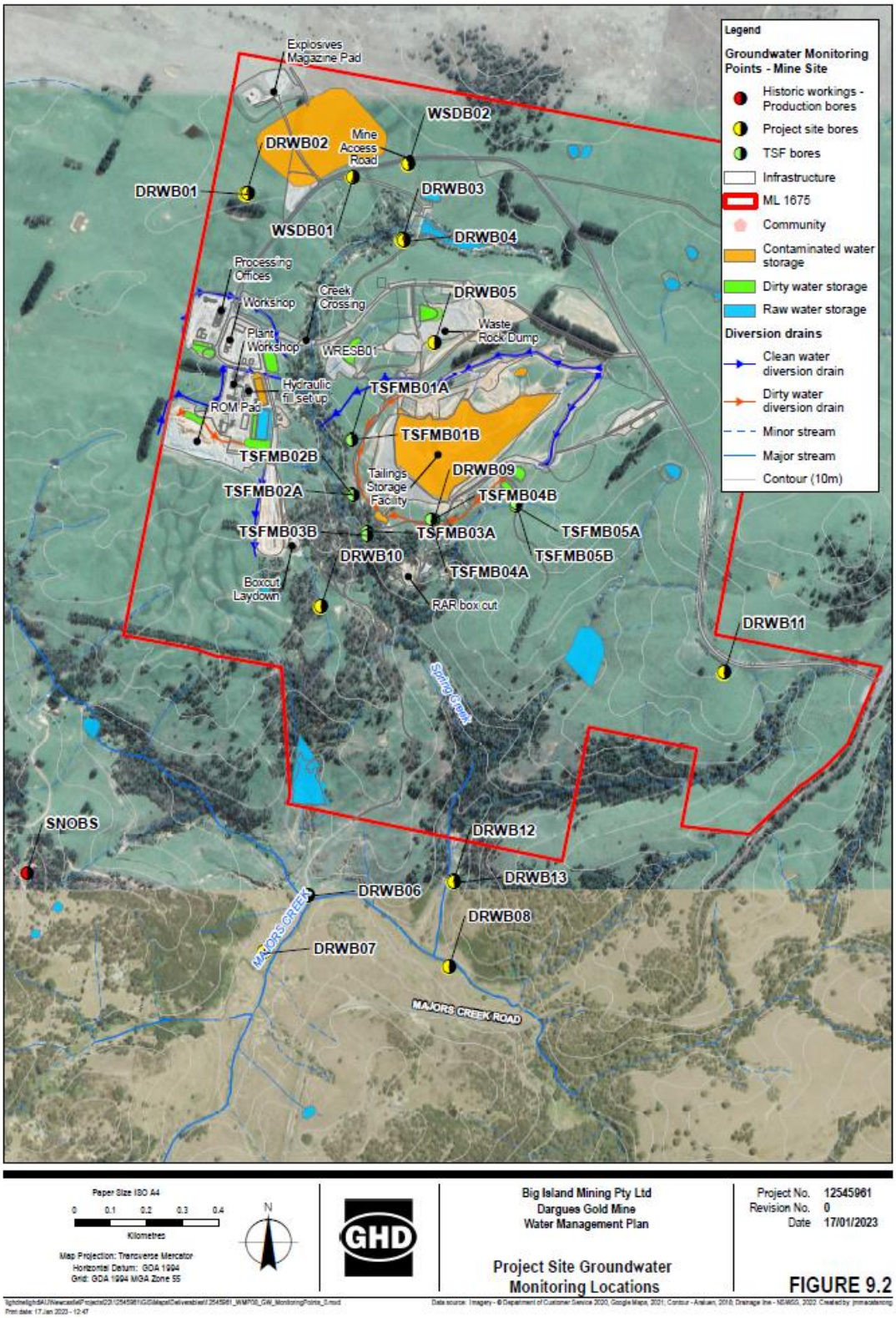


Figure 9.2 **Project Site Groundwater Monitoring Locations**

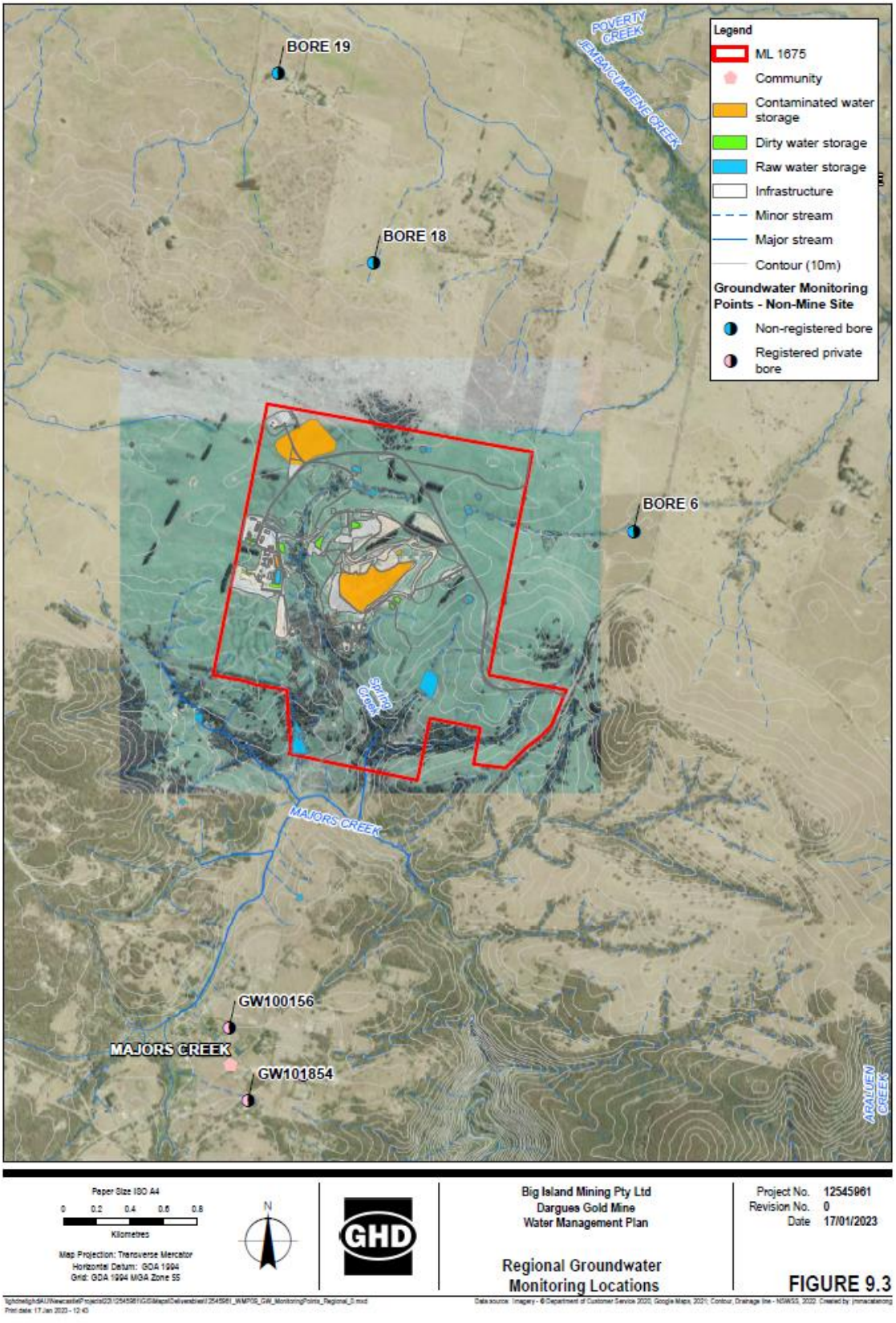


Figure 9.3 Regional Groundwater Monitoring Locations

Table 9.1 Groundwater Monitoring Locations – Mine Site

Bore	Location[1]		Elevation (mAHD)		Depth (m)	Hole Dip (degree)	Screen (mbGL)[3]	Aquifer	Water Act 1912 License No.
	(mE)	(mN)	Ground	TOC[2]					
Project Site Monitoring Bores									
DRWB01	748681	6063944	714.65	715.20	67	-90	61.0 – 7.0	granodiorite	
DRWB02	748676	6063945	714.67	715.24	15.9	-90	9.9 – 15.9	regolith	
DRWB03	749111	6063817	712.35	712.91	66.1	-90	60.1 – 66.1	granodiorite	
DRWB04	749115	6063814	712.72	713.29	16.5	-90	10.5 – 16.5	regolith	
DRWB05	749200	6063530	721.89	721.87	15.58	-90	9.6 – 15.6	regolith	
DRWB06	748848	6061994	632.34	632.98	6.45	-90	3.45 – 6.45	alluvium	
DRWB07	748724	6061835	636.72	637.17	11.25	-90	5.25 – 11.25	alluvium	
DRWB08	749240	6061796	627.38	628.01	11.22	-90	5.12 – 11.12	alluvium	
DRWB09	749197	6063037	TBC	TBC	102	-90	80-90	granodiorite	
DRWB10	748886	6062798	TBC	TBC	102	-90	80-90	granodiorite	
DRWB11	750005	6062613	712	713	100	-90	90-100	granodiorite	
DRWB12	749253	6062033	632	633	10	-90	5-10	alluvium	
DRWB13	749254	6062032	632	633	79	-90	65-79	granodiorite	10BL605772
WSDB01[4]	748975	6063992	TBC	TBC	TBC	TBC	TBC	regolith	
