Annual Monitoring Review and Management Report 2024-2025

MMG Rosebery

Date: 30/09/2025
Prepared by MMG Rosebery

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Executive Summary

This Annual Monitoring Review and Management Report (AMRMR) has been prepared in accordance with the requirements of Environmental Protection Notice's (EPN) 7153/3 and 8815/2, and Permit Conditions Environmental (PCE) 11514 for the annual monitoring period 1 July 2024 to 30 June 2025.

MMG Rosebery is Australia's largest volcanic hosted polymetallic base and precious metals (zinc, lead, copper, gold and silver) mine and its concentrator has been in continuous operation since 1936. MMG Limited (MMG) acquired Rosebery in June 2009. The mine currently produces zinc, lead and copper concentrates and gold doré using mechanised underground mining methods and crushing, grinding and flotation processes. Given the mine's long history, environmental performance at Rosebery is influenced by historical mining practices that preceded MMG's management of the operation.

During the reporting period MMG Rosebery conducted its annual risk profile review, confirming no new risks were added to the site material risk register. Continuous risk analysis and critical control design are integral to MMG's risk management processes, as evidenced by continual comprehensive inspections and audits by the Engineer of Record (EOR) and evaluations by the Independent Tailings Review Board (ITRB). During the reporting period, the EOR reports from both tailings' facilities found they do not present a significant risk to the environment and are suitable for the ongoing storage of tailings.

The 2016-2021 Environment Management Plan (EMP) Review report submitted to the EPA on 30 November 2021 discussed the broad environmental implications of mine activities and outlined MMG Rosebery's strategy for 2021-2026. The 2021-2026 Asset Strategy was growth focused. Review of the Asset Strategy in 2025 was still growth focused and centred around extending the operational life of Rosebery by unlocking the full potential of the resource, optimizing tailings solutions, embracing cost-effective technology, fostering a supportive work environment, and adhering to sustainable practices. The next EMP review is scheduled for 2026.

Securing additional tailings storage capacity is crucial. Extensive studies are underway to extend the life of the existing facilities whilst a long-term tailings solution is developed. Pending regulatory approvals, these projects have the ability to extend the current tailings storage capacity to 2030 based on current throughput rates. Progress on obtaining environmental approvals supporting a long-term tailings solution progressed throughout the reporting period.

MMG is committed to minimising its environmental footprint, aligning with the International Council on Mining and Metals (ICMM) mining principles and performance expectations, which guide environmental and social requirements. Annual business plans at MMG Rosebery set departmental targets, with environmental goals outlined in the 2025 business plan. During the reporting period a range of projects were either planned, commenced, or completed resulting in environmental improvement. These range from additional sprinklers being installed at the 2/5 Dam TSF, to installing bird deflectors on powerline spans.

During the reporting period, MMG Rosebery received eleven environment related community complaints, and six complaints related to other categories including damage to private property, exploration and community health and safety. Of the environment related complaints, six complaints pertained to noise, three to air quality and two to vibration. MMG Rosebery strives to address all complaints to the satisfaction of the complainants and continues to track and manage all community engagement using the stakeholder management software, Borealis.

MMG Rosebery has provided a security deposit to MRT as required under the *Mineral Resources Development Act* 1995 (MRDA), MRT assessed the value as being adequate. The security deposit value was derived from substantial studies completed as part of the closure prefeasibility programs at Hercules and Rosebery, the studies also informed the Mine Closure Plan submitted to the Environmental Protection Authority (EPA) and Mineral Resources Tasmania (MRT) in July 2024, in compliance with condition DC3 of EPN 7153/3. As at 30 June 2025, discussions are still underway for the revised security deposit which is currently being assessed by MRT as part of the lease renewal process.

The current reporting period saw a 1% decrease in ore mined and milled resulting in 860,788 tonnes of tailings deposited between the 2/5 Dam Tailings Storage Facility (TSF) and Bobadil TSF. In the ordinary course of business, waste rock mined remains underground and included 344,396 tonnes of mine backfill. However, this

year, 2,475 tonnes were placed within the 3 Level Waste Rock Dump. A total of 262.2 tonnes of non-mineral waste was disposed at the onsite landfill.

Environmental monitoring continued as per MMG Rosebery's environmental monitoring plans. A review of environmental results for the reporting period is detailed in section 6 and contained within specialist reviews appended to this report. Of note, there were no exceedances for the site discharge point Bobadil Outfall (BO) compliance limits during the reporting period.

1. Purpose

This report was prepared in accordance with the annual reporting requirements outlined in Environmental Protection Notice (EPN) 7153/3 (issued 10 November 2011), EPN 8815/2 (3 Level Waste Rock Dump (WRD) issued 13 February 2015) and Permit Conditions Environmental (PCE) 11514 (issued 7 November 2024). This AMRMR report covers the period 1 July 2024 to 30 June 2025 and is made publicly available through MMG Rosebery's community liaison office in Rosebery and on the MMG website. Requirements of these EPNs and PCE are summarised in Table 1 below.

Table 1. Report coverage of EPN and PCE requirements

EPN	EPN Requirement		Section
7153/3 & *PCE 11514*	G7 1	The AMRMR must be made publicly available...	1
	G7 2.1 *G8 2.1*	An Executive Summary.	Executive Summary
	G7 2.2 *G8 2.2*	A review of environmental aspects and impacts register against environmental controls and documentation.	4.1
	G7 2.3 *G8 2.3*	A review of activity compliance and annual external compliance audit against EPN requirements.	7.1
	G7 2.4 *G8 2.4*	Environmental planning, including objectives and targets relating to the review period and details of the forward environmental planning and forecasting process, including strategic issues for the activity, for but not limited to the management period.	4.2 and 4.3
	G7 2.5 *G8 2.5*	A review of environmental commitments and process changes (including annual tonnage) for, but not limited to, the management period.	3.1 and 4.4
	G7 2.6 *G8 2.6*	A review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring locations, including discharge and ambient monitoring points that illustrate significant trends.	6.3, 6.4, 6.5, 6.6 and Appendix E Appendix F Appendix G Appendix H Appendix I Appendix J
	A4-3	Analysis of yearly climate.	6.1 and Appendix E

EPN	EPN Requirement		Section
	A5-3 *A8-3*	Tabulated high volume air sampler, and dust and metal deposition results for the entire year, showing intermediate values as well as final monitoring results. Tabulated annual averages of the deposition increment above background, supported by deposition isopleths or graphs of monthly results. Summaries of all exceedances, describing the results of any investigations undertaken and the mitigation measures that were adopted in response. Any supporting data analysis or description necessary to aid interpretation of the dataset.	6.5 and Appendix I
	M4-3 *E2-2*	If the concentrations in effluent from Bobadil Tailings Dam end-of-pipe discharge of parameters listed in EPN do not comply with the levels specified. (Investigation Trigger Level) then an investigation must be conducted and a report summarising the outcomes of all such investigations be submitted in MMG Rosebery's AMRMR.	6.3 and Appendix F
	E5-1.2	Monitor the level of groundwater contamination (mass load of pollutants) due to seepages from the Bobadil, No.2 and No.5 and rehabilitated No.1 tailings storage facilities on the Stitt River and Lake Pieman.	Appendix F
	E3	Annual biological survey and ambient water quality monitoring program of the Stitt River and Lake Pieman to document ongoing environmental conditions, increase the understanding of temporal, spatial and seasonal biological and chemical changes within the lake and progress the development of site-specific toxicity guidelines for sulphate and zinc in Lake Pieman.	6.3, 6.4 and Appendix F Appendix G Appendix H
	N1-1.8	Results of the continuous noise monitoring program and noise related complaints must be reported in the AMRMR.	5.2, 6.6 and Appendix J
	G7 2.7 *G8 2.7*	Environmental performance, including incident management and community complaints and the corrective and preventative processes implemented.	5.2 and 6.7
	WM1 2.4	Any environmental or stability issue identified and associated with all tailings dams further outlined to the Director in the AMRMR.	6.8
	G7 2.8 *G8 2.8*	Any approvals or written notifications received in relation to this notice.	5.1
	G7 2.9 *G8 2.9*	A summary of any rehabilitation works carried out during the period and an estimate of current remediation liabilities.	5.3
	G7 2.10 / WM3-2 *G8 2.10 / WM2-2*	An inventory of wastes disposed of on The Land during the previous 12 months, including details of the quantities of each waste stream and the location of its disposal.	5.4

EPN	EPN Requirement		Section
8815/2	G4-4	Annual review of the surface and ground water monitoring program in accordance with Appendix B of the Detailed Design Report, including an assessment of surface and groundwater impacts from the 3 Level WRD.	6.2 and Appendix F
	M3 1.2	Results of 3 Level WRD surface and groundwater monitoring program.	6.2 and Appendix F



Figure 1. MMG Rosebery Mine

2. Endorsement

"I hereby certify that to the best of my knowledge, the information within this Annual Monitoring Review and Management Report is true and correct."

Name: Steve Scott



Position: General Manager MMG Rosebery

Date: 30 September 2025

3. Operational History

3.1 Operational History

EPN 7153/3, G6 1.1.1 Site and operational history, particularly where it relates to the environmental performance of the activity.

EPN 7153/3, G7 2.5 & PCE 11514, G8 2.5 A review of environmental commitments and process changes (including annual tonnage) for, but not limited to, the management period.

MMG Rosebery is Australia's largest volcanic hosted polymetallic base and precious metals (zinc, lead, copper, gold and silver) mine and has been in continuous operation since 1936. As such, environmental performance at Rosebery is influenced by historical mining practices that preceded MMG's management of the operation.

MMG Limited (MMG) acquired Rosebery in June 2009. The consolidated mining lease is 4913 hectares, which includes the Rosebery mine, the decommissioned Hercules mine and more than 178 minor legacy sites and remnant features. The Rosebery mining operations are located within Mining Lease (ML) 28M/1993, approximately 300 kilometres north-west of Hobart and 125 kilometres south of Burnie. Maps of MMG Rosebery operational areas are detailed in Appendix A.

Zinc, lead and copper concentrates and gold doré are produced at Rosebery using mechanised underground mining methods and crushing, grinding and flotation processes. Rosebery concentrates are transported by rail to the Port of Burnie where they are shipped in bulk carriers to smelters in Hobart, Port Pirie and overseas. Gold doré bars are sold to a refinery within Australia where they are refined into gold bullion.

MMG Rosebery production data is provided in Table 2. Waste rock and tailing tonnages are provided in section 5.4.1. Note the values reported in Table 2 are based on the financial year reporting period. Production limits in accordance with MMG Rosebery's permit conditions, Permit 1904 as varied by EPN 7153/3, are based on annual tonnes or ore processed from the anniversary date of the EPN (21st of September). MMG Rosebery's current permitted processing limit is 1.1M tonnes per year (EPA ref. EN-EM-PE-EX-038147_24 | H949382, 2018). Ore processed from September 2023 to September 2024 did not exceed the 1.1M tonne limit. Year to date values from September 2024 do not indicate that the limit will be exceeded in this reporting period to the end of September 2025.

Table 2. Rosebery production

	Unit	2023-2024FY	2024-2025FY	% Change
Ore Mined*	dry tonnes	995,106	983,883	-1.1
Ore Milled*	dry tonnes	995,416	987,326	-0.8
Gold doré*	oz	20,812	19,048	-8.6
Copper concentrate*	dry tonnes	7,723	7,482	-3.1
Lead concentrate*	dry tonnes	33,188	27,818	-16.2
Zinc concentrate*	dry tonnes	109,374	91,237	-16.6

*Data sourced from Envizi for period 1 July to 30 June.

Process changes and improvement projects that have influenced Rosebery's production and environmental performance from 2012-2025 are detailed in Table 3.

Table 3. Operational history and major environmental improvement projects (2012-2025)

Activity	Milestone	Details
Underground Mine	2012	Change in stability methods from mesh and bolts to fibrecrete and resin bolts, to improve ground support. Concrete batch plant used in fibrecrete approved by West Coast Council (PID 6021427).
	2014	Installation of concrete batching plant (PID 6021427) and noise attenuation wall.
	2015	Surface vent (PSF1) fan upgrade to meet increased ventilation flow demand as mine extended (Approval DA14195).
	2015	Installation of a new 120,000L capacity, self-bunded fuel bay and decommissioning of the existing fuel bay site.
	2018	Introduction of grouting for remnant mining.
	2019	Development activity in the 11L, requiring vibration monitoring in the Rosebery township.
	2023	Purchase of one new diesel electric hybrid loader.
	2023	Construction of a new Batch Plant at 4L (DA 2023/19)
	2024	Purchase of two new diesel electric hybrid loaders.
	2024	Upgrade to 33P booster fans underground.
	2024	Southern Upcast Ventilation Fan (PSF3) upgrade.
	2025	Purchase of one new battery electric production drill.
	2025	Z Lens Raisebore Hole construction and Booster Fan Installation.
Processing Plant	2014	Commissioning of refurbished MG3 Ball Mill (Approval H287020) to support increased throughput in grinding circuit and reduced grind size. No significant change in noise profile.
	2014	Installation and commissioning of a second Knelson concentrator to improve gold recovery to doré (Approval H316091).
	2015	Installation of a tertiary crushing circuit to increase throughput and enable a finer grind size, which improves recovery of all commodities and is beneficial for tailings transport.
	2021	Filter plant storm water drainage system works completed.
	2023	Primary conveyor replacement (CC3A) completed.
Tailings Storage	2012	Completed Stage 7 works at Bobadil TSF, which raised the TSF to RL 195m (EPN 8574/1).
	2012	Bobadil polishing pond stability analysis to improve understanding of embankment seepage.
	2013	Completed Stage 8 embankment raise at Bobadil TSF to RL 197m (EPN 8781/1).
	2014	Completion of Bobadil polishing pond redevelopment to improve water treatment (EPN 8814/1).

Activity	Milestone	Details
	2015	Completed Stage 9A upstream embankment raise to the southern portion of the facility to a crest of RL 199m at Bobadil TSF (EPN 9139/1).
	2016	Completed Stage 9B embankment raise at Bobadil TSF to provide storage capacity to allow continued production until 2017. Works include raising the northern portion of the facility to a crest of RL 199m using the upstream construction method and the construction of a new spillway that has been designed for closure (EPN 9139/1).
	2016	Construction of the 2/5 Dam TSF to a crest of RL 170m. The construction is a single continuous embankment formed via upstream and downstream construction over and around the previous 1, 2 and 5 Dam complex, originally constructed between 1950 and 1970 (PCE 9084).
	2018	Tailings deposition commenced in Q1 2018 at the 2/5 Dam (PCE 9084).
	2020	Murchison Highway mitigation works to reduce seepage water entering the Stitt River.
	2021	2/5 Dam TSF subaerial deposition infrastructure works, to allow deposition during construction of a Stage 2 raise (conditional subaerial approval).
	2021	Bobadil TSF 10A upstream and stepped in embankment raise to a crest of RL 201m completed and deposition commences (EPN 10504/1).
	2021	2/5 Dam TSF Stage 2 downstream raise construction to crest of RL 173m commenced (PCE 9084).
	2022	Bobadil TSF 10B upstream and stepped in embankment raise to a crest of RL 201m completed incorporating a 9-hectare trial closure cover over the stepped in area at RL 199m (EPN 10504/1).
	2022	Completion of works to separate the 2/5 Dam TSF seepage from stormwater drainage adjacent Murchison Highway.
	2024	2/5 Dam TSF screen bund construction completed and revegetated with Poa grass adjacent Murchison Highway in Q1 2024.
	2024	2/5 Dam TSF Stage 2 downstream raise construction to crest of RL 173m completed in Q1 2024 (PCE 9084 as varied by EPN 10620)*
	2024	Completion of 2/5 Dam TSF subaerial deposition works (currently operating under temporary approval pending formal approval upon EIS submission which is forecast for Q3 2025).
	2024	Approval received for Bobadil TSF Stage 11 & 12 raises (DA 2024/00032). New Permit Conditions Environmental received (PCE 11514).
	2025	Completion of finger raises at 2/5 Dam TSF.
	2025	Completion of Bobadil Stage 11A.
Waste rock management	2015	Commenced construction of Waste Rock Dump at the 3 Level Open Cut Area (3 Level WRD) in accordance with EPN 8815/2. Stage 1 Establishment phase has been completed and construction of Stages 1a and 1b were completed in September 2015.
	2024	Construction of the 3 Level Waste Rock Dump Stage 2 raise 1 including placement of the limestone layer was completed in Q1 2024.
Water Management	2012	Site water balance developed and used on an ongoing basis to refine water management controls.

Activity	Milestone	Details
	2012	Upgrade to site sewerage system.
	2012	Works on 1 Dam Surface drainage, stormwater management for 2 Dam, and hydrological studies on 1/2/5 Dam as part of site water balance model development (Superseded by the construction of the 2/5 Dam TSF).
	2014	Construction of 3 Level clearwater diversion drain to divert up-gradient uncontaminated water to Rosebery Creek.
	2020	Bobadil Polishing Ponds de-sludging works. Work commenced in Q1 2020 with a floating pontoon, pumping sludge within geo-tubes.
	2022	Separation of 2/5 Dam TSF seepage from stormwater drainage adjacent Murchison Highway completed and functional.
	2024	Capture and passive return of eastern seepage back to the seepage collection ponds at 2/5 Dam TSF was completed in Q1 2024.
	2024	Bobadil Polishing Ponds de-sludging works. Work completed during Q1 2024 and resulted in 100% dredging of cells 1 and 2.
	2024	Refurbishment of the Pieman Header Tank.
Closure	2012-2013	Decommissioning and removal of redundant infrastructure (old administration building, Heritage Centre, old tank on Filter Plant Road, Assay Laboratory, three sandfill and cement silos).
	2018-2019	Minor legacy workings closure project commenced.
	2019	Rosebery & Hercules Closure PFS project commenced.
	2024	Submission of updated Closure Plan and new security deposit.

3.2 Current Environmental Improvement Projects

A summary of the status of environmental improvement projects that were proposed for commencement or continuation during the reporting period is provided in Table 4.

Table 4. Environmental improvement projects – status as of 30 June 2025

	Project Details	Status	Status Details
1	TSF Seepage Characterisation Install continuous flow infrastructure on all 3 v-notch weirs at the 2/5 Dam TSF.	Awaiting Commencement	Forecast commencement Q4 2025
2	Bobadil Underdrainage Redirection Capture seepage prior to entry into the polishing ponds and pump back into the Bobadil TSF.	Commenced	Forecast completion Q4 2025
3	2/5 Dam TSF Northern Embankment Instrumentation Installation of geotechnical instrumentation including piezometers, shape-arrays and total stations.	Commenced	Forecast completion Q4 2025
4	Water Characterisation and Modelling Investigation into Rosebery water treatment options.	Commenced	Forecast completion Q4 2026
5	2/5 Dam TSF Sprinkler Extension Installation of two additional big-gun sprinklers on the northern wall (total of 16 around the TSF).	Commenced	Forecast completion Q3 2025
6	Acid Dosing Plant Sulphuric acid dosing plant to correct the flotation slurry feed pH following successful acid dosing trial.	Commenced	Forecast completion Q4 2025
7	Rock Breaker Dust Mitigation Trialling mitigation measures to capture fugitive dust emissions that result from rock breaking.	Commenced	Forecast completion Q4 2025
8	Crusher Dust Extraction Upgrade Extraction fan upgrade to mitigate dust and reduce exposure to lead dust, silica and diesel particulates.	Commenced	Forecast completion Q4 2026

	Project Details	Status	Status Details
9	Baillieu St Air Quality Monitors Installation of two new HVAS units within the Rosebery community associated with Bobadil Stage 11 & 12.	Commenced	Forecast completion Q3 2025
10	Raptor Mitigation on Private Power Infrastructure Bird deflectors installed on spans adjoining high-risk power poles.	Commenced	Forecast completion Q3 2025
11	Water Rationalisation Study Review of compliance monitoring requirements against current operations to inform updated compliance monitoring submissions to the EPA.	Commenced	Forecast completion Q4 2026
12	Review of Climate Strategy Review of the sites Climate Strategy including review of GHG emissions reduction targets.	Commenced	Forecast completion Q4 2025
13	Development of Nature Strategy Development of a site-specific Nature Strategy incorporating a LEAP assessment.	Commenced	Forecast completion Q4 2025
14	Upgrade Dust Deposition Network Upgrade infrastructure and relocate to align with EPN 7153/3 and AS/NZ 3580.10.1 2016.	Commenced	Forecast completion Q4 2025
15	Wedge-tailed Eagle Nest Management Procedure Development of an internal wedge-tailed eagle nest management procedure.	Commenced	Forecast completion Q4 2025
	Wedge-tailed Eagle Nest Activity Check Activity checks of known nests within MMG Rosebery's mining tenements.	Commenced	Forecast completion Q4 2025
16	ROM Drainage Diversion Installation of a new drainage system to and from the ROM Pad.	Complete	Completed Q2 2025
17	Bobadil Floc Plant Flocculant plant purchase to support dredging of the Bobadil Polishing Ponds.	Complete	Completed Q4 2024

	Project Details	Status	Status Details
18	Baillieu St Air Quality Monitors Installation of a new real-time air quality monitor and DDG within the Rosebery community associated with Bobadil Stage 11 & 12.	Complete	Completed Q1 2025
19	DustTrak DRX Units for Filter Plant and Core Shed Upgrade of real-time dust monitors to from single size fraction DustTrak II units to multi-size fraction DustTrak DRX units at the Filter Plant and Core Shed.	Complete	Completed Q3 2024
20	Sound Wall at Fan F2 A sound wall has been installed in the F2 fan room to reduce nuisance noise to the community.	Complete	Completed Q3 2024
22	Rock Breaker Shroud Purchase of a new rock breaker shroud to reduce nuisance noise to the community.	Complete	Completed Q2 2025
22	Battery Electric Drill Purchase of one new diesel electric drill to meet performance targets and reduce GHG emissions.	Complete	Completed Q2 2025
23	Raptor Interaction Risk Assessment on Private Power Infrastructure A risk assessment of MMG Rosebery's privately owned power infrastructure to inform installation of future mitigation measure for raptor interaction.	Complete	Completed Q4 2024
24	2/5 Dam TSF Air Quality Monitors Installation of four air quality monitoring instruments surrounding 2/5 Dam TSF to monitor dust in real-time.	Complete	Completed Q4 2024
25	Upgrade Vehicle Hygiene Facilities Upgrade vehicle/equipment hygiene facilities for management of weeds and *Phytophthora cinnamomi.*	Complete	Completed Q1 2025
26	7 Level Workshop Sprinklers Sprinklers installed on roof of 7L workshop for dust mitigation and management.	Complete	Completed Q2 2025

	Project Details	Status	Status Details
27	Dust Mitigation Plan Updated the sites Dust Mitigation Plan.	Complete	Completed Q1 2025
28	Raptor Survey Commissioned a raptor survey of a combined mining tenement area of 18,360 ha including the entirety of ML 28M/1993.	Complete	Completed Q2 2025
29	Weed Survey Commissioned a weed survey of ML 28M/1993.	Complete	Completed Q3 2024
30	*Phytophthora cinnamomi* (PC) Surveys Survey and soil sampling for PC at Hercules, Bobadil TSF, 2/5 Dam TSF and across the main operational site.	Complete	Completed Q2 2025
31	Targeted *Orthoceras strictum* Survey Targeted Horned Orchid survey.	Complete	Completed Q1 2025



Figure 2. Installation of bird deflectors on MMG Rosebery powerlines to mitigate interaction with raptors.

4. Planning

4.1 Risk Assessment

EPN 7153/3, G7 2.2 & PCE 11514, G8 2.2 A review of environmental aspects and impacts register against environmental controls and documentation.

The annual risk profile review for the site's material risks was performed in Q1 2025. During the review no new risks were added to the Site Material Risk Register.

Risk analysis of material risks and design of critical controls continues as part of MMG's risk management processes. Alongside the Site Material Risk Register, MMG Rosebery also maintains an Environmental Risk Register and Aspects and Impacts Register as per ISO 14001, though MMG Rosebery is not currently ISO accredited. The Environmental Risk Register was last reviewed in Q3 2021 and the Aspects and Impacts Register in Q2 2025. Further review of the registers is planned during the next reporting period. Additionally, MMG Rosebery is investigating implementing new risk management software, which could allow for consolidation of risk registers.

Tailings dam management in Tasmania is regulated by the Australian National Committee on Large Dams (ANCOLD) guidelines, and Tasmania's Water Management (Safety of Dams) regulations 2015. In addition, MMG also reports under the Global Industry Standard on Tailings Management (GISTM). At MMG Rosebery, the Bobadil and 2/5 Dam TSFs undergo monthly on-site surveillance by ATC Williams under the guidance of the Engineer of Record (EOR). As part of the surveillance program, the EOR conducts annual audits in line with ANCOLD guidelines, as well fulfilling reporting requirements in line with the above regulatory frameworks when required.

During the current reporting period, the EOR issued an Intermediate Inspection Report for the Bobadil and 2/5 Dam TSFs, covering the period December 2023 to January 2025 (Appendix B and Appendix C). The audit reports concluded that both facilities do not pose a significant environmental risk and remain suitable for the ongoing storage of tailings.

In addition, an autonomous Independent Tailings Review Board (ITRB) was established in 2022 to assess all aspects of the MMG Rosebery TSFs on an annual basis. Since its establishment, the ITRB has convened at Rosebery in July 2022, May 2023, May 2024, and March 2025. The Board also meets quarterly; during this reporting period, meetings were held in October and December 2024. The combined inspections by the EOR and evaluations by the ITRB provide Rosebery with clear actions to improve facility performance and mitigate risks.

4.2 Environmental Planning

EPN 7153/3, G7 2.4 & PCE 11514, G8 2.4 Environmental planning, including objectives and targets relating to the review period and details of the forward environmental planning and forecasting process, including strategic issues for the activity, for but not limited to the management period.

A core component of MMG's growth strategy is to identify opportunities to maximise the potential of existing assets. MMG has a coordinated approach to Integrated Business Planning (IBP) which is supported by the MMG Group office in Melbourne. IBP is a four-stage process; Corporate and Asset Strategy (strategically focused 10+ years), Strategic Development Planning (directionally focused 5+ years), Asset Business Planning (delivery focused 5 years) and Annual Business Plan (execution focused 1-3 years).

Asset Business Plans (ABP) are developed in alignment with the broader IBP stages. This enables flexible investment decisions and typically results in two business scenarios (production and productivity cases). The IBP process provides a consistent direction on long-term operational strategy and guides the annual (short-term) and rolling three-year (medium-term) budget plans. The IBP also provides a primary basis for internal, whole-of-life business valuation (net present value).

The 2016-2021 Environment Management Plan (EMP) Review report submitted to the EPA on 30 November 2021 discussed the broad environmental implications of mine activities and outlined MMG Rosebery's strategy

for 2021-2026. The 2021-2026 Asset Strategy was growth focused. Review of the Asset Strategy in 2025 was still growth focused and centred around extending the operational life of Rosebery by unlocking the full potential of the resource, optimizing tailings solutions, embracing cost-effective technology, fostering a supportive work environment, and adhering to sustainable practices. The next EMP review is scheduled for 2026.

During the reporting period, a review of the Climate Strategy was initiated. MMG Corporate have developed a Nature Strategy, and sites including MMG Rosebery are in the process of developing a site-specific Nature Strategy. A major piece of work scheduled for completion during the next reporting period is a Locate, Evaluate, Assess and Prepare (LEAP) assessment to inform the Nature Strategy. This will be completed in accordance with the Task Force on Nature-related Financial Disclosures (TNFD) guidance document.

The landscape of climate and nature-related disclosures is rapidly evolving in Australia and globally, driven by increasing regulatory requirements, investor expectations, and the growing adoption of reporting frameworks, emphasising transparency and accountability in addressing environmental risks and opportunities. As a result, MMG Rosebery is integrating environmental considerations into business planning processes to balance growth with sustainability, build business resilience and address evolving disclosure requirements.

A key constraint on the current Life of Asset (LoA) is the securing of additional tailings storage capacity. Extensive studies are underway to extend the life of the existing facilities whilst a long-term tailings solution is developed. During the reporting period, investigations began into a potential Bobadil TSF Stage 13 and 14 embankment raises. Bobadil Stage 13 and 14 will require further investigation prior to a business decision being made on whether or not they will be pursued. If they are pursued, these will be the last embankment raises undertaken at the Bobadil TSF. An update on the status of a potential Stage 13 and 14 raise will be included within the next reporting period. Additional ongoing studies to extend the LoA include the 2/5 Dam TSF subaerial conversion and 2/5 Dam TSF Stage 3 embankment raise.

During the reporting period, MMG Rosebery received approval to commence construction on Bobadil TSF Stage 11 and 12 embankment raises. Environmental impacts are managed via a new permit, Permit Conditions Environmental (PCE) 11514 (approved 7th November 2024). The new permit details MMG Rosebery's requirements prior to construction and during construction and operation of the TSF. Compliance against construction prerequisites is summarised in Appendix D. Approval to commence construction was received from the EPA on 6 March 2025. Completion of Stage 11A and 11B is forecast during the next reporting period.

Pending regulatory approvals, the 2/5 Dam TSF Subaerial and Bobadil TSF Stages 13 and 14 projects have the ability to extend the current tailings storage capacity by 4.36Mt, enabling continued tailings deposition beyond 2030.

4.3 Objectives and Targets

EPN 7153/3, G7 2.4 & PCE 11514, G8 2.4 Environmental planning, including objectives and targets relating to the review period and details of the forward environmental planning and forecasting process, including strategic issues for the activity for but not limited to, the management period.

In support of MMG's commitment to minimise the environmental footprint and ensure efficient use of natural resources, the MMG Executive Committee made the commitment to align with the International Council on Mining and Metals (ICMM), Mining Principles and corresponding Performance Expectations which provide a comprehensive set of environmental and social requirements, including issues such as mine closure, pollution and waste.

MMG was one of the member companies involved in the development and review process for the Performance Expectations and commenced implementation of the ICMM Performance Expectations in 2020, incorporating robust, site-level validation. At a site level, MMG Rosebery creates an Annual Business Plan that provides a framework for departmental targets. Departmental objectives and targets are created that align with the Annual Business Plan. MMG has recently developed a corporate Sustainability Framework that will be used to drive key performance indicators for environmental and social targets. Environmental and social objectives and targets for 2025 are outlined in Table 5.

Table 5. Environmental targets

Goal	Target	Status as of 1 July 2025
Maintain Compliance with environmental licence and regulatory requirements (ECC Targets & Objectives, 2024)	Zero regulatory enforcement actions	Zero regulatory enforcement actions during reporting period.
Compliance to Environmental, Sustainability and SHEC auditing and reporting programs (ECC Targets & Objectives, 2024)	All regulatory reporting completed by due dates	All regulatory reporting completed by due dates during reporting period.
Compliance against environmental monitoring plan (ECC Targets & Objectives, 2024)	>90% compliance against environmental monitoring plan	>90% compliance against environmental monitoring plan every month during reporting period.
Diminish environmental impacts of the operation on surrounding waterways (ECC Targets & Objectives, 2024)	No uncontrolled discharges from site	No uncontrolled discharges from site.
Reduce dust emissions from site (ECC Targets & Objectives, 2024)	No air quality/dust complaints	Three dust complaints received during reporting period (section 5.2, Table 8).
Continuously monitor noise and vibration emissions from site to identify opportunities to reduce community complaints (ECC Targets & Objectives, 2024)	<5 noise complaints and no vibration complaints	Six noise complaints received during reporting period (section 5.2, Table 8)
Compliance with Land Clearance & Disturbance Procedures (ECC Targets & Objectives, 2024)	All land clearance activities comply with procedure	All land clearance activities complied with the Land Clearance & Disturbance Procedure.
Complete and implement Weed Management Procedures onsite (ECC Targets & Objectives, 2024)	Update the Management Plan and proceeding all hierarchical documentation.	Weed and pathogen management framework updated.
Develop baseline for current non-mineral waste management separation compliance (ECC Targets & Objectives, 2024)	Develop baseline	Preliminary investigation underway via waste stream identification and laboratory classification.
Further develop waste management hierarchy & better quantify waste streams to identify opportunities (ECC Targets & Objectives, 2024)	Quantify waste streams and complete waste management hierarchy & develop opportunities for 2026	Updated Non-mineral Waste Handling and Disposal Register. Audited contractors waste management processes on-site.
Energy and Decarbonisation Action Plan (Rosebery Business Plan, 2025)	Receive delivery of and commission Battery Electric Production Drill Rig.	Battery electric drill purchased and operational.
Reduce Green House Gas (GHG) emissions (MMG Climate Resilience Strategy)	40% reduction in Scope 1 & 2 emissions by 2030 based on 2020 levels	Three diesel loaders replaced with diesel electric loaders. Investigations into diesel / electric hauling underway (pathway forward will be technology dependent).

		Investigation into green electricity contracts to reduce Scope 2 emissions underway. Quantification of Scope 3 emissions both up and downstream completed and emission intensity factor has been developed for each mineral produced by MMG Rosebery. Partnerships being investigated to reduce Scope 3 emission. Battery electric drill purchased.



Figure 3. MMG Rosebery's Epiroc Simba E70SG replaced diesel with battery power, helping reduce noise, heat, and diesel emissions underground. The drill rig forms part of Rosebery's long-term transition, following the successful rollout of diesel-electric loaders in 2023.

4.4 Environmental Commitments Review

EPN 7153/3, G7 2.5 & PCE 11514, G8 2.5 A review of environmental commitments and process changes (including annual tonnage) for, but not limited to, the management period.

Key environmental commitments and their current status are outlined in Table 6. Refer to Table 2 for annual tonnages.

Table 6. Environmental commitments – status as at 30 June 2025

Commitment	Details	Current Status
Review use of the flume for transporting tailings to Bobadil	Following the flume overtopping event in February 2022 MMG committed to reviewing the use of the flume.	A risk assessment and flume stability investigations were completed in Q4 2022 and Q1 2023. Outcomes resulted in plans for remedial work on the flume, ongoing surveys and monitoring of the embankment. Installation of monitoring technology for the flume has also been investigated, though installation of any technology has been deferred until a suitable solution can be found.
Crusher dust extraction upgrade	Extraction fan upgrade to mitigate dust and reduce exposure to lead dust, silica and diesel particulates.	Option analysis for the upgrade to the exhaust system (feed to the wet scrubber) is currently underway. Concepts are being considered and costed to form part of the business case. If approved, works are forecast to commence during 2026.
Ongoing noise improvement	Following noise complaints received during the reporting period, MMG Rosebery committed to ongoing noise mitigation.	During the reporting period, MMG Rosebery: • Purchased shrouds for pedestal and mobile rock breakers • Commissioned a rock breaker noise survey • Installed broadband reverse beepers on MMG haul trucks • Installed a sound wall fan F2 • Added the acoustic wall to the Distributed Control System (DCS)
Dust deposition network upgrade	Following audit recommendations, MMG Rosebery has committed to upgrade the dust deposition network.	Approval received from EPA to upgrade existing infrastructure and relocate some of the dust deposition gauges. New infrastructure has been purchased, currently awaiting supply and installation.

Blast monitor relocation	Following recommendations by an independent noise consultant, MMG Rosebery committed to relocating the blast monitoring infrastructure.	Awaiting EPA approval to relocate air blast overpressure (ABO) and vibration monitors. A trial ABO geophone is currently installed on the 7 Level administration building roof in anticipation of approval. Infrastructure being installed to allow for relocation of the vibration monitor.
Decommissioning of the Williamsford Settlement Pond (WSP)	The WSP has been identified as redundant and reporting metalliferous drainage to the environment.	A memo has been drafted to notify EPA of MMG Rosebery's intent to decommission the WSP. Decommissioning is scheduled for completion during 2026.
Removal of PAF material from Baker Creek weir	Following the identification of PAF material stockpiled at the Baker Creek weir during routine clean out of the weir, MMG Rosebery committed to removing the stockpile and disposing of the PAF material at the 2/5 Dam TSF.	Awaiting EPA approval to relocate PAF material.

Refer to section 7.1 for details of the external compliance audit against commitments in EPN 7153/3.

5. Implementation and Operation

5.1 Approvals and Notification

EPN 7153/3, G7 2.8 & PCE 11514, G8 2.8 Any approvals or written notification received in relation to this notice.

An update on the progress of Environmental Approvals within the reporting period is detailed in Table 7. Note that not all of the activities listed within Table 7 are directly related to EPN 7153/3, but for completeness have been included due their location within the bounds of "The Land" as defined by EPN 7153/3 (ML 28M/1993), or their significance to MMG Rosebery's ongoing operations.

Table 7. Environmental approvals update for the reporting period

Activity	Approval Reference	Approval Date	Details
South Marionoak TSF- Extension of time to lodge EIS	Letter D24-178703/001	30/7/24	Notice of Intent (NOI) and EPBC referral submitted for the proposal. EIS guidelines issued. Extension of time granted for the submission of the EIS by 31/7/2026.
2/5 Dam TSF Stage 2- Subaerial Deposition Change of Operation	Letter D25-55347	EIS in preparation. Extension approved on 25/03/2025	Notice of Intent (NOI) submitted, EIS guidelines issued, draft EIS submitted for final EPA review and comments. A second extension of time has been granted for the submission of the EIS by 24/4/2026.
2/5 Dam TSF Stage 2- G3 Extension to temporary subaerial deposition	Letter D24-263613/002	18/12/2024	Approval granted to extended temporary subaerial deposition into 2/5 Dam until 31/12/2025, on the condition that MMG continue to comply with the requirements identified within EPA letter D20-111750.
Bobadil TSF Stage 11/12- Extension of EPA assessment period	Letter D24-211736/001	24/9/2025	MMG received a request from the EPA to extend the board assessment period until 8 November 2024. MMG agreed to the request and received formal correspondence for the extension.
Bobadil TSF Stage 11/12- Embankment Raise	PCE 11514 – DA 2024/00032	16/12/2024	Development Application received on 16/12/2024. All PCE conditions were met with construction commencing in March 2025.
Bobadil TSF- Beach Blanket Drain Construction	EPN 12239/1 – Letter D25-28749	13/2/2025	Approval granted with an Environmental Protection notice for the installation of a beach blanket drain within the Bobadil TSF facility.
Bobadil TSF- Tailings Compaction Trial	Letter D25-8656	21/1/2025	Approval granted to place and compact tailings within the Bobadil TSF footprint to support the feasibility of a future project.
Acid Dosing Plant Approval- G4 Temporary Extension to Operate	Letter D25-54880	26/3/2025	Approval granted for an extension to temporarily operate the Acid Dosing Plant until 30/9/2025.

5.2 Community Feedback

EPN 7153/3, G7 2.7 & PCE 11514, G8 2.7 Environmental performance, including community complaints and the corrective and preventative processes implemented.

EPN 7153/3, N1 – 1.8 Noise related complaints must be reported in the Annual Monitoring Review and Management Report.

During the reporting period, MMG Rosebery received eleven environment related community complaints, and six complaints related to other categories including damage to private property, exploration and community health and safety (Table 8). MMG Rosebery categories complaints in accordance with the Rosebery Complaints and Grievance Procedure (MMG Rosebery, 2023). All complaints made were reportable under EPN 7153/3 and not PCE 11514, as no complaints were received regarding operations at the Bobadil TSF.

Of the environment related complaints, six complaints pertained to noise, three to air quality and two to vibration. The majority of noise complaints were related to nuisance noise audible at sensitive receptors from regular mining activities including rock breaking, stockpiling and batch plant operations. Investigations found the acoustic wall was open at the time of several complaints. MMG undertook remedial action to ensure the acoustic wall remains closed. MMG also purchased shrouds for the pedestal and mobile rock breakers and commissioned a noise survey to compare noise with and without the shroud installed. The noise assessment will be complete within the next reporting period and provided to the EPA.

One additional noise complaint was in relation to the location of a noise monitoring station within the Rosebery township. The noise monitor is located outside a residential dwelling and the resident was concerned that personal conversations were being recorded. MMG Rosebery's Environment Department liaised with the residents, confirming the monitor is purpose built for acoustic measurement and not surveillance and WAV files are not being recorded in accordance with surveillance and privacy laws.

All three air quality complaints were in relation to dust. All complaints were investigated and assessed against data captured by MMG Rosebery's air quality network. The network includes depositional dust, high volume air sampling and real-time dust monitoring across the Rosebery township, as well as three on-site weather stations. Analysis of the data did not show any evidence of elevated fugitive mining related dust at any of the monitoring sites located at sensitive receptors across the Rosebery township. Although there was no evidence of fugitive dust leaving site, MMG Rosebery has a capital works project in place to upgrade the crusher dust extraction fan and is investigating the installation of fog cannons to minimise fugitive dust emissions generated by the crusher.

Two vibration complaints were received in relation to seismic events that occurred during routine blasting operations. Blasting operations were investigated and found to be consistent with MMG blasting procedures. Vibration and overpressure limits were not exceeded and there was no damage to property. MMG Rosebery initiated stakeholder engagement to the satisfaction of the complainants.

The non-environmental complaints received were in relation to damage to private property, exploration and community health and safety. One complaint made in relation to damage to private property was following a storm event where a fallen tree had damaged the residents fence line. MMG undertook remedial action to remove the tree and fix the damaged fence. The other was made in relation a resident's felling trees on MMG owned private property. MMG engaged with the residents undertaking the felling to the satisfaction of MMG and the residents.

Complaints received in relation to exploration activities were centered around TSF3 exploration activity. MMG engaged in extensive stakeholder consultation, addressing their concerns, and providing additional information.

One community health and safety complaint was made regarding the use of herbicide in residential areas. MMG has ensured their maintenance contractor will not use herbicide for treatment of weeds surrounding the complainant's residence.

MMG Rosebery values all community feedback and strives for continual environmental improvement through implementing corrective and preventative processes identified during grievance investigations. All grievances and associated investigations are recorded and tracked within MMG's stakeholder management software, Borealis.

Table 8. Grievances received from the community during the reporting period*

ID	Category	Date Received	Details
GR-04252	Environment	23/07/2024	Grievance received from Rosebery resident regarding noise – Investigation found the acoustic wall was open during excavation and rock breaking works. MMG Rosebery undertook remedial action.
GR-04281	Damage to private property	17/09/2024	Grievance received from Rosebery resident regarding property damage – Investigation found fallen trees had damaged the residents fence following a storm event. MMG Rosebery undertook remedial action.
GR-04337	Damage to private property	3/10/2024	Grievance received from Rosebery resident regarding property damage – Investigation found another resident was illegally felling trees on MMG owned property. MMG Rosebery undertook remedial action.
GR-04340	Exploration	9/10/2024	Grievance received from Rosebery resident regarding exploration activity – Investigation found resident is seeking more information surrounding TSF3 exploration activity. MMG Rosebery scheduled a meeting with the resident to discuss TSF3 exploration.
GR-04339	Exploration	30/10/2024	Grievance received from Rosebery resident regarding exploration activity – Investigation found resident is seeking more information surrounding TSF3 exploration activity. MMG Rosebery held a meeting with the resident.
GR-04329	Environment	6/11/2024	Anonymous grievance received via EPA regarding dust – Investigation found there were elevated NW winds the day of the grievance but no evidence of fugitive dust leaving site.
GR-04428	Environment	11/01/2025	Anonymous grievance received via EPA regarding dust – Investigation found there were elevated W winds the day of the grievance but no evidence of fugitive dust leaving site.
GR-04438	Community Health and Safety	29/01/2025	Grievance received from Rosebery resident regarding community health and safety – Investigation found the resident didn't want weeds treated with herbicide in their residential area. MMG Rosebery ensured the cessation of treating weeds with herbicide near the resident's property.
GR-04465	Environment	24/02/2025	Grievance received from Rosebery resident regarding noise – Investigation found the owner and tenant of the property adjacent one of the noise monitoring stations were concerned the monitor was recording their activity. MMG discussed how the monitoring device operated with the resident.
GR-04477	Environment	20/03/2025	Grievance received from Rosebery resident regarding noise – Investigation found the acoustic wall was open during routine stockpiling and batch plant operations. MMG Rosebery undertook remedial action.
GR-04476	Community Health and Safety	24/03/2025	Grievance received from Rosebery resident regarding community health and safety – Investigation found the *poa* grass on the 2/5 Dam TSF screening bund had grown to a height that it was impeding traffic turning off the Murchison Highway into south Rosebery. MMG Rosebery undertook remedial action.

GR-04504	Environment	7/04/2025	Grievance received from Rosebery resident regarding vibration – Investigation found that during normal firing practices a seismic event occurred.
GR-04503	Environment	7/04/2025	Grievance received from Rosebery resident regarding vibration – Investigation found that during normal firing practices a seismic event occurred.
GR-04505	Environment	28/04/2025	Anonymous grievance received via EPA regarding noise – Investigation found noise was likely related to rock breaking. MMG Rosebery undertook remedial action.
GR-04506	Environment	30/04/2025	Grievance received from Rosebery resident regarding noise – Investigation found the noise was likely related to breaking of overburden at 4 Level and operation of the loader on the grizzly plate. MMG Rosebery undertook remedial action.
GR-04509	Environment	1/05/2025	Grievance received from Rosebery resident regarding dust – Investigation found there were elevated SSE winds at the time of the grievance but no evidence of fugitive dust leaving site.
GR-04510	Environment	3-4/05/2025	Multiple anonymous grievances received via EPA related to dust and noise – Investigation found dust emanating from the crusher but no evidence of fugitive dust leaving site. MMG Rosebery is undertaking remedial action. Investigation found no evidence of nuisance noise at sensitive receptors.

*All community feedback that is frivolous, vexatious, invalid or considered an issue rather than a grievance is not included in this report

5.3 Rehabilitation and Closure

EPN 7153/3 G7 2.9 & PCE 11514, G8 2.9 A summary of any rehabilitation works carried out during the period and an estimate of current remediation liabilities.

5.3.1 Closure Liability

MMG Rosebery has provided a security deposit to MRT as required under the Mineral Resources Development Act 1995 (MRDA), MRT assessed the value as being adequate. The security deposit value was derived from substantial studies completed as part of the closure prefeasibility programs at Hercules and Rosebery, the studies also informed the Mine Closure Plan submitted to the Environmental Protection Authority (EPA) and Mineral Resources Tasmania (MRT) in July 2024, in compliance with condition DC3 of EPN 7153/3. As at 30 June 2025, discussions are still underway for the revised security deposit which is currently being assessed by MRT as part of the lease renewal process.

5.3.2 Progressive Rehabilitation

No rehabilitation projects pertaining to EPN 7153/3 were commenced or completed during in the reporting period. Being an underground mine, the disturbance area is largely limited to operational areas that continue to be used or are planned to be used in the future and are therefore not available for rehabilitation. Current operating areas with potential to be progressively rehabilitated pertain to construction activity at the 2/5 Dam TSF, which is reported under the Permit Conditions - Environmental No. 9084 (Permit 9084) Annual Environmental Report (AER). A project initiated in 2018 in conjunction with the EPA and MRT to close out minor legacy workings throughout ML 28M/1993, identified 178 sites/features for remediation. This project requires the support of the Crown Land manager and is ongoing with 14 sites currently remediated.

Other areas undergoing rehabilitation-based projects include the Hercules mine site and Bobadil TSF. The status of the Hercules closure prefeasibility study aimed at the long-term closure and rehabilitation of the Hercules site is discussed below, see section 5.3.3. Monitoring of a nine-hectare closure cover trial that was installed during the 2022-2023 reporting period at the Bobadil TSF has been continued, producing preliminary

results. The cover trial was not intended for long-term rehabilitative purposes but is mentioned here due to its significance in informing future TSF closure and rehabilitation (see section 5.3.4).

5.3.3 Hercules

Hercules comprises legacy workings located on the southwest portion of ML 28M/1993. The area is managed and monitored in accordance with the Hercules Monitoring and Maintenance Plan, and MMG continues to undertake a work program to refine the understanding of the site and develop long-term, sustainable closure outcomes. Over the past 12 months, MMG has continued/completed the following tasks within the Hercules closure prefeasibility project:

- Development of site specific water quality criteria;
- Developed a GoldSIM solute balance model;
- Redesigned the 4L area into a final landform;
- Investigating using a geomorphic final landform;
- Delivery of a Social Impact and Opportunity Assessment and commenced capacity building within the community to understand closure;
- Completion of the phase 2 ground water study;
- Internal final land use workshop;
- Continued to collect water quality and flow data to inform surface and groundwater models. The models will be used to assess rehabilitation options;
- Commenced design and engineering of a 'no regrets' rehabilitation work program that will be executed in 2025 / 2026; and
- Completed the 20th year of monitoring of revegetation works that were completed in 2004. This long-term data set provides invaluable information for the broader rehabilitation program at site.

Revegetation works were undertaken at Hercules from 2005 to 2008 and subsequently assessed annually using the Hercules Assessment Index for Rehab (HAIR). Upon transition from active treatment to monitoring only (in the absence of ground works which ceased in 2008), annual monitoring was decreased to biannually in 2012.

The last HAIR assessment was undertaken in January 2024 (year 20 of the program) during the last reporting period. The results were consistent with previous years. In the absence of any on-ground work since 2008, results have graded to a consistent set of values with pH and nutrient values approaching base line values, and vegetation cover parameters levelling off. The results generally reflect the recent trends with the exception of an arguably significant decline in the pH parameter. The next survey is scheduled for summer 2025.

5.3.4 Bobadil Tailings Storage Facility

During the 2021-22 reporting period, a nine-hectare closure cover trial was installed at the Bobadil TSF as part of the continuation of a comprehensive PFS (PFS Part B, begun in 2020) that will inform and advise the final closure design of the facility. The trial monitors performance of two cover variants that aim to reduce rainfall infiltration and oxygen ingress. Monitoring and data collection continued throughout the reporting period. Preliminary results show that Cover Option 2 fulfills both primary and secondary cover option requirements, with seepage shown to be <1% of cumulative rainfall and oxygen concentrations below the geosynthetic clay liner limited to <2% (SGME, 2024). Field results have also allowed the development of a model (showing good correlation with observed results) that can be used to predict long-term cover performance. The trial will continue as vegetation continues to establish, facilitating stronger results.

During the last reporting period *Phytophthora cinnamomi* (root rot) was identified within the cover trial and broader Bobadil TSF. In response, MMG Rosebery installed signage, an automated wheel wash and a disinfection station containing Phytoclean at the Bobadil TSF during the current reporting period. The presence of root rot within the cover trial shouldn't alter the results or inhibit the performance of the trial. Monitoring of the vegetation during the reporting period found susceptible species have declined in number and coverage, but non-susceptible species are filling the gaps and the overall coverage percentage score has increased across the trial (LMRS, 2025). This concludes that the presence of root rot is unlikely to have a negative effect on the effectiveness of the cover vegetation trial in the medium or long-term (LMRS, 2025).

5.4 Waste Disposal

EPN 7153/3 G7 2.10 & PCE 11514, G8 2.1 An inventory of waste disposed on The Land during the previous 12 months, including details of the quantities of each waste and the location of its disposal.

5.4.1 Waste Rock and Tailings

The mineral waste mined to establish development drives used to access the ore body, is primarily used to backfill underground mine stopes and voids. All waste rock that cannot be stored underground is sent to the surface and placed in the 3 Level Waste Rock Dump (3LWRD). Prior to 2024, no waste rock had been carted to surface since February 2017. In the ordinary course of business, waste rock mined remains underground and included 344,396 tonnes of mine backfill. However, this year, 2,475 tonnes were placed within the 3 Level Waste Rock Dump. Waste rock placed at the 3LWRD was sampled in accordance with EPN 8815 and NAG_7 did not exceed 8 kg H_2SO4_4 per tonne for all samples (SGME, 2025).

Since commissioning of the 2/5 Dam TSF in April 2018, tailings have primarily been deposited at the 2/5 Dam TSF. Following completion of the Bobadil Stage 10A & 10B embankment raises, tailings are deposited at Bobadil intermittently depending on operational strategies. Approval for Bobadil TSF Stage 11 & 12 raises was received within the reporting period and Stage 11 is expected to be completed during 2025. This will likely alter the deposition strategy during the next reporting period, with an increased proportion of the tailings likely reporting to Bobadil TSF. A total of 798,169 tonnes of dry tailings was deposited at 2/5 Dam TSF and 62,619 tonnes at the Bobadil TSF during the reporting period. Waste rock and tailings production is summarised in Table 9.

Table 9. Waste rock and tailings production (tonnes)

	July 2023-June 2024	July 2024-June 2025	% Change
Waste rock mined	385,571	346,871	-10
Waste rock to underground	385,571	344,396	-11
Waste rock to 3 Level WRD	0	2,475	NA
Dry tonnes tailings (Total)	845,131	860,788	2
Dry tonnes tailings (Bobadil TSF)	66,103	62,619	-5
Dry tonnes tailings (2/5 Dam TSF)	779,027	798,169	2

5.4.2 Onsite Landfill

In accordance with EPN 7153/3 Condition WM3, the Bobadil Landfill is an authorised, onsite landfill. The Bobadil Landfill is used for the disposal of lead contaminated inert materials, including used filter cloths (usually buried underground), poly pipe and other plastics, timber, rubber (but not tyres) and non-recyclable metal.

The amount of waste disposed at the Bobadil landfill was 262.2 tonnes during the reporting period (as determined by load cells fitted to the bin collection vehicle and tracked by the authorised waste management contractors by way of a docket book), an increase of 28.21% from the previous reporting period. The increase is due to the large amount of waste disposed at Bobadil during the September 2024 mill shutdown.

The Bobadil Landfill has reached capacity and as a result MMG Rosebery have investigated alternative waste management options during the reporting period. Strategic planning is currently focused on disposal of certain waste underground, whilst simultaneously progressing a study to classify contaminated waste streams to allow for potential disposal to off-site facilities. Waste stopped being disposed at the Bobadil Landfill in May 2025, and will be disposed underground during the next reporting period. This is in accordance with EPN 7153/3 condition WM3.

6. Checking and Corrective Action

6.1 Meteorological Monitoring

EPN 7153/3, A4-3 Analysis of yearly climate.

In accordance with EPN 7153/3, A4-3, MMG commissioned a review of meteorological data for the reporting period. The report found temperature, relative humidity and rainfall data for the reporting period indicated that the mine experienced a cool, wet and humid climate with wetter winter and autumn months and drier summers. Results are summarised in Appendix E (EY, 2025).

6.2 Water Monitoring – 3 Level Waste Rock Dump (EPN 8815/2)

EPN 8815/2, G4-4 Annual review of the surface and ground water monitoring program in accordance with Appendix B of the Detailed Design Report, including an assessment of surface and groundwater impacts from the 3 Level WRD.

EPN 8815/2, M3 1.2 Results of 3 Level WRD surface and groundwater monitoring program.

In accordance with EPN 8815/2, G4-4 and M3 1.2, MMG continued its water quality monitoring program at the 3LWRD and commissioned a review of surface and ground water monitoring results for the reporting period. Results are summarised in section 14 of Appendix F (Koehnken, 2025).

6.3 Water Monitoring – Rosebery (EPN 7153/3)

EPN 7153/3, G7 2.6 & PCE 11514, G8 2.6 A review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring locations, including discharge and ambient monitoring points that illustrate significant trends.

EPN 7153/3, M4-3 & PCE 11514, E2-2 If the concentrations in effluent [from Bobadil Tailings Dam end-of-pipe discharge] of parameters [listed in EPN] do not comply with the levels specified in Column 5 of Table 3 (Percentile Investigation Trigger Level) at the point at which it is discharged to the Pieman River when measured in the units specified in Column 2 of Table 3, then, an investigation into the possible reason for the exceedance must be conducted and a report summarising the outcomes of all such investigations be submitted to the Director in MMG Rosebery's Annual Monitoring Review and Management Report in compliance with G7.

EPN 7153/3, E3 Annual biological survey and ambient water quality monitoring program of the Stitt River and Lake Pieman must be undertaken in accordance with columns 1 to 4 of Table 6 of Attachment 2 and columns 1 to 6 of Table 7 of Attachment 2 to document ongoing environmental conditions, increase the understanding of temporal, spatial and seasonal biological and chemical changes within the lake, and progress the development of site-specific toxicity guidelines for sulphate and zinc in Lake Pieman.

In accordance with EPN 7153/3 conditions G7 2.6, M4-3 and E3, and PCE 11514 conditions G8 2.6 and E2-2, MMG continued its water quality monitoring program and commissioned a review of surface and ground water monitoring results for the reporting period. Results are summarised in Appendix F (Koehnken, 2025). Additionally, all water quality monitoring data pertaining to EPN 7153/3 is submitted to the EPA on a quarterly basis.

During the reporting period there was one reportable environmental incident pertaining to water quality and/or management that was reported to the EPA, and one internal investigation was completed resulting from an Investigation Trigger Level exceedance. On September 2, 2024, a light vehicle struck the flume transporting treated mine water and tailings (≈400 L/s, 1.5 % solids) from the ETP to the Bobadil TSF. Damage to the flume occurred on an inside bend in the Chasm Creek catchment, limiting loss as most flow continued down the flume. Bunding and road drains prevented direct discharge to Chasm Creek; some water and minor solids entered a road drain, with solids retained within 50 m and none reaching culverts. The site was contained within 30 minutes, the flume repaired within hours, and the EPA notified on September 3, 2024.

The 95th percentile for Total Nitrogen during the reporting period was 5.7 mg/L, marginally greater than the 5.5 mg/L Investigation Trigger Level, with the highest results recorded in March–April 2025. The internal investigation found several likely contributors that included increased underground and shallow blasting (resulting in less dilution of residues), placement of recently blasted rock within the Bobadil TSF as part of the Stage 11 and 12 construction works, and below-average rainfall reducing inflows and dilution. Despite the exceedance, the risk to the receiving environment is considered low due to the 95th percentile value being generic in nature and not linked with known ecosystem processes in the receiving environment. Additionally, Lake Pieman provides strong and ongoing dilution, turbulent flows restrict algal growth, and the naturally dark water further limits light penetration. At the time of this report being submitted to the EPA (30 September 2025), the 95th percentile is still exceeding the Investigation Trigger Level. It is expected to take some time to drop below 5.5 mg/L given the high individual values recorded during the first half of 2025.

A review of the water quality monitoring data for the reporting period found water quality monitoring was conducted in accordance with requisite conditions and that water treatment was effective in reducing metals concentrations in the discharge water. Water chemistry results recorded at the authorised discharge point, Bobadil Outfall (BO), complied with EPN discharge limits for all parameters. MMG Rosebery hasn't exceeded a compliance limit of BO discharge parameters (excluding false TPH positives) since 2020.

The annual water quality review recommends a review of monitoring requirements at BO to reflect current water management processes. MMG Rosebery engaged Technical Advice on Water to complete a review of monitoring requirements at BO during Q2 2025. The findings will be used to support a submission to the EPA during the next reporting period.

Monitoring of Lake Pieman during the reporting period highlighted the impact Bastyan Dam Power Station operations have on water quality within the lake. Dam operation prior to sampling results in a well-mixed water column showing near uniform profiles for electrical conductivity, pH and temperature at most sites (September 2024, December 2024 & June 2025). When sampling occurred during times of decreased operation, the water column was stratified (March 2025).

In general, results from the reporting period are consistent with the understanding of mixing within Lake Pieman and highlight the role hydrology, and especially the role power station operations, play in mixing in the lake. The reporting period demonstrates that short, intermittent power station operations are sufficient to maintain a well-mixed water column and relatively low metal concentrations. Sources downstream of BO remain substantial contributors of zinc and other parameters to the lake.

MMG Rosebery's water quality monitoring program is comprehensive. For a more detailed review of results from the reporting period refer to Appendix F (Koehnken, 2025).



Figure 4. Water quality monitoring of the rivers surrounding MMG Rosebery

6.4 Biological Monitoring

EPN 7153/3, G7 2.6 & PCE 11514, G8 2.6 A review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring locations, including discharge and ambient monitoring points that illustrate significant trends.

EPN 7153/3, E3 An annual biological survey and ambient water quality monitoring program of the Stitt River and Lake Pieman must be undertaken in accordance with columns 1 to 4 of Table 6 of Attachment 2 and columns 1 to 6 of Table 7 of Attachment 2 to document ongoing environmental conditions, increase the understanding of temporal, spatial and seasonal biological and chemical changes within the lake, and progress the development of site specific toxicity guidelines for sulphate and zinc in Lake Pieman.

In accordance with EPN 7153/3 conditions G7 2.6 and E3, MMG continued its biological monitoring program (encompassing an annual survey of Lake Pieman and bi-annual spring and autumn surveys of the Stitt and Ring rivers) and commissioned a review of the monitoring results upon completion of the surveys. Results are summarised in Appendix G (Entura, 2025) and Appendix H (Entura, 2025).

6.4.1 Lake Pieman

Lake Pieman biological monitoring was undertaken in November 2024. The results showed no evidence of toxicological impacts from site discharge at BO on algal biomass and macroinvertebrate communities along the shoreline adjacent to the outfall. The results showed little variation in algal biomass between sites and a consistently low diversity and abundance of macroinvertebrates at all sites, the second lowest recorded since the inception of the monitoring program. This is likely due to a prolonged and large spill event from the Bastyan Power Station in the months prior to the survey scouring invertebrates from the shoreline of the lake. It's likely the communities had not recovered to levels which occur under more stable lake conditions.

During the last reporting period, a new method for measuring algal growth was established to help overcome the issue of a fluctuating lake levels. The new method uses a suspended tile anchored to the substrate that will rise and fall with the lake and thus allow a surface which is constantly submerged. This system offers the same sampling conditions (surface type, surface orientation and sampling depth) at each site, and allows the scrape to be collected after the substrate has been removed from the water which is consistent with current recommendations by NRE Tas. This method was only partially successful in November 2024 due to the loss of eight of the tiles during the large spill event. The tiles were subsequently resecured with improved methodology and will be resampled during the next sampling run for comparison with the existing algal scrape method.

The report highlighted biomonitoring of shoreline habitats in Hydro storages with large operating ranges, like Lake Pieman, is strongly impacted by the overwhelming influence of lake level changes on habitat availability and quality. Lake level changes also impact the ability to sample consistently between sites and within sites over time. This makes it difficult to compare results between sampling events. As such, MMG Rosebery has commissioned a review into the value of information provided by the Lake Pieman biological monitoring program. The review will be finalised during the next reporting period. For a more detailed review of results from the reporting period refer to Appendix G (Entura, 2025).

6.4.2 Ring and Stitt Rivers

Biological monitoring of the Ring and Stitt rivers assesses the ecological status of the riverine ecosystem and is used to evaluate changes over time and relate this back to environmental conditions and management actions associated with MMG Rosebery mining operations. Biological monitoring of the Ring and Stitt rivers was undertaken in spring 2024 and autumn 2025. Results are summarised in Table 10 and Table 11, and monitoring locations are shown in Figure 5. For a more detailed review of results, refer to Appendix H (Entura, 2025).

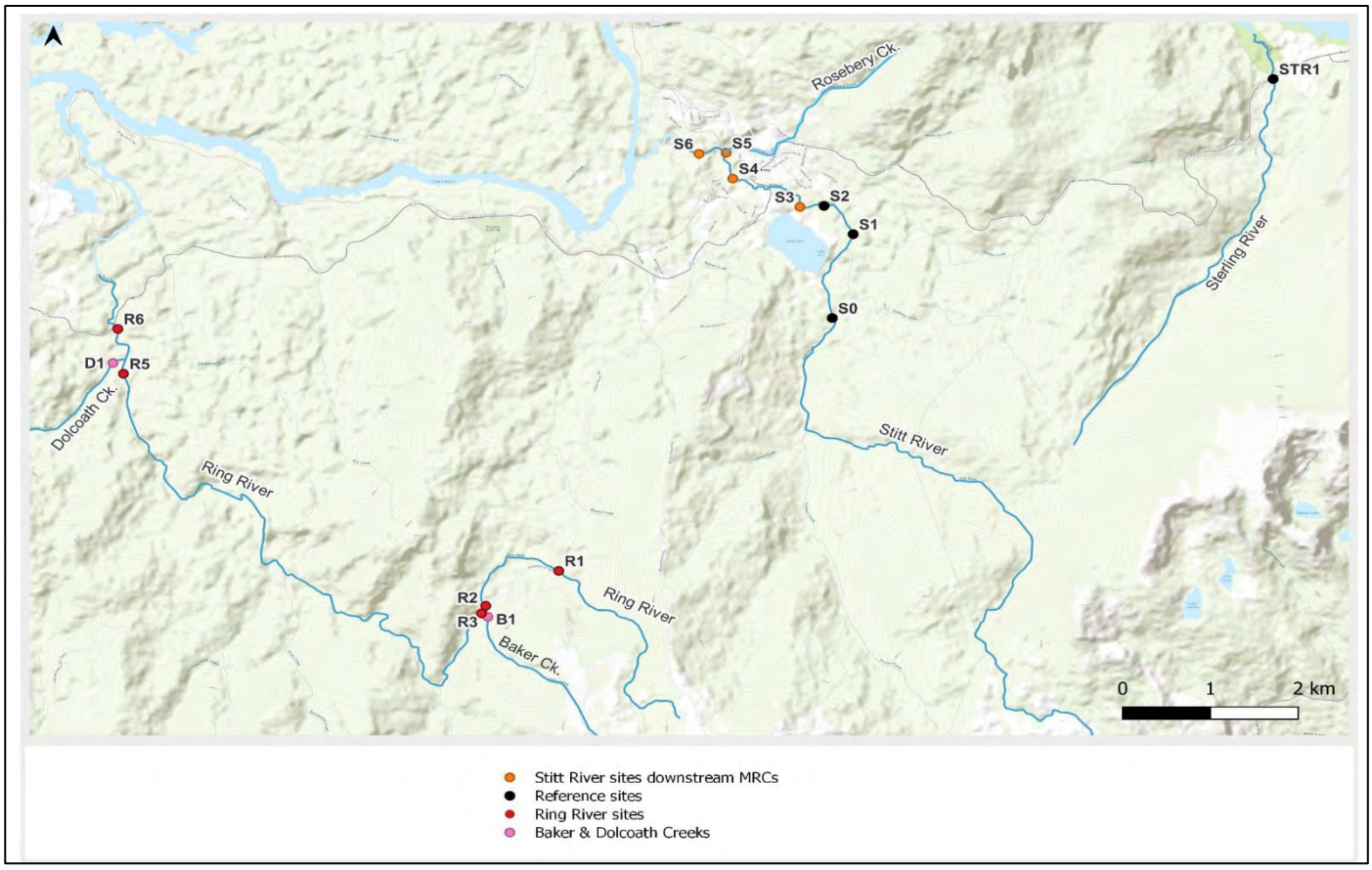


Figure 5. Location of monitoring sites in the Ring River catchment, Stitt River, and the Sterling River. MRC refers to mining related contaminants.

Table 10. Key findings from biological monitoring of the Ring River

Nature of Change	Findings of Monitoring Program
Status of environmental conditions	The legacy of pollution from the Hercules mine area, particularly via Baker Creek, continues to impact the Ring River catchment, with the sites (except R1 in spring 2024) rated as severely to extremely impaired by the AusRivAS assessments and as poor to very poor by the TRCI Aquatic Life Index.
Status of understanding of temporal, spatial and seasonal biological changes	Unlike the previous reporting period, there was no clear pattern in abundance between sites. Site R2 upstream of Baker Creek had the highest abundance in spring and autumn, however site R1 further upstream showed abundances similar to R5 downstream of Baker Creek. Diversity showed a similar pattern. Site R3 downstream of the Baker Creek confluence was the least diverse and abundant on both occasions, consistent with previous results. AusRivAS samples at site R1 in spring 2024 returned O/E scores of significantly impaired (Band B) and reference condition (Band A). However, all other sites, and all sites during the spring survey returned O/E scores of severely impaired (Band C) or worse. The spring survey results clearly show the impact of Baker Creek, with upstream sites being less impacted (Band B & C), compared with downstream sites (Band D). Unlike the previous reporting period, there was no clear trend for a greater diversity or abundance of highly sensitive taxa at the two most upstream Ring River sites upstream of the Baker Creek confluence (R1 & R2). Unexpectedly, the highest abundance and diversity of highly sensitive taxa was recorded at the most downstream site on the Ring River (R6) during spring 2024. In summary, the metrics used in the analysis suggest that Baker and Dolcoath creeks remain in a highly degraded condition.

Table 11. Key findings from biological monitoring of the Stitt River

Nature of Change	Findings of Monitoring Program
Status of environmental conditions	The Stitt River is in significantly better condition than the Ring River. All sites were assessed as equivalent to reference condition (Band A) or better (Band X) with the exception of site S6 in spring 2024, and S5 and S6 in autumn 2025. Overall, the AusRivAS outputs from reporting period suggest that the sites downstream of mining related contaminants (S3-6) are continuing to improve, in particular sites S3 and S4.
Status of understanding of temporal, spatial and seasonal biological changes	Physical and biological indicators exhibit an improving temporal trend in the ecological status of the Stitt River. Historically, spatial trends have shown a decline in the ecological status of the Stitt River between the upper and lower reaches, likely due to legacy seepage of mine contaminants into the lower Stitt from a range of sources. During the reporting period, monitoring showed continued improvement in temporal and spatial trends.

	Site S6 reported poor AusRivAS scores for both replicates in spring 2024 and for one replicate in autumn 2025. Despite this, the AusRivAS scores at S6 in autumn 2025 were the second highest reported at the site. Site S5 reported healthy AusRivAS scores in spring 2024 but poor scores in autumn 2025. Sites S3 and S4 reported AusRivAS reference scores in both seasons and have had five consecutive reference condition scores from autumn 2023 to autumn 2025. Prior to this, these sites have never had consecutive reference condition scores since the use of the O/Epa model began in 2015. Site S6 continues to be impaired compared with the other sites as a result of being downstream of the Rosebery Creek which is a major source of contaminant for the Stitt River. Since 2021, the abundance of brown trout has increased at the Stitt River downstream sites. In spring 2024, the mean abundance of fish was higher at downstream sites than at the reference sites and was only lower than the reference sites in autumn 2025 because of a very high abundance at the Sterling River reference site. In particular, the fish data shows a substantial increase in the abundance of trout at site S5 from the autumn in 2021 to 2025. Overall, the fish monitoring is consistent with evidence from the macroinvertebrate sampling that river health is improving in the Stitt River downstream from sources of mining related contaminants.

6.5 Dust Monitoring

EPN 7153/3, G7 2.6 & PCE 11514, G8 2.6 A review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring location, including discharge and ambient monitoring points that illustrate significant trends. Include a review of the accuracy of the sampling procedure, sampling schedule, sample locations and test methods applied.

EPN 7153/3, A5-3 & PCE 11514, A8-3 Tabulated high-volume air sampler, and dust and metal deposition results for the entire year, showing intermediate values as well as final monitoring results. Tabulated annual averages of the deposition increment above background, supported by deposition isopleths or graphs <of monthly results>. Summaries of all exceedances ..., describing the results of any investigations undertaken and the mitigation measures that were adopted in response. Any supporting data analysis or description necessary to aid interpretation of the dataset.

In accordance with EPN 7153/3 conditions G7 2.6 and A5-3, and PCE 11514 conditions G8 2.6 and A8-3, MMG continued its dust deposition and ambient air quality monitoring program and commissioned a review of the monitoring results for the reporting period. Results are summarised in Appendix I (EY, 2025).

During the reporting period there were no exceedances of trigger levels or compliance limits at any HVAS locations, although twelve sampling results were deemed invalid due to failed sampling events. Internal investigations were completed for all failed sampling events, and corrective and preventative actions were developed and are being implemented to reduce the likelihood of reoccurrence (refer to section 6.7). Actions included the purchasing of new HVAS units and inlets, including spares, and updating of field sheets, work instructions and procedures. The installation of a new Baillieu Street HVAS monitoring location in accordance with PCE 11514 has been delayed until Q3 2025. In August 2025, the EPA granted an extension for the installation until the 10 October 2025. Results for Baillieu Street will be included within the next reporting period.

Across the dust deposition network there were no exceedances of compliance limits or trigger levels for any deposition gauges at or beyond site boundary. A minimum of four months were considered invalid at each location due to high rainfall causing the gauges to overflow. However, the dust deposition during these periods

would likely be low due to the high moisture content of the dust generating materials. Given the frequency of overflown gauges, MMG Rosebery made a submission to the EPA during the reporting period to upgrade the dust deposition network which will include upgrading infrastructure (larger gauges, new stands) and sample locations to comply with AS/NZ 3580.10.1 2016: Methods for sampling and analysis of ambient Determination of particulate matter – Gravimetric method (Australian/New Zealand Standard, 2016). EPA approval was received Q3 2025, and the upgrade will be completed during the next reporting period.

During the reporting period a quality control issue with depositional dust data was also identified by MMG environmental staff. Investigation into QAQC samples that are performed every month when the gauges haven't overflowed has found metal contamination is often present. Metal concentrations should be below detectable limits given clean gauges are filled with Milli-Q (purified) water and sent to the laboratory for analysis. This has resulted in an ongoing investigation between MMG and the laboratory to identify the source of contamination. The presence of contamination within QAQC samples has raised concern over the integrity of the entire depositional dust monitoring dataset. As such, MMG Rosebery has commissioned an independent review of the network and associated data quality, and work will continue through the next reporting period.

Considering the low environmental risk to air quality and the typical annual rainfall, a small, targeted dust deposition network is recommended to provide more meaningful information regarding MMG Rosebery's dust impact. As dust deposition rates are indicators of amenity issues, a consolidated network outside of the boundary of the MMG Rosebery Mine, along with MMG's existing community complaints program, could provide better insight into the mines impacts (EY, 2025).

Continuous real-time dust monitoring results also remained below the inspection and mitigation levels outlined in MMG Rosebery's Dust Mitigation Management Plan for the reporting period. The number of alerts and alert days for inspection and mitigation levels were assessed using 15-minute and 60-minute rolling averages from the telemetry network. Exceedances of inspection and mitigation levels were recorded at the Core Shed and Filter Plant on 22 October 2024 due to smoke from Parks and Wildlife Service fuel reduction burns near Zeehan, and further inspection level alerts occurred on 14 February 2025 and 31 March 2025, attributed to regional bushfires. Since late 2020, site-specific calibration factors, applied with EPA Tasmania's assistance, have reduced false dust alarms from wood fire smoke haze. During the reporting period, several upgrades were implemented across the real-time monitoring network, including upgrades of the Core Shed and Filter Plant DustTrak II units to DRX models in October 2024, and the instalment of four real-time air quality monitors around the 2/5 Dam TSF (Figure 6).

Several dust related grievances were received from the community during the reporting period. All grievances were thoroughly investigated and recorded within MMG's stakeholder manager software, Borealis. Several dust related improvement projects were commenced during the reporting period to reduce the likelihood of mining related fugitive dust causing environmental nuisance or harm at sensitive receptors. These are summarised in section 3.2.

The review of dust deposition and ambient air quality monitoring data for the reporting period found monitoring was conducted in accordance with requisite conditions and that current management measures prescribed in MMG Rosebery's Dust Mitigation Plan were sufficient for mitigating fugitive dust. It is recommended that the mitigation and inspection trigger levels are checked in three years (due in 2027) to understand if they are sufficient to assist in the continued control of dust from site (EY, 2025).



Figure 6. Real-time air quality monitors installed around the 2/5 Dam TSF.

6.6 Noise and Vibration Monitoring

EPN 7153/3, G7 2.6 & PCE 11514, G8 2.6 A review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring locations ... that illustrate significant trends.

EPN 7153/3, N1 1.8 Results of the continuous noise monitoring program and noise related complaints must be reported ...

In accordance with EPN 7153/3 conditions G7 2.6 and N1 1.8, and PCE 11514 condition G8 2.6, MMG continued its noise and vibration monitoring program and commissioned a review of monitoring results for the reporting period. Results are summarised in Appendix J (Tarkarri, 2025).

A review of the noise and vibration data for the reporting period was undertaken and found that annual average LAeq, LA90 and LA10 15-minute noise levels were similar to those measured in the previous year. Data availability for continuous noise monitoring was >97% across all monitoring locations, and post quality control for adverse weather, meter overloads and data drift resulted in data availability between 73% and 82%. This is similar to the last reporting period. The review suggests a review of data download and calibration procedures to mitigate data loss. MMG Rosebery is investigating the use of telemetry to eliminate the requisite for manual data download.

Noise monitoring during the reporting period found annual average noise levels were similar to those from the last reporting period (within 1-2 dB) with exception to increases in evening levels noted at Mt Black. The elevated evening noise levels observed Mt Black during the reporting period will require further investigation to determine the source. On average, the Police House and Cohen St monitoring locations were noisier in comparison to the Mt Black, Murchison Street and Alec Street locations. Average day, evening and night noise levels for Police House and Cohen St were still ≤53 dB for L_{Aeq}, L_{A90} and L_{A10}.

It's worth noting that MMG Rosebery's current noise monitoring set up does not allow for compliance with EPN 7153 condition N1 1.3. The current monitoring system does not have the capability of measuring a 1/3-octave band spectrum (tonality) or recording concurrent impulse time response to noise levels (impulsiveness). The review also recommended noise monitoring time intervals be changed from 15 minutes to 10 minutes in line

with EPN 7153/3 condition N3.3 which pertains to triennial noise survey requirements. This change would also allow for improved accuracy in relating noise data with weather data (which records every 10 minutes) (Tarkarri, 2025).

Ground vibration and air blast overpressure monitoring for the reporting period found MMG remained below ground vibration exceedance limits during blasting times. Monitoring of air-blast overpressure (ABO) found that 1.5% of blasts exceeded 115 dB limit which is acceptable under EPN 7153 condition B2 1.1 (for 95% of blasts, ABO must not exceed 115 dB). It is likely the exceedances were not generated by blasting activity but rather generated by sources local to the monitor, with most coinciding with adverse weather conditions.

There were four records of ABO during blast times that exceeded the 120 dB limit set by EPN 7153 condition B2 1.2. Investigation found all exceedances occurred on 31 August 2024 and can be attributed to severe weather conditions from heavy rainfall and strong winds. The investigation determined the ABO exceedance was not a result of underground blasting. For a more detailed review of results, refer to Appendix I (Tarkarri, 2025).

This review and previous reviews have also highlighted the current ground vibration and ABO location does not comply with AS 2187.2-2006. MMG have applied to the EPA to relocate blast monitoring instrumentation to a more suitable location based on an investigation by a specialist consultant. The relocation of blast monitoring infrastructure is scheduled for next reporting period, pending formal EPA approval.

6.7 Environmental Event Management

EPN 7153/3, G7 2.7 & PCE 11514, G8 2.7 Environmental performance, including incident management ... and the corrective and preventative processes implemented.

EPN 7153/3, G3 If an incident causing or threatening environmental nuisance, serious environmental harm of material environmental harm from pollution occurs in the course of the activity, then the person responsible for the activity must immediately take all reasonable and practicable action to minimise any adverse environmental effects from the incident.

During the reporting period, MMG Rosebery recorded 15 environmental incidents including those concerning compliance with EPN limits. All incidents have been addressed and reported in Section 6 and referenced appendices. All environmental incidents are detailed in Table 12.

