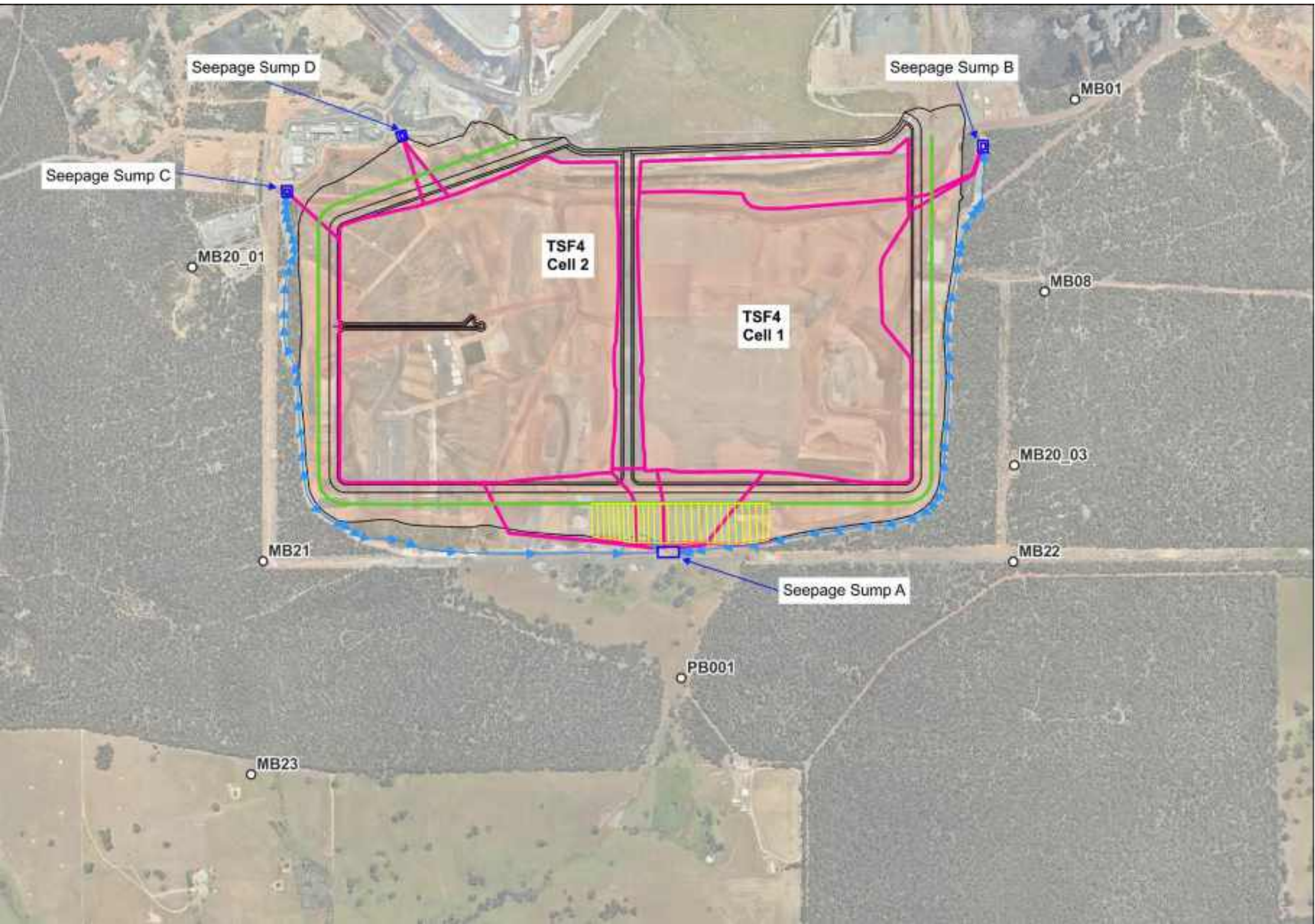
TSF4 Seepage Management Plan

Seepage Management Plan

Talison Lithium Pty Ltd

14 March 2025



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Superintendent Environment (Talison Lithium Australia Pty Ltd)

Authorised By Date 18/3/2025

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Executive Summary

Introduction and Background

This *TSF4 Seepage Management Plan* (**SMP**) summarises the understanding of risk associated with TSF4 seepage and covers the monitoring requirements and actions to manage the risk to the receiving environment. The *TSF4 Human Health and Environmental Risk Assessment* completed by GHD (2023h), other supporting investigations, and this SMP are required to address conditions and requests for information from the Department of Energy, Mines, Industry Regulation and Safety (**DEMIRS**) and the Department of Water and Environmental Regulation (**DWER**) related to the TSF4 approvals.

TSF4 compromises two cells with basal and embankment liners, as follows:

– Cell 1: Engineered clay-liner over ~80% of the area and Bituminous Geosynthetic Membrane (**BGM**) over the remaining ~20% of the area.
– Cell 2: 100% BGM liner.
– The embankments and future embankment lifts will be lined with BGM (with the exception of the divider embankment above 1,270m Reduced Level (**RL**)).

Operation of TSF4 has the potential to impact the surrounding environment through mobilisation of impacted seepage and run-off from the facility into the surface water and groundwater systems. The *TSF4 Human Health and Environmental Risk Assessment* (GHD 2023h) concluded:

– Predictive groundwater modelling of the subsurface beneath TSF4 shows that the Contaminants of Potential Concern (**CoPC**) within seepage that migrates through and beneath the engineered basal liner will adsorb/attenuate within the underlying saprolitic aquifer and remain close to the TSF4 footprint during operations and post-closure. The CoPCs should not migrate in groundwater beyond the mine-site boundary, nor discharge and impact the beneficial uses of the Woljenup Creek catchment.
– TSF4 internal drainage (above the engineered basal liner) and external surface drainage will be directed towards and be collected in sumps located external to TSF4 (Sumps A, B, C & D). The collected drainage, which will exceed site-specific water quality criteria, will be pumped-back to the Mine Water Circuit (**MWC**) during operations and until such time as the water is of suitable volume and quality for release via passive management strategies post-closure.

The key objectives for managing TSF4 potential seepage impacts on groundwater and surface water systems are:

– Maintain the groundwater quality at the mine premises boundary at background levels; and
– Prevent TSF4 seepage and/or drainage adversely impacting on the receiving environment of Woljenup Creek.

This TSF4 SMP is divided into *Groundwater Management* and *Surface Water Management*, as detailed below.

Groundwater Management

Overview:

The aim of the groundwater monitoring program is to detect TSF4 derived seepage impacts on the groundwater system and confirm that the impacted groundwater is within that predicted by groundwater modelling (modelled TSF4 impacts indicate impacts limited to margins of TSF4 footprint).

Monitoring:

Monitoring will occur in the following monitoring bores:

– Baseline monitoring bores: Bores generally removed from the TSF4 footprint. Monthly and quarterly (until included on L4247/1991/13) monitoring on the shallow and deeper bores respectively for field parameters, CoPCs, and ions.
– TSF4 perimeter monitoring bores: Shallow, intermediate, and deep bores located at the perimeter of TSF4 (within ~50m of the external toe of the southern embankment). Single sampling event during W6901/2024/1 Time Limited Operations (**TLO**), then when included on L4247/1991/13, monitoring for field parameters, CoPCs (metals), and ions.

The monitoring schedule is presented in **Appendix A Table 1**.

Reporting:

Data from monitoring events will be evaluated against Trigger levels (presented in **Appendix A Table 2**) . Where Trigger levels are not exceeded, **Routine Monitoring Reporting** will be undertaken, as per **Section 6.2**. Where the Trigger levels are exceeded and actions implemented, the **Non-routine Monitoring Reporting** will be undertaken as per **Section 6.3**.

Trigger and Interim Levels:

Baseline monitoring bores:

An exceedance of the *Site-Specific Water Quality Guidelines* (**WQG**) developed by GHD (2023e) occurs in a number of existing baseline monitoring bores (deemed as naturally occurring given the mineralised geological setting). Consequently, Trigger levels are based on a 30% increase above the baseline concentrations (seasonal maximum), for the key CoPCs at each monitoring bore (i.e.: As, Cs, Li, Rb, Sb, U). Trigger levels are presented in **Appendix A Table 2.**

TSF4 perimeter bores:

Monitoring of TSF4 perimeter bores has identified baseline (naturally occurring) concentrations above the WQGs. In addition, groundwater modelling indicates that TSF4 seepage (CoPCs) will impact some of the perimeter bores in the future. Perimeter monitoring bore Interim levels are therefore a 100% increase above baseline concentrations (seasonal maximum) for the key CoPCs (i.e. As, Cs, Li, Rb, Sb, U).

Trigger Levels (and Interim Levels) are presented in **Appendix A Table 2.** Where the Trigger levels are exceeded, Talison will implement **Action 1**. Interim Levels will be assessed after at least one year of monitoring (to detect potential seasonal effects) and Trigger Levels then set for bores at which Interim Levels currently apply.

Action 1: Monitoring and Review

Confirmatory monitoring will be undertaken within one month of Trigger exceedances. If elevated CoPC concentrations are reported, the groundwater will be assessed for TSF4 decant source signature based on the concentrations of major ions (SO_4, Na, HCO_3, and Cl) added during ore processing. Any increasing trends in decant source signature concentrations in groundwater will be assessed against the geochemical setting to provide supporting evidence of TSF4 impacts.

Where the reviews find supporting evidence of TSF4 impacts on groundwater due to elevated CoPC concentrations and increasing trends of decant signature, then Talison will:

- Report to DWER within 2 weeks of confirmation of TSF4 impacts, including monitoring results, follow-up actions and scheduling/reporting (as per **Section 6.2**).
- Implement **Action 2**.

Action 2: Risk Assessment

Update the TSF4 seepage risk assessment with new information including impacted groundwater extent, migration direction, and fate of impacted groundwater. Impacted groundwater fate will be predicted, which may include recalibration of the existing groundwater model and/or groundwater investigations, where required to support the risk assessment update.

Where the beneficial use of groundwater is diminished (above baseline concentrations, and above site-specific WQGs) at the following locations:

- At the premises boundary; and/or
- Discharge into Woljenup Creek;

the updated seepage risk assessment will present an understanding of the site-specific receptors which may be impacted (human health and the environment). If the receptors are exposed to impacted water quality above the WQGs, then the risk to the receptors is deemed unacceptable and implement **Action 3**.

Action 3: Remediation

Remedial options will be designed and implemented if risk to the receptors is assessed as unacceptable, the options which may include one or more of the following:

– Control of TSF4 source discharge (mitigation of surface water runoff and/or groundwater seepage).
– Pump-back of impacted groundwater (abstraction/recovery bores).
– Capture and management of impacted surface water within Woljenup Creek (e.g.: pump-back to MWC).

Surface Water Management: TSF4 Sumps

Overview:

The aim of monitoring drainage into the external Sumps (A, B, C, and D) is to detect flow rates outside the modelled values. Any differences would be accommodated in the yet to be designed passive management system, which is to be implemented post closure (to accommodate residual TSF4 seepage into sumps once active pump-back to the MWC ceases).

Monitoring:

Monitoring of TSF4 drainage into Sumps A, B, C, and D, either through discharge flow rates into the sumps, or pump-back rates to the MWC, using metered systems.

Reporting:

Metered discharges (or pump back) into/from Sump A will be evaluated against the Trigger levels (presented in **Appendix A Table 3**) within one month of receipt of data. Where Trigger levels <u>are not</u> exceeded, **Routine Monitoring Reporting** will be undertaken as per **Section 6.2**. Where Trigger levels <u>are exceeded</u> and actions implemented, **Non-routine Monitoring Reporting** will be undertaken as per **Section 6.3**.

Trigger Levels:

Applicable two years after the commencement of operations (i.e. commencing 18 January 2026) to accommodate tailings drainage achieving a settled water quality and flow rates, the Trigger levels are deemed 150% of modelled flow rates at Sump A, averaged over a period of 12 months. The Trigger levels are presented in **Appendix A Table 3.** (Sump A potentially discharges to the environment of Woljenup Creek, while any discharge from Sumps B, C and D is captured within the MWC).

Action: Update Predictive Modelling

If triggered during operations, the existing predictive model will be updated after three years post operation commencement (i.e. 18 January 2027). Where the existing model is updated, the results of the updated model will be used to review and set new Trigger levels.

<u>Surface Water Management: Woljenup Creek</u>

Overview:

Impacts on Woljenup creek, recognised as the TSF4 receiving environment, may occur as surface water runoff and groundwater discharge.

Monitoring:

The monitoring program includes flow rates, field parameters, CoPCs (metals) and major ions/nutrients within Woljenup Creek downstream of TSF4. Relatively high frequency (monthly) monitoring during W6618/2021/1 TLO, single sampling event during W6901/2024/1 TLO, then when included on L4247/1991/13, monitoring for field parameters, CoPCs (metals), and ions. The monitoring program and schedule is presented **Appendix A Table 4.**

Reporting:

Monitoring data will be evaluated against the Trigger levels presented in **Appendix A Table 5** within two weeks of receipt. Where Trigger levels <u>are not</u> exceeded, **Routine Monitoring Reporting** will be undertaken, as per **Section 6.2**. Where Trigger levels <u>are exceeded</u> and actions implemented, **Non-routine Monitoring Reporting** will be undertaken as per **Section 6.3**.