WSDB02[4]	749129	6064030	TBC	TBC	TBC	TBC	TBC	regolith	
Mine Workings									
MW01	Variable throughout the life of the Project							granodiorite	
Tailings Storage Facility Monitoring Bores									
TSFMB01A	748968	6063267	689		50	-90	43.0 – 48.0	Granodiorite	10BL605864
TSFMB01B	748970	6063264	689		10	-90	7.0 – 10.0	Regolith	10BL605864
TSFMB02A	748970	6063111	680		50	-90	47.0 – 50.0	Granodiorite	10BL605864
TSFMB02B	748973	6063108	680		10	-90	7.0 – 10.0	Regolith	10BL605864
TSFMB03A	749011	6062997	671		50	-90	47.0 – 50.0	Granodiorite	10BL605864
TSFMB03B	749013	6063009	671		10	-90	7.0 – 10.0	Regolith	10BL605864
TSFMB04A	749190	6063040	698		50	-90	47.0 – 50.0	Granodiorite	10BL605864
TSFMB04B	749195	6063040	698		10	-90	7.0 – 10.0	Regolith	10BL605864
TSFMB05A	749426	6063079	711		50	-90	47.0 – 50.0	Granodiorite	10BL605864
TSFMB05B	749427	6063085	711		10	-90	7.0 – 10.0	Regolith	10BL605864
Historical Workings – Production Bores									
Snobs	748072	6062059	696	696.5	78	-90	70 – 76	granodiorite	
Stuart and Mertons	To be confirmed once constructed							granodiorite	
United Miners	To be confirmed once constructed							granodiorite	

Note1: projection MGA94 Zone 56
Note 2: TOC = Top of Collar
Note 3: mbGL = meters below ground level
Note 4: proposed additional groundwater monitoring bores to be installed near the approved WSD