There is general alignment between MMG Rosebery's Risk Consequence Criteria ratings and the Environmental Management and Pollution Control Act 1994 (EMPCA) definitions for incidents resulting in Serious (rating ≥4) and Material (rating 3) Environmental Harm referenced in condition G3. All environmental incidents during the reporting period were confined onsite, and in accordance with EMPCA, no environmental incidents that occurred during the reporting period resulted in material or serious environmental harm.

All incidents were entered in MMG's Incident Event Management (IEM) system and required an incident investigation. The investigation process records all incident details and reports on immediate actions taken, applies a risk rating as per MMG's Risk Consequence Criteria, and identifies control failures and corrective actions required. The IEM system ensures that in all cases corrective and preventative actions were developed and implemented as per condition G7 2.7, to reduce the likelihood of reoccurrence.

The majority of controls implemented in response to incidents during the reporting period were either administrative or engineered. Examples of corrective and preventive processes developed and implemented via engineering controls include installing a flow switch on that water line that is interlocked with the crusher so that the crusher is unable to start without water flow (event ID 3614707); and replacement of all HVAS inlets greater than 10 years old or with faulty clips (event ID 3462571).

There are currently two events still open, event ID 346571 and 3643748 (refer to Table 12, open incidents are highlighted in red text). Investigations have been completed for both events however the status remains open as there are outstanding actions yet to be implemented (including administrative, engineered and elimination) to prevent re-occurrence prior to closing out. All actions are due to be completed by the end of Q4 2025. Average close out time on incident investigations during the reporting period was 21 days, and the median close out time was 6 days.

Table 12. Environmental incidents during the reporting period

Event Date	Event Description	Risk Consequence Criteria Rating*		Reported to EPA	Event Status
		Actual	Potential		
14.08.2024	3447808: Tank bung failure	Level 0	Level 0	No	Closed
02.09.2024	3459712: Vehicle impacted flume	Level 2	Level 2	No	Closed
02.09.2024	3462571: Missed HVAS sample	Level 1	Level 1	Yes	In Progress
07.10.2024	3483683: SA160 accelerator spillage	Level 1	Level 1	No	Closed
23.10.2024	3494890: Seepage collection system liner failure	Level 0	Level 0	No	Closed
06.11.2024	3503871: Hydraulic oil spill	Level 0	Level 0	No	Closed
05.12.2024	3530077: Missed HVAS sample	Level 1	Level 1	Yes	Closed
22.11.2024	3530783: Change in 2/5 eastern seep	Level 1	Level 1	No	Closed

19.11.2024	3564939: Invalid HVAS samples	Level 1	Level 1	Yes	Closed
14.02.2025	3568973: DustTrak exceedance	Level 0	Level 0	No	Closed
11.04.2025	3602141: Hydraulic oil leak	Level 1	Level 1	No	Closed
01.05.2025	3614553: Deceased wallabies	Level 0	Level 0	No	Closed
30.04.2025	3614707: Excessive dust in crusher	Level 1	Level 1	No	Closed
06.06.2025	3639283: Diesel spill from LV fuel pod	Level 1	Level 1	No	Closed
17.06.2025	3643748: Fuel spill from scrap vehicle	Level 1	Level 1	No	In Progress

*Refers to MMG Rosebery's Risk Consequence Criteria

6.8 Tailings Dam Management

EPN 7153/3, WM1 2.4 (all tailings' dams must) have any environmental or stability issue identified and associated with it reported to the Director within 24 hours of becoming aware of the issue and further outlined to the Director in the Annual Monitoring Review and Management Report.

Tailings dam management in Tasmania is regulated by the Australian National Committee on Large Dams (ANCOLD) guidelines, and Tasmania's Water Management (Safety of Dams) regulations 2015. In addition, MMG also reports under the Global Industry Standard on Tailings Management (GISTM). GISTM requires a 5-yearly Dam Safety Review (DSR) by an independent engineer. ANCOLD requires a Comprehensive Inspection Report every two years by the dam's EOR (internally referred to as an Intermediate Inspection Report). The Tasmanian Water Management Regulations requires a Comprehensive Surveillance and Inspection Report every two years by an engineer with 5-years or more experience.

At MMG Rosebery, the Bobadil and 2/5 Dam TSFs undergo monthly on-site surveillance by ATC Williams under the guidance of the Engineer of Record (EOR). As part of the surveillance program, the EOR conducts annual audits in line with ANCOLD guidelines, as well fulfilling the above reporting requirements when required.

During the current reporting period, the EOR issued an Intermediate Inspection Report for the Bobadil and 2/5 Dam TSFs, covering the period December 2023 to January 2025 (Appendix B and Appendix C). The audit reports concluded that both facilities do not pose a significant environmental risk and remain suitable for the ongoing storage of tailings.

In addition, an autonomous Independent Tailings Review Board (ITRB) was established in 2022 to assess all aspects of the MMG Rosebery TSFs on an annual basis. Since its establishment, the ITRB has convened at Rosebery in July 2022, May 2023, May 2024, and March 2025. The Board also meets quarterly; during this reporting period, meetings were held in October and December 2024. The combined inspections by the EOR and evaluations by the ITRB provide Rosebery with clear actions to improve facility performance and mitigate risks.

7. Review

7.1 EPN Compliance

EPN 7153/3, G7 2.3 & PCE 11514, G8 2.3 A review of activity compliance and annual external compliance audit against EPN requirements.

MMG Rosebery commissions an annual independent audit against EPN 7153/3 conditions. The last audit was completed in September 2024 during the current reporting period. The audit found that as per previous audits, MMG Rosebery exhibits a high level of statutory compliance against EPN 7153/3. During the audit period (September 2023 to September 2024) there was no evidence of any "significant" environmental impact/harm occurring or being demonstrated as a result of the operation's current activities.

The audit reviewed compliance against 105 EPN conditions and found MMG Rosebery to be compliant against 103. Two historical noncompliance's were identified pertaining to over-topping of the HVAS pond in January 2024 (last reporting period), and last submission of quarterly data to the EPA in November 2023 (last reporting period). The audit also identified 31 observations/improvement opportunities.

MMG Rosebery utilises annual compliance audits not only to assess compliance against statutory requirements but to drive continual environmental improvement that translates to improved environmental outcomes. To facilitate this process all non-compliant audit findings and selected observations are entered into to MMG Rosebery's database as actions and assigned to relevant MMG personnel for implementation. The next audit is scheduled for September 2025, and the accompanying report will be submitted to the Director of the EPA Tasmania within 30 days of receipt.

8. Acronyms

Acronym	Definition
AMRMR	Annual Monitoring Review and Management Report
EOR	Engineer of Record
EPA	Environment Protection Authority
EPN	Environmental Protection Notice
ETP	Effluent Treatment Plant
HVAS	High Volume Air Sampling
HAIR	Hercules Assessment Index for Rehabilitation
MRT	Mineral Resources Tasmania
NRE	Department of Natural Resources and Environment Tasmania
PM10	Fraction of total particles suspended in the air, having diameters less than 10µm
PFS	Pre-Feasibility Study
QA/QC	Quality assurance / quality control
SHEC	Safety, Health, Environment and Community
TSF	Tailings Storage Facility
TSP	Total suspended particles – the term given to the fraction of total particles suspended in the air having diameters generally less than 50µm
WRD	Waste rock dump

9. References

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LMRS (2025). *Bobadil TSF Cover Trials Rehabilitation: Revegetation Success and Root Penetration Monitoring System – Year 3*. LMRS Pty Ltd. 45 Gormanston Rd, Moonah, TAS 7009.

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Koehnken (2025). *MMG Rosebery Annual Water Quality Monitoring Review 2024-2025*. Technical Advice on Water. PO Box 3093, West Hobart, TAS 7000.

SGME (2024). *Cover Trial Annual 22-23 Report – Bobadil Tailings Storage Facility*. SGM Environmental Pty Ltd. PO Box 5622, Stafford Heights, Qld 4053.

SGME (2025). *Audit Report – Three Level Waste Rock Dump*. SGM Environmental Pty Ltd. PO Box 5622, Stafford Heights, Qld 4053.

Tarkarri (2025). *Rosebery Mine Environmental Noise, Ground Vibration and Air Blast Overpressure Annual Monitoring Data Review*. Tarkarri Engineering. PO Box 506, Kings Meadows, TAS 7249.

Appendix A Location Maps



Scale: 1 : 6,000
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1991
Grid: Map Grid of Australia, Zone 55

0 0.07 0.15 0.3 0.45

Kilometers

2/5 Dam Tailings Storage Facility
Annual Monitoring Review and Management Report
2023 - 2024

MMG



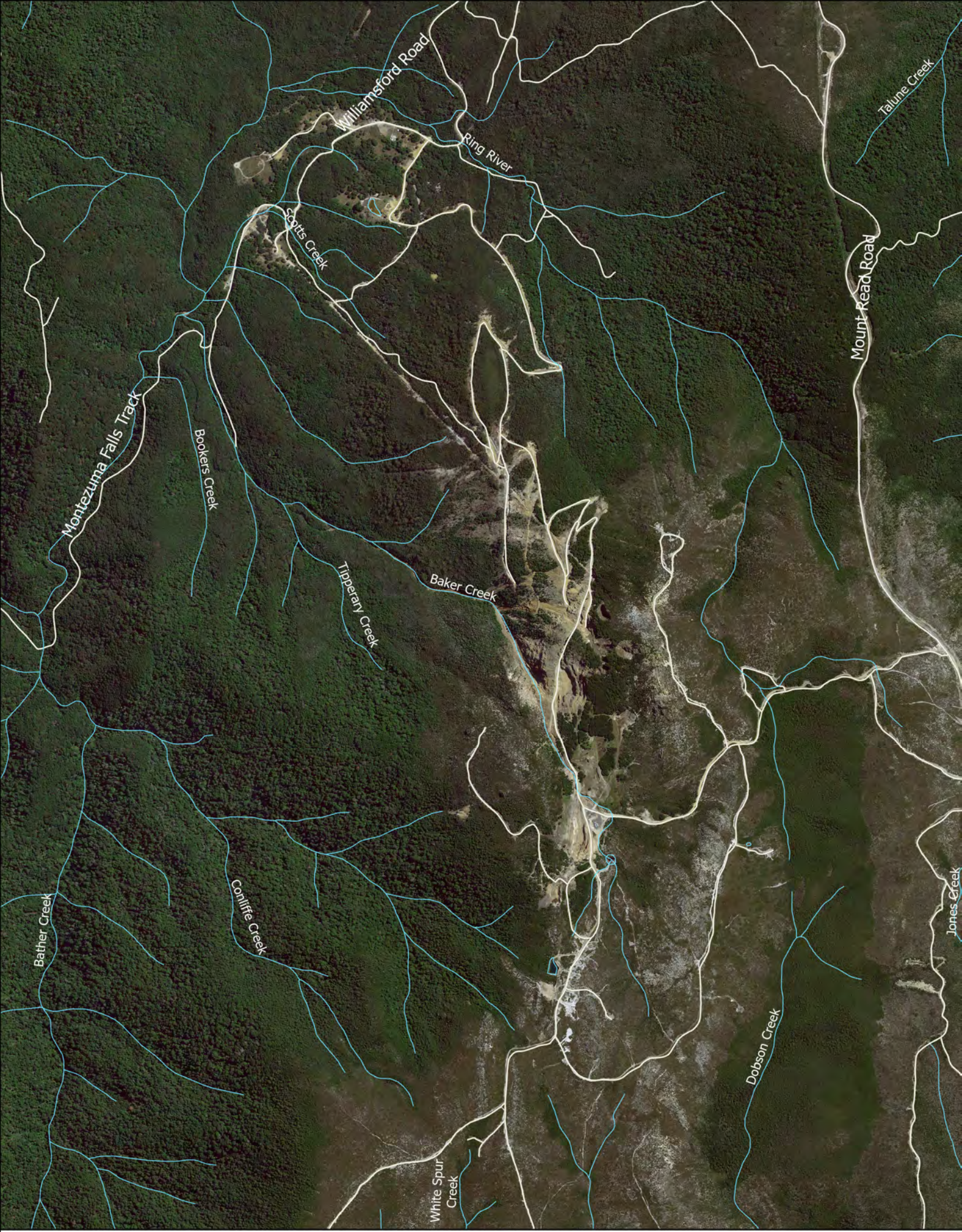
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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1991
Grid: Map Grid of Australia, Zone 55

0 0.07 0.15 0.3 0.45

Kilometers

Bobadil Tailings Storage Facility
Annual Monitoring Review and Management Report
2023 - 2024

MMG



Scale: 1 : 14,500
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1991
Grid: Map Grid of Australia, Zone 55

0 0.17 0.35 0.7 1.05

Kilometers

Hercules and Mount Read
Annual Monitoring Review and Management Report
2023 - 2024

MMG



Scale: 1 : 10,000
Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1991
Grid: Map Grid of Australia, Zone 55

0 0.13 0.25 0.5 0.75
Kilometers

MMG Rosebery Mine and Rosebery Township
Annual Monitoring Review and Management Report
2023 - 2024

Appendix B 2/5 Dam TSF 2024 Engineer of Record Annual Inspection (ATCW, 2025)

REPORT

MMG ROSEBERY MINE
ABN: 23 004 074 962

2/5 Dam TSF
2024 Engineer of Record Annual Audit

107031.126R02-RevA
AUGUST 2025



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Document Control

Project Name:	MMG Rosebery Mine
Document Title:	2/5 Dam TSF, 2024 Engineer of Record Annual Inspection
File Location:	J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Documents\R02 2-5 Dam CY2024\Text\107031.126R02.docx
Project Number:	107031.126

Revision History

Revision	Issue	Issue Date	Prepared by	Reviewed by
A	Draft Issue	29/08/2025	Arun Muhunthan / Jedd Linke-Nagel	Keith Seddon

Issue Register

Distribution List	Date
MMG Rosebery Mine	29/08/2025

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EXECUTIVE SUMMARY

This Report documents the 2024 Intermediate Audit Inspection findings for the 2/5 Dam Tailings Storage Facility (TSF) and Seepage Collection Ponds at the MMG Rosebery Mine, Rosebery Tasmania. This report covers the audit period December 2023 to January 2025.

The inspection has been carried out as part of the obligations of the EoR to MMG and provides an overview of the performance of the structures and adherence to the Operations and Maintenance Manual (O&MM). The inspection was conducted between the 3rd and 6th of February 2025 by Arun Muhunthan (EoR) and Jedd Linke-Nagel (Senior Engineer) from ATC Williams (ATCW)

The facility was observed to be in generally good condition at the time of the inspection. Discharge of tailings is split between the Bobadil TSF and 2/5 Dam with majority of discharge into the 2/5 Dam TSF.

Since the 2023 annual inspection the following works have been carried out:

- A combination of sub-aerial and sub-aqueous deposition has continued.
- Stage 2 construction has been completed.

A number of recommendations have arisen from the 2024 EoR annual inspection. These are a combination of previous audit actions that have not been completed and new action items resulting from the inspection.

Recommendations have been developed based on the site visit, review of monitoring information and discussions with site personnel. Each recommendation has been assigned a priority as follows:

- High priority – A possible current threat to the integrity of the tailings storage facility due to direct evidence of a deficient and non-conformances against requirements; or not meeting expected MMG or industry requirements; or through urgency due to a limited window of opportunity to address a recommendation.
- Medium priority – A possible longer-term issue with the tailings storage facility management that may result in a future threat to the integrity of the facility.
- Low priority – Does not represent a threat and mainly associated with maintenance or operational aspects.

Table ES1 presents the recommendations stemming from the 2024 EoR annual inspection. The recommendations include currently open actions. Items such as routine monitoring, vegetation management, etc are not included as these items are well established standard operating activities.

Accepted recommendations should have an action plan developed.

TABLE ES1: RECOMMENDATIONS

Item	Aspect	Recommendation	Priority
1	Instrumentation	Inclinometer IC9 is now defective and broken. This should be replaced with a new inclinometer to allow ongoing monitoring together with nested vibrating wire piezometers installed at depths where large movements had occurred previously. Consideration should be given to installing additional nested vibrating wire piezometers within the Geotechnical Units 1A, 2A and 3A adjacent to inclinometers IC6, IC8, IC9 and IC10 as part of the 2/5 Dam geotechnical investigation work.	High
2		At times, no readings are recorded by the total stations. Large data fluctuations were also noted for some movement monitors. This should be investigated with the total station supplier.	High

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Item	Aspect	Recommendation	Priority
3		Movement monument SM11 should be fixed and re-attached to its bracket to allow for monitoring.	High
4	Seepage	Water quality testing of seepage within the concrete pit downstream of the Murchison Highway and storm water quality on the opposite side of the road should be undertaken on a quarterly basis.	Medium
5		The reverse filter wall should be extended across the south-eastern embankment and the historical 5 dam downstream slope as a permanent measure to mitigate any possible future tailings leak at the southern end of the eastern embankment.	High
6	Seepage Collection Pond	Remedial options have now been developed for damage to the split lining system in the western cell. The lining system should be remediated as soon as EPA approval has been obtained for the selected remedial option.	Medium
7	BGM Liner	Minor damage on Northern and Eastern Embankment upstream liner. These areas should be patched/repaired prior to tailings reaching above this level.	Low
8	Clean Water Diversion Drain	No significant change with most of the cracks on safety bund, apart from the major crack located at the western end. Consideration should be given to remediating this crack, similar to the way the remediation work has been completed on the previous major crack.	Low
9	Erosion	Erosion observed in the clean water diversion drain should continue to be inspected monthly.	Low
10	Maintenance	Ongoing clearing of drains should be planned as part of routine maintenance.	Low
11		The Screening Bund seepage collection drain toe bund crest surface requires re-grading to allow natural drainage through bund openings to the downstream stormwater drain.	Low
12		Potholes and low points on the crest of the embankments and Seepage Collection Pond require maintenance.	Low

Based on the inspection and a detailed review of all inspection and monitoring data, governance of the 2/5 Dam TSF is considered to be of a high standard. The facility is inspected and monitored in general accordance with the requirements of the Operation and Maintenance Manual, the construction TARPs, and relevant ANCOLD guidelines.

It is considered that the 2/5 Dam TSF does not present a significant risk to the environment downstream of the facility and is suitable for the on-going storage of tailings generated at the Rosebery Mine.

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1 INTRODUCTION

This Report documents the 2024 Intermediate Audit inspection of the 2/5 Dam Tailings Storage Facility (TSF) and Seepage Collection Ponds at the MMG Rosebery Mine, Rosebery Tasmania.

The inspection has been carried out as part of the obligations of the Engineer of Record (EoR) to MMG and provides an overview of the performance of the structures and adherence to the Operations and Maintenance Manual (O&MM) **[1]**.

The previous annual inspection of the structures was the comprehensive audit carried out by ATC Williams (ATCW) in January 2024 which is documented in the previous Surveillance Report **[2]**.

The O&MM outlines the frequency of inspections, with intermediate audits to be completed annually by the design engineer / EoR (ATCW) as well as comprehensive audits completed biannually. The next comprehensive audit is required for the 2025 calendar year.

This report covers monitoring data from the previous calendar year (2024). Since the 2023 annual inspection the following works have been carried out:

- A combination of sub-aerial and sub-aqueous deposition has continued.
- Stage 2 construction has been completed.

2 SCOPE OF WORK

The inspection was completed by the EoR in accordance with the requirements for intermediate inspections outlined in ANCOLD **[4]**.

3 GENERAL INFORMATION

3.1 Operational Status

The 2/5 Dam TSF was re-commissioned in April 2018, after the original 2 and 5 Dams were decommissioned in 1996 and 1995, respectively. The facility was the primary tailings storage at Rosebery until mid-2022 when Bobadil TSF Stage 10 was completed. Tailings are now batch discharged, alternating between the two facilities.

The perimeter embankments have now been constructed to the Stage 2 design height, with construction having commenced in early 2021 and completing in February 2024.

3.2 Physical Details

3.2.1 Location

The 2/5 Dam is located approximately 1 km southeast of the Rosebery Mine. A general site location plan is presented in **Figure 1**. The general layout of the 2/5 Dam TSF, with January 2025 aerial imagery, is presented on **Figure 2**, whilst typical sections are presented on **Figure 3** and **Figure 4**.

3.2.2 Dam Type and General Layout

The facility can be described as a side hill facility. There is a clean water diversion to the south of the TSF to reduce inflow from the surrounding catchment area. The catchment area of 2/5 Dam is approximately 57.4 hectares (Ha), inclusive of the natural topography between the TSF and the clean water diversion. A Seepage Collection Pond (SCP) is located to the north of the northern embankment.

The facility, in its current form, is a single continuous embankment formed via a combination of upstream and downstream construction over and around the previous 1, 2 and 5 Dam complex, which

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was originally constructed between 1950 and 1970. The facility currently has a crest elevation of RL 173.0 m on all embankments (Stage 2 crest elevation).

An overview of historical 1,2 and 5 dam construction together with a discussion of the 2015 design, storage, flood capacity and Stage 2 development of the current 2/5 TSF is provided in **Appendix A**.

A general layout plan of the storage is shown on **Figure 2**.

3.2.3 Catchment Characteristics

The diversion drains constructed around the 2/5 Dam TSF have reduced the size of the total catchment area. As such, only runoff from the area between the clean water diversion and the southern flank of the TSF is reporting to the TSF decant pond. The total surface area within the diversion drains is approximately 57.4 ha, comprising the natural catchment and pond surface area. The catchment area between the embankments and the seepage collections drains approximately 14.5 ha.

3.3 Consequence Category

3.3.1 ANCOLD Consequence Classification

The Consequence Category was last assessed as part of the Stage 2 design **[3]** in accordance with ANCOLD **[4]** and the facility was assigned a Consequence Category of “High A”.

3.3.2 GISTM Consequence Classification

A preliminary assessment of the GISTM Consequence Category **[5]** of Bobadil TSF was also conducted as part of the previous Comprehensive Audit **[2]**. A Consequence Category of “Very High” was assigned.

3.4 Surveillance Program

3.4.1 Frequency

ANCOLD (2019) **[4]** indicates that for a “High A” Consequence Category dam, routine visual inspections should be carried out on a daily to 3 times per week basis, that intermediate inspections are carried out annually and that comprehensive inspections are carried out at 2 yearly intervals.

3.4.2 Routine Visual Inspections

Routine visual inspections of the 2/5 Dam TSF and SCP are specified in the O&MM **[1]** and are required to be conducted on a shift/daily, weekly, and monthly basis. Refer to **Section 5** of this Report for a more detailed discussion of these inspections and their implementation.

3.4.3 Monitoring

The facility is monitored regularly, with reports prepared on a monthly basis to summarise the findings. Monitoring includes measurement of phreatic conditions, pond water levels, embankment movement or settlement, internal drainage, and seepage from the facility. Details of instrumentation and monitoring, including the frequency of data collection, is provided in **Section 5.3**. In addition, a bathymetric survey is conducted on a 6-monthly basis to assess the elevation and stored density of the tailings and associated water cover depth. These requirements are detailed in the O&MM **[1]**.

Further details regarding monitoring, including a review of results for the audit period, are presented in **Section 5** of this Report.

Figure 5 presents the locations of piezometers and seepage monitoring instrumentation around the TSF, **Figure 6** presents the locations of survey prism and settlement plate monitors, and **Figure 7** presents the locations of inclinometers.

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4 SURVEILLANCE INSPECTION

4.1 Details of Inspection

The inspection was conducted between the 3rd and 6th of February 2025 by Arun Muhunthan (EoR) and Jedd Linke-Nagel (Senior Engineer) from ATCW. Pamela Soto (MMG Manager Tailings & Water Australia) was also in attendance during parts of the inspection.

The weather during the inspection was mostly sunny and hot, with some showers on the 3rd of February. The weather conditions were not a factor during the inspection.

Details of the inspection, in the form of the monthly checklist are presented in **Appendix B**. A summary of inspection observations is presented in **Figure 8**.

4.2 Photographic Record

Representative photographs taken during the audit inspection are presented in **Appendix C**. Individual photos are discussed where appropriate in the following sections of this Report.

The approximate locations of the photographs are presented as **Figure 9**.

4.3 2/5 Dam

4.3.1 Freeboard, Spillway, Diversion and Decant

The pond elevation at the time of the inspection in early February was RL 169.02 m – consistent with a survey undertaken in January 2025, as presented in **Figure 2**.

The tailings head of beach elevation varies around the facility. The beach elevation is approximately RL 169.5 m against the northern embankments, RL 169.2 m against the western embankment and RL 170.0 m against the eastern embankment. This indicates a wall freeboard of between 3.0 m and 3.8 m for the current Stage 2 embankment crest (RL 173 m). The freeboard requirement is a minimum beach freeboard of 0.3 m for the facility, considering sub-aerial deposition.

In terms of pond freeboard, the pond elevation observed during the inspection is 1.98 m below the spillway (RL 172 m).

The decant inlet was clear of obstructions.

The spillway was in good condition and had only recently been constructed to its Stage 2 elevation (refer to **Photograph 23**). It is noted that the construction materials such as culvert sections, old HDPE pipe and excavator buckets previously observed during the January 2024 inspection had been removed and the spillway was clear of obstructions. The spillway batter slopes are cut into natural rock and were observed to be competent at the time of inspection.

The diversion channel was observed to be in good condition (refer to **Photograph 35**). As previously observed, there is evidence of possible loosening of rock in the western cut face between benches 1 and 2 and an exclusion zone has been established below this area. The cut face appears largely unchanged since the previous annual inspection. The low flow drain (in the base of the diversion channel) has been reinstated after previously being backfilled with granular fill to improve the width of the haulage route for Stage 2 construction (refer to **Photograph 34**).

A small gravel bund has been constructed near the northwestern end of the channel to attenuate flow to the filter bund. A small amount of water is pooling against the filter bund, which was installed to manage sediment laden runoff from construction activities. While observed to have performed reasonably since installation and remained in good condition, the pooled water may signify that the filter bund is blinded by sediment and is likely at the end of its service life.

4.3.2 Embankments

The embankments were generally in good condition.

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Significant rutting and potholes were observed at several locations along the length of the western embankment crest (refer to **Photograph 16**), and to a much lesser extent on the northern, eastern and southern embankments (refer to **Photograph 3, 4, 6 and 11**). Evidence of previously pooled water was visible at a low point on the upstream edge of the western embankment, which is understood to be due to sprinkler operation from this embankment.

The upstream lining system was generally observed to be in good condition on the western and northern embankments, with some minor damage observed on the northern embankment between the Stage 1 and 2 liners (refer to **Photograph 17 and 36**). Areas of minor liner damage were also observed at the southern end of the eastern embankment and will require repair (refer to **Photograph 37**). Ballast gravel placed upstream of the eastern embankment has eroded in areas and should be remediated.

Downstream batters, buttresses and benches appeared to be in good condition with no structural deficiencies or new seepage locations identified. Existing seepages are discussed in the following section.

4.3.3 Embankment Seepage

Seepage was observed from previously noted locations at the downstream toe of the northern and eastern embankments. No new seepage locations have been identified during the inspection period.

Most of the historical seepage points from the northern embankment has been covered by Stage 2 construction but the two predominant areas at the toe are still visible, these being:

- Toe seep at low point @ 379071E, 5373120N (point A on **Figure 8**, refer to **Photograph 30**).
- Toe seep at old drain @ 379103E, 5373102N (point B on **Figure 8**).

Both seepage points have been instrumented to monitor seepage rate. A small weir had been formed to capture seepage from points A and B (**Figure 8**).

Seepage from the downstream toe of the original 5 Dam embankment, defined by channels cut to the seepage collection drain, were:

- Broad area of toe seepage @ 379338E, 5372805N (point C on **Figure 8**, refer to **Photograph 27**).
- Original 5SP03 toe drain outlet (point D on **Figure 8**).
- At the southern end of the eastern embankment @ 379254E, 5372297N (point E on **Figure 8** and associated with the original southern abutment of 5 Dam.
- Concentrated seep through the reverse filter wall in the decommissioned clean water diversion drain (point F on **Figure 8**, refer to **Photograph 28)**.

Minor seepage is emanating approximately 1.5 m up the downstream batter at original southern abutment of 5 Dam (point G on **Figure 8**). The majority of the seeps were assessed as low flow and were clear. Iron precipitates were present at seepage points C, E and F. Reeds are present in general proximity to the seeps.

The seepage flow in the decommissioned clean water diversion drain (point F) was high and is noted to have slightly increased in extent and flow rate since the January 2024 inspection. Significantly more vegetation has grown in the area since the previous inspection. A reverse filter has been incorporated into the downstream shell of Stage 2 works in this area to reduce the risk of tailings carry through.

Pre-existing seepage from the old northern 5 Dam embankment remains. These seeps are mainly associated with chimney drain discharge (points D).

4.3.4 Screening Bund

The screening bund has a crest level of RL 172 m and a downstream buttress with a crest level of RL 163 m. The raise and reprofiling of the screening bund was completed in 2023, with additional works including implementation of seepage collection and stormwater systems, and ground improvements (jet grouting between the toe of the Stage 1 screening bund and Murchison Highway).

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Vegetation on the downstream face of the screening bund consisted of grass and shrubs and is growing well. The surface has been covered with topsoil and seedlings, with vegetation growth continuing to develop (refer to **Photograph 19 and 20**).

Seepage is being collected in the two pits located downstream of the wall and being pumped via return pipeline into the TSF.

Iron precipitates were observed within the downstream drain and pit (refer to **Photograph 31**), likely from runoff from the residential area to the west. Water quality testing should be considered to investigate its origins. It is recommended that water quality testing of seepage within the concrete pit downstream of the Murchison Highway and storm water on the opposite side of the road should be undertaken on a quarterly basis for MMG's record and for utilisation in the closure design of the facility.

The screening bund lower buttress crest has several minor low points. The toe buttress crest is not graded towards the slotted outlets within the safety bund at the northern side of the seepage pits. Although no pooling water was observed during the inspection the surface requires re-grading to allow natural drainage through bund openings to the downstream stormwater drain.

4.3.5 Tailings Deposition

Tailings were being discharged using an open discharge pipeline at Finger 6 on the northern end of the eastern embankment. Ongoing tailings deposition is split between the 2/5 Dam and Bobadil TSF.

The northern end of the tailings beach was largely submerged beneath the decant pond at the time of inspection, but still with a significant area of tailings exposed due to ongoing subaerial deposition. The subaerial tailings were uniform with very little channeling observed.

Isolated ponding was observed on the tailings beach at the southern end of the western embankment due to a low point in the tailings.

Sprinklers have been installed on the embankment crests and the extended fingers located at the southern half of the TSF to aid dust suppression on exposed tailings. However, no sprinklers were in operation at the time of inspection.

4.3.6 Seepage Collection Drains

There are two perimeter surface seepage collection drains. One is located at the toe of the existing 5 Dam (eastern drain) and collects all seepage from the eastern part of the TSF. The other drain is located at the toe of the Northern Embankment (western drain). Seepage into the eastern drain reports to the Seepage Collection Ponds after passing through a V-notch weir. Seepage collected from the western drain flows into the natural environment after passing through a V-notch weir.

Additionally, internal toe drains have been installed within the North Embankment. The three pipe outlets discharge into a channel, pass through a V-notch weir and discharge into the Seepage Collection Pond.

The eastern drain is generally in good condition. Flow was clear. Reeds and grasses are present within the drain and are constricting flow slightly in some areas. Consideration should be given to including clearing the drain as part of annual maintenance. A concrete headwall structure connects the open and pipeline sections of the drain (**Figure 8**, refer to **Photograph 33**) and appears to be functioning as intended, with no signs of erosion around the headwall or leaking of the pipeline. A small amount of moss was present on the grate on the upstream side of the headwall but was not impeding flow. A small amount of water was observed at the toe of the new pipeline bund (refer to **Photograph 44**) and is likely attributed to runoff and percolation of rainfall. However, consideration may be given to water quality testing to confirm the source.

V-notch weirs located at monitoring points along both the eastern and western drains were clear of obstructions.

4.3.7 Clean Water Diversion

The clean water diversion drain (CWDD) is located to the south of the TSF. A very low flow over the control weir, located towards the eastern end, was observed at the time of inspection (refer to

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Photograph 42). Flow commenced approximately halfway along the drain at the intersection with an ephemeral creek line. Up gradient the drain was dry.

Sections of erosion and slumping on the upstream side slope of the CWDD have previously been noted during inspections over several years and have remained mostly unchanged over the current inspection period.

An eroded section, with associated slumping was observed on the upstream side slope through low strength glacial clays/silts around 379247E, 5371843N (point H on **Figure 8,** (refer to **Photograph 43**). The amount of slumped material appears similar to that observed during the January 2024 inspection. Flow in this area is largely unobstructed, with the slumped material having been cleared. Undercutting of the glacial material remains present so this area should continue to be monitored.

Extensive cracking of the safety bund on the downstream edge of the access road associated with the drain has been observed in previous inspections, in places towards the mid to western end of the drain. This is associated with areas where the access road is in fill (noting that the entire drain is in cut). Cracking was observed to have continued developing in some locations (refer to **Photograph 40**) while having been remediated on the southern extent of the previously observed cracking (refer to **Photograph 39**). These locations are illustrated in **Figure 8**. Remediation works have comprised rebuilding and widening the safety bund with rockfill.

The remaining visible cracks have mostly rounded edges with vegetation litter present, and vary in width from hairline to approximately 200 mm. The rounded edges suggest that cracking is old or very slowly developing. The width and extent of cracking has slightly increased since the January 2024 inspection. The cracks have been mapped by ATCW site engineers and are monitored on a monthly basis. Consideration should be given to remediate remaining cracks, similar to the way the remediation work has been completed on the previous major crack.

As a risk mitigation measure a bund remains in place across the access track to limit access to pedestrian traffic.

The spillway and box culvert CWD outlet was in good condition. There is some undercutting of the culvert on the downstream side that appears similar in extent since the January 2024 inspection. It is recommended that rockfill is placed in this area to mitigate further undercutting.

4.4 Seepage Collection Pond

The upstream and downstream slopes were observed to be in good condition. Minor areas of vegetation are present on the downstream batter but are not of concern. There are minor potholes and ruts on the crest of the ponds that require maintenance.

The lower (western) pond has previously been observed to have considerable damage to the liner in the form of split seams and liner tears (refer to **Photograph 25**). The condition of the liner has remained largely unchanged since the January 2024 inspection.

The spillway crest was clear of obstructions. The two seepage inlet structures are in reasonable condition.

The seepage return pump and the pump bridge appear to be in good condition.

The Low Flow structure between the two cells appeared to be in generally good condition and free of debris. Inspection of the liner in this area revealed peeling of a liner flap directly downstream of the culvert (refer to **Photograph 38**). While it is not allowing water to migrate to the underlying material, repair work should be considered to prevent future damage.

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5 REVIEW OF SURVEILLANCE

5.1 Review of Previous Surveillance Reports

5.1.1 General

MMG now capture recommendations in the IEM register which presents the actions, presents timeframes and nominates the responsible MMG personnel. The IEM register was reviewed as part of the annual inspection.

5.1.2 Review of 2023 EoR Inspection Report

The 2023 EoR inspection report prepared by ATCW **[2]** was reviewed. Issues raised, and corrective action completed, as presented in the IEM register are presented in **Table 1**.

TABLE 1: ACTION ITEMS STATUS FOR 2023 INSPECTION

Item	Aspect	Recommendation	Priority	Status
1	Instrumentation	Instrumentation should be connected to telemetry systems following completion of Stage 2 construction works.	High	Complete.
2	Seepage	Further investigation into the source of seepage within the concrete pit downstream of the Murchison Highway should be undertaken.	Medium	Not actioned.
3		Seepage at the southern end of the eastern embankment has increased since the previous annual inspection. This should be investigated by assessing seepage flux and calibrating it to observed flow.	Medium	Investigation and monitoring ongoing.
4	Seepage Collection Pond	Damage to the split lining system in the western cell. Following completion of the Stage 3 design, an action plan should be developed and possible modification to the ponds and seepage collection/return infrastructure considered.	Medium	Development of remedial options for liner repair is in progress.
5	Erosion	Erosion observed in the clean water diversion should continue to be inspected monthly.	Low	Ongoing.
6	Vegetation Management	Ongoing clearing of drains should be planned as part of routine maintenance.	Low	Ongoing.

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Item	Aspect	Recommendation	Priority	Status
7	Tailings Spigots	Additional anchorage should be placed on the base of the western embankment spigots to ensure no movement and consequently no damage to the upstream liner.	Low	Complete.

5.2 Routine Inspections

5.2.1 General

Routine Inspection procedures for the mandatory surveillance of the 2/5 Dam TSF and SCP are specified in the O&MM **[1]**. The inspection requirements are as follows:

- Shift/Daily and Weekly Routine Inspections – relating to issues that may develop over time and impact on the safety of the dam or the environment.
- Monthly Routine Inspections – relating to issues that may develop over time and routine monitoring.

In addition to the above routine monitoring, the results are compiled into monthly reports to provide MMG with a summary of the performance of the facility.

5.2.2 Routine Shift/Daily and Weekly Inspections

The TSF Coordinator is responsible for coordinating the shift/daily and weekly inspections and reporting. The inspections are recorded electronically in the Effluent System Change Register which includes the checklists from the O&MM.

The previous review of the register was to 31 December 2023. The register was reviewed for compliance with the O&MM for the 12-month period ending 31 December 2024. The findings summarised below:

- Daily Inspections – 365 daily inspections were recorded during the audit period (100% completion).
- Weekly Inspection – 52 weekly inspections were recorded during the audit period (100% completion).

From review of the register, it is apparent that the high level of compliance with regard to inspections has been maintained throughout the 12-month period since the previous review.

Based on review of the register it is considered that the inspections are being carried out in general accordance with the requirements of the O&MM.

5.2.3 Routine Monthly Inspections and Reports

Routine monthly inspections are the responsibility of the Concentrator Department, who have contracted ATCW to complete the monitoring and inspections. Monthly inspections are stored by MMG within their electronic library. The inspections are presented in a TARP format. The inspections have been completed in accordance with the O&MM.

5.2.4 Non-scheduled Inspections and Corrective Action

There were two triggers for non-scheduled inspections during the audit period, as described in the following sections.

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5.2.4.1 Trigger 1 – Increased Seepage at the Southern End of the Eastern Embankment

In early September 2024, the seepage at the southern end of the 2/5 Dam Eastern Embankment increased by over 100%, primarily due to heavy rainfall and a rise in the TSF pond level. The TARP level was subsequently increased to 'High'.

As a result, daily monitoring of V-notch readings and visual inspections were conducted until the flow returned to its previous levels by the end of October.

5.2.4.2 Trigger 2 – Cloudy Water at the Southern End of the Eastern Embankment

On 22 November 2024, MMG observed cloudy water at the southern end of the Eastern Embankment seepage location. The TARP level was subsequently increased to 'High'.

The cloudy water ceased immediately after tailings deposition upstream of the area was halted. This incident prompted an unscheduled inspection by ATCW and initiated daily inspections of the seepage area by MMG.

Tailings deposition has since resumed upstream of the seepage location, following the placement of geotextile against upstream of the seepage area. Deposition is currently restricted to daytime operations, with daily monitoring of the seepage area continuing.

As a long-term solution, ATCW has recommended extending the existing reverse filter wall across the entire toe of the southern end of the embankment, including the area where cloudy water was observed. The inspection report, including detailed recommendations, is provided in **Appendix F**.

5.3 Monitoring

5.3.1 General

Routine monitoring of the facility has been carried out during the audit period. The following monitoring was carried out.

- Water Level within the TSF has been measured at the decant since June 2018. Readings are typically taken manually on a weekly basis.
- Seepage on a weekly basis from:
  - Western end of the Northern embankments (V-notches 2 and 3)
  - Internal drainage from the northern embankment (V-notch 4).
  - Eastern flank of the facility (V-notch 5).
  - Southern end of the eastern embankment (V-notch 6).
  - Possible seepage and stormwater flow at the stormwater outlet culvert located on the western side of the Murchison Hwy to the north of the Screening Bund (V-notch 1).
- Phreatic surface within the facility (56 functional piezometers) on a monthly basis (maximum), with data recorded automatically every 6 hours. Standpipe piezometers were measured daily during construction, up to February 2024, and monthly thereafter.
- Survey prisms installed on settlement plates on the northern embankment were monitored daily using a robotic total station during construction and reported in the daily site reports up to October 2024. After this time, the movement monitoring system was overhauled with 49 prisms installed. Data has been recorded on a 6-hourly basis since November 2024.
- Lateral movement of embankment and foundation is monitored using inclinometers (9 total, as of July 2025). Automated shape arrays provide data on an hourly basis, whereas manual readings are taken monthly.

The following sections provide a discussion and summary of the monitoring.

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5.3.2 Monitoring Piezometer Water Levels

There were 56 vibrating wire piezometers (VWP) installed in the 2/5 Dam TSF throughout the audit period to measure the phreatic surface within the embankments and tailings. There are 46 piezometers on the northern, eastern and southern embankments and 10 piezometers located upstream and downstream of the screening bund. The locations of the VWPs are shown on **Figure 5**.

The observed water levels within the northern, eastern and southern embankments piezometers are summarised in **Figures 11** to **16**.

The figures show that many piezometers installed within the northern embankment had shown a response to Stage 2 raise northern embankment buttress construction works during 2022 and into 2023, particularly on the central and eastern sections. Since this time, readings in these areas have generally continued to steadily decrease or remain stable, as pore water pressures induced by construction loading dissipate.

VW23 and VW28 piezometers, which experienced significant pore pressure increases during Stage 2 construction works during loading have stopped providing data as of August 2024 and February 2025 respectively. These piezometers should be replaced with new piezometers.

Abnormally high readings observed at VW38A were investigated, with a replacement piezometer (VW49) installed nearby in December 2023 to verify the data. The readings at VW49 are significantly lower and indicate that the VW38A readings are erroneous. Similarly, additional piezometers installed in the vicinity of VW40 and VW45 have indicated that the abnormally high readings at these piezometers are not indicative of the actual subsurface water levels.

TARP levels for piezometers have been defined for Stage 2 operational conditions. With the exception of the high readings at VW38, VW40 and VW45, which have been investigated and found to be erroneous, all other northern embankment piezometers remained within the green TARP level throughout the inspection period.

The piezometers installed within the 5 Dam (eastern embankment) show a strong correlation to pond elevation and have mostly remained below TARP levels during the 2024 inspection period. VW5 increased above the green TARP level between September to October 2024 in response to significant rainfall and an increase in the pond level. This was noted at the time in the monthly inspections and the overall phreatic surface for the eastern embankment was deemed to be acceptably low. Readings have returned to below the green TARP level at VW5 since this time.

Piezometers were installed either side of the screening bund in May 2019, and 3 additional piezometers were installed in September 2022 to monitor construction works associated with the screening bund. All screening bund piezometers have remained steady throughout the inspection period, with minor fluctuations corresponding to the pond level within the TSF. **Figure 17** summarises the pore pressures since installation.

Review of piezometer records indicate that all correctly functioning piezometers installed within the 2/5 Dam are within the Normal TARP level, as of January 2025.

5.3.3 Monitoring Internal Drainage and Seepage

There are six V-Notches installed within 2/5 Dam TSF to monitor seepage flow. The locations are shown on **Figure 5.**

V-Notches 2, 3 and 4 are used to measure internal drainage and seepage from the western flank of the North embankment whilst V-Notch 5 measures seepage from the eastern part of the facility. V-notch weir 1 measures seepage and stormwater flow to the north of the screening bund at the stormwater outlet. V-notch 6 monitors toe seepage from the southern end of the eastern embankment.

Monitoring of the V-notch weirs had been carried out on a weekly basis during construction up to February 2025. Monthly readings were carried out for the remainder of the inspection period. A summary of monitoring results since January 2018, or installation, is provided in **Figure 18**.

Monitoring since the start of 2024 Indicates:

- Northern Flank Seepage (measured at V-Notches 2 and 3):

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- These V-notches were installed as part of Stage 2 works in the latter part of 2022. V-notch 2 measures seepage from the western abutment and along the western toe of the Northern embankment. Up to March 2024, this seepage was being pumped back into the seepage collection pond using an automated pump, hence, V-notch 2 reported zero flow during this time, noting that the few recorded non-zero readings were during periods of heavy rainfall and can likely be attributed to incidental rainfall and runoff. Since March 2024, V-notch 2 has remained sensitive to rainfall and readings have varied between 0.9 l/s and 13 l/s, spiking in September 2024 in response to sustained heavy rainfall. V-notch 3 measures seepage at the northwestern toe of the TSF. Flow rates at this V-notch have remained low over the inspection period, varying between 0 l/s to 1.7 l/s during the inspection period.

- Northern Embankment Internal Drainage (measured at V-Notch 4):
  - The flow rate has mostly remained steady over the reporting period, with very minor fluctuations corresponding with rainfall. The average flow rate is approximately 6.2 l/s with a high of approximately 7.2 l/s in October 2024.
- East Embankment Seepage (measured at V-Notch 5):
  - The V-notch is manually read; hence the readings can only be related to rainfall immediately preceding (day of or previous day) the measurements. Based on this approach there is a correlation between rainfall and flow.
  - The flow varies from a peak of 7.1 l/s to a low of approximately 1.2 l/s.
  - Base flow of seepage, from the original 5 Dam embankment during periods of little or no rainfall is approximately 1.5 l/s.
- Northern End Screening Bund (measured at V-Notch 1):
  - The monitoring suggests a weak correlation with rainfall, indicating likely flow of seepage from the TSF or other source of water ingress around the site.
  - The flow has varied during the inspection period from a peak of approximately 4.0 l/s (during heavy rainfall) to a low of 0.6 l/s and an average flow rate of approximately 1.4 l/s, very similar to the previous year's monitoring. This suggests that the seepage collection system installed in April 2022 is working well.
- Southern End of Eastern Embankment (measured at V-Notch 6):
  - The V-Notch measures the seepage emanating at the southern end of the Eastern Embankment.
  - Readings have mostly remained steady over the duration of the inspection period, with the exception of a large spike in September and October 2024 (refer to **Section 5.2.4**). The flow rate varied from a low of 1.6 l/s in January to a high of 26.0 l/s in October, noting that there is a weak correlation between flow rate and rainfall. However, the high reading was primarily attributed to heavy rainfall and a rise in the TSF pond level.
  - A high TARP level was assigned to V-notch 6 during this time, until levels stabilised and returned to normal levels in early 2025. Investigation was recommended to determine the cause of the increased readings and presence of cloudy water.

5.3.4 Settlement and Movement Monitoring

A new surface movement monitoring system, comprising 49 prisms and 3 automated total stations, has been in operation since October 2024. The locations are shown in **Figure 6** and plotted data is provided in **Appendix D**.

Minor fluctuations in readings are observed in most of the prisms, with larger fluctuations and missing data observed at those located furthest from, or without a clear line of sight to, the total stations. Many

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points with errors or large movements are monitored by the same total station (TS1) and may be related to an issue with the calibration of the total station, as well as climatic conditions such as fog and heavy rainfall. Despite the fluctuations, general trends in the data are visible.

Settlement is generally low and uniform across similarly located prisms. Prisms on the eastern half of the northern embankment and northern end of the eastern embankment (SP10, SP11, SP12, SP13, SP14 and SP15) show more movement in the upstream direction than other points on their respective embankments.

Given that the total station occasionally failed to record readings and significant data fluctuations were observed in some movement monitors, it is recommended that this issue be investigated further with the total station supplier.

It is understood that large movements may be attributed to calibration issues with Total Stations 1 and 3 and long lines of site across the water body/tailings in the TSF.

5.3.5 Inclinometer Monitoring

A total of 9 inclinometers (IC5-IC10 and SAVV1 -SAVV3) are located within the toe buttress downstream of the Northern embankment.

All inclinometers, excluding IC7 and IC9 (as of September 2024), are equipped with either in-place segments or shape arrays. IC7 is a damaged inclinometer and provides data to a depth of approximately 16 m but this data only provides relative movements as the base is no longer fixed to a defined position. IC9 is defective and has not provided readings since September 2024 when the shape array segments were removed.

The inclinometer locations are presented on **Figure 7**.

Review of the inclinometer information indicates:

- The inclinometer plots indicate that minor movement of the embankment is occurring primarily within the rockfill and upper foundations. It is considered that the movements are likely due to ongoing primary and secondary consolidation of the foundation silt due to the new embankment load and post construction settlement of rockfill due to particle breakage.
- IC5 - movement of approximately 50 mm over the previous 12-month period at, or just above, the embedded liner is a similar rate of movement to other inclinometers. A total movement (above the liner) of 220 mm has been recorded since installation in June 2018.
- IC6 shows continuing consolidation of soft silts at a depth of 10 m to 18 m. Installation of new segments was completed in April 2024. Based on limited data since this time, maximum displacements of -8 mm and +32 mm are reported.
- IC7 – monitoring, since re-installation in May 2024, suggests uniform consolidation is occurring over most of the depth of the inclinometer, with maximum deflections higher near the surface. The maximum recorded deflection is typically less than 10 mm. Similar observations were made for IC7 prior to May 2024 before installation of new segments.
- IC8 is showing movement up to 16 mm within the upper 14 m since installation of new segments in September 2023.
- IC9 shows minor consolidation within the upper 20 m below surface, with a maximum deflection of 55 mm since installation of new segments in October 2023. IC9 has been damaged since September 2024, and no data has been provided since this time. At the time of writing (July 2025), IC9 has been replaced.
- IC10 data plots indicate generally minor movements since installation in September 2023, with the exception of reported near-surface deflections up to +65 mm, likely caused by northern embankment construction works and subsequent consolidation.
- SAAV1 is showing consolidation to a depth of 16 m below surface since installation of in-place segments in October 2023. Maximum deflections up to 10 mm are recorded at depth. Near surface movements of up 45 mm are observed.

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- SAAV2 is showing minor consolidation, with movement generally limited to the upper 10 m of rockfill. Deflections up to 25 mm at the surface have been observed since re-installation of segments in April 2024.
- SAAV3 shows minor consolidation within the upper 15 m below surface, with a maximum deflection of 38 mm since installation of new segments in August 2023, likely caused by northern embankment construction works and subsequent consolidation.

The most recent inclinometer plots are presented in **Figures 19 to 30**.

Displacement vectors showing the direction of movement of near-surface inclinometer nodes are illustrated in **Figure 7** and suggest embankment movement is mostly towards the downstream, as is typically expected. This is also consistent with the surface movement monitoring observations (refer to **Section 5.3.4**). Movement at the near-surface inclinometer nodes ranges from 8 mm to 18 mm since October 2024 when the surface movement monitoring points and total stations were commissioned, which is in general alignment with the magnitude of movement observed at the movement monitoring points.

Appendix E presents time series of displacement of identified critical inclinometer nodes along with vibrating wire piezometer data in the vicinity of the critical nodes. The trends suggest that the rate of movement generally increased during Stage 2 construction on the Northern Embankment but have decreased since completion of construction in February 2024.

IC9 was identified to have become blocked in September 2024 at RL 137.2 m and IC6 showed an increase in movement at RL 137.5 m (around the same level) during December 2024 – January 2025. The rate of movement has since reduced but remains at a higher rate than that observed prior to the initial increased rate in mid-December. A detailed assessment reviewing the abnormal movement at IC6 was undertaken in June 2025 by reviewing all other instrumentation in the vicinity of IC6. The outcome was summarised in a memo which is re-produced in **Appendix G**.

It is recommended that inclinometers should be continually monitored for changes in movement rates, particularly in the inclinometers that have demonstrated continual movement. Inclinometer IC9 is now defective. This should be replaced with a new inclinometer to allow ongoing monitoring together with nested vibrating wire piezometers installed at depths where large movements had occurred previously.

Consideration should also be given to installing additional nested vibrating wire piezometers within the geological Units 1A, 2A and 3A adjacent to inclinometers IC6, IC8, IC9 and IC10,

The current rate of movement is considered acceptable but ongoing monitoring is recommended.

5.3.6 Tailings and Decant Pond Level

The storage volume occupied by tailings is assessed via bathymetric survey which is generally undertaken on a 6-monthly basis. Three aerial Lidar surveys and two bathymetric surveys have been carried out during this audit period.

The storage volume has been estimated from the most recent bathymetric survey completed in August 2024, combined with the most recent aerial survey completed in April 2025, shown in **Figure 10**. The bathymetric survey indicates the stored tailings volume since commissioning is approximately 3.19 Mm^3. Approximately 4.83 Mt of tailings has been discharged into the TSF between commissioning and April 2025. The estimate of emplaced tailings density based on volume and tonnage is approximately 1.51 t/m^3. The design considered densities of 1.25 t/m^3 for tailings below the pond level and 1.5 t/m^3 for tailings above the pond. It is possible that settlement of the existing tailings has occurred and is contributing to an overall density higher than the design values.

An assessment of the most recent bathymetric and Lidar surveys indicates:

- Tailings level in the TSF varies with the maximum beach level of RL 170.5 m near the southern end of the eastern embankment and the minimum beach level of RL 165.0 m in the middle of the TSF.
- Average beach slopes for sub-aerial tailings and sub-aqueous tailings are approximately 1.5% and 3.0% respectively.

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- Approximate volume of water in the facility at the time of survey is 179,000 m^3.

At the time of the annual inspection the pond elevation was RL 169.02 m. With the spillway at the Stage 2 invert level of RL 171 m, Stage 2 perimeter embankments at RL 173 m and a maximum operating pond level of RL 170, it is considered that sufficient freeboard has been provided. The available freeboard was 3.98 m and exceeds the minimum design freeboard of 1 m.

5.3.7 Remaining Capacity

Tailings deposition scheduling based on the January 2025 survey indicates that the remaining Stage 2 storage capacity from sub-aerial and sub-aqueous tailings deposition is approximately 1.2 Mt. This deposition strategy allows for an average of 2 m water cover over the tailings surface at the end of filling. At a nominal tailings deposition rate of 680,000 tpa (85% of throughput), it is expected that the 2/5 Dam TSF will reach its full capacity by December 2026 under sub-aerial deposition.

6 OPERATION, MAINTENANCE AND EMERGENCY MANAGEMENT

The O&MM was last updated in April 2025 **[1]** for Stage 2 sub-aerial deposition. It is considered that the O&MM adequately reflects the current condition of the 2/5 Dam TSF.

7 REVIEW OF DAM STATUS

Based on the inspection and a detailed review of all inspection and monitoring data, governance of the 2/5 Dam TSF is considered to be of a high standard. The facility is inspected and monitored in general accordance with the requirements of the O&MM, construction TARPs, and relevant ANCOLD guidelines.

It is considered that the 2/5 Dam TSF does not present a significant risk to the environment downstream of the facility and is suitable for the on-going storage of tailings generated at the Rosebery Mine.

8 SUMMARY OF RECOMMENDATIONS

A number of recommendations have arisen from the 2024 EoR annual inspection. These are a combination of previous audit actions that have not been completed and new action items as a result of the inspection.

Recommendations have been developed based on the site visit, review of monitoring information and discussions with site personnel. Each recommendation has been assigned a priority as follows:

- High priority – A possible current threat to the integrity of the tailings storage facility due to direct evidence of a deficient and non-conformances against requirements; or not meeting expected MMG or industry requirements; or through urgency due to a limited window of opportunity to address a recommendation.
- Medium priority – A possible longer-term issue with the tailings storage facility management that may result in a future threat to the integrity of the facility.
- Low priority – Does not represent a threat and mainly associated with maintenance or operational aspects.

Table 2 presents the recommendations stemming from the 2024 EoR annual inspection. All accepted recommendations should have an action plan developed.

TABLE 2: RECOMMENDATIONS

Item	Aspect	Recommendation	Priority
1	Instrumentation	Inclinometer IC9 is now defective and broken. This should be replaced with a new inclinometer to allow ongoing monitoring	High

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Item	Aspect	Recommendation	Priority
		together with nested vibrating wire piezometers installed at depths where large movements had occurred previously. Consideration should be given to installing additional nested vibrating wire piezometers within the Geotechnical Units 1A, 2A and 3A adjacent to inclinometers IC6, IC8, IC9 and IC10 as part of the 2/5 Dam geotechnical investigation work.	
2		At times, no readings are recorded by the total stations. Large data fluctuations were also noted for some movement monitors. This should be investigated with the total station supplier.	High
3		Movement monument SM11 should be fixed and re-attached to its bracket to allow for monitoring.	High
4	Seepage	Water quality testing of seepage within the concrete pit downstream of the Murchison Highway and storm water quality on the opposite side of the road should be undertaken on a quarterly basis.	Medium
5		The reverse filter wall should be extended across the south-eastern embankment and the historical 5 dam downstream slope as a permanent measure to mitigate any possible future tailings leak at the southern end of the eastern embankment.	High
6	Seepage Collection Pond	Remedial options have now been developed for damage to the split lining system in the western cell. The lining system should be remediated as soon as EPA approval has been obtained for the selected remedial option.	Medium
7	BGM Liner	Minor damage on Northern and Eastern Embankment upstream liner. These areas should be patched/repaired prior to tailings reaching above this level.	Low
8	Clean Water Diversion Drain	No significant change with most of the cracks on safety bund, apart from the major crack located at the western end. Consideration should be given to remediating this crack, similar to the way the remediation work has been completed on the previous major crack.	Low
9	Erosion	Erosion observed in the clean water diversion drain should continue to be inspected monthly.	Low
10	Maintenance	Ongoing clearing of drains should be planned as part of routine maintenance.	Low
11		The Screening Bund seepage collection drain toe bund crest surface requires re-grading to allow natural drainage through bund openings to the downstream stormwater drain.	Low
12		Potholes and low points on the crest of the embankments and Seepage Collection Pond require maintenance.	Low

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9 CLOSURE

Based on the outcomes of the surveillance inspection, the 2/5 Dam TSF has been deemed to be in a safe operable condition, with operations able to continue despite the recommendations stated above. The facility was found to be performing in accordance with the design expectations, and in line with current best practice.

Your attention is drawn to the “Conditions of Report” which appear at the end of this report.

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REFERENCES

[1] ATC Williams (2025). MMG Rosebery Mine, 2/5 Dam Tailings Storage Facility Stage 2 Operating Manual, Rev 0. Reference 107031.83 OMM-01-Rev0, April.

[2] ATC Williams (2024). 2/5 Dam TSF, 2023 Engineer of Record Annual Inspection, Reference 107031.68R12-Rev1, September.

[3] ATC Williams (2022). 2/5 Dam TSF, Stage 2 Sub-Aerial Deposition Detailed Design. Reference 107031.83R02, October.

[4] ANCOLD (2019). Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure. July.

[5] GISTM (2020), Global Industry Standard on Tailings Management, August 2020.

CONDITIONS OF REPORT

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FIGURES

NOTE:

1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- 2-5 DAM TSF IMAGE DATED APRIL 2025
3.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



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No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:25,000
JOB No.	107031.126
DATE	01.05.25
DESIGN	JLN
DRAWN	JLN/DR
CHECKED	AM
APPROVED	KS

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MMG ROSEBERY MINE
2024 EOR INSPECTION

GENERAL LOCATION PLAN

DWG. No.
FIGURE 1

SHEET SIZE A3 | Rev. A

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SHEET 1 OF 1

NOTE:
1.- 2-5 DAM TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	01.05.25
DESIGN	JLN
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MMG ROSEBERY MINE
2024 EOR INSPECTION

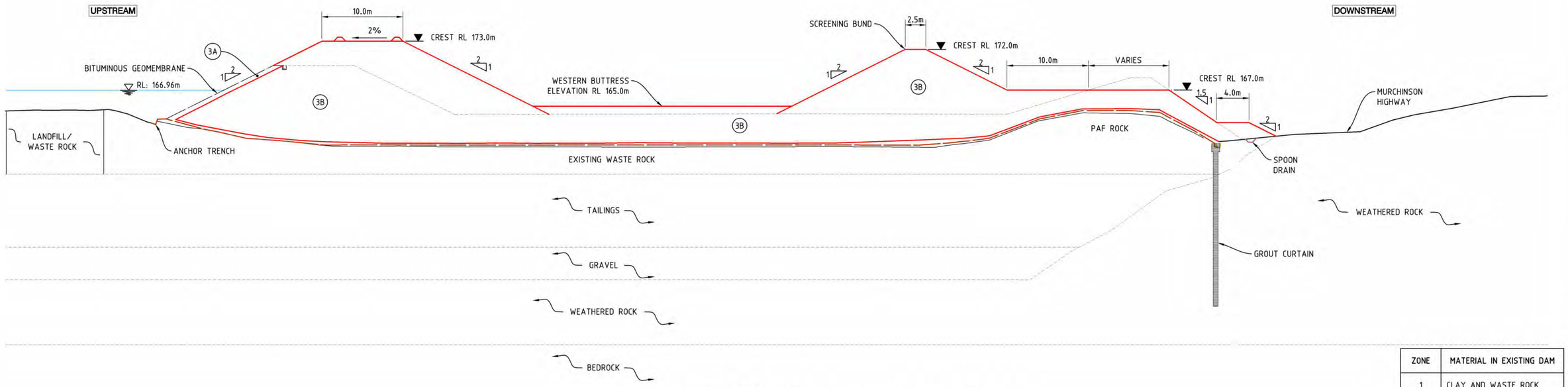
2/5 DAM TSF
GENERAL LAYOUT

DWG. No.
FIGURE 2

SHEET SIZE: A3 | Rev.: A

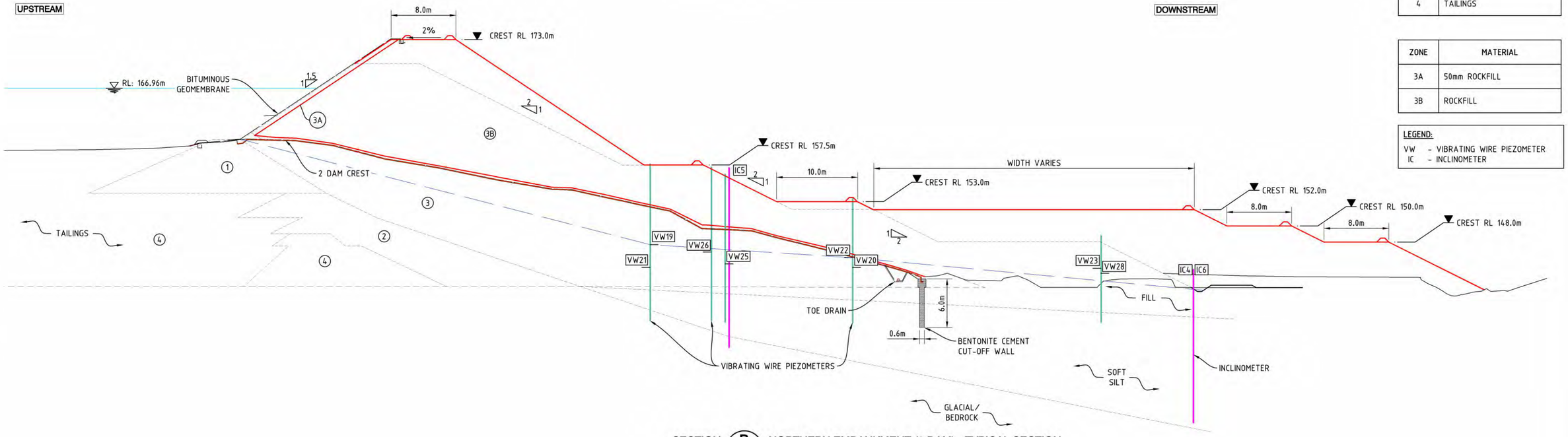
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SHEET 1 OF 1



SECTION A — WESTERN EMBANKMENT - TYPICAL SECTION
SCALE 1:500 — FIG 2

ZONE	MATERIAL IN EXISTING DAM
1	CLAY AND WASTE ROCK
2	GLACIAL FILL
3	WASTE ROCK
4	TAILINGS



SECTION B — NORTHERN EMBANKMENT (2 DAM) - TYPICAL SECTION
SCALE 1:500 — FIG 2

ZONE	MATERIAL
3A	50mm ROCKFILL
3B	ROCKFILL

LEGEND:
VW - VIBRATING WIRE PIEZOMETER
IC - INCLINOMETER

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE: AS SHOWN
JOB No. 107031.126
DATE 01.05.25
DESIGN JLN
DRAWN JLN/DR
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MMG ROSEBERY MINE
2024 EOR INSPECTION

2/5 DAM TSF
TYPICAL SECTIONS
WESTERN AND NORTHERN EMBANKMENTS

DWG. No.
FIGURE 3

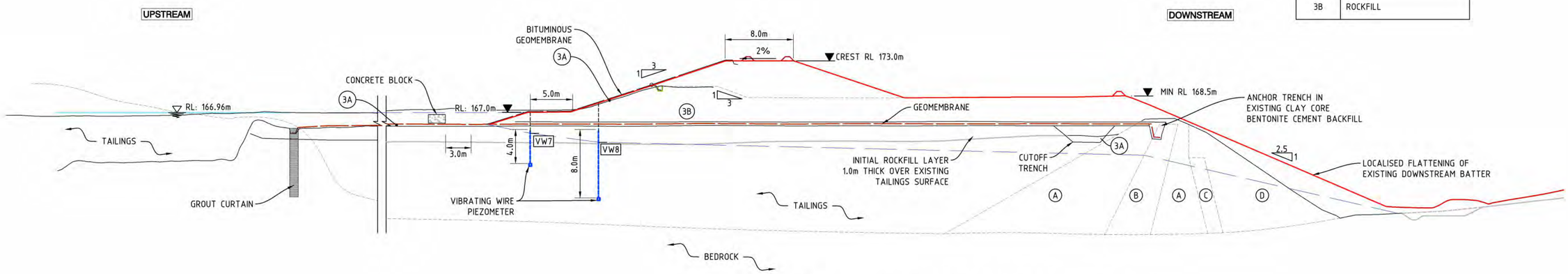
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SHEET 1 OF 1

ZONE	MATERIAL IN EXISTING DAM
A	GLACIAL TILL CONTAINING SOME FINES
B	CLAYEY SILT, SANDY CLAYS AND GRAVELLY CLAYS
C	SANDY GRAVEL - MAX 4% PASSING BS 100 SIEVE
D	GLACIAL TILL WITH MINIMUM FINES

ZONE	MATERIAL
3A	50mm ROCKFILL
3B	ROCKFILL



SECTION C — EASTERN EMBANKMENT (5 DAM) - TYPICAL SECTION
SCALE 1:500 — FIG 2

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	AS SHOWN
JOB No.	107031.126
DATE	01.05.25
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2/5 DAM TSF
TYPICAL SECTIONS
EASTERN EMBANKMENT

DWG. No. **FIGURE 4**

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SHEET 1 OF 1

NOTE:
1.- 2-5 DAM TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

E379500 E379000 E378500

N5373000 N5372500

N W E S

V-NOTCH 1
V-NOTCH 2
V-NOTCH 3
V-NOTCH 4
V-NOTCH 5
V-NOTCH 6

EROSION PROTECTION RIP-RAP MATERIAL
SPILLWAY
DECANT
WESTERN SEEPAGE COLLECTION DRAIN
SEEPAGE COLLECTION POND
NORTHERN EMBANKMENT
EASTERN SEEPAGE COLLECTION DRAIN
WESTERN EMBANKMENT
EASTERN EMBANKMENT

2/5 DAM TSF

VW1A VW1B VW2A VW2B VW3A VW3B VW4A VW4B VW5 VW6 VW7 VW8 VW9 VW10 VW12 VW14 VW15 VW16 VW18 VW19 VW20 VW21 VW22 VW23 VW25 VW26 VW27 VW30 VW31 VW32 VW33 VW34 VW35 VW36 VW37 VW38 VW39 VW40 VW41 VW42 VW43 VW44 VW45 VW46 VW47 VW48 VW49

IC5 IC6 IC7 IC8 IC9 IC10

SAAV1 SAAV2 SAAV3

SP2

LEGEND:
- OPERATIONAL VIBRATING WIRE PIEZOMETER LOCATIONS
- TERMINAL BOX LOCATIONS FOR PIEZOMETERS
- INCLINOMETER LOCATIONS
- V-NOTCH LOCATIONS

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	01.05.25
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2/5 DAM TSF
MONITORING INSTRUMENTATION
LOCATION PLAN

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FIGURE 5

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SHEET 1 OF 1

NOTE:
1.- 2-5 DAM TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022
3.-MOVEMENT DATE RANGE IS 12/11/2024 - 12/05/2025, UNLESS OTHERWISE SPECIFIED

N
W E
S

E 379050
E 379200
E 379350
N 5373150
N 5373000
N 5372850
E 378900

SP6 8 mm
SP7 14 mm
SP8 14 mm
SP9 19 mm
SP10 43 mm (12/11/2025 - 6/03/2025)
SP11 46 mm
SP12 50 mm
SP13 56 mm

SM1 2 mm
SM8 2 mm
SM2 6 mm
SM9 7 mm
SM15 9 mm
SM3 2 mm
SM10 6 mm
SM21 5 mm
SM4 4 mm
SM16 9 mm
SM11 1 mm (8/01/2025 - 12/05/2025)
SM17 16 mm
SM5 2 mm
SM12 6 mm
SM18 14 mm
SM6 5 mm
SM13 4 mm
SM19 2 mm
SM7 2 mm (12/11/2025 - 22/04/2025)
SM14 4 mm
SM20

LEGEND:
SURVEY PRISM AND SETTLEMENT PLATE LOCATION
DIRECTION OF MOVEMENT

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	01.05.25
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2/5 DAM TSF
SURVEY PRISM AND SETTLEMENT PLATE MOVEMENT

DWG. No.
FIGURE 6

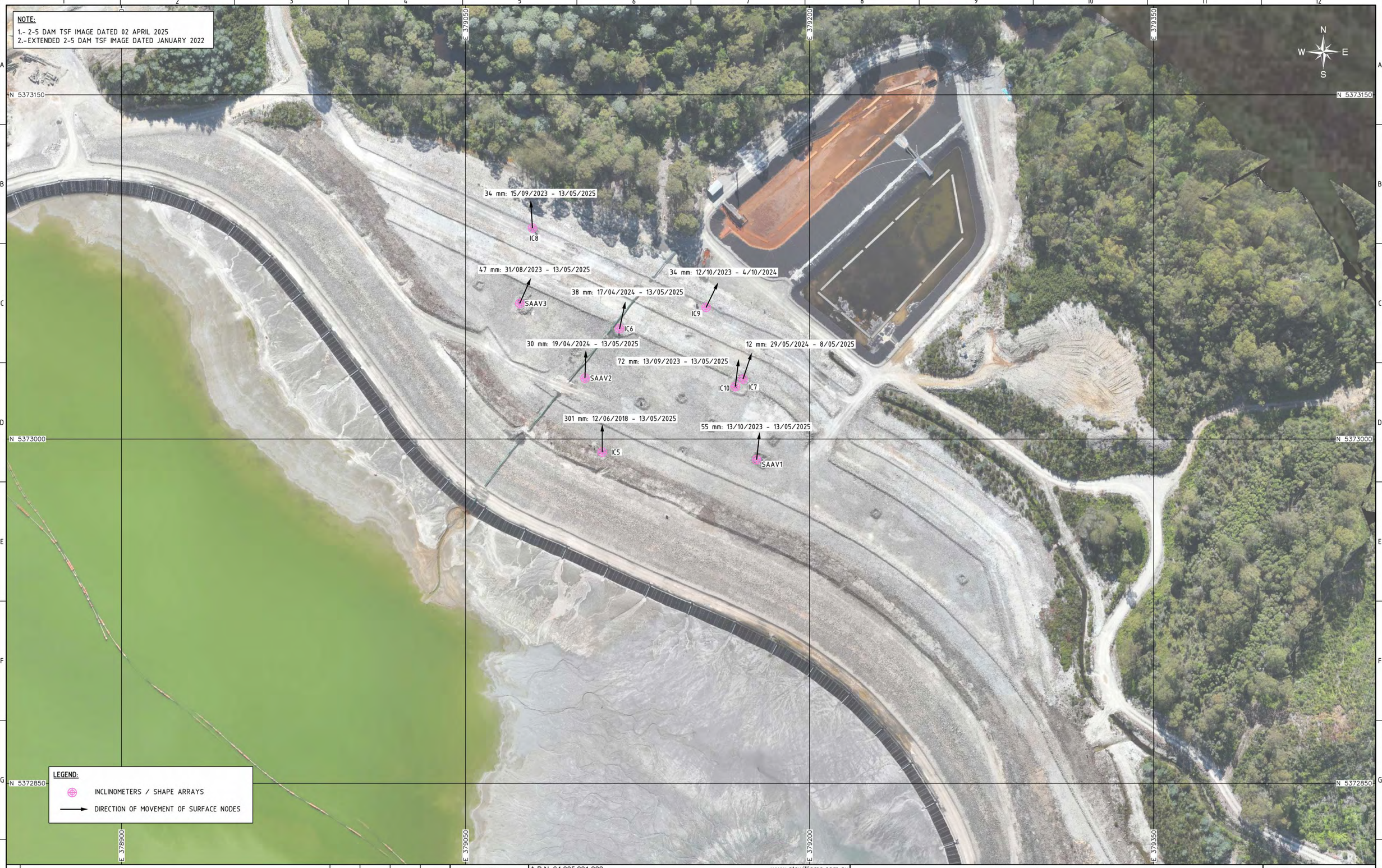
SHEET SIZE	A3	Rev.	A

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SHEET 1 OF 1

NOTE:

1.- 2-5 DAM TSF IMAGE DATED 02 APRIL 2025
2.-EXTENDED 2-5 DAM TSF IMAGE DATED JANUARY 2022



No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

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DATE	01.05.25
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2/5 DAM TSF
INCLINOMETER MOVEMENT AT TOP OF CASING

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FIGURE 7

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SHEET 1 OF 1

NOTE:
1.- 2-5 DAM TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

DAMAGE LINER AT CULVERT OUTLET
WATER DRAINING FROM UNDER SCP LINER
TOE SEEPAGE
DAMAGE TO SEEPAGE COLLECTION POND LINER
POINT A
POINT B
DIVERSION DRAIN EXCLUSION ZONE
POINT C: POOLED WATER AND IRON STAINING (OLD CHIMNEY DRAIN OUTLET)
HISTORICAL CLEAR SEEPAGE
POINT D: HISTORICAL CONCENTRATED CLEAR SEEPAGE IN TOE DRAIN
IRON PRECIPITATE AT PIT
WESTERN EMBANKMENT CREST LOW POINTS AND POTHOLES
WET AREA DOWNSTREAM OF PIPELINE BUND
CONCRETE HEADWALL STRUCTURE
IRON PRECIPITATES
POINT G: SEEPAGE UP BATTER THROUGH REVERSE FILTER
POINT F: CLEAR SEEPAGE FROM TOE (REVERSE FILTER)
MINOR LINER DAMAGE
POINT E: SEEPAGE
EROSION OF BALLAST MATERIAL
CRACKING IN DOWNSTREAM BUND AT VARIOUS LOCATIONS OF CLEAN WATER DIVERSION DRAIN
RECENTLY REPAIRED DOWNSTREAM BUND
UNDERCUTTING AT CONCRETE OUTLET
POINT H: UNDERCUTTING IN CWDD GLACIAL MATERIAL

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	01.05.25
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2/5 DAM TSF
INSPECTION OBSERVATIONS

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FIGURE 8

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SHEET 1 OF 1

NOTE:
1.- 2-5 DAM TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

E 378000 E 378750 E 379500 E 380250
N 5373000 N 5372250

LEGEND:
- PHOTOGRAPH LOCATION AND DIRECTION
- FOCUS PHOTOGRAPHY
- PANORAMIC PHOTOGRAPHY
- REFER APPENDIX C FOR PHOTOPGRAPHS

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	01.05.25
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2/5 DAM TSF
PHOTOGRAPH LOCATIONS

DWG. No. FIGURE 9

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J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\CADD\CAD\2024 Audit\2-5\Figure 9 - 2-5 Photograph Locations.dwg

Printed on Wednesday, 04 June 2025 10:31:14 AM

NOTE:

1.-BATHYMETRY SURVEY WAS NOT CONDUCTED IN APRIL 2025 DUE TO BOAT ACCESS ISSUES. TAILINGS SURFACE BENEATH DECANT POND HAS BEEN INFERRED USING THE PREVIOUS BATHYMETRIC SURVEY (AUGUST 2024) AND DESIGN BELOW-WATER BEACH SLOPES.