Trigger levels:

Trigger levels are based on a 30% increase over seasonal baseline maximum concentrations at SW24/01, or where analytes were not tested, the site-specific WQGs have been adopted as Trigger levels. TTrigger levels are presented in **Appendix A Table 5**; where they are exceeded, implement **Action 1**.

Action 1: Review of monitoring results:

Where Triggered, confirmatory monitoring will be undertaken within one month. If elevated CoPC concentrations persist (30% more than baseline), Woljenup Creek waters (i.e.: SW24/01) will be evaluated for TSF4 decant source signature (SO_4, Na, HCO_3).

If the impact to the Creek is deemed to reflect TSF4 source seepage and/or drainage implement **Action 2**. If a TSF4 source is not supported, then update baseline concentrations with new information, and adjust Trigger levels accordingly. In addition, increase the frequency of monitoring of Woljenup creek waters to monthly (includes all monitoring parameters). Review the requirement for monthly monitoring after six months.

Action 2: Risk Assessment

Compare Woljenup Creek water quality to the site derived WQGs. If TSF4 impacts cause water quality to exceed guidelines, identify site-specific receptors and identify exposure scenarios to confirm whether the potential risk is elevated to an actual risk. Where risks to the receiving environment (Woljenup Creek) are deemed to pose an actual risk, implement **Action 3**.

Action 3: Remediation

Where CoPC concentrations in Woljenup Creek are deemed to pose an unacceptable risk to the receptors, remedial options will be designed and implemented based on the following strategy:

– Control of TSF4 source discharge (mitigation of surface water runoff and/or groundwater seepage).
– Capture and management of impacted surface water within Woljenup Creek (e.g.: pump-back to MWC).

Review of Seepage Management Plan

This SMP is subject to updates based on new data and information gathered during monitoring, and any findings from investigations and risk assessments. Review of the SMP will occur at the following time frames:

– End of TLO.
– During operations at 5 yearly intervals.
– End of operations.
– End of site management.

In consultation with DWER, the SMP will also be reviewed and updated at times that new information becomes available which alters the understanding of risks posed to the receptors.

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1. Introduction

1.1 Background

Talison Lithium Pty Ltd (**Talison**) is constructing Tailings Storage Facility # 4 (**TSF4**) to facilitate ongoing operation of their Greenbushes Mine in Western Australia. The Department of Energy, Mines, Industry Regulation and Safety (**DEMIRS**) has approved the Mining Proposal (MP Reg ID 92728) and the Department of Water and Environmental Regulation (DWER) has issued Works Approvals (W6618 and W6901) to allow construction of TSF4. Operation of TSF4 is conditioned by L4247/1991/13.

Revision 0 of this Seepage Management Plan (**SMP**) was conditioned by the original version of W6618/2021/1. This revision of the SMP has been updated and is implemented in accordance with W6618/2021/1 Condition 15(d). It is informed by a suite of Studies (GHD 2023a-GHD 2023h), particularly the *Human Health and Environmental Risk Assessment* (HHERA) (GHD 2023h) to monitor and manage potential environmental impacts associated with seepage from TSF4 during operation, and post-closure.

1.2 Purpose of this Plan

The purpose of the SMP is to provide a monitoring program and management response to potential impacts on groundwater and surface water systems from TSF4 seepage. Management objectives are:

– Maintain the groundwater quality at the mine premises boundary at background levels; and
– Prevent the TSF4 seepage and/or drainage causing adverse impacts to the receiving environment of Woljenup Creek.

Monitoring is intended to demonstrate that potential TSF4 seepage impacts are broadly consistent with groundwater modelling outcomes and the HHERA. The SMP specifies Trigger values indicating deviation from modelled outcomes and a management framework should exceedances of Triggers occur.

1.3 Management Plan Structure

The reporting structure adopted for the risk assessment is as follows:

– **Introduction:** This chapter
– **Overview of TSF4 Assessment:** Presents a summary of the site setting derived from the *Hydrogeological Conceptual Model* (GHD, 2023d), an overview of the seepage risks based on the HHERA (GHD, 2023h), and the *Site-Specific Water Quality Guidelines* (**WQG**) based on the review and adjustment of the published guidelines (GHD, 2023e).
– **Management Strategy:** Outlines the approach to monitoring and management of seepage with key monitoring sites situated along seepage pathways, and action plans designed to confirm predictive modelling results and intervene to mitigate unforeseen impacts if necessary.
– **Groundwater Management:** Approach to demonstrating that TSF4 seepage impacts within the subsurface are broadly consistent with the modelled predicted distribution, that the risks to the primary potential receptor (Woljenup Creek) remain low, and to provide a contingency framework should groundwater seepage results indicate concentrations above modelled concentrations (i.e., the Triggers) and WQGs (i.e., the thresholds).
– **Surface Water Management:** Details how water released from Sump A post-closure into Woljenup Catchment (which may impact the receptors) will be managed, the approach to identify whether concentrations of Contaminants of Potential Concern (**CoPC**) in Woljenup Creek can be attributed to TSF4 seepage (i.e., Triggers), and a contingency framework should TSF4 impacts (CoPCs) to Woljenup Creek be detected and/or WQGs exceeded (i.e., the thresholds).

1.4 Overview of TSF4

The location and layout of the mine site and TSF4 is presented in **Figure 1.1** along with the surface water drainage lines. The figure shows that the downstream waterways that may be impacted by any seepage or potential discharge from TSF4 includes Woljenup Creek and Blackwood River.

The TSF4 footprint and relevant design features are presented in **Figure 1.2**. The design and operational features for managing tailings drainage/seepage are as follows:

– External embankments comprising waste rock buttresses with clay cores keyed into the underlying strata to limit seepage outside the facility.
– Cell 1 is underlain by Bituminous Geosynthetic Membrane (**BGM**) over ~20% of the area and an engineered clay-liner over the remaining ~80% of the area. Cell 2 comprises 100% BGM. The embankments and future embankment lifts will be lined with BGM (excluding the divider embankment above 1,270m Reduced Level (**RL**)).
– Natural clay materials (not shown) underlie the TSF4 footprint and wider surrounding area (~10m to ~15m thick), which is in turn underlain by bedrock basement materials.
– Drainage from the tailings deposited via slurry methods (decant waters) is collected via the following:
    - Internal perimeter drains positioned immediately above and below the liner;
    - A tailings underdrainage system, located above the liner to collect and direct tailings drainage (under gravity) through the embankment walls into four external collection sumps (Sumps A, B, C, and D);
    - External perimeter toe drains located around the foot of the western, southern, and eastern embankments of TSF4; and
    - Network of outlet pipes directing internal and external drainage to four lined sumps located outside the TSF4 embankments (Sumps A, B, C, and D).

Figure 1.2 shows that one of the sumps (Sump A) is located within the upper parts of the Woljenup Creek catchment, while the remaining sumps (Sumps B, C, and D) are situated within the catchments of the operational mine site (discharging to Cowan Brook Dam and the open pit).

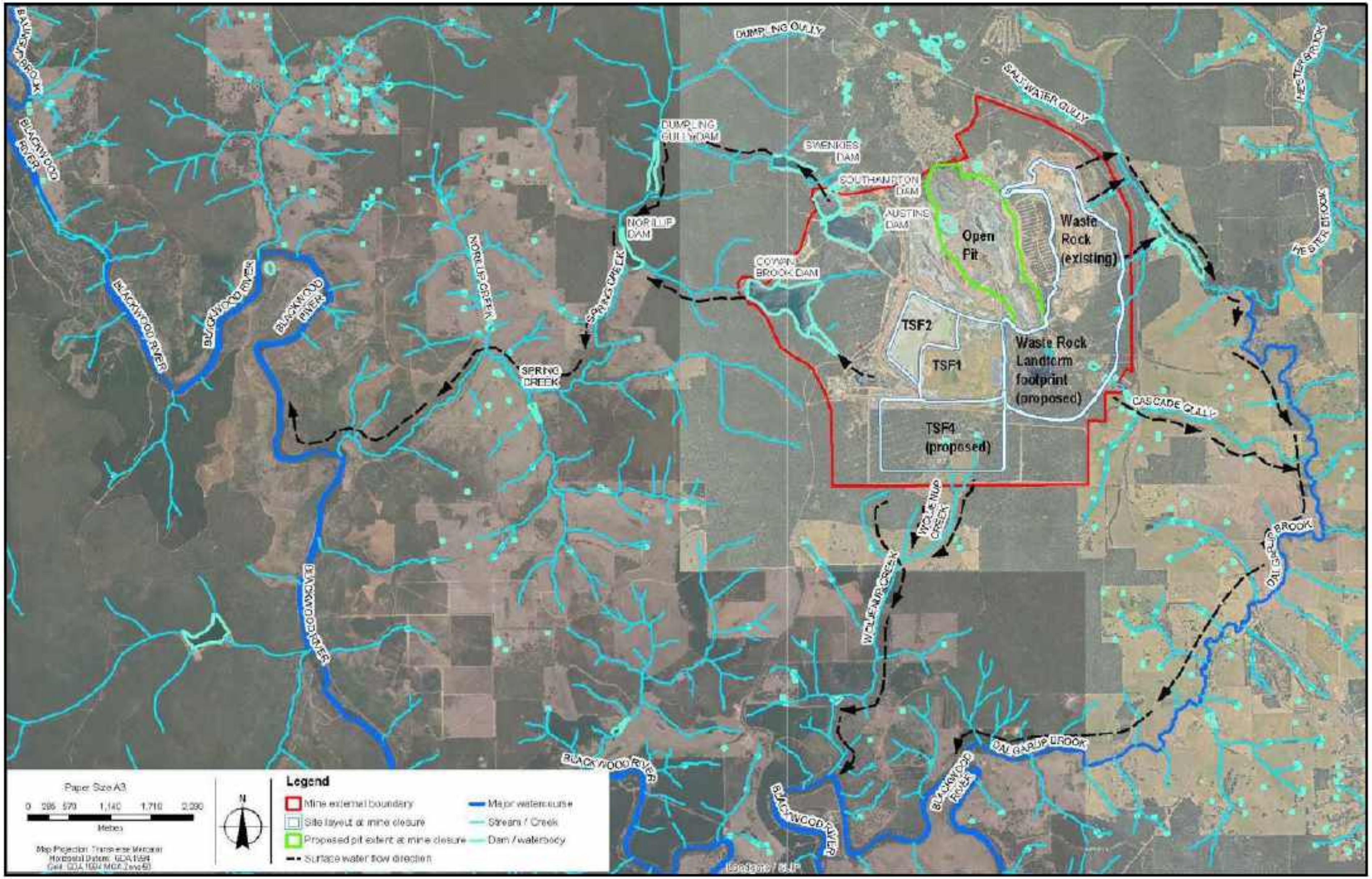


Figure 1.1: Mine Site Locality Plan Indicating Surface Water Discharge Pathways

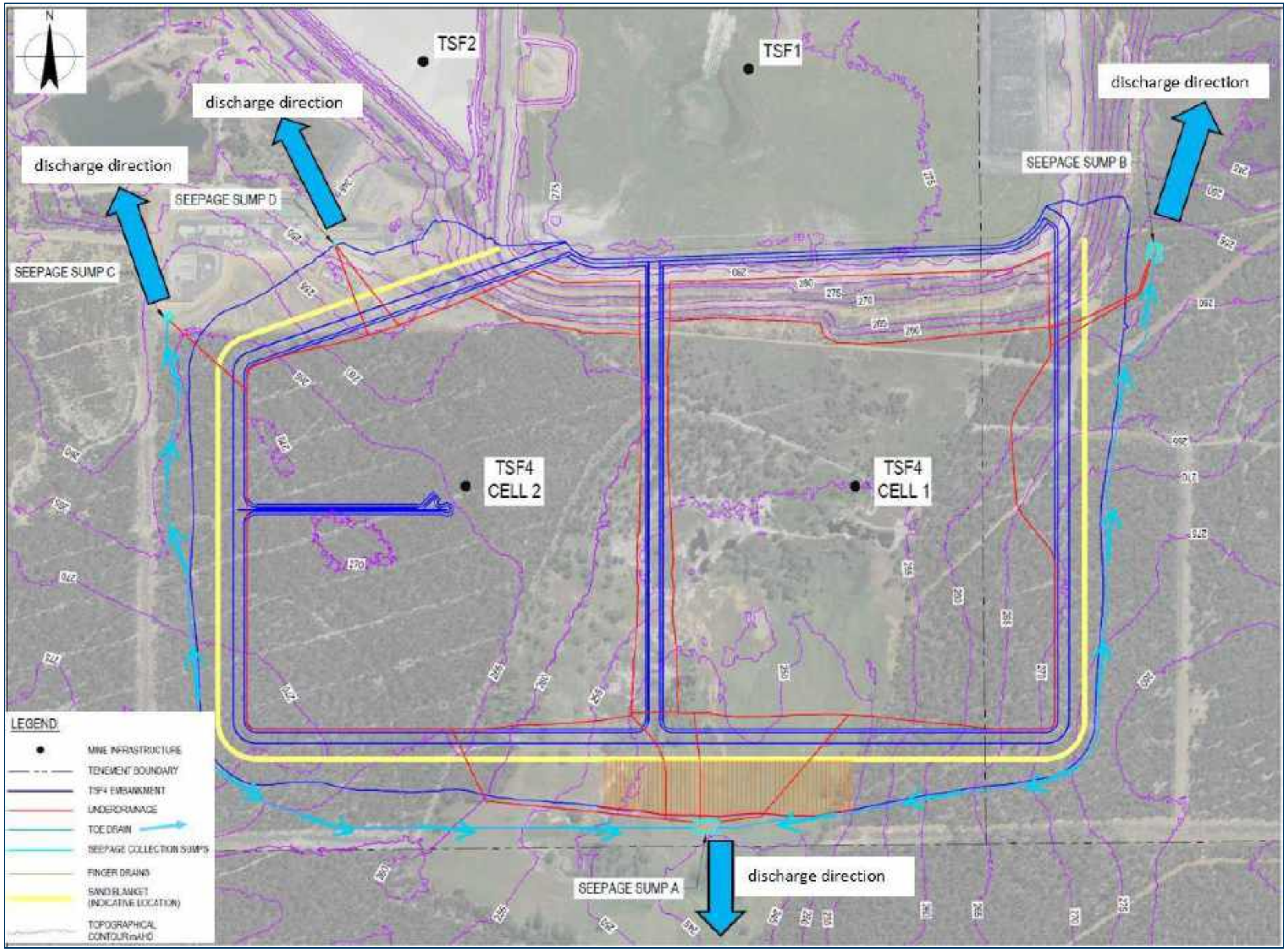


Figure 1.2: TSF4 Layout Indicating Internal and External Drainage

2. Overview of TSF4 Risk Assessment

2.1 TSF4 Risk Setting

2.1.1 Introduction

Based on the GHD (2023a-2023g) supporting investigations, GHD (2023h) completed a HHERA based on the understanding of seepage and discharge from TSF4. For the purposes of this report:

- The term "seepage" relates to waters migrating in the natural subsurface beneath the TSF4; and
- The term "drainage" relates to waters expressed at the surface derived from internal TSF4 drainage and TSF4 runoff.