Table 9.2 Groundwater Monitoring Locations – Non-Mine Site

Bore	Location[1]		Elevation (mAHD)		Depth (m)	Hole Dip (degrees)	Screen (mbGL)	Aquifer
	(mE)	(mN)	Ground	TOC[2]				
Registered Private Bores								
GW100156	748432	6060612	Not known	Not known	47	-90	Nil	Not known
GW110023	748872	6060331	Not known	Not known	90	-90	42m-48m 66m-78m	Granodiorite
GW101854	748542	6060186	Not known	Not known	32	-90	Nil	Not known
GW110752 [6]	748936	6068058	Not known	Not known	42	-90	6m-42m	Not known
GW110858 [6]	750723	6063383	Not known	Not known	36	-90	6m-36m	Not known
GW110886 [6]	752904	6066016	Not known	Not known	24	-90	5m-24m	Not known
GW110919 [6]	749028	6068245	Not known	Not known	36	-90	6m-36m	Not known
GW111630 [6]	751668	6066001	Not known	Not known	30	-90	Not known	Not known
GW112287 [6]	751071	6066744	Not known	Not known	48	-90	12m-48m	Not known
Non-registered Bores[4]								
Bore 6	750840	6063571	699	Not known	Not known	-90	Not known	Not known
Bore 18	749290	6065175	696	Not known	30m	-90	Not known	granodiorite
Bore 19	748713	6066305	670	Not known	36m	-90	Not known	granodiorite

Note1: projection MGA94 Zone 56
Note 2: TOC = Top of Collar Elevation
Note 3: mbGL = meters below ground level
Note 4: Bore reference numbers sourced from bore census prepared for the *Environmental Assessment*.
Note 5: Nested bore. Both bores to be monitored.
Note 6: Dargues to undertake consultation with landholders of these bores to confirm that they can be accessed for monitoring.

9.4 GROUNDWATER LEVEL MONITORING PROGRAM

Groundwater levels are monitored at all project site monitoring bores, TSF monitoring bores and within the historical workings listed in Table 9.1. Groundwater levels are also monitored at registered private bores GW100156 and GW110023 listed in Table 9.2. Groundwater levels cannot be monitored at GW101854 due to the bore headworks.

Groundwater levels are monitored at the frequency of sampling of water quality field parameters outlined in Table 9.3.

9.5 GROUNDWATER QUALITY MONITORING PROGRAM

Table 9.3 presents the groundwater quality monitoring program.

All groundwater monitoring sample collection, storage and transportation is undertaken in accordance with the procedures outlined by the document *Murray Darling Basin Groundwater Quality Sampling Guidelines, August 1997, Technical Report No. 3* published by the Murray Darling Basin Commission. It is noted, however, that the identified sampling procedure will be required to be modified in some cases because of bore conditions or landholder instructions, including restrictions on the volume of water that may be purged or the equipment that may be used.

In response to concerns expressed by the DPI Water [now DPE Water] in relation to the quality of groundwater in the deep granodiorite aquifer and potential impacts associated with paste fill operations, the Company will undertake monitoring of groundwater in the underground workings.

Table 9.3 Groundwater Monitoring Program

Bore	Monitoring Frequency[1]	Parameters [1]
Project Site Monitoring Bores		
DRWB01	Monthly	Field parameters: pH, electrical conductivity (EC), dissolved oxygen (DO), temperature
DRWB02 DRWB04	Quarterly	pH (lab), EC (lab), TSS, redox, major anions and cations, nitrate, nitrite, nitrate + nitrite, total nitrogen, TKN, TON, ammonia, phosphorus, dissolved metals
DRWB06 DRWB07 DRWB08 DRWB09 DRWB10 DRWB12 DRWB13	Monthly	Field parameters: pH, EC, DO, turbidity, temperature
	Quarterly	pH (lab), EC (lab), TSS, redox, major anions and cations, nitrate, nitrite, nitrate + nitrite, total nitrogen, TKN, TON, ammonia, phosphorus, dissolved metals, xanthates
Deep Granodiorite Aquifer		
MW01	Monthly	Field parameters: pH, EC, DO, turbidity, temperature
	Quarterly	pH (lab), EC (lab), TSS, redox, major anions and cations, nitrate, nitrite, nitrate + nitrite, total nitrogen, TKN, TON, ammonia, phosphorus, dissolved metals, xanthates
Tailings Storage Facility Monitoring Bores		
TSFMB01A	Weekly	Field parameters: pH, EC, DO, turbidity, temperature
TSFMB01B TSFMB02A TSFMB02B TSFMB03A TSFMB01B TSFMB04A TSFMB04B TSFMB05A TSFMB05B	Monthly	pH (lab), EC (lab), TSS, redox, major anions and cations, nitrate, nitrite, nitrate + nitrite, total nitrogen, TKN, TON, ammonia, phosphorus, dissolved metals, xanthates, alkalinity
Historic workings		
Snobs	Monthly	Field parameters: pH, EC, DO, turbidity, temperature
Stuart and Mertons United Mines	Quarterly	pH (lab), EC (lab), TSS, redox, major anions and cations, nitrate, nitrite, nitrate + nitrite, total nitrogen, TKN, TON, ammonia, phosphorus, dissolved metals, alkalinity
Registered Private Bores < 3 km		
GW100156	Quarterly	Field parameters: pH, EC, DO, turbidity, temperature
GW110023 GW101854 [2]	Annual	Field parameters: pH, EC, DO, turbidity, temperature

Note 1: REDOX = Oxygen reduction potential
Major cations = sodium, potassium, calcium
Major anions = chloride and sulphate
TKN = Total Kjeldahl Nitrogen
Phosphorous = total phosphorus and reactive phosphorus
Dissolved metals = aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, zinc
Note 2: Bore equipped with a pump. Not suitable for monitoring of standing water levels.

The Company notes that simply sampling water removed from the workings would not provide an accurate representation of groundwater quality within the deep granodiorite aquifer because the mine water will comprise water sourced from the following.

- Groundwater inflow to the workings.
- Surface water pumped underground for use in mining-related operations, potentially resulting in contamination of that water.
- Surface water taken underground and used for dust suppression purposes.

As a result, to avoid the risk of contamination and non-representative samples, the Company will construct a series of short, downward-sloping, drill holes in the deepest section of the workings. The drill holes will be constructed in a manner that ensures that mine water cannot flow into the hole. As a result, the Company anticipates that the quality of the water in the drill hole will reflect the quality of groundwater within the deep granodiorite aquifer.