E 378500 E 379000 E 379500

N 5373000 N 5372500

TAILINGS LEVEL RL 169.5m

TAILINGS LEVEL RL 169.2 m

POND LEVEL RL 168.5m

TAILINGS LEVEL RL 170.0m

EXTENT OF APRIL 2025 SURVEY. SEE NOTE 1

TAILINGS LEVEL RL 170.5 m

TAILINGS LEVEL RL 170.5m

TAILINGS LEVEL RL 170.5m

EXTENT OF JANUARY 2025 SURVEY. SEE NOTE 3

SURVEY HEIGHT CHART	
ELEVATION	COLOUR
165.00 to 165.50	
165.50 to 166.00	
166.00 to 166.50	
166.50 to 167.00	
167.00 to 167.50	
167.50 to 168.00	
168.00 to 168.50	
168.50 to 169.00	
169.00 to 169.50	
169.50 to 170.00	
170.00 to 170.50	

SURVEY NOTES:

1.- GRID COORDINATE SYSTEM IN USE MGA 94 Z55 G.
HEIGHT DATUM: AHD

2.- CONTOURS GENERATED FROM CLIENT SUPPLIED FILES
2_5 Dam 02-04-2025.dxf, (DATED 02.04.2025)
240723_2 5 TSF_elev_1x1.xyz (DATED 21.08.2024)

3.- OUTER IMAGERY SOURCED FROM GOOGLE EARTH (DATED 27.10.2020)
INNER IMAGERY SOURCED BY CLIENT,
2_5 Dam 02-04-2025.JPG, (DATED 02.04.2025)

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:5,000
JOB No.	107031.126
DATE	14.07.25
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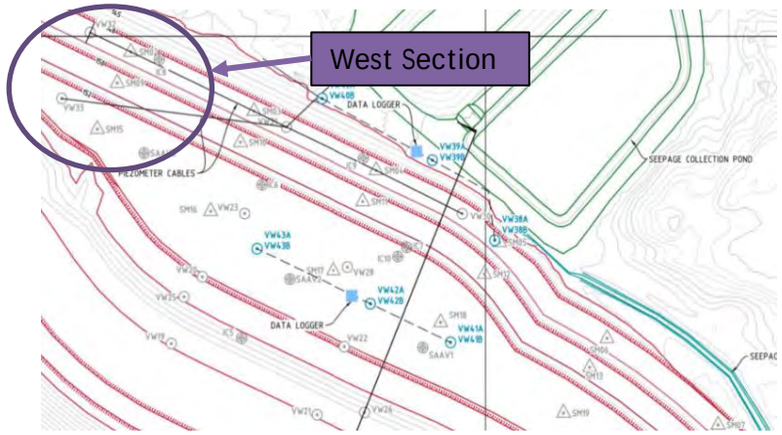
2/5 DAM TSF
BATHYMETRIC AND AERIAL SURVEY APRIL 2025

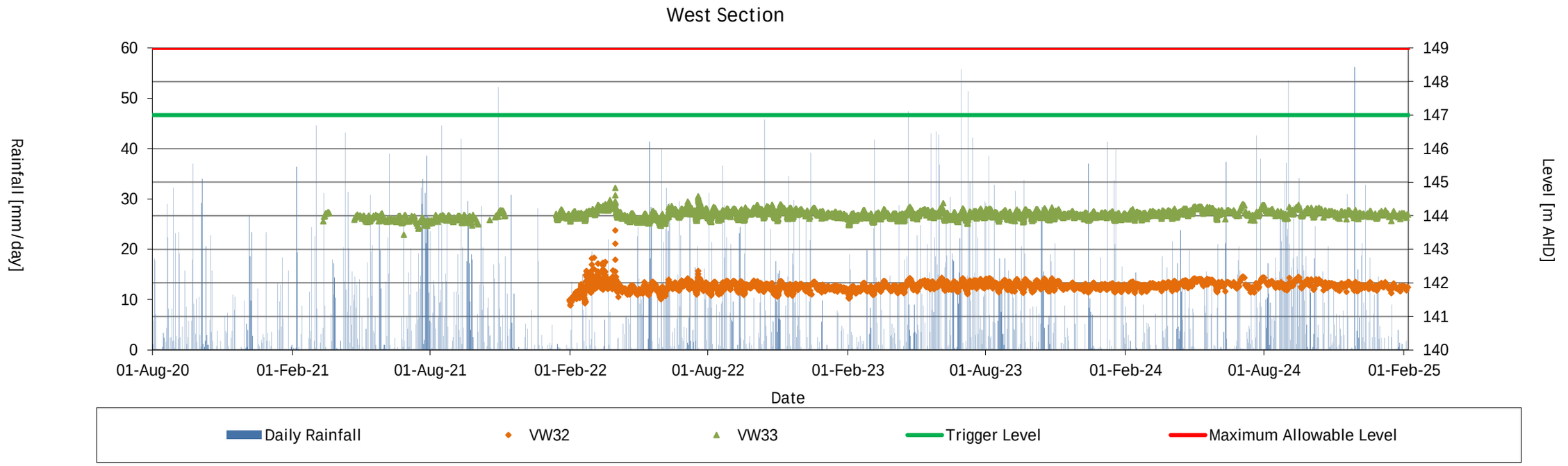
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FIGURE 10

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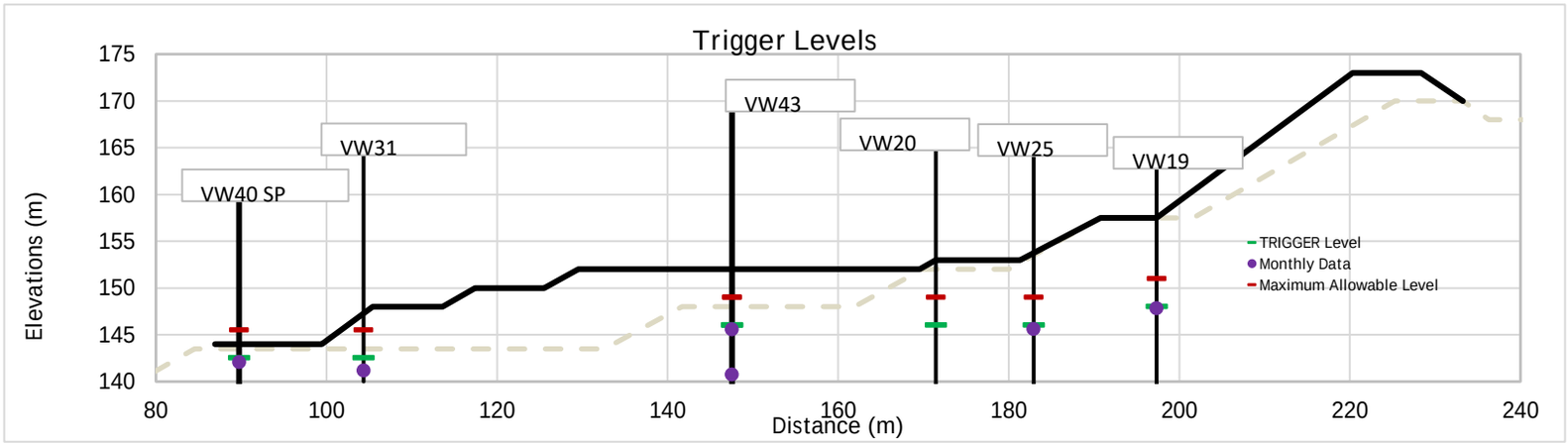
2024 EOR INSEPCTION

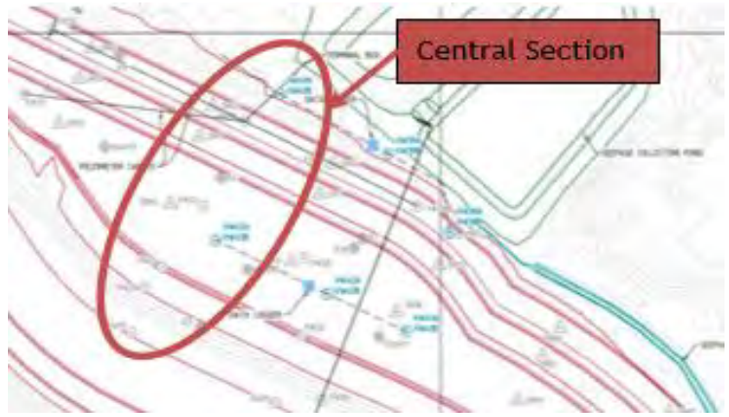
2-5 DAM TSF - NORTHERN EMBANKMENT (WEST) PIEZOMETER LEVELS

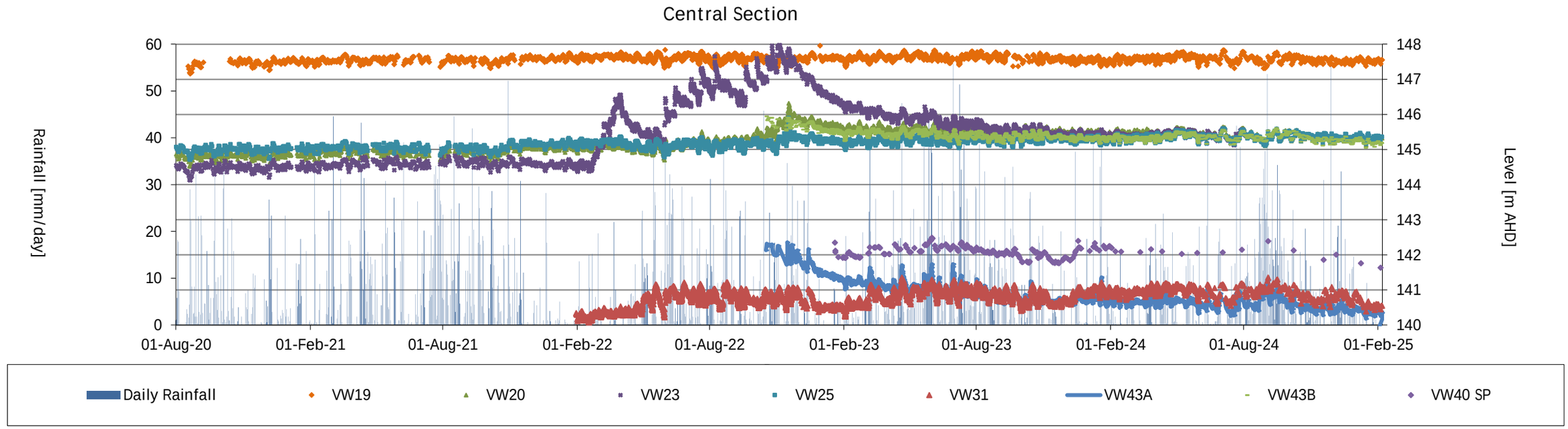
AUGUST 2020 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 11**

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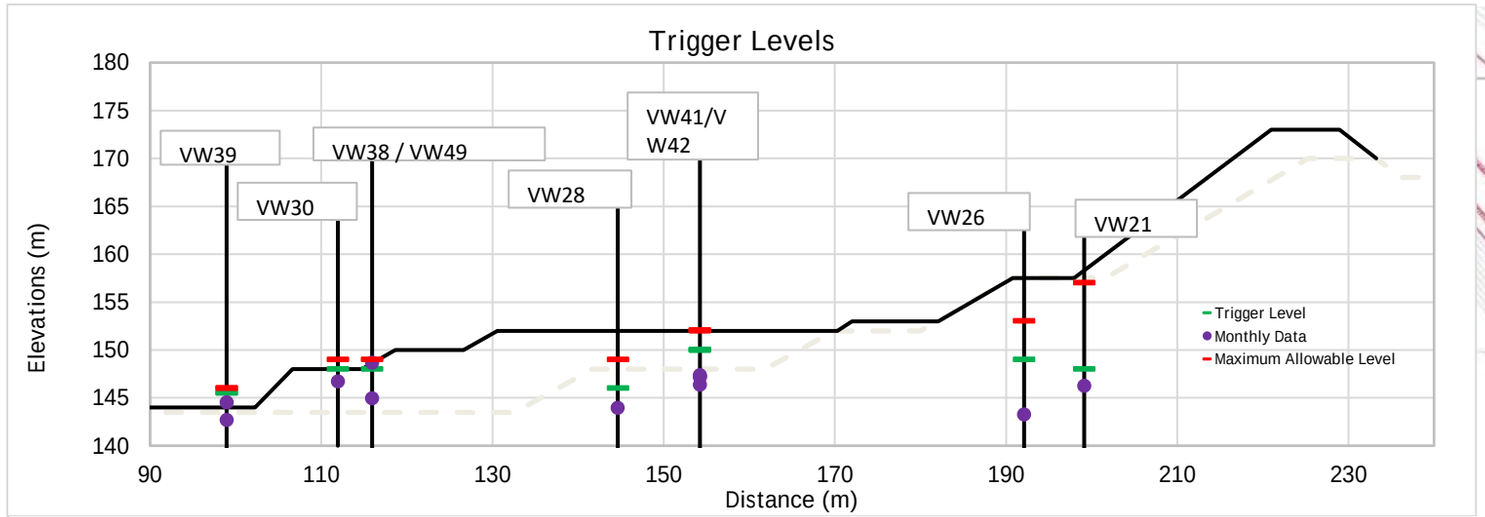
2024 EOR INSEPCTION

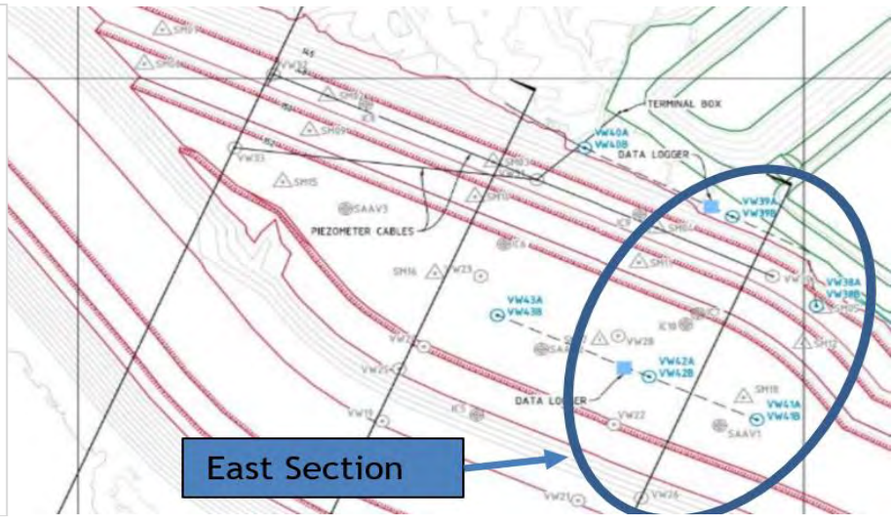
2-5 DAM TSF - NORTHERN EMBANKMENT (WEST) PIEZOMETER LEVELS

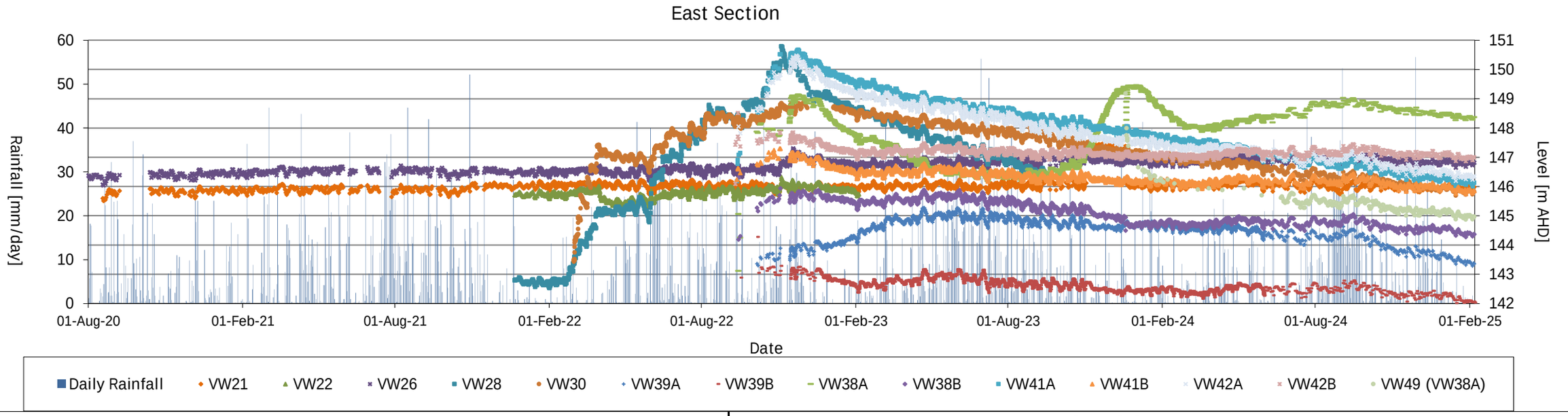
AUGUST 2020 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 12**

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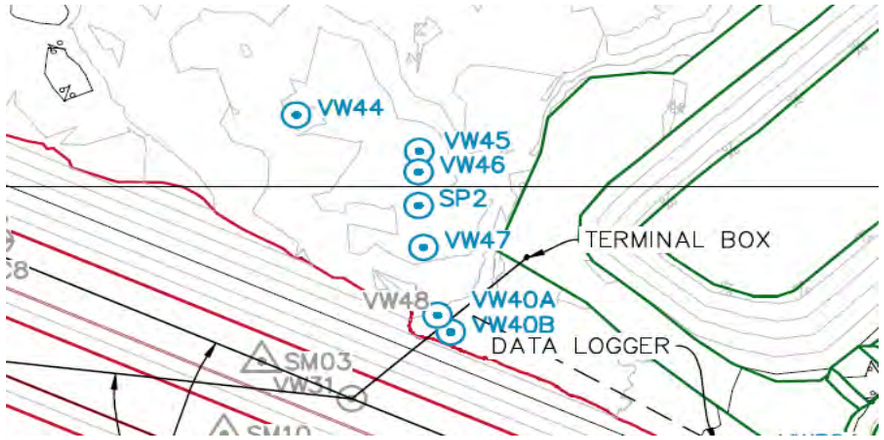
2024 EOR INSEPCTION

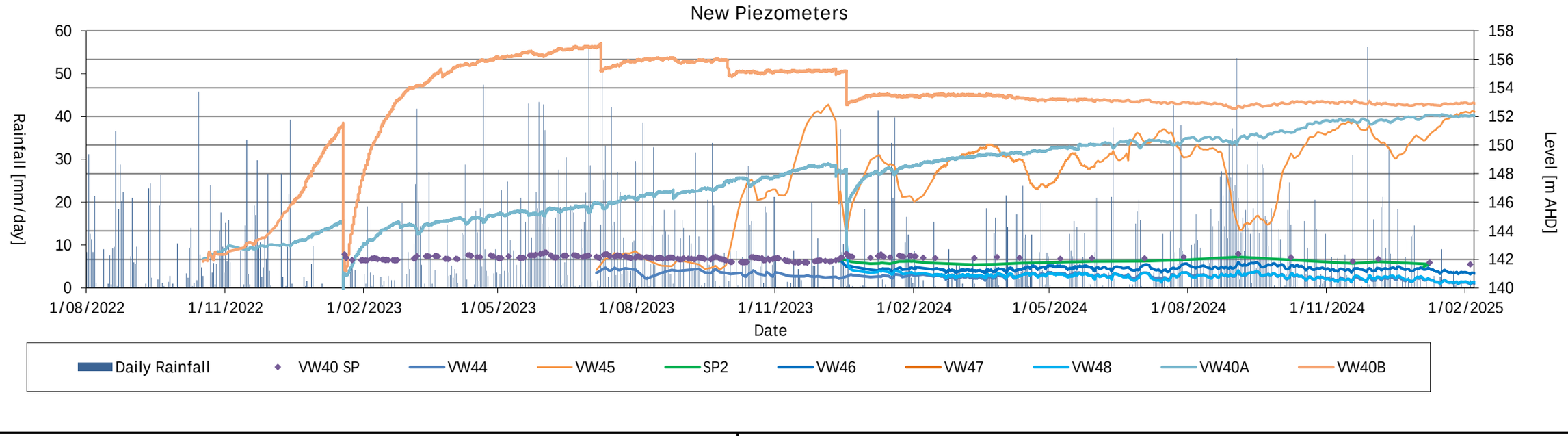
2-5 DAM TSF - NORTHERN EMBANKMENT (WEST) PIEZOMETER LEVELS

AUGUST 2020 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 13**

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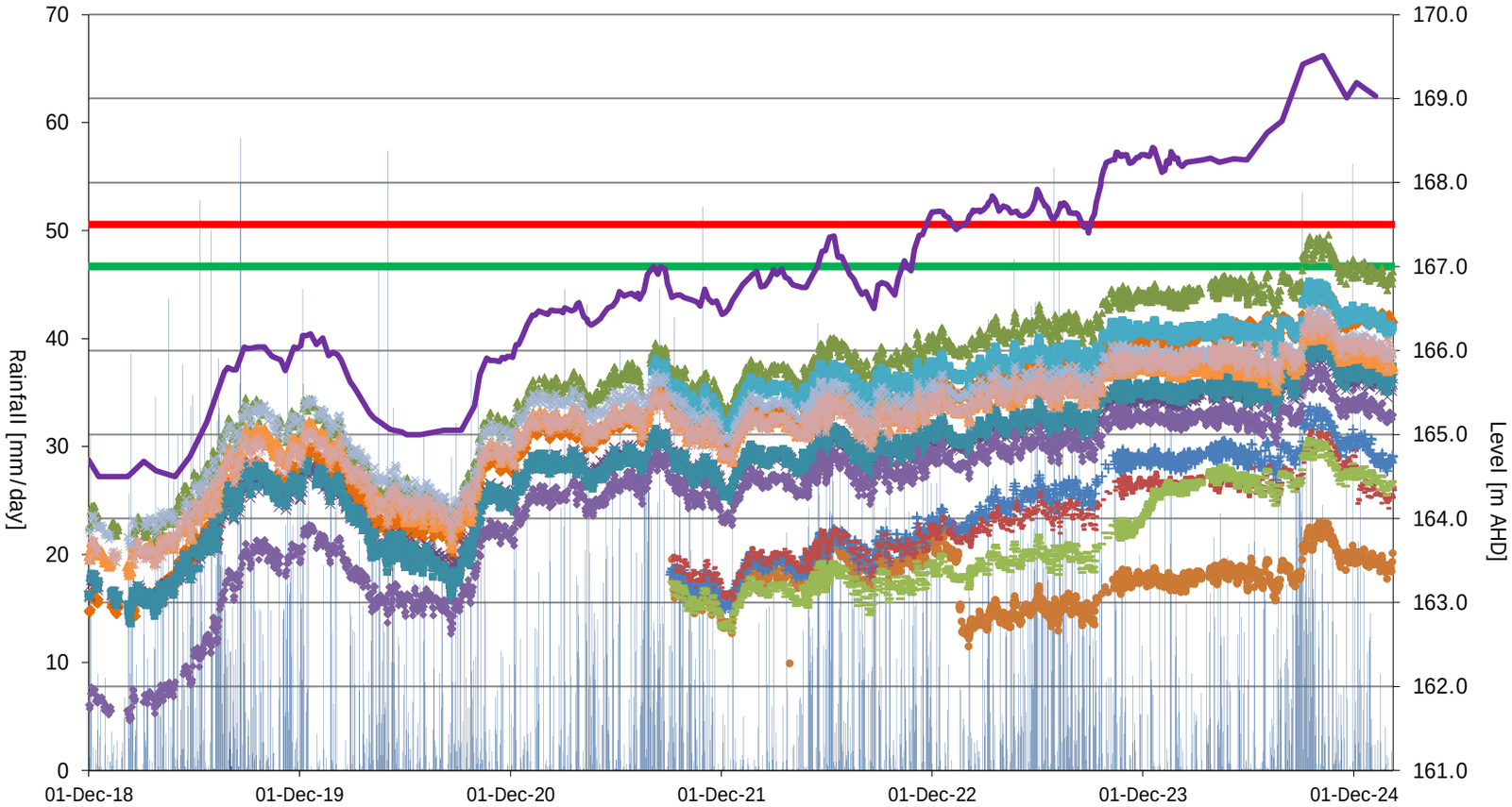
2024 EOR INSEPCTION

2-5 DAM TSF - NORTHERN EMBANKMENT (NEW) PIEZOMETER LEVELS

AUGUST 2022 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 14**

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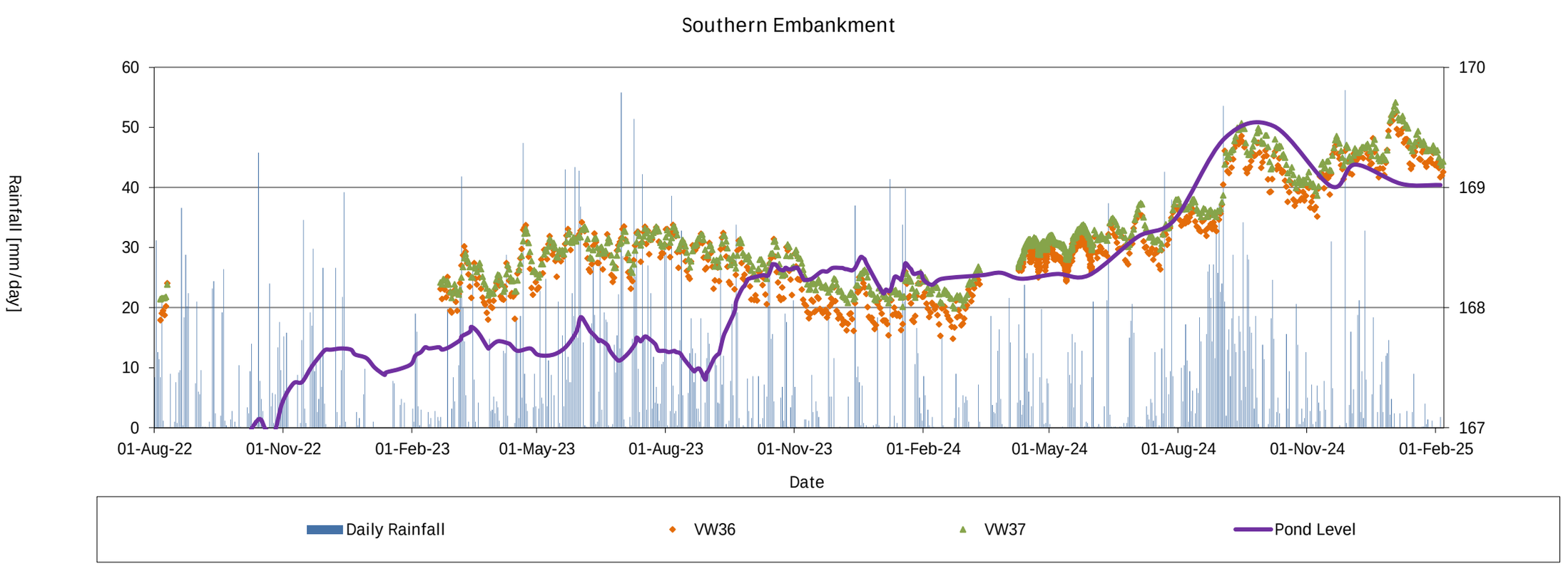
2024 EOR INSEPCTION

2-5 DAM TSF - EASTERN EMBANKMENT PIEZOMETER LEVELS

DECEMBER 2018 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 15**

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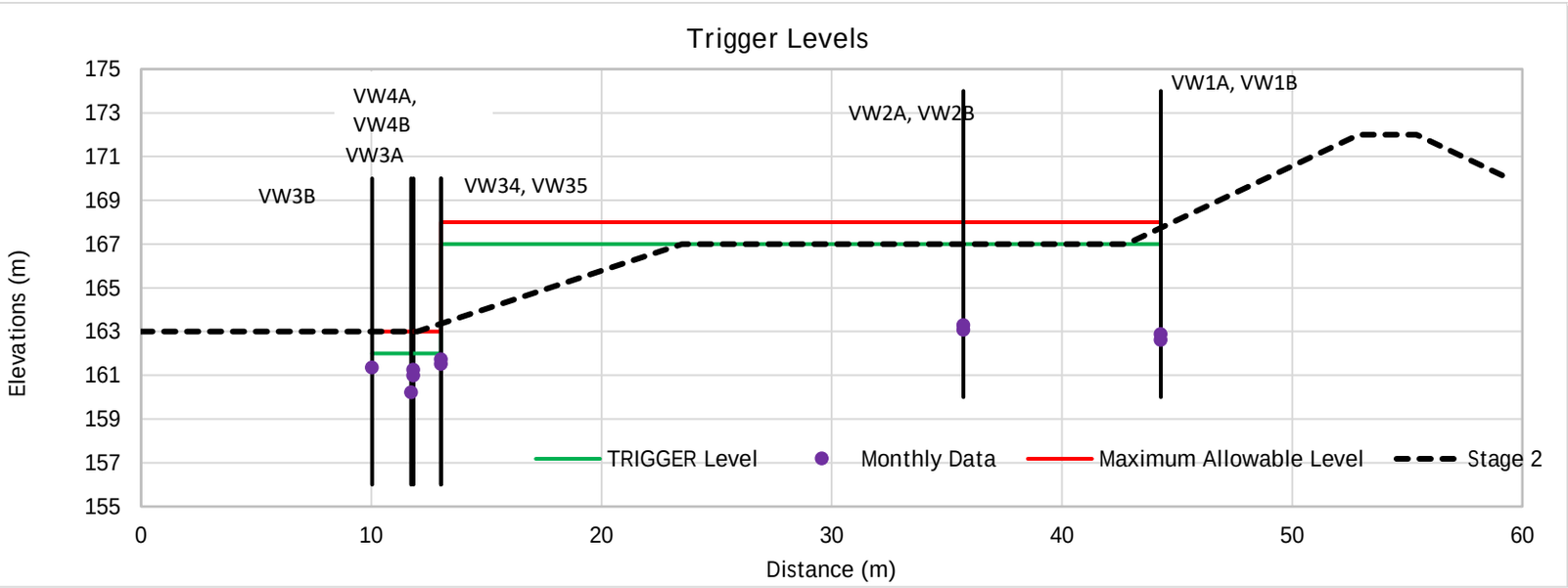
2024 EOR INSEPCTION

2-5 DAM TSF - SOUTHERN EMBANKMENT PIEZOMETER LEVELS

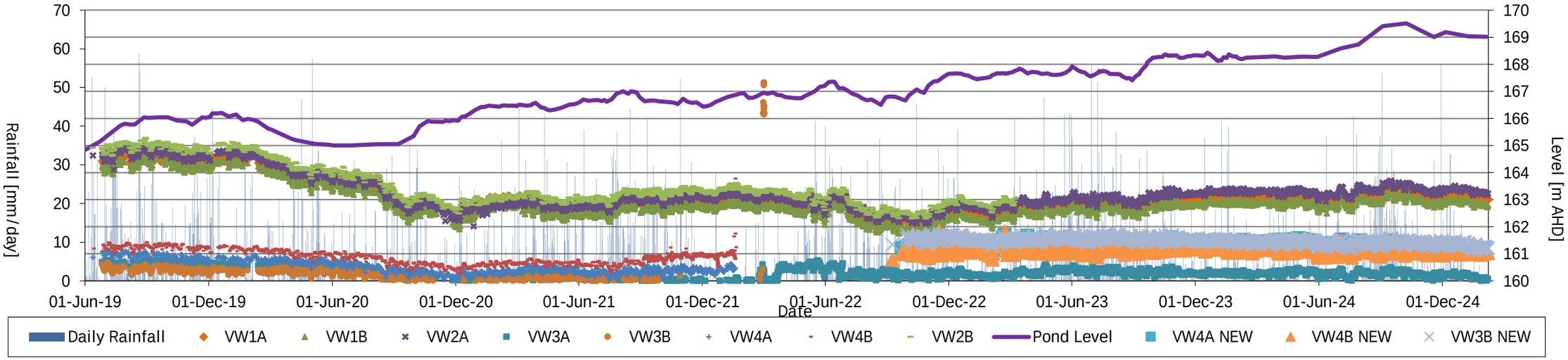
AUGUST 2022 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 16**

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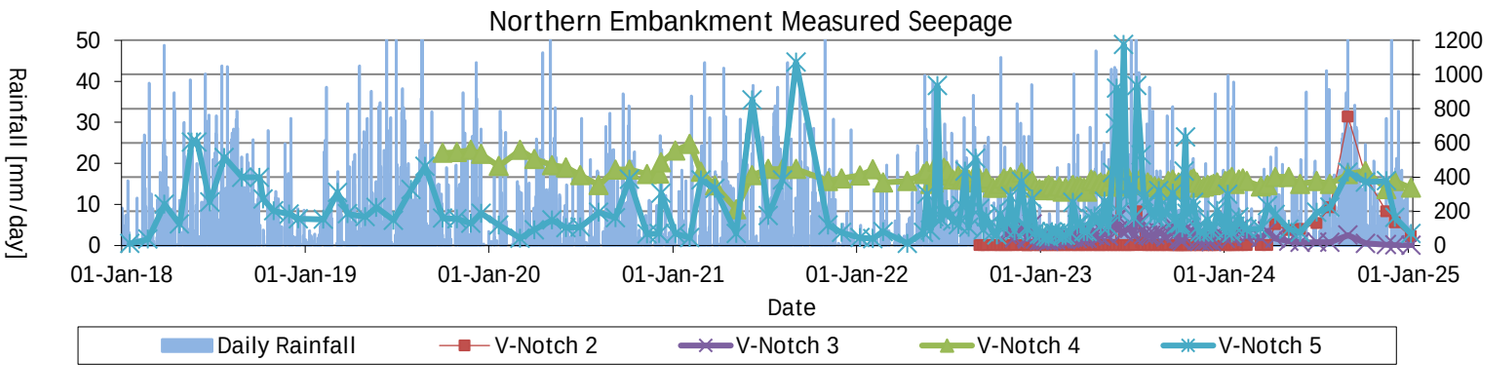
2024 EOR INSEPCTION

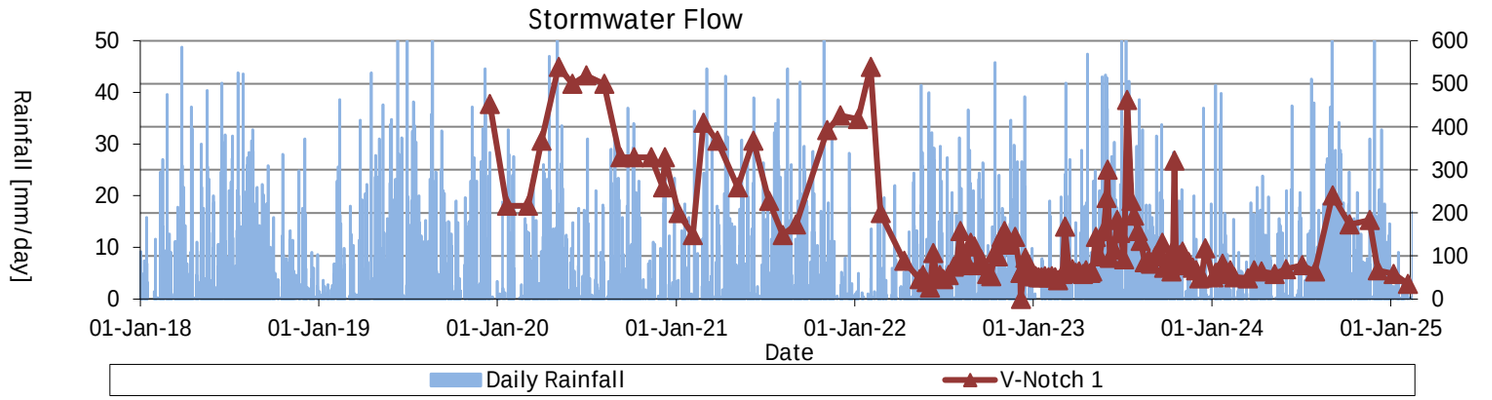
2-5 DAM TSF - SCREENING BUND PIEZOMETER LEVELS

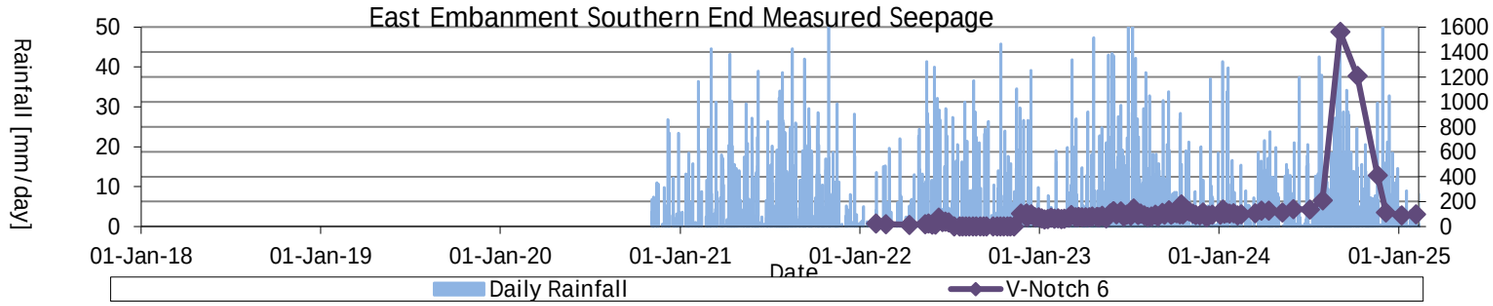
JUNE 2019 TO FEBRUARY 2025

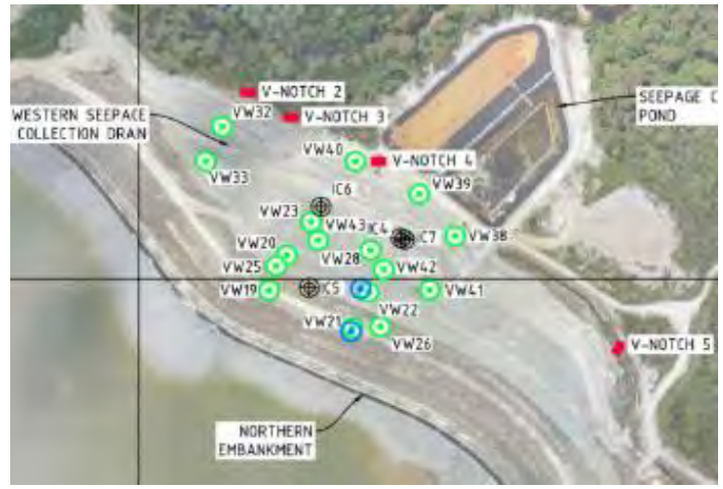
Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 17**

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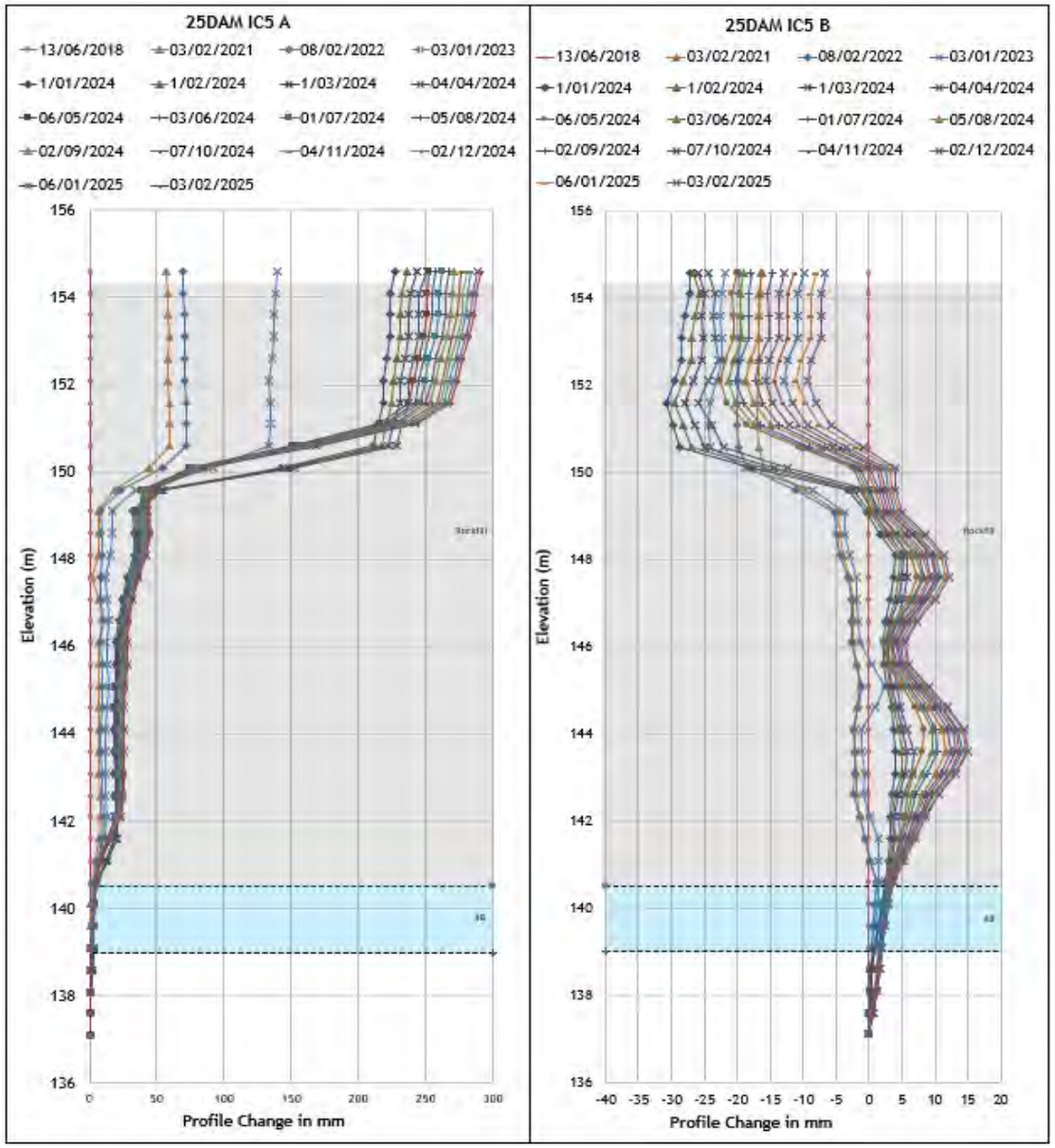
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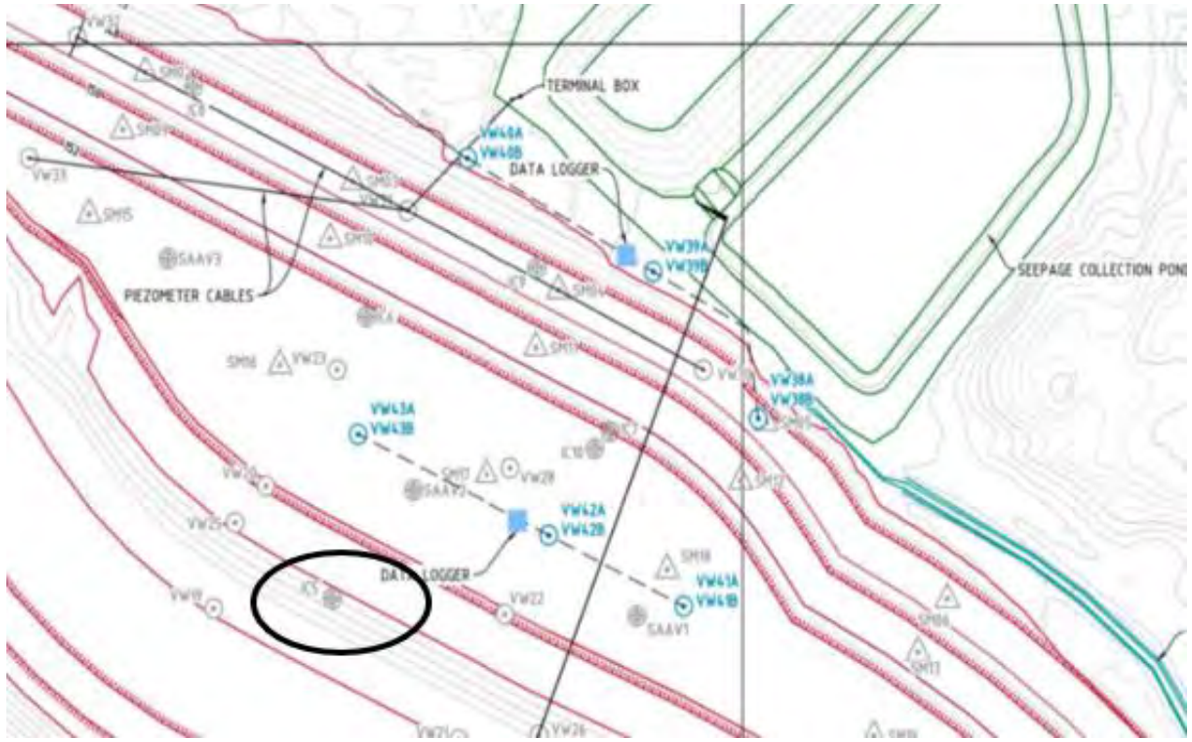
2-5 DAM TSF - SCREENING BUND PIEZOMETER LEVELS

JANUARY 2018 TO FEBRUARY 2025

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 18**

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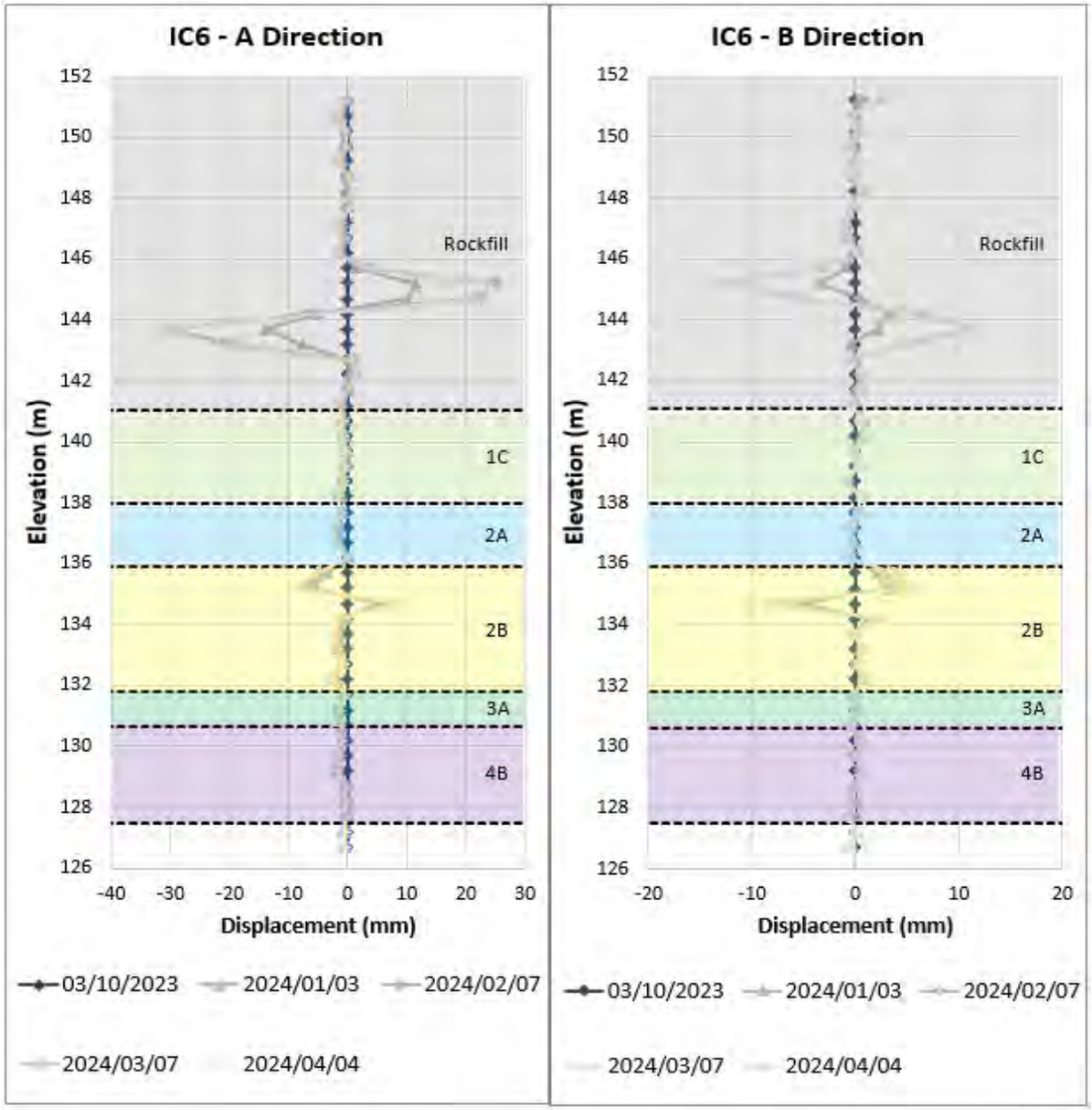
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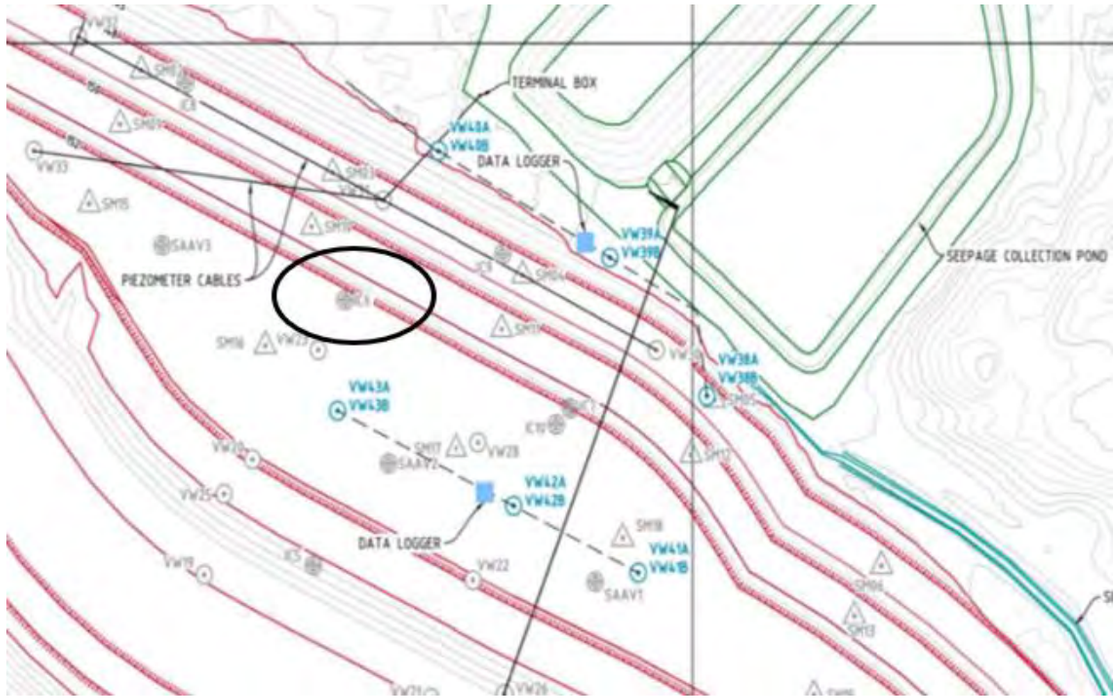
INCLINOMETERS

IC5 - PROFILE CHANGE

Date:	23/07/2025	Job No:	107031.126	FIGURE 19

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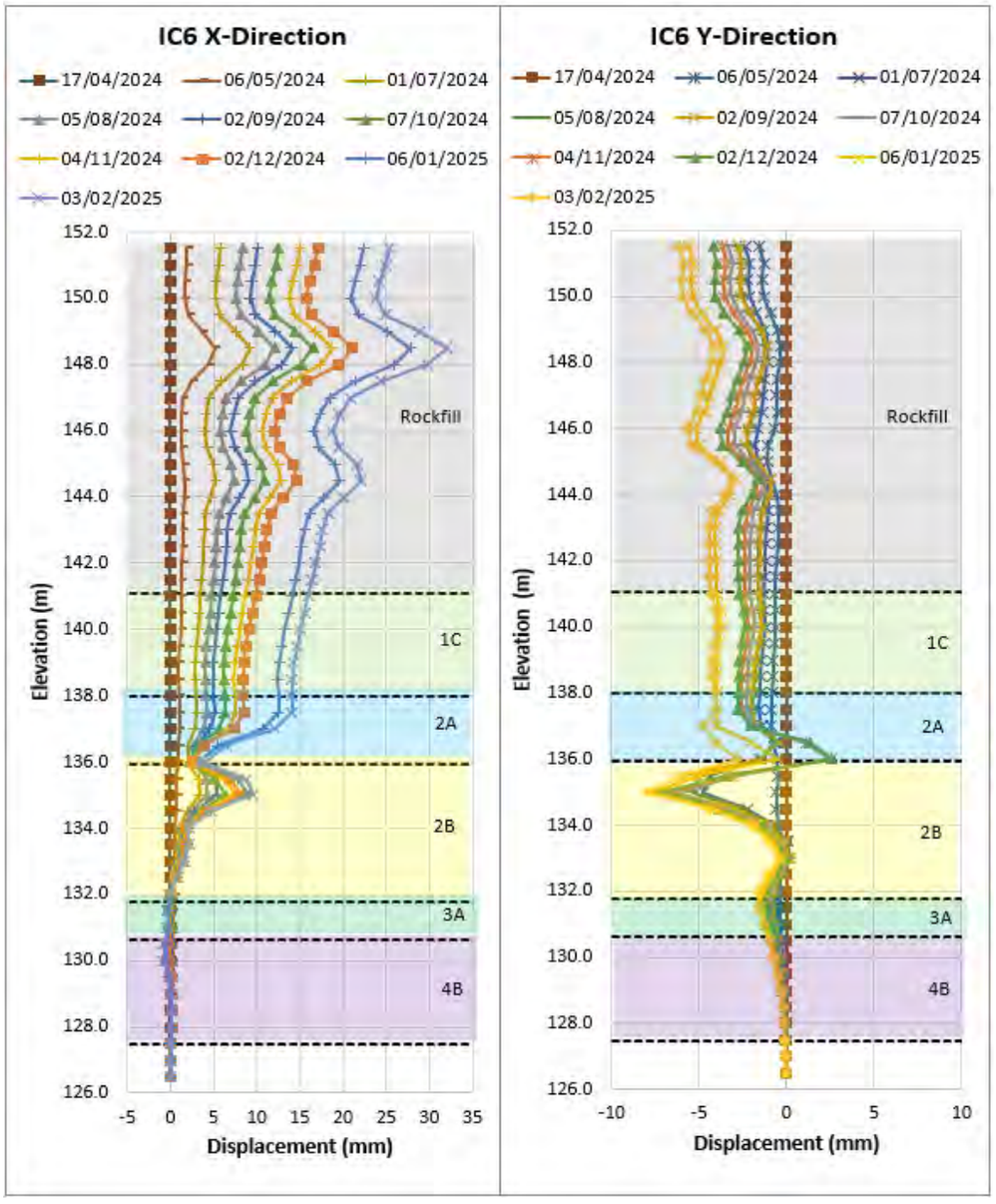
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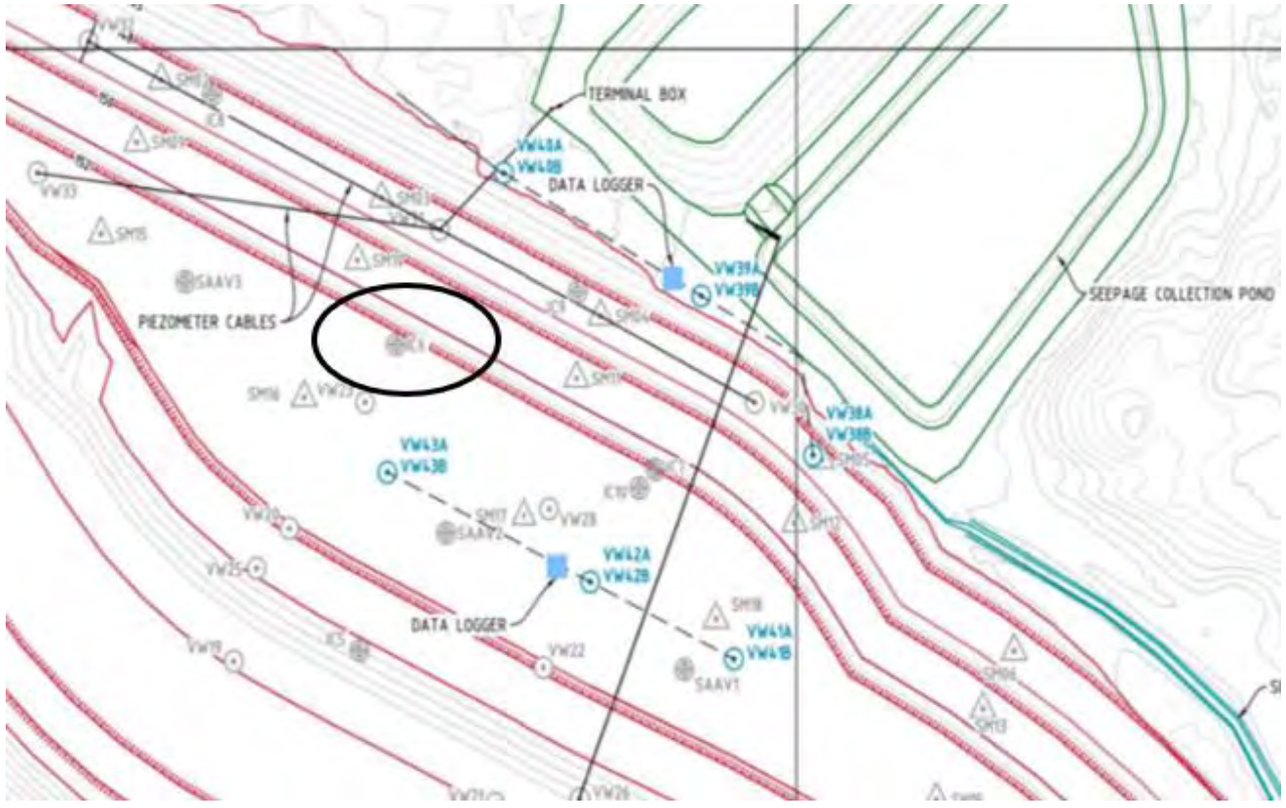
INCLINOMETERS

IC6 - PROFILE CHANGE (TO APRIL 2024)

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 20**

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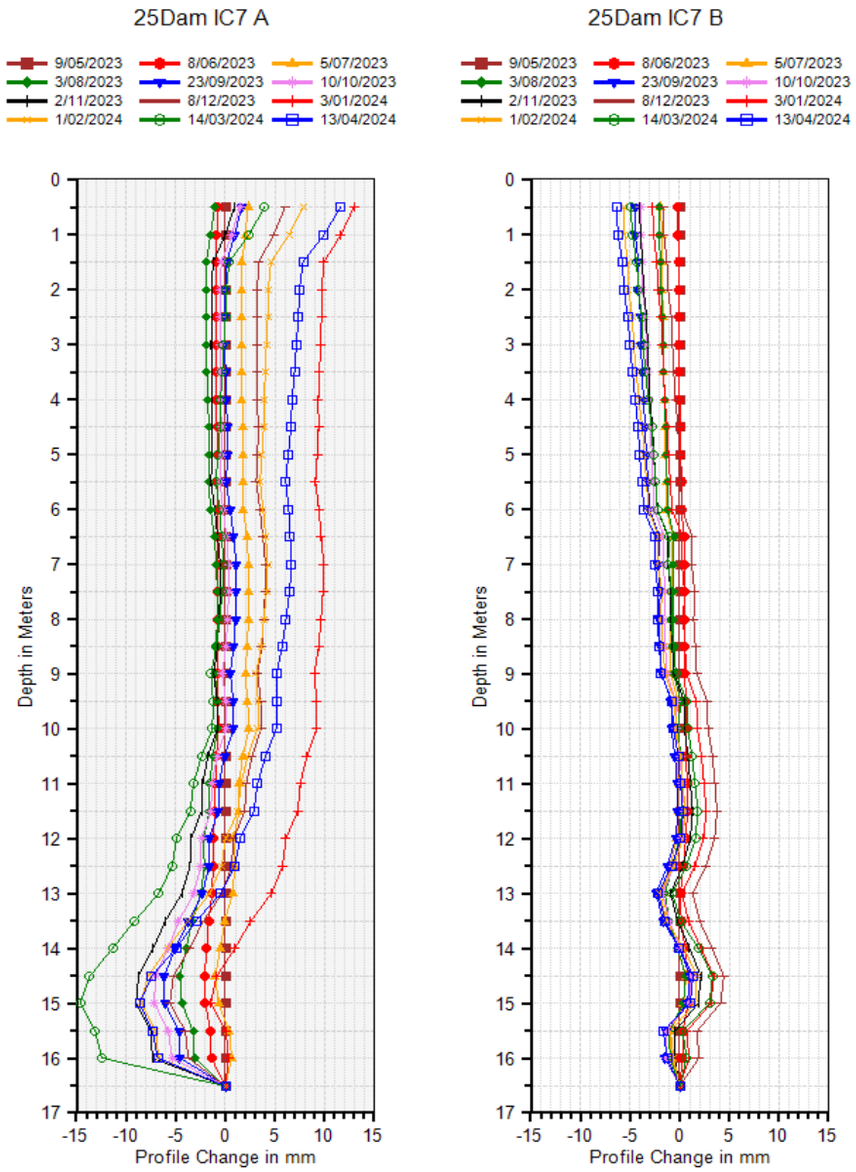
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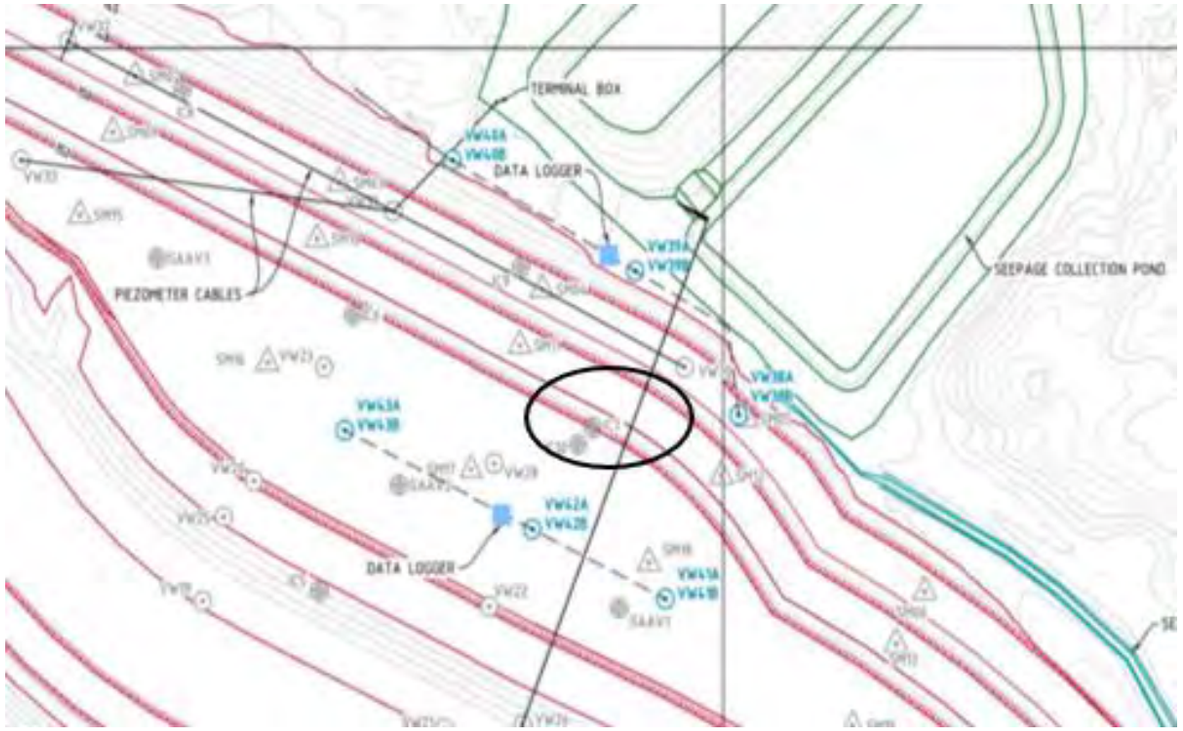
2024 EOR INSEPCTION

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IC6 - PROFILE CHANGE (FROM APRIL 2024)

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 21**





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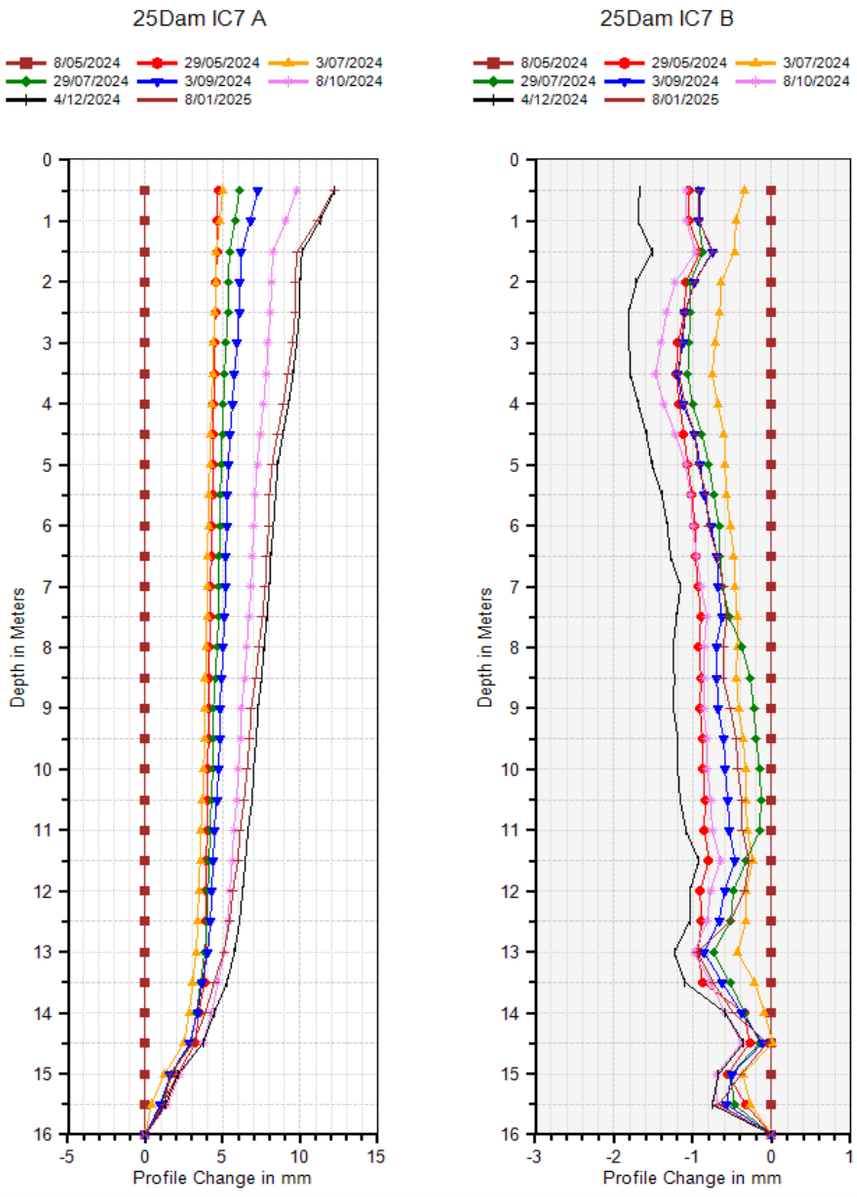
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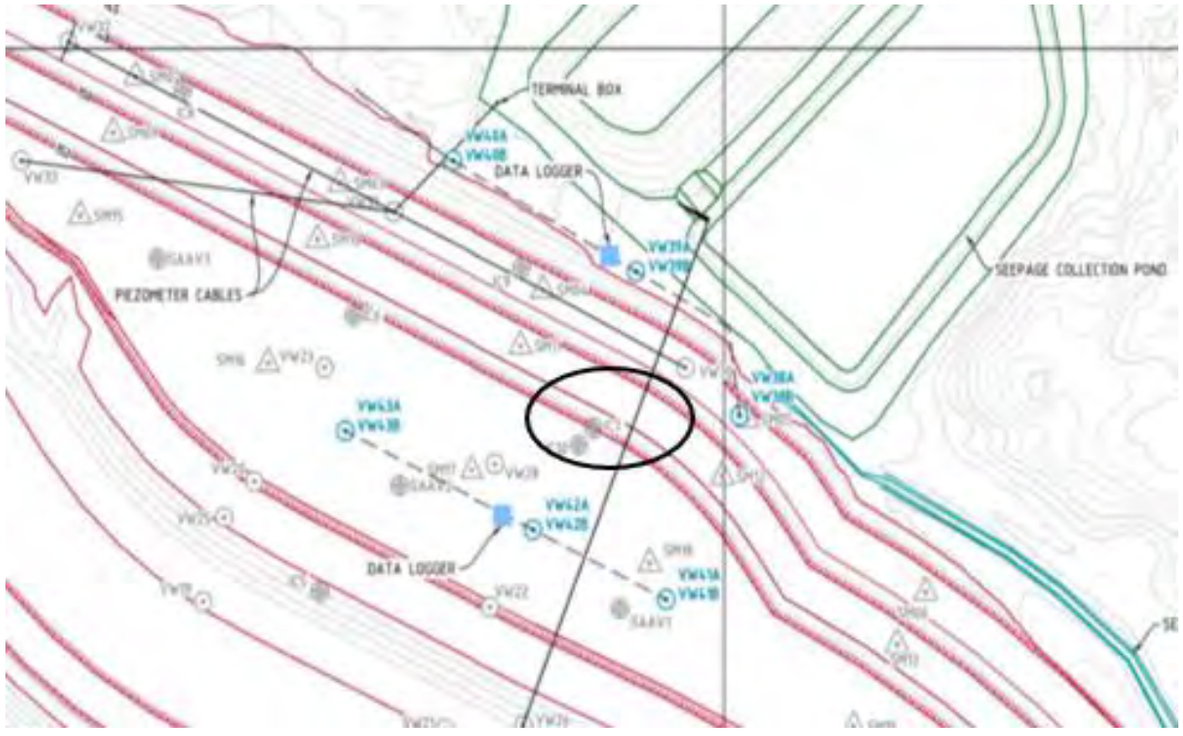
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IC7 - PROFILE CHANGE

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 22**

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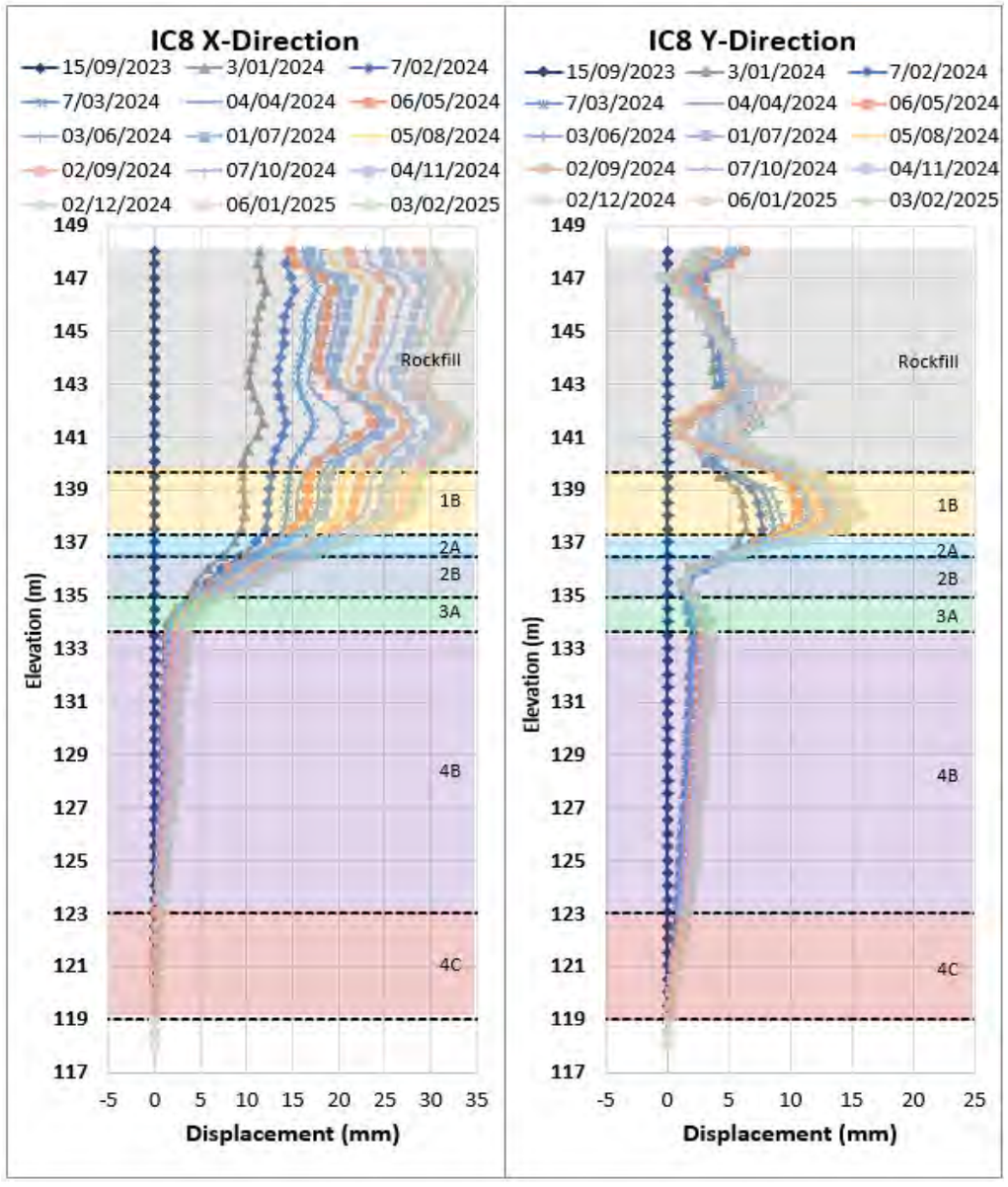
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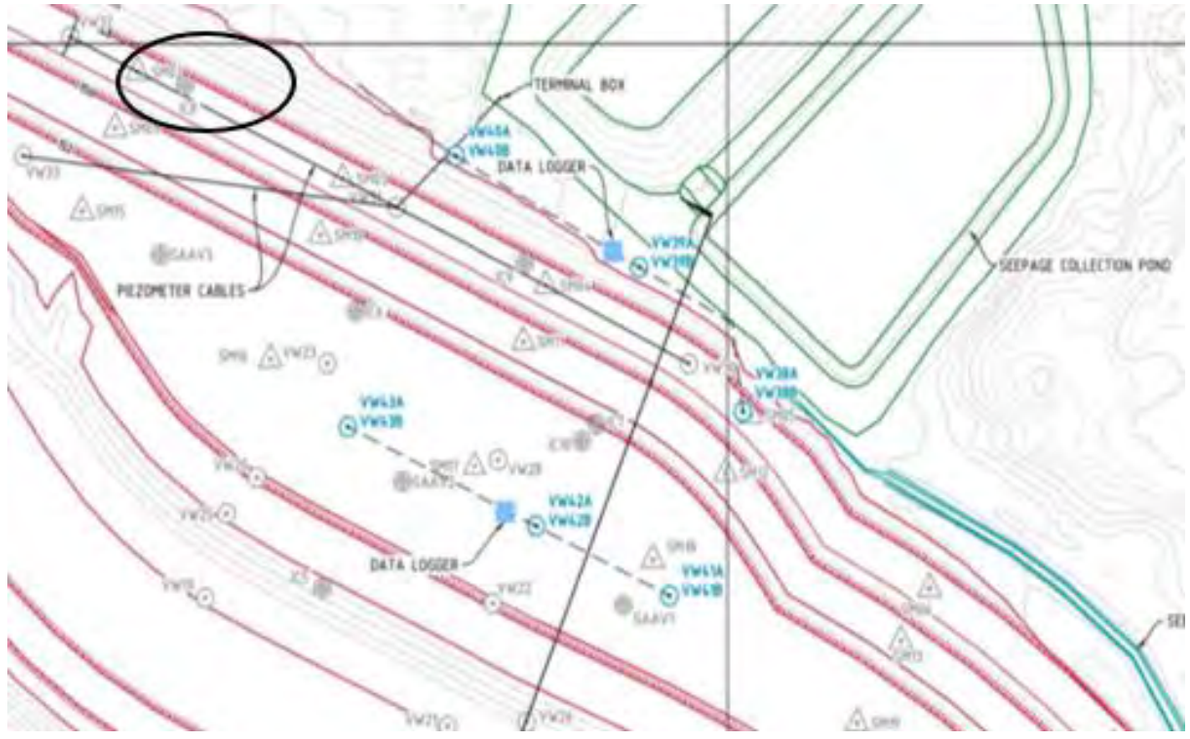
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IC7 - PROFILE CHANGE

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 23**

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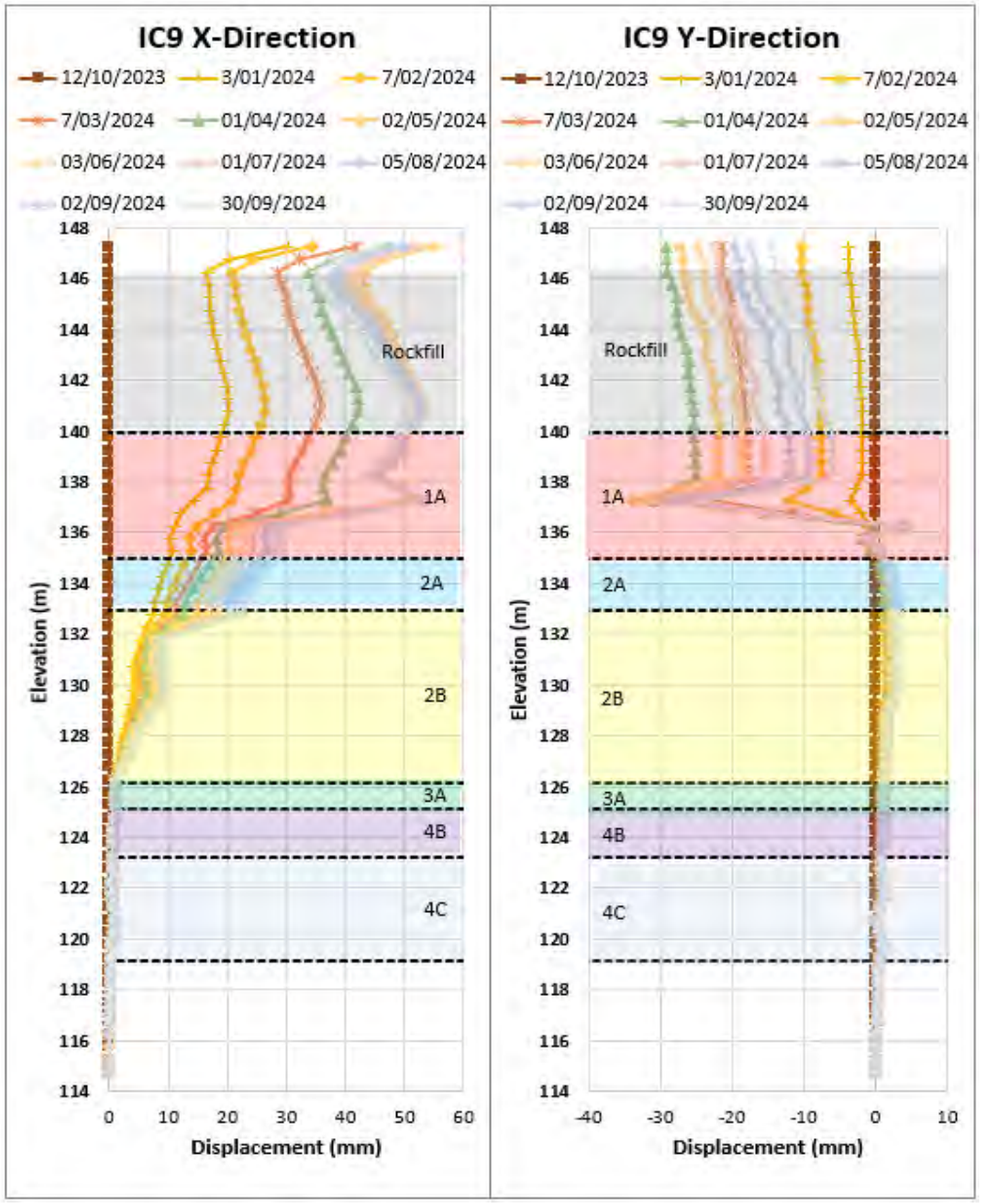
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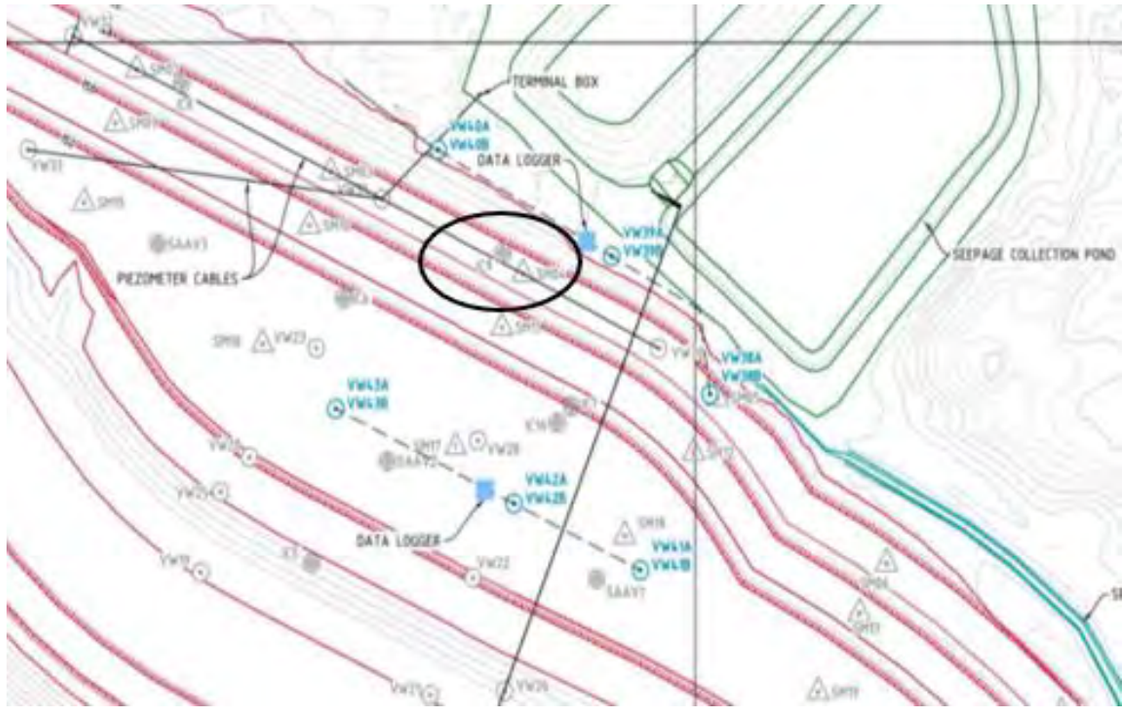
IC8 - PROFILE CHANGE