The following summaries outline the understanding of the **source-pathway receptor** linkages derived from TSF4 seepage and drainage.

2.1.2 Potential Sources of Impact

The sources of potential impact on the receiving environment include:

- Tailings decant and leaching (slurry/process waters), which were found to exhibit CoPC concentrations above the human health and environmental WQGs (i.e.: Al, Sb, As, Cd, Cs, Li, Mn, Rb, Tl, U, V, and Zn).
- Waste Rock was found to leach CoPCs with concentrations above the human health and environmental WQGs (i.e.: As, Li, Sb, V, NO_3, SO_4).

The WQGs for the relevant CoPCs adopted for the mine site are summarised **in Table 2.1**. The list of CoPCs was derived from testing of tailings decant, tailings leaching, and waste rock leaching, the testing, and results of which has been summarised and presented in the *TSF4 Seepage Risk Assessment* (GHD, 2023h). WQGs are based on a combination of published criteria from the Australian and New Zealand Governments (ANZG, 2018) and the Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ, 2000), as well as site-specific WQGs which were derived from a review and adjustment of these published guidelines (GHD, 2023e).

Table 2.1: Summary of Adopted Water Quality Guidelines from GHD (2023e)

CoPC (filtered)	Water quality guidelines (mg/L)[1]				
	Agricultural use - Livestock	Agricultural use - Irrigation	Aquatic Environment	Potable use	Non-potable use
Aluminium	5	5	0.055	0.2	NR
Antimony	0.15	NR	0.09	0.003	0.06
Arsenic	0.5	0.1	0.013	0.01	0.2
Cadmium	0.01	0.01	0.001	0.002	0.04
Caesium	2.0	NR	0.1	0.08	1.6
Chromium (III+VI)	1.0	0.1	0.004	0.05	1.0
Copper	0.5	0.2	0.0014	2.0	40
Lithium	0.82	2.5	2.0	0.007	0.14
Manganese	10	0.2	1.9	0.5	10
Molybdenum	0.15	0.01	0.034	0.05	1.0

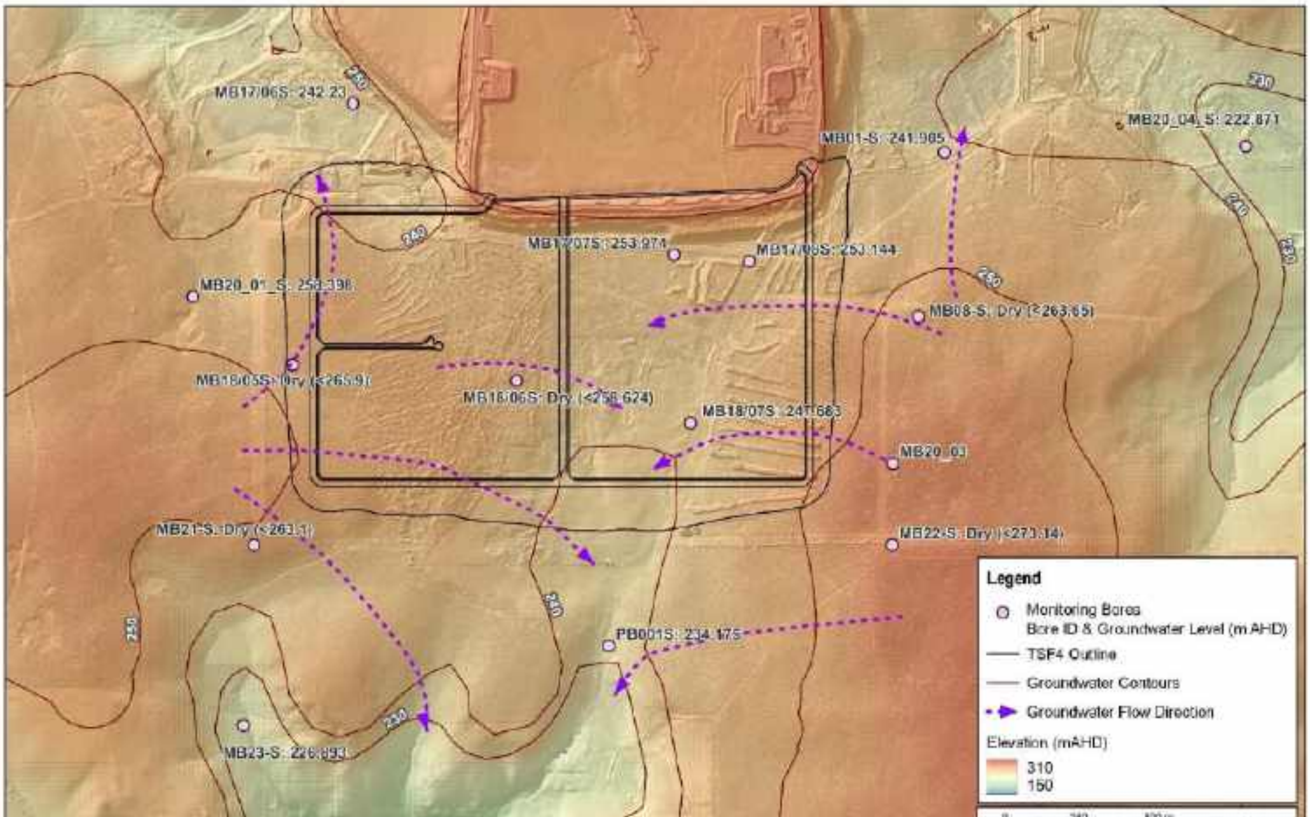
1 NR = Guideline not required (CoPC does not pose a risk to receptors).

CoPC (filtered)	Water quality guidelines (mg/L)[1]				
	Agricultural use - Livestock	Agricultural use - Irrigation	Aquatic Environment	Potable use	Non-potable use
Nickel	1.0	0.2	0.05	0.02	0.4
Rubidium	0.39	NR	0.017	0.014	0.28
Thallium	0.13	0.001	0.00003	0.00004	0.0008
Uranium	0.2	0.01	0.0005	0.02	0.4
Vanadium	0.1	0.1	0.0006	0.0002	0.004
Zinc	20	2	0.04	3	60
Sulfate	1000	NR	429	250	NR
Nitrate (as N)	90	NR	2.4	50	NR

2.1.3 Source Migration Pathways

2.1.3.1 Groundwater Seepage

TSF4-impacted waters (decant, tailings and waste rock leach) that migrate downwards through the TSF4 basal liner and into the underlying saprolitic clay profile (clays of ~10 m to ~15 m thickness) will migrate southwards with groundwater flow. The groundwater could potentially discharge ~750m downgradient of TSF4 into the Woljenup Creek, at which artesian groundwater levels are indicated. Groundwater flow directions in the shallow saprolite formation in the vicinity of TSF4 are shown in **Figure 2.1**.



Data Source: Talison Lithium - Elevation (2022), GHD - Monitoring Bores, Mine Facilities, Groundwater Contours.

Figure 2.1: Shallow Saprolitic Profile Groundwater Contours

2.1.3.2 Drainage Waters

During operations, TSF4-impacted drainage waters (i.e., internal drainage and surface water runoff) collected into the four external sumps (Sumps A, B, C, and D) will be returned via pump-back to the Mine Water Circuit (**MWC**) and, as such, do not represent a migration pathway during operations.

However, post-closure (post 2037), the drainage waters will be managed until such time as the volume and water quality is suitable for the pump-back to the MWC to cease. At this time, drainage into Sump A will be managed through passive means (yet to be designed), and therefore represents a potential source migration pathway from Sump A into the Woljenup Catchment if not managed appropriately. The remaining sumps (Sumps B, C, and D) will discharge into the operational mine site (Cowan Brook Dam and the open pit catchments).

2.1.4 Receptors

The sensitive receptors of the receiving environment are associated with surface water system of Woljenup Creek, where both surface water and groundwater derived from TSF4 may discharge. Beneficial uses of water within Woljenup Creek include the aquatic environment, non-potable, and stock water uses. A survey of landholder water uses in the Woljenup Creek catchment was conducted by Talison between September and November of 2021, which are illustrated in **Figure 2.2**. Jones Dam, located in Woljenup Creek ~770 m downgradient of Sump A, is used for stock watering purposes and is the closest receptor to TSF4.

2.2 TSF4 Risk Quantification (Modelling)

2.2.1 Introduction

A three-dimensional numerical groundwater flow and transport model of the mine site was developed to assess potential impacts to surface water and groundwater from TSF4 (GHD, 2023g), the objectives of which were:

– Characterise the fate and transport of CoPCs in “seepage” from the TSF4, including attenuation and potential discharge locations of any impacted groundwater; and
– Estimate the expected timeframe for “drainage” from TSF4 to reach an acceptable quality such that active management of drainage into the Sumps is no longer required following closure of the facility (passive management/walk away scenario).

Contaminant transport modelling included two metals/metalloids (Arsenic and Lithium) using site-specific adsorption coefficients derived from testing of clays beneath the TSF4 site (GHD, 2023b). As and Li were adopted since they are considered ‘end-members’ due to their relative respective low and high adsorption and mobility characteristics, which cover the wide range of other CoPCs including Antimony, Caesium, Rubidium, and Uranium. Consequently, modelling As and Li distribution in groundwater accommodates the distribution of other CoPCs. The modelling also included cumulative impacts from other sources such as TSFs 1, and 2 and Floyds Waste Rock Landform.

2.2.2 Groundwater Seepage Results

An example of the predictive groundwater fate and transport modelling results for the distribution of Li derived from TSF4 seepage (with cumulative impacts from existing facilities) is presented in **Figure 2.3**. This figure shows the simulated distribution and concentrations of Li in the upper saprolite formation in 2150, which reflects the furthest extent of the simulated plumes (including those for As).

The contours presented in **Figure 2.3** correspond with the Li WQGs presented in **Table 2.1**. The distribution shows that Li (and other metal CoPCs) adsorb/attenuate within the underlying saprolitic aquifer and remain close to the TSF4 footprint during operations and post-closure. The distribution also shows that the CoPCs will not migrate in groundwater beyond the mine-site boundary, nor discharge and impact the beneficial uses in the Woljenup Creek catchment.