Groundwater within the drill hole will be sampled using the methodology described previously.

As mine workings progress, the Company anticipates that the standing water level within the relevant drill holes will be lowered until they become dry. Prior to this occurring, a replacement drill hole will be constructed lower in the workings. This process will be repeated until the workings reach their full depth, at which time a permanent sampling location will be established.

Following completion of mining operations and a subsequent decision to cease mine dewatering, the workings are expected to fill with water. In order to allow continued sampling of water within the deepest section of the mine, the Company will install infrastructure to allow sampling at that point. This infrastructure may include a pipeline down the decline, a drill hole to intersect the deepest workings or similar. Further information in relation to the proposed sampling infrastructure will be provided prior to the cessation of mine dewatering operations.

9.6 GROUNDWATER MODEL REVIEW AND REFINEMENT

A sensitivity analysis and review of the groundwater model was undertaken in preparation for the Land and Environment Court hearing by Australasian Groundwater and Environmental Consultants (AGE). That model was subsequently updated in 2013 following the commencement of construction.

In summary, the sensitivity analysis and model review was undertaken to determine the sensitivity of the model to a range of parameters. The analysis concluded the following.

- The range of predicted baseline decline in baseflow in Majors and Spring Creek resulting from the Project is comparatively small, namely within ±1L/s.
- The range of predicted groundwater drawdown scenarios was limited, with the exception of the area to the southeast of the Dargues Reefs Mine where variations in the assumed permeability of southeast-striking fractures resulted in an extension of the cone of drawdown in that area. Further groundwater level monitoring in that area will facilitate clarification of the extent of groundwater drawdown in that area throughout the life of the Project.

The groundwater model was reviewed and refined by AGE in July 2021 and included transient calibration, taking into account:

- ongoing groundwater and surface water level, flow and quality monitoring results; and
- a statistical analysis of input rainfall data between Braidwood and Majors Creek.

Overall, the updated model simulates lower inflow rates and a reduced drawdown footprint compared to previous model predictions.

Proposed pump testing will be undertaken using bores DRWB09 or DRWB10 (Figure **9**.**2**). The test pumping will be undertaken once underground mining has commenced and there is evidence of depressurisation of the granodiorite aquifer. The test program will target the fracture-controlled granodiorite aquifer. Pumping rates and duration will be determined during the test, however, the Company anticipates that the pumping bore will be drawn down relatively quickly and the duration of the test may be limited. Standing water levels in the pump bore, surrounding bores and open exploration holes will be monitored during and following the pump test.

9.6.1 Model Refinement and Review Program

Groundwater level monitoring data will be compared against drawdown predictions. This review will be undertaken on a six-monthly basis in accordance with EPBC 2010/5770 Approval Conditions. An investigation will be launched in the event that the following triggers are exceeded:

- Should the observed groundwater drawdown diverge by more than 15% from the modelled groundwater drawdown.
- Should the measured reduction in baseflow in Majors or Spring Creeks diverge from the modelled reduction in baseflow.

The investigation will include comparison of groundwater levels, mining progression and climate data to identify the potential cause of groundwater level or baseflow trends. Should the review indicate that impacts from mining are greater than predicted, the hydrogeological model will be updated.

The results of any review of the groundwater model will be presented in the *Annual Review.*

9.7 GROUNDWATER QUALITY - TRIGGERS, ACTIONS AND RESPONSE PLAN

9.7.1 Trigger Values – Groundwater Quality

Table 9.4 presents the groundwater quality trigger values for groundwater within and surrounding the Project Site that would be implemented throughout the life of the Project. Groundwater quality triggers are generally based on the range of baseline groundwater quality in regolith and alluvium presented in the *Environmental Assessment*.

Where the water quality is worse than the trigger values included in Table 9.4 the Groundwater Quality TARP (Table 9.5) would be implemented.

Table 9.4 Groundwater Quality Trigger Values – Project Site and Surrounds

Parameter	Unit	Initial Trigger Value
pH value	pH	6.5-8.5
Electrical Conductivity	µS/cm	>1300
Dissolved Oxygen	%sat	-
REDOX	mV	-
Bicarbonate Alkalinity as $CaCO_3$	mg/L	>200
Carbonate Alkalinity as $CaCO_3$	mg/L	>0.1
Hydroxide Alkalinity as $CaCO_3$	mg/L	>0.1
Total Alkalinity as $CaCO_3$	mg/L	>200
Chloride	mg/L	>300
Sulphate	mg/L	>110
Calcium	mg/L	>110
Magnesium	mg/L	>50
Sodium	mg/L	>60
Potassium	mg/L	>1.8
Nitrate as N	mg/L	>3.2

Parameter	Unit	Initial Trigger Value
Nitrite as N	mg/L	>0.02
Total Oxidized Nit. As N	mg/L	>3.2
Total Phosphorus as P	mg/L	>0.71
Aluminium	mg/L	-
Arsenic	mg/L	>0.002
Cadmium	mg/L	>0.0005
Chromium	mg/L	>0.001
Copper	mg/L	>0.0007
Iron	mg/L	-
Lead	mg/L	>0.0012
Mercury	mg/L	>0.0002
Nickel	mg/L	>0.003
Zinc	mg/L	>0.057
Xanthate	mg/L	-