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 24**

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NO DTAA AFTER 2024/09/30



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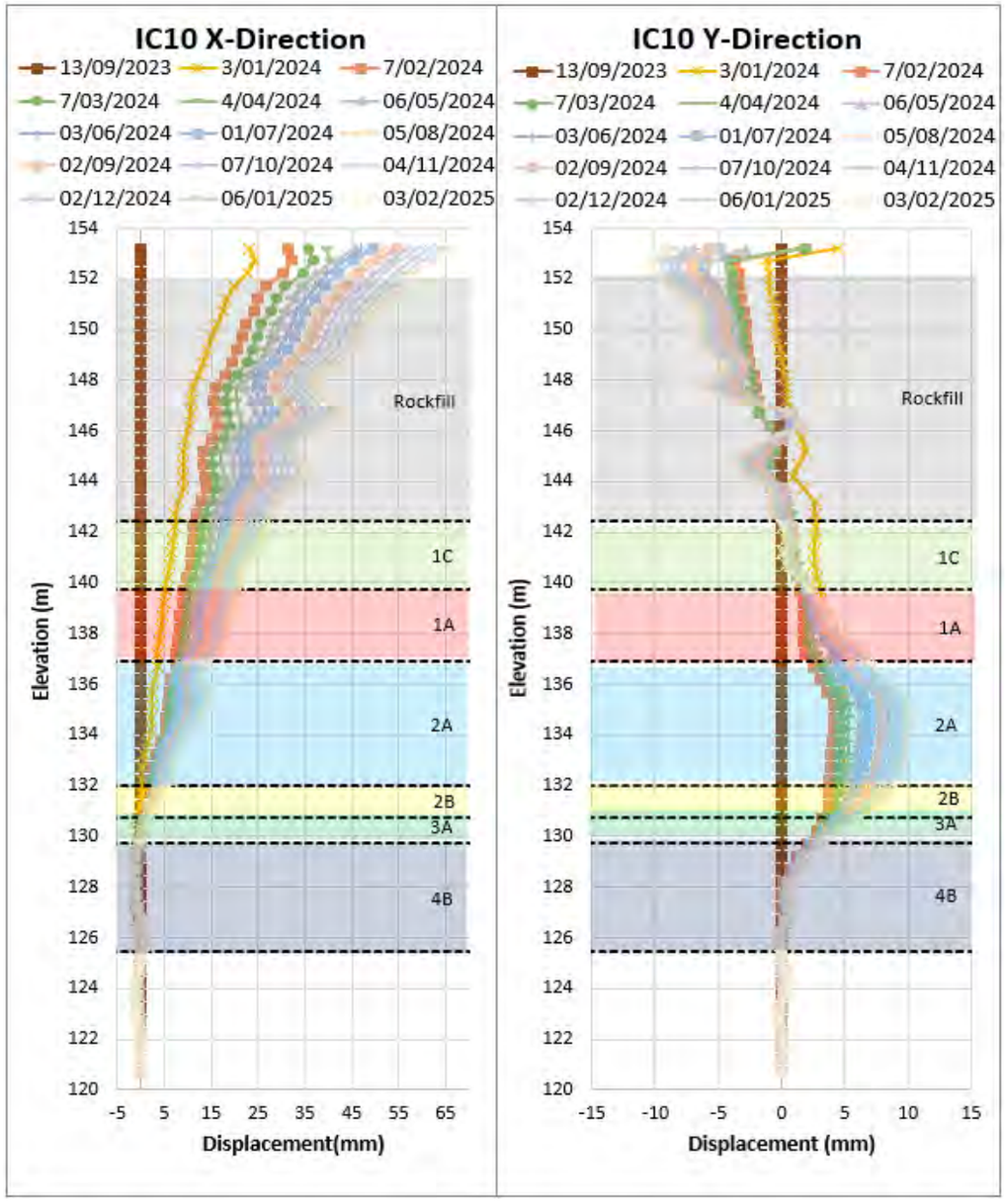
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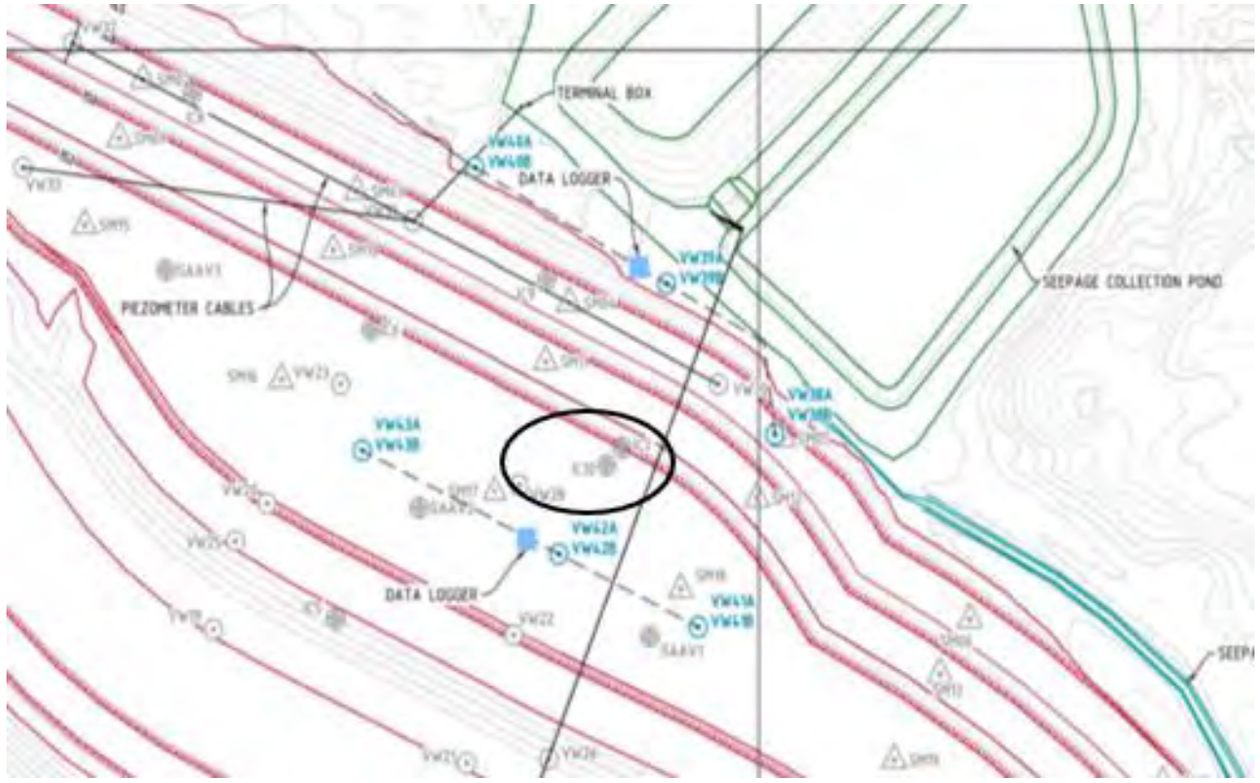
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IC9 - PROFILE CHANGE

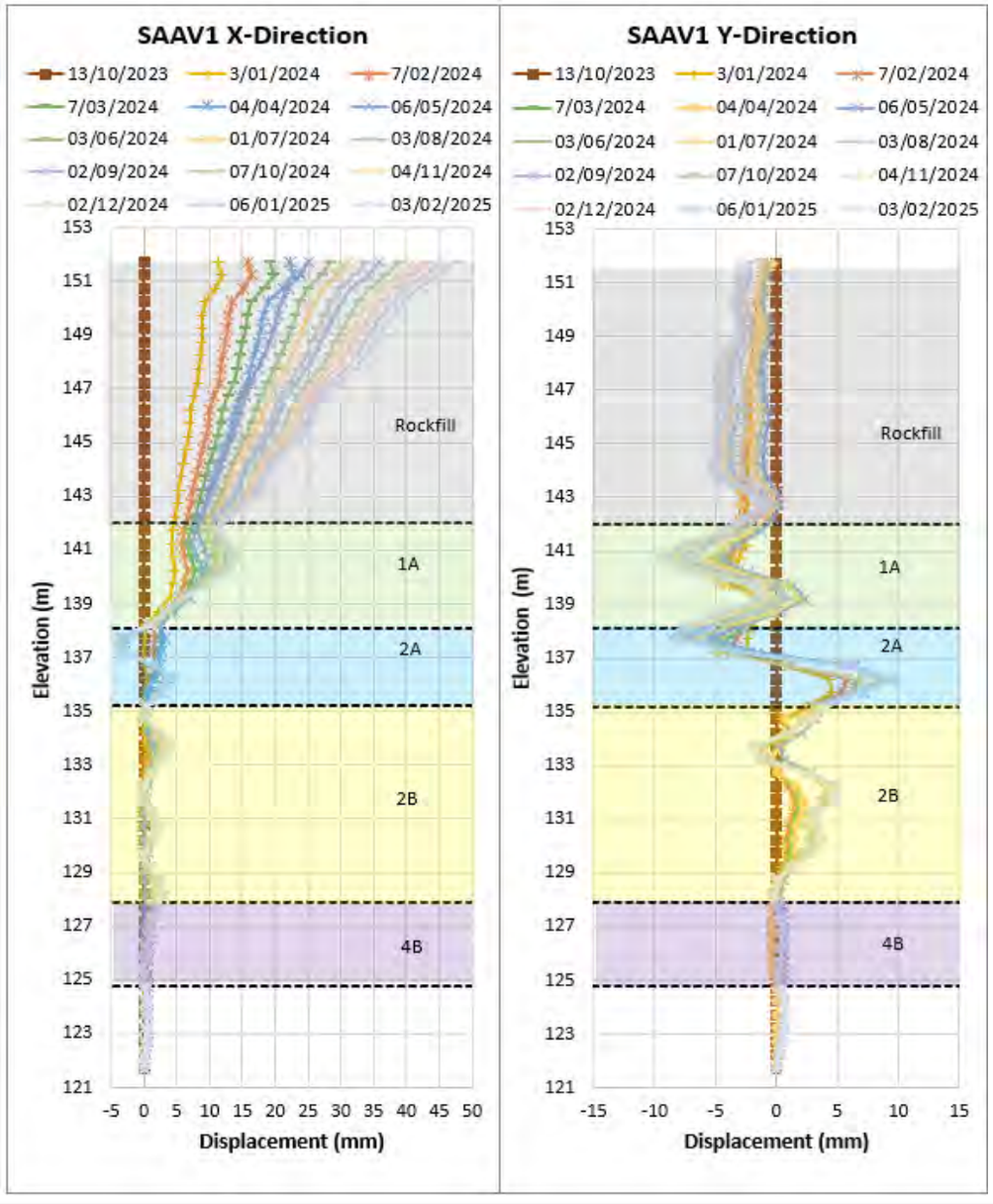
Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 25**

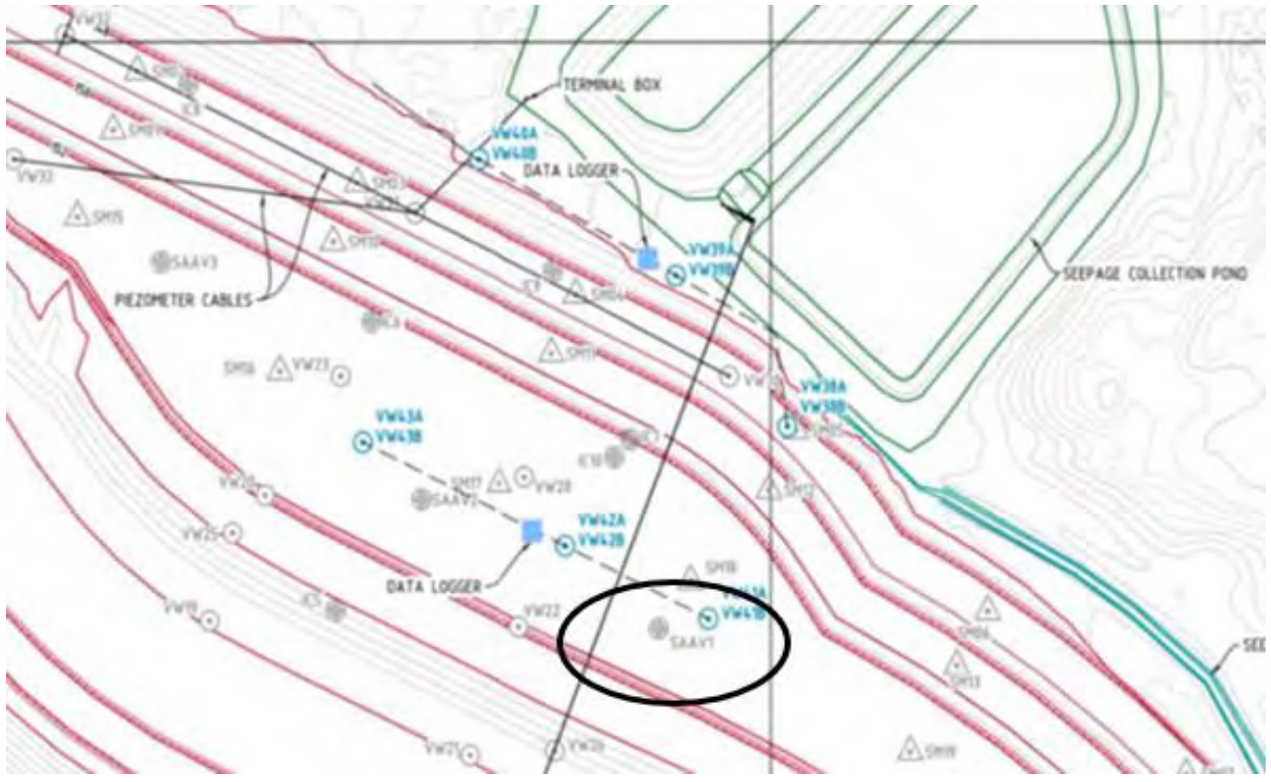
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	Date: 23/07/2025	**Job No:** 107031.126	**FIGURE 26**	





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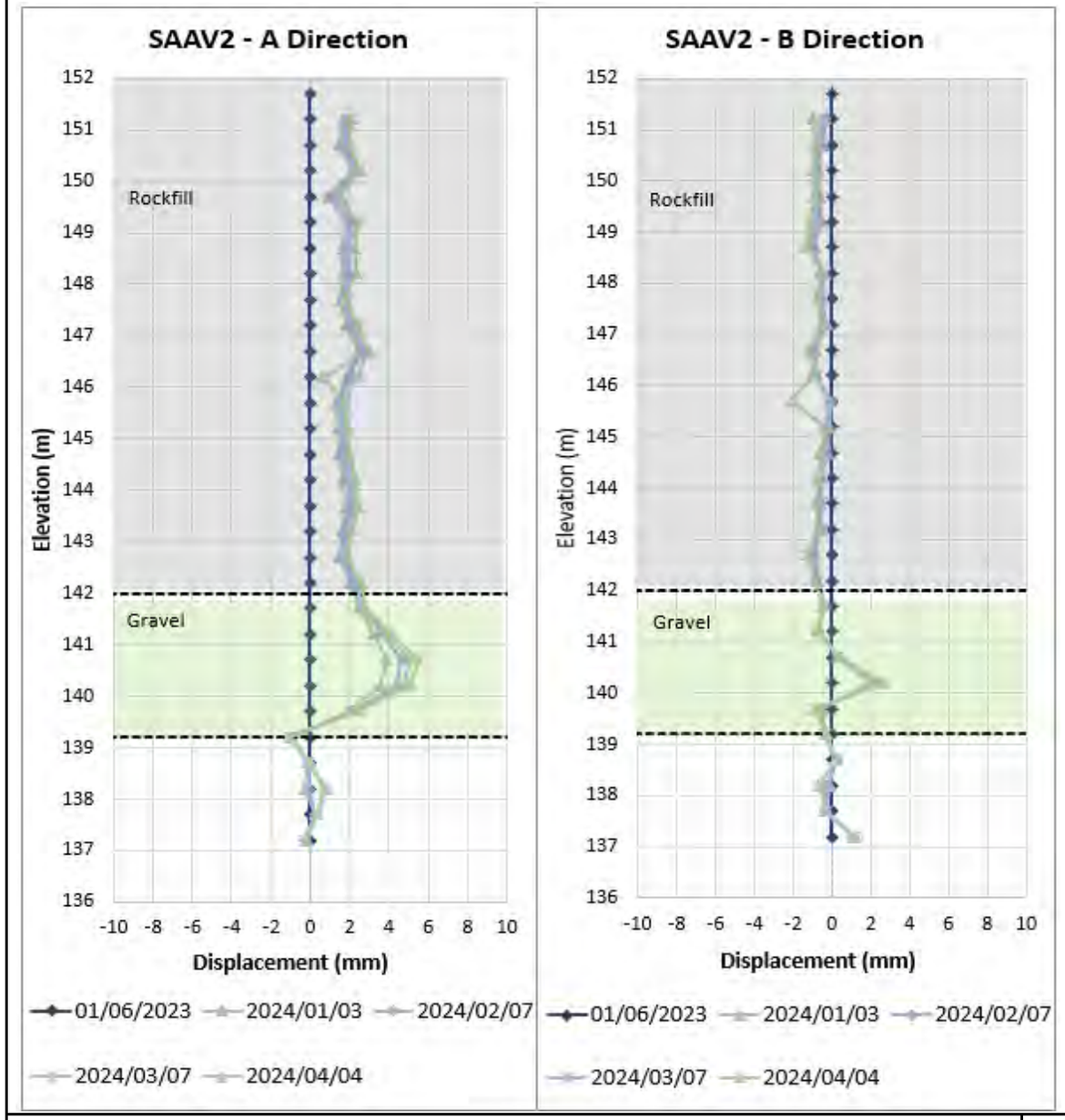
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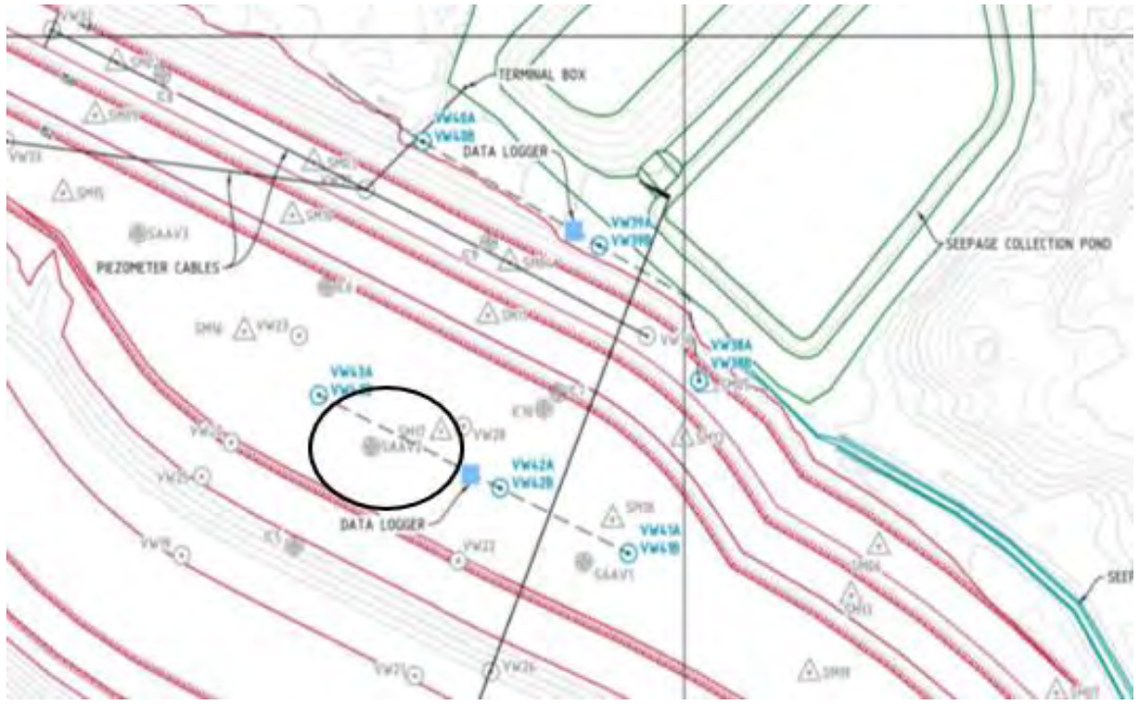
INCLINOMETERS

SAAV1 - PROFILE CHANGE

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 27**

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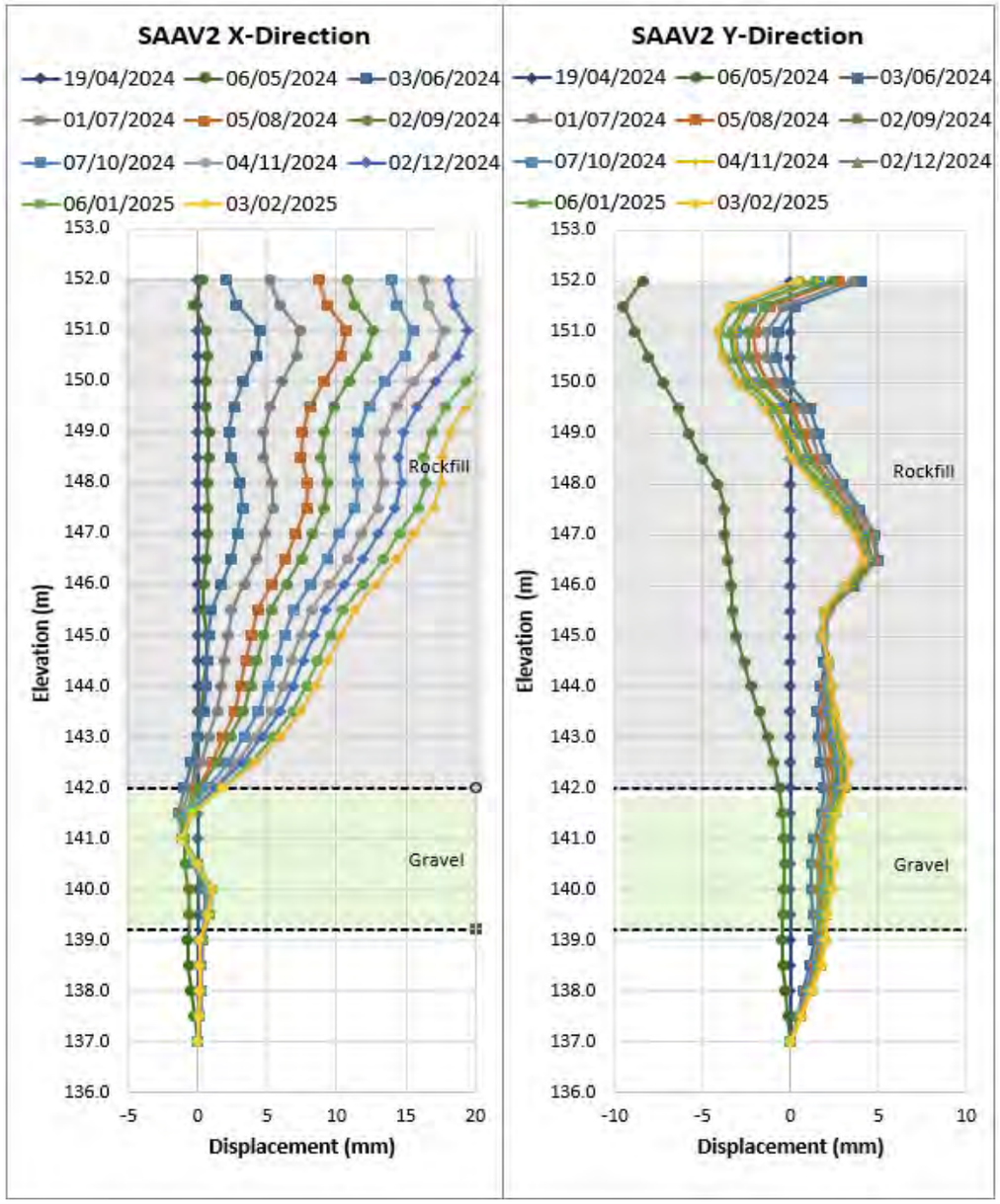
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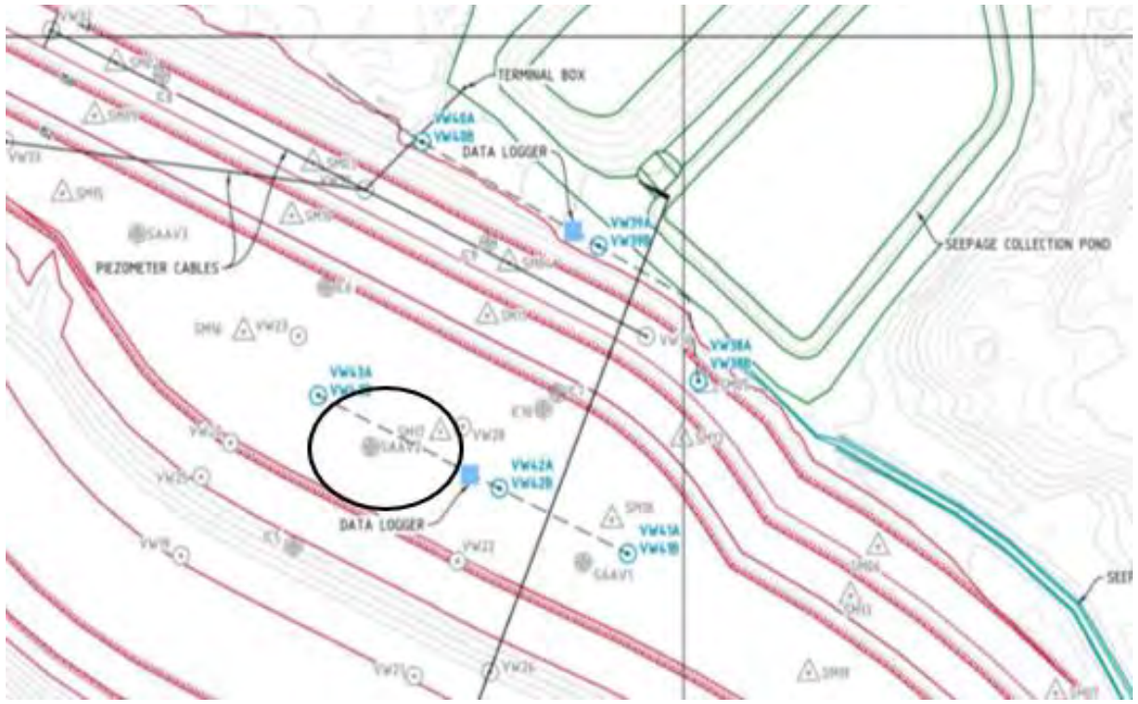
INCLINOMETERS

SAAV2 - PROFILE CHANGE

Date: 23/07/2025	**Job No:** 107031.126	**FIGURE 28**

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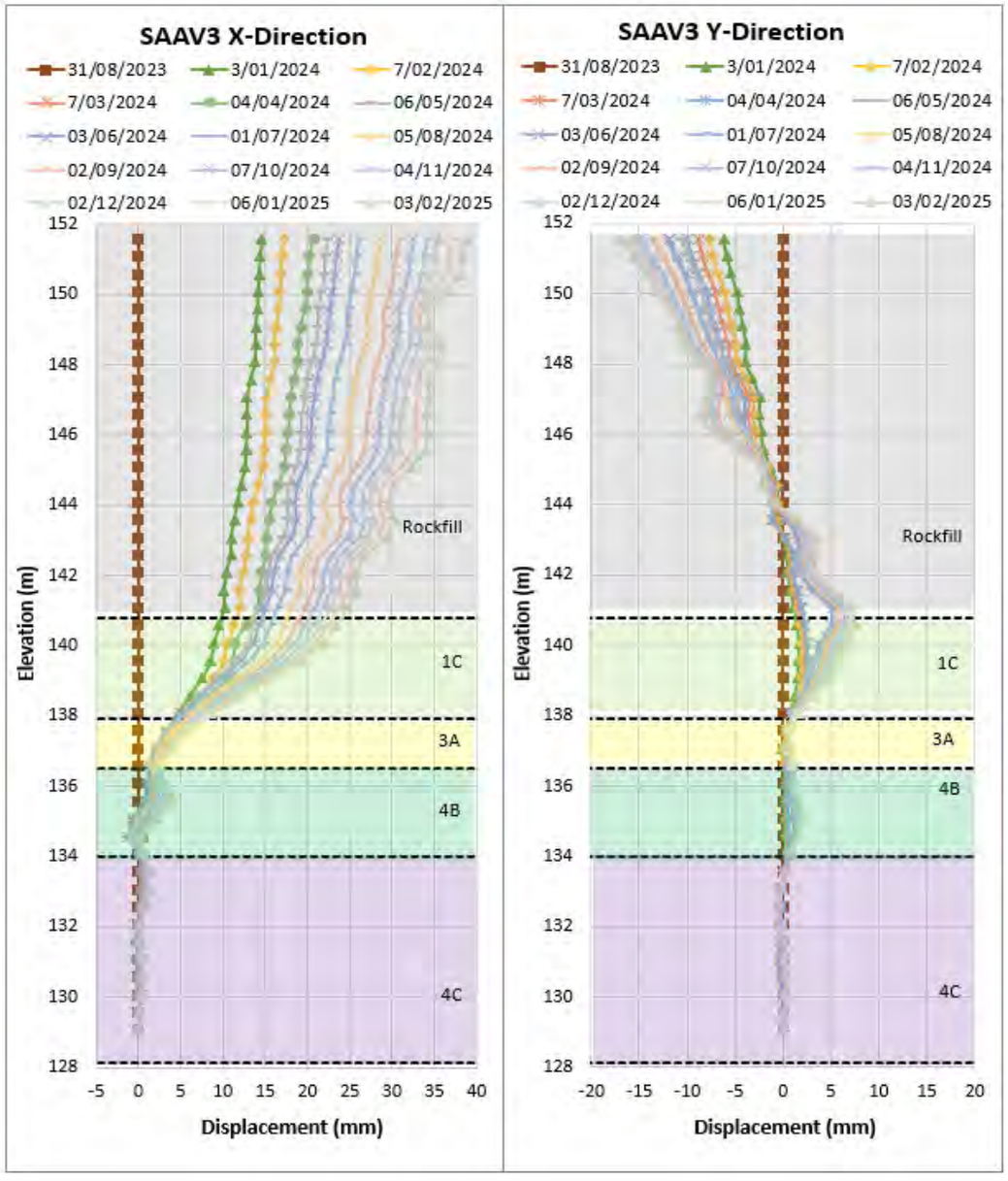
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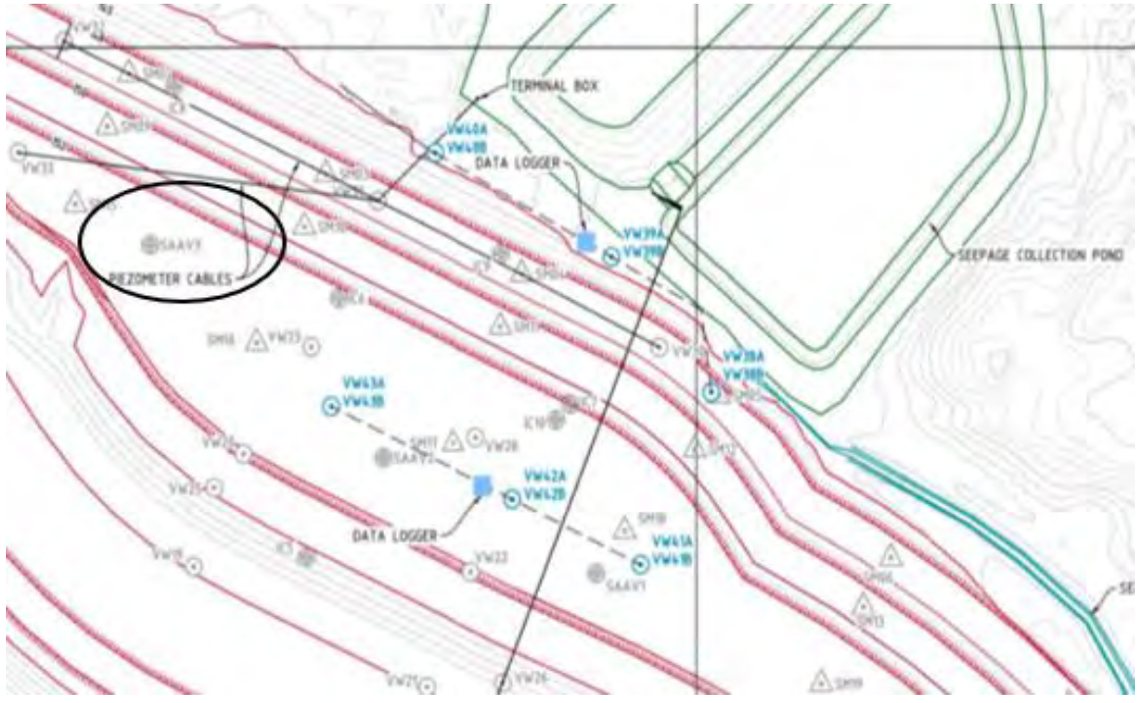
INCLINOMETERS

SAAV2 - PROFILE CHANGE

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE 29**

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2024 EOR INSEPCTION

INCLINOMETERS

SAAV3 - PROFILE CHANGE

Date: 23/07/2025	**Job No:** 107031.126	**FIGURE 30**

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APPENDICES

APPENDIX A – 2/5 DAM TSF DISCUSSION

DISCUSSION OF HISTORIC AND RECENT DESIGN AND CONSTRUCTION

1 BACKGROUND

The 2/5 Dam TSF encompasses the previous 1, 2 and 5 Dams which were originally built between 1950 and 1970. The 2 Dam Embankment was constructed using waste rock sourced from mine operations, which has been classified as Potentially Acid Forming (PAF) material. Hence, the new TSF has been designed to not only provide storage for future tailings, but also to remediate unresolved acid drainages and seepage issues from the previous TSFs.

2 PHYSICAL DETAILS

2.1 Location

Topographic Series Map Name:	DUNDAS
Number:	3636
Australian Mapping Grid Co-ordinates:	378750 E, 5372500 N

The 2/5 Dam is located approximately 1 km south east of the Rosebery Mine. The site is fenced off to the general public, but pedestrian access is possible. A general site location plan is presented in **Figure 1**. The general layout of the 2/5 Dam TSF is presented on **Figure 2.**

2.2 Historical Dam Information

The 2/5 Dam TSF was constructed across 1 and 5 Dams and also was formed as a downstream raise to the existing 2 Dam embankment. The following subsections explain the background of dams 1, 2 and 5 and the current 2/5 facility:

Dam 1

- After rehabilitation, 1 Dam was used as a sports field. Historical data indicated that tailings were deposited within the area and then capped using waste rock from mine operations.
- A pocket of landfill on the upstream side of the Western Embankment was identified between 2 Dam and 1 Dam but its extents could not be adequately defined.

Dam 2

- 2 Dam was constructed in 1955. It was raised on three (3) occasions, until 1991.
- Between 1991 and 2001 additional waste rock was placed on the downstream face of the dam, and the crest width was widened.
- The embankment final height was RL 161 m, and presented a 10 m wide crest, with an upstream edge safety windrow.
- Tailings deposition ceased in 1996 at which time the facility was flooded with water/treated effluent from the Rosebery Sewerage Scheme and was treated as a wetland.

Dam 5

- The embankment was constructed on the east of the facility to a crest elevation of RL 166 m in 1970.

TAILINGS.WATER.WASTE.

- Construction drawings show that the 5 Dam has an internal sand filter that helps alleviate phreatic levels caused by seepage within the embankment, and it presents a clay core as a lower permeability barrier.
- Tailings deposition ceased in 1995 and the facility was flooded with water/treated effluent from the Rosebery Sewerage Scheme in 1996.

2.3 Current Dam Information

2.3.1 Description

The current 2/5 Dam TSF includes:

- A western embankment across the old 1 Dam area;
- A northern embankment against the downstream face of the existing 2 Dam;
- An eastern embankment the eastern side of 5 Dam. The embankment was constructed across tailings and on natural ground (towards the southern end);
- A southern embankment constructed on natural ground at the southern extent of the TSF;
- The TSF Embankment is of zoned rockfill construction, with an exposed waterproofing bituminous geomembrane (BGM) liner on the upstream face, an embedded lining system comprised of BGM liner sandwiched in a lower and upper layer of non-woven geotextile (Bidim A64) and a combination of foundation grout curtain along the perimeter of the facility through rock and cement bentonite walls through glacial and historic fill materials.;
- Seepage collection drains adjacent to the downstream toe of the eastern and northern embankments to manage near surface seepage;
- A seepage collection pond was constructed downstream of the northern embankment to capture seepage and pump it back into the TSF;
- A screening wall adjacent to the Murchison Highway to both provide a vegetation screen to the South Rosebery residents and to act as a diversion wall in the highly unlikely event of failure of the western embankment;
- A clean water diversion drain along the southern side of the TSF to reduce rainfall inflows to the TSF; and
- A diversion drain and spillway between the western and northern embankments to direct the flood waters to the north of the site resulting from an unlikely spillway discharge during operations and from the flood resulting from highly unlikely failure of the western embankment.

2.3.2 2/5 Dam Geometry

The current geometry of the facility is presented on **Figure 2**, whilst typical sections are presented on **Figure 3** and **Figure 4**. The current geometry of the embankment is a uniform crest elevation of RL 173 m (excluding the northern embankment, where construction is in progress) with a crest width of 8 m for the northern, eastern and southern embankments and a 10 m width for the western embankment. The maximum embankment height is about 29 m at the Northern Embankment toe adjacent to the Seepage Collection Ponds (SCP).

Each embankment presents different upstream and overall downstream slopes. A summary of the geometry of the embankments is given below:

- Crest Level
  - Perimeter Embankment = RL 173 m
  - Screening Wall = RL 172 m

TAILINGS.WATER.WASTE.

- Crest Width
  - Northern, Eastern and Southern Embankment = 8 m
  - Western Embankment = 10 m
  - Screening Wall = 2.5 m
- Embankment Slopes
  - *Northern Embankment* Upstream = 1.5:1 (H:V)
    Downstream = 1.5:1 (H:V), 2:1 (H:V) on benches with intermediate benches at RL 157.5 m, RL 153 m, RL 152 m (toe buttress), RL 150 m and RL 148 m.
  - *Eastern Embankment* Upstream = 3:1 (H:V) with a 5m wide upstream bench at RL 167.0m
    Downstream = 2.5:1 (H:V)
  - *Western Embankment* Upstream = 2:1 (H:V)
    Downstream = 2:1 (H:V)
  - *Western Screening Wall* Upstream = 2:1 (H:V)
    Downstream = 2:1 (H:V)
  - *Southern Embankment* Upstream = 3:1 (H:V)
    Downstream = 3:1 (H:V)

2.3.3 2/5 Dam Storage Capacity

The facility has been designed as a 2-stage facility. The current crest elevation of RL 173 m (Stage 2) has been designed to store approximately 1.6 Mt of tailings over 22 months with an allowance for a 2 m water cover. The design stored dry density is 1.25 t/m^3, this equates to approximately 1.3 Mm^3 for tailings storage and 0.8 Mm^3 of water.

2.3.4 2/5 Dam Catchment Characteristics

The catchment area of the facility excluding the catchment attributed to the clean water diversion drain is about 45 Hectares.

2.3.5 Consequence Category

A Consequence Category “High C” was adopted for the 2/5 Dam TSF as part of the design **[Ref. 3]**. This was based on the following:

- Population at Risk in the event of failure: 1 to 10
- Damage and loss severity level: Major

2.3.6 2/5 Dam Flood Capacity

The decant system for the 2/5 Dam TSF consists of a concrete inlet structure with provision for inserting stop boards across the inlet. The capacity of the decant is about 80 l/s.

TAILINGS.WATER.WASTE.

The TSF has a spillway located at the west, between the northern and western embankments. which has been cut into the existing rock and outlets into the diversion drain. The spillway is 20 m wide at the base and 1.0 m deep. The invert elevation of the Stage 2 Spillway is RL 172 m. The estimate capacity of the spillway is 35.5 m^3/s. A flood routing study was completed as part of the 2/5 Dam TSF design report for a Probable Maximum Precipitation (PMP) rainfall event. The flood routing results indicated a maximum flood height of 0.81 m for the critical storm duration of 3 hours. Hence, the spillway would safely discharge the runoff and process inputs resulting from the design storm (PMP).

2.4 Seepage Collection Pond

2.4.1 Purpose of Dam

The lined Seepage Collection Ponds purpose is to collect all seepage from the downstream toe area of the North and East Embankments. The collected water is pumped back into the TSF through a return water pipe.

2.4.2 Physical Details

2.4.2.1 Location

The Seepage Collection Ponds are located downstream of the Northern Embankment as shown on **Figure 2**.

3 GENERAL LAYOUT

The structure comprises two lined confining cells separated by an intermediate embankment, a low flow concrete structure, an intermediate weir, two inlet concrete culverts, emergency spillway, and submerged pump sump with associated pumping infrastructure at its lowest elevation.

The structure is mainly founded below ground level, and only low height embankments were constructed on the west and north flanks. The eastern side of the facility abuts natural ground.

A general locality plan is shown on the aerial photograph presented on **Figure 2**.

4 GEOMETRY

The eastern cell is 2 m deep with a crest elevation of RL 145.5 m. The floor of this cell falls at a grade of 0.5% towards the north west corner. A dividing embankment al RL 145.5m separates the two cells. At its northern end, the dividing embankment contains a low flow control structure, consisting of an inverted box culvert fitted with removable marine grade aluminium stop logs, set at an invert level 100 mm above the floor of the cell. The water level within the upper cell can be controlled by inserting or removing stop logs. A 5 m wide emergency overflow weir with an invert 0.5 m below crest elevation is located at the southern end of the dividing wall.

The western cell has been formed primarily in cut, with a floor level of RL 140.5 m and a crest level of RL 144.0 m. The floor was shaped with a 0.5% grade towards a sump located in the south west corner. The western cell has been constructed with an emergency spillway, 0.5 m deep, located on the western wall.

Both cells have been lined with a geomembrane sealing system comprised of BGM bituminous liner.

A pump bridge has been constructed between the western wall of the west cell and pump sump to facilitate access to the submersible pump, at the concrete sump in the base of the lower pond.

TAILINGS.WATER.WASTE.

5 STORAGE CAPACITY

The storage capacity of the Seepage Collection Ponds is approximately 15,000 m^3. The upper pond has a capacity of 6,000 m^3 while the lower pond has a greater capacity at 9,000 m^3 **[Ref. 5]**.

6 CATCHMENT CHARACTERISTICS

The contributing catchment area is approximately 18.5 Ha. It also accepts seepage and internal drainage from the TSF.

7 FLOOD CAPACITY

The pond was sized to have sufficient capacity to store the 1:100, 24-hour AEP rainfall event **[Ref. 5]**.

The emergency spillway is 5 m wide at the base and has a depth of 0.5 m. The estimated capacity of the spillway is about 5 m^3/s and is designed to discharge runoff from a rainfall event of 1 in 1,000-year return period.

7.1.1 Consequence Category

A Consequence Category “LOW” was adopted for the Seepage Collection Pond as part of the design **[Ref. 3]**. This was based on the following:

- Population at Risk in the event of failure: <1
- Damage and loss severity level: Medium

7.1.2 Water Management

The water level is remotely monitored on a daily basis from the ultrasonic probe. The water is pumped back to the TSF based on pre-set pond elevations.

TAILINGS.WATER.WASTE.

APPENDIX B – EOR INSPECTION CHECKLIST

TAILINGS.WATER.WASTE.

MMG ROSEBERY MINE EOR INSPECTION
2/5 DAM TAILINGS STORAGE FACILITY

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	3rd - 6th Febraury 2025
Weather Conditions :	Sunny, Max Temp 32°C
Rainfall :	1.4 mm on 3rd February

WESTERN EMBANKMENT

Item	Criteria	Checked	Comment
Crest	Condition of surface	Y	Fair. The crest surface is uneven in some locations with potholes present. There are some low points on either side of the fine rockfill bund where water has previously pooled from the crest sprinklers. Minor vegetation growth along the anchor trench at the upstream side of the bund around areas of pooled water.
	Condition of safety bund	Y	Bunds are in good condition. Upstream bund has been constructed using fine rockfill, and is covering the tailings pipeline.
Downstream Batter	Slumps, bulging or rilling of rockfill	Y	Good. Some loose rockfill at the northern end of the batter slope.
	Seepage / soft spots	Y	None.
	Tree / shrub growth	Y	None.
Upstream batter	Slumps/bulging /heave	Y	None. Most spigots are now anchored with tailings.
	Condition of geomembrane	Y	Good.
Other Comments	1. Low points at the crest anchor trench and upstream to the tailings pipeline should be backfilled to prevent water pooling and allow drainage of rainfall and sprinkler spill into the TSF. 2. Low tailings level at the southern end of the western embankment has created a low area in the beach where water is pooling.		

WESTERN BUTTRESS

Item	Criteria	Checked	Comment
Surface	Condition of surface	Y	Generally good. Minor water pooling within some low points. Area being used for laydown of miscellaneous items at the southern end.

SCREENING BUND

Item	Criteria	Checked	Comment
Crest	Condition of surface	Y	1. In good condition. 2. The Screening Bund toe buttress crest is still uneven and is not graded towards the slotted outlets within the safety bund at the northern side of the seepage pit. Some loose road base material has been placed directly north of the pump station, but has not been graded or compacted. Some minor water pooling was observed at the time of inspection. Minor vegetation is growing through the road base material on the toe bund crest.
Downstream Batter	Slumps, bulging or rilling of rockfill	Y	Nothing observed.
	Seepage / soft spots	Y	All seepage is being collected in the two pits located downstream of the wall and being pumped via return pipeline into the TSF.
	Tree / shrub growth	Y	Vegetation growing well. Some minor plant growth in older areas. The surface has been covered with topsoil and seedlings and good vegetation growth continues.
Upstream batter	Slumps, bulging or rilling of rockfill	Y	None.
	Tree / shrub growth	Y	Some minor, sparse vegetation growth along the entire extent.
Other Comments	1. The toe buttress crest is not graded towards the slotted outlets within the safety bund at the northern side of the seepage pits, however no pooling water was observed during the inspection. Minor vegetation is growing through the road base.		

MMG ROSEBERY MINE EOR INSPECTION
2/5 DAM TAILINGS STORAGE FACILITY

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	3rd - 6th Febraury 2025
Weather Conditions :	Sunny, Max Temp 32°C
Rainfall :	1.4 mm on 3rd February

SPILLWAY

Item	Criteria	Checked	Comment
Spillway	Obstructions or erosion	Y	None.
	Stability of side slopes	Y	Good.
Other Comments	The pond level was 169.02 m, a 10 mm decrease since the previous inspection.		

DIVERSION CHANNEL

Item	Criteria	Checked	Comment
Diversion Channel	Obstructions or erosion	Y	Minor vegetation growth at the channel invert - no flow obstruction.
	Stability of side slopes	Y	1. Generally good condition. 2. Potentially some loosening of blocks in cut face between bench 1 and 2 on western side of cutting. An exclusion zone and bunded area has been instated around the area of concern. There is no vehicular access to this area.
	Seepage	Y	None observed.
	Outlet	Y	Water is pooling behind the Filter bund, no overflow observed at the time of inspection. Very limited flow identified percolating through the filter bund.
Other Comments	A small gravel bund has been construced near the northwestern end of the channel to attenuate flow to the filter bund.		

DECANT

Item	Criteria	Checked	Comment
Decant	Obstructions or tailings build up	Y	None Observed
	Obstructions or blockages	Y	None Observed
	Decant pond clarity	Y	Clear
	Obstructions to flow at decant pipe inlet	Y	None Observed.
	Pond Level	Y	RL = 169.02 m.
Other Comments	1. The pond level has decreased by 10 mm since the previous audit. 2. Pipe backing rings and floats previously identified to be in direct contact with the BGM liner have been cushioned.		

NORTH EMBANKMENT

Item	Criteria	Checked	Comment
Crest	Condition of surface	Y	Generally good. Some minor potholes present.
	Condition of safety bund	Y	Generally good.
Downstream Bench	Condition of bench surface	Y	Good.
	Condition of safety bund	Y	Good.
Downstream Batter	Slumps, bulging or rilling of rockfill	Y	No changes observed.
	Seepage / soft spots	Y	None observed.
	Tree / shrub growth	Y	Minor sparse vegetation growth on most of the downstream batter slopes and the RL 150 m bench.

MMG ROSEBERY MINE EOR INSPECTION
2/5 DAM TAILINGS STORAGE FACILITY

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	3rd - 6th Febraury 2025
Weather Conditions :	Sunny, Max Temp 32°C
Rainfall :	1.4 mm on 3rd February

Upstream batter	Slumps/bulging /heave	Y	None observed.
	Condition of geomembrane	Y	Good, batter slopes cannot be inspected thoroughly due to steep grade.
Downstream Toe	Seepage / soft spots	Y	All seepages are directed into the Seepage Collection Pond except the seepage at the western end (V-notches 2 and 3). Minor vegetation growth upstream of V-notch 2.
Comments	Inclinometer IC9 has had segments removed and is now being read manually using probe.		

EAST EMBANKMENT

Crest	Condition of surface	Y	Good.
	Condition of safety bund	Y	Good.
Downstream bench	Condition of surface	Y	Potholes and low points are present due to vehicular movement during construction.
	Condition of safety bund	Y	Good.
Downstream Batter	Slumps, bulging or rilling of rockfill	Y	None Observed.
	Seepage / soft spots	Y	Seepage continues from the southern end of the Eastern Embankment. The seepage was similar to the previous month, with no flow appearing on the batter slope. Flow was only percolating at the abutment at historically seen regions. A decrease in flow has been reported over recent months.
	Tree / shrub growth	Y	Minor vegetation, but of no concern.
Upstream batter	Slumps/bulging /heave	Y	No change in the erosion of Zone 3A ballast observed at the southern end of the liner flap geotextile coverage area.
	Condition of geomembrane	Y	Generally good. Some minor damage has been identified on the crest just before the anchor trench.
	Spigots in operation	Y	An open discharge pipeline was discharging tailings from Finger 6 at the northern end.
Other Comments	1. Seepage flow has recorded for V-notch 6 has stabilised after reducing for several months, the readings are now below 90 L/min, which has not been seen since early 2024.		

SOUTHERN EMBANKMENT

Crest	Condition of surface	Y	Good.
	Condition of safety bund	Y	Good.
Downstream batter	Slumps, bulging or rilling of rockfill.		None.
	Seepage / soft spots	Y	None.
	Tree / shrub growth	Y	Some minor growth.
Upstream batter	Slumps/bulging /heave	Y	None Observed.
	Condition of geomembrane	Y	Good.
Other Comments	None.		

MMG ROSEBERY MINE EOR INSPECTION
2/5 DAM TAILINGS STORAGE FACILITY

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	3rd - 6th Febraury 2025
Weather Conditions :	Sunny, Max Temp 32°C
Rainfall :	1.4 mm on 3rd February

SEEPAGE COLLECTION DRAINS

Item	Criteria	Checked	Comment
Eastern Seepage Collection Drains	Main drain	Y	Generally in good condition, vegetation is growing back where clearing works were completed. Eastern embankment southern end seepage is now discharged into the existing drains, working well.
	Finger drains	Y	Drains flowing. No notable changes.
Other Comments	All surface seepages from the eastern embankment report to the drain. A decrease in flow was reported compared to the previous month. Minor vegetation growth within the drain in some locations with no obstruction to the flow.		

SEEPAGE COLLECTION POND

Item	Criteria	Checked	Comment
Crest	Condition of surface	Y	Reasonable, numerous potholes present.
	Condition of safety bund	Y	Good.
Dividing Embankments	General condition	Y	Good
Downstream Batter	Slumps, bulging, rilling of rockfill	Y	None Observed
	Seepage / soft spots	Y	None Observed
	Tree / shrub growth	Y	Minor vegetation, no concern at this time.
Upstream batter	Slumps/bulging /heave	Y	None Observed
	Condition of geomembrane	Y	Good
Pump Station	Operation of pump	Y	Ok
	Condition of pump bridge	Y	Good
Spillway	Obstructions to spillway	Y	None observed. Fallen tree on downstream slope not impacting flow capacity
Freeboard	Estimate of spillway freeboard	Y	Approximately 2 m
Other comments	1. Tears, split seams, and dislodged patches have previously been identified on the floor liner in the Western Pond. Additionally, Uplifted liner can be seen in several locations within the base of the Western Pond. Significant amount of silt and minor vegetation growth in the lower pond. MMG to consider carrying out temporary or permanent repair works sooner if Stage 3 works are delayed. 2. The mesh cage placed around the pump sump to prevent deleterious material from entering the sump has been mostly blocked with fines and vegetation. Very minimal water is flowing through the cage, water inflow is mostly through the inlets in the concrete base.		

CLEAN WATER DIVERSION DRAIN

Item	Criteria	Checked	Comment
Diversion Channel	Obstructions or erosion	Y	Generally is in good condition. Minor undercutting at places and some vegetation growth. No changes have been noticed since last month, and the flow is not impeded.
	Stability of side slopes	Y	Good, soil section being undercut near the southern end. There is a minor slump but not obstructing the flow and no visible changes since last month's inspection.
Other Comments	1. Remediation work has been completed in the southern tension crack area, where the access track width is now reduced to 3.5m. 2. Since the previous month's inspection, there has been no, or very minor, changes in the tension cracks in other areas. Additional remediation works are anticipated to occur in the near future.		

APPENDIX C – PHOTOGRAPHIC SUMMARY

TAILINGS.WATER.WASTE.



Photograph 1 – North-West part of the 2-5 Dam TSF.



Photograph 2 – TSF southern part, and exposed tailings beach, looking northwest.



Photograph 3 – Southern Embankment, looking west.



Photograph 4 – Southern Embankment crest and downstream batter, looking east.



Photograph 5 – Eastern Embankment, looking north.



Photograph 6 – Eastern Embankment, looking south.



Photograph 7 – Eastern Embankment southern end, BGM liner flap coverage with geotextile and finer rockfill.



Photograph 8 – Eastern Embankment open discharging finger, finger 4.



Photograph 9 – Eastern Embankment downstream batter and buttress, looking south



Photograph 10 – Eastern Embankment downstream batter and buttress, looking north.



Photograph 11 – Northern Embankment, looking west.



Photograph 12 – Northern Embankment, looking east.



Photograph 13 – Northern Embankment downstream buttress, looking east.



Photograph 14 – Northern Embankment, downstream buttress RL152.0m bench and instrumentation, looking east.



Photograph 15 - Northern Embankment downstream RL148.0m buttress eastern end, looking east.



Photograph 16 – Western Embankment, crest potholes due to vehicular movement and minor water pooling, looking north.



Photograph 17 – Western Embankment, looking south.



Photograph 18 – Western Embankment downstream face, diversion channel and Screening Bund upstream face, looking south.



Photograph 19 – Screening Bund lower buttress and pump station access track, southern side of the pump station looking north.



Photograph 20 – Screening Bund lower buttress, northern side of the pump station, looking north.



Photograph 21 – Decant upstream bench (Stage 1 crest, RL270 m) and floating pipe laying over BGM.



Photograph 22 – Decant, clear water view and free from debris.



Photograph 23 – Spillway and dust suppression pump station, looking west.



Photograph 24 – Northern embankment downstream buttress and Seepage pond view from the crest.



Photograph 25 – Polishing Pond, western cell, liner uplift and vegetation growth, looking south.



Photograph 26 – Polishing Pond, eastern cell, looking south.



Photograph 27 – Historical seepage points and collection drain at the corner of original 2 dam and 5 dam, looking north.



Photograph 28 – Eastern Embankment southern end, filter wall seepage extent, iron stain and vegetation growth.



Photograph 29 – Eastern Embankment toe seepage point and toe drain, southern end seepage flowing towards seepage ponds, looking south.



Photograph 30 – Northern Embankment western end toe, looking east.



Photograph 31 – V Notch 1, Murchison Highway V notch, significant debris and silt accumulated.



Photograph 32 – V Notch 2, western toe of northern Embankment, significant vegetation growth around seep collection area.



Photograph 33 – Eastern Embankment Southern seepage diversion inlet and vegetation growth.



Photograph 34 – Diversion channel low level flow, minor vegetation grown, looking downstream



Photograph 35 – Diversion channel and spillway flow outlet channel, looking south.



Photograph 36 – BGM liner surface, stage 1 crest decant bench and western embankment upstream face, looking south.



Photograph 37 – Minor liner damage at southern end of the eastern embankment.



Photograph 38 – Liner Damage, peeled out at the culvert outlet in the flow between seepage pond cells.



Photograph 39 – Clean water diversion drain access track bund repair work, looking north.



Photograph 40 – Historical safety bund crack at the clean water diversion drain access track



Photograph 41 – No-flow during dry season, western section of the clean water diversion drain



Photograph 42 – Flow depth measurement scale and material deposition at the outlet of clean water diversion drain.



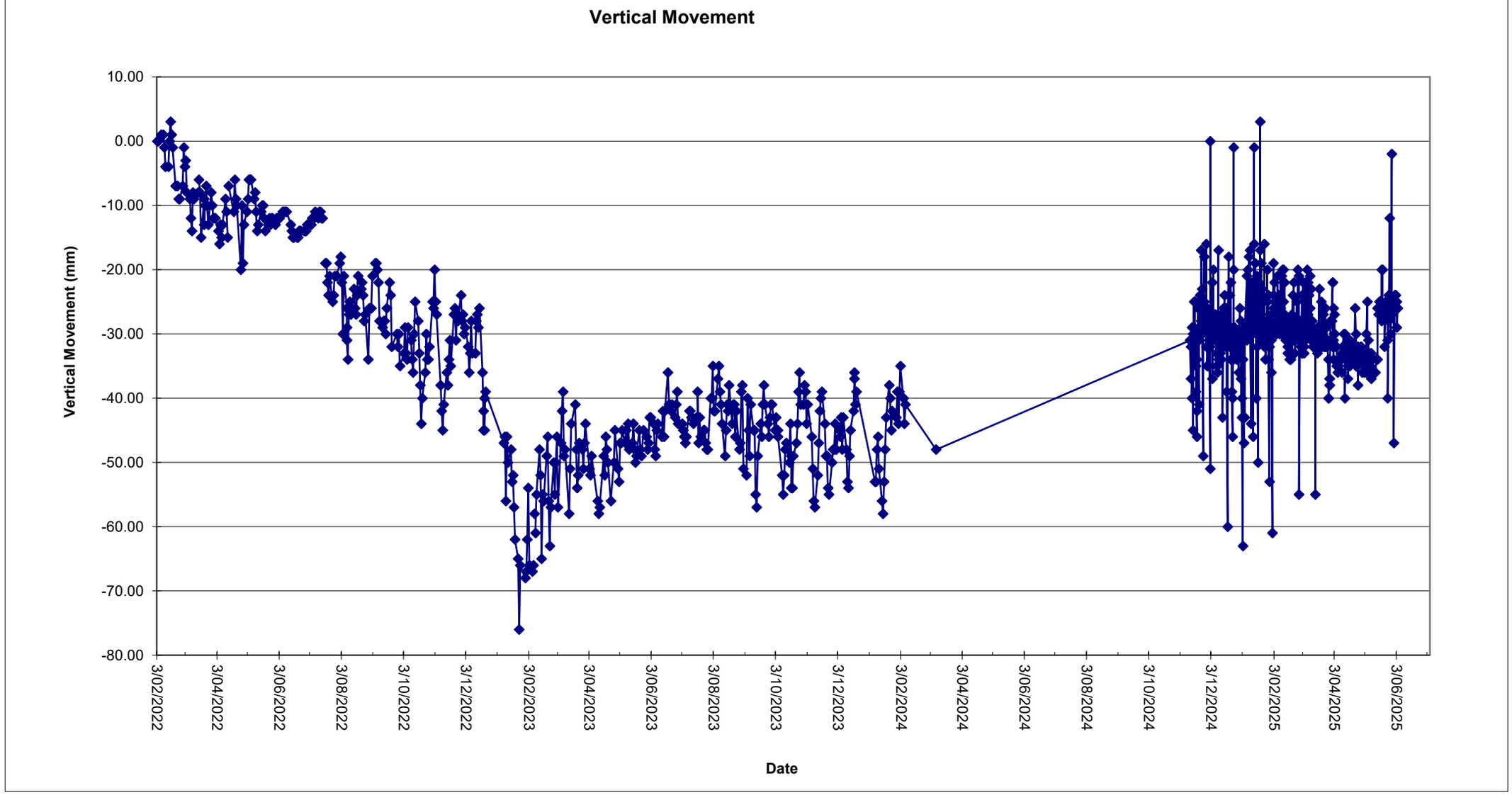
Photograph 43 – Undercutting in clean water diversion drain upstream batter slope.



Photograph 44 – Water at toe of eastern drain pipeline bund.

APPENDIX D – SETTLEMENT MONITORING

TAILINGS.WATER.WASTE.



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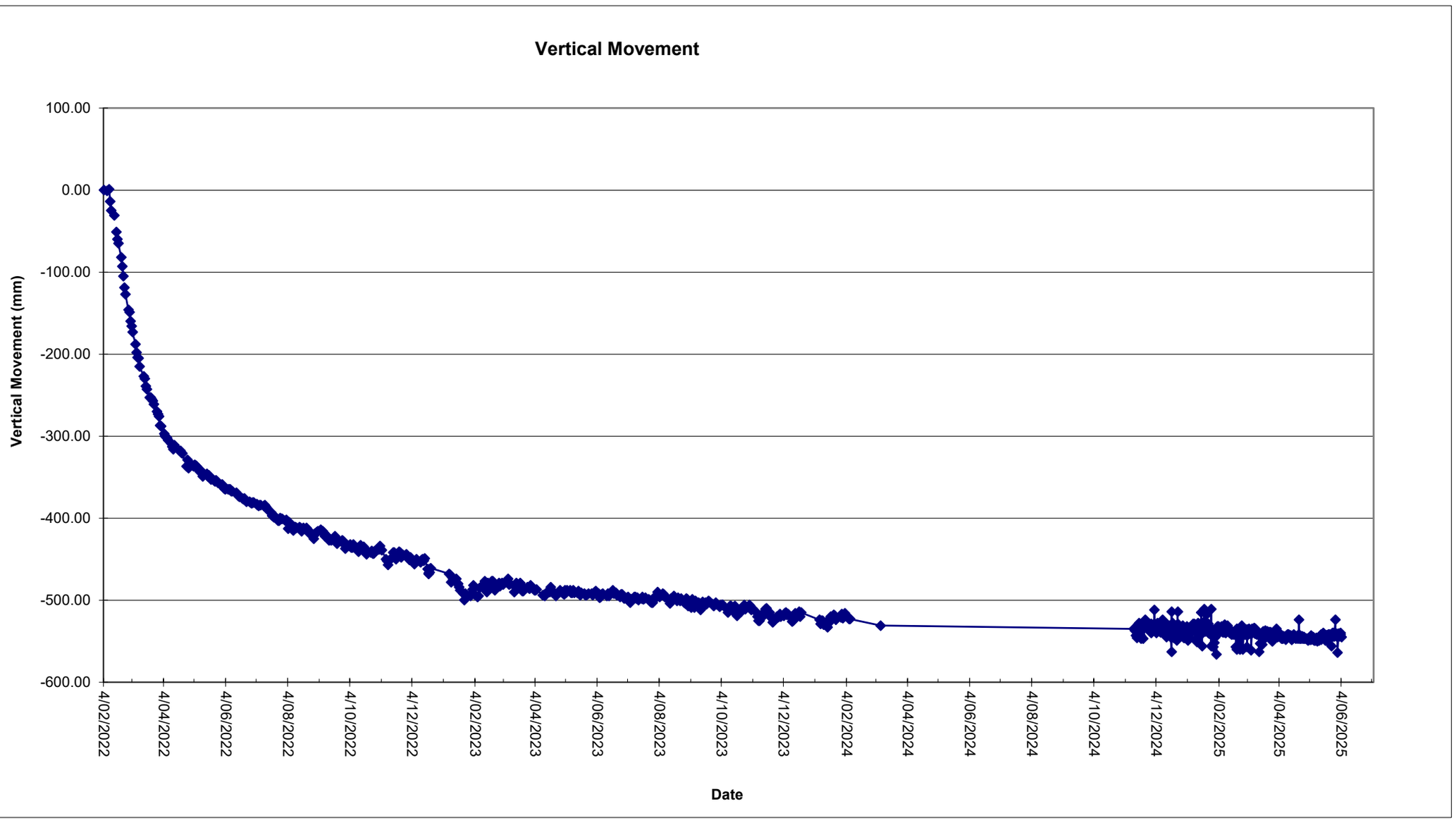
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM1

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D1

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM1



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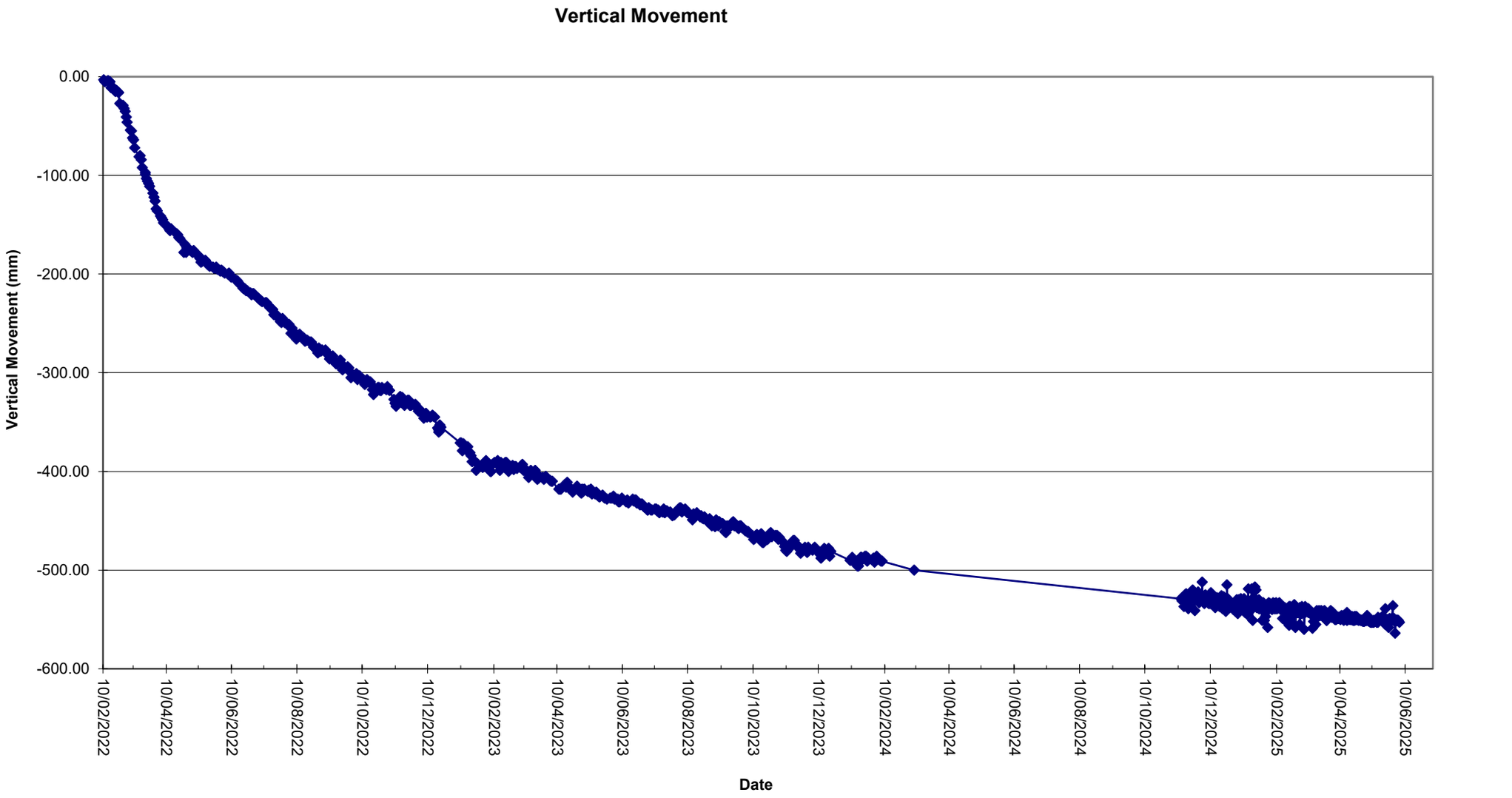
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2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM2

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D2**

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM2



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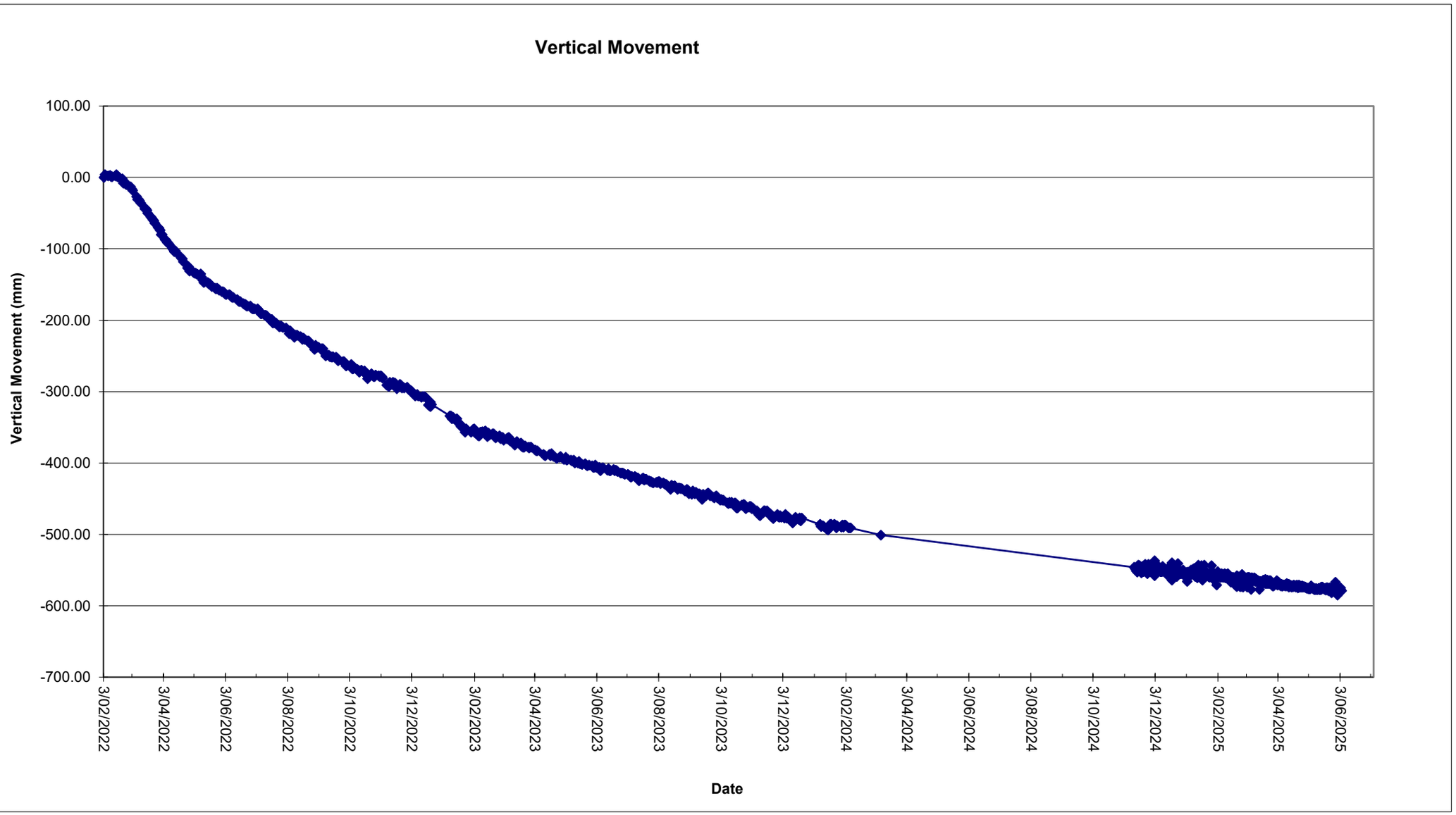
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM3

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D3

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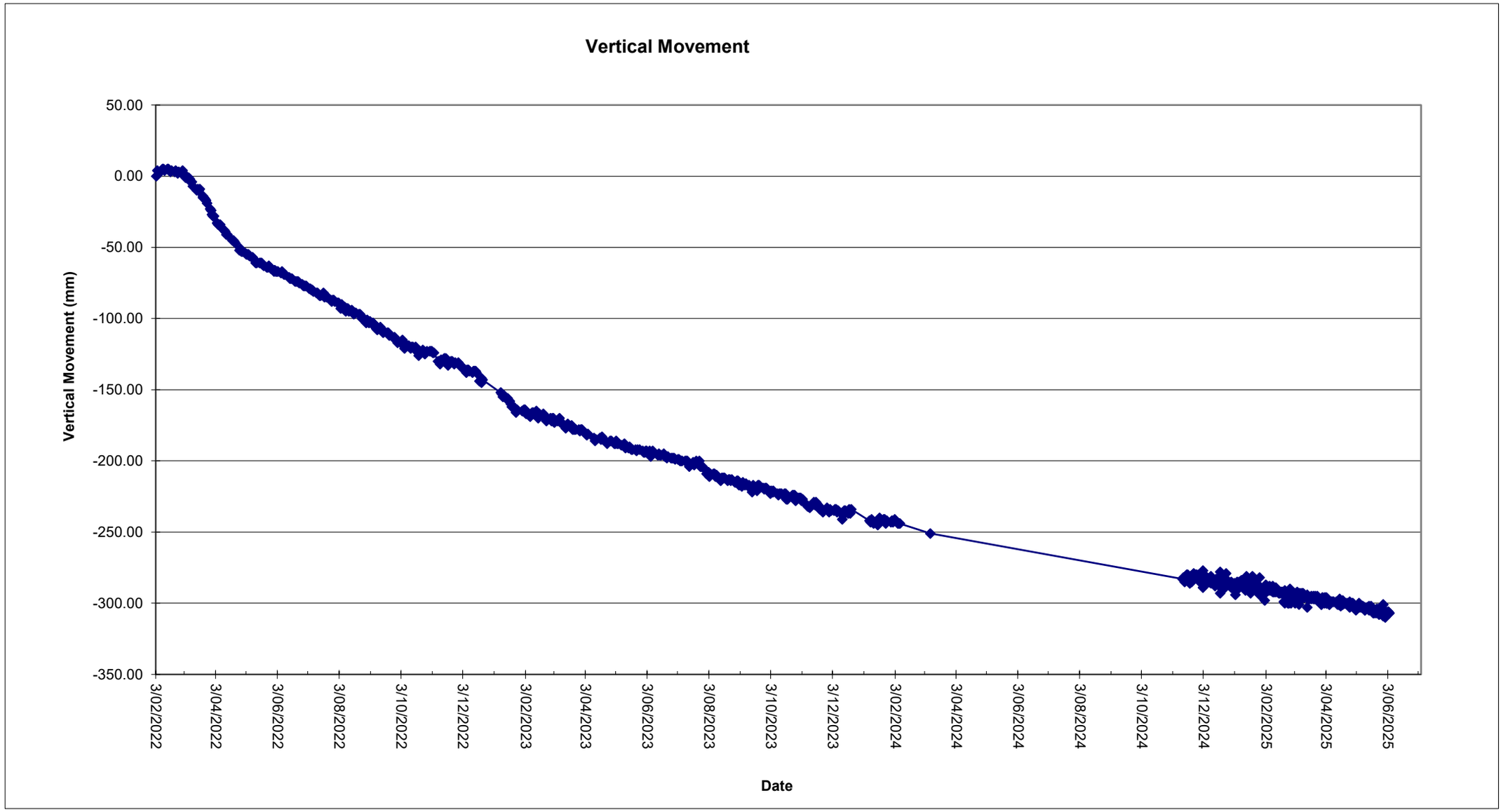
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM4