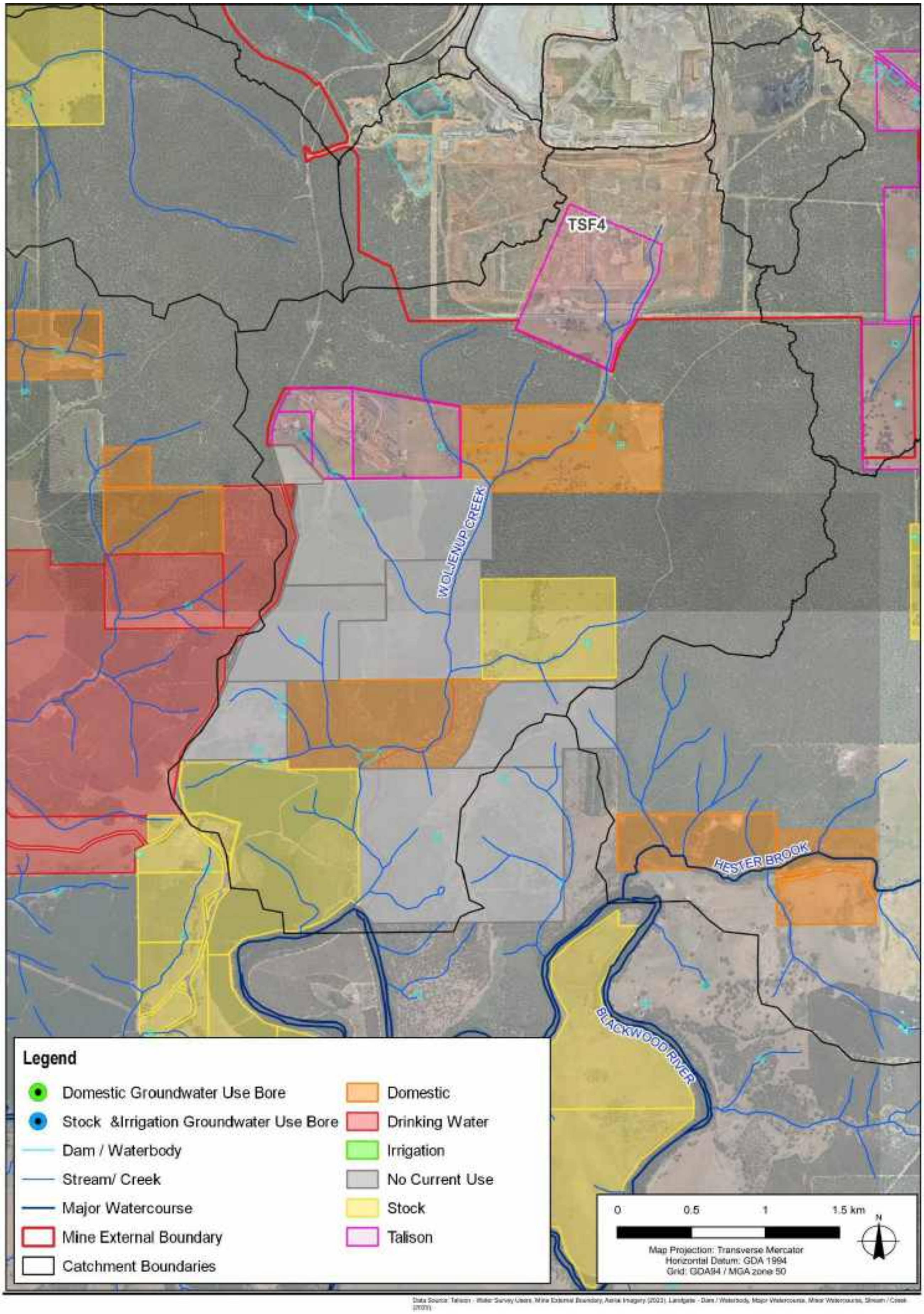


Figure 2.2: Talison Survey Surface and Groundwater Users

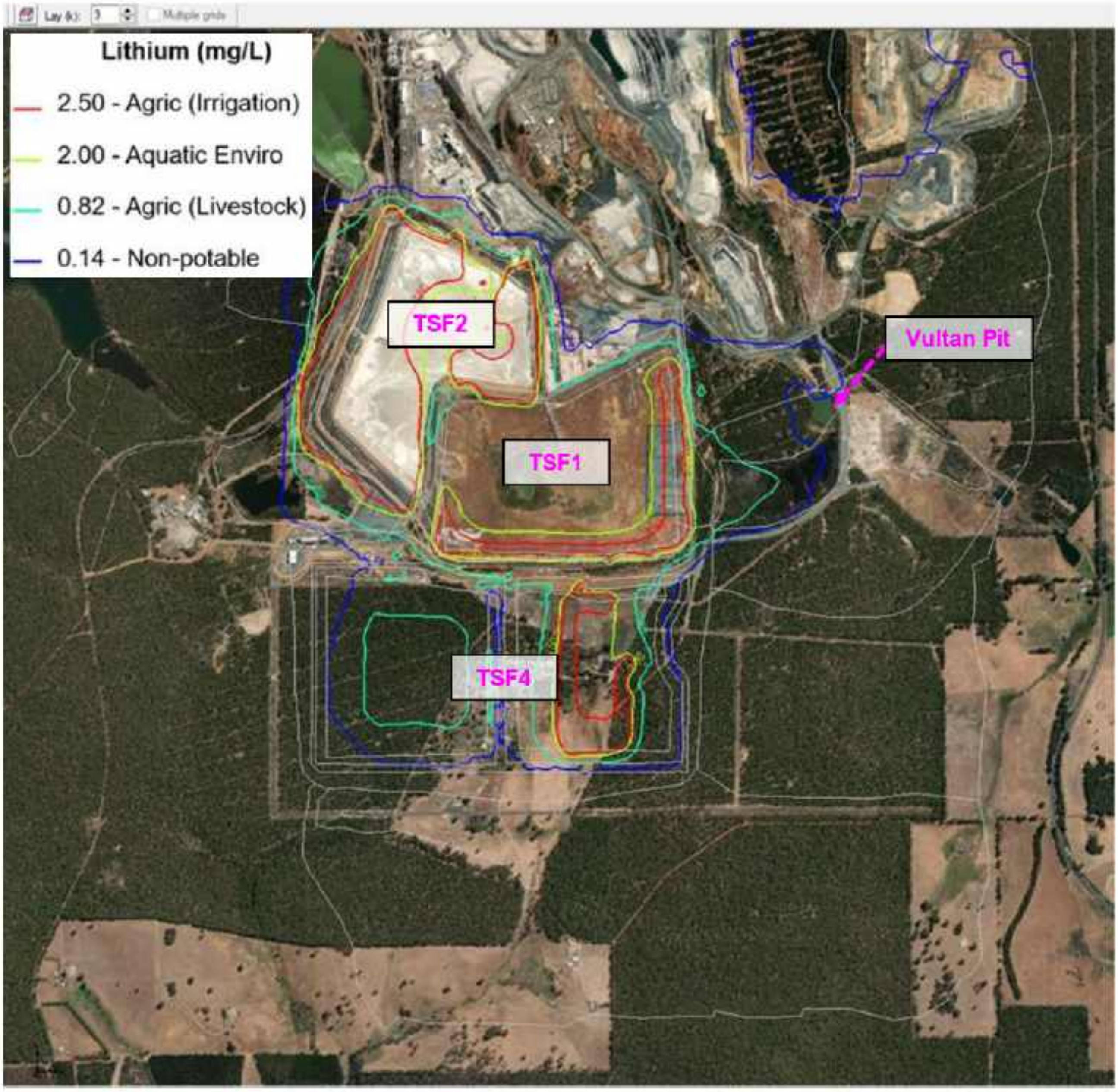


Figure 2.3: Example of Simulated Lithium Concentrations within the Pallid Saprolite Formation in 2150

The background Li concentration in the groundwater in the areas surrounding TSF4 (and much of the mine site) is above the drinking water WQG of 0.007 mg/L (although this is not a recognised use in the Woljenup Creek catchment) as would be expected within the mineralised zone. As such, the contour associated with this WQG is affected by background to the extent that it could not be depicted in **Figure 2.3**.

Of note in **Figure 2.3** is the simulated Li plume to the east of TSF1. Seepage from the toe of TSF1 is directed via the ponds associated with historical dredge mining and is collected within Vultan Pit, where the seepage waters are returned to the MWC. An elevated north-south access road dams the seepage from discharging further eastwards to areas off-the mine site boundary (i.e., to Cascade Gully). Any overflows from Vultan Pit discharge towards and are captured in the central lode open pit (and sumps).

2.3 TSF4 Drainage into Sumps

Drainage from TSF4 into Sumps A, B, C and D (internal drainage and run-off), was also included in the predictive modelling, to show expected timeframe for "drainage" from TSF4 to reach an acceptable quality and volume (passive management/walk away scenario). Results for Sump A, which is in the headwaters of Woljenup Catchment, are presented herein. Results for Sumps B, C, and D, which drain into internal mine catchments, are not discussed herein, however, the modelling report includes all sump results (GHD, 2023g).

Time series of the modelled drainage flows and Li concentrations into Sump A are shown in **Figure 2.4** and the associated Li loads are presented in **Figure 2.5**. The modelled drainage flows and As concentrations into Sump A are shown in and **Figure 2.6** and the associated As loads are presented in **Figure 2.7**. These modelling results indicate the following:

- Flows to Sump A are predicted to peak at ~150 m^3/day just after closure in 2038. Given that the groundwater mounding beneath the TSF4 dissipates slowly over time, the graphs show that the drainage flow rates to Sump A gradually decline to ~40 m^3/day in 2100.
- The Li concentration in 2038 is ~2.7 mg/L, which is above all WQGs, and reduces to ~1.7 mg/L in 2060 and remains close to ~1.7 mg/L until 2100, which is above the drinking water, aquatic environment, and irrigation WQGs (note that drinking water and irrigation are not recognised uses in Woljenup Creek catchment). Although the Li concentrations do not reduce after 2060, the flows do reduce resulting in the loads reducing from ~120 g/day in 2060 to 60 g/day in 2100.
- The As concentration at closure in 2038 is ~0.015 mg/L, which is above the drinking water and aquatic environment WQGs and reduces to ~0.004 mg/L in 2060 and remains close to ~0.004 mg/L until 2100, which is below all the relevant WQGs. Although the As concentrations do not reduce after 2060, the flows do reduce resulting in the loads reducing from ~0.34 g/day in 2060 to 0.14 g/day in 2100.

These modelling results indicate that at some point after closure (potentially 10 to 20 years), the flows into Sump A should be sufficiently low to accommodate passive management measures to mitigate discharge from Sump A and the risk to Woljenup Creek (e.g.: infiltration basin, constructed wetland, etc).