Table 9.5 Groundwater Quality TARP

Surface Water Quality - TARP					
Event Level	**Trigger**	**Action / Planned Response**	**Immediate Contact**	**Mandatory Analysis Team**	**InControl Reportable**
Level 1	Water quality sampling results equal to or less than prescribed trigger values.	Continue monitoring program as prescribed in the *Water Management Plan.*	None required.	Sustainability Manager	No
Level 2	Water quality sampling results greater than prescribed trigger values.	Compare the result with historical sampling data to determine whether the exceedance is related to seasonal variation, or sampling error.	Mine Manager Process Plant Manager	Sustainability Manager	No
Level 3	Exceedance not comparable to historical data.	Undertake check sampling within one month of initial sampling to confirm initial results. Commence investigation to determine possible causes of the exceedance. The investigation should include comparison of water quality data against mining progression, rainfall data, groundwater model predictions and, flow conditions in Majors or Spring Creek	General Manager Mine Manager Process Plant Manager	General Manager Mine Manager Process Plant Manager Mining Geologist Sustainability Manager	No
Level 4	Check sampling confirms exceedance.	Immediate implementation of appropriate management measures pending further investigation; and Engagement of a suitably qualified and experienced expert in consultation with government agencies to further investigate and report on the exceedance(s) including, potentially undertaking biological or aquatic ecology sampling, provide advice in relation to the significance of the exceedance(s) and recommended amelioration measures to be implemented.	Company Director General Manager Mine Manager Process Plant Manager Government Agencies DPE	Company Director General Manager Mine Manager Process Plant Manager Sustainability Manager	Yes

9.7.2 Trigger Values – Groundwater Level

Table 9.6 presents the groundwater level trigger values that would be implemented throughout the life of the Project for groundwater in non-Project related bores that are outside the proposed Project Site. It is noted that these trigger levels apply only to non-Project related bores surrounding the Project Site. However, the Company will monitor groundwater levels within bores and exploration drill holes within the Project Site for use when validating and revising the groundwater model during the life of the Project.

Table 9.6 Groundwater Level Trigger Values – Non-Mine Related

Parameter	Aquifer	Trigger Value
Standing water level in non-Project related bores.	Granodiorite or Regolith	Standing water level below 10th percentile measured level.
	Alluvial Aquifer	
	All aquifers – actively used bores	Standing water level below intake during normal operation of the bore.

For the purposes of determining the trigger value of "Standing water level below 10th percentile measured level", all groundwater level monitoring data for a particular bore will be analysed to determine the 10th percentile, namely the water level that is lower than 90% of the water level readings. As more data is collected, the trigger value for each bore will be adjusted to reflect the larger dataset of water levels.

9.8 EXTERNAL WATER USERS - TRIGGERS, ACTIONS AND RESPONSE PLAN

In determining whether water users are likely to be adversely impacted by the exceedance, the Company will take into account the following factors.

- Whether the available drawdown in the bore, namely the distance between the standing water level and the pump intake, has been reduced to a degree that may result in the water level being further lowered to the level of the pump intake during normal used of the bore. No fixed degree of Project-related drawdown can be established for all potentially-affected bores because the level of drawdown that may affect the ability of a landholder to use the bore will depend on the rate and frequency of pumping during normal operation, the permeability of the material surrounding the bore and depth of the pump intake.
- Whether the exceedance is likely to result in reduced surface water availability for a landholder who has recently, is currently, is likely to or reasonably could use surface water for a beneficial purpose.
- Whether the reduced availability of surface water or groundwater could reasonably be attributed to the Project.

In the event of a dispute in relation to whether a water user is likely to be adversely impacted by the exceedance, the Company would initially seek to explain how it reached the conclusion that is reached and negotiate an appropriate arrangement with the water user. In the event that a mutually agreeable arrangement cannot be achieved, the Company would seek the assistance of the Secretary of the Department of Planning, Industry and Environment to resolve the issue in accordance with the requirements of *Condition 3(23)* of MP 10_0054 MOD5.

In the event that a water user is determined to have been adversely impacted by the Project, the Company will implement the following.

- Provide equivalent compensatory water, at least on an interim basis, within 24 hours of any Project-related adverse impact being identified.
- Negotiate an alternative long-term water supply. This may include the following.

– Re-equipping or deepening of an existing bore.

– Construction of a new bore.

– Provision of water from some other source, including supply and equipping of one or more water tanks.

- In the event that an alternative water supply cannot reasonably be provided, the Company will identify appropriate alternative compensation in consultation with the affected land owner.

In the event of a dispute in relation to the above, the Company will implement the previously identified dispute resolution measures.

Finally, the Company will, prior to commencing mining operation, consult with surrounding water users predicted to be adversely or potentially adversely impacted by the Project, namely, the owners of bores 6, 15, 16, 17, 18 and 20 identified in Figure 4.26 of the *Environmental Assessment* in relation to management of potential impacts to their water supply.

10. REPORTING AND EVALUATION OF COMPLIANCE

As indicated in **Section 7 and 9**, the Company will, within three business days of the receipt of all water-related monitoring data, review that data against the trigger values identified in Table 7.4, Table 9.4 and Table 9.6**.** In the event that an exceedance of the relevant trigger values is identified, the actions identified in relevant section of this Plan (i.e. **Section 7.7, 7.8, 7.9, 8.6, or 9.7**) will be implemented.

At the end of each calendar month, all water-related monitoring data will be collated into a monthly environmental monitoring report, together with monitoring data relevant to other aspects of the surrounding environment. That report will provide the following in relation to water-related monitoring results.

- An overview of water-related monitoring undertaken during the month for both quality and volume, including identification of monitoring for which results have been received and for which results are still pending.

An overview of whether any of the trigger values identified in Table 7.4, Table 9.4 and Table 9.6 have been exceeded and the status of the resulting actions, if any. Errors and outliers will be identified by comparison of monitoring data against historical data, climate data and mining progression.

- A graphical presentation of the monitoring data received during the month compared with historic monitoring data and site water balance model.
- A discussion of the status of any investigations into exceedances of the relevant trigger values during previous months.

The monthly environmental monitoring report will be reviewed by the Sustainability Manager, Mining Manager and General Manager. Once approved, the report will be made publicly available on the Project website within 28 days of the end of the month.