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D4

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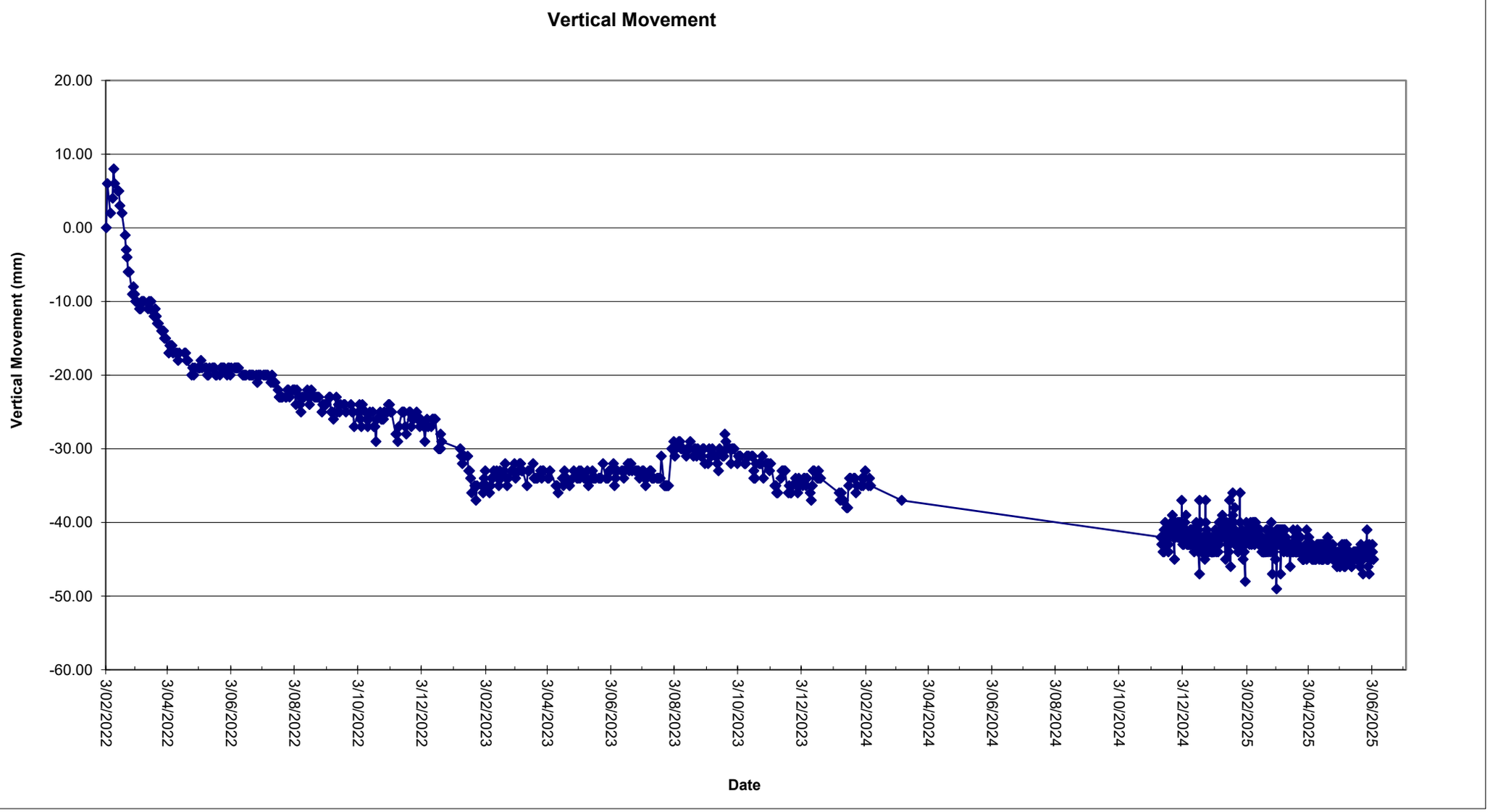
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM5

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D5

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM5



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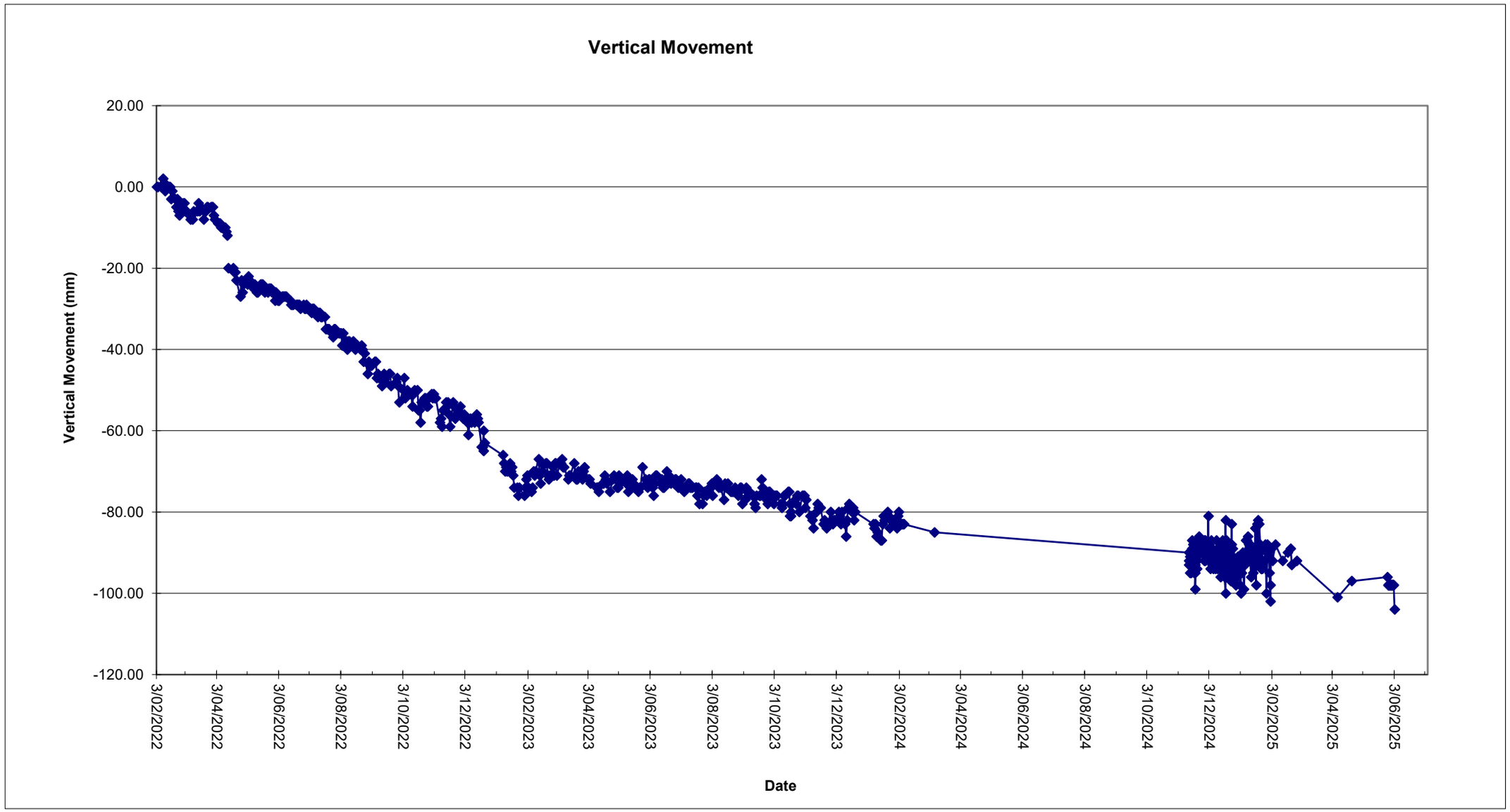
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM6

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D6

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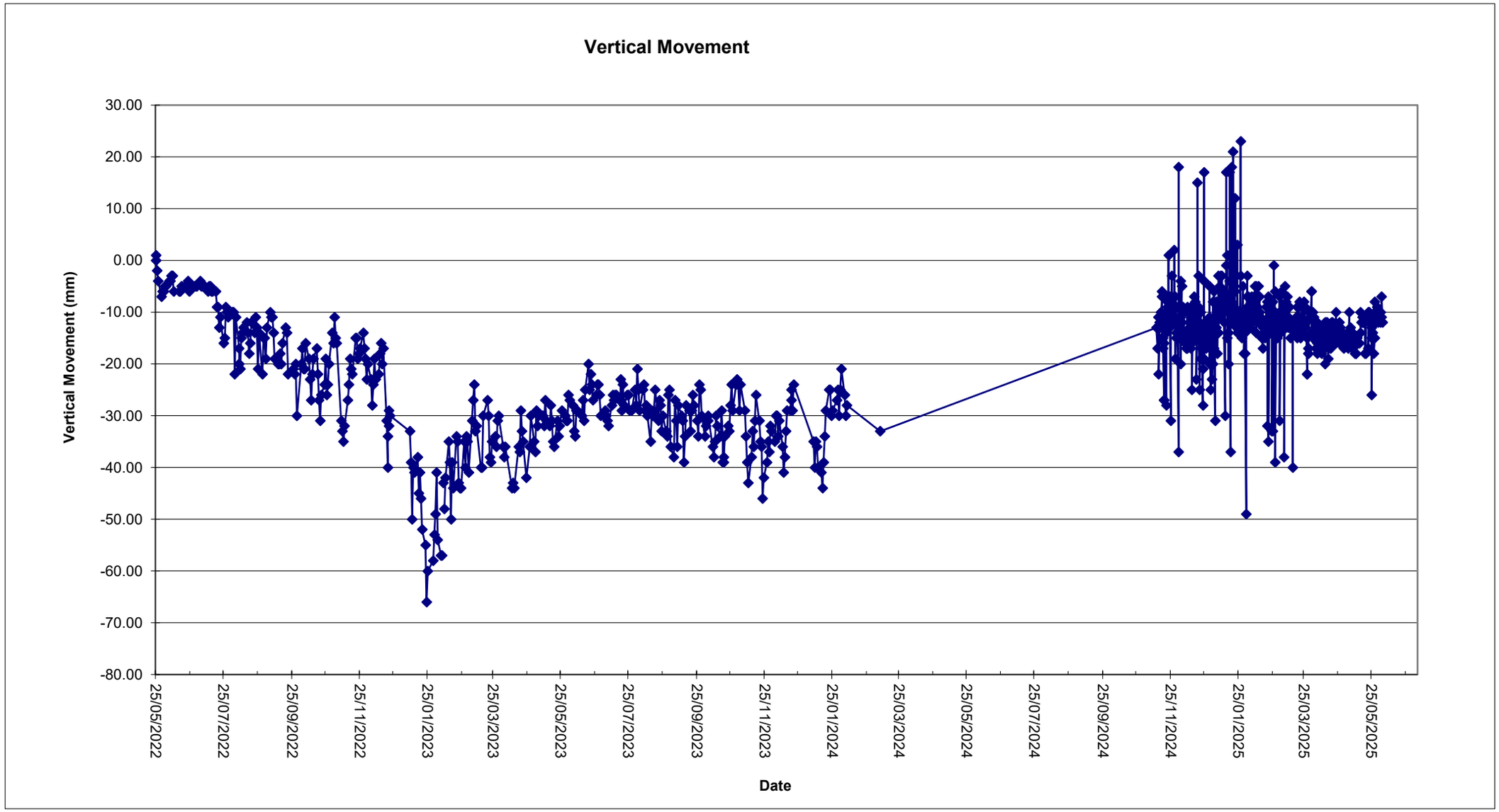
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM7

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D7

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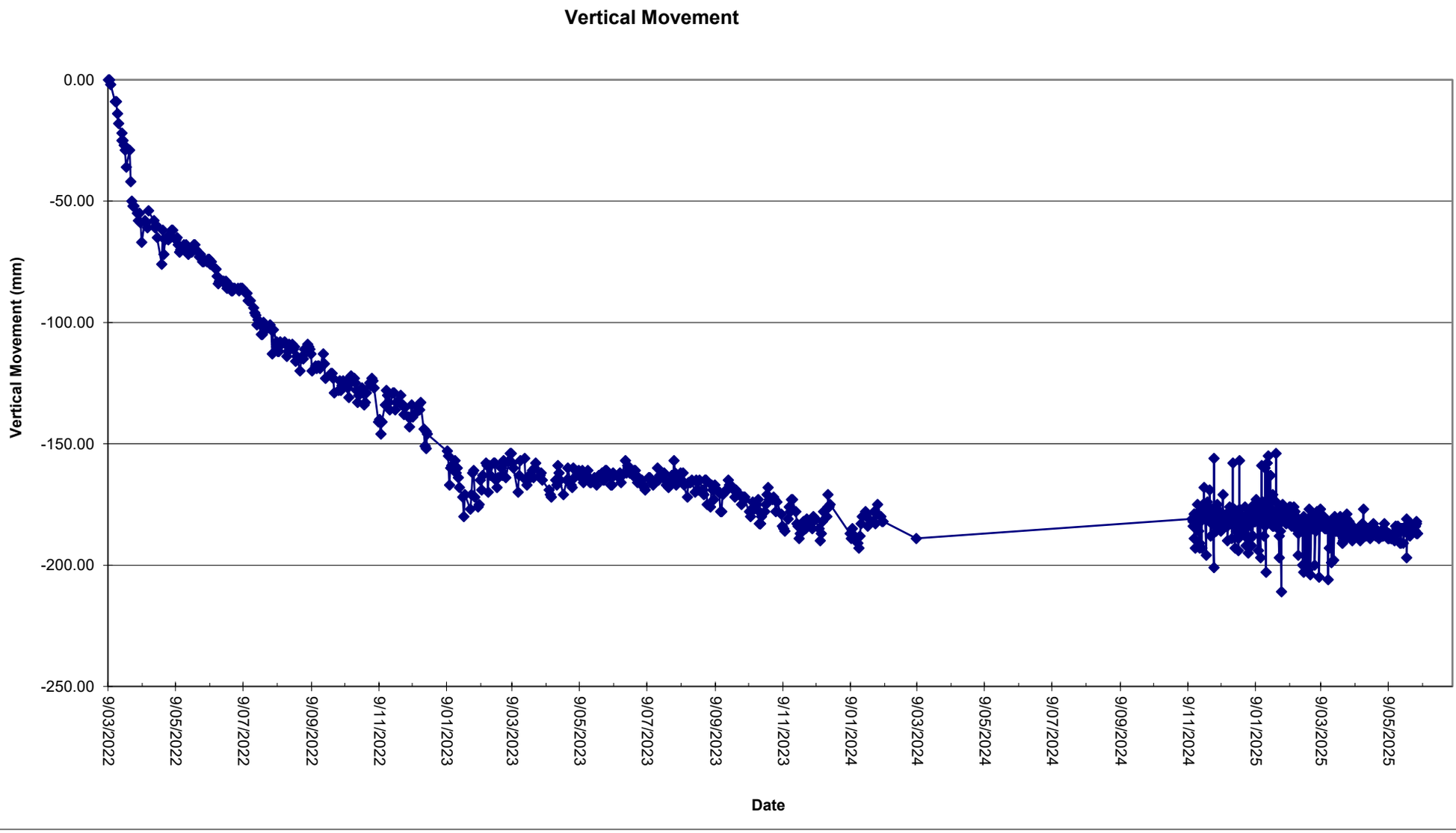
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM8

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D8

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM8



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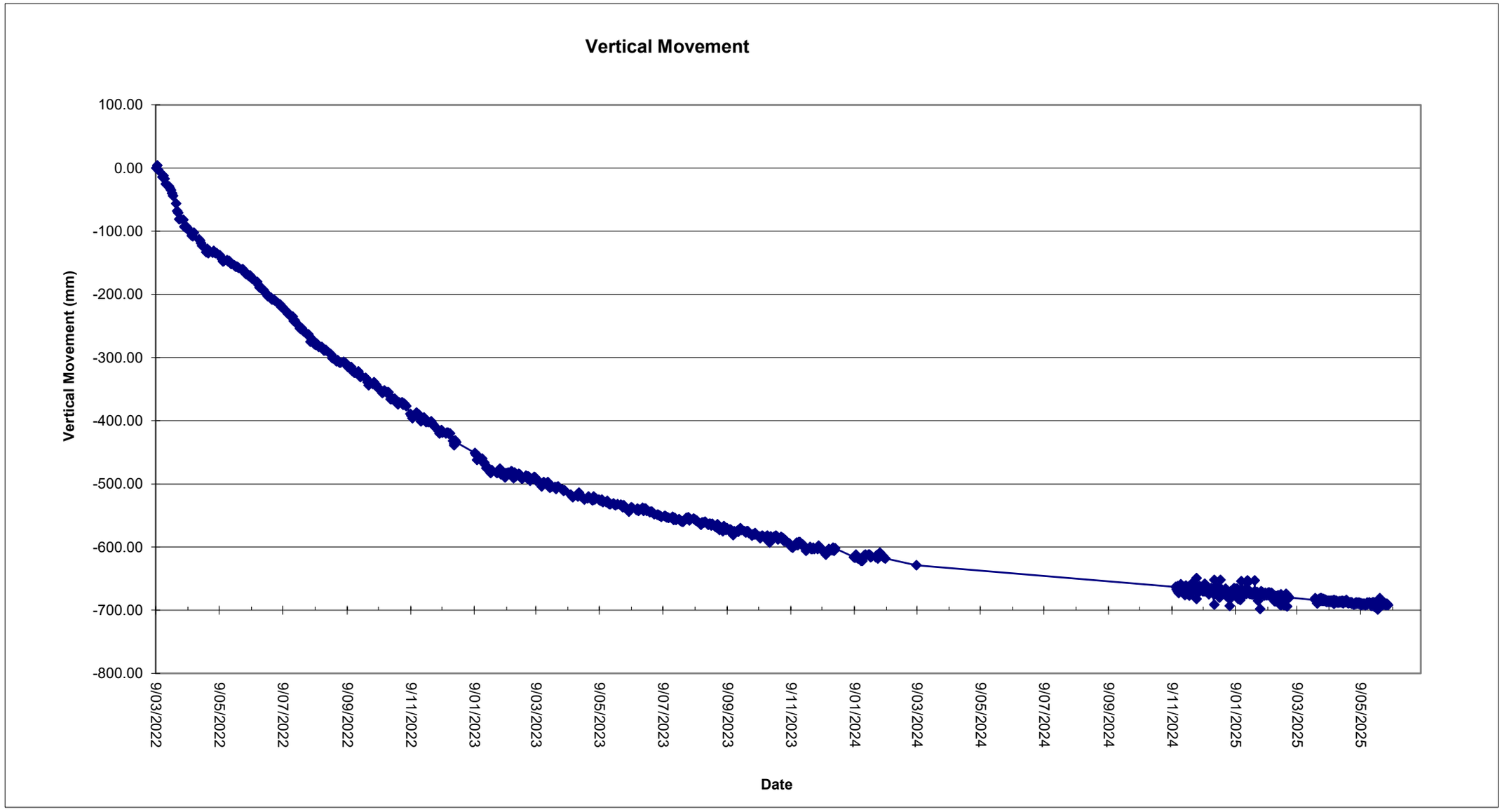
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM9

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D9

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM9



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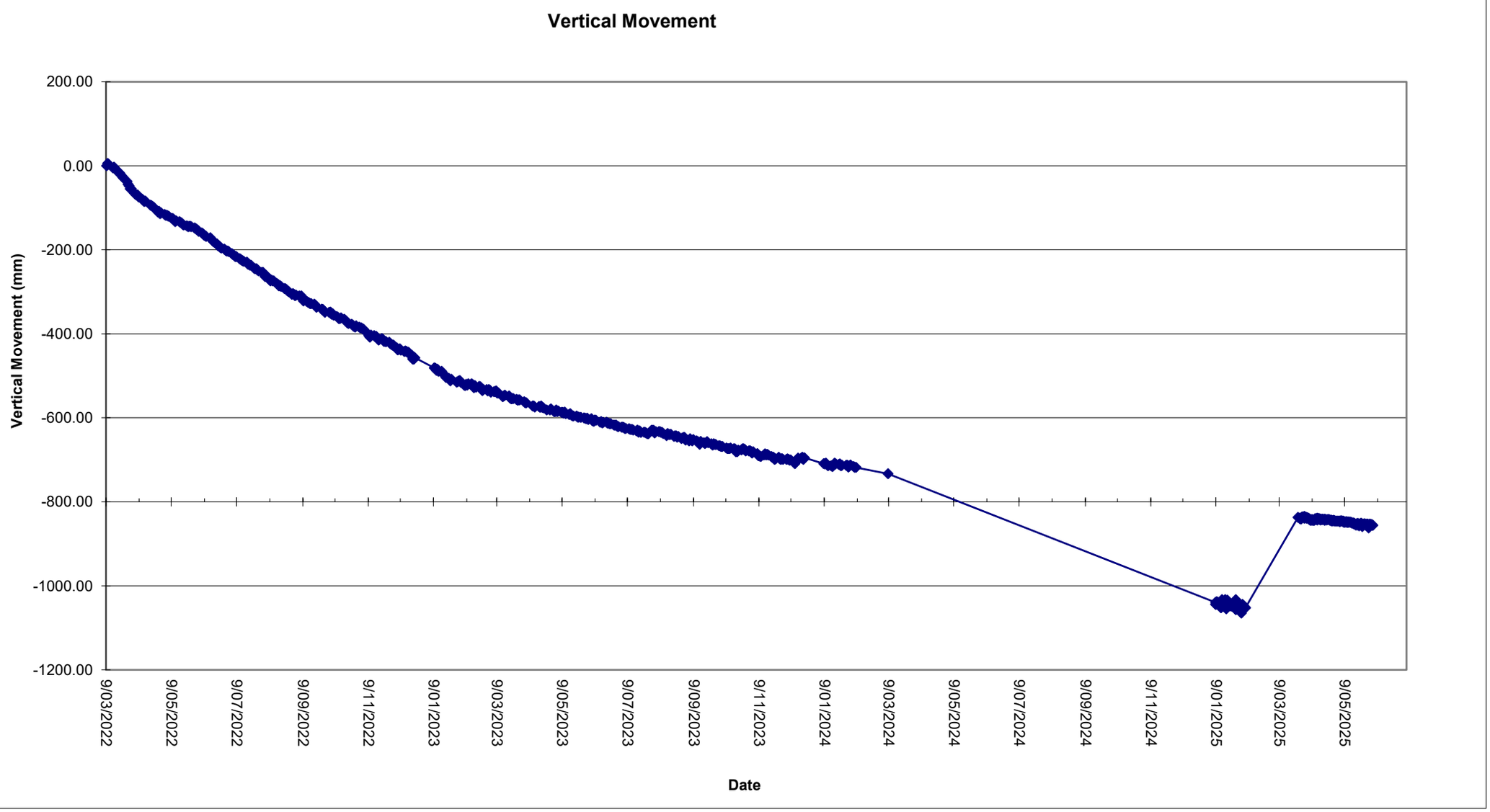
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM10

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D10

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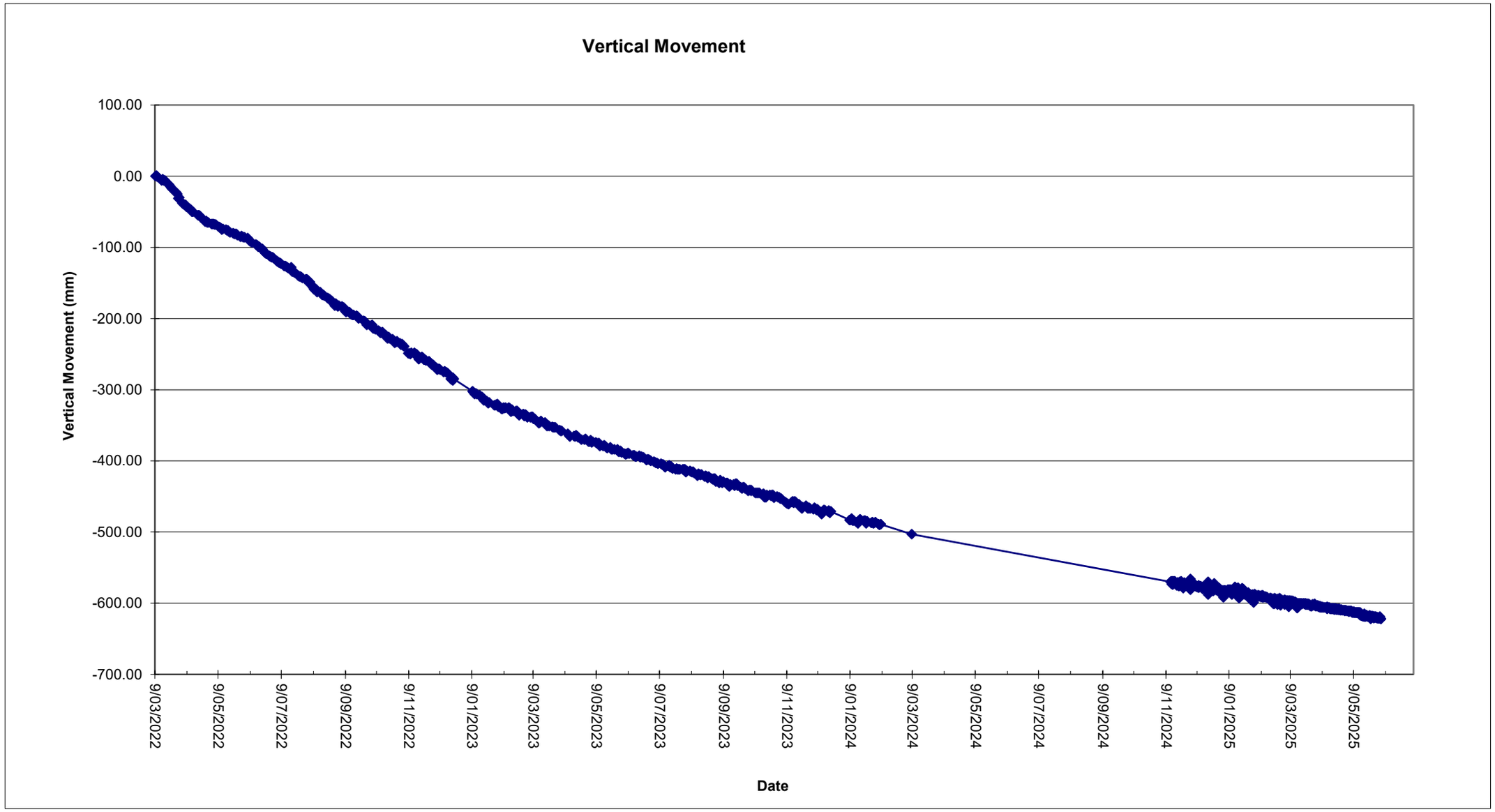
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM11

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D11

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2024 EOR INSPECTION

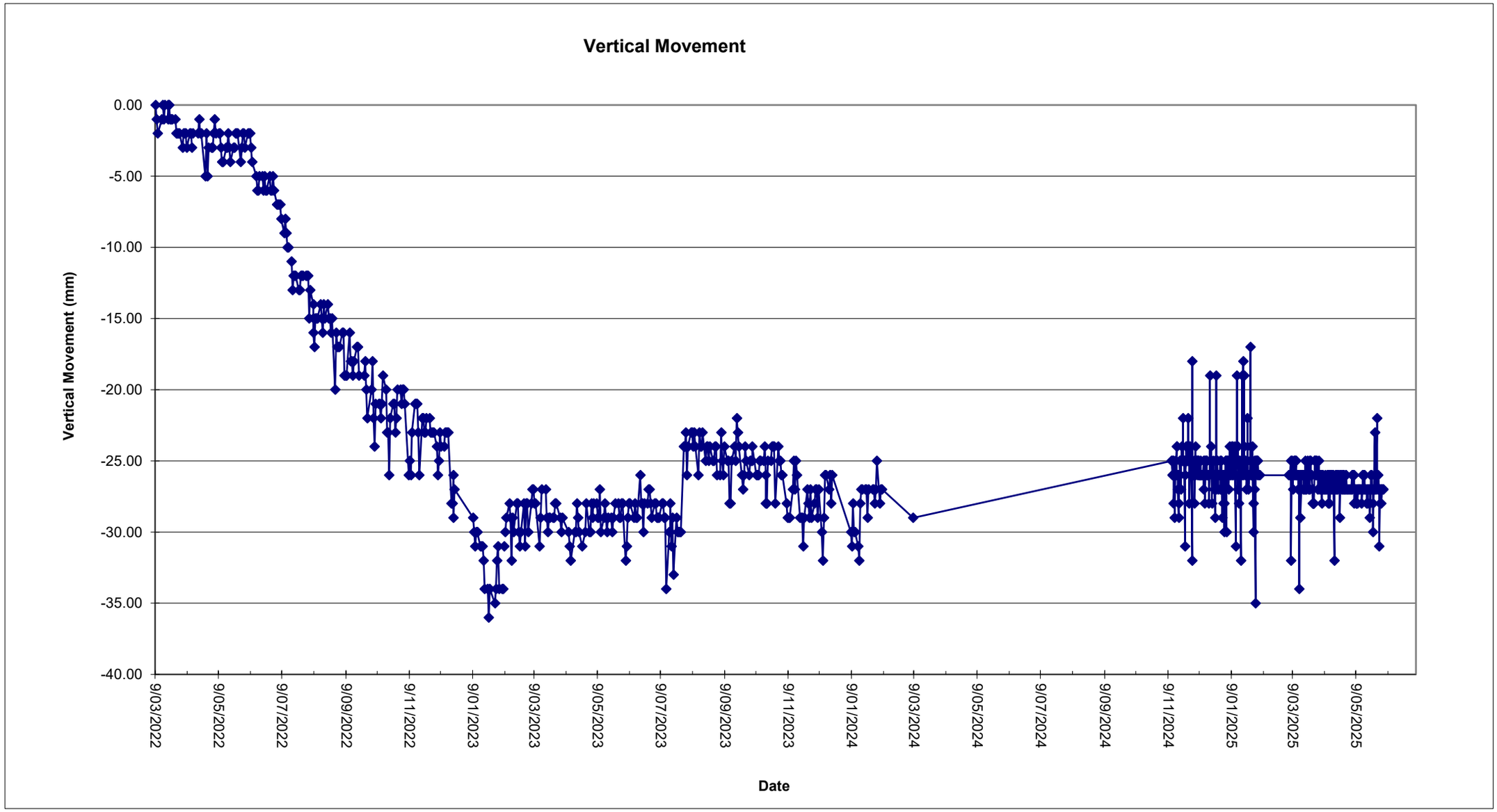
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM12

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D12

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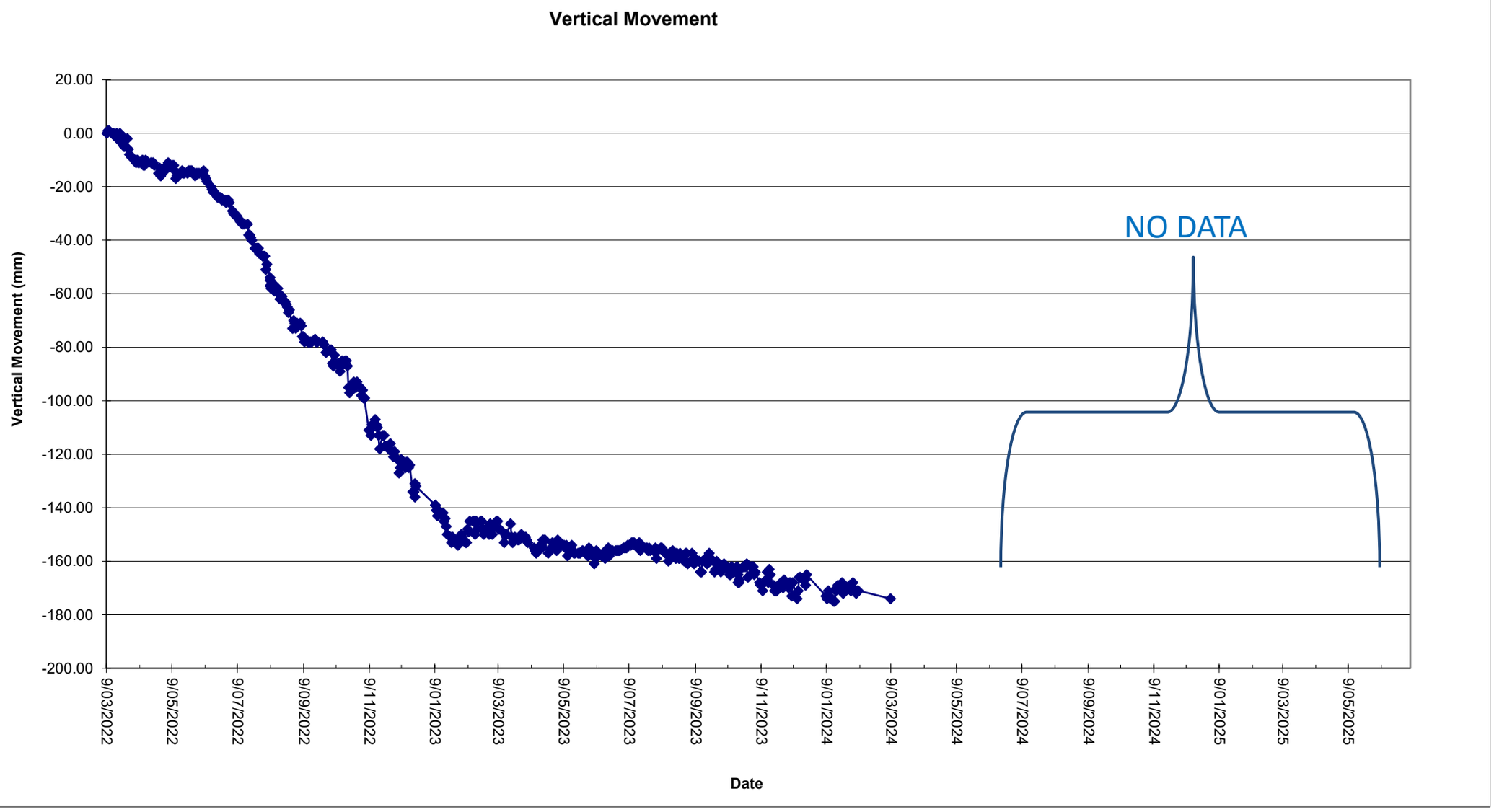
2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM13

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D13**

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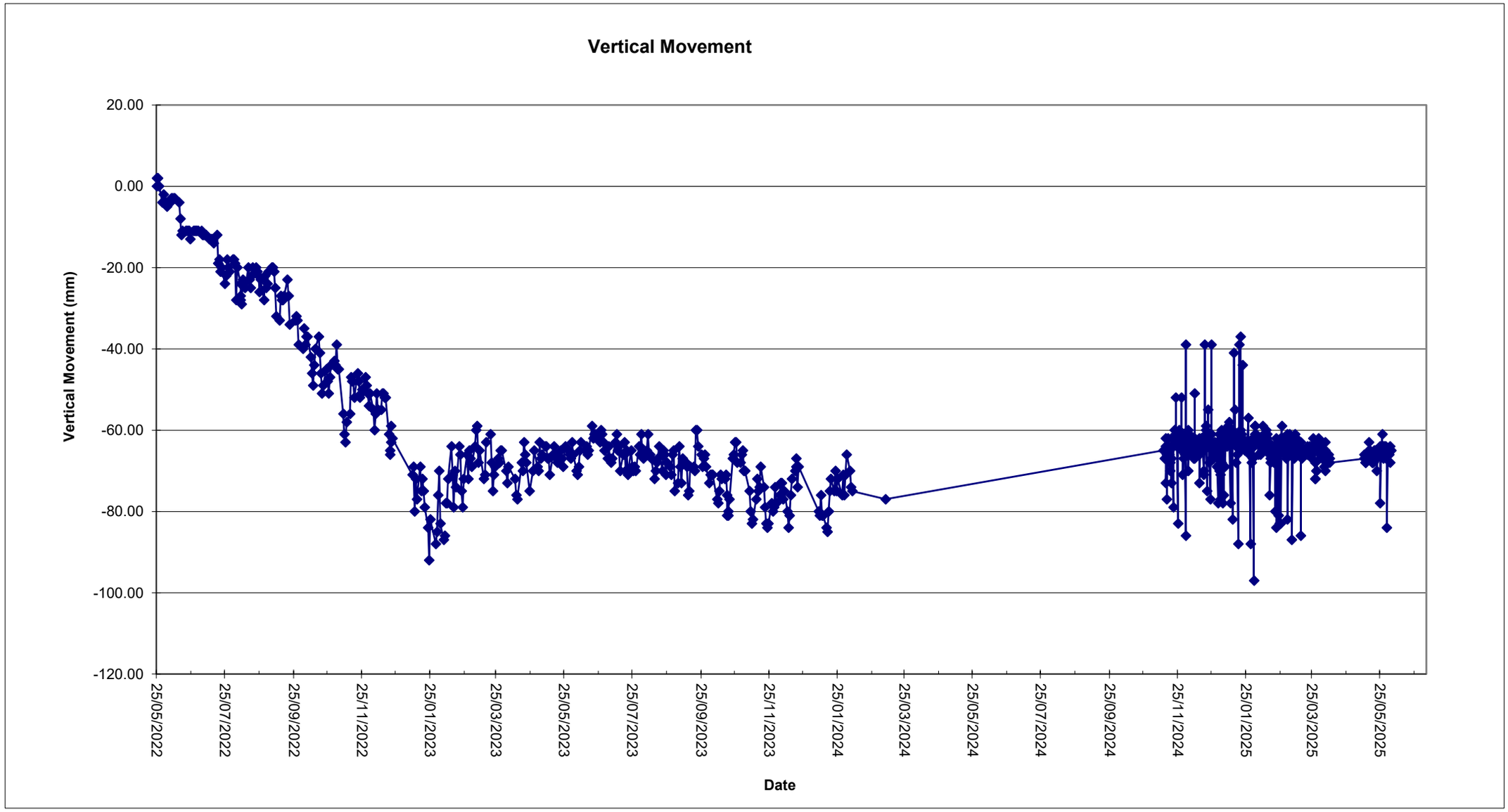
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM14

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D14

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM14



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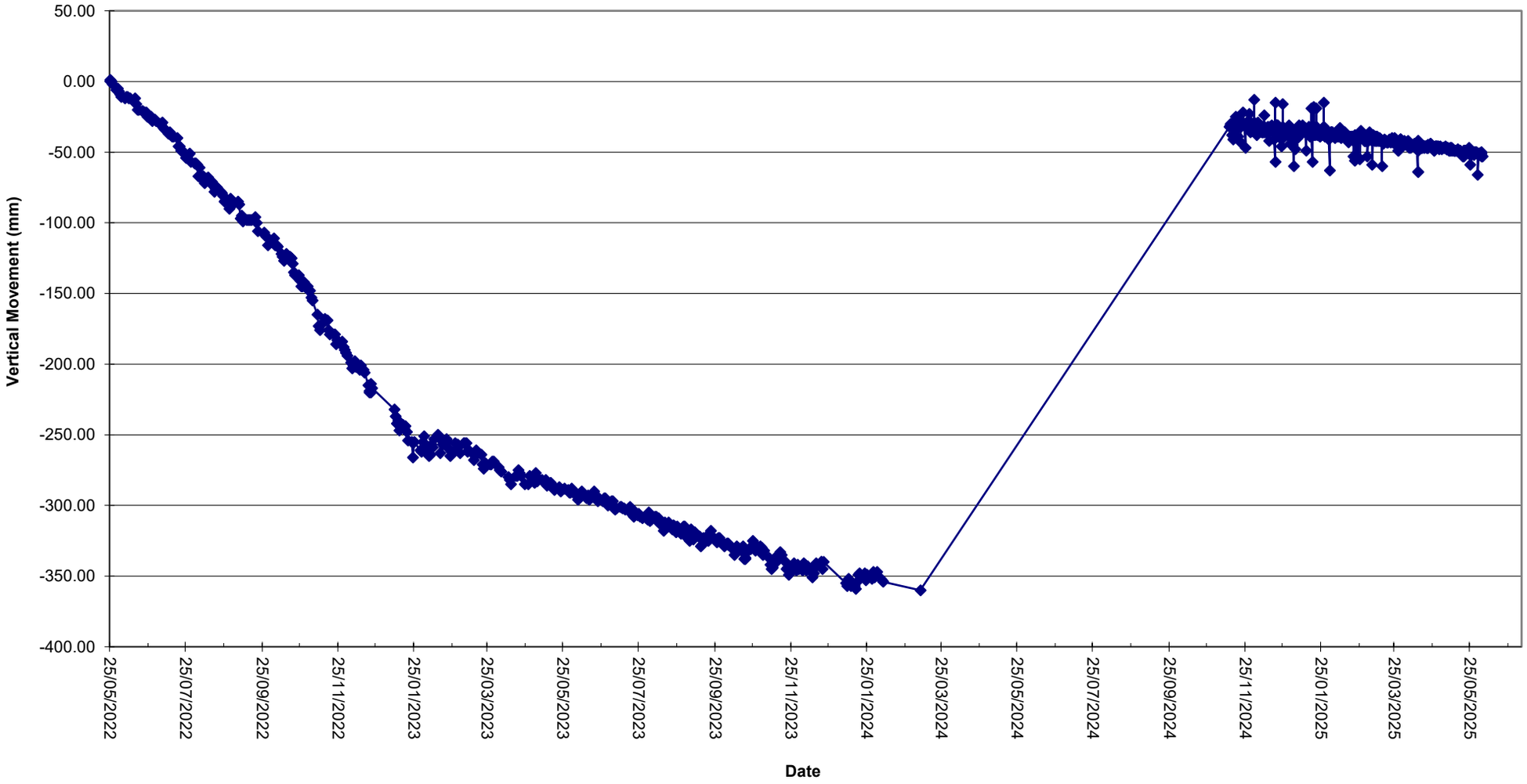
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM15

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D15

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2024 EOR INSPECTION

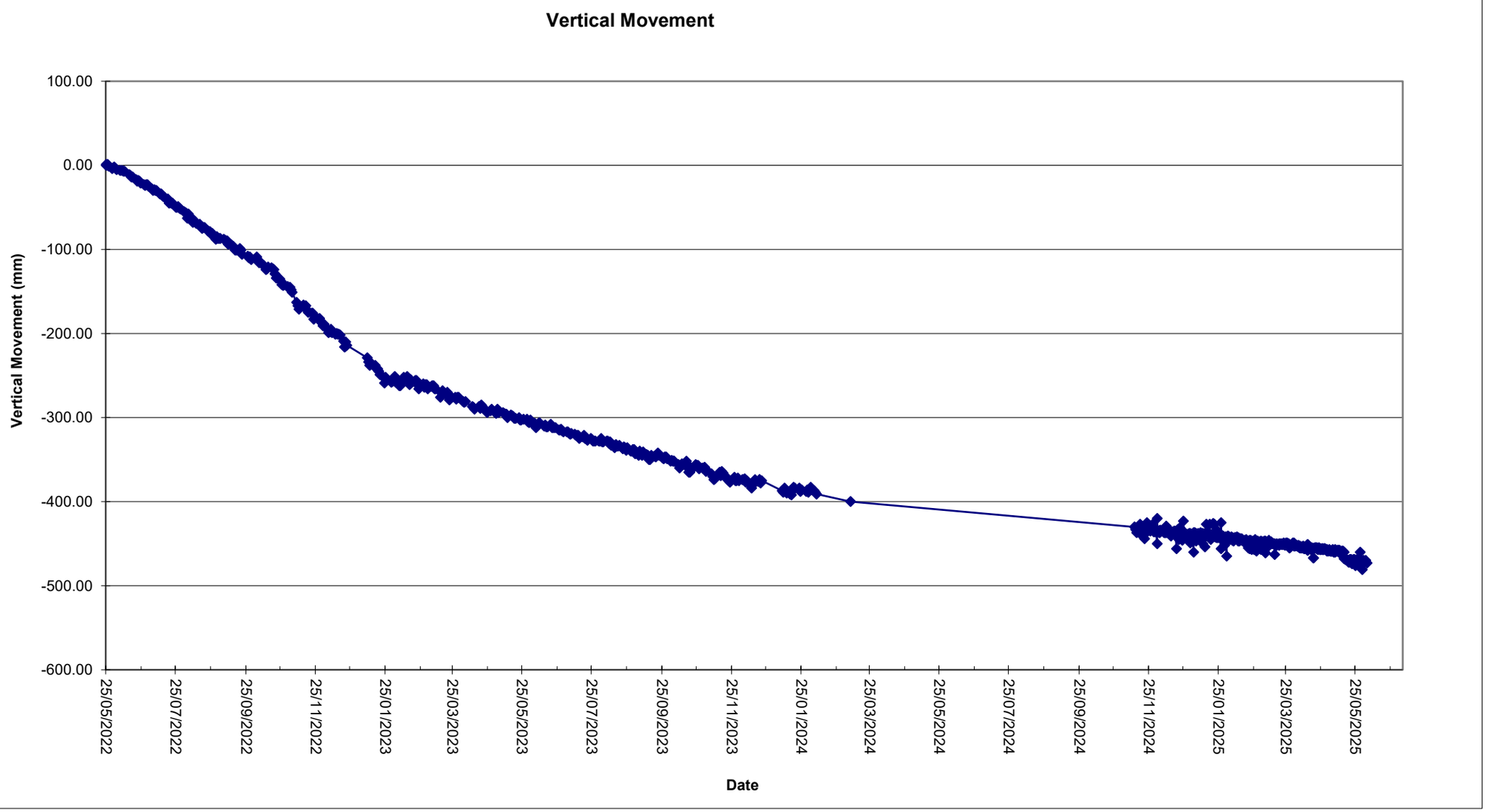
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM16

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D16

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM16



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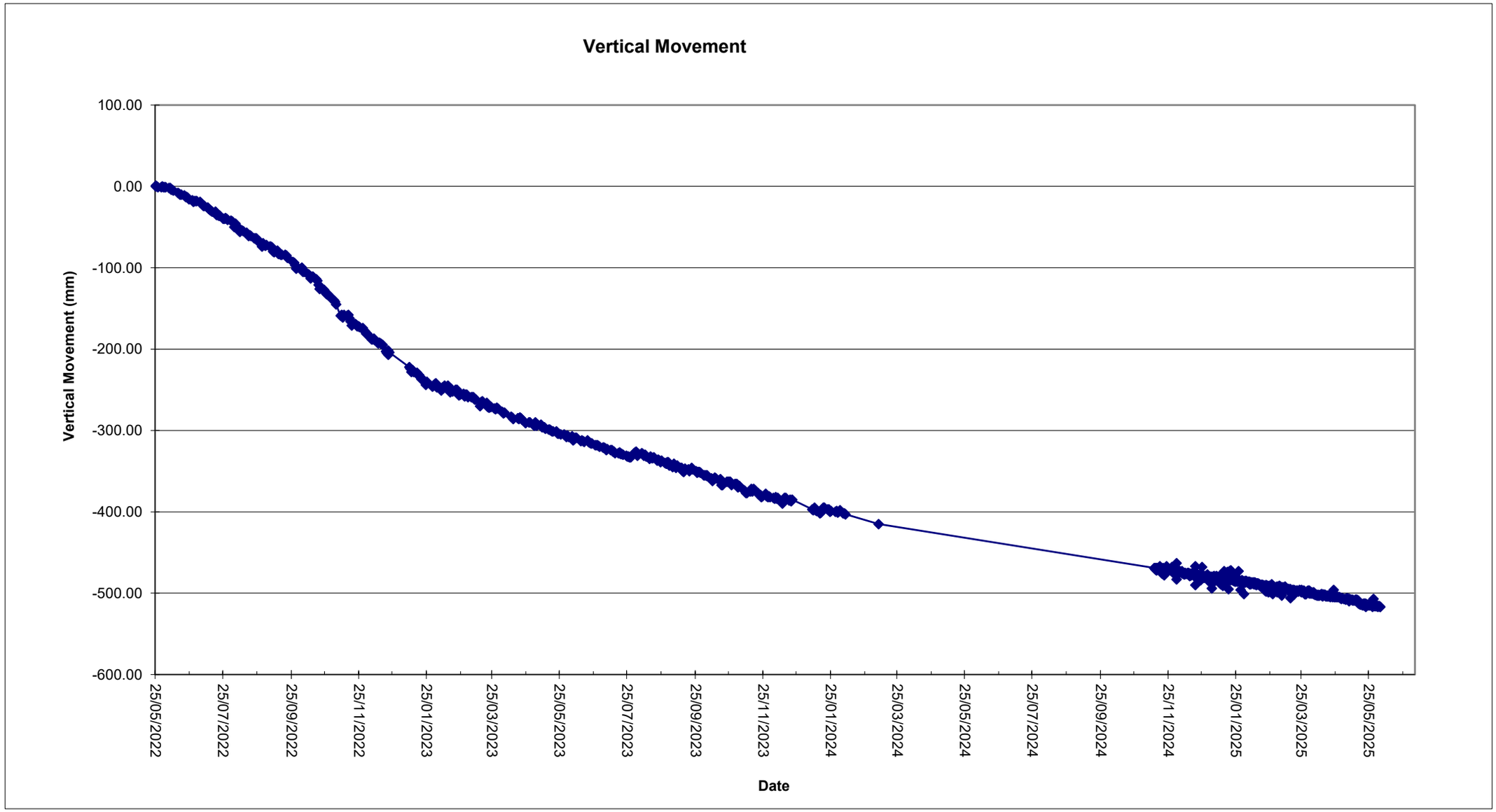
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2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM17

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D17**



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2024 EOR INSPECTION

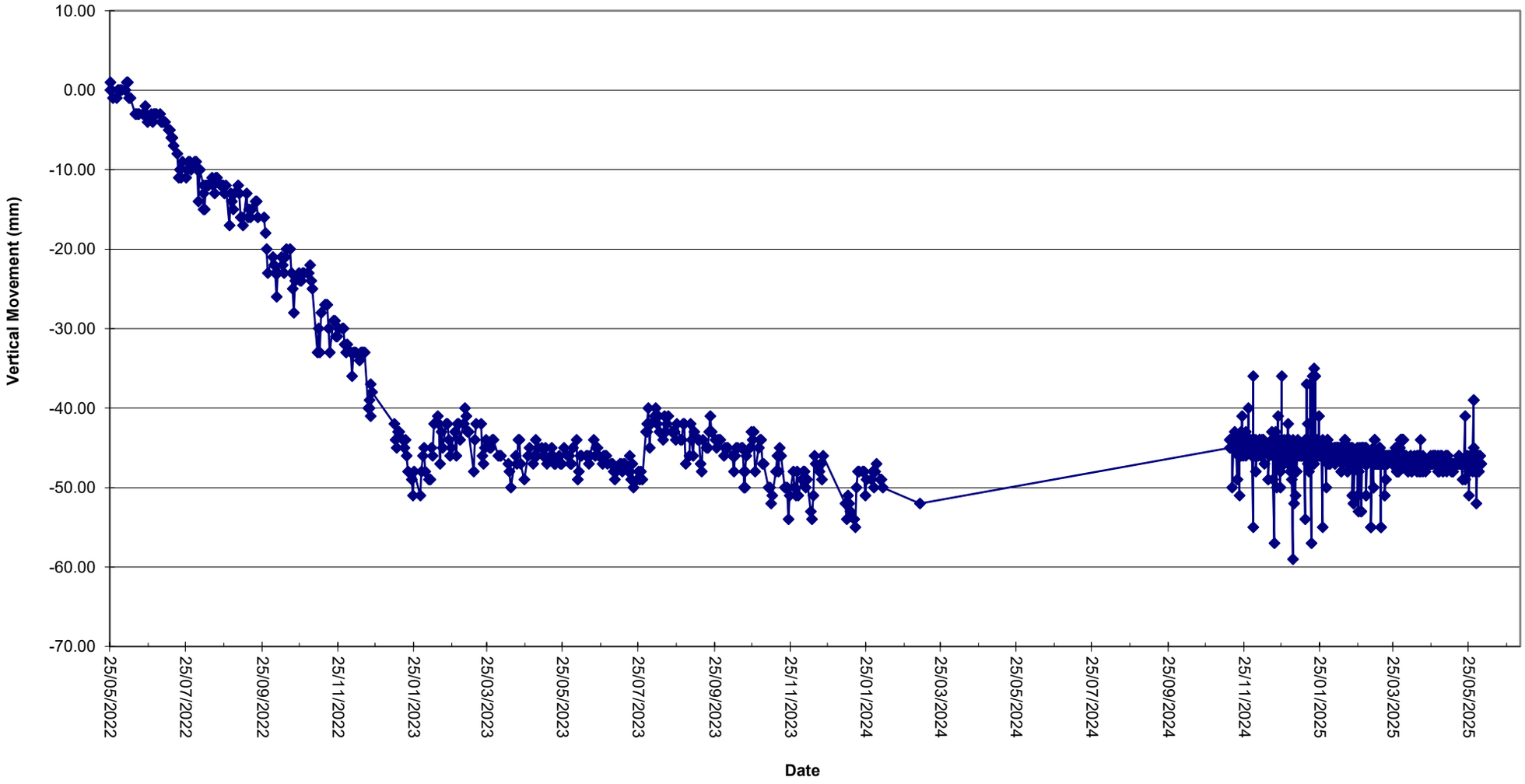
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM18

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D18

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM18



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2024 EOR INSPECTION

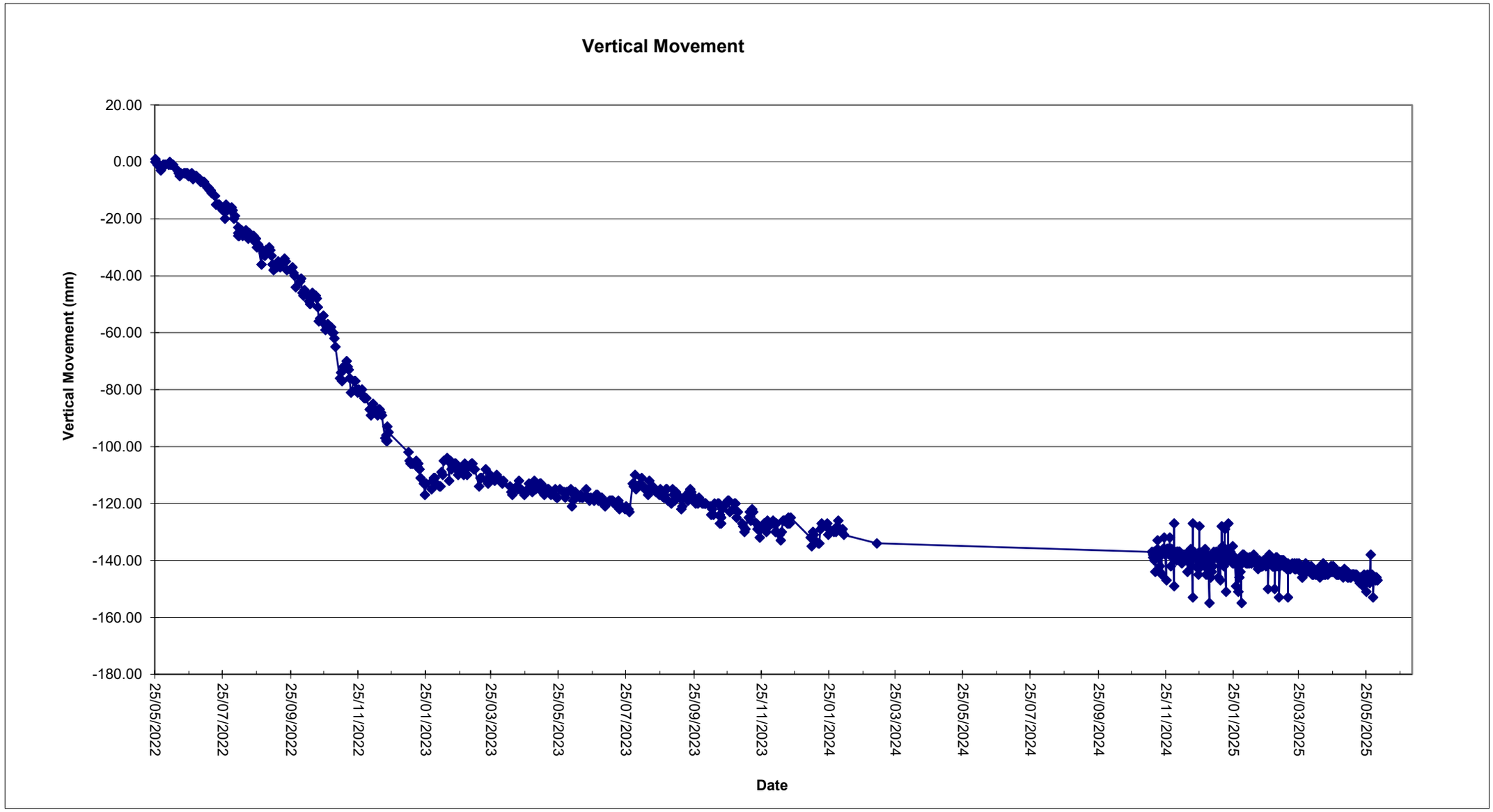
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM19

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D19

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM19



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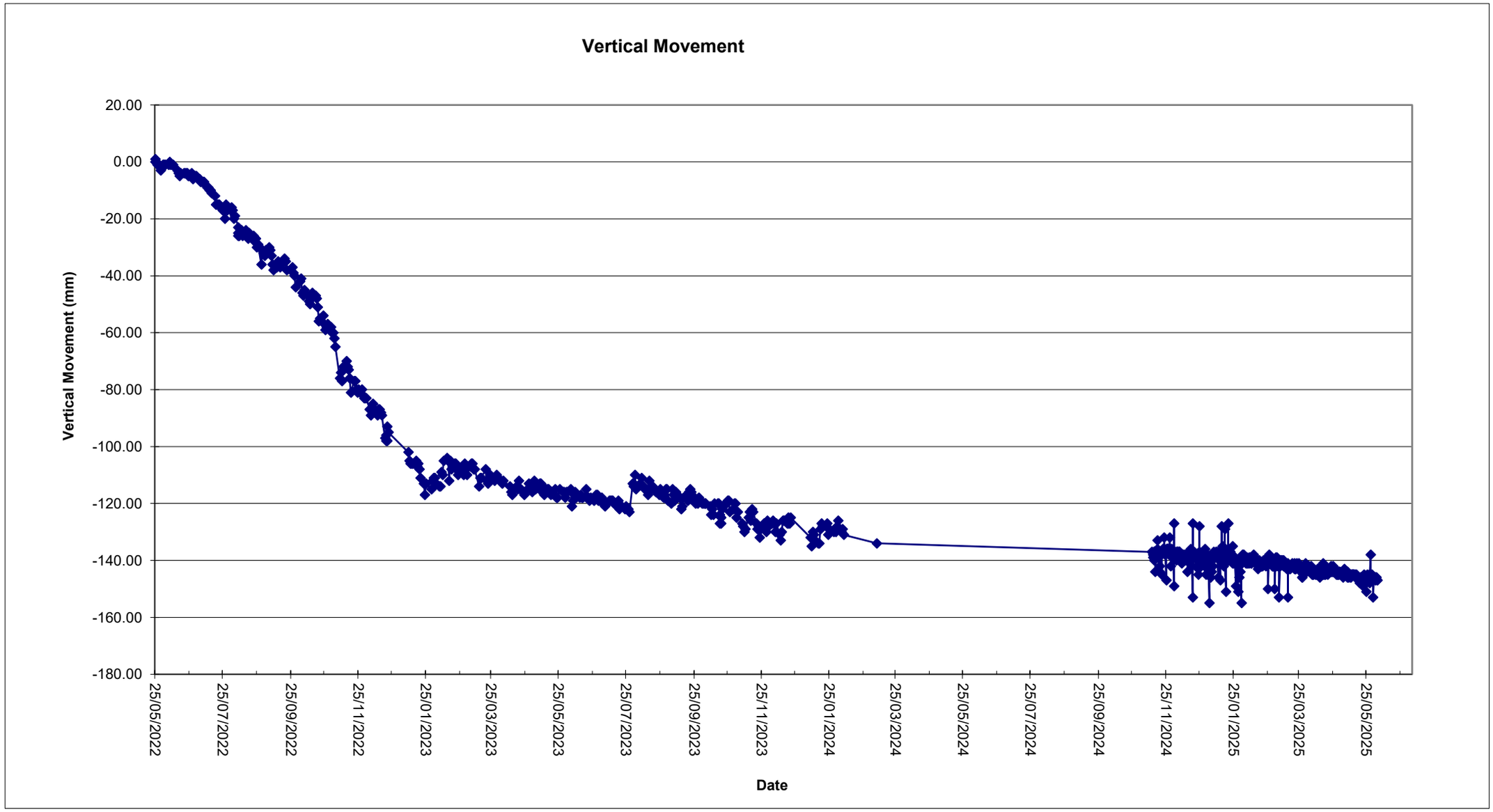
2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM20

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D20**

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM20



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2024 EOR INSPECTION

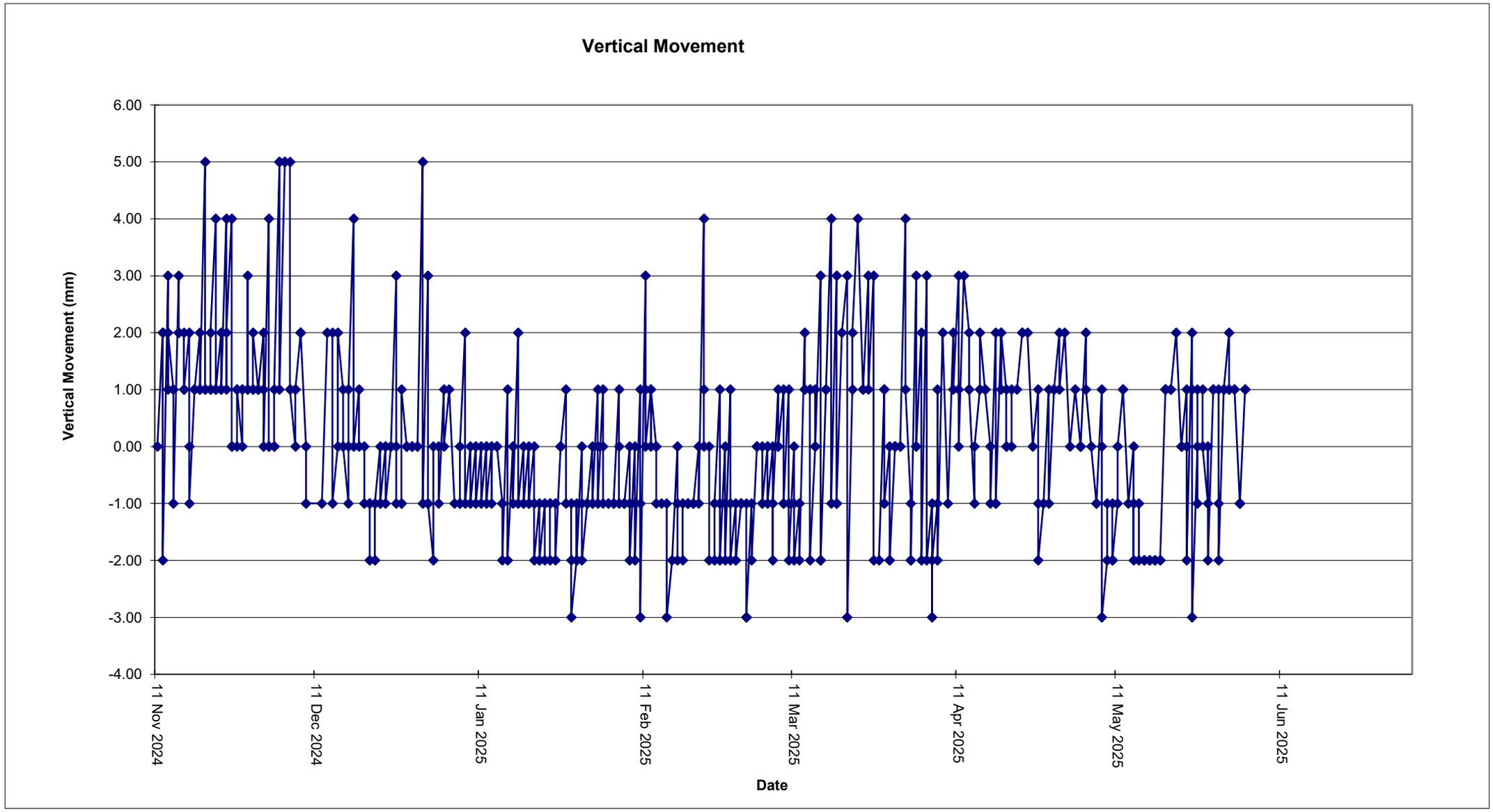
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SM21

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D21

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SM21



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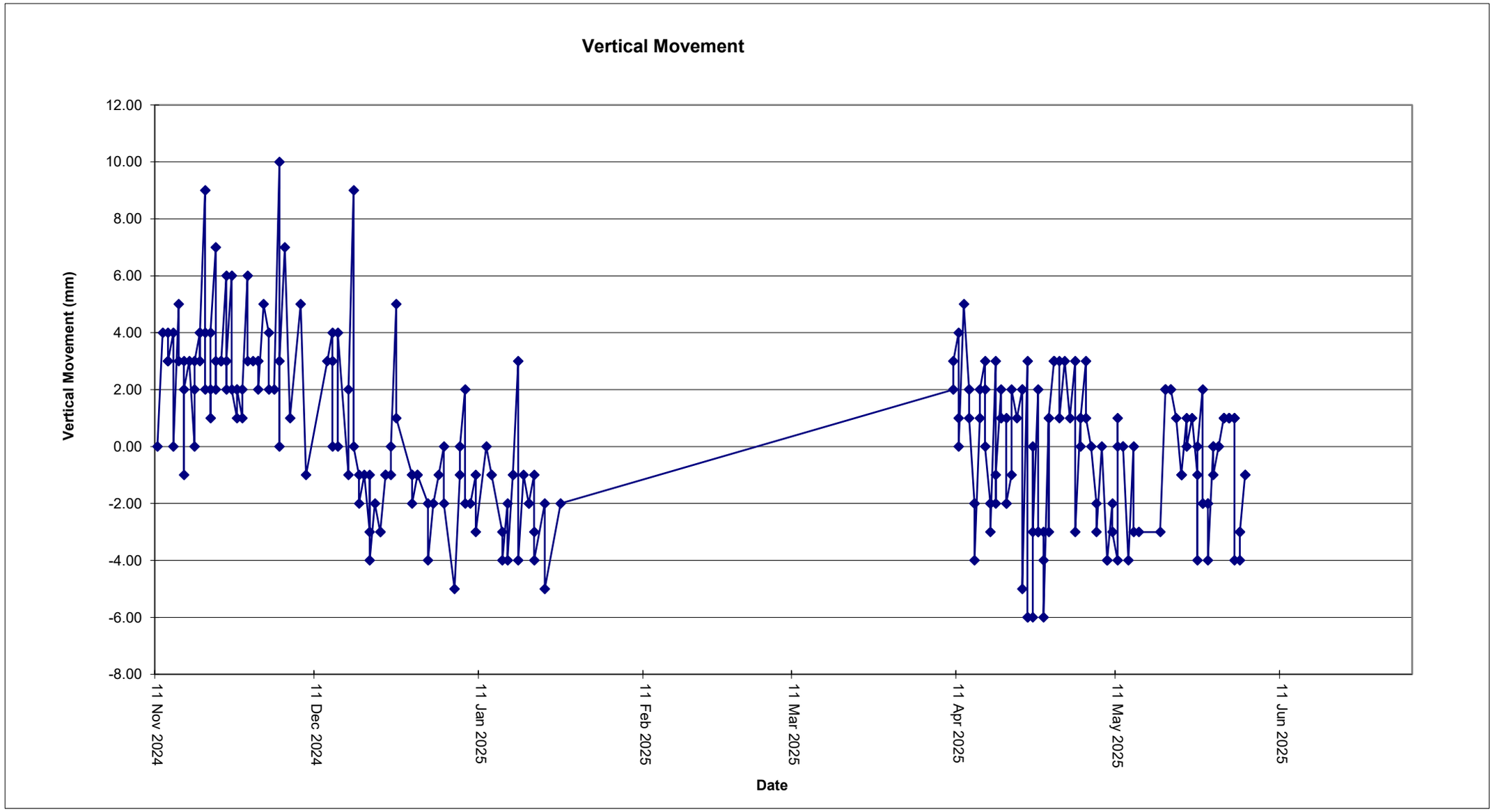
2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP06

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D22**

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP06



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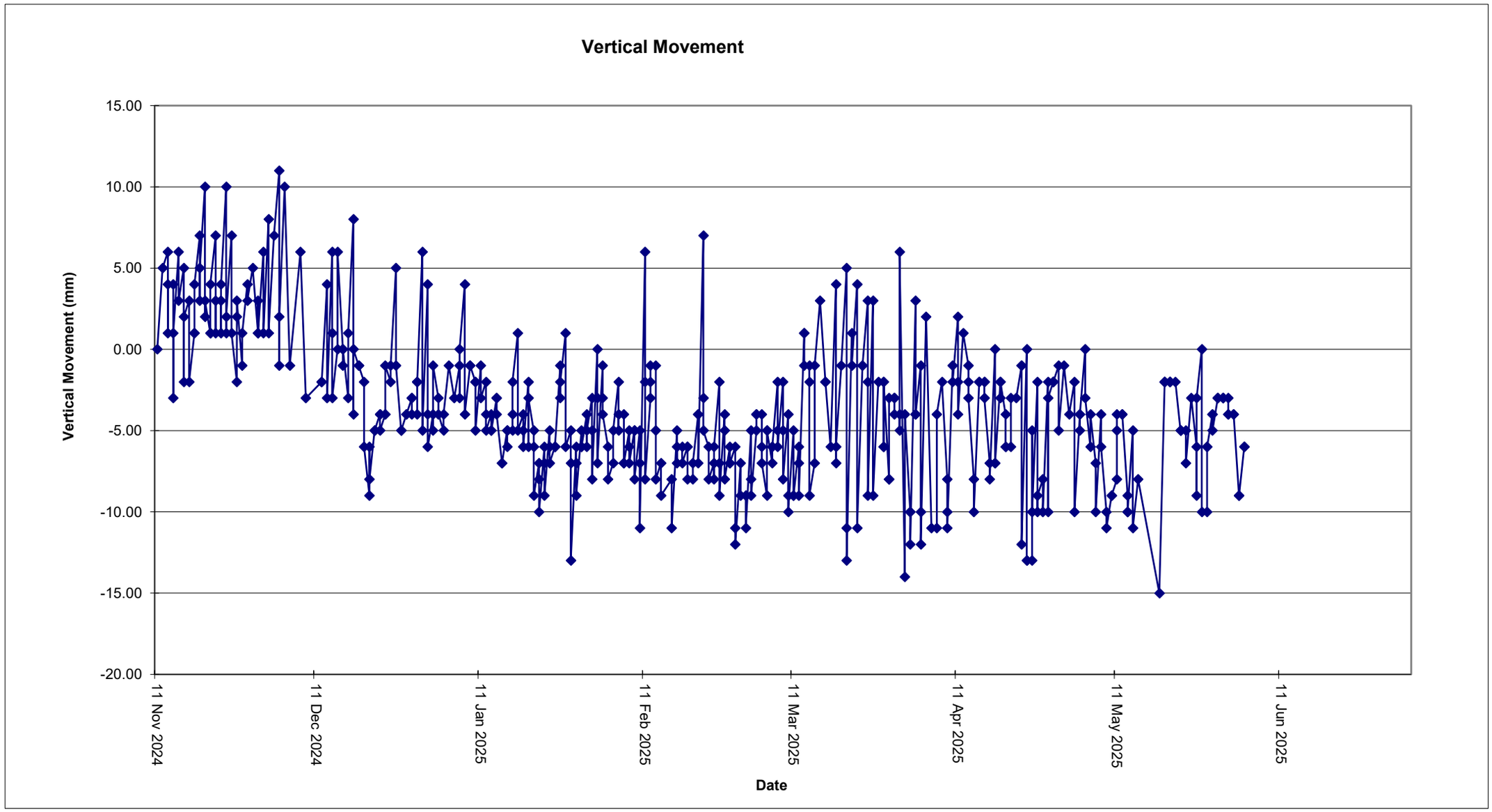
2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP07

Date:	23/07/2025	**Job No:**	107031.126	**FIGURE D23**

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP07



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2024 EOR INSPECTION

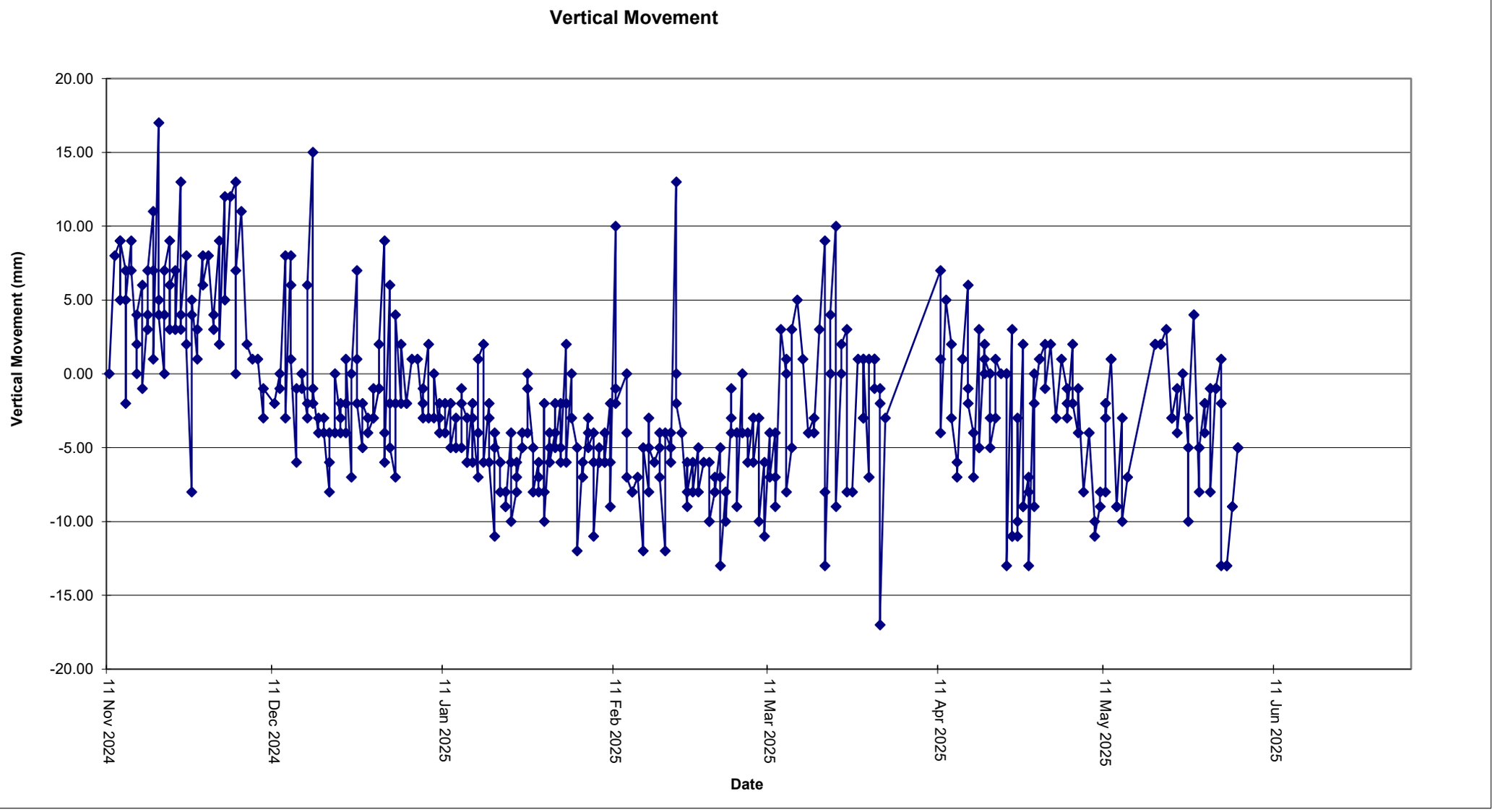
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP08

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D24

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP08



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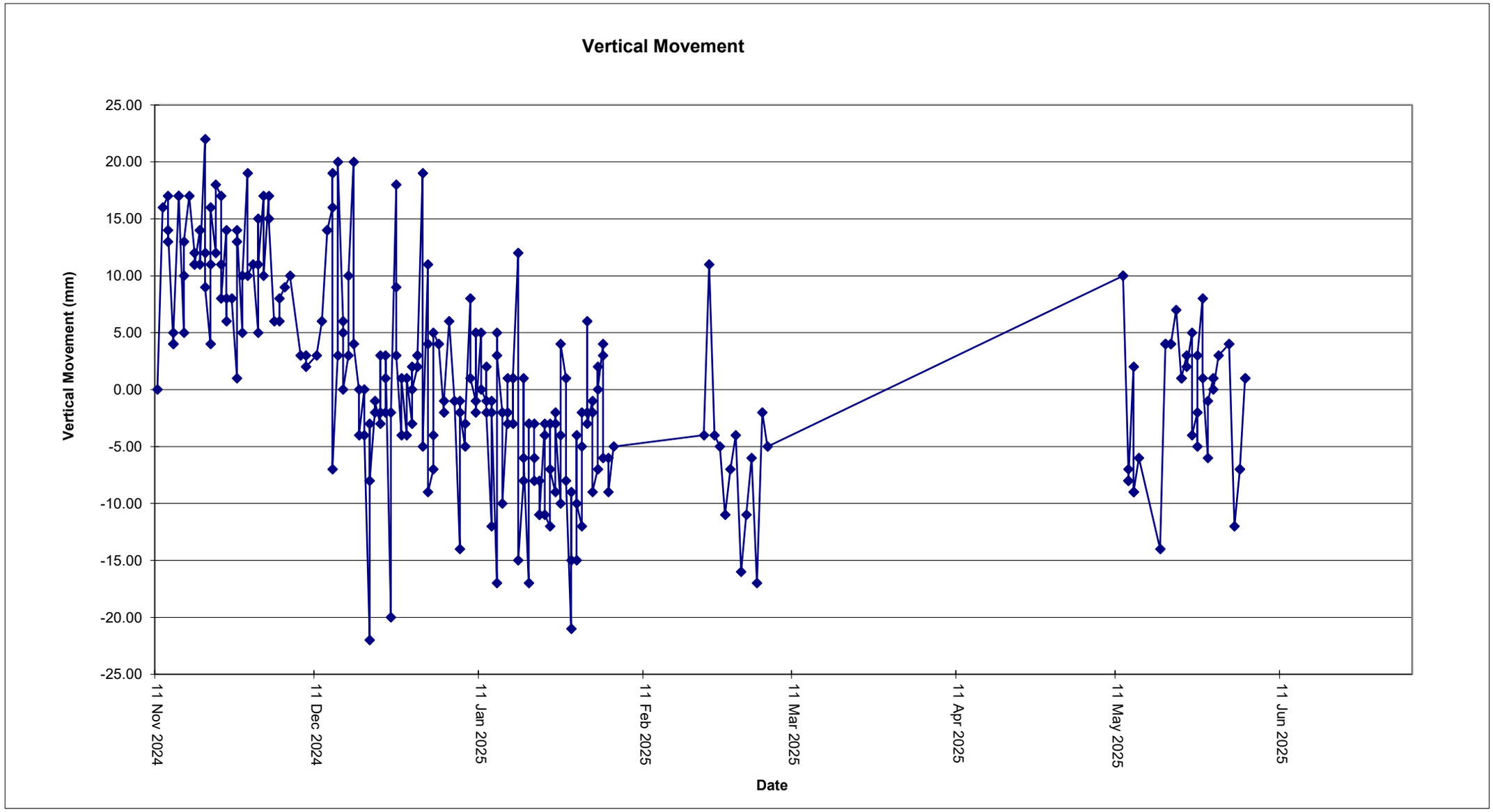
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP09