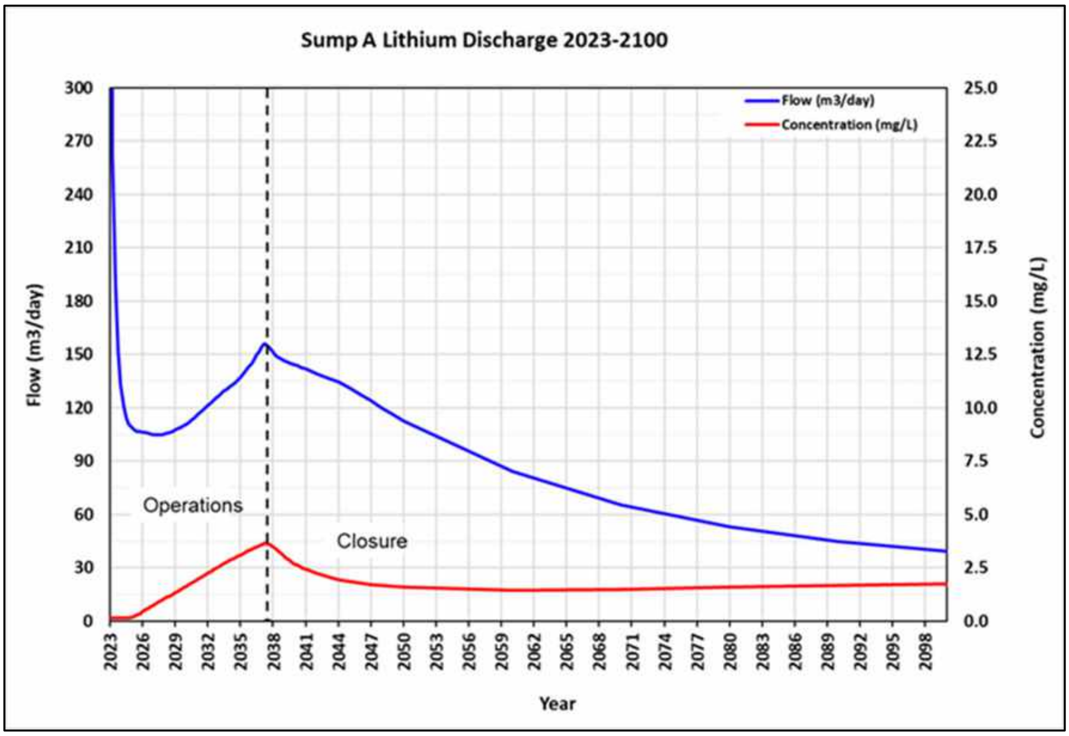


Figure 2.4: Simulated Lithium Concentrations and Flows into Sump A

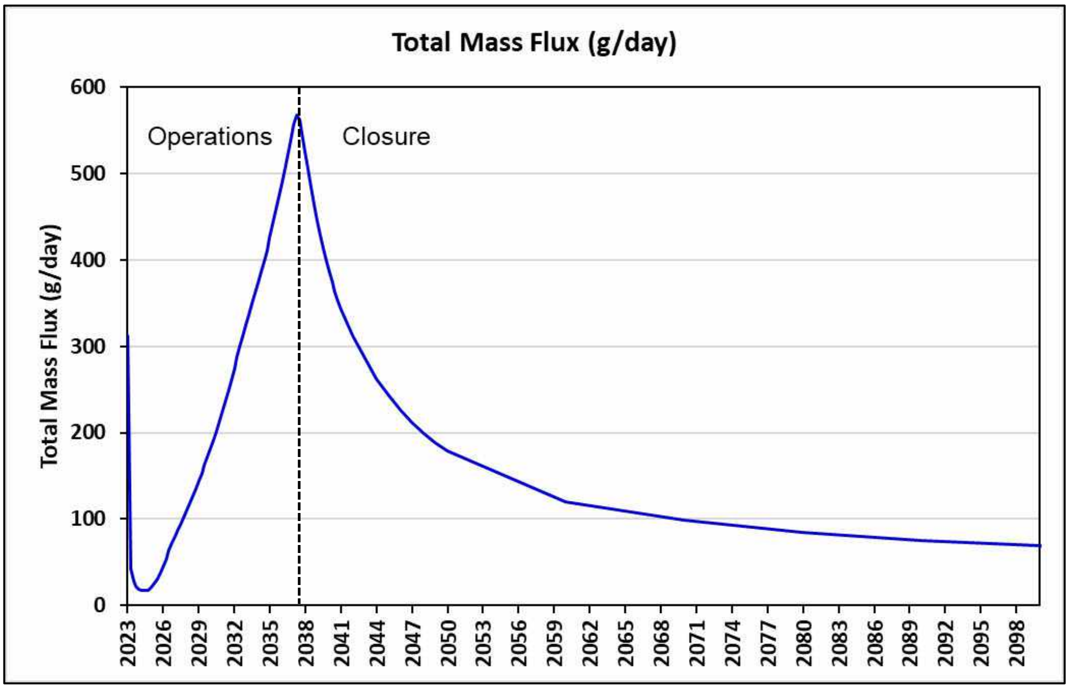


Figure 2.5: Simulated Lithium Loads into Sump A

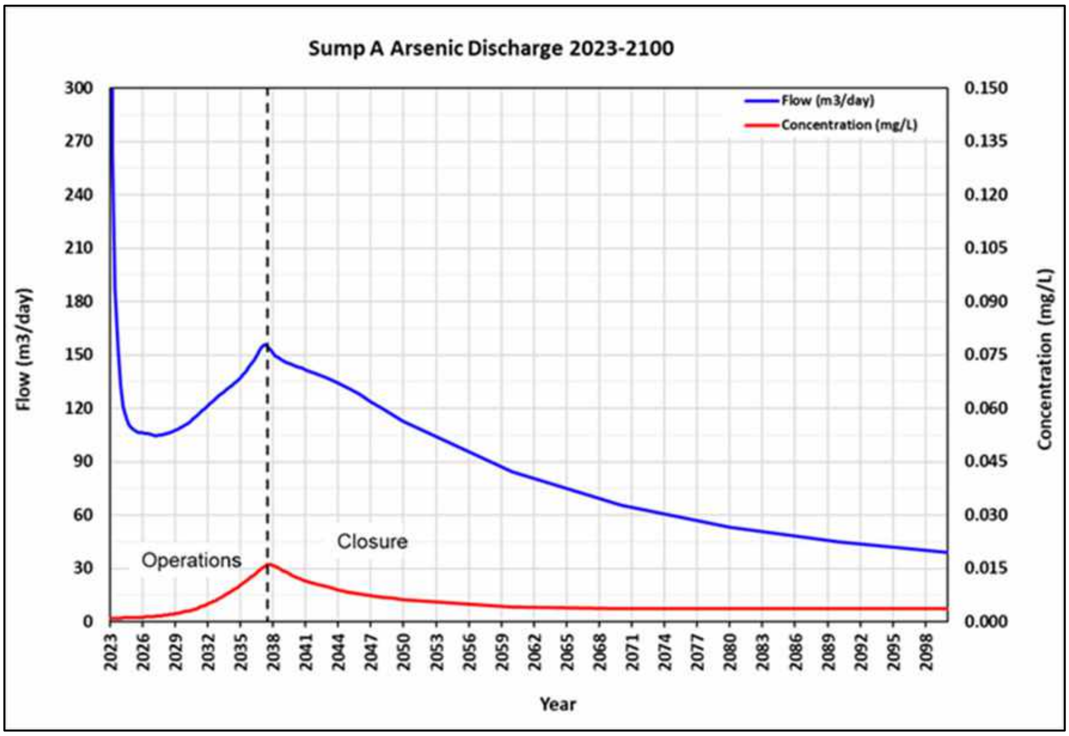


Figure 2.6: Simulated Arsenic Concentrations and Flows into Sump A

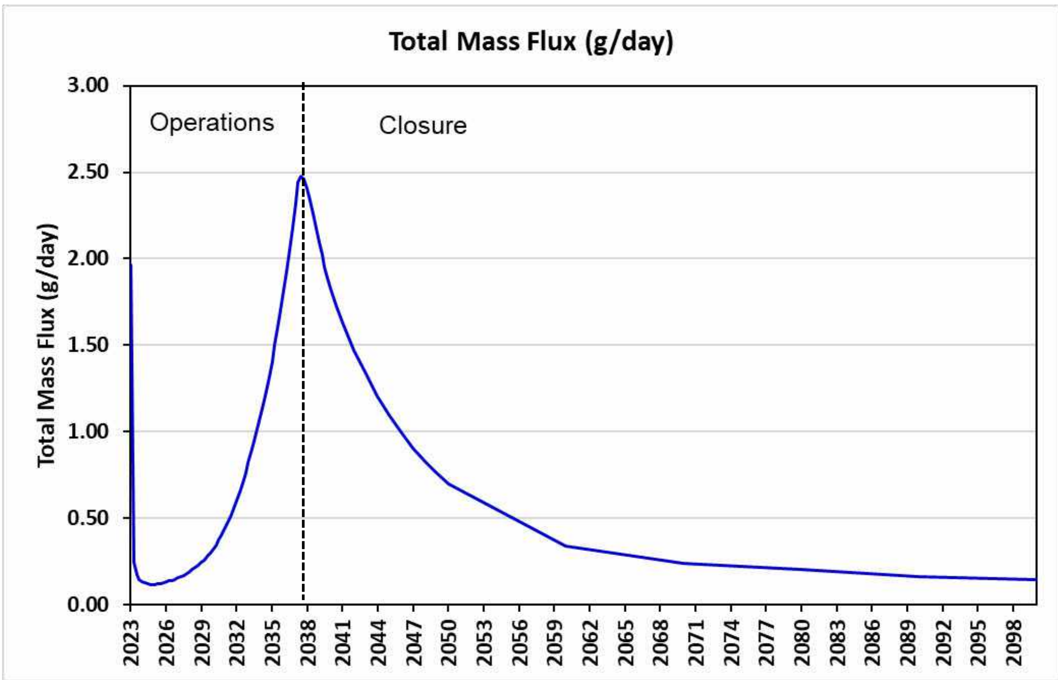


Figure 2.7: Simulated Arsenic Loads into Sump A

3. Management Strategy

3.1 Overarching Strategy

The key objectives for managing seepage and/or drainage from TSF4 are to:

- Preserve the groundwater quality at the mine premises boundary; and
- Prevent the TSF4 seepage and/or drainage causing adverse impact on the receiving environment of Woljenup Creek.

The overarching strategy to manage seepage and/or drainage to meet these objectives is to provide a contingency framework to action should monitoring and assessment indicate the following:

- The distribution of TSF4 seepage impacts within the subsurface (aquifer) varies significantly from the modelled predictions.
- Groundwater Triggers are activated with concentrations nearing or exceeding the modelled predictions, and/or concentrations exceeding baseline concentrations and/or WQGs.
- Changes in quality in Woljenup Creek attributed to TSF4 seepage/discharge and/or where surface water Triggers are exceeded (i.e., concentrations nearing or exceeding baseline quality).
- Seepage/drainage from TSF4 poses unacceptable risks to receptors and where surface water WQGs are exceeded (i.e., concentrations nearing or exceeding WQGs).

To implement this strategy, monitoring will be undertaken to achieve the objectives detailed in the following section.

3.2 Monitoring Objectives

3.2.1 Groundwater Monitoring Objectives

The objective for groundwater monitoring is to monitor along identified potential seepage pathways from the source (i.e., TSF4) to the receptors (i.e., potential downgradient beneficial users) for the purposes of:

- Demonstrating that the distribution of TSF4 seepage impacts within subsurface is broadly consistent with the modelled predictions (i.e., Triggers).
- Confirming baseline water level and quality conditions and establishing whether these conditions change during Time Limited Operation (TLO).
- Monitoring groundwater in the underlying formations adjacent to the source (TSF4) for early warning of exceedances (e.g., perimeter of TSF).
- Monitoring groundwater discharge areas, to assess groundwater quality that may discharge to surface water.
- Identifying groundwater seepage and drainage concentrations attributable to TSF4 that are:
    - Above modelled predictions (i.e., Triggers).
    - Above WQGs at the groundwater receptors or discharge zones (i.e., thresholds).

3.2.2 Surface Water Monitoring Objectives

The objective for surface water monitoring is to monitor along identified surface flow paths (i.e., Woljenup Creek) from the potential source to the receptors for the purposes of:

- Monitoring flows and quality upstream of Jones Dam (SW24-01) to identify impacts.
- Establishing baseline flow and quality conditions at key locations along the creek.
- Monitoring TSF4 drainage into Sump A (flows and quality) to validate predictive groundwater model and supply predictive information with which to develop TSF4 closure management options.
- Identifying CoPC concentrations attributable to TSF4 that are:

- Above a defined baseline quality Triggers at monitoring points
- Above WQGs at monitoring points

4. Groundwater Management

4.1 Monitoring Bore Network

4.1.1 Baseline Groundwater Monitoring Bores

Groundwater monitoring bores in eight locations are currently monitored as part of the baseline monitoring program for TSF4 (GHD, 2023c), the bore details of which are summarised in **Table 4.1**, and the locations of presented on **Figure 4.1**. These bores have been monitored quarterly since May 2022 as part of the conditions of the TSF4 Works Approval (W6618/2021/1), or where the bore was unserviceable (dry) the next closest monitoring bore was incorporated into the monitoring network. The baseline groundwater conditions have been reported for by GHD (2023c). A summary of these baseline results is shown in **Appendix A Table 2** , as "italic" values, for key CoPCs, which are presented as maximum seasonal concentrations (2022/2023).

Table 4.1: Summary of Baseline Groundwater Monitoring Locations

Bore ID	Easting	Northing	Standpipe Top Elevation (mAHD)	Ground Level (mAHD)	Screen interval (m)		Comments
					Top	Bottom	
MB01-D	414314.8	6250825	249.04	248.42	28.1	31.1	Adjacent to TSF1 seepage pond
MB01-I			249.04	248.42	11.2	14.2	
MB01-S			249.01	248.42	6	9	
MB08-D	414225.1	6250274	271.28	270.65	15	18	Dry throughout monitoring
MB08-I	414225.6	6250272	271.29	270.65	10	13	
MB08-S	414225.8	6250271	271.33	270.65	4	7	
MB20_01D	411734	6250344	260.382	259.86	24.7	27.7	Added in Oct 2022
MB20_01I	411772.9	6250341	260.432	259.9	11.85	14.85	
MB20_01S	411771.8	6250338	260.328	259.94	0.5	3.5	Targeting perched layer
MB20_03D	414138.6	6249775	281.214	280.47	33	36	Added in Oct 2022
MB20_03I	414138.5	6249774	281.166	280.53	21.8	27.8	
MB21-D	411978.6	6249500	269.8	269.21	17.7	20.7	Dry throughout monitoring
MB21-I	411978.5	6249499	269.76	269.14	9	12	
MB21-S	411978.6	6249497	269.75	269.1	3	6	
MB22-D	414133.9	6249497	282.7	282.14	21.5	24.5	N/A
MB22-I	414135	6249498	282.7	282.14	12	15	Dry throughout monitoring
MB22-S	414135.9	6249498	282.8	282.14	6	9	
MB23-D	411945.2	6248880	228.46	227.82	30	33	Artesian
MB23-I	411943	6248886	228.59	227.99	11.5	14.5	
MB23-S	411942.1	6248888	228.71	228.06	2	3	Targeting perched layer
PB001D	413181.1	6249162	238.526	237.95	18	24	Added in Oct 2022
PB001I	413180.2	6249160	238.396	237.85	9.7	12.7	
PB001S	413179.4	6249157	238.351	237.76	18	24	