The monthly environmental monitoring reports would be collated into the *Annual Review* for the Project which would also be made publicly available on the Project website once approved by the Department of Planning, Industry and Environment. The *Annual Review* will report on trends in water monitoring data, including comparison of data against historical data, mining progression and climatic data. This will enable trends and variability in data to be attributed to either climatic drivers, or mining activity. The Company will present the actual versus forecast annual usages against each work and access license listed in Section 3.3 as part of the annual water balance presented in the *Annual Review*.

Compliance with the above reporting requirements and the performance of erosion and sediment controls will be audited during the Independent Environmental Audit, in accordance with Schedule 5, Condition 8 of the Project Approval.

11. COMPLAINTS HANDLING AND RESPONSE

The *Environmental Management System* includes a detailed complaints management procedure. This sub-section records the procedures that would be implement following receipt of a water-related complaint.

Water-related complaints may be received via one of the following methods.

- Directly via the 24-hour, 7 day per week Community Information Line (1800 732 002). This number is advertised widely in the local media, on signage at the Project Site entrance and on the Company's website (www.divminerals.com.au).
- Directly via a dedicated email address (DGM.Community@divminerals.com.au) which is advertised in a similar manner to the Community Information Line.
- Directly via the Project website (www.divminerals.com.au).
- Indirectly via the relevant government agencies.

In addition, regular public meetings are held with the community as part of the Company's standard consultation procedures. These meeting will provide a further forum at which complaints may be received.

Following receipt of any water-related complaint, the Company would implement the following procedure.

1. The complaint will be reviewed by the Sustainability Manager or their delegate to determine the nature, date and time of the event the subject of the complaint.
2. Where appropriate, data from data loggers or real-time monitors would be downloaded or retrieved and examined for evidence that may support the complaint. Similarly, the result of the most recent sampling programs would be similarly reviewed.
3. Where appropriate, further sampling would be undertaken to test the veracity of the complaint. The nature of that sampling would depend on the nature of the complaint.
4. A report would be prepared outlining the results of Steps 2 and 3 above and that report would be made available to the complainant. The Environmental Supervisor or their delegate would contact the complainant to discuss and attempt to resolve the complaint.
5. In the event that the procedures identified in Step 3 above resolve the issues raised, no further action would be taken. In the event that the complaint is not resolved, the Environmental Supervisor would seek to determine what further test work would resolve the complaint and, where reasonable and appropriate, implement that test work.

6. In the event that the monitoring program identifies an exceedance of the triggers the relevant action plan would be implemented.
7. In the event that multiple complaints are received from the same individual(s) and the Company can demonstrate:
   - that it has appropriately investigated at least three of those complaints and the results of those investigation indicate on each occasion that the relevant trigger values have not been exceeded as a result of the Project; and
   - there is documented evidence of a genuine attempt by the Company to discuss the issue and seek a resolution with the complainant;

then the Company may, in consultation with the relevant government agencies, limit responses to further complaints from that individual(s).

12. PUBLICATION OF MONITORING INFORMATION

The Company will place all monthly monitoring reports on the Project's website (www.aureliametals.com.au). In addition, those reports will be included as appendices to the *Annual Review*. That document would also be published on the Project's website.

Finally, the Company would make all reports prepared in response to an exceedance of a trigger value available on the Project website where that report indicates that the exceedance of the trigger value is directly attributable to the Project and that the exceedance has the potential to result in environmental harm or required modification of this Plan.

13. ROLES AND RESPONSIBILITIES

Table 13.1 shows the roles and responsibilities held by each member of staff respectively.

Table 13.1 Roles and Responsibilities

ROLES	RESPONSIBILITY
General Manager	Must ensure adequate resources are available to enable implementation of the Plan.
Mining Manager	Accountable for the overall environmental performance of the Project, including the outcomes of this Plan.
Sustainability Manager	Ensure the implementation of this Plan, including reporting of non-compliances with the trigger values and subsequent implementation of the relevant action plan. Ensure employees are competent through training and awareness programs.

14. COMPETENCY TRAINING AND AWARENESS

All personnel shall undergo surface water and groundwater management awareness training as part of the Site induction program. The following areas are covered in the induction.

- The importance of appropriate management of water within the Project Site, including the sensitivity of the downstream receiving environment and the Company's obligations under MP 10_0054 MOD5, its Environmental Protection Licence and its obligations under the *Protection of the Environment Operations Act 1997.*
- The location and significance of the contaminated, dirty and clean water catchments within the Project Site.
- The relevant management measures that are to be implemented within each of the identified catchments. These will include:
  - appropriate storage, management and use of all hydrocarbons and chemicals; and
  - the requirement to report all spills and other incidents with the potential to cause pollution to water.

15. INCIDENT REPORTING

Incident reporting is addressed in the relevant action plans, however, in summary, in the event that an investigation concludes that an exceedance of the relevant trigger values is directly attributed to activities associated with the Project the event will be immediately reported to those agencies listed in Table 15.1.

Table 15.1 Notification List

Type	Contact
Regulatory Agency	Department of Planning and Environment
	Environment Protection Authority
	Queanbeyan Palerang Regional Council
	Eurobodalla Shire Council
Aurelia Metals	General Manager
	Mine Manager
	Process Plant Manager
	Sustainability Manager
Big Island Mining	Directors
Community	Downstream Water Users Register
	Community Consultative Committee
	Social Media

In addition, in accordance with the requirements of the Project's Environmental Protection Licence, the *Dargues Gold Mine – Pollution Incident Response Management Plan* (the PIRMP) would be implemented.

16. REVIEW

In accordance with Condition 5(4) of MP 10_0054 MOD5, this Plan will be reviewed and, if required, revised within 3 months of:

- the submission of an annual review under Condition 5(3);
- the submission of an incident report under Condition 5(6);
- the submission of an audit report under Condition 5(8); and
- any modification to the conditions of MP 10_0054.

In addition, this Plan will be reviewed and modified as required:

- during development of the Project;
- following reviews of the groundwater model; and
- following the implementation of any action plan that recommends modification to management of water within or surrounding the Project Site.