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D25

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP09



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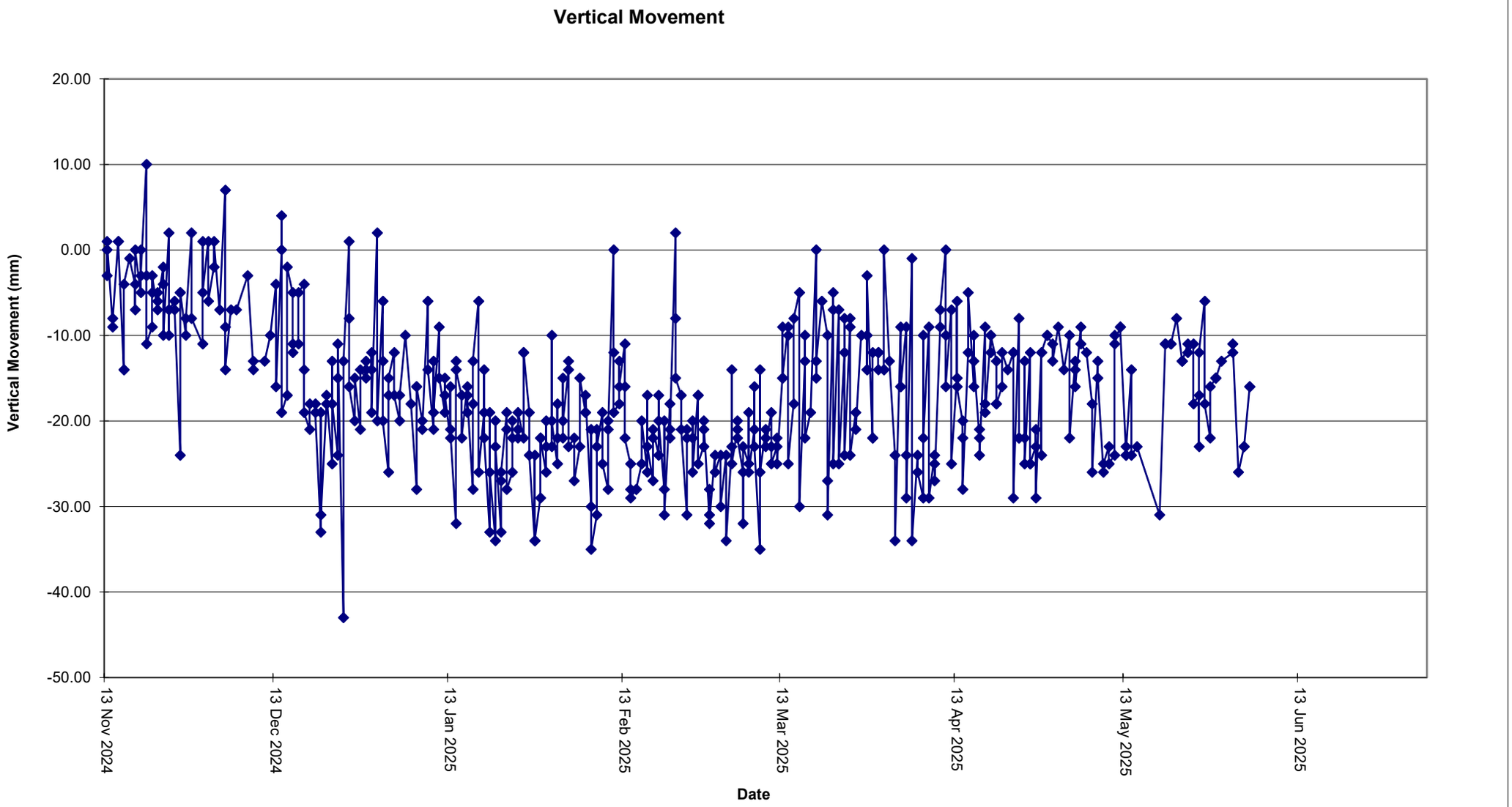
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP10

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D26

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP10



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2024 EOR INSPECTION

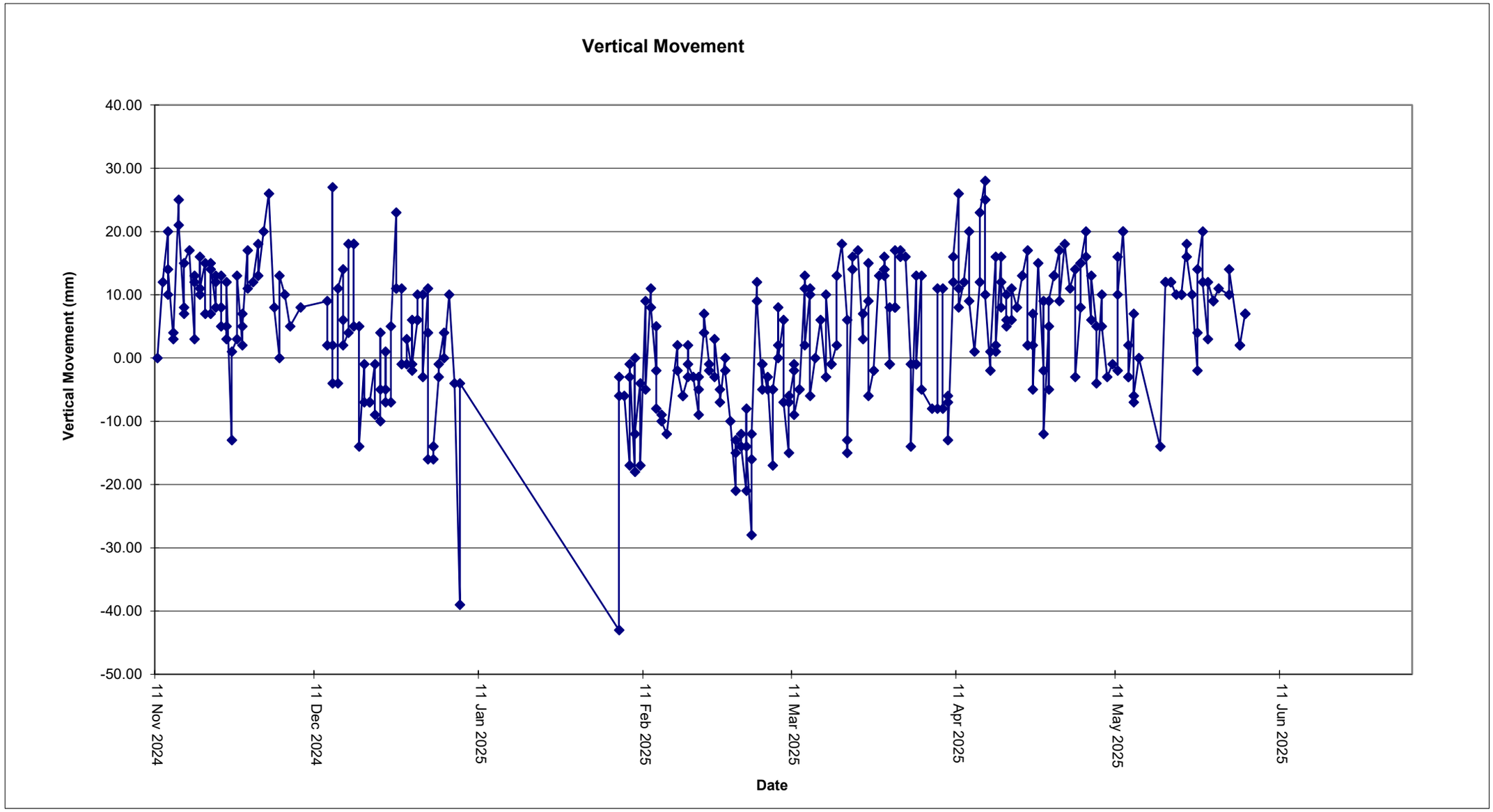
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP11

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D27

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP11



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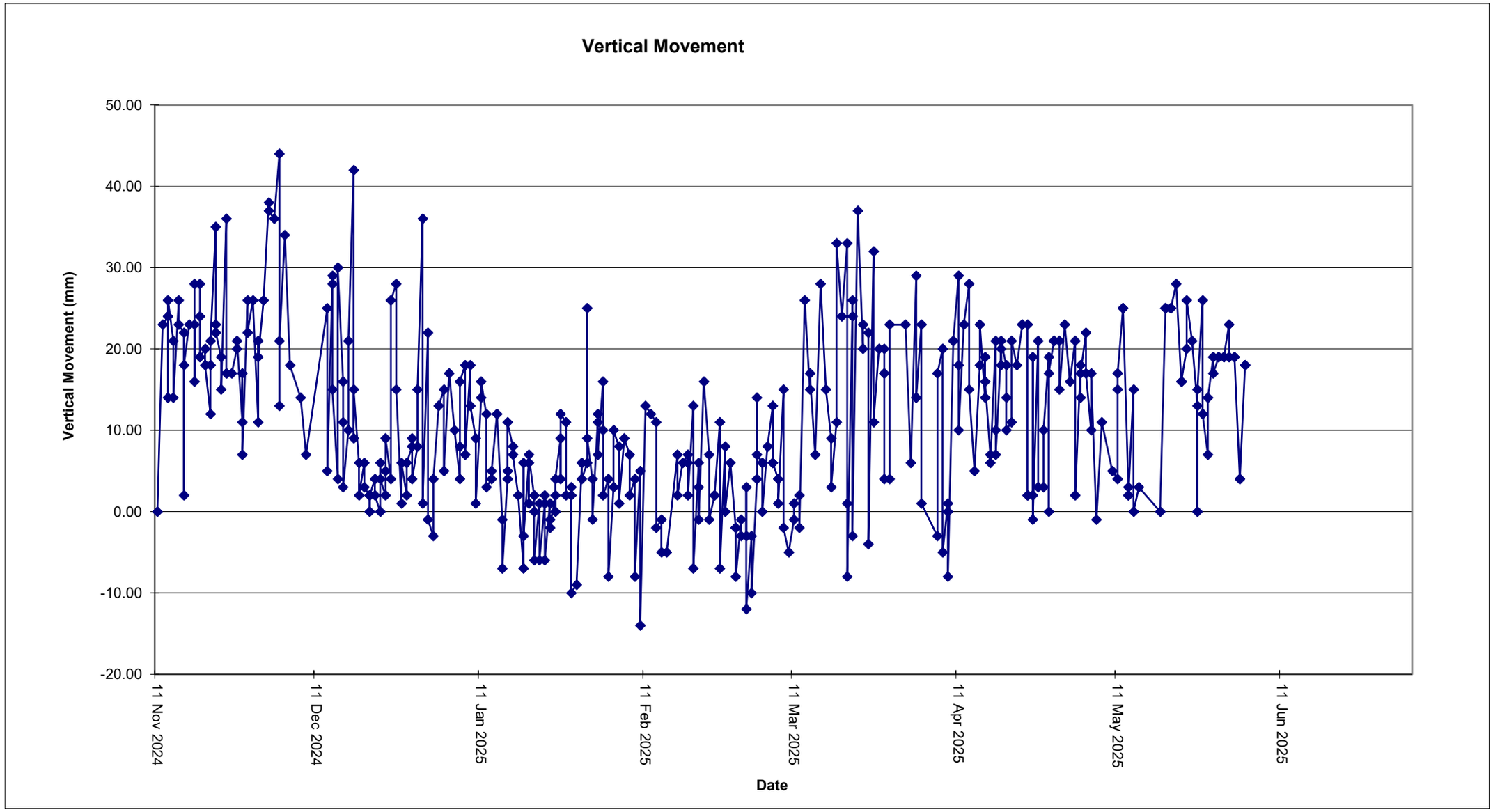
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP12

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D28

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP12



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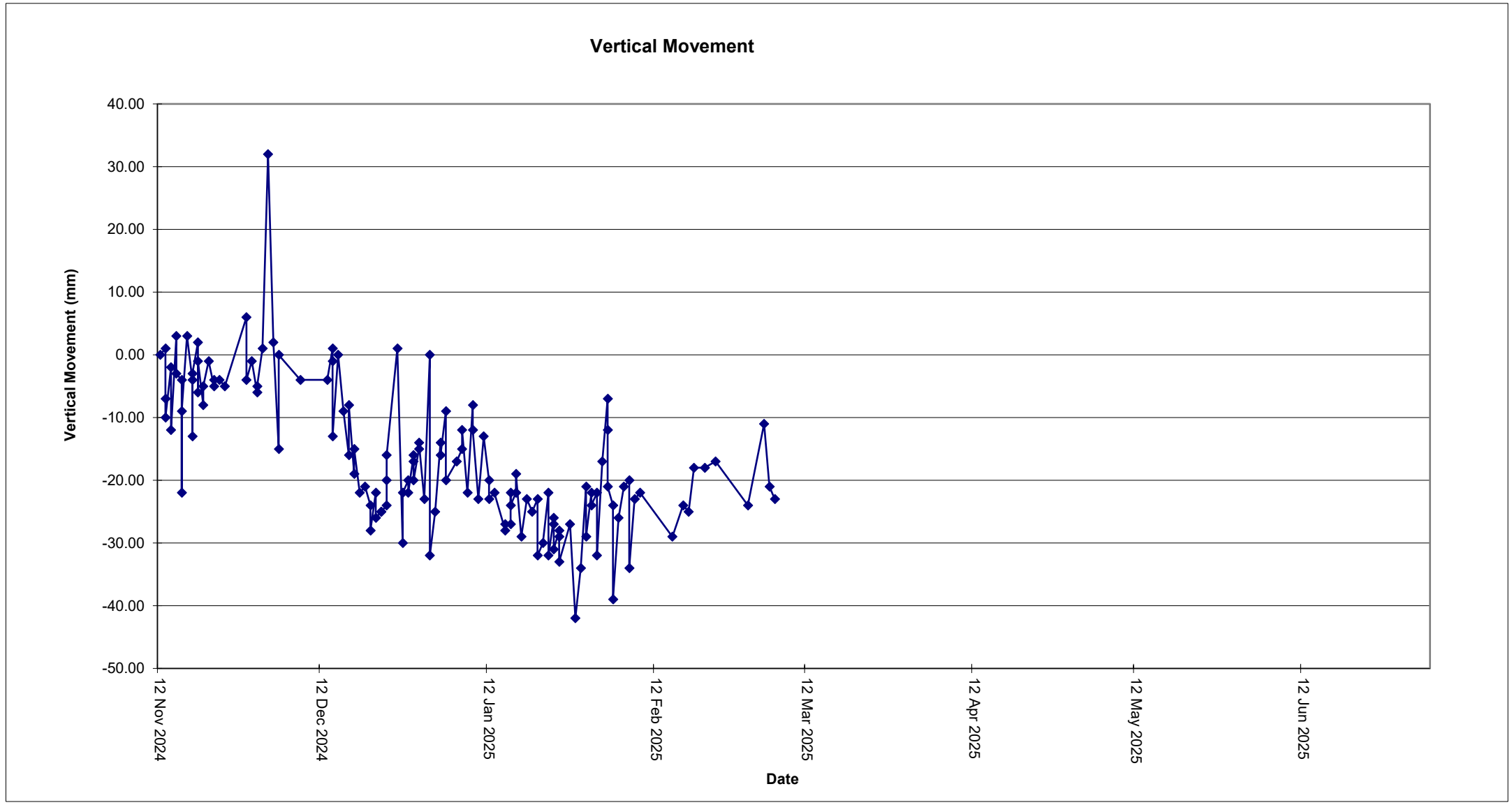
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP13

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D29

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D1-D29 - NE.xlsx Figure SP13



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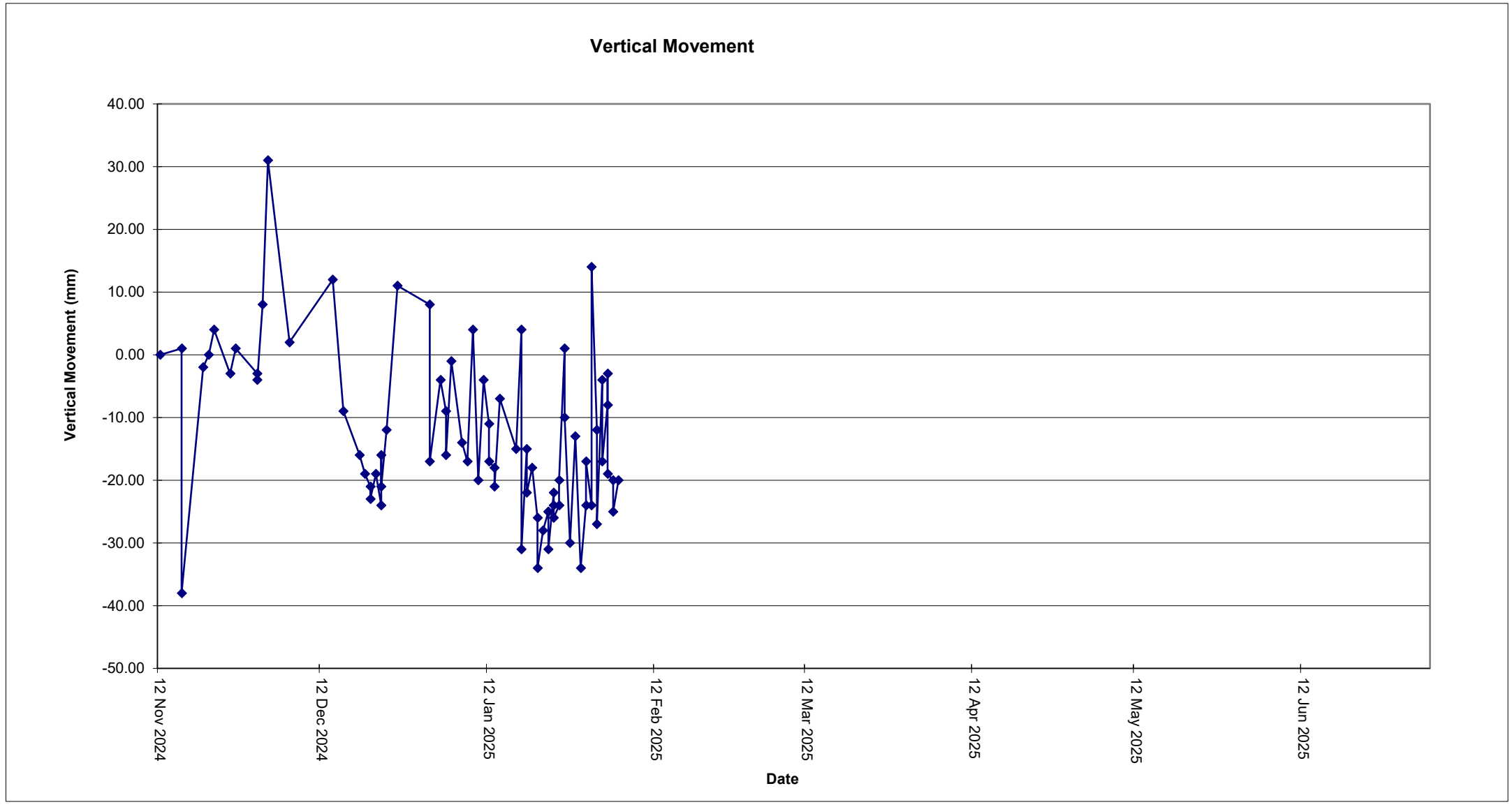
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP14

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D30

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP14



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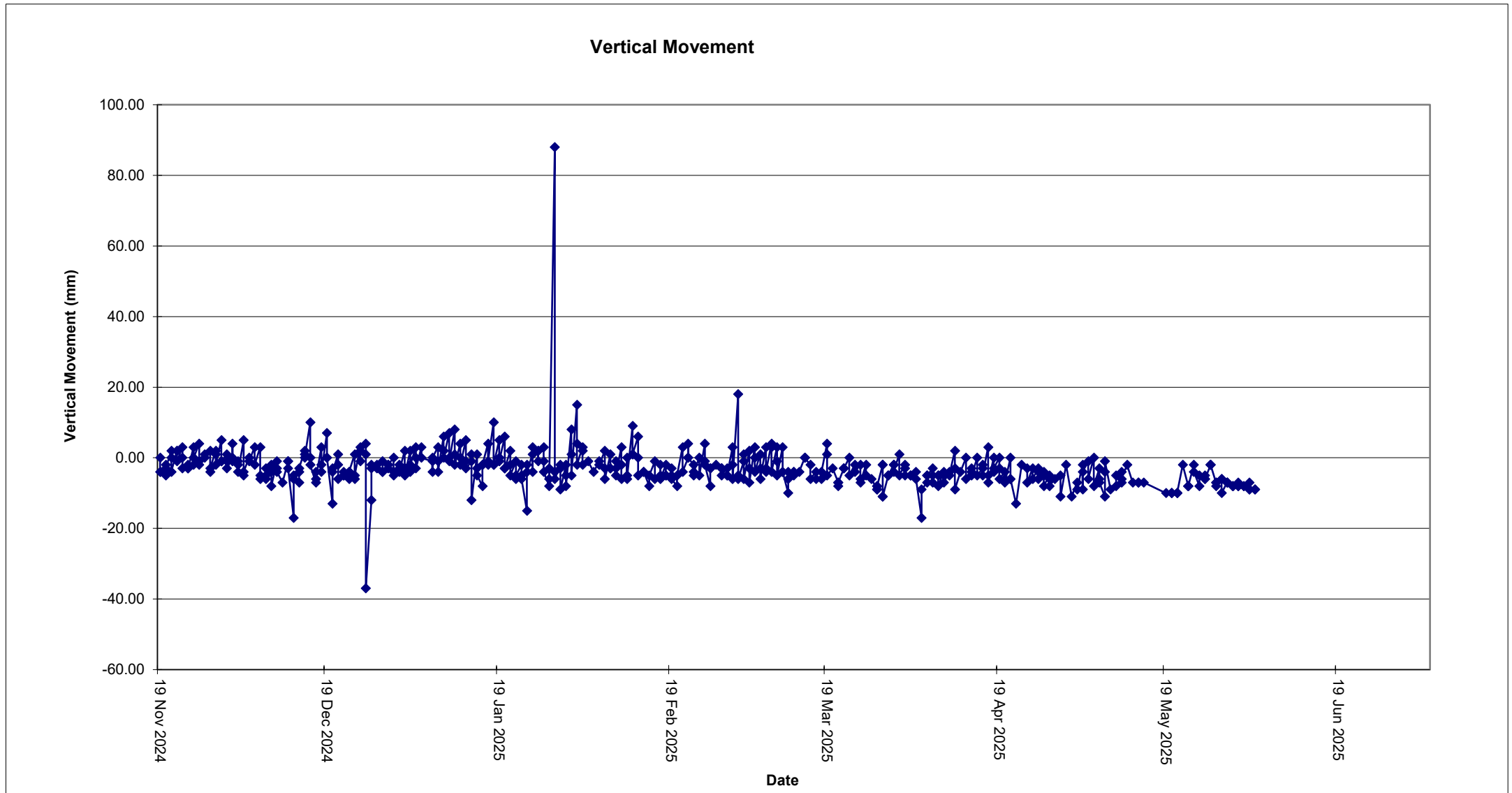
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP15

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D31

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP15



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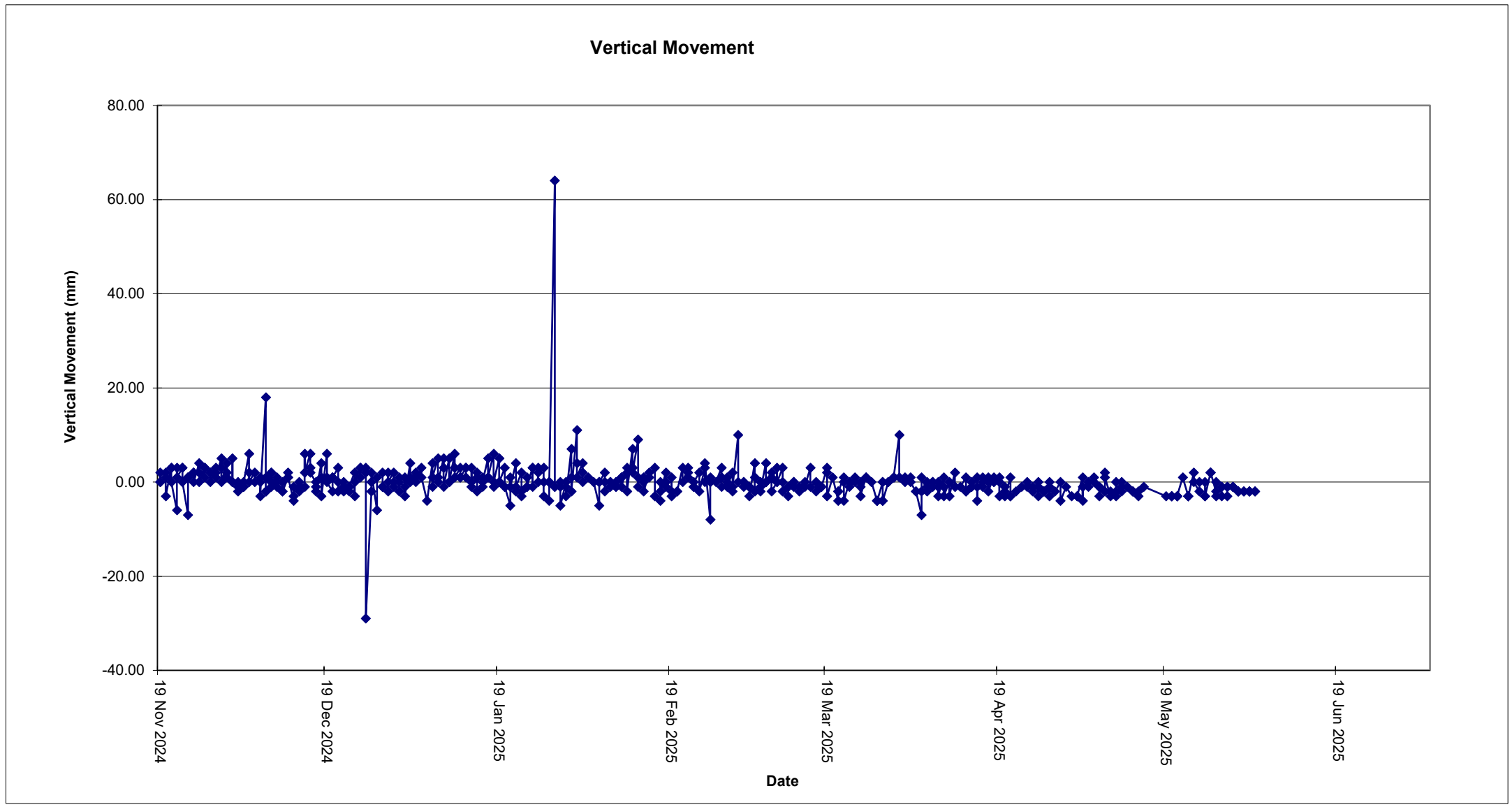
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP16

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D32

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP16



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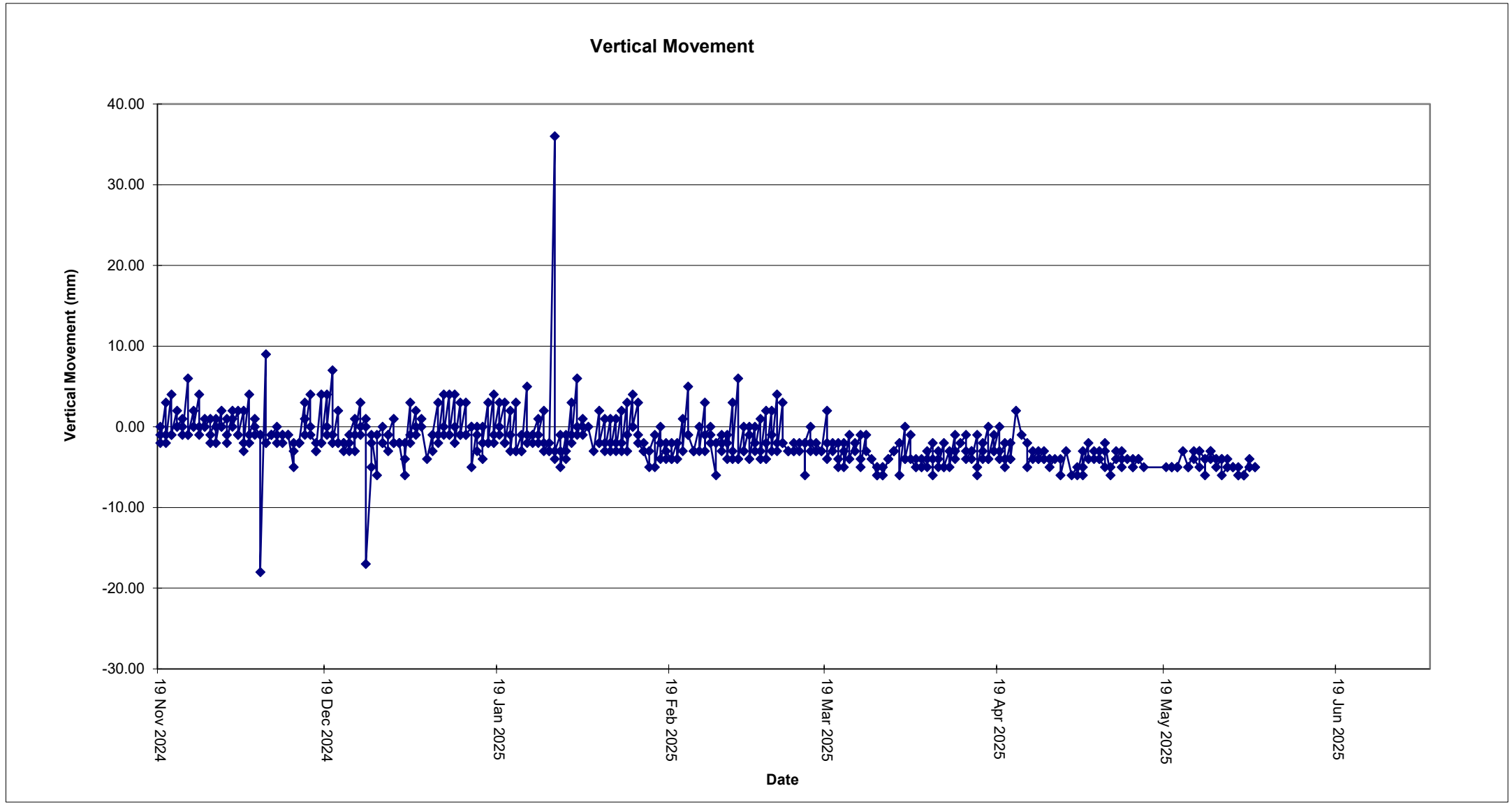
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP17

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D33

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP17



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2024 EOR INSPECTION

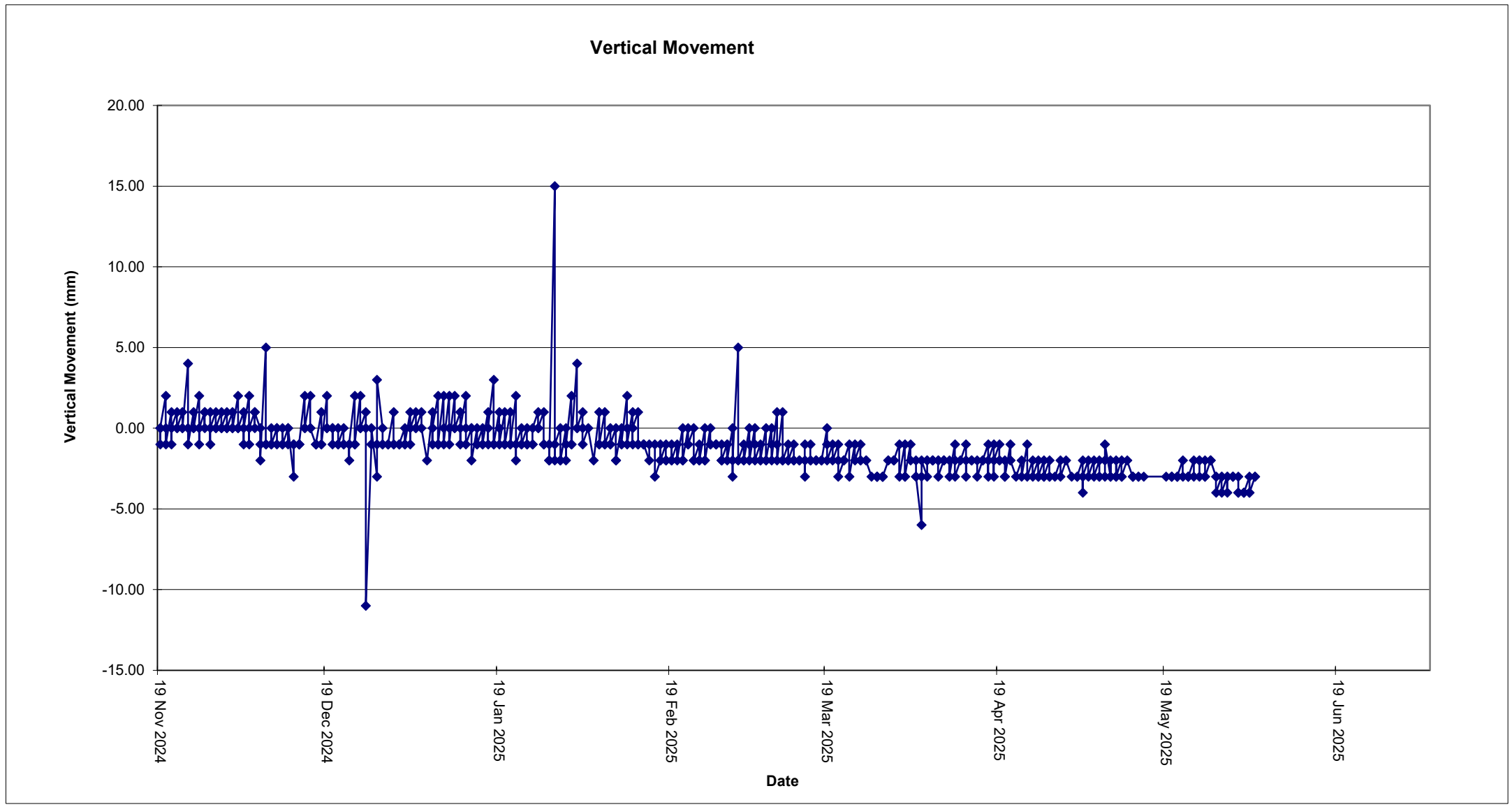
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP18

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D34

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP18



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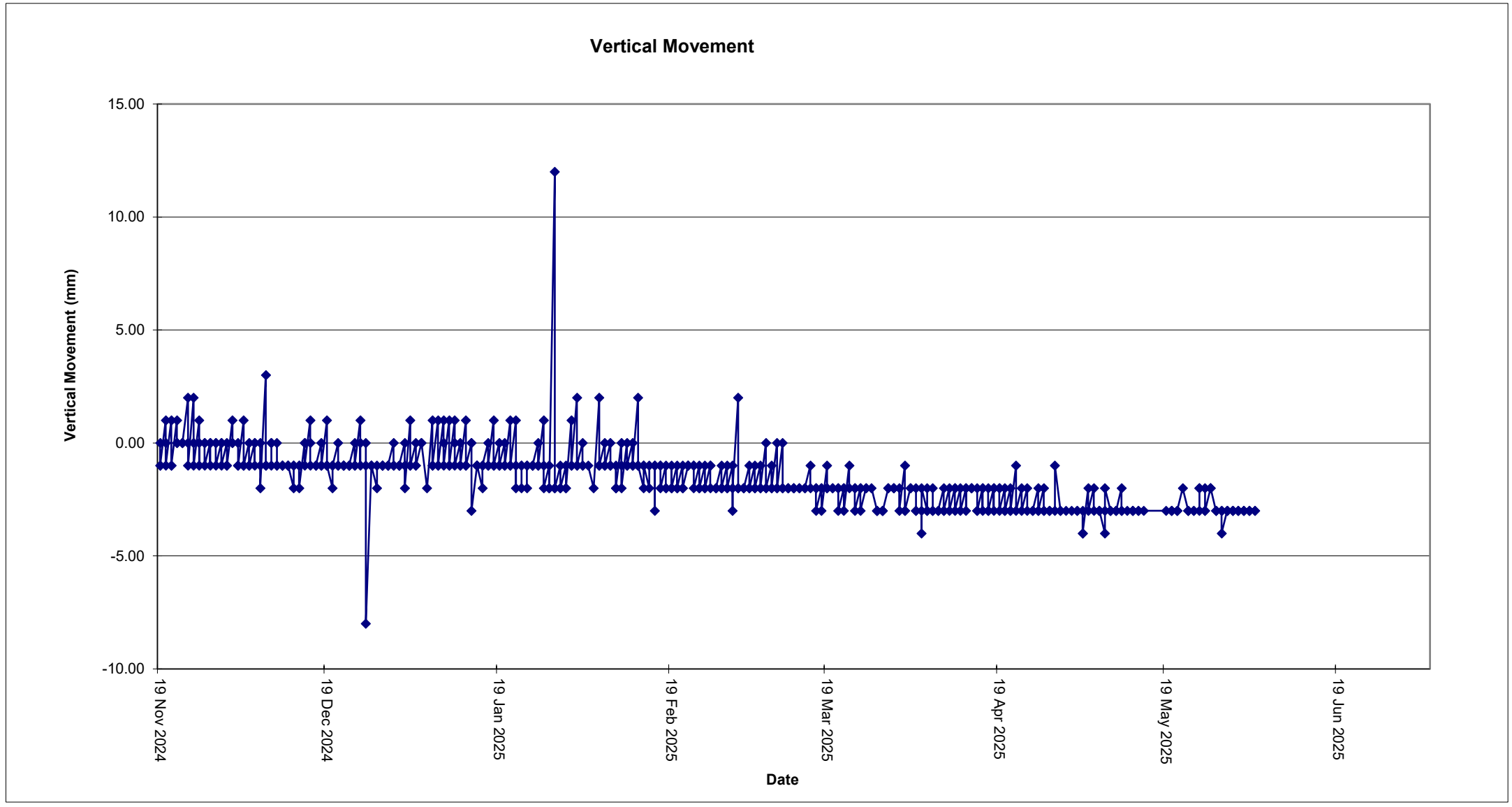
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP19

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D35

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP19



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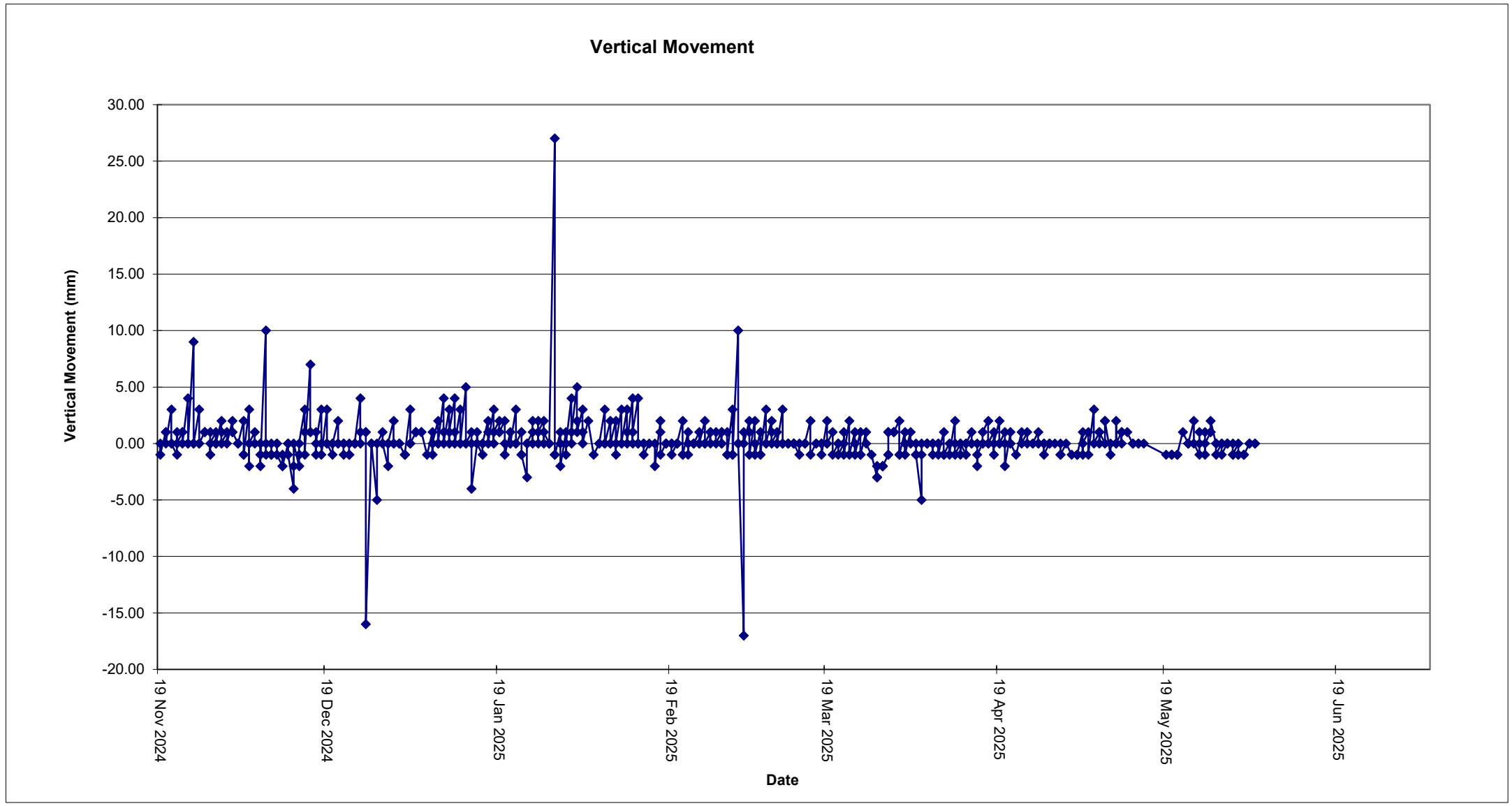
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP20

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D36

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP20



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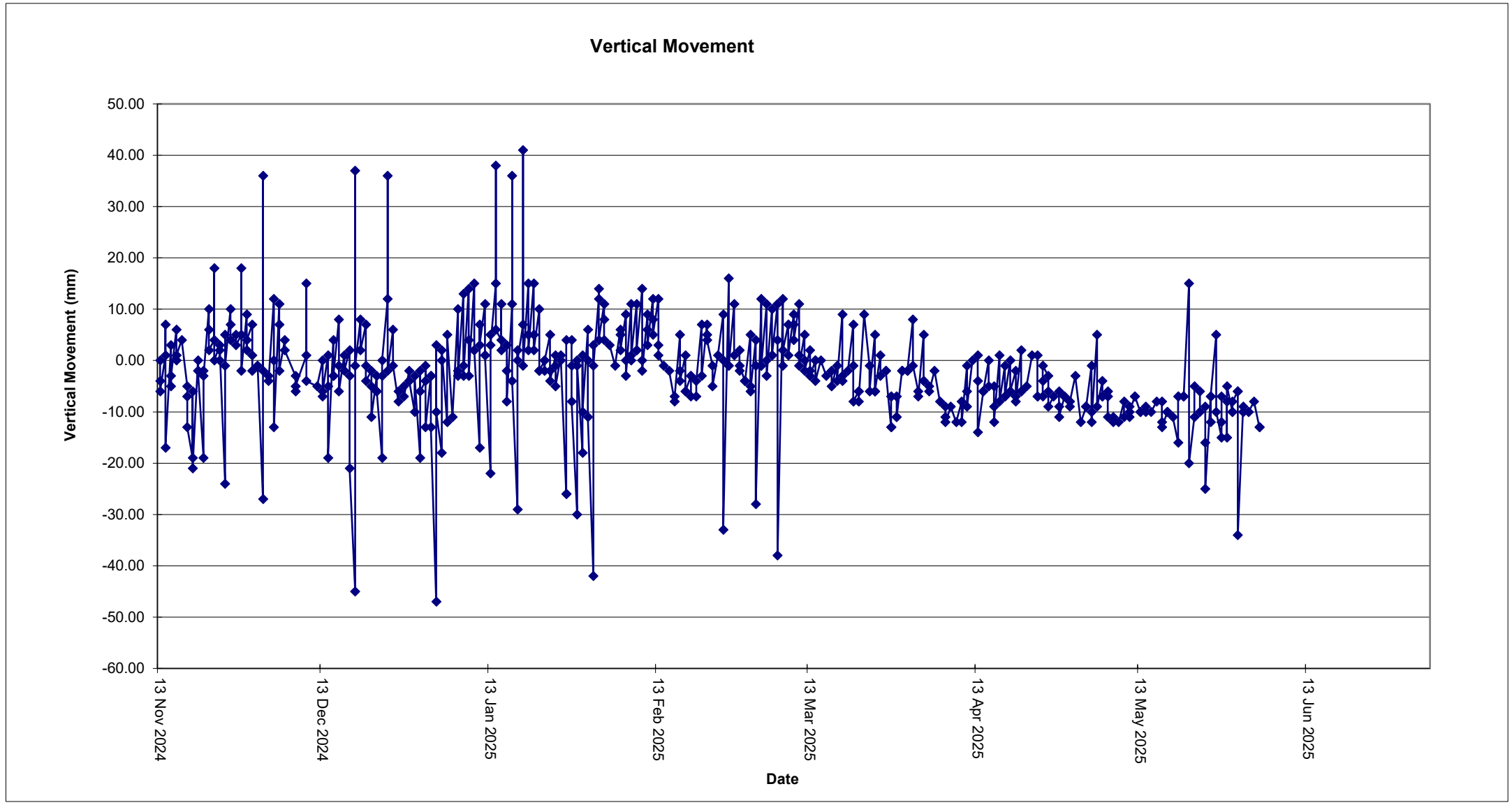
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP21

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D37

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP21



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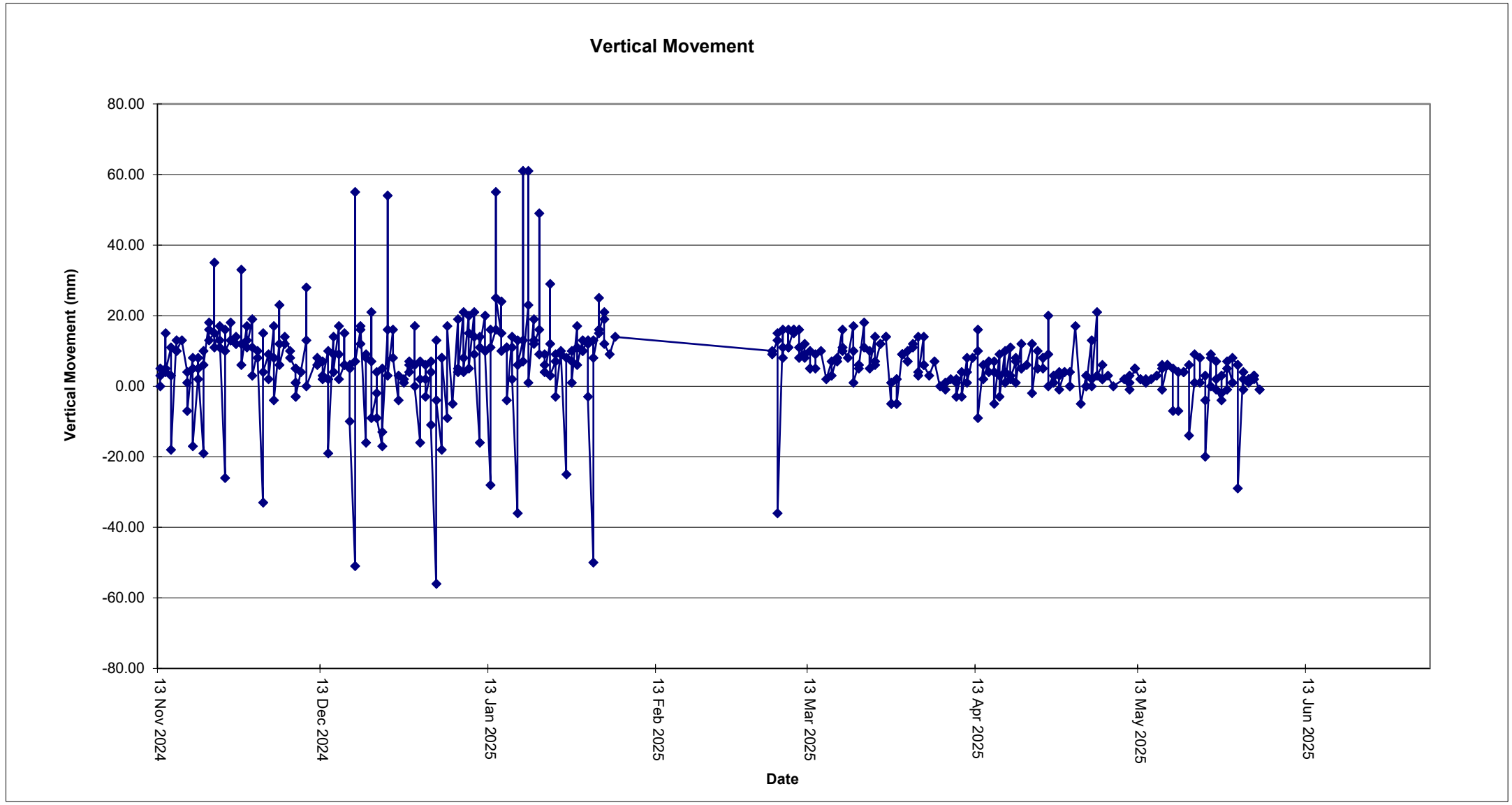
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP37

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D38

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP37



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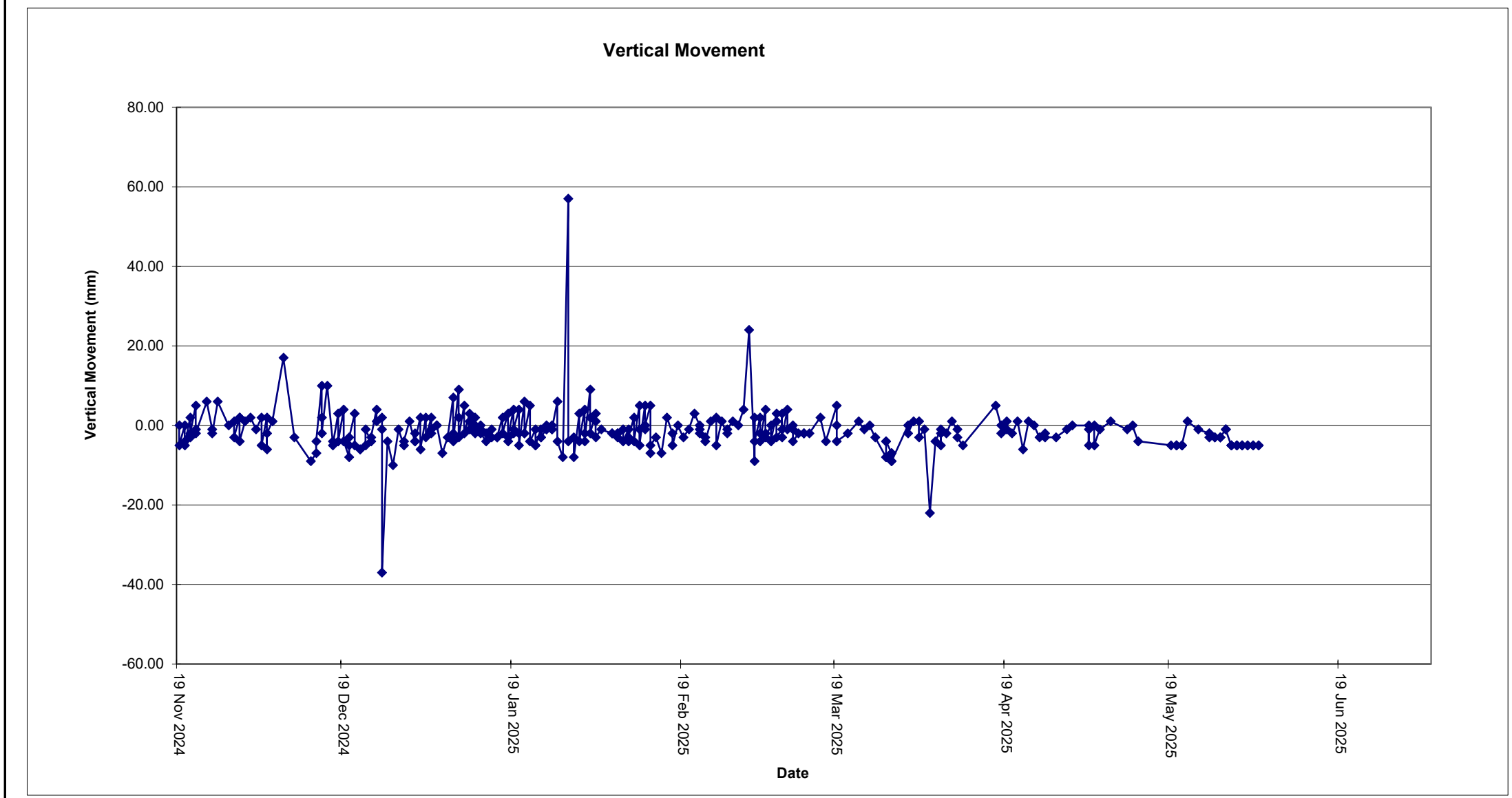
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP38

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D39

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP38



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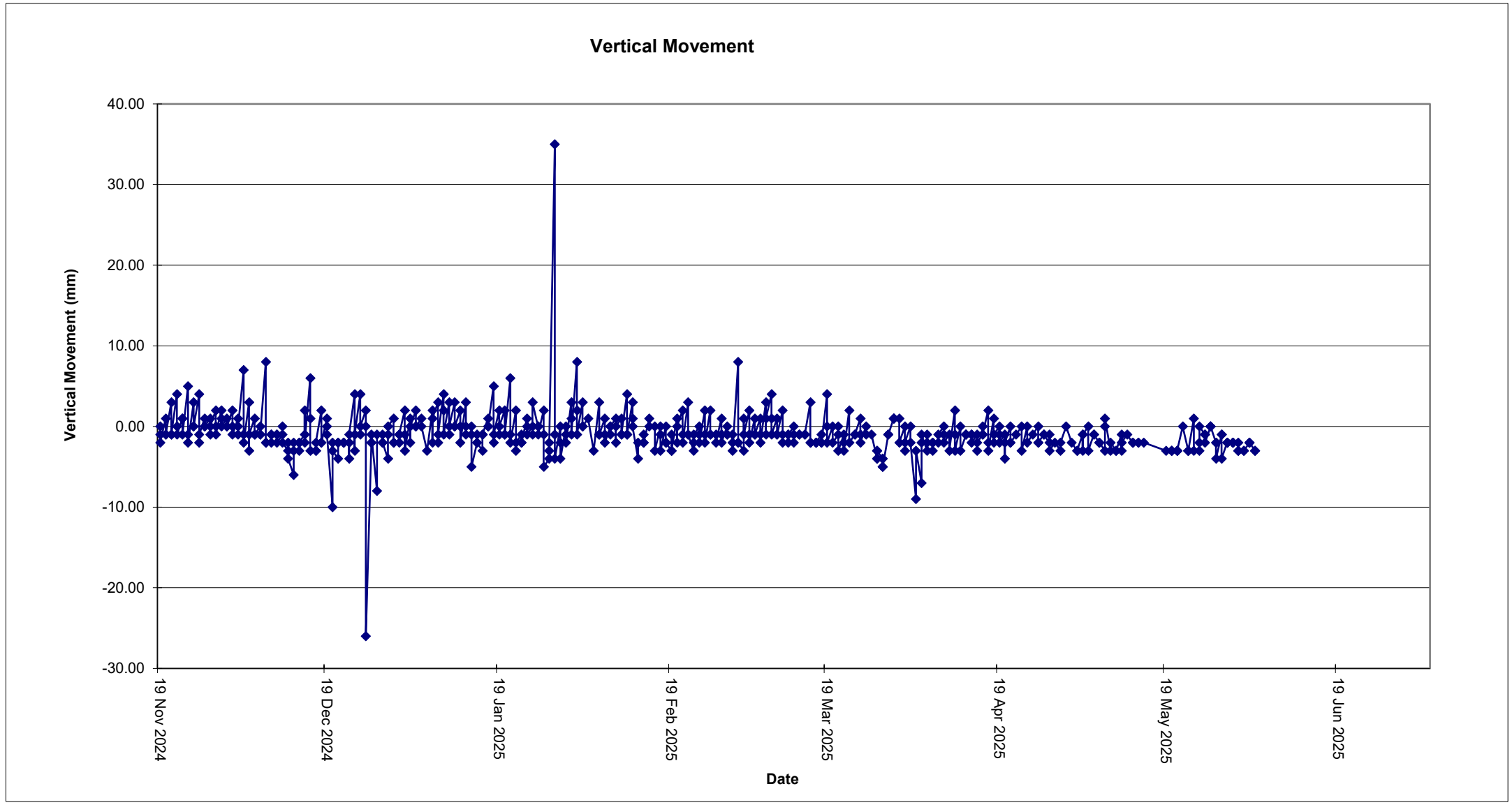
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP39

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D40

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP39



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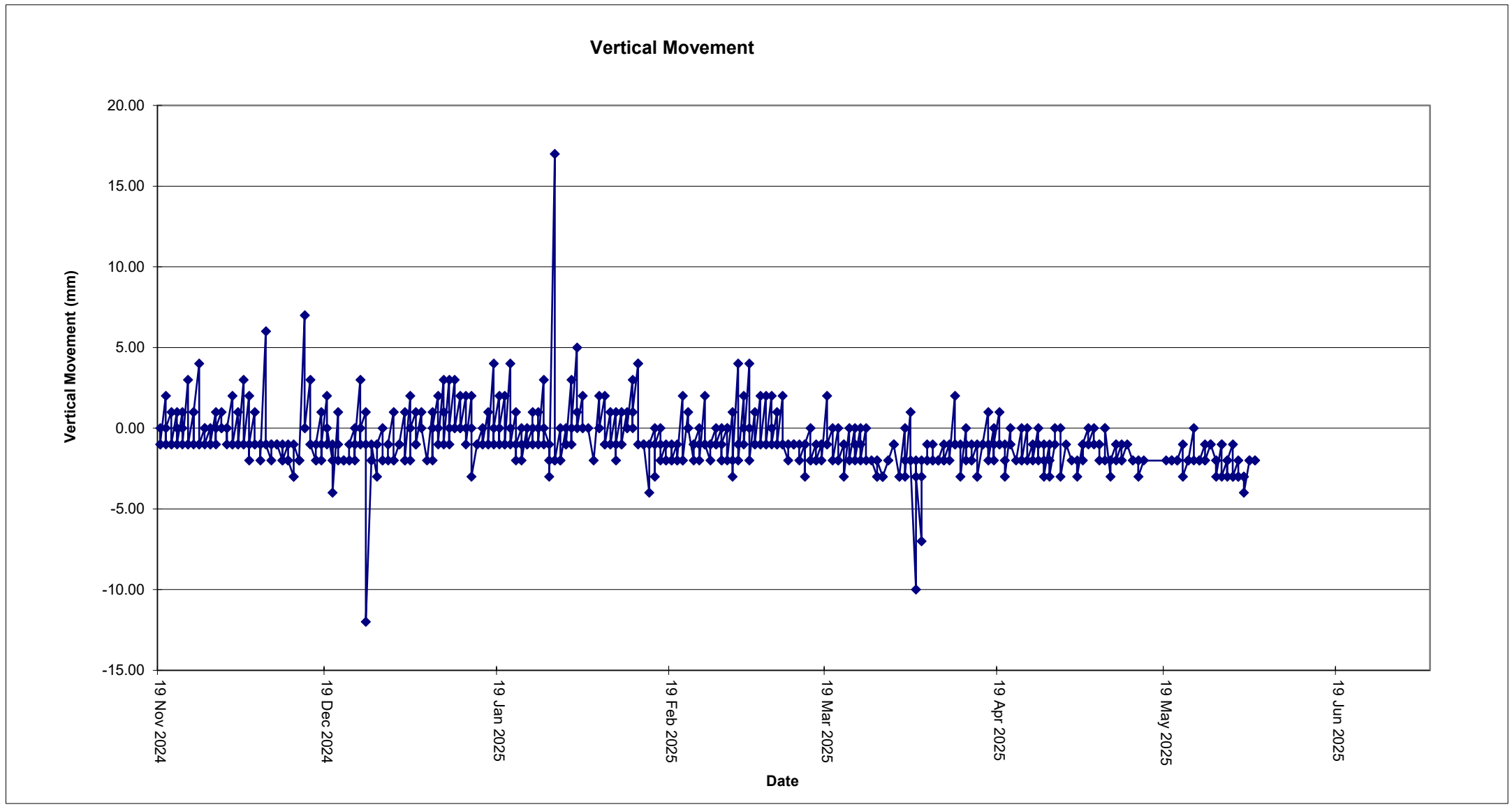
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP40

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D41

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP40



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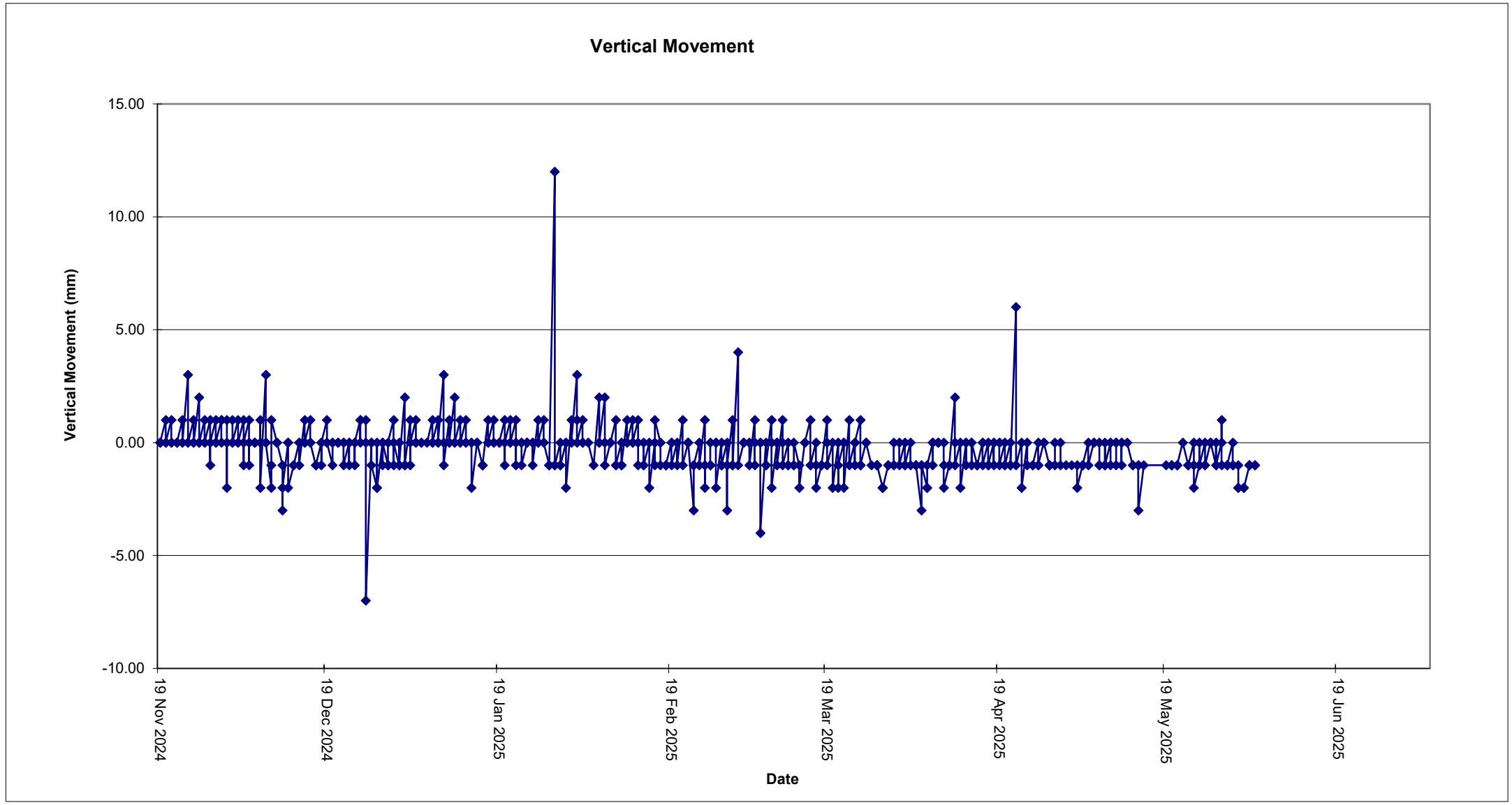
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP41

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D42

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP41



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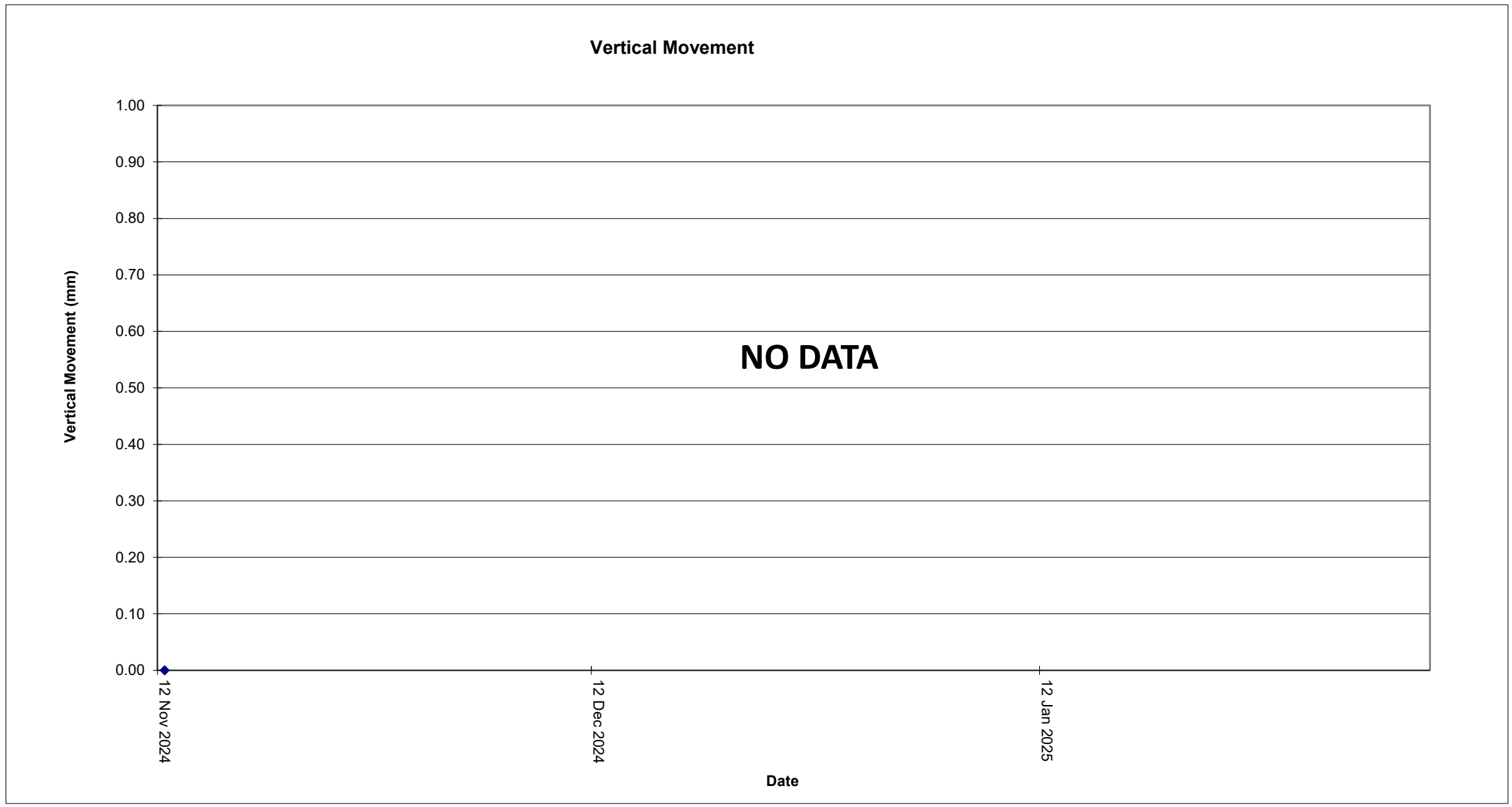
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP42

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D43

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP42



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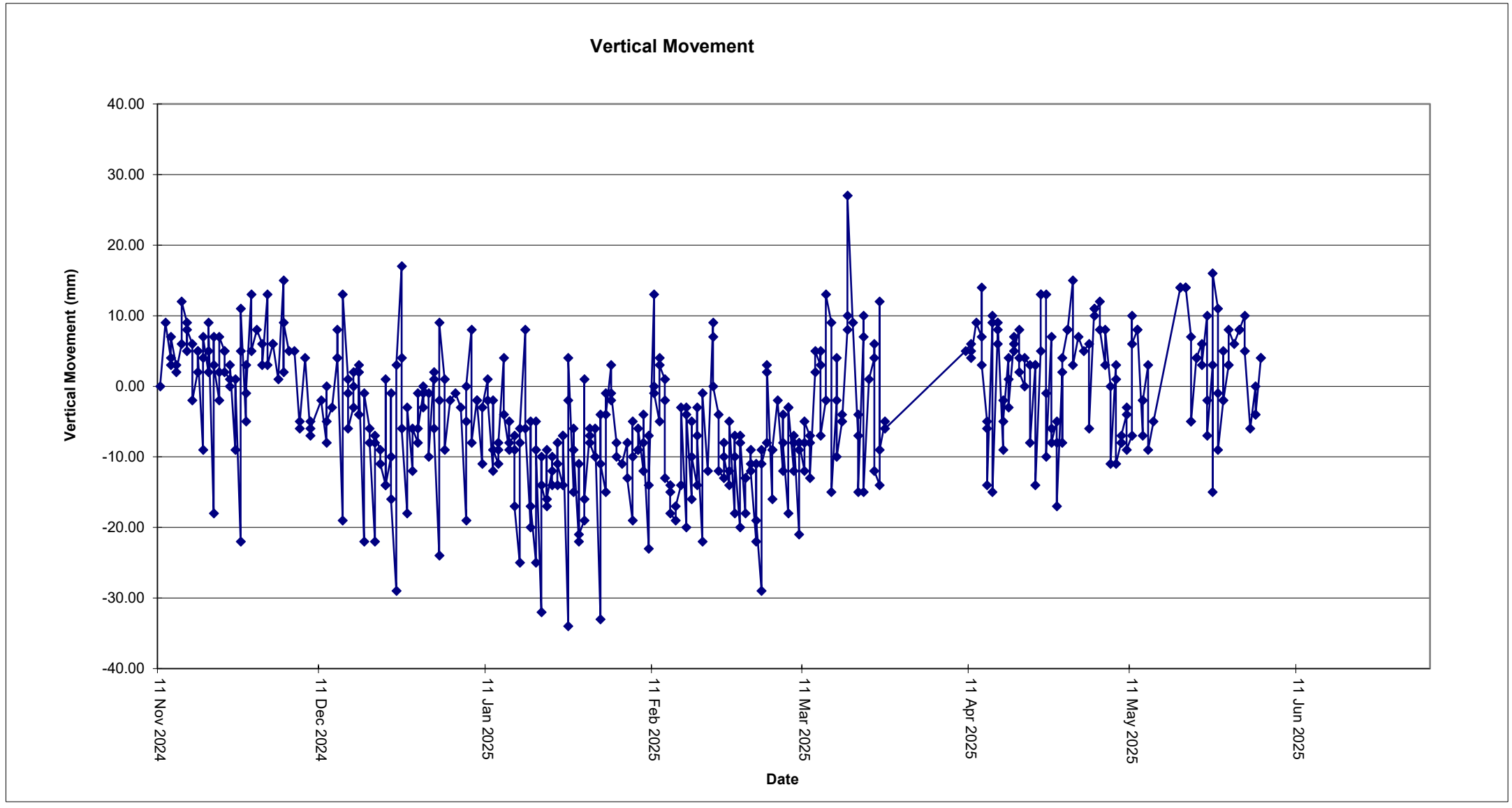
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP43

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D44

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP43



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MMG ROSEBERY MINE

2024 EOR INSPECTION

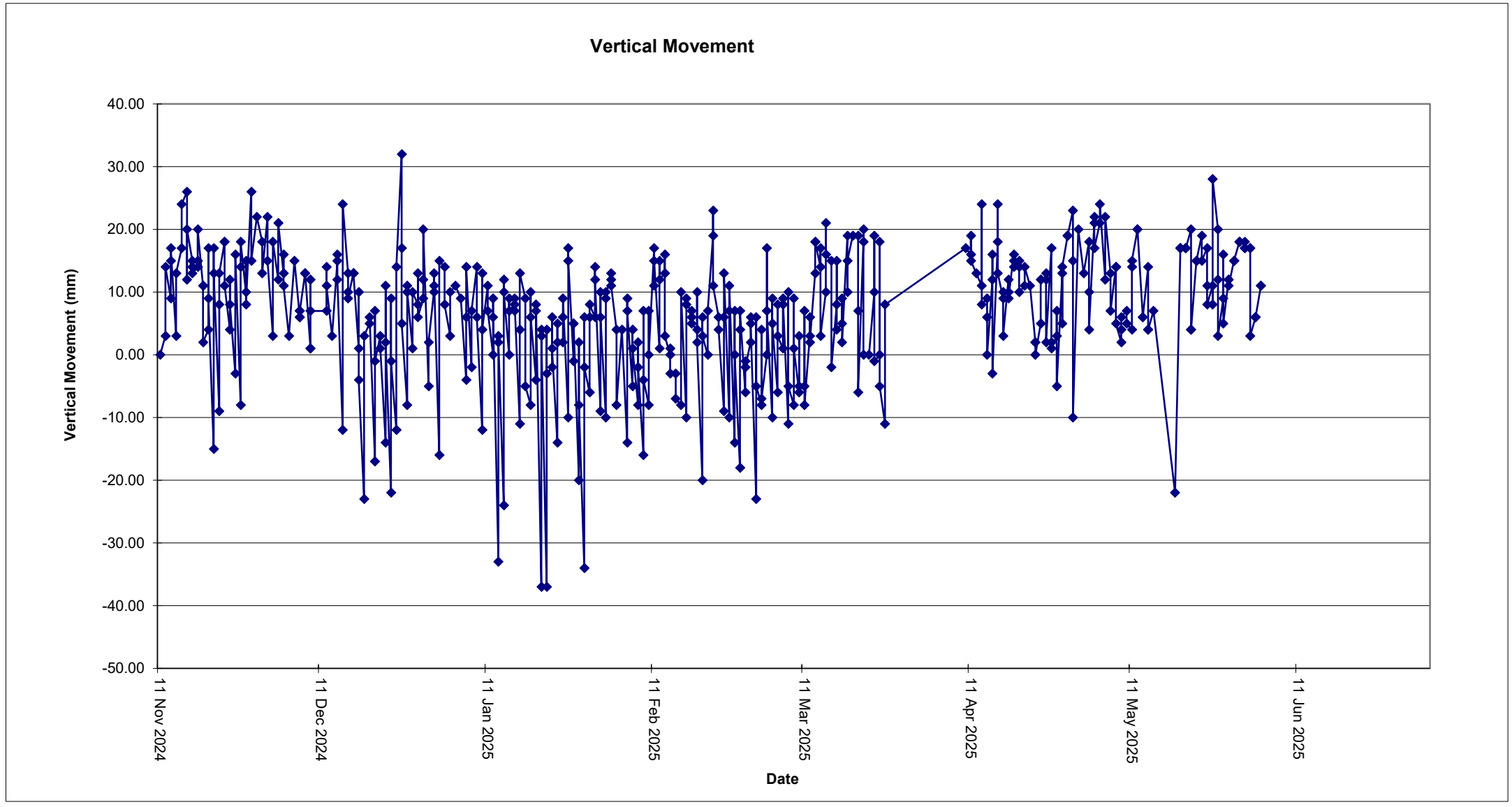
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP01

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D45

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP01



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2024 EOR INSPECTION

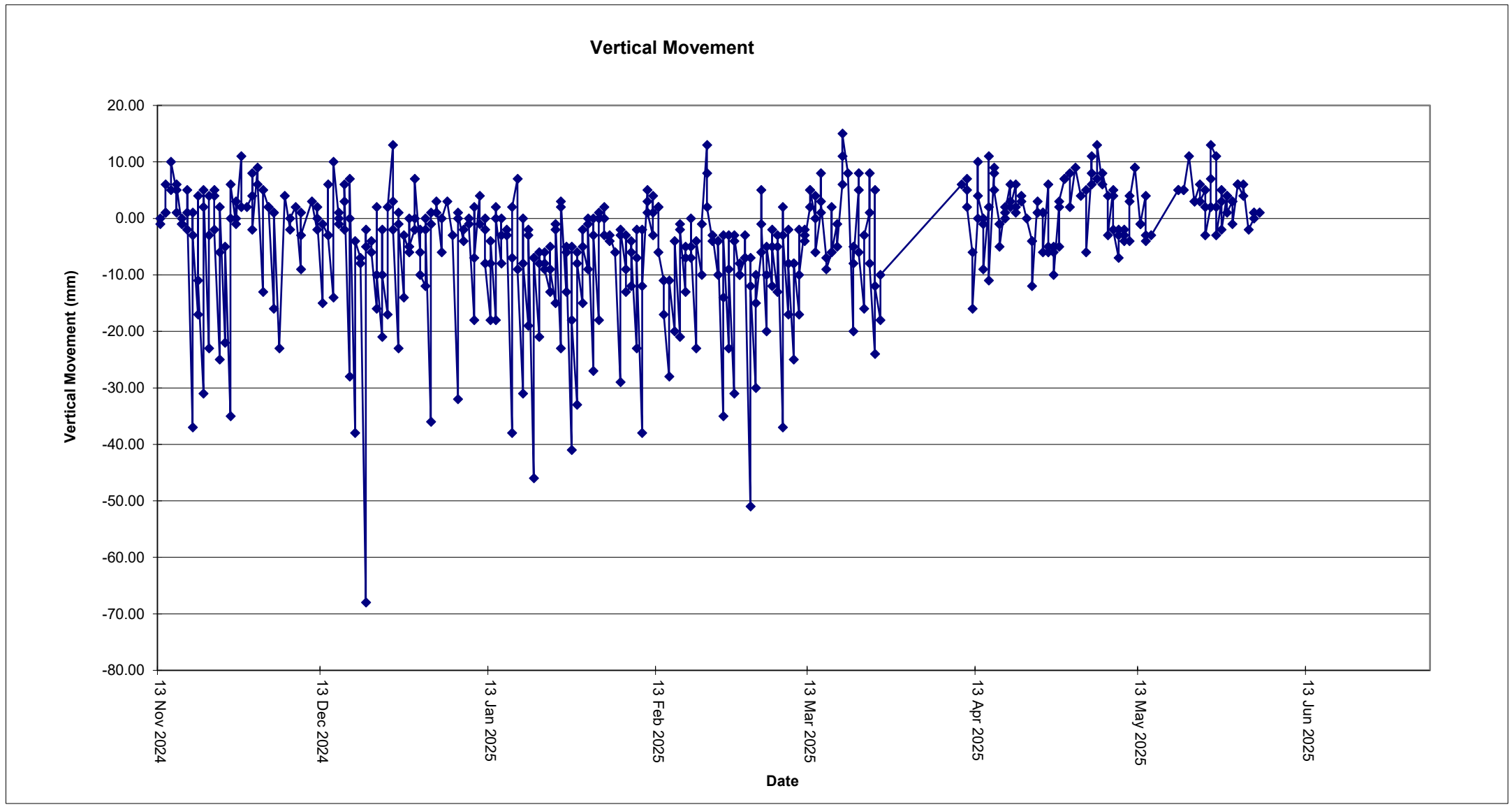
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP02