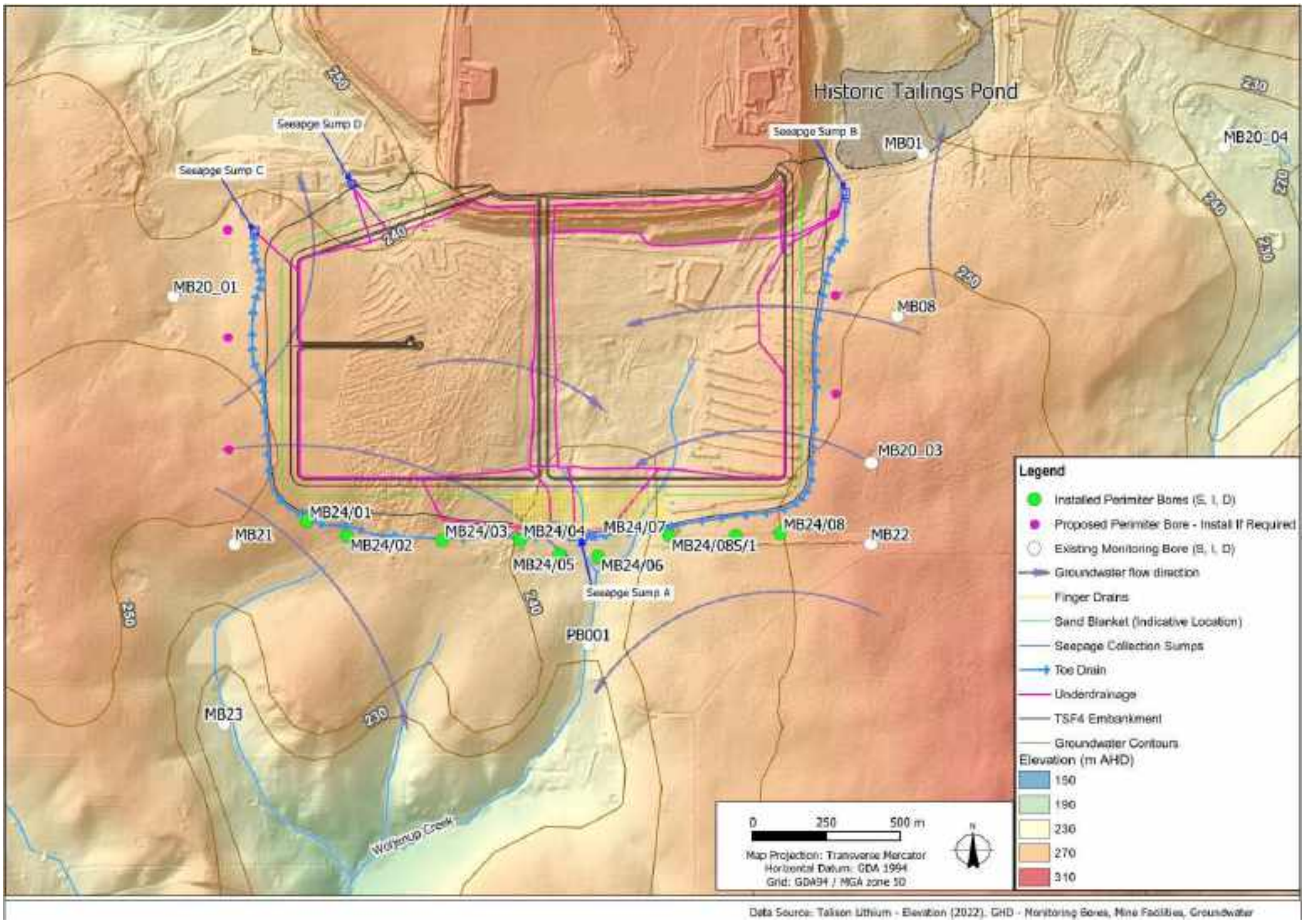


Figure 4.1: Location Plan of Existing and Potential Groundwater Monitoring Bores

4.1.2 Perimeter Groundwater Monitoring Bores

4.1.2.1 Southern Perimeter Monitoring Bores

Additional monitoring bores have been installed along the southern toe of theTSF4 embankment during TLO and as part of ongoing TSF4 operations. Given the generalised southerly groundwater flow direction (see **Figure 4.1**), the purpose of the southern perimeter monitoring bores is to detect TSF4-derived seepage into the subsurface and demonstrate that potential impacts in the subsurface (saprolitic aquifer) are within those modelled. The monitoring bores provide an early warning should unanticipated impacts occur.

Locations of the southern perimeter monitoring site are shown in **Figure 4.1**, and comprise nested shallow, intermediate, and deep bores at each site, nominally set at the base of surficial sands, within the saprolite formation, and at the base of the saprock layer. Screened intervals were:

– Shallow bores: 4 m to 7 m.
– Intermediate bores 11 m to 14 m.
– Deep bores 26 m to 29 m.

Coordinates of the southern perimeter monitoring sites are presented in **Table 4.2**. Groundwater monitoring will be undertaken at the southern perimeter bores to establish baseline conditions.

Table 4.2: Coordinates of Southern Perimeter Monitoring Bores

Bore ID	Easting	Northing
MB24/08S	413828	6249534
MB24/08S/1	413677	6249527
MB24/08I	413834	6249534
MB24/08D	413840	6249535
MB24/07S	413451	6249525
MB24/07I	413461	6249525
MB24/07D	413475	6249525
MB24/06S	413211	6249455
MB24/06I	413200	6249459
MB24/06D	413188	6249464
MB24/05S	413079	6249462
MB24/05I	413074	6249446
MB24/05D	413067	6249458
MB24/04S	412947	6249512
MB24/04I	412937	6249514
MB24/04D	412921	6249514
MB24/03S	412682	6249511
MB24/03I	412733	6249511
MB24/03D	412697	6249511
MB24/02S	412361	6249524
MB24/02I	412364	6249523
MB24/02D	412368	6249521
MB24/01S	412222	6249575
MB24/01I	412226	6249573
MB24/01D	412230	6249570

4.1.2.2 East and West Perimeter Monitoring Bores

Additional monitoring bores are to be installed along the western and eastern toes of theTSF4 embankment following the preliminary period of operations (e.g.: 2 to 5 years) if the groundwater mounding beneath TSF4 produces an observable outwards radial groundwater flow pattern from TSF4, and a localised reversal of the dominant southerly groundwater flow direction. The occurrence of an outwards radial flow pattern will be indicated and assessed during annual reporting via collation and presentation of the monitored groundwater levels.

The proposed locations of the eastern and western perimeter monitoring sites are presented in **Figure 4.1**, the nominal coordinates of which are presented in **Table 4.3** (locations of which may vary by up to 50m depending on site conditions for installation). Monitoring sites would comprise nested shallow, intermediate, and deep bores at each site nominally set at the base of surficial sands, within the saprolite formation, and at the base of the saprock layer. Target screened intervals would be as detailed above and would be subject to confirmation during drilling.

Table 4.3: Coordinates of Potential Eastern and Western Perimeter Monitoring Bores

Bore ID	Nominal Easting	Nominal Northing	Status
MB24-09-D	411960	6250565	Pending
MB24-10-D	411960	6250200	Pending
MB24-11-D	411960	6249820	Pending
MB24-12-D	414015	6250615	Pending
MB24-13-D	414015	6250340	Pending
MB24-14-D	414015	6250005	Pending

4.2 Groundwater Monitoring Program

The groundwater monitoring methods and procedures are documented by Talison (2019). The groundwater monitoring program for the baseline and perimeter monitoring bores is presented **Appendix A Table 1**. Monitoring occurs as follows:

- Baseline monitoring bores: Monthly and quarterly (until included on L4247/1991/13) monitoring on the shallow and deeper bores respectively for field parameters, CoPCs, and ions.
- TSF4 perimeter monitoring bores: Single sampling event during W6901/2024/1 TLO, then when included on L4247/1991/13, monitoring for field parameters, CoPCs (metals), and ions.

The laboratory limit of reporting (**LoR**) will be sufficiently low for comparison with the WQGs (see footnote to **Appendix A Table 1**).

4.3 Reporting and Evaluation of Monitoring Data

The reporting and evaluation of groundwater monitoring data will be undertaken as detailed in **Section 6**.

4.4 Response to TSF4 Impacts to Groundwater

4.4.1 Trigger Levels

The key identifiers of impacts from TSF4 include those CoPCs which are elevated in concentration within the TSF4 decant (tailings depositional slurry waters) and are at concentrations elevated above that of the background conditions of the area, as confirmed through the baseline monitoring. The key CoPCs are As, Cs, Li, Rb, Sb, and U.

In addition to CoPCs, the decant/slurry waters also comprise elevated concentrations of sulphate, carbonate, and sodium given the addition of sulphuric acid (H_2SO_4) and sodium carbonate ($NaHCO_3$) during the processing of the Li ore. Although subject to chemical reactions within the aquifer (e.g., precipitation) these major ions, together with the CoPCs, provide verification of tailings impacts to groundwater (GHD, 2023i).

The Trigger levels adopted for the baseline monitoring bores are presented in **Appendix A Table 2**. Given there is exceedance of WQGs in a number of existing baseline monitoring bores (deemed as naturally occurring given the mineralised geological setting), the Trigger levels are based on a 30% increase above the baseline concentrations (seasonal maximum), for the key CoPCs at each monitoring bore (i.e.: As, Cs, Li, Rb, Sb, U).

It is anticipated that the Perimeter Bores will indicate (naturally occurring) CoPC concentrations above the guidelines. Interim levels against which Perimeter monitoring bores are initially assessed are a 100% percentage increase above the averaged Baseline monitoring bores Trigger Levels as detailed in **Appendix A Table 2.** Interim Levels will be assessed after at least one year of monitoring (to detect potential seasonal effects) and Trigger Levels then set for bores at which Interim Levels apply.

4.4.2 Actions

Where groundwater Trigger levels are exceeded, the following sequential actions will be implemented.

4.4.2.1 Action 1: Monitoring and Review

Confirmatory monitoring will be undertaken within one month of the Trigger exceedance. If elevated CoPC concentrations persist (30% higher than Trigger levels) the groundwater will be assessed for TSF4 decant source signature based on the concentrations of major ions: SO_4, Na, HCO_3, and Cl (SO_4, Na, HCO_3 are added during ore processing). Any increasing trends in decant source signature concentrations in groundwater will be assessed against the geochemical setting to provide supporting evidence of TSF4 impacts (qualified personnel will be required, e.g.: geochemist).

Where TSF4 impacts to groundwater are supported with both CoPCs and increasing trends of decant signature then implement **Action 2**.

4.4.2.2 Action 2: Risk Assessment

Update the TSF4 seepage risk assessment, with new information including impacted groundwater extent, migration direction and fate of impacted groundwater. Where required to support the risk assessment update, predictions of impacted groundwater fate will be made, which may include recalibration of the existing groundwater model and/or groundwater investigations and/or increased monitoring frequency.

Where the beneficial use of the groundwater is diminished (above baseline concentrations and above site-specific WQGs) and the impacts extend to the premises boundary and/or the discharge into Woljenup Creek, then present an understanding of exposure scenarios to the receptors (human health and the environment). If the exposure scenarios are complete, then the risk to the receptors is deemed unacceptable and implement **Action 3**.

4.4.2.3 Action 3: Remediation

Remedial options will be designed and implemented if risk to the receptors is assessed as unacceptable, which may include but not be limited to one or more of the following:

- Control of TSF4 source discharge (mitigation of surface water runoff and/or groundwater seepage).
- Pump-back of impacted groundwater (abstraction/recovery bores).
- Capture and management of impacted surface water within Woljenup Creek (e.g.: pump-back to MWC).
- Optimisation of TSF4 tailings deposition to reduce duration, extent, and storage of decant.
- Early closure and capping of the TSF4 facility.

5. Surface Water Management

5.1 Surface Monitoring Locations

The surface water monitoring methods and procedures are documented by Talison (2022).

The locations of the proposed surface water monitoring sites, the TSF4 drainage recovery sumps (Sump A, B, C, and D), and Woljenup Creek are depicted in **Figure 5.1** (for the full Woljenup Creek catchment), and are summarised in **Table 5.1**.

Initial surface water was monitored in Jones Dam (SW20/02) as part of the baseline monitoring program for TSF4 which commenced in May 2022 as a condition of the TSF4 Works Approval (W6618/2021/1). Jones Dam (SW20/02) cannot be accessed (denial of access by landholder), and a new location SW24/01 has been established as an alternative. This location (SW24/01) is the closest accessible location downstream of TSF4 on Woljenup Creek (see **Figure 5.1**).

Table 5.1: Details of Proposed Surface Water Monitoring Locations

General Location	Site Location	Easting	Northing	Purpose
TSF4 mining lease	Sump A	413141	6249524	Monitor TSF4 drainage returns
	Sump B	414047	6250689	
	Sump C	412047	6250558	
	Sump D	412378	6250719	
	SW23/01	412288	6248473	Monitor tributary discharging into Woljenup Creek from mine camp area[2] (different impact zone)
	SW24/01	413180	6249160	Replacement for SW20/02, which cannot be accessed (landowner denying access).
Woljenup Creek (off-site)	SW23/02	411540	6246543	Large pool[3] within Woljenup Creek (receptor ~4.6 km downstream of TSF4 and ~1.2 km upstream of Blackwood River confluence)