All reviews will include the adequacy of strategies, plans and programs as required under the Project Approval.

Recommendations for appropriate measures or actions to improve the environmental performance of the Project and/or any assessment, plan or program will be incorporated into this Plan.

Appendix A Rehabilitation Performance Indicators and Completion Criteria – Reproduced from the *Mine Operations Plan 2017*

Objective	Performance Indicator	Completion Criteria	Rehabilitation Monitoring Methodology	Monitoring Frequency	Justification/ Source[1]	Progress at start of MOP	Expected Completion	TARP Ref No.[2]
Phase 1 – Decommissioning								
Domain 1 – Infrastructure Area								
All infrastructure and services not suitable for a lawful final land use will be removed.	Services not required for final land use disconnected.	All relevant services disconnected.	Relinquishment inspection and report, including photographs.	Single occurrence following decommissioning (unless follow up actions are identified).	EA – Section 2.14.5	Not Commenced	Post MOP	
	Infrastructure not required for final land use removed.	All relevant infrastructures removed.				Not Commenced	Post MOP	
Those sections of roads/tracks to be retained for a lawful final land use reduced in width / size to that suitable for final land use.	Roads not required for final land use are removed.	Roads removed unless specified to be retained (see **Plan 4**).				Not Commenced	Post MOP	
	Roads required for final land use are reduced in width (if required).	Road reduced in width to that suitable for final land use.				Not Commenced	Post MOP	
Domain is free from hazardous materials and contaminants.	Contaminated land identified and remediated.	Contaminated land assessment indicates contamination acceptable for final land use.	Contamination report prepared by qualified person.	Following decommissioning with follow up validation testing, as required.		Not Commenced	Post MOP	7
	No hazardous materials remain.	Contaminated land assessment indicates contamination acceptable for final land use.	Contamination report prepared by qualified person.	Following decommissioning with follow up inspection if required.		Not Commenced	Post MOP	7
Domain 2 – Tailings Storage Facility *Domain 3 – Water Management Area* *Domain 4 – Material Emplacement Area* *Domain 5 – Stockpiled Material* *Domain 6 – Box Cut and Decline*								
All infrastructure not suitable for lawful final land use will be removed.	Infrastructure not required for final land use removed.	All relevant infrastructure removed.	Relinquishment inspection and report, including photographs.	Single occurrence following decommissioning (unless follow up actions are identified).	EA – Section 2.14.5	Not Commenced	Post MOP	
Domain is free from contaminants.	Contaminated land identified and contaminated material placed within Tailings Storage Facility.	Contaminated land assessment indicates any contamination is acceptable for final land use.	Contamination report prepared by qualified person.	Following decommissioning with follow up validation testing as required.		Not Commenced	Post MOP	7
Phase 2 – Landform Establishment								
Domain 1 – Infrastructure Area								
Free draining, stable and permanent landform established.	Presence of erosion / sedimentation controls and monitored water quality.	Water quality meets the objective of Section 120 of the *Protection of the Environment Operations Act 1997*. 'Downstream' water quality monitoring records total suspended solids <50mg/L or within 10% of 'upstream' levels (whichever is the greater).	Water quality testing. Monitoring reported annually through Annual Reviewing.	Quarterly during and immediately following operations with frequency to be reduced progressively post-closure, based on performance.	EA – Section 2.14.3	Not Commenced	Post MOP	1 and 7
		No 'active' erosion or sedimentation visible.	Monitoring reports, including photographs.	Visual inspections undertaken quarterly during operations and post-closure until site relinquishment.		Not Commenced	Post MOP	
Domain 2 – Tailings Storage Facility								
Infrastructure removed, and domain made safe.	Infrastructure removed.	All exposed pipework and infrastructure removed, where it is safe to do so.	Relinquishment inspection and report, including photographs.	Single occurrence following decommissioning (unless follow up actions identified).	EA – Section 2.13.5	Not Commenced	Post MOP	2

Objective	Performance Indicator	Completion Criteria	Rehabilitation Monitoring Methodology	Monitoring Frequency	Justification/ Source[1]	Progress at start of MOP	Expected Completion	TARP Ref No.[2]
Phase 2 – Landform Establishment (Cont'd)								
Domain 2 – Tailings Storage Facility (Cont'd)								
Retained water management structures are stable and permanent overflow drainage is constructed.	Sediment basins and dams are stable and contain a suitably designed spill way for overflow of water to surrounding drainage lines.	Walls and spillways do not show signs of active erosion and are assessed to be stable.	Relinquishment inspection and report, including photographs, prepared by a qualified person.	Single occurrence following completion of final landform (unless follow up actions identified).	EA – Section 2.14.3	Not Commenced	Post MOP	7
Free draining, stable and permanent landform established.	Landform suitable for growth media establishment.	Decommissioned dams have been backfilled and landform constructed to blend with surrounding topography.	Relinquishment inspection and report, including photographs, prepared by a qualified person.	Single occurrence following decommissioning (unless follow up actions identified).		Not Commenced	Post MOP	1 and 2
Domain is non-polluting.	Landform and retained water management structures are non-polluting.	Water monitoring indicates that water quality complies with the trigger values determined in accordance with ANZECC (2000) or is consistent with ambient water quality and satisfies Section 120 of the POEO Act 1997.	Water quality testing.	Monthly during and immediately following operations with frequency to be reduced progressively post-closure, based on performance.	EA – Section 2.14.3	Not Commenced	Post MOP	7
Domain 3 – Water Management Area								
No landform establishment activities applicable to this domain.								
Domain 4 – Material Emplacement Area *Domain 5 – Stockpiled Material*								
Free draining, stable and non-polluting landform established.	All material used in rehabilitation activities and surface appropriately profiled. Landform suitable for growth medium development.	No pooling of water observed within landform. Landform established to integrate with the surrounding topography / cropping land.	Relinquishment inspection and report, including photographs, prepared by a qualified person.	Single occurrence following completion of final landform establishment (unless further earthworks required).	EA – Section 2.14.7	Not commenced	Post-MOP	1
Domain 6 – Box Cut and Decline								
Safe landform established.	Access to box cut blocked.	Access to box cut blocked, removed or covered.	Relinquishment inspection and report, including photographs, prepared by a qualified person.	Single occurrence following completion of final landform establishment (unless further earthworks required).	EA – Section 2.14.6	Not Commenced	Post-MOP	3
	Construction of safety bunds around box cut perimeter.	Safety bunds constructed.	Visual inspection completed by site personnel. Relinquishment inspection and report, including photographs, prepared by a qualified person.	Visual inspections to occur a part of regular site operation. Single occurrence following completion of final landform establishment (unless further earthworks required).		Not Commenced	Post-MOP	3
	Box cut backfilled from WRE where sufficient material exists.							
Phase 3 – Growth Medium Development								
Domain A – Infrastructure Area								
No growth medium development activities applicable to this domain.								
Domain B – Water Management Area								
No growth medium development activities applicable to this domain.								