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D46

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP02



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2024 EOR INSPECTION

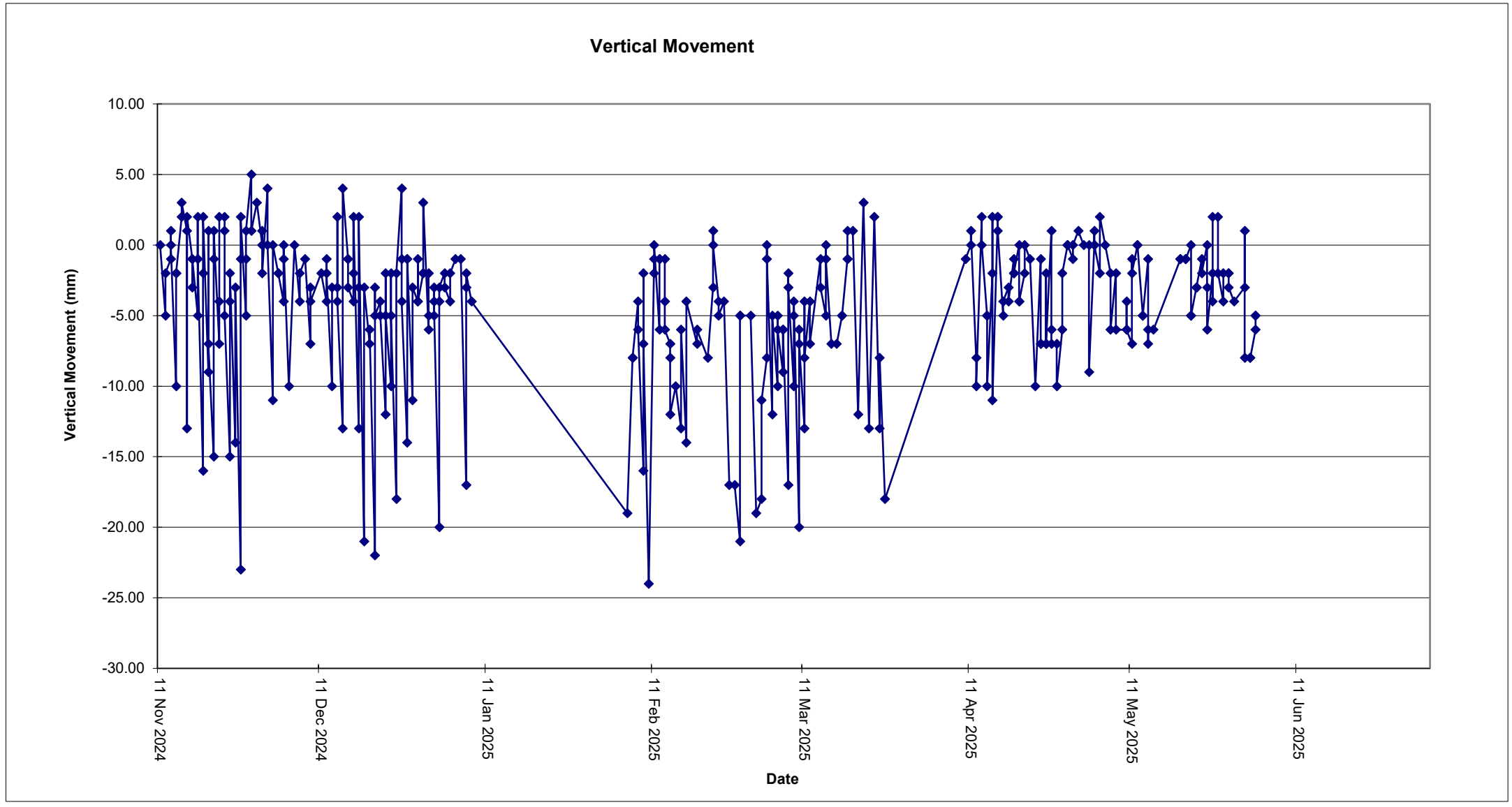
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP03

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D47

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP03



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2024 EOR INSPECTION

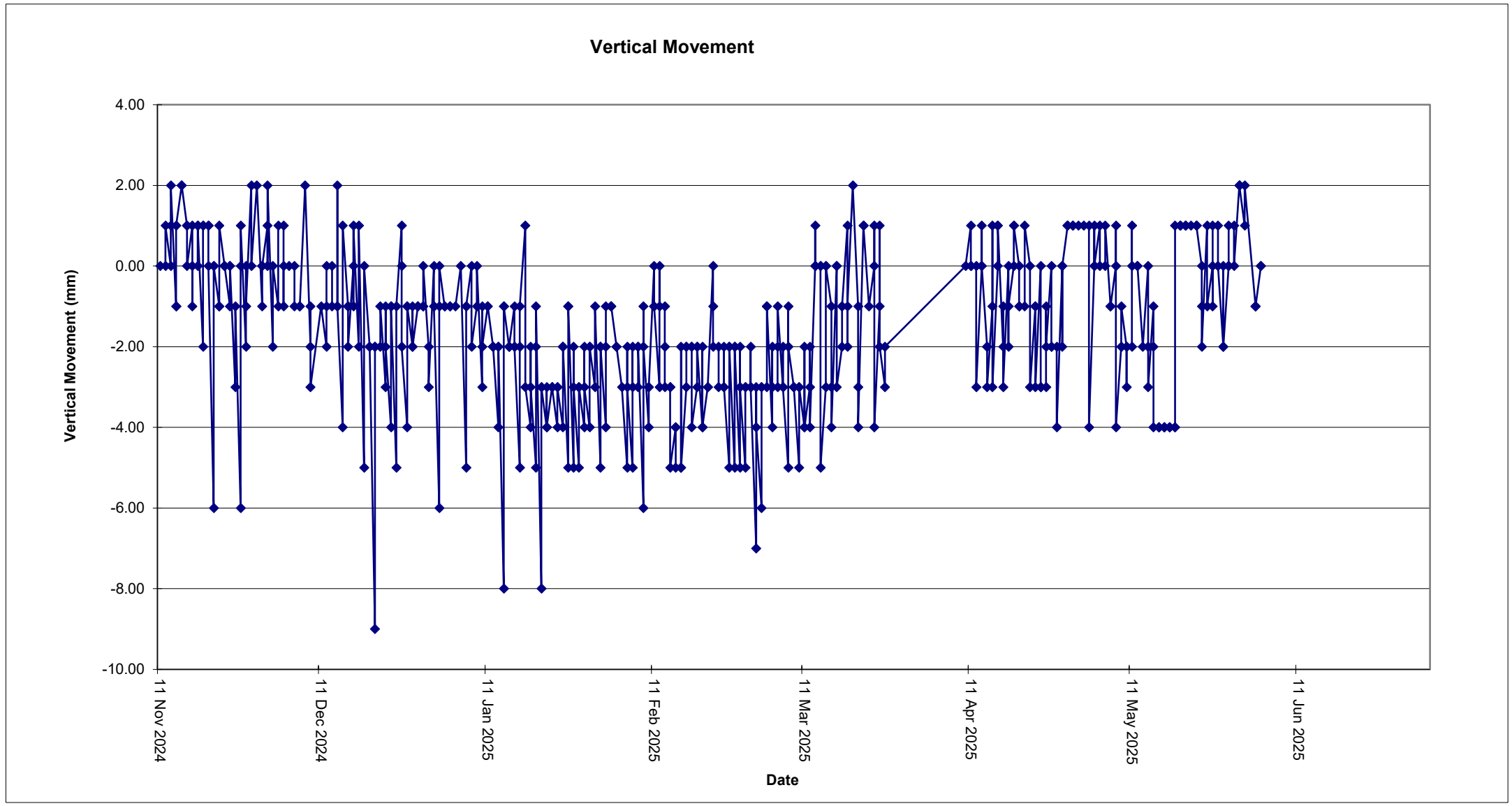
2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP04

Date: 23/07/2025 **Job No:** 107031.126

FIGURE D48

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP04



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2024 EOR INSPECTION

2-5 DAM TSF - SETTLEMENT MONUMENTS

Movement Monument SP05

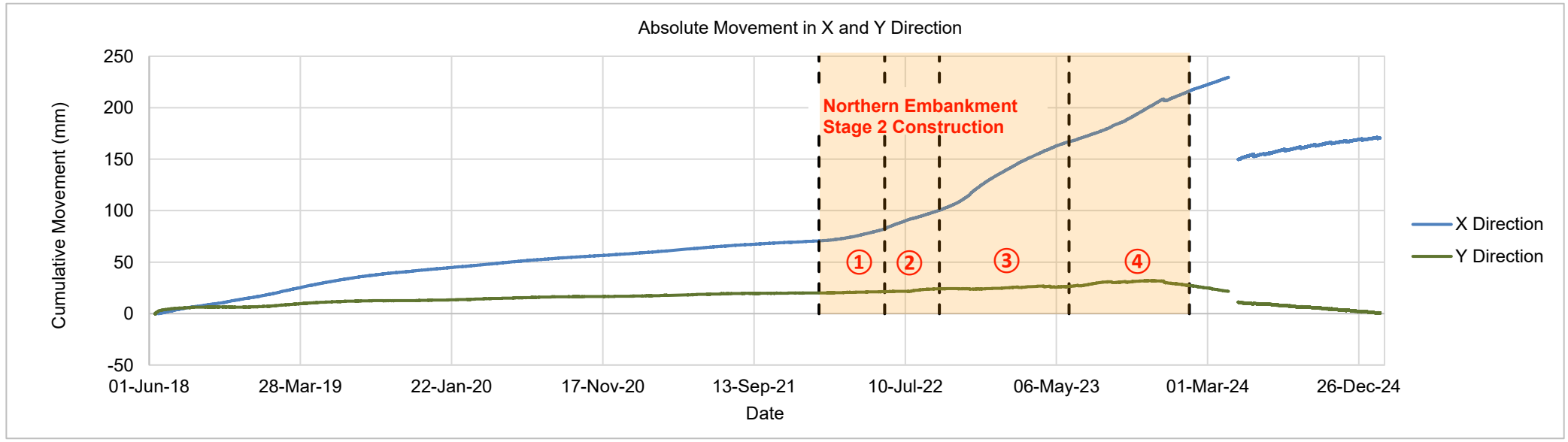
Date: 23/07/2025 **Job No:** 107031.126

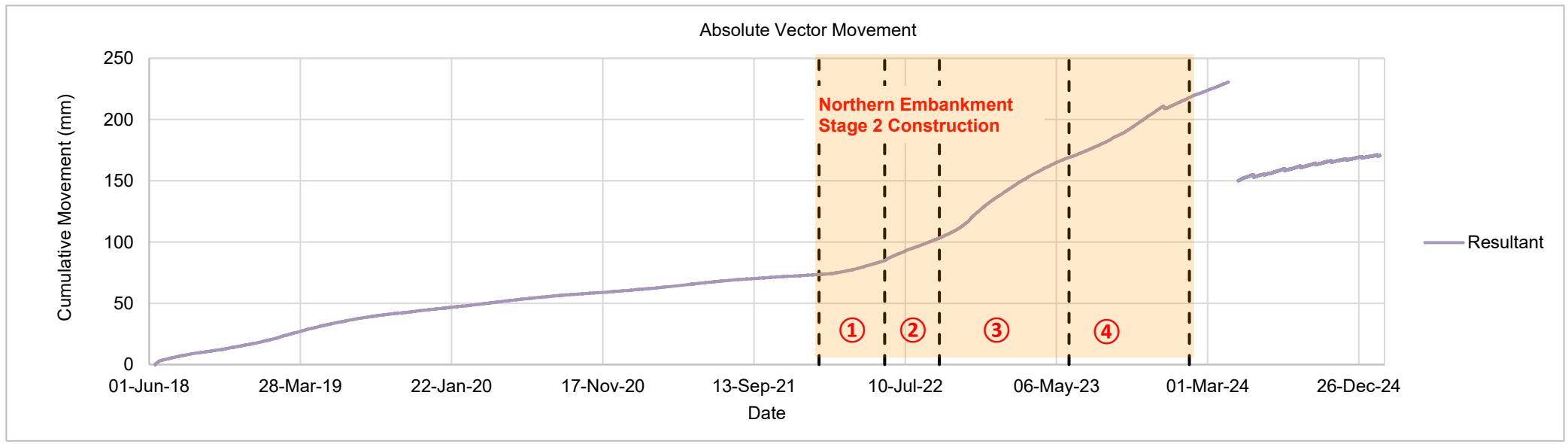
FIGURE D49

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\D - Monuments Plot\FIG D30-D49 - EE SE WE.xlsx Figure SP05

APPENDIX E – INCLINOMETER TIME SERIES PLOTS

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2024 EOR INSPECTION

2-5 DAM TSF - INCLINOMETERS

IC5 - SENSOR RL 150.6 m MOVEMENT

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E1

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\00-E1 - IC5.xlsx Figure E1



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2024 EOR INSPECTION

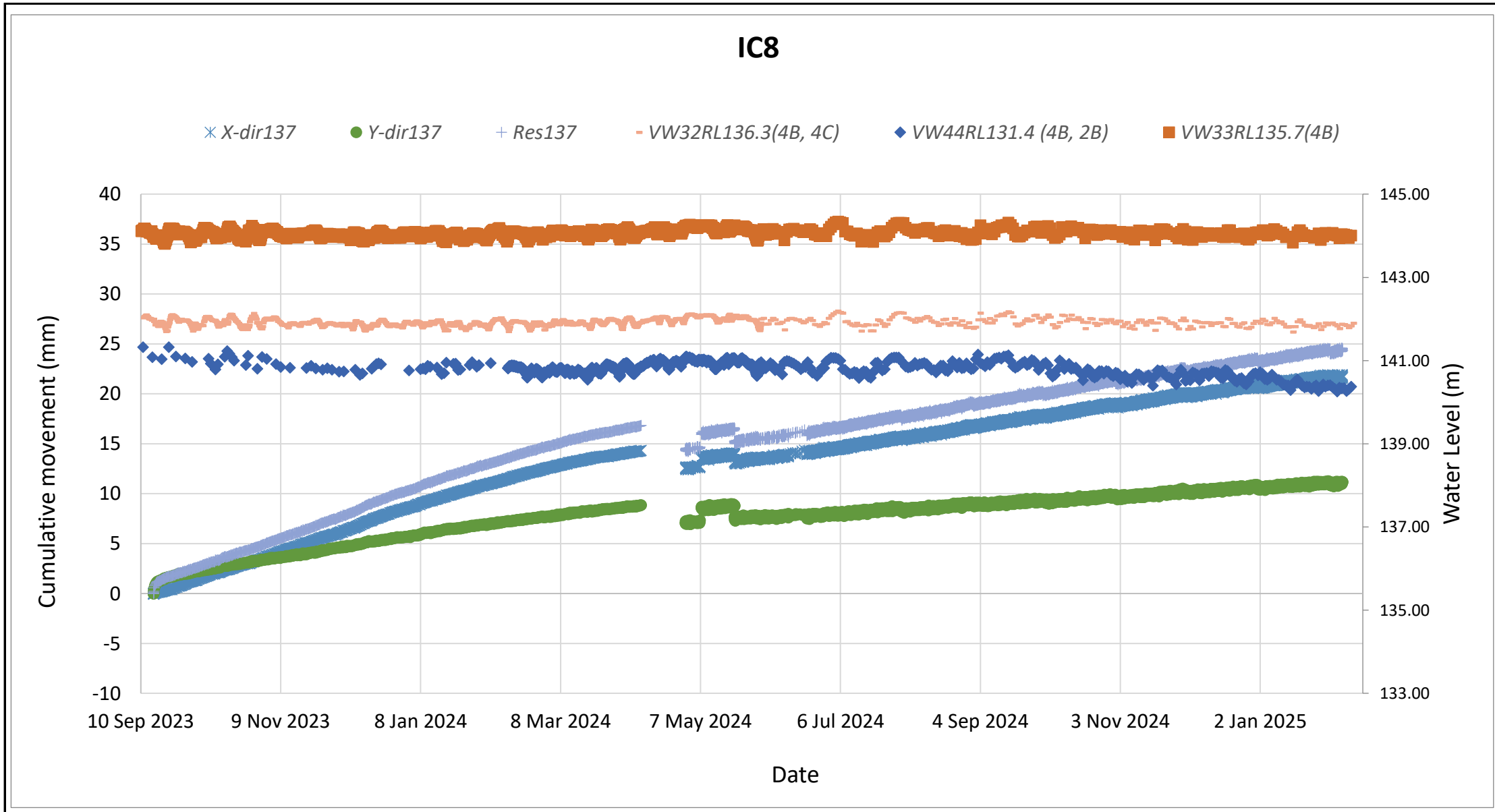
2-5 DAM TSF - INCLINOMETERS - VWPs

IC6

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E2

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\01 IC6-EOR.xlsx IC6



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2024 EOR INSPECTION

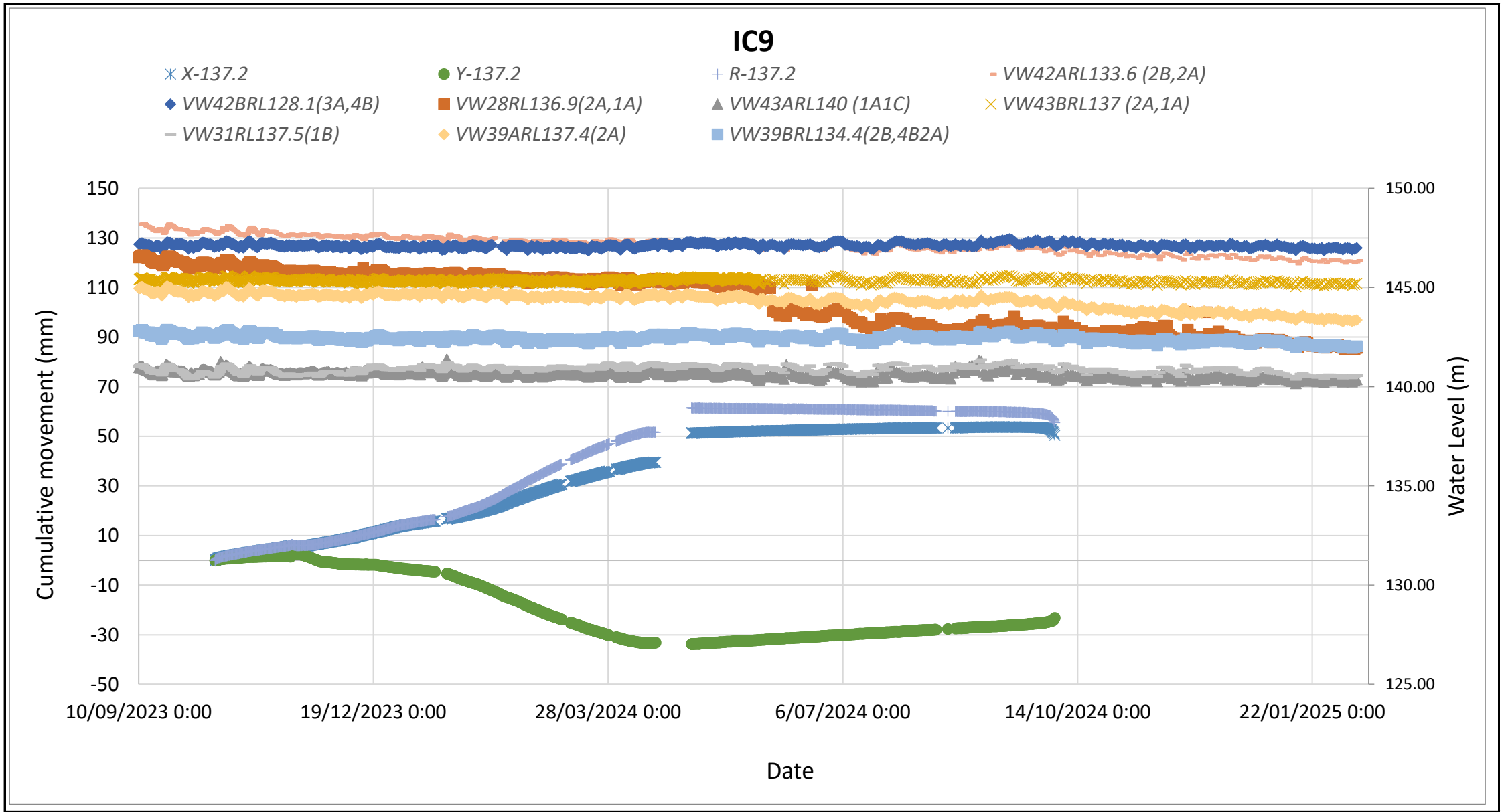
2-5 DAM TSF - INCLINOMETERS - VWPs

IC8

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E3

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\02 IC8-EOR.xlsx IC8



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2024 EOR INSPECTION

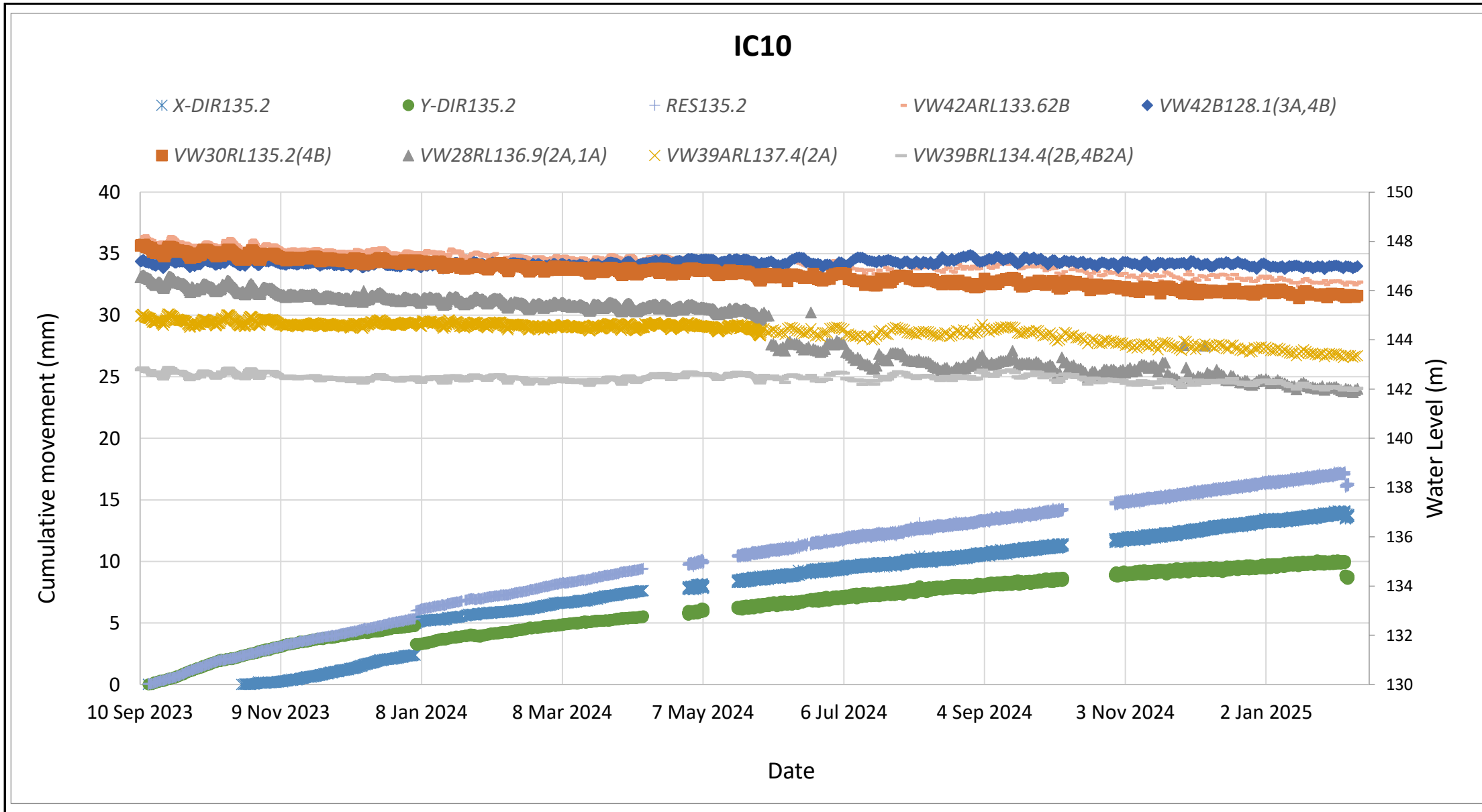
2-5 DAM TSF - INCLINOMETERS - VWPs

IC9

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E4

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\03 IC9-EOR-.xlsx IC9



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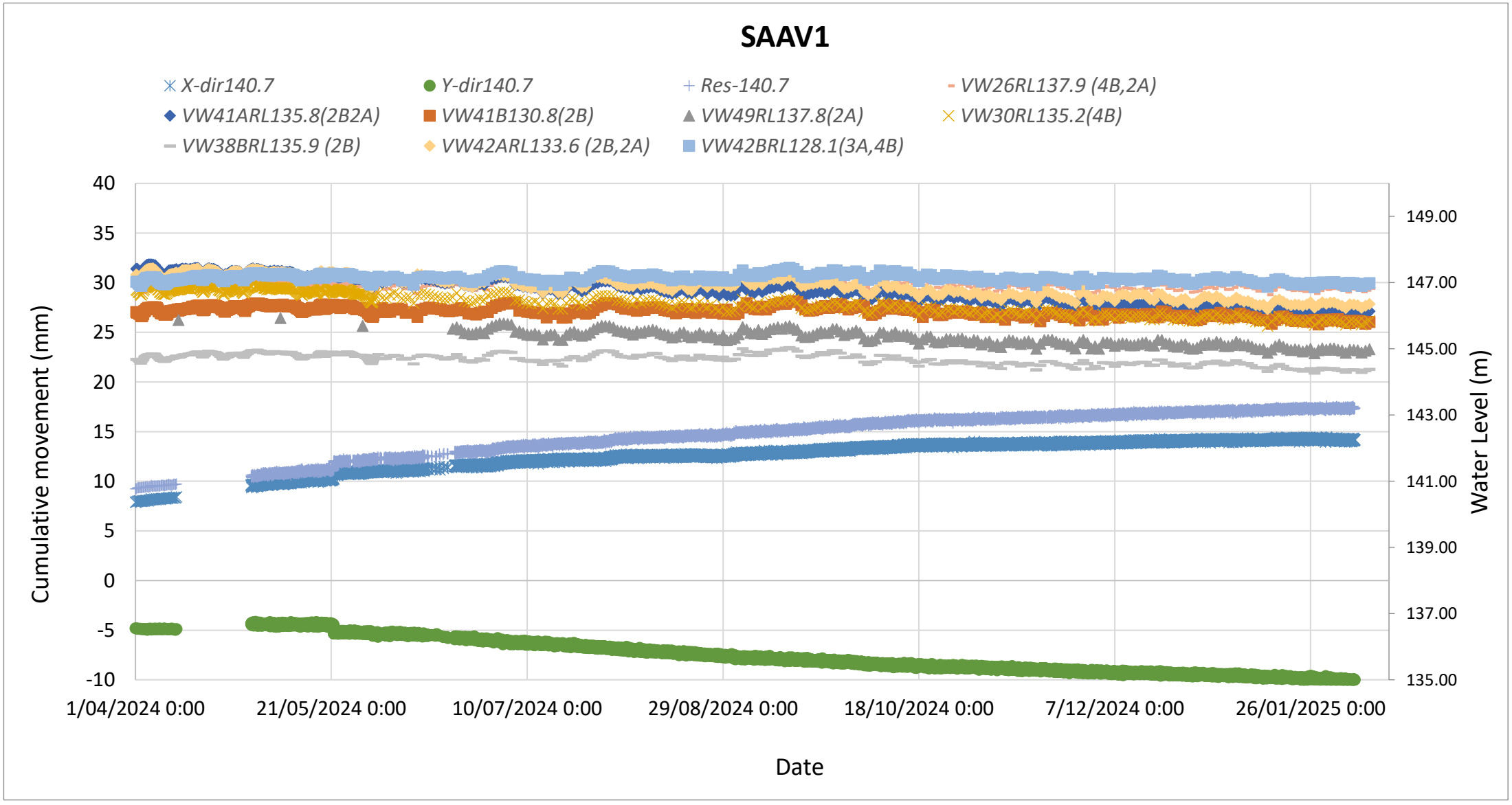
2-5 DAM TSF - INCLINOMETERS - VWPs

IC10

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E5

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\04 IC10-EOR.xlsx IC10



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2024 EOR INSPECTION

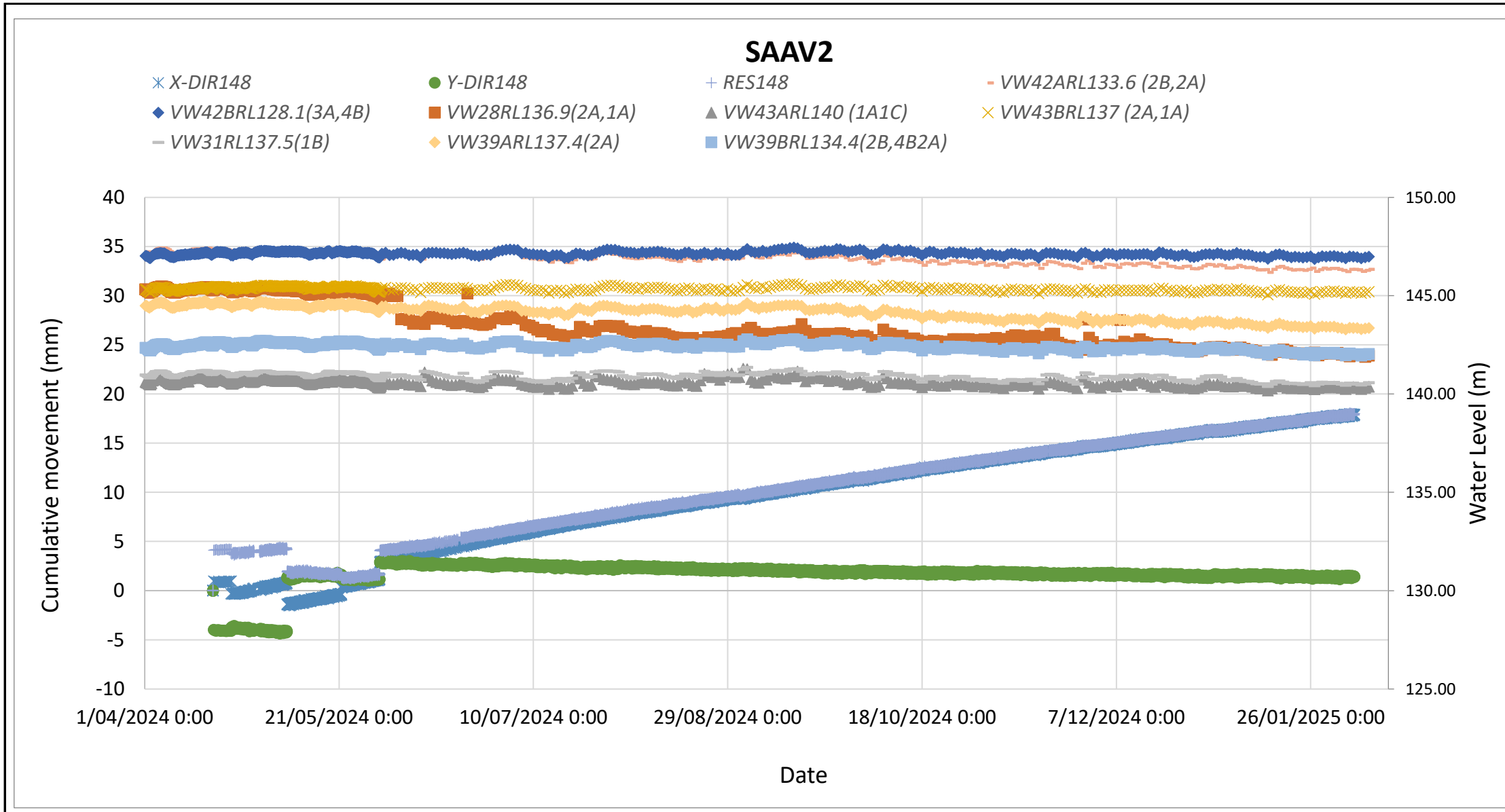
2-5 DAM TSF - INCLINOMETERS - VWPs

SAAV1

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E6

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\05 SAAV1-EOR-.xlsx SAAV1



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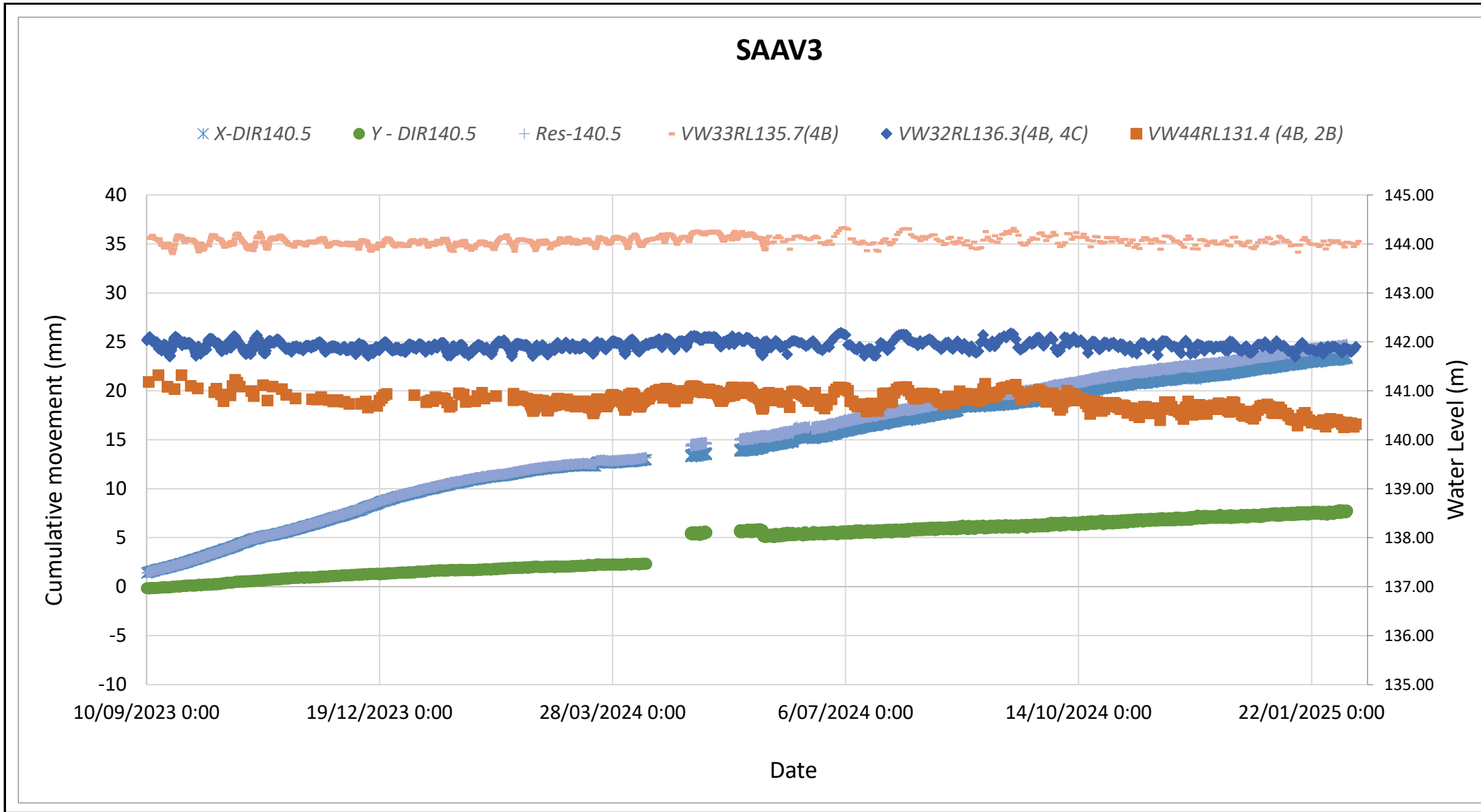
2-5 DAM TSF - INCLINOMETERS - VWPs

SAAV2

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E7

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\06 SAAV2-EOR-.xlsx SAAV2



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2024 EOR INSPECTION

2-5 DAM TSF - INCLINOMETERS - VWPs

SAAV3

Date: 23/07/2025 **Job No:** 107031.126

FIGURE E8

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\2-5 DAM\Appendices\E - SAA - TIME Series Plot WITH VWPS\07 SAAV3-EOR.xlsx SAAV3

APPENDIX F – TURBID SEEPAGE DOWNSTREAM OF FILTER WALL SITE VISIT LETTER

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Our Ref: 107031.117L01-Draft

18 June 2025

MMG Limited

Level 23/28 Freshwater Place

Southbank, VIC 3006

ATTENTION: Ms Pamela Soto

Dear Pamela,

SITE VISIT REPORT – 2/5 DAM TSF TURBID SEEPAGE DOWNSTREAM OF FILTER WALL

1 INTRODUCTION

This letter presents the findings of a site visit that was carried out by ATC Williams (ATCW) on 26 and 27 November 2024 to inspect the turbid seepage observed at the MMG Rosebery Mine 2/5 Dam Tailings Storage Facility (TSF).

The site visit entailed a visual inspection and assessment of the downstream filter wall due to the discovery of turbid seepage emanating from the toe, the location of which is illustrated in **Photo 1** (see **Attachment 2** for all referenced photos). The reverse filter wall was built during the Stage 2 embankment raise construction works to remediate a previously witnessed tailings leak, for which a similar inspection was carried out in February 2022. (**Attachment 1**).

The filter wall was built at the same location of the Old Clean Water Diversion Drain (CWDD) which was backfilled as part of the 2/5 Dam Stage 1 Construction works in 2017.

The visual inspection of turbid seepage location was carried out by ATCW Engineer Luisa Luengas along with Pamela Soto and Marty Viney of MMG.

2 OBJECTIVES

The purpose of the site visit to the 2/5 Dam TSF was to assess the overall integrity of the embankment and filter wall buttress and toe, as well as the current conditions immediately upstream of this area, in order to identify a potential active inlet point that could have a direct connection with the turbid water witnessed by MMG Operations on Friday 22 November 2024 (**Photo 2 and 3**).

The site visit also focused on gaining understanding on the potential source location and temporary remedial works that can be put in place as a control to avoid any potential turbid water from re-appearing in the filter wall downstream toe and V-notch. It is noted that the turbid seepage water witnessed on 22 November 2024 has no longer been carrying sediments and appears to be clear ever since.

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3 BACKGROUND INFORMATION

3.1 General

The general background information regarding the history and construction of the embankment at the location of the Old Clean Water Diversion Drain at the 2/5 Dam TSF are discussed in detail in **Attachment 1**. The present letter offers complementary background information since the time of the Stage 2 embankment raise construction.

3.2 Stage 2 Construction

The Stage 2 construction works at the 2/5 Dam commenced during 2021 and were completed in the first quarter of 2024. The Stage 2 design made allowance for a downstream raise of the Stage 1 embankment to a final crest level of RL 172 m.

3.3 2022 Tailings Leak

During monthly audit observations on 2 February 2022, an ATCW Site Engineer discovered a minor tailing leak that appeared to have emanated from the downstream toe of the old CWDD (**Attachment 1** and **[1]**). The leak took place near a known seepage point that is currently being monitored for flow via a V-notch weir.

Inspection of the leak suggested a small volume of tailings were contained immediately downstream within a small rockfill bund wall that had facilitated ponding of historical seepage. Some tailings travelled downstream along the decommissioned clean water diversion drain for approximately 100 m. Based on visual observations, it is understood that tailings flow stopped prior to detection of the leak and tailings were not transported to the Stitt River.

3.4 2022 Filter Wall Construction

Following the discovery of the tailings leak on February 2, 2022 **[1]**, ATCW recommended for remedial works to take place during the Stage 2 Construction campaign **[2]**. ATCW prepared a site instruction on 22 April 2022 with suggested remedial measures. ATCW's remediation works included the construction of an earth and rockfill reversed filter wall immediately downstream of the old CWDD to control any potential future tailings transport.

3.5 2023 South-Eastern Embankment Seepage Collection System Extension

Additionally, the works also included the extension of the perimetral downstream seepage collection toe drain to the south-eastern end (at the location of the filter wall). The purpose of this was to safely route all seepage waters emanating from this area to the Seepage Collection Ponds and then back into the TSF, as was intended by the design of this closed circuit. The extension of the seepage collection system was constructed between July and December 2023, during the Stage 2 construction works. **[3]**

3.6 2024 Turbid Seepage

3.6.1 Discovery and Notice

During a morning routine daily site audit by the MMG operations team, it was discovered that a turbid seepage was emanating from the toe of the filter wall (**Photo 2**) and was being transported to the V-notch (**Photo 3**) and Seepage Collection Ponds. This inspection took place at 9:30 am on 22 November 2024.

The turbidity of the water was not found to be high but was considerable enough to be detectable by the naked eye.

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MMG informed ATCW (EoR), as soon as this was noticed and the directive to cease tailings deposition was given. All valves were fully closed and deposition no longer active by 10:30 am on the same day.

3.6.2 Immediate Actions Timeline

Following the directive to cease deposition in the area, the following immediate actions were instructed and implemented:

1. MMG Operations team to monitor the downstream affected area for changes in conditions (seepage) every 6 hours and continue reporting. Starting from 9:30 am 22 November 2024.
2. Virtual meeting held between ATCW and MMG at 11:15 am to discuss action plan, which was documented via email the same day.
3. Phone call with MMG operations team site personnel at 12:00 pm 22 November 2024, where the staff indicated that the water's cloudiness had decreased significantly since tailings deposition ceased at the southern end.

It is understood that MMG Operations had attempted to sample the seepage water but, due to the decrease in turbidity following cease of operations, it was not possible to recover a sample with enough sediments to allow for testing and identification of material type.

It was also agreed that a Principal Engineer familiar with the 2/5 Dam TSF site (Luisa Luengas from ATCW) was to undertake a site visit on 26 and 27 November, to coincide with the planned visit by Pamela Soto (MMG RTFE). Luisa Luengas was one of the full-time site engineers present during the Stage 1 Construction activities as well as the engineer that visited site to verify and document the 2022 tailings leak after it was discovered. Luisa has been familiar with the MMG Rosebery TSF works since 2015 and is currently studying the feasibility of a Stage 3 raise at the TSF site.

MMG operations reported on the same day at 5:52 pm that the seepage was no longer showing signs of turbidity.

4 SITE VISIT

4.1 Date and Inspection

The site visit took place on 26 and 27 November 2024 by Luisa Luengas who inspected the upstream and downstream zones of the old CWDD embankment, the upstream tailings beach, Northern and Eastern embankment slopes, drains and toes as well as the seepage collection drain in the area and the Seepage Collection Ponds.

4.2 Old CWDD Status

4.2.1 Upstream and Downstream Slopes

The downstream slope of the backfilled Old CWDD appears to be in good condition. No settlement was observed at the crest.

It appears that there is a wet zone at the downstream toe of the Old CWDD embankment, which was evident by the presence of moss and vegetation (**Photo 4**). This is also the area where the turbid seepage emanated from. It is important to make the distinction that the turbid seepage appeared to flow from a stream that has typically not shown the presence of oxides, which is understood to be related to Potentially Acid Forming (PAF) materials (**Photo 5**).

The upstream slope of the recently built Stage 2 embankment in this area appears to be in good condition and tailings are yet to reach its Bituminous Geomembrane (BGM) lined toe.

4.2.2 Downstream Toe

There are no visible signs of instability at the toe. It is noted that prior to Stage 1 construction, this low point has always presented ponding/seepage, including post grouting and lining

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activities, and following the construction of the reverse filter. This is evident by the presence of moss in the downstream toe of the embankment.

At the time of the initial inspection, when deposition was not active, two potential flow paths were identified based on the amount of fine deposited sediment in those locations (**Photos 6 to 8**) .

It is worth nothing that at the time of the inspection by the ATCW Principal Engineer, there was no turbid seepage present, and a reduced amount of seepage water was emanating from these locations.

4.2.3 Tailings Beach

Sub-aerial deposition upstream of the Old CWDD ceased immediately upon discovery of the leak as reported in **Section 3.6.1**. It is understood that sub-aerial deposition began in the area towards the end of 2021 and it continued until the January 2022 tailings leak was discovered during the monthly audit **[1]**. Following the construction of the reverse filter wall (**Section 3.4**), no other instance of turbid seepage or further tailings were reported until the current episode of 22 November 2024. It is understood that sub-aerial tailings deposition in the area had started approximately five (5) days before the turbid seepage was discovered.

At the time of the site visit, the tailings beach immediately upstream of this location (**Photos 9 to 10**) appears to be at the same elevation reaching the Stage 1 ground level in this area, which from as-built records appears to be ~RL 171.0 m.

During the site visit and walk over, the MMG Operations team and the ATCW Principal Engineer discovered a location within the exposed rockfill face (E 379213 N 5372250) where small sink holes were observed in the tailings beach upstream of the embankment. In order to investigate the potential for a source point of the turbid seepage, MMG Operations re-started tailings deposition from the open discharge pipe on the southern end of the TSF basin.

Deposition ran for 2 hours on the afternoon of 26 November (**Photo 11**), and then subsequently for another 4 hours on the morning of 27 November. No turbid seepage was observed emanating from the downstream toe, suggesting that there is no active piping erosion occurring. However, it was noted that bleed water from the tailings pond was flowing through the sink holes and into the rockfill backfill immediately upstream of the old CWDD backfill area.

4.3 Monitoring

4.3.1 General

The flow at the toe of the old CWDD is being monitored, for both water and tailings flow, on a 6 hourly basis since the day that the turbid seepage was discovered.

4.3.2 Water Flow

Water flow at the location of the seep in question has been historically estimated to be approximately < 0.5 L/s. The seepage that emanates from this area flows to a downstream V-Notch weir (V-Notch 6) that is monitored monthly and, more recently, daily due to the turbid seepage discovery.

At the time of the monthly audit in early November, this V-notch was reading a flow of approximately 4.3 L/s. It is believed that there was active tailings deposition on the upstream zone at the time of this reading being recorded. Nonetheless, after the deposition ceased, the V-notch was reading a much lesser flow of 1.5 L/s (**Photo 12**), which is a more typical reading to be expected during the month of December.

The last V-notch reading that took place on 11 December 2024 shows that the flow measured by the V-notch has stabilised at 1.5 L/s.

4.3.3 Tailings Flow

At the time of the initial site inspection, there was no active tailings deposition in the area and the tailings beach immediately upstream appeared to be dry.

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Once the tailings deposition was recommenced, following the discovery of the upstream minor sink holes/ boils (**Photo 13 and 14**), tailings water was observed to be flowing into the sink hole and into the exposed rockfill immediately near it (**Photo 15**). This flow continued for a number of hours, but no turbidity was discovered on the downstream flow daylighting at the toe.

A temporary measure was taken to place a layer of geotextile (A64 Bidim) along the upstream surface area as to cover the sink holes and exposed rockfill and to minimise the amount of sediment being transported into the rockfill (**Photo 16**).

Following this measure, no water turbidity in the downstream toe has since been reported.

5 GEOPHYSICS SURVEY

A geophysical survey **[4]** was conducted by GBG Group on the second day of the site visit, as witnessed by ATCW Engineer Luisa Luengas. The geophysics survey comprised the mapping of 2 lines, one along the crest of the filter wall and buttress, and the second, along the perceived wet line on the downstream slope of the filter wall and along the upstream edge of the access ramp towards the eastern embankment as shown in **Photo 17**. The plan view showing the location of the survey lines is presented in **Photo 18**.

It is worth noting that both geophysical survey lines are located downstream of the grout curtain alignment at the height of the old Clean Water Diversion Drain Cut. Refer to **Attachment 3** for details regarding the location of the grout curtain alignment.

The survey images have been overlaid along a long section generated for each of the lines as shown in **Attachment 4.** Line 1 was surveyed for Electrical Resistivity Tomography (ERT) and Multichannel Analysis of Surface Waves (MASW), while Line 2 was only surveyed for ERT.

As shown in **Attachment 4**, there appears to be two low resistivity zones beneath the original Pre-2017 surface, which is the surface prior to the construction works for Stage 1.

One of the low resistivity zones can be identified from Chainage 27 to 47 along Line 1, which appears to be the same low resistivity zone shown on Line 2 between Chainages 18 to 31.

The second low resistivity zone that is present along both lines seems to be located on Chainage 57 to 63 in Line 1, which coincides with Chainages 38 to 41 on Line 2.

The analysis of the MASW survey along Line 1 does not appear to indicate the presence of loose sediment within the body of the fill used to backfill the Old Clean Water Diversion Drain, or within the filter materials.

6 POTENTIAL SOURCES

A desktop investigation review of historical documentation for the 2/5 Dam and together with the observation made on site indicates two potential mechanisms for the turbid seepage water that was observed downstream of the filter wall, these being:

1. The turbid seepage has emanated from the original tailings leak that was discovered in 2022 **[1]**, for which the reverse filter wall was formulated **[2]**.
   The contributing factor for the turbidity of the seepage could be around the filter wall performance and width extents. The filter wall has worked as intended as to stop tailings particles from being transported immediately downstream. It is likely the rockfill upstream the filter wall could have now been filled with tailings, which could have resulted in lateral mobilisation of tailings along a preferential flow path, which is the location of the downstream seepage that carried turbidity – immediately to the north of the filter wall extent. It is worth noting that the flow in this area has always been present, but no turbidity was ever discovered prior to 22 November 2024.
2. The turbid water is immediately downstream from Grout Line F. Stage 1 As-Built records for the grout line in this location (refer to **Attachment 3**) show that there was a high grout intake within the first downstage of the grout holes (0 m to 5 m from the surface), specifically FP101, FS101 and FT01. This signifies that the bedrock within the first 5 m depth in this zone was highly fractured. This also could have been attributed to the location of the Stage 1 Quarry immediately upstream and the fact that the old CWDD had to be blasted through to be constructed.

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The ground RL at the time of the Stage 1 grouting campaign in this location was approximately RL 171 m. The location of the tailings beach at the time of the site visit (26 and 27 November 2024) was also approximately ~ RL 171 m. The turbid seepage could have been tailings seepage that potentially travelled through a fissure in the bedrock that was not fully grouted.

3. Based on the results of the geophysical survey, more specifically the ERT mapping, there appears to be two low resistivity zones located immediately underneath the base cut of the Old Clean Water Diversion Drain (refer to **Attachment 4**).
   Taking into consideration that the Old Clean Water Diversion Drain had to be blasted in order to be formed, it is possible that the first low resistivity zone is representative of fractured bedrock that has acted as a seepage path following the commencement of tailings deposition in the upstream area. Nonetheless, as shown in Line 1, there is less perceived water flow (high resistivity) within this area than the more downstream Line 2 (low resistivity). This can indicate that the grout curtain has acted as per design intent to decrease the potential upstream flow travelling downstream within the fractured bedrock. The presence of a more distinct low resistivity zone along Line 2 could indicate that the natural phreatic line increases away from the embankment toe, which can be attributed to the low laying nature of the topography in this region. Additionally, as shown in **Photo 6**, a pioneer glacial till (low permeability) layer was placed along the old CWDD base to decrease the potential for any upwards seepage paths to fully develop.
   The likelihood of the tailings leak being related to the low resistivity zones shown by the ERT survey is lower when we consider the elevation of the tailings leak compared to the elevation of the low resistivity zones. Additionally, we consider that any potential seepage path at these low elevations would have been filled with tailings once tailings deposition started in the area in 2018, hence making the appearance of tailings in 2022 less likely to be a direct correlation.
   The second low resistivity zone located towards the north, appears to show the location of a historical drain that used to connect the 5 Dam to the Old CWDD. This drain was understood to have been backfilled with clay at one point in time, perhaps prior to the raising of the 5 Dam walls. It is possible that this zone is acting as a seepage path for the stained seepage that has historically been seen in this location. Nonetheless, more information about the foundation make up in this location is necessary to better understand the origin and cause of this low resistivity zone.

7 PROPOSED SHORT-TERM AND LONG-TERM REMEDIAL OPTIONS

Based on the location of the sink hole and the witnessing of tailings flow within the rockfill in that zone, the most plausible theory is that the turbid water was related to the original tailings leak from 2022 **[1]**.

During the site visit by the ATCW Principal Engineer, GBG Group was visiting the MMG Rosebery site and undertook a geophysics survey of two lines along the downstream slope and toe of the area in question (**Photo 17**). The information from this survey was used to increase our understanding of potential sources as well as to refine the formulation of the long-term repair in this area.

Based on the site visit observations following the placement of geotextile in the upstream zone, the daily monitoring by the MMG Operations team, controlled tailings deposition and that no turbid water has been observed downstream of the filter wall, the following is proposed as a temporary short-term measure until a long-term measure is implemented:

a. Control deposition upstream of the filter wall with tailings placement limited to daytime hours (day shift only) and during weekdays only.
b. Inspect the filter wall seepage area at least 3 times per day and cease tailings deposition immediately if any turbidity is observed.

Additionally, to supplement the short-term measure proposed above, a permanent measure is being formulated. It is proposed for the reverse filter wall to be extended to encompass the downstream zone of the south-eastern embankment and the historical 5 Dam downstream slope. The extension of the reverse filter wall will include the construction of a French seepage collection drain at the toe to minimise the hydraulic gradient within the foundation and to direct

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the seepage water to the V-notch. However, in order to fully define the effectiveness of this proposed long term remedial option, it is recommended for a borehole to be drilled at the location of the low resistivity zone present around CH 30 in Line 2.

8 CLOSING

This memorandum presents the findings from the site visit and aims to provide background information and an understanding of current conditions. A detailed design for the filter wall extension will be prepared. Conclusions drawn are based on the observations made, ATCW's prior involvement at the mine and review of existing information.

Yours sincerely,

LUISA LUENGAS

Principal Engineer

luisal@atcwilliams.com.au

ATC Williams Pty Ltd

Attachments:

1. Attachment 1 - ATC Williams (2022), "2/5 Dam Stage 2 Construction - Inspection of Old Clean Water Diversion Drain Seepage and Tailings discharge" Ref. 107031.84-M01-Rev1, February 2022.
2. Attachment 2 - Photographs
3. Attachment 3 – Stage 1 Grout Line F As-Built Records
4. Attachment 4 – Geophysical Survey Interpretation

REFERENCES

[1] ATC Williams (2022). "2/5 Dam Stage 2 Construction - Inspection of Old Clean Water Diversion Drain Seepage and Tailings discharge" Ref. 107031.84-M01-Rev1, 2 February, 2022.

[2] ATC Williams (2022). "Eastern Embankment Southern End Modification" Ref 107031.82-SI-001, 22 April 2022

[3] ATC Williams (2024). "2/5 Dam TSF - Seepage Diversion System Downstream of the Eastern Embankment - Construction Report" Ref 107031.92-R02-Rev0, 18 March 2024.

[4] GBG Group (2025). "MMG Rosbery Mine Bobadil TSF Geophysical Investigation" Ref GBGA2731_Report (Rev1), 17 February 2025.

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ATTACHMENTS

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ATTACHMENT 1 – TAILINGS LEAK 2022 MEMORANDUM

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MEMORANDUM

TO	Pamela Soto/Laura Moore	**COMPANY**	MMG Rosebery
FROM	Luisa Luengas	**OFFICE**	Hobart
PROJECT TITLE	2/5 Dam Stage 2 Construction		
SUBJECT	Inspection of Old Clean Water Diversion Drain Seepage and Tailings discharge		
DATE	9 February 2022	**OUR REF**	107031.84 M01-Rev1

1 INTRODUCTION

This memorandum presents the findings of a site visit that was carried out by ATC Williams (ATCW) at the 2/5 Dam Project in the MMG Rosebery Mine, in Rosebery, Tasmania on February 3 and 4, 2022.

The site visit entailed a visual inspection and assessment of the Old Clean Water Diversion Drain (CWDD) (**Photo 1**) which was backfilled as part of the 2/5 Dam Stage 1 Construction works in 2017, and which is expected to be downstream raised during the current Stage 2 Embankment Raise Construction.

2 OBJECTIVES

The purpose of the site visit to the 2/5 Dam Project was to assess the overall integrity of the embankment, mainly along the Old CWDD, due to a recently observed tailings leak emerging from its downstream toe (**Photo 2-3**). The leak was identified during monthly audit activities by an ATCW engineer currently supporting Stage 2 Construction works.

The site visit also focused on gaining a better understanding of potential origin of the leak, causes, and current status of the flow (ie: is the flow active?).

3 BACKGROUND INFORMATION

3.1 General

The 2/5 Dam TSF encompasses previous 1, 2 and 5 Dams which were originally built between 1950 and 1970 to provide storage to tailings and waste generated from the Rosebery underground mine. The 2/5 Dam was closed and rehabilitated in the 1980s, when Bobadil was constructed to be the primary TSF of the mine.

As part of the surface water management of the historic 2/5 Dam TSF, a clean water diversion drain was built along the south flank to intercept any rainfall runoff and re-direct it to the Stitt River (prior to 2017).

Very few construction records exist from the original works undertaken at the 2/5 Dam, and the knowledge associated to this infrastructure has been gathered based on visual observation of satellite photographs.

It is understood that the old CWDD was blasted through fresh rock in order to be shaped. This was evident from the exposed fresh rock faces of the deep channel as well as the quality of the rock upstream of the drain, which was used as the main rockfill quarry for Stage 1 Construction.

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3.2 Stage 1 Construction

ATCW undertook a feasibility design of the 2/5 Dam in 2015 that considered the recommissioning and raising of the existing facility in order to support ongoing operations at Rosebery. This study was based upon a storage of 5 Mt of tailings over 6.25 years from 2017 – 2023 with an average production rate of 800,000 tpa. The Feasibility Study identified development of the embankments in two stages; Stage 1 to RL 170.0 m and Stage 2 to RL 173.0 m, with Stage 1 providing storage for 3 Mt of tailings and Stage 2 providing storage for a further 2 Mt. Sub-aqueous deposition was selected to manage community expectations in relation to potential dust generation.

The project advanced to the construction stage, and to support future tailings storage modelling at the site, it was necessary to backfill the Old CWDD, as this location coincided with the future embankment alignment.

Stage 1 Construction works commenced in 2016 and were completed in 2017. The construction works in this area (old CWDD) entailed:

- Grouting of foundation rock to depths of 15 to 20 m along the alignment of future anchor trenches. Grouting was considered complete once the permeability of the rock was 5×10^{-7} m/s or less.
- Backfilling of CWDD cut with Zone 3B rockfill (**Photo 4-6**)
- Anchor trench in rock along completed grout curtain alignment to facilitate liner anchoring (**Photo 7 and 8**)
- Placement of lower liner protection layer Zone 3A above backfilled surface (**Photo 8**)
- Placement of geosynthetic lining system (Bituminous liner sandwiched in 2 layers of geotextile) (**Photo 9**)
- Anchoring of lining system in previously excavated anchor trench and backfill of anchor trenches with sulphate resistant concrete (**Photo 10**)
- Placement of upper liner protection layer Zone 3A above lining system (**Photo 11**)
- Placement of Zone 3B rockfill to form liner ballast on downstream slope of the backfill zone (**Photo 12**)

The upstream zone of the old CWDD was blasted as part of the main quarry works (**Photo 13**). Designed offset distances from grouting curtain were maintained, blasting vibrations were monitored and quality assurance coring along the grouting curtain in the area proved that the grout curtain's integrity remained after all blasting for the project ceased. Lining activities commenced after all blasting was complete.

3.3 2021 Tailings Deposition

The tailings deposition strategy at the 2/5 Dam was modified from sub-aqueous to a combination of sub-aqueous and sub-aerial deposition via perimeter spigots. The modified deposition strategy commenced during 2021.

Sub-aerial deposition upstream of the Old CWDD was active during the second half of 2021 and early 2022.

Tailings deposition ceased within the area as a preventative measure upon discovery of the tailings at the downstream toe.

3.4 Stage 2 Construction

The Stage 2 Construction works at the 2/5 Dam commenced during 2021 and are expected to be completed during the current year. The current design for Stage 2 is a downstream raise. Any remedial measures will be incorporated into the downstream shell design.

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3.5 Tailings Leak

During monthly audit observations on February 2, 2022, an ATCW Site Engineer discovered a minor tailings leak that appeared to have emanated from the downstream toe of the old CWDD (**Photo 2-3**). The leak took place near a known seepage point that is currently being monitored for flow via a v- notch weir.

Inspection of the leak suggested a small volume of tailings were contained immediately downstream within a small rockfill bund wall that had facilitated ponding of historical seepage. Some tailings travelled downstream along the decommissioned clean water diversion drain for approximately 100 m. Based on visual observations, it is understood that tailings flow stopped prior to detection of the leak and tailings were not transported to the Stitt River.

4 SITE VISIT

4.1 Location and Date

The site visit took place on February 3 and 4, 2022 by ATCW's Senior Associate Engineer Luisa Luengas who was one of the full-time site engineers present during the Stage 1 Construction activities. Luisa has been familiar with the MMG Rosebery TSF works since 2015 and continues providing support when necessary.

The ATCW Engineer inspected the upstream and downstream zones of the Old CWDD embankment, the upstream tailings beach, and the Northern and Eastern embankment slopes, drains and toes.

4.2 Old CWDD Status

4.2.1 Upstream and Downstream Slopes

The downstream slope of the backfilled Old CWDD appears to be in good condition. Some minor settlement was observed at the crest, which is expected from the behaviour of rockfill with such particle size distribution. (**Photo 14)**

The upstream slope that has not been buried by tailings appears to be in good condition. (**Photo 15**)

4.2.2 Tailings Beach

Sub-aerial deposition upstream of the Old CWDD ceased immediately upon discovery of the leak. It is understood that sub-aerial deposition began in the area towards the end of 2021 and continued during early 2022. No previous audit identified tailings emanating from the toe, therefore it is inferred the leak occurred sometime during January 2022.

A perimeter spigot is located immediately upstream of the Old CWDD and this spigot has been closed until further notice as a preventative action. (**Photo 15**)

No piping or sink holes were observed in the tailings beach upstream of the embankment suggesting that there is no active piping erosion occurring.

4.2.3 Downstream Toe

There are no visible signs of instability at the toe. It is noted that historically, this low point has always presented ponding/seepage, including post grouting and lining activities. (**Photo 7**)

Initial inspection of the toe identified two potential flow paths, one predominantly water flow (A) and the second with tailings (B) (**Photo 17**). At the time of the inspection, water was flowing from the toe although no active tailings flow was evident.

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4.3 Monitoring

4.3.1 General

The flow at the toe of the Old CWDD is being monitored, for both water and tailings flow, on a daily basis.

4.3.2 Water Flow

Water flow at this location has been estimated to be approximately ~ 0.5 l/s. As previously mentioned, an adjacent seep is monitored via a v-notch weir. The seepage measured by the weir is linked to the historic 5 Dam, while the water flow at the toe of the old CWDD is associated to its upstream zone, namely the Stage 1 quarry.

Currently the water flow remains constant and does not appear to have increased during the monthly inspections.

4.3.3 Tailings Flow

Measurements of tailings thickness undertaken both on February 3 and 4 suggested no active tailings flow, nonetheless the possibility of this being a discreet flow was not dismissed.

Due to the size of the rockfill in the area, a detailed inspection of the flow characteristics was challenging therefore it was decided that removal of the oversized rocks at the downstream toe within the drain would facilitate a more accurate visual inspection of the toe. (**Photo 18**)

An excavator and vac truck were deployed to the area. The vac truck emptied the settled tailings immediately downstream of the toe and the excavator carefully removed the oversize rock under the supervision of the ATCW Senior Associate Engineer. Removal of rockfill was only superficial and was kept at a safe offset distance from the liner anchor trench/grout curtain alignment, which did not affect the thickness of buttressing rockfill above the liner.

Following removal of the oversize it was possible to identify a primary tailings flow path and this allowed the Engineering team to create temporary bunding around this location as a means to verify if tailings flow had ceased or was still active. (**Photo 19-22**)

Measurements of tailings thickness within the temporary monitoring sump appear to have not changed between measurements taken on February 4 and February 7. Similarly, visual inspection shows no water turbidity, which suggest that there is no active tailings flow. (**Photo 23-24)**

4.3.4 Environmental Monitoring

MMG is currently undertaking water quality monitoring at a number of locations downstream of the Old CWDD. It is understood environmental monitoring is ongoing and will continue throughout the remediation works aimed at cleaning the small volume of tailings that flowed along the decommissioned clean water diversion drain.

5 PROPOSED IMMEDIATE ACTIONS

Based on the site visit observations, the daily continuous monitoring of the zone, and the cessation of tailings deposition within the area no further tailings flow is expected.

Preliminary investigations suggest that there is a defect in either the lining system, anchor trench or grouted rock that has allowed preferential flow of tailings. The design of the fill and lining system within this area is such that removal of rockfill to inspect the lining system is not possible. As this would result in uplift forces resulting in total liner failure in the area.

In order to facilitate the development of a detailed remediation plan to correct and minimise any potential further tailings transport downstream of the old CWDD during future filling activities, the following immediate actions have been proposed:

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- Cease all tailings deposition immediately upstream of this location (actioned as part of the immediate response plan);
- Undertake a detailed survey of the existing embankment profile to be compared with As-built survey and to facilitate engineering analysis;
- Continue monitoring on a daily basis and advice if any changes are noted;
- Remove the tailings that were transported downstream of the Old CWDD via the construction of 2 access roads that will allow the access of a vac truck

The most appropriate remedial design will be inclusion of a reverse filter in the area that would stop any further tailings flow in the event that they remobilised. This will be incorporated into a revised Stage 2 design in this location.

6 CLOSING

This memorandum presents the findings from the site visit and aims to provide background information and an understanding of current conditions. A detailed design will be prepared once the initial immediate actions listed above are undertaken. Conclusions drawn are based on the observations made, ATCW's prior involvement at the mine and review of existing information.

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PHOTOGRAPHS



Location of detected tailings

02/02/2022

Photo 1



Panorama. Downstream slope old CWDD

02/02/2022

Photo 2



settled tailings at downstream toe

02/02/2022

Photo 3

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	Backfilling of Old CWDD Open Channel 2017 **Photo 5**
	Backfilling of Old CWDD Open Channel. View to the west 2017 **Photo 6**
	Historical ponding of water at low point 2017 **Photo 7**

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	Placement of lower Zone 3A – liner protection material 2017 **Photo 8**
	Lining system installation 2017 **Photo 9**
	Concrete anchoring of liner along grout curtain alignment 2017 **Photo 10**

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	Placement of upper Zone 3A – liner protection material 2017 **Photo 11**
	Downstream buttressing with Zone 3B 2017 **Photo 12**
	Upstream of Old CWDD Quarry 2017 **Photo 13**

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	View of area after initial clean-up. From downstream 03/02/2022 **Photo 14**
	View of spigot, tailings beach and upstream slope of old CWDD fill 03/02/2022 **Photo 15**
	Sandbags positioned in historical culvert to minimise further tailings transport downstream 03/02/2022 **Photo 16**

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	Initial monitoring points 03/02/2022 **Photo 17**
	Oversize rockfill removal 04/02/2022 **Photo 18**
	Location of main tailings flow path 04/02/2022 **Photo 19**

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	Location of main tailings flow path 04/02/2022 **Photo 20**
	Main tailings flow path bunded to further monitor 04/02/2022 **Photo 21**

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	Additional clean-up of area 04/02/2022 **Photo 22**
	No change noted on monitoring sump – no tailings flow active 07/02/2022 **Photo 23**
	No change noted on monitoring sump – no tailings flow active 07/02/2022 **Photo 24**

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ATTACHMENT 2 – PHOTOGRAPHS

	Location of discovered turbid seepage 22/11/2024 **Photo 1**
	Location of discovered settled sediment – 2 outlets 22/11/2024 **Photo 2**
	Turbid seepage travelling to V-Notch #6. Tailings deposition ceased 22/11/2024 **Photo 3**

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	Seepage flows towards downstream V-Notch #6 26/11/2024 **Photo 4**
	Turbid seepage apparent on clear seepage (New PAF fill) and not oxidised seepage (NAF 5Dam Fill) 26/11/2024 **Photo 5**
	Location of discovered settled sediment – 2 outlets 26/11/2024 **Photo 6**

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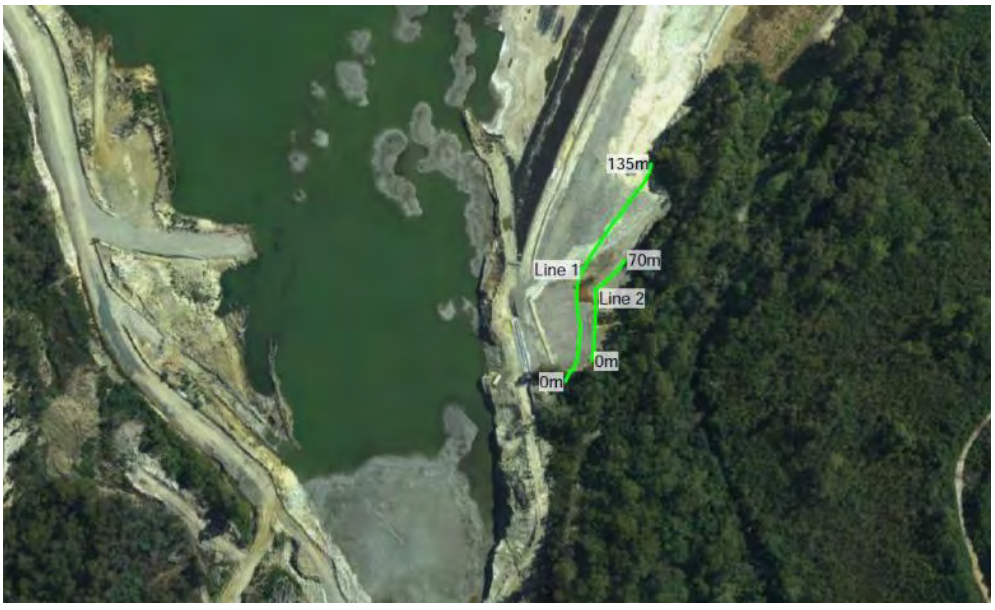
	settled tailings at downstream toe – closer to filter wall location 26/11/2024 **Photo 7**
	settled tailings at downstream toe – north of filter wall location 26/11/2024 **Photo 8**
	Upstream area – View to the south. Immediately upstream from turbid seepage 26/11/2024 **Photo 9**

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	Upstream area – View to the north Immediately upstream from turbid seepage 26/11/2024 **Photo 10**
	Tailings deposition recommences at 16:00 26/11/2024 **Photo 11**
	V-Notch #6 reading in the afternoon – clear seepage 26/11/2024 **Photo 12**

	Arrow shows location tailings ingress on old CWDD upstream area 27/11/2024 **Photo 13**
	Arrow shows location tailings ingress on old CWDD upstream area 27/11/2024 **Photo 14**
	Location of sink hole, witnessed tailings ingress on the upstream area of the old CWDD after re-start of tailings deposition 27/11/2024 **Photo 15**

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	Temporary measure. Placement of geotextile over suspected intake location 27/11/2024 **Photo 16**
	Location of geophysics survey lines (crest of filter wall buttress & downstream toe line) 27/11/2024 **Photo 17**
	Plan view Location of geophysics survey lines (crest of filter wall buttress & downstream toe line) 27/11/2024 **Photo 18**

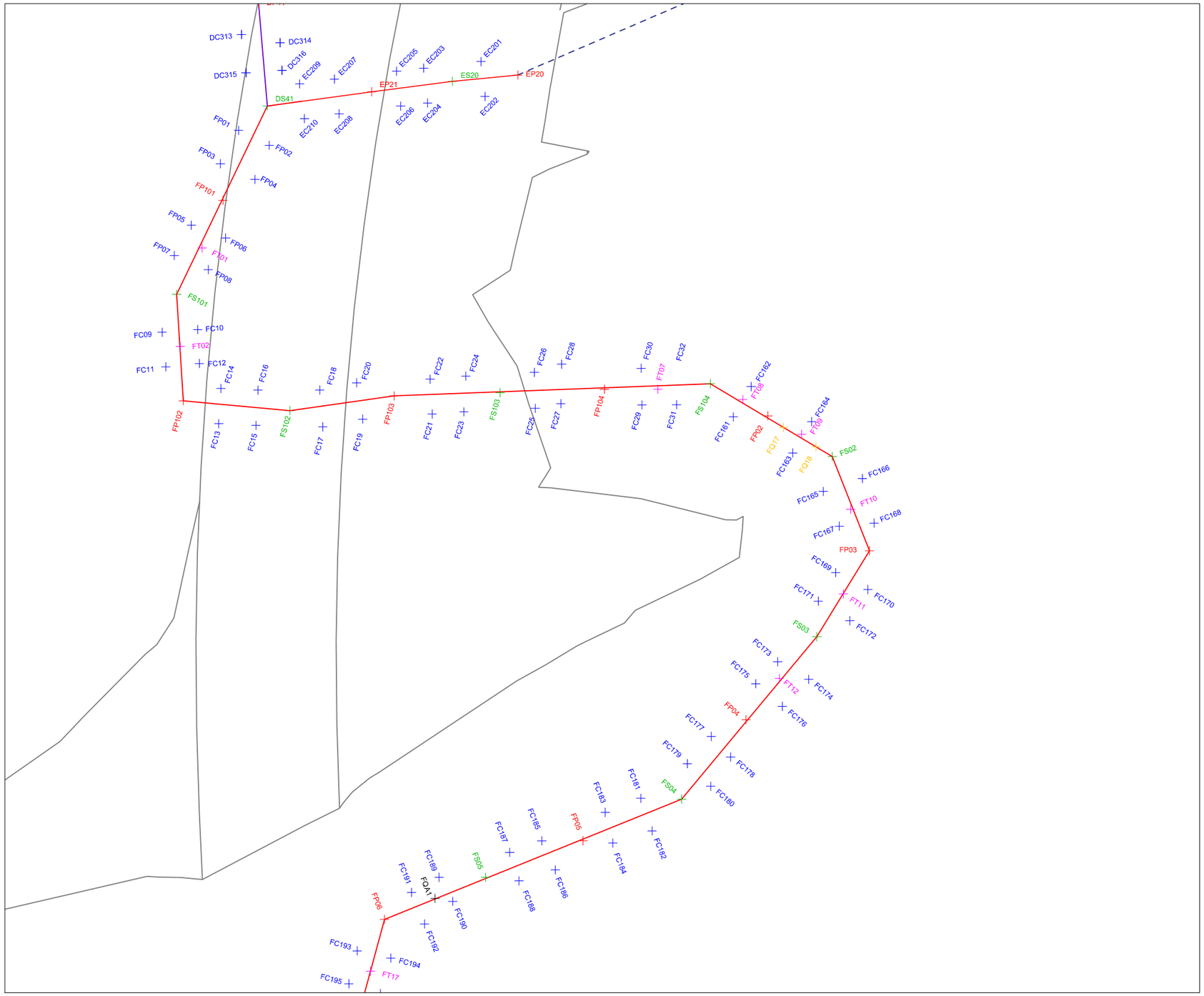
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ATTACHMENT 3 – STAGE 1 GROUT LINE F AS-BUILT RECORDS

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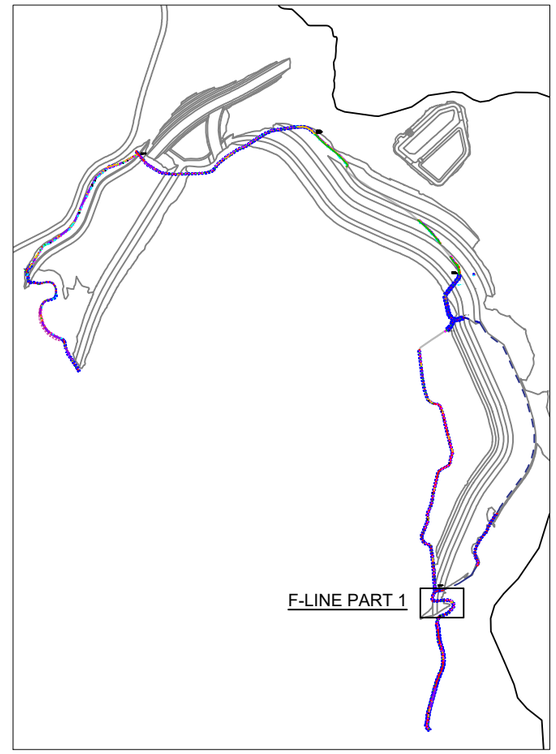
BOREHOLES FOR F-LINE PART 1

1:250



FOUNDATION GROUTING PLAN

not to scale



LEGEND:

- + - Consolidation holes
- + - Primary holes
- + - Secondary holes
- + - Tertiary holes
- + - Quaternary holes
- + - Quinary holes
- — - 20m grout curtain from surface
- — - 25m grout curtain from surface
- - - CB wall supply only

Notes:
This a colour drawing - drawings printed in black and white will not display information correctly

Rev		Date	Drawn	Checked	Approved
04	Revised borehole layout	2017.11.22	AW	MG	IR
03	Revised borehole layout	2017.08.09	PW	PW	PW
02	Revised borehole layout	2017.04.28	SD	NM	NM
01	Revised borehole layout	2017.03.16	NM	NM	NM
00	Issued for construction	2017.01.24	AW	NM	NM