2 Location can be moved slightly upstream to suitable site on Talison property.

3 This is Site 3 from the waterway condition assessment (GHD, 2023e).

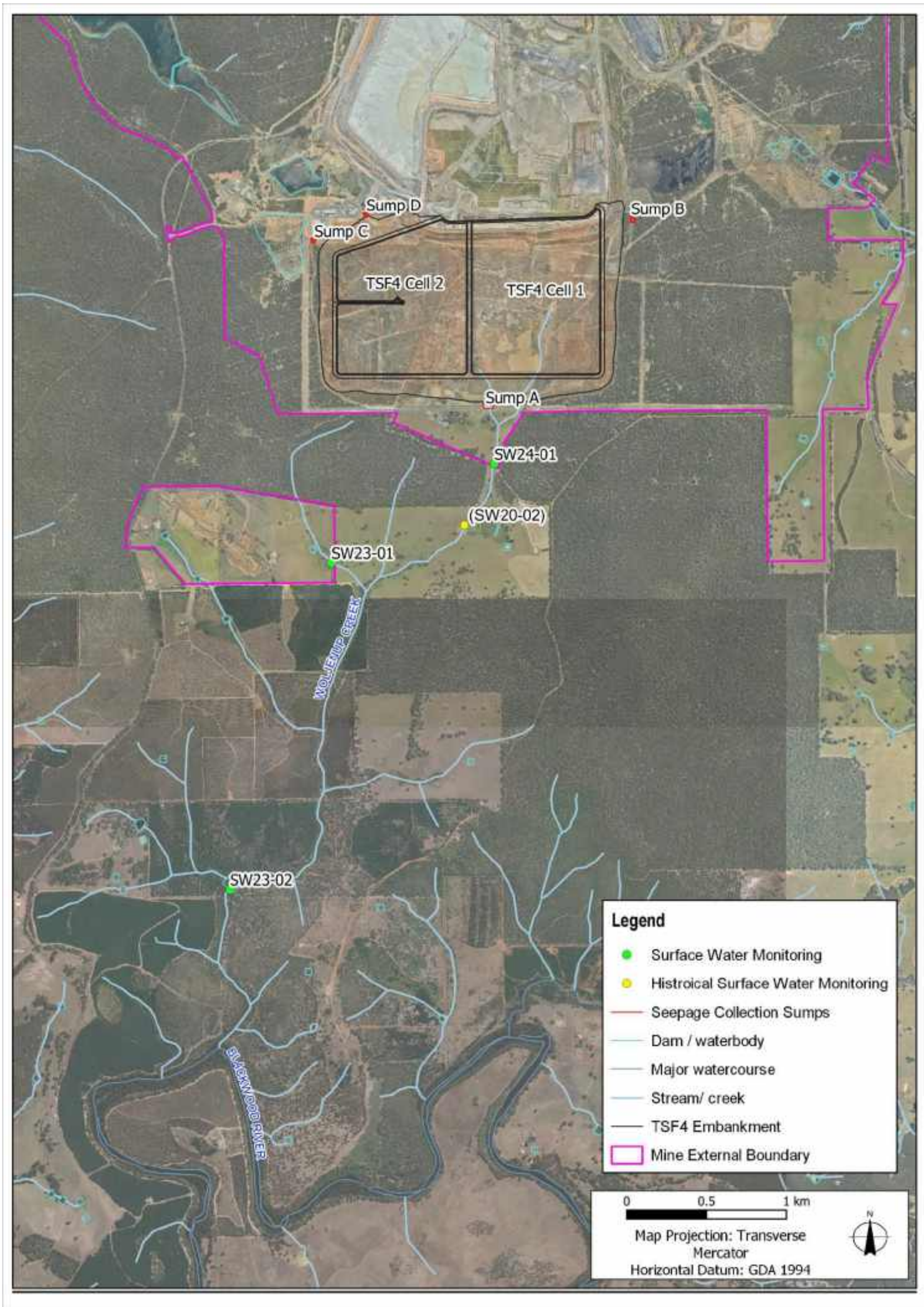


Figure 5.1: Plan of Proposed Surface Water Monitoring Locations

5.2 Management of TSF4 Sumps

5.2.1 Overview

TSF4 drainage into the sumps will be returned to the MWC until such time as the water is of suitable quality and quantity to accommodate implementation of appropriate passive management strategies. The aim of monitoring drainage into the external Sumps (Sumps A, B, C & D) during operations is to detect flow rates exceeding or being less than the modelled values. Any differences in water volumes and flow will be accommodated in the yet to be designed passive management system, which is to be implemented post closure (active pump-back to the MWC to cease).

The passive management options may include, but are not limited to the following:

- Direct discharge to Woljenup Creek where CoPC concentrations permit (potential dilution from streamflow to reduce CoPC concentrations).
- Construction of infiltration basins to promote seepage into the underlying saprolitic profile and attenuation of CoPCs.
- Construction of wetlands for the removal of metals from solution through the vegetated wetlands and favourable geochemical conditions (metals sink).
- Optimisation of TSF4 tailings deposition to reduce the duration, extent, and storage of decant in TSF4.
- Decommissioning, redirection or sealing of the drains discharging into Sump A to promote seepage into the underlying naturally occurring saprolitic profile with subsequent attenuation of CoPCs.

The above options require feasibility assessments/studies to support selection of a preferred management option, which will be based on the updated predictive and verified modelling results.

5.2.2 Trigger Levels

The Trigger levels are based on the comparison of the metered flow rates into the sumps (or abstracted from the sumps) against the modelled predicted flow rates.

During the initial tailings depositional stages, the TSF4 drainage water flows into the sumps are likely to be subject to significant variation. Trigger levels will therefore not be applicable until two years of operations has elapsed to allow for flow rates into the sump to move towards an equilibrium. Trigger levels (following two years of operations) are based on the monitored flow rates that equates to 50% exceedance of modelled flow rates into Sump A.

The sump flow rates will be averaged over a 12-month period and an appropriate moving average (two to three monthly) to assess trends. The Trigger levels are presented for Sump A in **Appendix A Table 3** (Sump A potentially discharges to the environment of Woljenup Creek, while any discharge from Sumps B, C and D is captured within the MWC).

5.2.3 Action (Update Predictive Modelling)

Where triggered, the existing predictive model will be updated after three years (post operation commencement). Where the existing model is updated, the results from the updated model will be used to review and set new Trigger levels.

5.3 Management of Woljenup Creek (Receptor)

5.3.1 Overview

Given the location of the TSF4 in the upper parts of the Woljenup Creek catchment, the creek is recognised as a receiving environment for TSF4 impacted surface water runoff and impacted groundwater discharge (artesian conditions indicate discharge of groundwater may occur). The sources of potential impact to the receiving environment from TSF4 are:

- Tailings decant and tailings leaching (slurry/process waters), which were found to exhibit concentrations of CoPCs above the human health and environmental WQGs (i.e.: Al, Sb, As, Cd, Cs, Li, Mn, Rb, Tl, U, V, Zn).

- Waste rock was found to leach concentrations of CoPCs above the human health and environmental WQGs (i.e. As, Li, Sb, V, NO_3, SO_4).

5.3.2 Trigger Levels

Seasonal baseline conditions at Woljenup Creek have been established at location SW20/02 (GHD, 2023c), which is a dam located immediately down-gradient of the TSF4 footprint and within the flow line of the creek (See **Figure 5.1**).Trigger levels for the CoPCs are presented in **Appendix A Table 5** and are based on the following:

- 30% increase of the seasonal baseline maximum concentrations at SW20/02, or where unavailable.
- The site-specific WQGs have been adopted.

5.3.3 Actions

5.3.3.1 Action 1: Monitoring and Review

Where triggered, confirmatory monitoring will be undertaken within one month. If elevated CoPC concentrations persist (above 30%), Woljenup Creek waters (e.g. SW20/02) will be evaluated for TSF4 decant source signature (SO_4, Na, HCO_3). Any increasing trends in TSF4 decant source signature concentrations in Woljenup Creek will be assessed against the geochemical setting to provide supporting evidence of TSF4 impacts, or otherwise (qualified personnel will be required, e.g.: geochemist).

If a TSF4 source is not supported, then update baseline concentrations with new information, and adjust Trigger levels accordingly.

If the impacted Creek water is deemed to reflect TSF4 source seepage and/or drainage:

- Implement **Action 2**; and
- Increase the frequency of monitoring of Woljenup creek waters to monthly (review the requirement for monthly monitoring after six months).

5.3.3.2 Action 2: Risk Assessment

Compare the Woljenup Creek water quality to the site derived WQGs; where TSF4 impacts cause water quality to exceed guidelines, then present the understanding of the site-specific risk through the following:

- Confirm site-specific receptors of Woljenup Creek (stock watering, domestic use, and aquatic ecology have been identified in an earlier 2021 water use survey depicted in **Figure 2.2**).
- Confirm exposure scenarios where receptors may ingest/contact the impacted waters (e.g. recreational exposure).

Where risks to the receptors are deemed unacceptable, that is the identified receptors will be exposed to water quality which exceeds the guidelines, then implement **Action 3**.

5.3.3.3 Action 3: Remediation

Where CoPC concentrations in Woljenup Creek are deemed to pose an unacceptable risk to the receptors, remedial options will be designed and implemented based on the following strategy:

- Control of TSF4 source discharge (mitigation of surface water runoff and/or groundwater seepage).
- Capture and management of impacted surface water within Woljenup Creek (e.g.: pump-back to MWC).

6. Reporting

6.1 Overview

Monitoring data will be evaluated against the Trigger levels (presented in **Appendix A Table 2**, **Appendix A Table 3**, and **Appendix A Table 5** for groundwater quality and Woljenup Creek water quality) within two weeks of receipt of the data.

Where the Trigger levels are not exceeded, **Routine Monitoring Reporting** will be undertaken, as presented in **Section 6.2**.

Where the Trigger levels are exceeded, **Non-routine Monitoring Reporting** will be undertaken, as presented in **Section 6.3**.

6.2 Routine Monitoring Reporting

6.2.1 Quarterly Reporting

The quarterly monitoring report will summarise the monthly monitoring data and/or the quarterly monitoring data. The evaluation of the groundwater and surface water monitoring data will include the following data presentation.

- Compliance with the monitoring requirements and licence conditions (tabulated).
- Tables of water quality (metals, major ions, nutrients, field parameters), water levels, and flow rates where applicable.
- Evaluation of monitoring data against Trigger levels.
- Summary of quality control and sampling methods (QA/QC).

6.2.2 Annual Reporting

The annual monitoring report will summarise the data obtained over the year, compiled from the monthly and quarterly and bi-annual monitoring events. The annual evaluation of the groundwater and surface water monitoring data will include the following data presentation.

- Compliance with the monitoring requirements and licence conditions.
- Graphs of water quality with respect to key CoPCs (As, Cd, Sb, Li) in groundwater and Woljenup Creek, and flows into (or out of) Sumps (A, B, C &D).
- Tables of water quality (metals, major ions, nutrients, field parameters), water levels, and flow rates where applicable.
- Groundwater flow directions (groundwater contour plans).
- Summary of quality control and sampling methods (QA/QC).

6.3 Non-routine Monitoring Reporting

Where the monitoring data has been evaluated and deemed to exceed the Trigger levels (evaluation within two weeks of receipt of the data), the exceedance of the Trigger levels will be communicated to DWER within two weeks (i.e., within four weeks of receipt of data).

The communication to the DWER will comprise the following:

- Timelines for implementation of actions.
- Scope of reporting on actions.
- Timelines of reporting on actions.

7. Review

This SMP will be subject to review and updates, based on the following:

- Increased understanding of the risks posed to the receiving environment.
- Decreased uncertainty in data variability (e.g.: improved reliability in trend analysis).
- Changes to TSF4 operations schedule and/or seepage collection systems.
- Changes to TSF4 source composition (CoPCs), including improvements or degradation of TSF4 decant (seepage source), and/or tailings and waste rock leaching tests.

The review of the SMP will include, where justified, updates to the following:

- Frequency of monitoring.
- Monitoring parameters/CoPCs.
- Reporting frequency.
- Actions.

A review of the SSMP will occur at the following time frames:

- End of TLO time limited operations.
- During operations at 5 yearly intervals.
- End of operations.
- End of site management.

The SMP will also be reviewed at any time new information that alters the understanding of risks posed to the receptors becomes available. Updates to the plan will only occur if deemed necessary following the review.

8. References

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Appendix A

Monitoring, Triggers Levels and Response Schedules

Appendix A Table 1: Groundwater Monitoring and Management

Frequency	Bore Suite	Monitoring Location	Analytes[4]	Trigger Levels	Action 1: Monitoring and Review	Action 2: Risk Assessment	Action 3: Remediation
Baseline Bores							
Monthly until W6618/2021/1 TLO expires (Post-inclusion of GW bores on L4247/1991/13) In accordance with L4247/1991/13	Shallow monitoring bores	– MB01-S – MB08-S (dry) – MB21-S (dry) – MB22-S (dry) – MB23-S (artesian) – MB20-01-S – PB001-S	**Field parameters:** Water Level (m BGL), pH, TDS, DO **Major ions:** Cl^-, NO_3^-, SO_4^- **Metals:** As, Co, Cu, Fe, Li, Mg, Mn, Na, Ni, Sb, Th, U	The Trigger levels are presented in **Appendix A Table 2.** Trigger levels are based on 30% above seasonal maximum concentrations for key CoPCs: – As, Cs, Li, Rb, Sb, U[5]	**Sub-action 1):** – Confirm CoPC occurrence/concentration (>30%) via next monthly monitoring. – If confirmed, then implement Sub-action 2. **Sub-action 2):** – Assess groundwater for TSF4 decant signature (source) via assessment of concentrations of SO4, Na, HCO3 (displayed as Cl ratios). – If CoPC and decant source signature support TSF4 impacts to groundwater, then implement Sub-action 3. – Otherwise implement Sub-action 4. **Sub-action 3):** – Confirm CoPC and decant source occurrence/concentration via next monthly monitoring. – If confirmed, then implement Action 2. – If CoPC concentrations are below 30% of the seasonal maximum, implement Sub action 4. **Sub-action 4):** – Return to routine monitoring, CoPC concentrations deemed to reflect natural variation (reset/review natural seasonal variation range).	– Investigate impacted groundwater extent, migration direction and fate to include additional installation of groundwater monitoring bores and additional monitoring, where required; and/or – Predict impacts at the receptors (e.g.: groundwater modelling to predict discharges to creek of CoPCs)[6]. – Where the beneficial use of the groundwater is diminished (above baseline concentrations, and above site specific WQGs) at the premises boundary and/or discharges into Woljenup Creek, then present an understanding of exposure scenarios to the receptors (human health and the environment). – If exposure scenarios are complete, then the risk to the receptors is deemed unacceptable and implement Action 3. – Otherwise develop/update monitoring schedule and network, as required.	Design and implement remediation strategy, such as: – Pump-back of impacted groundwater (abstraction bores); and/or – Pump-back of impacted creek waters; and/or – Implement source control, including mitigation of TSF4 seepage and discharge.
Quarterly until W6618/2021/1 TLO expires (Post-inclusion of GW bores on L4247/1991/13) In accordance with L4247/1991/13	Intermediate and deep monitoring bores	– MB01-I & D – MB08- I & D (dry) – MB21-I & D (dry) – MB22-I & D (dry) – MB23-I & D (artesian) – MB20-01-I & D – MB20-03- I & D – PB001- I & D					

[4] Laboratory Limits of Reporting (LoR) to below WQGs as follows: < 1 mg/L major-ions/nutrients; < 0.1 mg/L Mn; < 0.01 mg/L Al, Cs, Mo, Ni; < 0.001 mg/L Sb, As, Cs, Cr, Li, Rb; <0.0001 mg/L Cd, Cu, U; <0.00001 mg/L Tl, V.
[5] Concentrations of As, Cs, Li, Rb, Sb, U are elevated in TSF4 source water (decant) compared to groundwater of the area and are deemed as key indicators of source "breakthrough".
[6] Predictive modelling estimates of impact is subject to uncertainty (probabilistic predictions).