Objective	Performance Indicator	Completion Criteria	Rehabilitation Monitoring Methodology	Monitoring Frequency	Justification/ Source[1]	Progress at start of MOP	Expected Completion	TARP Ref No.[2]
Phase 3 – Growth Medium Development (Cont'd)								
Domain C – Rehabilitation Area – Grassland *Domain F – Rehabilitation Area – Forest*								
Establish soil / growing medium suitable for pasture use.	Compacted surfaces deep ripped along contour.	Photographs of ripped areas.	Photographs included in a relinquishment report.	Following deep ripping.	EA – Section 2.14.10	Not Commenced	Post MOP	
	Minimum growth medium depth of 300mm spread over domain.	Photographs of covered areas.	Photographs included in a relinquishment report, soil test pits used to determine depth.	Following growth medium spreading.				4, 5 and 6
Phase 4 – Ecosystem and Land Use Establishment								
Domain A – Infrastructure Area *Domain B – Water Management Area*								
No ecosystem and land use establishment activities apply to these domains.								
Domain C – Rehabilitation Area – Grassland *Domain F – Rehabilitation Area – Forest*								
Establishment of vegetation communities with a similar species composition to the surrounding vegetation communities.	Weeds are not competing or impacting on rehabilitated area.	Rehabilitation monitoring confirms the foliage cover of non-native and non-target species (weeds) is equivalent to surrounding vegetation / analogue sites not disturbed by mining activities.	Photographs included in a relinquishment report.	Following deep ripping.	EA – Section 2.14.10	Not Commenced	Post MOP	9
	Grazing by native, domestic and feral fauna not adversely impacting on ecosystem development.	Domestic grazing animals are excluded from the rehabilitation area except when controlled grazing is required for ecosystem development. Feral and native animal control programs implemented. Revegetation monitoring reports confirm appropriate level of grazing / equivalence with analogue sites not disturbed by mining.	Photographs included in a relinquishment report.	Following growth medium spreading.				8 and 11
Phase 5 – Ecosystem and Land Use Sustainability								
Domain A – Infrastructure Area *Domain B – Water Management Area*								
No ecosystem and land use sustainability activities apply to this domain.								
Domain C – Rehabilitation Area – Grassland *Domain F – Rehabilitation Area – Forest*								
Land capability similar to pre-mining capability.	Land capability.	Land capability, assessed in accordance with OEH, 2012.	Assessment report prepared by suitably qualified person.	Assessment by suitably qualified consultant (included in relinquishment report).	EA – Section 2.14.10	Not commenced	Post-MOP	8 and 10
	Agricultural productivity.	Agricultural productivity trending towards analogue sites and consistent with Land Capability Class VI established in OEH, 2012.	Production report prepared a suitable independent person.	Single occurrence post-closure (unless further activities required).		Not commenced	Post-MOP	
	Landform left to revegetate naturally or as required for final land use.	Revegetation monitoring reports confirm that vegetation diversity is consistent with analogue sites.	Assessment report prepared by suitably qualified person.	Quarterly visual inspections by site personnel. Reporting on rehabilitation condition every three years, increased to annually post-mine closure for a minimum of 5 years or otherwise until site relinquishment.		Not commenced	Post-MOP	

Objective	Performance Indicator	Completion Criteria	Rehabilitation Monitoring Methodology	Monitoring Frequency	Justification/ Source[1]	Progress at start of MOP	Expected Completion	TARP Ref No.[2]
Phase 5 – Ecosystem and Land Use Sustainability (Cont'd)								
Domain C – Rehabilitation Area – Grassland *Domain F – Rehabilitation Area – Forest (Cont'd)*								
Land capability similar to pre-mining capability (Cont'd)	Coverage, Biomass and Landscape Function Analysis.	Average landscape coverage, estimates of biomass and analysis of stability, infiltration/runoff and nutrient cycling indices trending towards analogue site.				Not commenced	Post-MOP	
	Weed species and abundance.	Revegetation monitoring confirms the foliage cover of non-native and non-target species (weeds) is equivalent to surrounding vegetation / analogue sites not disturbed by mining activities.	Weed inspection report (and subsequent control program, if required).	Biannually.		Not commenced	Post-MOP	9
	Pest species and abundance.	Monitoring confirms that pest species and abundance is consistent with analogue sites.	Pest species inspection report (and subsequent control program, if required).	Annually.	EA – Section 2.14.10	Not commenced	Post-MOP	9
Phase 6 – Land Relinquishment								
All domains								
Demonstrated compliance with all performance indicators for Phases 1 to 5.	Demonstrated compliance with all completion criteria for Phases 1 to 5.	Demonstrated compliance with all completion criteria for Phases 1 to 5.	Relinquishment report prepared by suitably qualified or experienced person(s).	Prior to relinquishment.	EA – Section 2.12.3	Not Commenced	Post MOP	