Frequency	Bore Suite	Monitoring Location	Analytes[7]	Trigger Levels	Action 1: Monitoring and Review	Action 2: Risk Assessment	Action 3: Remediation
Perimeter Bores:							
Single sampling event 60-180 calendar days Post-W6901/2024/1 TLO commencement (Post-inclusion of GW bores on L4247/1991/13) In accordance with L4247/1991/13	Shallow, intermediate and deep monitoring bores	Southern Perimeter Bores: – MB24-01 – MB24-02 – MB24-03 – MB24-04 – MB24-05 – MB24-06 – MB24-07 – MB24-08 Western and Eastern Perimeter Bores (if/when installed): – MB24-09 – MB24-10 – MB24-11 – MB24-12 – MB24-13 – MB24-14	**Field parameters**: Water Level (m BGL), pH, EC, TDS, Hardness, Dissolved Oxygen, **Major cations and anions:** Ca, Cl^-, Mg, Mn, K, Na, NO_3^-, PO_4^{3-}, SO_4^{2-} **Metals:** Al, As, B, Ba, Be, Cd, Co, Cr (III), Cr (VI), Cu, Fe, Hg, Li, Ni, Pb, Mo, Ra-226, Ra-228, Rb, Sb, Se, Sn, Sr, Th, Tl, U, Zn	The interim Trigger levels are presented in **Appendix A Table 2.** Trigger levels are based on 30% above seasonal maximum concentrations[8] for key CoPCs: – As, Cs, Li, Rb, Sb, U[9] 1,	**Sub-action 5):** – Confirm CoPC occurrence/concentration (30%) via next monthly monitoring. – If confirmed, then implement Sub-action 6. **Sub-action 6):** – Assess groundwater for TSF4 decant signature (source), includes assessment of concentrations of So4, Na, HCo3 (displayed as Cl ratios). – If TSF4/decant impacts confirmed, then implement Sub-action 7. – If decant signature not supported, then implement Sub-action 8. **Sub-action 7).** – If groundwater quality at the impacted groundwater bore(s) exceeds the predicted WQG at that bore(s), then implement Action 2. – Otherwise implement Sub-action 8. **Sub-action 8):** – Return to routine monitoring, as CoPC concentrations deemed to reflect natural variation.	**Sub-action 9:** – Recalibrate existing groundwater model with new/updated concentrations. – Present updated understanding of impacted groundwater extent, migration direction and fate[10]. – If adverse risk of impacts to receptor(s) confirmed (eg.: discharge to creek above guidelines) then implement Action 3, otherwise implement Sub-action 10. **Sub-action 10:** If required, updated monitoring network to include installation of groundwater monitoring bores to define extent of impacts and to validate the predictive modelling, otherwise continue monitoring as per regular schedule.	Design and implement remediation strategy, such as: – Pump-back of impacted groundwater (abstraction bores), and/or – Pump-back of impacted creek waters, and/or – Implement source control to mitigate TSF4 seepage and discharge to groundwater.

7 Laboratory Limits of Reporting (LoR) to below WQGs as follows: < 1 mg/L major-ions/nutrients; < 0.1 mg/L Mn; < 0.01 mg/L Al, Cs, Mo, Ni; < 0.001 mg/L Sb, As, Cs, Cr, Li, Rb; <0.0001 mg/L Cd, Cu, U; <0.00001 mg/L Tl, V.
8 Seasonal maximum concentrations to be established following installation of TSF4 perimeter bores.
9 Concentrations of As, Cs, Li, Rb, Sb, U are elevated in TSF4 source water (decant) compared to groundwater of the area and are deemed as key indicators of source "breakthrough".
10 Predictive modelling estimates of impact is subject to uncertainty (probabilistic predictions).

Appendix A Table 2: Groundwater quality (*Italics*) and adopted Trigger and Interim Levels (Bold).

Bore ID[11]	Antimony	Arsenic	Caesium	Lithium	Rubidium	Uranium
Baseline monitoring bores (mg/L):						
MB01-D*	*<0.001*	*0.006*	*0.006*	*1.94*	*0.065*	*0.02*
	0.002	**0.0075**	**0.0075**	**2.43**	**0.081**	**0.025**
MB01-I*	*<0.001*	*0.002*	*<0.001*	*0.51*	*0.019*	*0.009*
	0.002	**0.002**	**0.002**	**0.64**	**0.024**	**0.011**
MB01-S*	*<0.001*	*0.001*	*<0.001*	*0.94*	*0.01*	*<0.001*
	0.002	**0.002**	**0.002**	**1.17**	**0.013**	**0.002**
MB20_01D	*<0.001*	*0.002*	*0.001*	*0.43*	*0.016*	*<0.001*
	0.002	**0.003**	**0.002**	**0.54**	**0.02**	**0.002**
MB20_01I	*<0.001*	*<0.001*	*<0.001*	*0.018*	*0.01*	*0.002*
	0.002	**0.002**	**0.002**	**0.023**	**0.013**	**0.0025**
MB20_01S	*<0.001*	*<0.001*	*<0.001*	*0.054*	*0.004*	*<0.001*
	0.002	**0.002**	**0.002**	**0.068**	**0.005**	**0.002**
MB20_03D	*<0.001*	*0.017*	*0.013*	*1.0*	*0.08*	*<0.001*
	0.002	**0.021**	**0.016**	**1.25**	**0.10**	**0.002**
MB22-D	*<0.001*	*0.04*	*0.006*	*1.74*	*0.08*	*<0.001*
	0.002	**0.050**	**0.008**	**2.18**	**0.10**	**0.002**
MB23-D	*<0.001*	*0.042*	*<0.001*	*0.047*	*0.005*	*<0.001*
	0.002	**0.053**	**0.002**	**0.059**	**0.006**	**0.002**
MB23-I	*<0.001*	*<0.001*	*0.001*	*0.017*	*0.023*	*<0.001*
	0.002	**0.002**	**0.002**	**0.021**	**0.029**	**0.002**
MB23-S	*<0.001*	*0.002*	*<0.001*	*0.101*	*0.018*	*<0.001*
	0.002	**0.002**	**0.002**	**0.126**	**0.023**	**0.002**

[11] * = Monitoring bores are deemed impacted from TSF4 seepage ponds (e.g.: concentrations do not reflect background)

Bore ID[11]	Antimony	Arsenic	Caesium	Lithium	Rubidium	Uranium
Baseline monitoring bores (mg/L):						
	0.002	**0.002**	**0.002**	**0.036**	**0.002**	**0.002**
PB001_D	*<0.001*	*0.002*	*<0.001*	*0.042*	*0.002*	*<0.001*
	0.002	**0.002**	**0.002**	**0.053**	**0.002**	**0.002**
PB001_I	*<0.001*	*0.002*	*<0.001*	*0.117*	*0.006*	*<0.001*
	0.002	**0.002**	**0.002**	**0.146**	**0.008**	**0.002**
PB001_S	*<0.001*	*0.002*	*0.001*	*0.058*	*0.008*	*0.012*
	0.002	**0.003**	**0.003**	**0.073**	**0.010**	**0.015**
TSF4 perimeter monitoring bores mg/L (Interim Trigger levels)[12]:						
MB24 -1 to 14	**0.002**	**0.01**	**0.004**	**0.28**	**0.021**	**0.005**

[12] Trigger levels to be updated following collection and review of at least one year's monitoring data

Appendix A Table 3: Sump A Predictive flow rates and Trigger levels

Year	Predictive Modelling Results	Trigger Levels[13]
	Flow Rate (m3/d)	
2024	121	181
2025	113	169
2026	117	176
2027	122	183
2028	128	192
2029	135	202
2030	143	215
2031	154	231
2032	165	247
2033	174	261
2034	183	275
2035	195	292
2036	208	312
2037	217	326
2038	204	306
2039	191	287
2040	182	273
2041	177	265
2042	170	255
2043	163	244
2044	156	234
2045	149	224
2046	143	214
2047	137	206
2048	131	197
2049	126	189
2050	121	182
2060	87	130
2070	66	99
2080	52	79
2090	44	66
2100	38	57

[13] Trigger levels: flow rates based on 150% of modelled values, and Lithium based on 200% of modelled values

Appendix A Table 4: Woljenup Creek Monitoring and Management

Frequency	Monitoring Location	Analytes[14]	Trigger Levels	Action 1: Monitoring and Review	Action 2: Risk Assessment	Action 3: Remediation
Monthly until W6618/2021/1 TLO expires	– SW24/01	**Field Parameters:** Ph, TDS **Major ions**: Cl^-, SO_4^-, NO_3^- **Selected metals:** As, Co, Cu, Fe, Mg, Mn, Li, Na, Ni, Sb, Th, U	The Trigger levels are presented in **Appendix A Table 5.** Trigger levels are based on 30% increase above the seasonal baseline maximum concentrations at SW20/02, or where baseline concentrations absent, adopt WQGs.	**Sub-action 1:** – Confirm CoPC concentration (>30%) via next monthly monitoring. – If confirmed, then implement Sub-action 2. **Sub-action 2**: – Evaluate creek waters for TSF4 decant source signature (SO_4, Na, HCO_3). – If the impacts to the Creek are deemed to reflect TSF4 source, then implement Sub-action 3 and **Action 2**. – If a TSF4 source is not supported implement sub-action 4. **Sub-action 3**: – Increase the frequency of monitoring of the Woljenup creek waters to monthly. – Review the requirement for monthly monitoring after six months. **Sub-action 4**: – Update baseline concentrations with new information and adjust Trigger levels accordingly.	– Compare of the Woljenup Creek water quality to the site derived WQGs. – Where TSF4 impacts cause water quality to exceed guidelines, then present an understanding of risks by identifying site-specific receptors and potential exposure scenarios of Woljenup Creek (human health and the environment). – Where risks to the receptors are deemed unacceptable, implement Action 3.	Remedial options will be designed and implemented based on – Control of TSF4 source discharge (mitigation of surface water runoff and/or groundwater seepage),and/or – Capture and management of impacted surface water within Woljenup Creek (e.g.: pump-back to MWC).
(post- W6618/2021/1 TLO expiration) Single sampling event 60-180 calendar days Post- W6901/2024/1 TLO commencement	– SW24/01 – SW23/01 – SW23/02	**Field Parameters:** pH, EC, TDS, Dissolved Oxygen **Major cations and anions**: Ca, $CaCO_3$, Cl^-, NO_3^-, SO_4^{2-} **Selected metals:** Al, As, Cd, Cs, Li, Mn, Rb, Sb, Th, U, V, Zn				
(Post-inclusion of Woljenup Creek SW mtrg locations on L4247/1991/13) In accordance with L4247/1991/13		In accordance with L4247/1991/13				

[14] Laboratory Limits of Reporting (LoR) to below WQGs as follows: < 1 mg/L major-ions/nutrients; < 0.1 mg/L Mn; < 0.01 mg/L Al, Cs, Mo, Ni; < 0.001 mg/L Sb, As, Cs, Cr, Li, Rb; <0.0001 mg/L Cd, Cu, U; <0.00001 mg/L Tl, V.

Appendix A Table 5: Woljenup Creek (SW20/02) Water Quality and Adopted Trigger Levels

Analyte	Maximum seasonal 2022/2023 (mg/L)	Trigger level (mg/L)[15]
List of CoPCs:		
Sulfate (filtered)	32	50
Nitrate (as N)	1.7	2.2
Aluminium (filtered)	0.04	0.05
Antimony (filtered)	<0.001	0.002
Arsenic (filtered)	<0.001	0.002
Cadmium	Not Analysed	0.001[16]
Caesium (filtered)	<0.001	0.002
Lithium (filtered)	0.006	0.008
Manganese (filtered)	1.56	2.0
Rubidium (filtered)	0.011	0.014
Thallium (filtered)	<0.001	0.00003[16]
Uranium (filtered)	<0.001	0.0005[16]
Vanadium*	Not analysed	0.0006[16]
Zinc*	Not analysed	0.04[16]
Major-Ions (for assessment of TSF4 decant source):		
Total Dissolved Solids	612	Not applicable (not a CoPC)
Alkalinity (total as CaCO3)	184	Not applicable (not a CoPC)
Sodium (filtered)	131	Not applicable (not a CoPC)
Chloride	267	Not applicable (not a CoPC)
Total Dissolved Solids	612	Not applicable (not a CoPC)

15 Trigger levels based on 30% above the seasonal maximum concentration
16 Trigger levels based on fresh-water aquatic WQG, until follow-up monitoring confirms baseline concentrations