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KELLER GROUND ENGINEERING

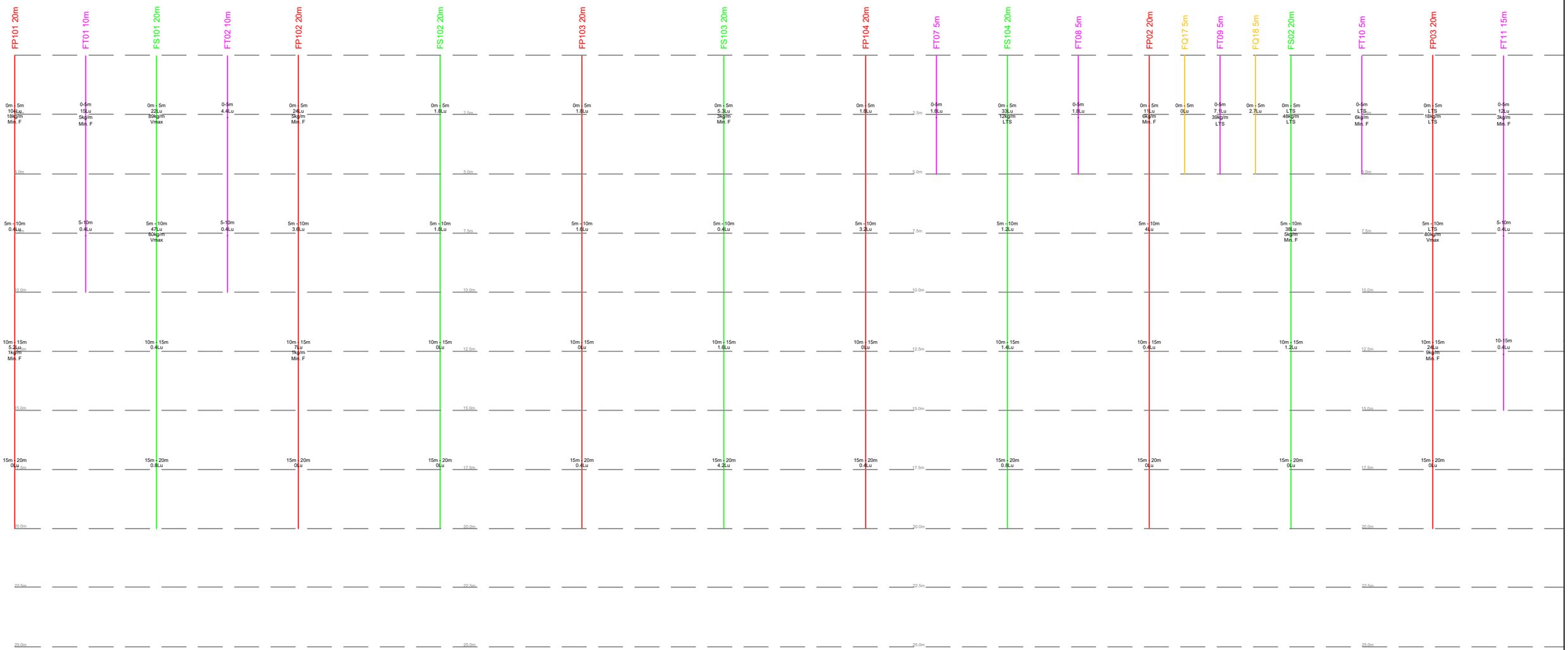
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PROJECT:
MMG ROSEBERY DAMS

DRAWING TITLE:
BOREHOLES FOR F-LINE PART 1

AS BUILT

Scale: 1:250 (A3)	Drawn by: AW	Date: 2017.11.22
Client: MMG	Checked by: MG	Approved by: IR
Rev: 04	E198-F101	



LEGEND	
Primary Borehole, Number, Depth	FP() m
Secondary Borehole, Number, Depth	FS() m
Tertiary Borehole, Number, Depth	FT() m
Quaternary Borehole, Number, Depth	FQ() m

Notes:
1. Depth scale is indicated with a dashed grey line at 2.5m increments.
2. Depths are measured from ground surface

Rev		Date	Drawn	Checked	Approved
03	QA Borehole Information Update	23/11/2017	AW	MG	IR
02	Progress update	25/07/2017	PW	PW	PW
01	Progress update	21/06/2017	NM	NM	NM
00	Initial issue	25/05/2017	NM	NM	NM

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PROJECT:
MMG ROSEBERY DAMS

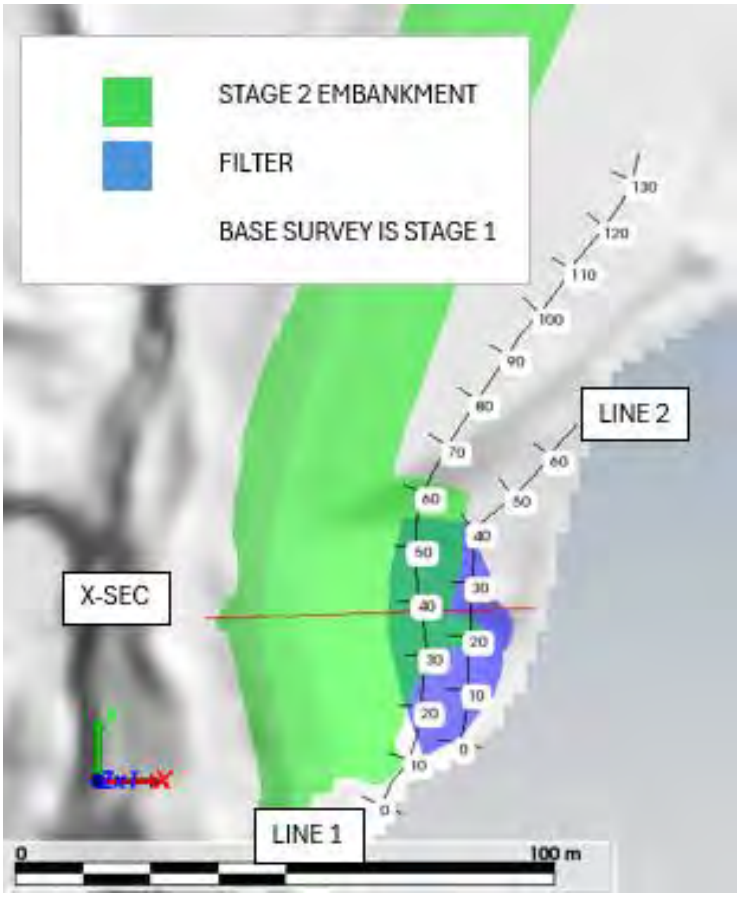
DRAWING TITLE:
F-LINE DRILL AND GROUT LONG SECTION 1

AS-BUILT

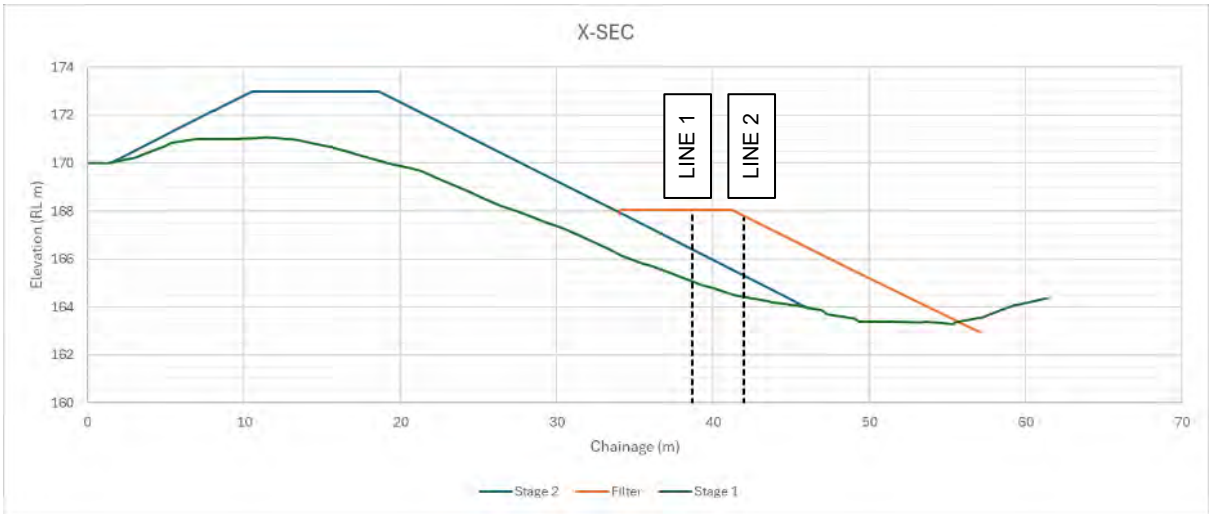
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NTS	AW	23/11/2017
Client:	Checked by:	Approved by:
MMG	MG	IR
Rev:	E198-F201	
03		

ATTACHMENT 4 – GEOPHYSICAL SURVEY INTERPRETATION

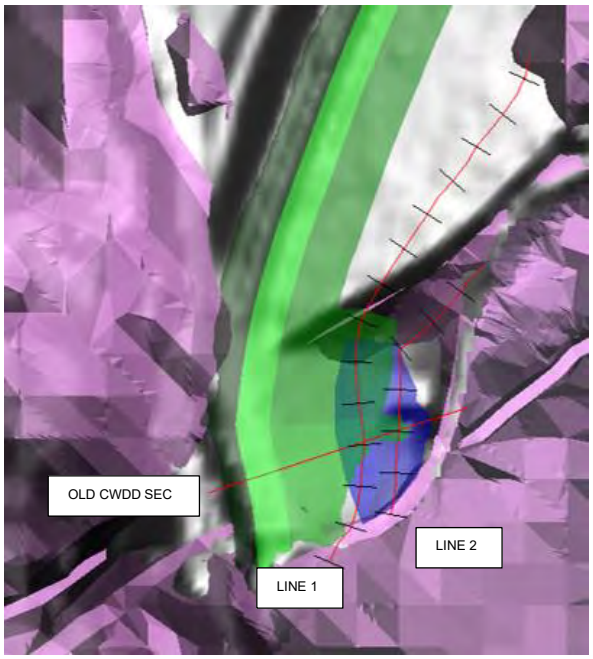
Location of Section Lines in Plan View



Cross Section X-Sec



Section cut along Old Clean Water Diversion Drain

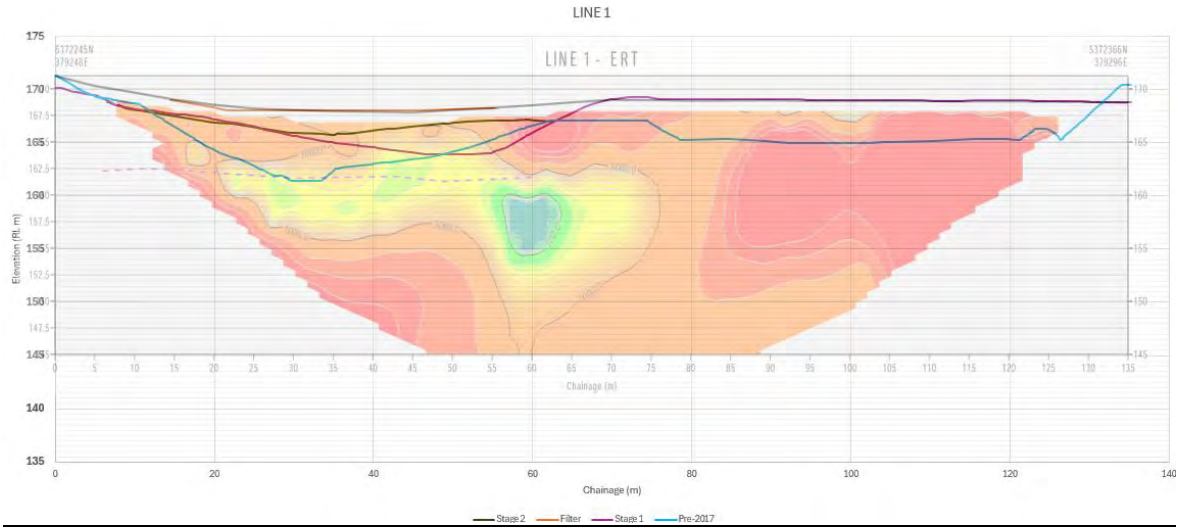


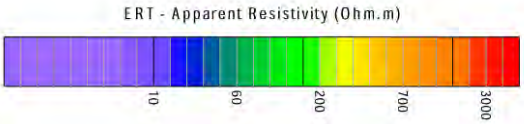
Cross Section Old Clean Water Diversion Drain



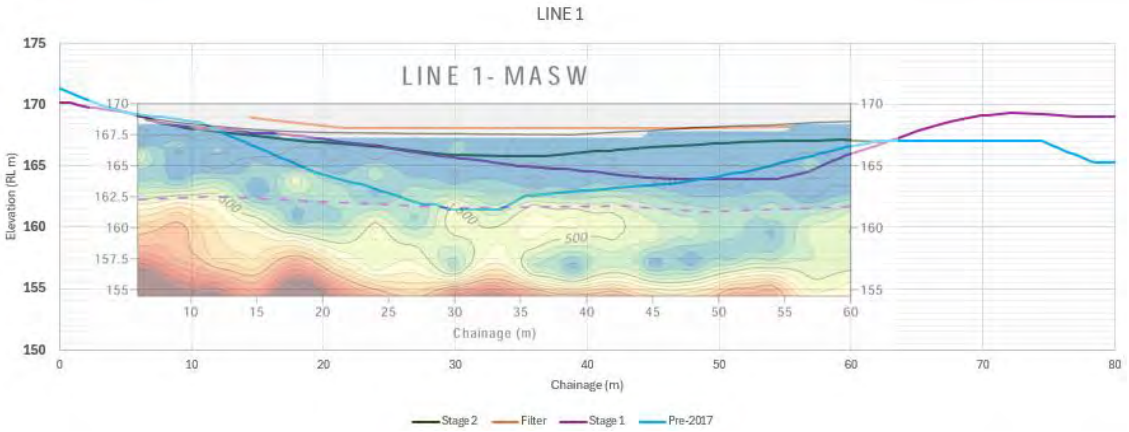
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Long Section Line 1 vs ERT Survey





Long Section Line 1 vs MASW Survey



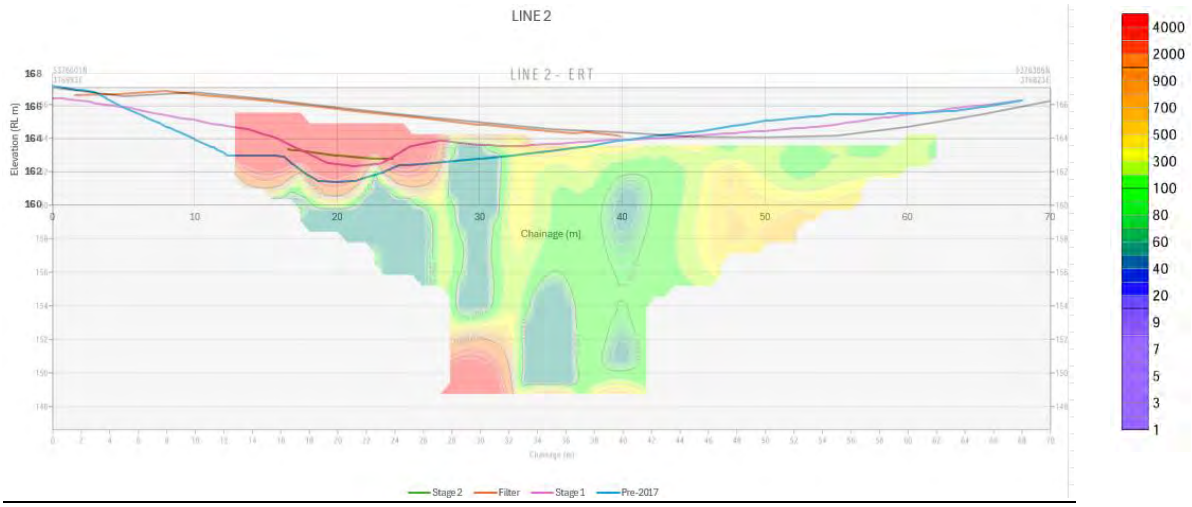


Shear Wave Velocity Material Classification

Class	S-wave Velocity (m/s)	Description
S.1	Equal to or greater than 800	High to very high stiffness rock
S.2	575 to less than 800	Medium to high stiffness rock
S.3	375 to less than 575	Low to medium stiffness rock
S.4	250 to less than 375	Very stiff sediment or very low stiffness rock
S.5	Less than 250	Loose sediment

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Long Section Line 2 vs ERT Survey



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APPENDIX G – INSTRUMENTATION ASSESSMENT MEMORANDUM

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MEMORANDUM

TO	Pamela Soto / Laura Moore	**COMPANY**	MMG
FROM	Luke Eyles / Arun Muhunthan	**OFFICE**	Melbourne
EMAIL	arunm@atcwilliams.com.au	**PHONE**	03 8587 0900
PROJECT TITLE	Engineer of Record Ad hoc Support		
SUBJECT	2-5 Dam Instrumentation Assessment and Residual Strength Analysis		
DATE	12 June 2025	**OUR REF**	107031.126 M03

1 INTRODUCTION

This memorandum provides an overview of the critical instrumentation readings discussed during the last annual Independent Tailings Board Review (ITRB) meeting, held from 25th to 27th March 2025. Additionally, it includes a stability assessment of the 2/5 Dam Tailings Storage Facility (TSF) Northern Embankment, focusing on critical sections with residual strength parameters for key materials. The analysis incorporates the latest subsurface conditions and material parameters for the Northern Embankment.

It also outlines remedial measures to enhance the factor of safety if these materials are likely to reach residual strength.

2 BACKGROUND

2.1 Northern Embankment Foundation

2.1.1 Soil Strata

A geotechnical investigation completed by others **[1] [2]** prior to the investigation carried out for the Stage 1 and Stage 2 raises indicated the 2/5 Dam TSF foundation consisted of 4 m thick glacial till (mixture of gravelly and sandy clays and silts) and underlying bedrock. It is understood that these investigations were carried out through the 2/5 Dam TSF embankment crest, but no geotechnical investigation reports are available for review to confirm the soil strata.

The soil profiles downstream of the Northern Embankment inferred from the Stage 2 investigations **[3]** revealed 3 m to 6.5 m of rockfill material overlying fine-grained soils, comprising low permeability, sandy silt and silty clay material. The thickness of fine-grained soil varied from 1.5 m to 12.8 m. A soft organic silt/peat layer was present at the base of the silt layer at the interface with the glacial deposits. The thickness of organic silt varied from 0.3 m to 2.2 m. It should be noted that pore pressure dissipation during the 2/5 Dam TSF Stage 2 construction took longer than it anticipated. Hence, an additional investigation together with installation of vibrating wire piezometers was carried out in September 2022 **[4]** to better define the Northern Embankment foundation profile for future embankment raises.

The following three geotechnical investigations were conducted as part of the Stage 3 embankment raise feasibility study:

- 2/5 Dam Stage 2, Northern Embankment Geotechnical Investigation and Piezometer Installation Factual Report, Reference 107031.82 R01, November 2024 **[4]**,
- 2/5 Dam Stage 3 Feasibility Study Northern Embankment Buttress Design Piezometer Installation and Geotechnical Investigation Report, 107031.87 R03, August 2023 **[5]**, and

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- 2/5 Dam TSF Stage 3 2024 Geotechnical Investigation and Laboratory Testing of Northern Embankment Foundation Material Report, 107031.120 R01, August 2024 **[6]**.

The Silt and Organic Silt materials defined for the Stage 2 embankment raise were further divided into the following subunits based on the above geotechnical investigation.

- Unit 1A: Low to medium plasticity (non-organic) Silt, very soft to firm, likely to be sensitive fine-grained. (shown as “1a-1” on the geological cross-sections in **Appendix A**)
- Unit 1B: Sand with silt (shown as “1b-1” on the geological cross-sections in **Appendix A**)
- Unit 2A: High Plasticity (Organic) Silt, soft to firm. (includes “2a-1” and “2a-2” on the geological cross-sections in **Appendix A**)
- Unit 2B: High Plasticity (Organic) Silt stiff. (shown as “2b-1” on the geological cross-sections in **Appendix A**)
- Unit 3A: High Plasticity (non-organic) Silt, very soft to firm likely to be sensitive fine-grained. (shown as “3a-1” on the geological cross-sections in **Appendix A**)
- Unit 4B: Low Plasticity (non-organic) Silt, stiff to very stiff. (shown as “4b-1” on the geological cross-sections in **Appendix A**)
- Unit 5: Weathered rock.

2.1.2 Leapfrog Model

As part of the current 2-5 Dam stage 3 Feasibility Study, a 3D geotechnical model of the Northern Embankment foundations was developed in Leapfrog **[7]** and later modified to integrate a parallel 3D geological model of the same area developed by others (Tim Callaghan – Local Geologist).

The 3D Leapfrog model, in its final and most current iteration, was presented to MMG on 23 July 2024. The cross sections extracted at the various locations through the Leapfrog model are presented in **Appendix A**.

2.1.3 Operational TARP Re-assessment

Following the definition of the new stratigraphy, material parameters and completion of the 3D Leapfrog model, a re-assessment of the Northern Embankment operational TARP levels was completed to incorporate the updated subsurface profile **[8]**.

Additionally, several new piezometers had been installed and did not have operational trigger levels assigned to them. Moreover, several existing piezometers have become inactive or verified as providing erroneous readings prior to developing the TARP. Active and non-erroneous piezometers were assigned updated ‘Green’ and ‘Amber’ TARP trigger levels that reflect the most recent Northern Embankment conditions. Inactive and erroneous instruments were removed from the TARP.

2.2 ITRB Meeting

The 2024/2025 ITRB meeting was held from the 25th to 27th of March 2025. ATCW presented the instrument monitoring records to ITRB and MMG at this meeting, showing that increased movement occurred during December 2024 – January 2025 in inclinometer IC6, located in the central region of the Northern Embankment. During the meeting, concerns were expressed related to the increased rate of movement identified. The increased rate of movement is demonstrated in **GRAPH 1**, and can be seen between mid-December 2024 to mid-January 2025.

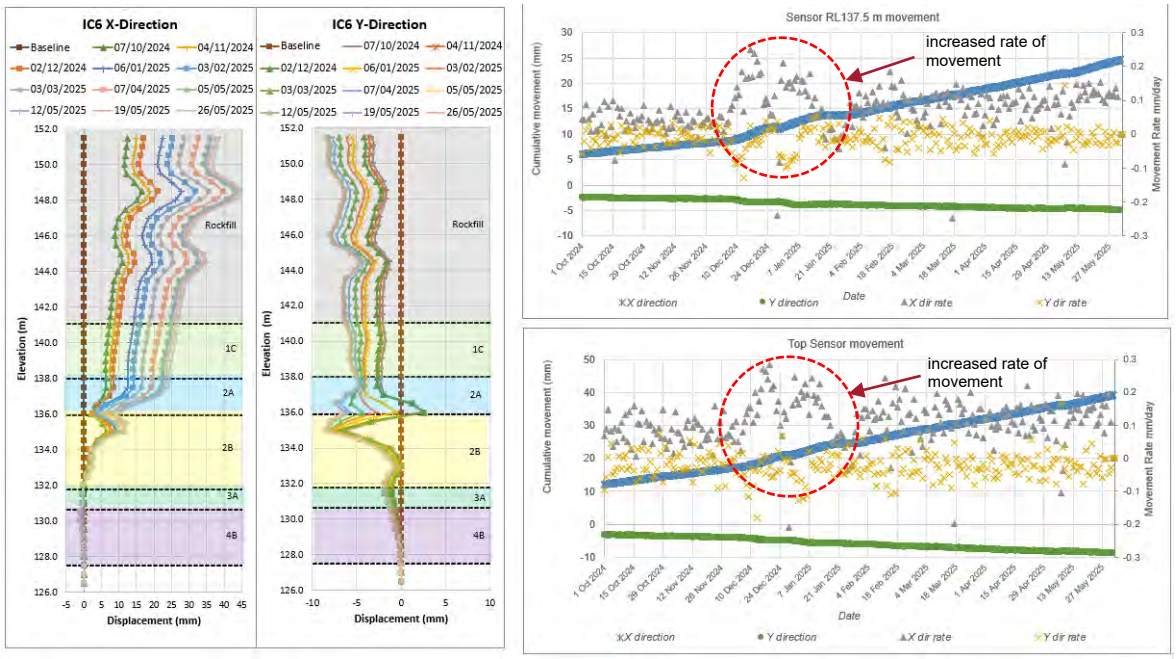
The temporary increased movement rate is indicated by the increased gradient, denoted by the red circle shown in **GRAPH 1** during the mid-December 2024 to mid-January 2025 period. Since the increased rate of movement period, the movement has reduced but is still demonstrating continuous movement at a higher rate in comparison to the movement experienced before the

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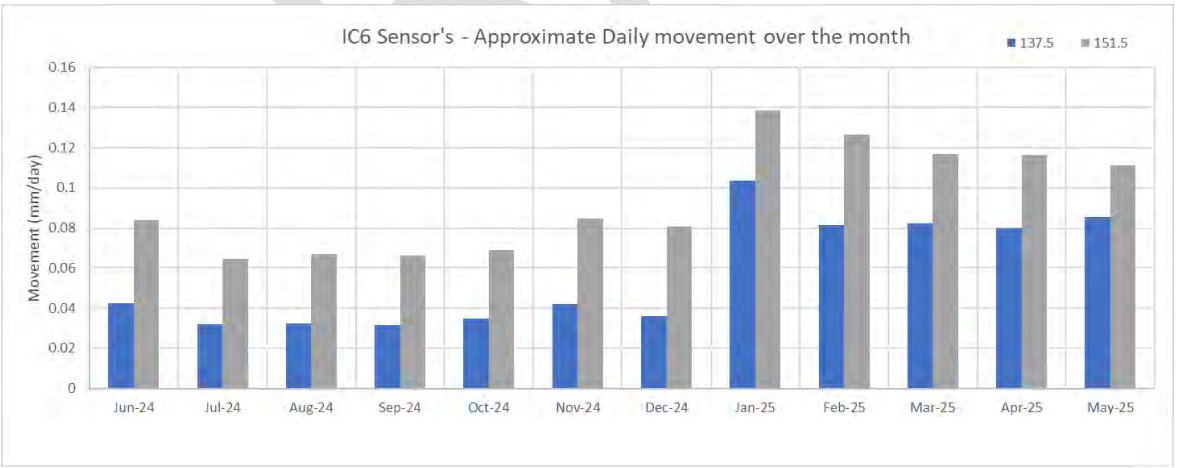
initial increased rate in mid-December. This is illustrated in **Graph 2**. It should be noted that no other activities other than lowering the pond level in the TSF occurred during the higher rate of movement period.

GRAPH 1 – INCLINOMETER IC6 MOVEMENT (TOP SENSOR AND SENSOR AT RL 137.5 m)



- X direction – Perpendicular to the embankment crest with positive towards downstream
- Y direction – Parallel to the embankment crest with positive 90 degrees anticlockwise to the X positive direction.

GRAPH 2 – INCLINOMETER IC6 DAILY RATE OF MOVEMENT AT RL 137.5 AND 151.5 (FROM MONTHLY AVERAGE)



2.3 Monitoring Instrumentation in the Vicinity of IC6

Several vibrating wire piezometers, settlement monuments (prisms), and inclinometers are located near IC6. The general layout of these instruments is shown in **Diagram 1**, while detailed plots from inclinometers, piezometers, and total station readings are provided in **Graphs 3 to 10**.

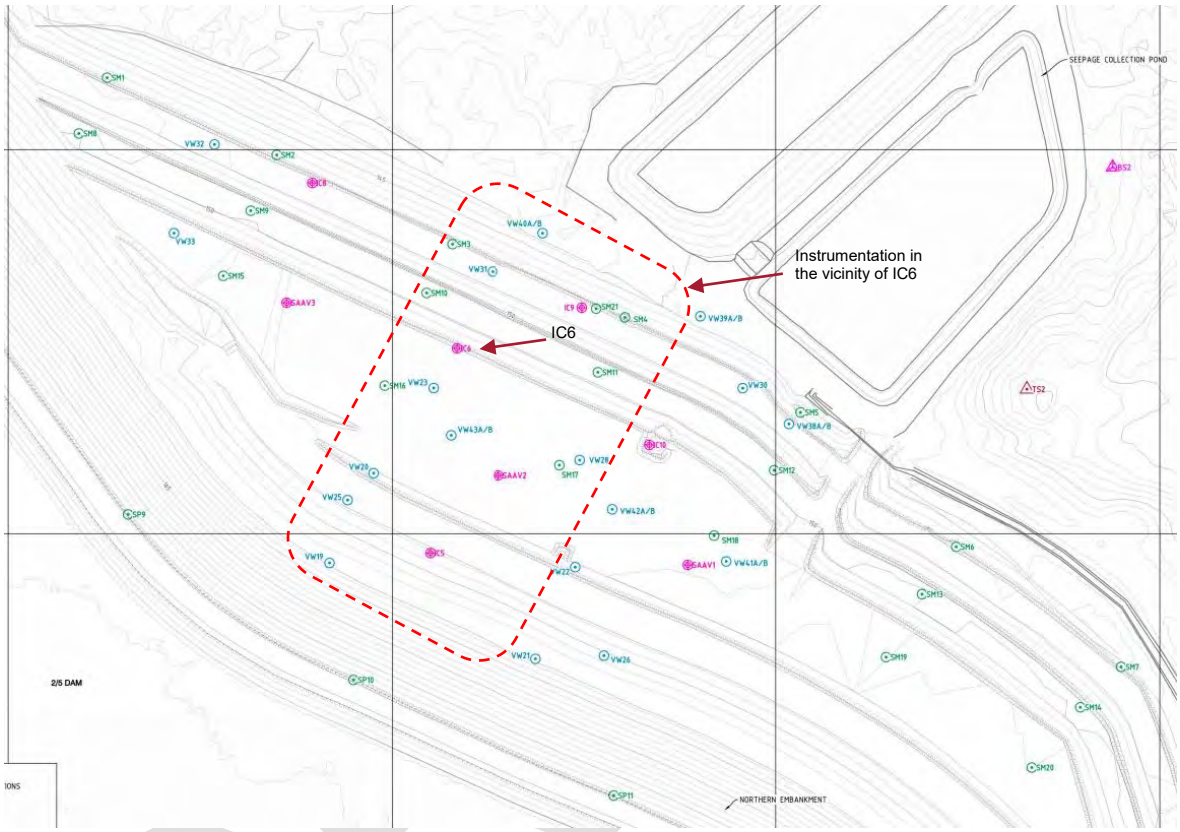
A review of inclinometer data (**Graphs 3 and 4**) near IC6 shows no abnormal trends over the past 12 months, apart from a slight reduction in movement rate with time. However, movement

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monitoring (prisms) data (**Graphs 5 and 6**) indicate an increased rate of horizontal movement between November and February 2025, which then stabilised in March.

Piezometer data (**Graph 8**) shows a drop in the phreatic surface of up to 1 m between November 2024 and March 2025. This is likely due to a combination of lower TSF pond levels, summer weather conditions, and ongoing consolidation of the Northern Embankment foundation units.

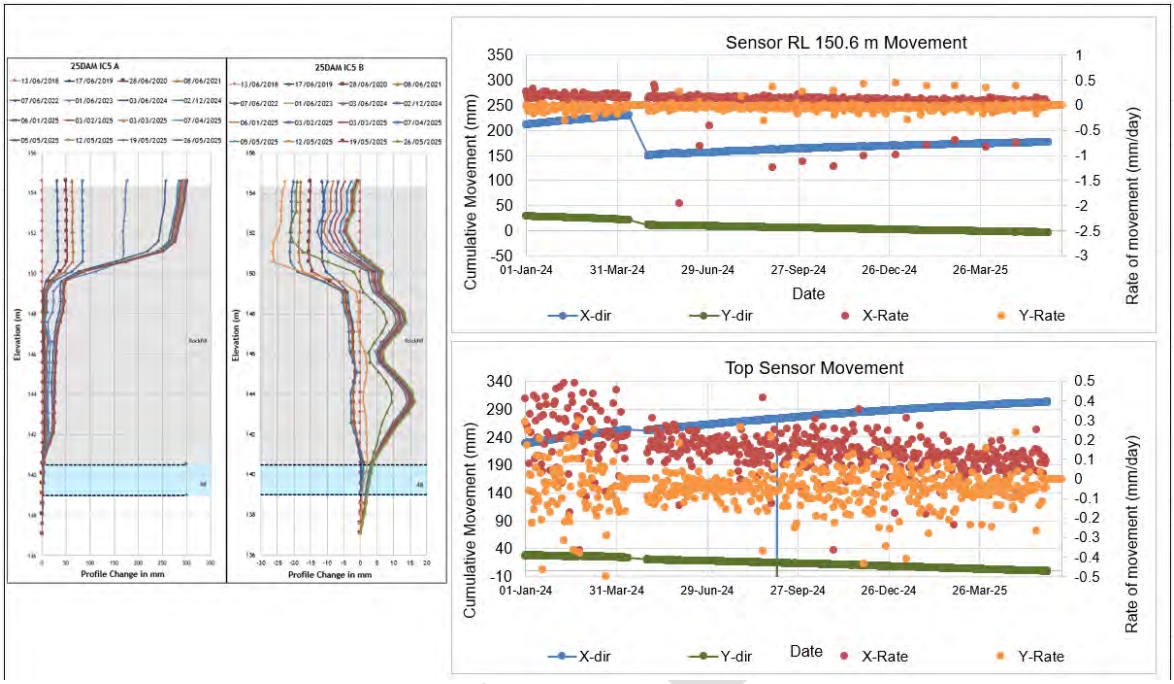
DIAGRAM 1 – INSTRUMENTATION LAYOUT



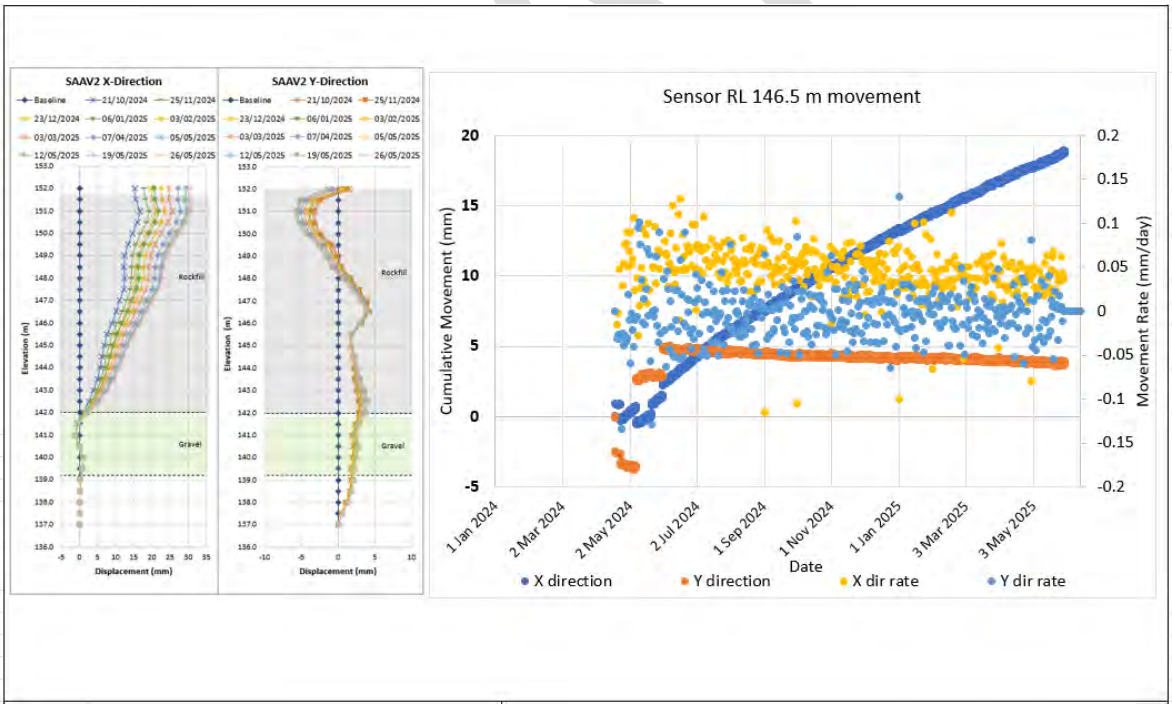
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GRAPH 3 – INCLINOMETER IC5 MOVEMENT

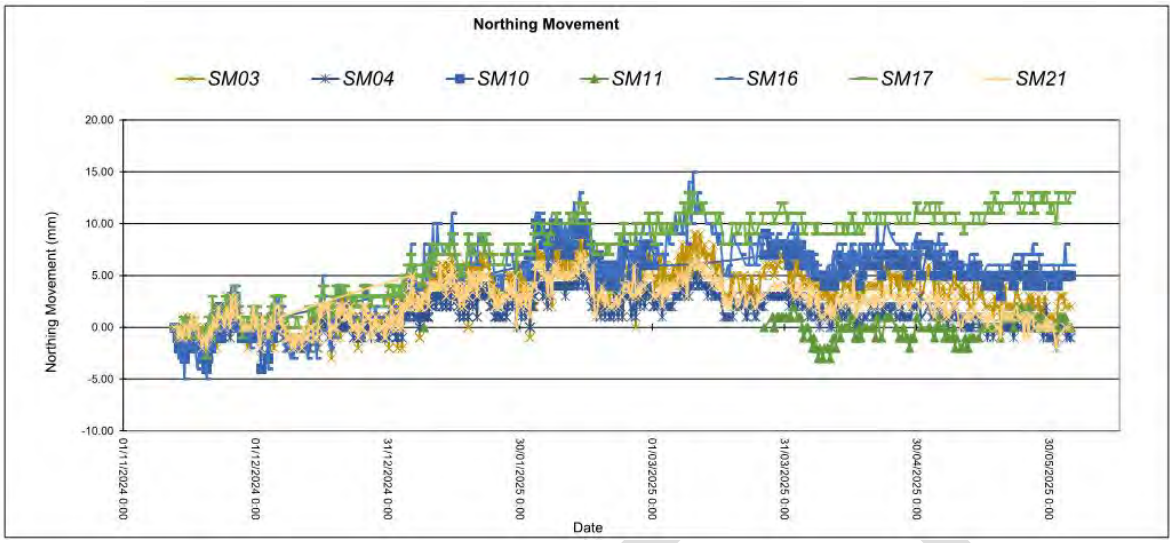


GRAPH 4 – INCLINOMETER SAAV2 MOVEMENT



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GRAPH 5 – SETTLEMENT MONUMENTS NORTHING MOVEMENT

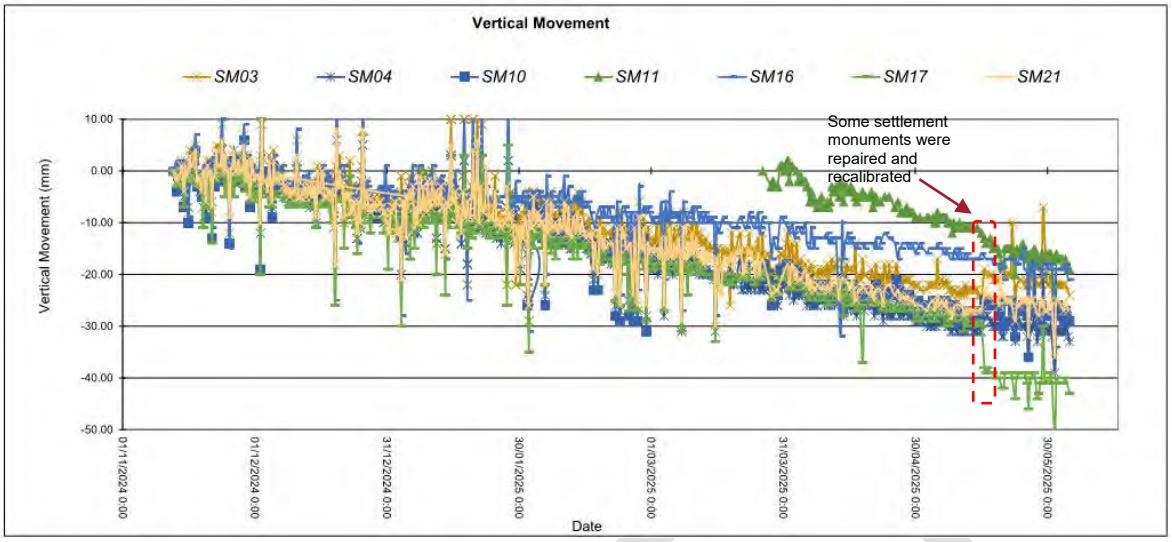


GRAPH 6 – SETTLEMENT MONUMENTS EASTING MOVEMENT

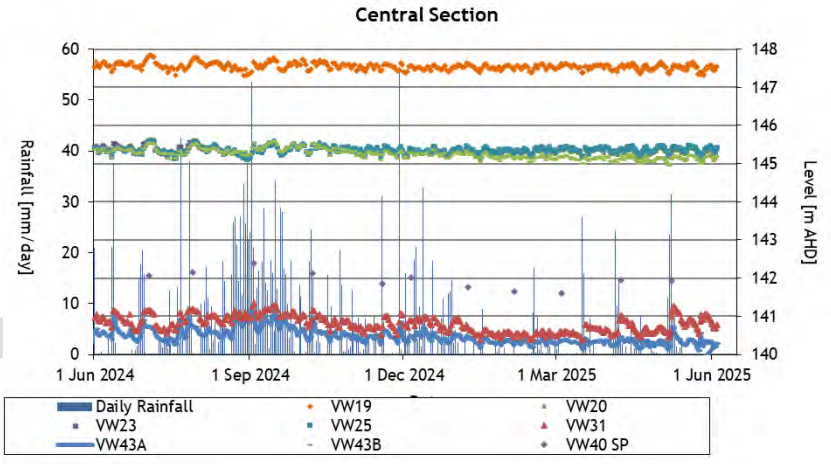


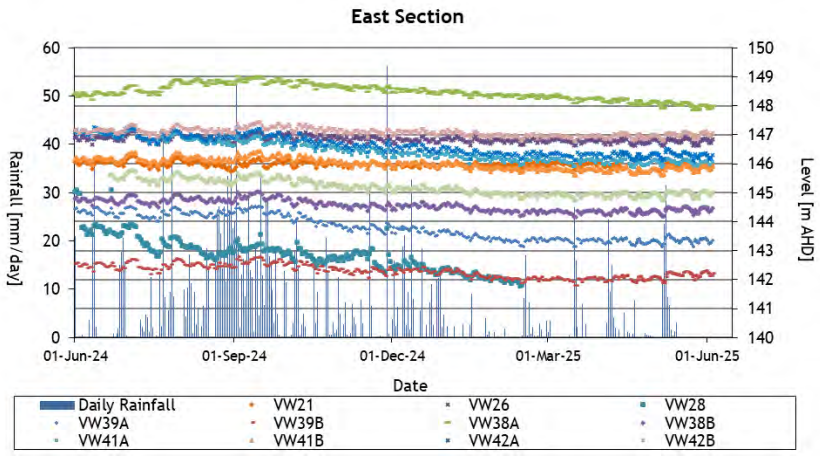
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GRAPH 7 – SETTLEMENT MONMENTS VERTICAL MOVEMENT



GRAPH 8 – VIBRATING WIRE PIEZOMETER READINGS





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2.4 ITRB's Concern

ITRB has expressed concern at the increased rate of horizontal displacement within IC6, and movement monitors in proximity to IC6, towards the downstream direction from December 2024. ITRB's view is that this is potentially indicative of a secondary phase of creep deformation that occurs in marginally stable slopes. The ITRB consider the deformation observation at the Northern Embankment to be a potential dam safety issue. It should be noted that that ITRB had seen the instrumentation data up to mid-March 2025 at the time of the ITRB meeting. During this period, all movement monitors were showing an upward trend.

2.5 Consolidation and Creep

Consolidation refers to the reduction in soil volume due to the expulsion of excess pore water under applied stress. This process, known as primary consolidation, occurs relatively quickly. Once excess pore pressures dissipate, creep (or secondary compression) may continue at a slower rate due to viscous deformation of the soil skeleton.

While consolidation and creep are distinct, they are interrelated. Primary consolidation sets the stage for creep, and both contribute to total settlement. The extent of settlement depends on soil compressibility, applied load, and drainage conditions. As vertical settlement occurs, lateral displacement often accompanies it, especially during the early stages when excess pore pressures are high. Over time, as pore pressures reduce, the ratio of lateral to vertical movement typically decreases.

Although creep under undrained conditions can generate excess pore pressures, current vibrating wire piezometer data do not support this. Vibrating wire piezometer readings (**Graph 8**) show no increase in pore pressure, and the observed ratio of horizontal to vertical movement in movement monitors (**Graphs 5, 6, and 7**) ranges between 0.2 and 0.3, suggesting that undrained creep is not evident.

At this stage, it remains unclear whether the observed deformations are due solely to consolidation or a combination of consolidation and creep. Similarly, it cannot yet be confirmed whether the foundation materials have experienced strength reduction due to creep, as suggested by ITRB. A geotechnical investigation is currently underway to assess the strength of the Northern Embankment foundation units.

2.6 Action Plan – Post ITRB Concern

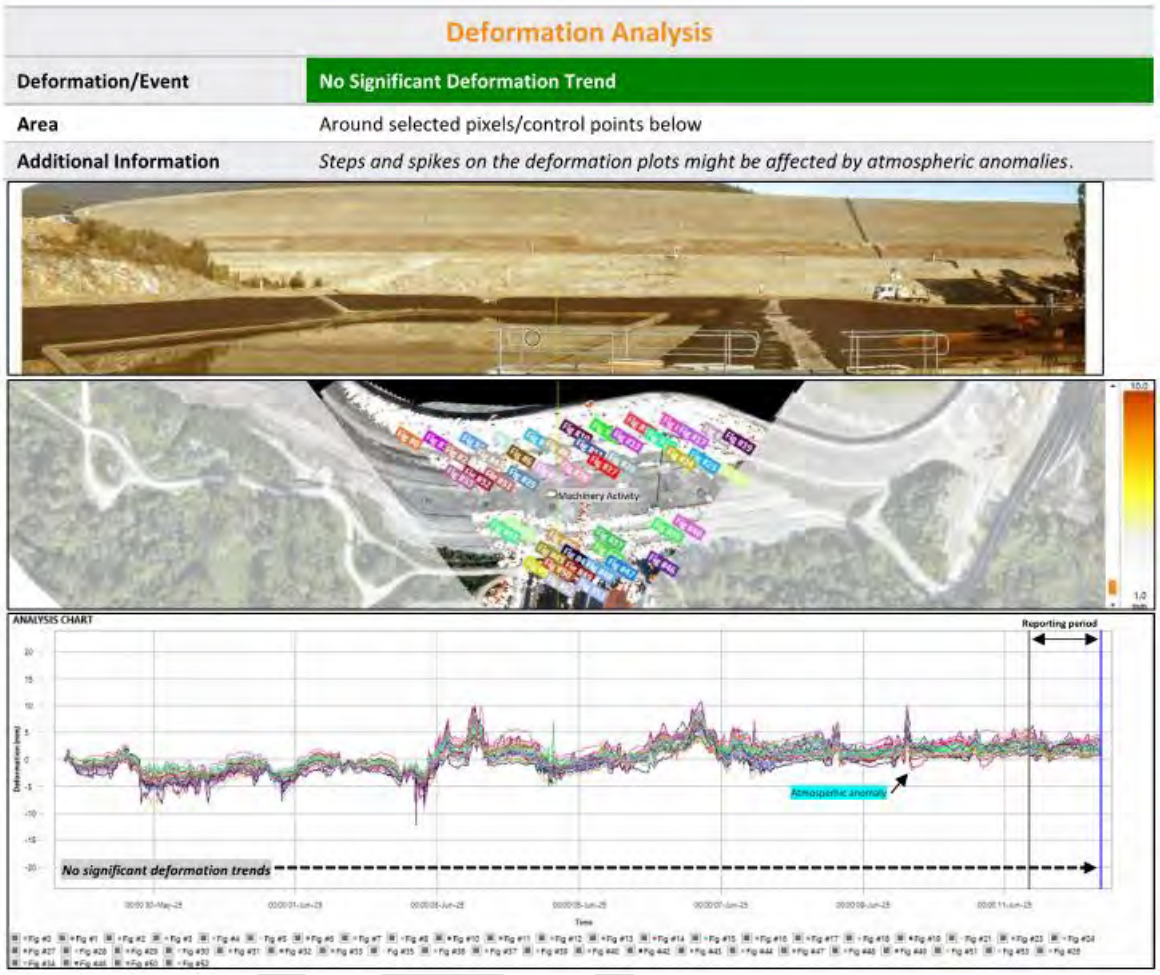
The following actions were carried out post ITRB meeting.

- Daily review of instrumentation was carried out by EoR from 31st of March to 28th of April. Given that no abnormal trend was noticed during this daily review the review frequency was relaxed to weekly until the end of May. Now it is currently on a fortnightly basis. An example of the fortnightly EoR review is provided in **Appendix B**.
- A detailed inspection sheet was prepared for the Northern Embankment monitoring, and the Northern Embankment is inspected two times daily by the MMG operations team.
- An additional 8 prisms were installed at the Northern Embankment, as shown in **Figure 2** and monitoring results are presented in the EoR fortnightly review report (**Appendix B)**. Installation of two additional inclinometers are currently in progress.
- A TARP has been developed for the geotechnical investigation, summarising the FoS against in-situ strength of foundation units.
- A geotechnical investigation has recently commenced to assess the current strength of the foundation units of the Northern Embankment.
- A radar was also installed on site, scanning the Northern Embankment every two minutes. A summary report indicating no significant deformation is presented in **Graph 9**.

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GRAPH 9 – VIBRATING WIRE PIEZOMETER READINGS



2.7 Geotechnical Investigation Outcome

The following actions are recommended depending on the results of the ongoing geotechnical investigation into the strength of the foundation materials:

- If strength gain is observed due to Stage 2 loading:
  - Undertake targeted sampling and laboratory testing to evaluate the potential for future creep.
  - Perform detailed static and seismic deformation analyses to forecast long-term embankment behaviour.
  - Define Trigger Action Response Plan (TARP) limits for instrumentation based on predicted deformations.
- If strength reduction is identified:
  - Conduct stability analyses incorporating residual strength parameters for brittle foundation units.
  - Evaluate and implement appropriate remedial measures to achieve an agreed target factor of safety for the Northern Embankment.

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A set of stability analyses using residual strength parameters estimated from the previous investigation for critical foundation units is presented in **Sections 3** and **4**.

3 OBJECTIVE AND METHODLOGY OF STABILITY ANALYSIS

Due to the increased rate of movement identified in IC6 from December 2024 to January 2025, as outlined in **Section 2.2**, additional stability analysis has been completed on Northern Embankment critical cross-sections D and E (**Figure 1**), which are both located within the central region of the embankment. The additional stability analysis has been completed with residual strength material parameters to verify whether an acceptable FOS can be obtained with residual strength parameters, or whether remediation works are required to achieve an acceptable FOS.

The following methodology was adopted in this work:

- Limit equilibrium stability analyses were performed on cross-sections D and E. The details of analyses are provided in **Section 4**.
- Strength reduction method stability analyses were solely performed on Section E. The analyses assessed both undeformed mesh and deformed mesh conditions. The details of these analyses are provided in **Section 5**.

4 NORTHERN EMBANKMENT LIMIT EQUILIBRIUM STABILITY ANALYSES

4.1 Overview

Stability assessment of critical embankment cross-sections D and E located within the central region of the Northern Embankment has been completed using residual strength parameters for Zone 1A and 2A material. Two cases of residual strength parameters have been analysed, as outlined in **Table 1**.

Several different embankment profiles have been considered to assess the necessity and applicability of potential remediation works that would be required to achieve an acceptable FOS using residual strength parameters for key materials.

4.2 Phreatic Levels

Phreatic surfaces have been estimated based on the most recent in-situ VWP readings. Only VWPs within close proximity to the relevant cross-section have been used (as shown in **Appendix D**).

4.3 Critical Foundation Units

To identify the critical foundation material experiencing movement within the IC6 subsurface profile, the inclinometer segmented node plot has been overlain with current known foundation conditions.

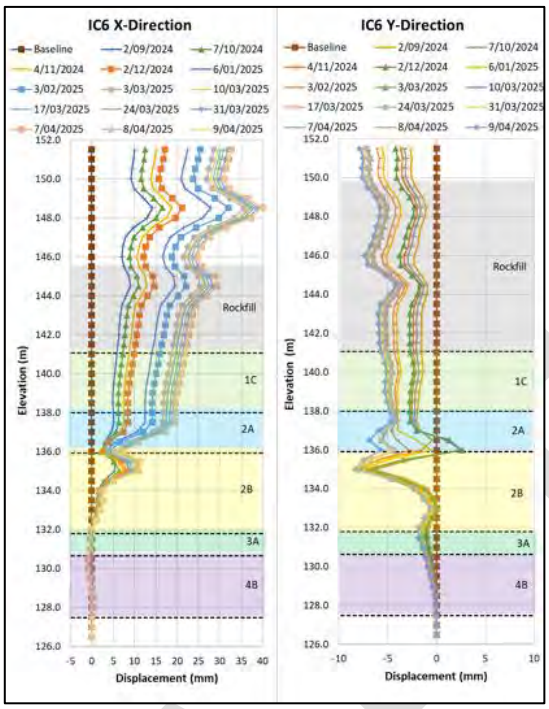
As presented in **GRAPH 10**, the x-directional movement perpendicular to the embankment initiated movement within the Zone 2A material layer. Due to the movement within the Zone 2A material, and the temporary increased rate of movement as discussed in **Section 2.2**, Zone 2A material has been reduced to residual strength parameters for this analysis.

Unit 1A material which typically overlays Unit 2A material within the Northern Embankment subsurface profile and has historically shown low peak strengths, has also been reduced to residual strength parameters to provide confidence to the model outputs.

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GRAPH 10 – IC6 DIRECTIONAL MOVEMENT PLOT



4.4 Material Strength Parameters

As discussed in **Section 4.1**, as a conservative approach to material parameter adoption, Zone 2A and 1A material have reduced to residual strength parameters.

Two separate cases have been adopted for Zone 2A residual strength material. Cases are based on the following:

- Case 1 – Based on in-situ shear vane testing from the 2024 CPT investigation **[6]**,
- Case 2 – Based on laboratory testing performed on samples retrieved from the 2024 CPT investigation **[6]**.

For Zone 1A, a constant residual value of 14 kPa was used, as recommended in **[6]**. All other materials characteristics have been applied in an undrained state as per the '2-5 Dam Stage 3 Feasibility Design Basis of Design' (BoD) **[9]**, and are presented in **Appendix C**.

The material parameters for Zone 1A and 2A materials are summarised in **Table 1**.

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TABLE 1: REDUCED MATERIAL STRENGTH PARAMETERS

Material Name	Model	Unit Weight (kN/m^3)	Minimum Strength (kPa)	Tau/Sigma Ratio		Cohesion (kPa)
				Case 1	Case 2	
1A - Low Plasticity Silt (RESIDUAL)	Undrained (Phi=0)	15.8	—	—		14
2A-1 - High Plasticity Silt (Organic S-F) (RESIDUAL 0.14)	SHANSEP	16.3	16	0.14	0.2	

4.5 Design Cases

4.5.1 Section D

The Section D cross-section has considered two embankment profiles with the adoption of both Case 1 and Case 2 material parameters. The design profiles considered were:

1. Current embankment conditions, and
2. Proposed remediation option for the lower Seepage Collection Pond (SCP) backfill **[10]** (1.5 m pond backfill to RL 142 m).

4.5.2 Section E

The Section E cross-section has considered three embankment profiles with the adoption of both Case 1 and Case 2 material parameters. The design profiles considered were:

1. Current embankment conditions,
2. A 50 m downstream buttress to RL 146 m, and
3. A 50 m downstream buttress to RL 148 m.

4.6 Methodology

All stability assessments have been undertaken using propriety software SLOPE/W **[11]** utilising the Morgenstern-Price method, satisfying both force and moment equilibrium criteria.

For all cases, wedge failure was assessed. Optimised circular failure was also added for comparison purposes.

4.7 Results

The stability assessment results are summarised in **TABLE 2** and **TABLE 3** respectively, with the graphical Slope/W outputs presented in **Appendix D.**

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TABLE 2: SECTION D - SUMMARY OF STABILITY ASSESSMENT

Embankment Profile	Material Parameter Case	Failure Type	Factor of Safety		Fig No.
			Wedge Failure	Optimised Circular Failure	
1 Current Geometry	Case 1	Global	0.96	1.04	D3 / D4
		Local	0.98	0.85	
	Case 2	Global	1.15	1.17	D5 / D6
		Local	1.07	0.98	
2 1.5 m SCP backfill to RL 142m	Case 1	Global	1.05	1.05	D7 / D8
		Local	1.16	1.09	
	Case 2	Global	1.19	1.23	D9 / D10
		Local	1.21	1.21	

TABLE 3: SECTION E - SUMMARY OF STABILITY ASSESSMENT

Embankment Profile	Material Parameter Case	Failure Type	Factor of Safety		Fig No.
			Wedge Failure	Optimised Circular Failure	
1 Current Geometry	Case 1	Global	1.11	1.06	D11 / D12
		Local	1.38	1.14	
	Case 2	Global	1.24	1.27	D13 / D14
		Local	1.37	1.20	
2 50 m buttress to RL 146 m	Case 1	Global	1.31	1.14	D15 / D16
		Local	1.66	1.81	
	Case 2	Global	1.49	1.28	D17 / D18
		Local	2.05	1.58	
3 50 m buttress to RL 148 m	Case 1	Global	1.30	1.15	D19 / D20
		Local	1.77	1.58	
	Case 2	Global	1.48	1.29	D21 / D22
		Local	2.14	1.72	

5 SECTION E STRENGTH REDUCTION STABILITY ANALYSES

Strength reduction method was used to perform stability analyses on Section E. All analyses were performed in FLAC software. Two sets of analyses were performed:

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- Run 1 – Stability of the updated Section E geometry (similar to the stability in **Section 4**), and
- Run 2 – Stability of the deformed mesh of previous Section E geometry from coupled FLAC analyses in **[12]**.

5.1 Run 1 – Section E Updated Geometry

Stability analyses were performed on the geometry similar to the limit equilibrium stability analyses in **Section 4.** The following methodology was employed in these analyses:

- The updated geometry was imported in FLAC V9 software.
- Mesh was generated using the global unstructured size of 0.3 m.
- Material groups were assigned to the model.
- Phreatic level from **Section 4.2** were imported.
- Mohr-Coulomb model was assigned to all material groups.
- A coefficient of at rest, K_0, of 0.5 was assumed for the foundation materials to initiate the effective stresses within the system. Sensitivity analyses on K_0 with adoption of 0.7 had only a marginal impact on the results.
- Material parameters from **Section 4.4** were assigned to the model.
- Factor of safety analyses were performed on unsolved model (i.e. undeformed mesh).

Results of these analyses are presented in **Appendix E** and summarised in **TABLE 4**. The stability results estimated from strength reduction method are comparable to those obtained from LEM analyses.

TABLE 4: SECTION E - SUMMARY OF STRENGTH REDUCTION METHOD – UPDATED GEOMETRY

Embankment Profile	Material Parameter Case	Geometry Condition	Factor of Safety			Fig No.
			Wedge Failure	Optimised Circular Failure	Strength Reduction Method	
1 Current Geometry	Case 1	Undeformed Mesh	1.11	1.06	0.90	E1
	Case 2		1.24	1.27	1.04	E2
2 50 m buttress to RL 146 m	Case 1		1.35	1.14	1.02	E3
	Case 2		1.52	1.28	1.17	E4
3 50 m buttress to RL 148 m	Case 1		1.30	1.15	1.04	E5
	Case 2		1.48	1.29	1.22	E6

5.2 Run 2 – Section E Deformed Geometry

Stability analyses were performed on the previous Section E geometry, which was adopted in numerical modelling, presented in **[12]**. The following methodology was adopted in analyses:

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- The coupled analysis which was verified against field monitoring data was retrieved for the end of Stage 2 construction. Displacements were set to zero.
- Residual shear strength of 15 kPa was adopted for both Unit 1A and 2A as an average value. Since the geometry is different from the updated model, Unit 1B was assumed to be Unit 1B/1A and 15 kPa residual shear strength was applied to the layer as well.
- Model was solved till reaching equilibrium.
- Factor of safety analyses was performed on the deformed mesh.
- Two cases in which a buttress to RL 146 m and RL 147 m with a width of 25 m was also performed.

Results of these analyses are presented in **Appendix E** and summarised in **TABLE 5**.

TABLE 5: SECTION E - SUMMARY OF STRENGTH REDUCTION METHOD – PREVIOUS GEOMETRY

Embankment Profile	Geometry Condition	FoS Strength Reduction Method	Fig. No.
Current Geometry	Deformed Mesh	1.1	E7
25 m buttress to RL 146 m		1.4	E8
25 m buttress to RL 147 m		1.4	E9

The difference in FoS between the Run 1 (Section E Updated Geometry – **Section 5.1**) and Run 2 (Section E Deformed Geometry - **Section 5.2**) is most likely due to the analyses being performed on deformed mesh that has reached a stable condition prior to the FoS analysis in Run 2. Therefore, there is no unbalance force in the system.

6 CONCLUSIONS AND RECOMMENDATIONS

Further investigation works are required on the Northern Embankment foundation materials to clarify if Zone 2A and 1A material are in a reduced strength state as assumed within this stability analysis. These works will provide further clarification on subsurface material parameters, and on the likely cause of the continuous movement on inclinometer IC6. Potential remediation works cannot be confirmed as a necessity until further geotechnical investigation works have been completed.

The FOS achieved for section D and section E for the current embankment profiles when considering material units 1A and 2A at residual strength parameters does not meet the required FOS. However, with the proposed remediation works within the lower SCP and construction of a 50 m buttress to RL 146 m at the toe will increase the FOS to at least 1.2 with residual strength. This is considered adequate for the residual strength scenarios.

Inclinometers should be continually monitored for changes in movement rates, particularly in the inclinometers that have demonstrated continual movement. IC9, which is located directly downstream of IC6, is currently defective and broken. It should be replaced with a new inclinometer to allow ongoing monitoring in its area, which has seen past movements within the foundations. Additionally, another inclinometer is recommended to be installed further downstream on the IC6 and IC9 alignment. This inclinometer is presented as IC11 in **Figure 2.**

Consideration should also be given to installing additional nested vibrating wire piezometers within the geological Units 1A, 2A and 3A adjacent to inclinometers IC6, IC8, IC9R, IC10, and IC11 to

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allow pore pressure monitoring within material units that are experiencing movement. Recommended locations are indicated in **Figure 2**. Moreover, VW23 and VW28 piezometers, which experienced significant pore pressure increases during Stage 2 construction works during loading have stopped providing data as of August 2024 and February 2025 respectively. These piezometers should be replaced with adjacent piezometers as indicated in **Figure 2.**

7 CLOSURE

This memorandum has presented an assessment of the 2/5 Dam TSF Northern Embankment critical cross-sections residual strength analysis. Please feel free to contact the author should you have further questions.

ATTACHMENTS

FIGURES

FIGURE 1 – STAGE 2 NORTHERN EMBANKMENT TARP STABILITY SECTIONS

FIGURE 2 – PROPOSED INSTRUMENTTION LOCATIONS

APPENDICES

APPENDIX A **LEAPFROG MODEL – NORTHERN EMBANKMENT SECTIONS**

APPENDIX B **EXAMPLE OF FORTNIGHTLY EOR INSTRUMENTATION REVIEW**

APPENDIX C **MATERIAL PARAMATERS**

APPENDIX D **LIMIT EQUILIBRIUM STABILITY RESULTS**

APPENDIX E **STRENGTH REDUCTION STABILITY RESULTS**

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[3] ATC Williams (2020), MMG Rosebery Mine, 2/5 Dam Tailings Storage Facility Stage 2 Embankment Raise Detailed Design, Reference 107031.77-R03 Rev 1, December 2020.

[4] ATC Williams (2024), MMG Rosebery Mine, Northern Embankment Piezometer Installation and Geotechnical Investigation Report, Reference 107031.82-R01, November 2024.

[5] ATC Williams (2023), MMG Rosebery Mine, 2/5 Dam Stage 3 Feasibility Study Northern Embankment Buttress Design Piezometer Installation and Geotechnical Investigation Report, 107031.87 R03, November 2023

[6] ATC Williams (2024), MMG Rosebery Mine, 2/5 Dam TSF Stage 3 - 2024 Geotechnical Investigation and Laboratory Testing of Northern Embankment Foundation Material, Reference 107031.120-R01-Rev0, October 2024.

[7] ATC Williams (2024), MMG Rosebery Mine, 2/5 Dam Stage 3 Feasibility Study - Northern Embankment Foundations 3D Model - Leapfrog, Reference 107031.121-M01-Rev0, 15 April 2024.

[8] ATC Williams (2024), MMG Rosebery Mine, Piezometer TARP Re-assessment - Northern Embankment Foundation Update, Reference 107031.83 M04, 10 December 2024.

[9] ATC Williams (2024), MMG Rosebery Operations, 2/5 Dam Northern Stage 3 Feasibility Design Basis of Design, Reference 107031.87-BoD-C, August 2024.

[10] ATC Williams (2025), MMG Limited, Proposed Remediation Options to Repair the MMG Rosebery Mine 2/5 Dam Lower Seepage Collection Pond's Base Liner, Reference 107031.129-L01, February 2025.

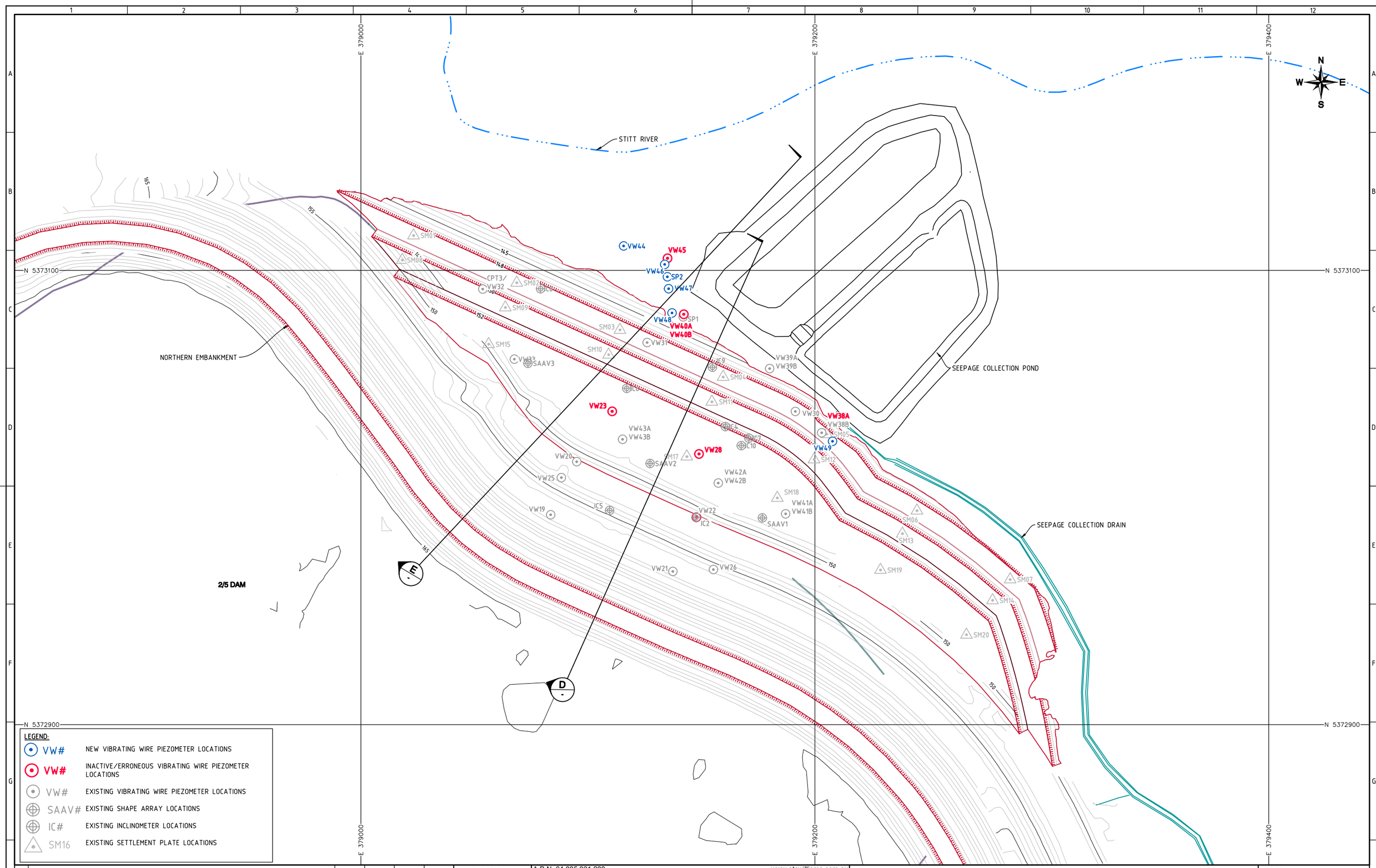
[11] GEOSLOPE International Ltd, "SLOPE/W 22019 for Slope Stability Analyses – Version 10", Calgary, Canada.

[12] ATC Williams (2024), MMG Rosebery Operations, 2/5 Dam Northern Stage 3 Feasibility Numerical Analysis and Static Liquefaction Report, Reference 107031.97 R01-RevB, November 2024.

DRAFT

TAILINGS.WATER.WASTE.

FIGURES



LEGEND:

VW#	NEW VIBRATING WIRE PIEZOMETER LOCATIONS
VW#	INACTIVE/ERRONEOUS VIBRATING WIRE PIEZOMETER LOCATIONS
VW#	EXISTING VIBRATING WIRE PIEZOMETER LOCATIONS
SAAV#	EXISTING SHAPE ARRAY LOCATIONS
IC#	EXISTING INCLINOMETER LOCATIONS
SM16	EXISTING SETTLEMENT PLATE LOCATIONS

No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D
1		29.04.2025	LE	AM	AM
0		10.12.2024	LE	AM	AM

SCALE:	1:1,500
JOB No.	107031.126
DATE	29.04.2025
DESIGN	LE
DRAWN	LE
CHECKED	AM
APPROVED	AM

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MMG ROSEBERY MINE
2/5 DAM TAILINGS STORAGE FACILITY

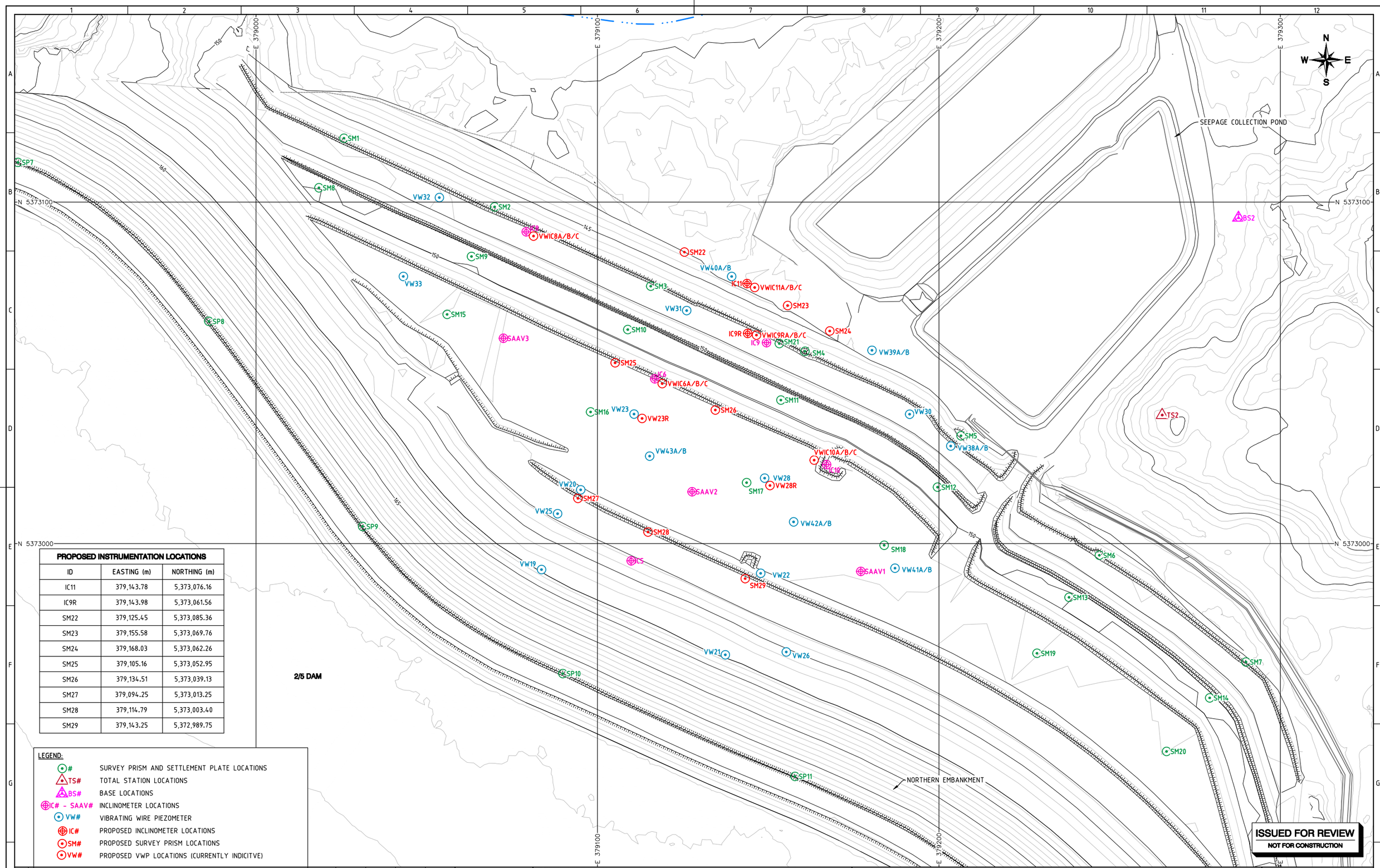
STAGE 2 NORTHERN EMBANKMENT
TARP STABILITY SECTIONS
INSTRUMENTATION PLAN

DWG. No.
FIGURE 1

SHEET SIZE	A3	Rev.	1

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SHEET 1 OF 1



PROPOSED INSTRUMENTATION LOCATIONS

ID	EASTING (m)	NORTHING (m)
IC11	379,143.78	5,373,076.16
IC9R	379,143.98	5,373,061.56
SM22	379,125.45	5,373,085.36
SM23	379,155.58	5,373,069.76
SM24	379,168.03	5,373,062.26
SM25	379,105.16	5,373,052.95
SM26	379,134.51	5,373,039.13
SM27	379,094.25	5,373,013.25
SM28	379,114.79	5,373,003.40
SM29	379,143.25	5,372,989.75

LEGEND:

#	SURVEY PRISM AND SETTLEMENT PLATE LOCATIONS
TS#	TOTAL STATION LOCATIONS
BS#	BASE LOCATIONS
IC# - SAAV#	INCLINOMETER LOCATIONS
VW#	VIBRATING WIRE PIEZOMETER
IC#	PROPOSED INCLINOMETER LOCATIONS
SM#	PROPOSED SURVEY PRISM LOCATIONS
VW#	PROPOSED VWP LOCATIONS (CURRENTLY INDICITVE)

ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

No.	DESCRIPTION	DATE	DRAWN	CHECKD	APPRD

SCALE:	1:1,000
JOB No.	107031.126
DATE	17.05.24
DESIGN	JLN
DRAWN	JLN
CHECKED	AM
APPROVED	-

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MMG ROSEBERY MINE
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NORTHERN EMBANKMENT
PROPOSED INSTRUMENTATION LOCATIONS

DWG. No. **FIGURE 2**

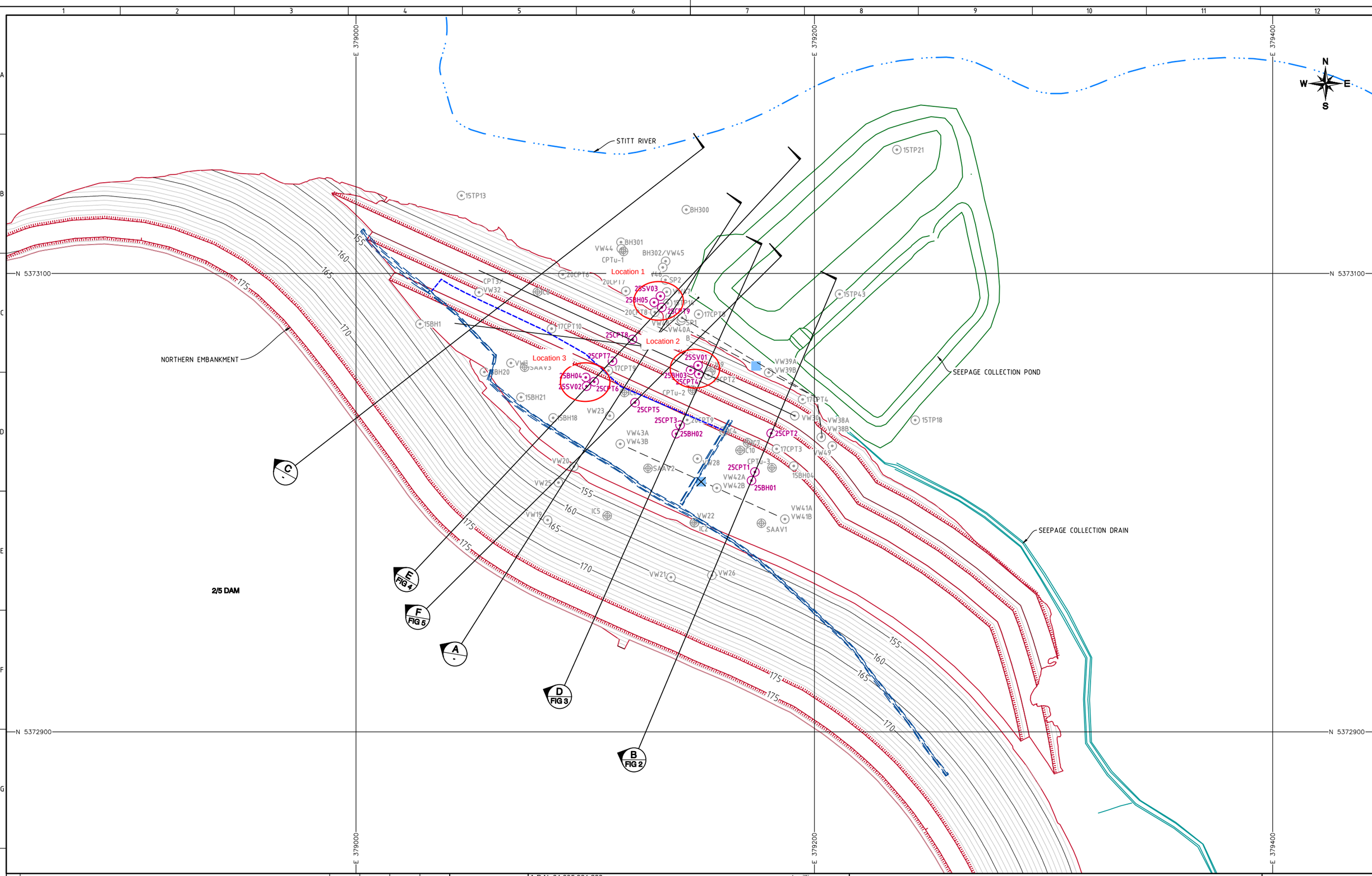
SHEET SIZE A3 | Rev. A

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SHEET 1 OF 1

APPENDICES

APPENDIX A – LEAPFROG MODEL – NORTHERN EMBANKMENT SECTIONS



No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:1,500
JOB No.	240412
DATE	14.05.25
DESIGN	MK
DRAWN	SP
CHECKED	MK
APPROVED	MK

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NORTHERN EMBANKMENT
PROPOSED INVESTIGATION LOCATIONS 2025

DWG. No.
FIGURE 1

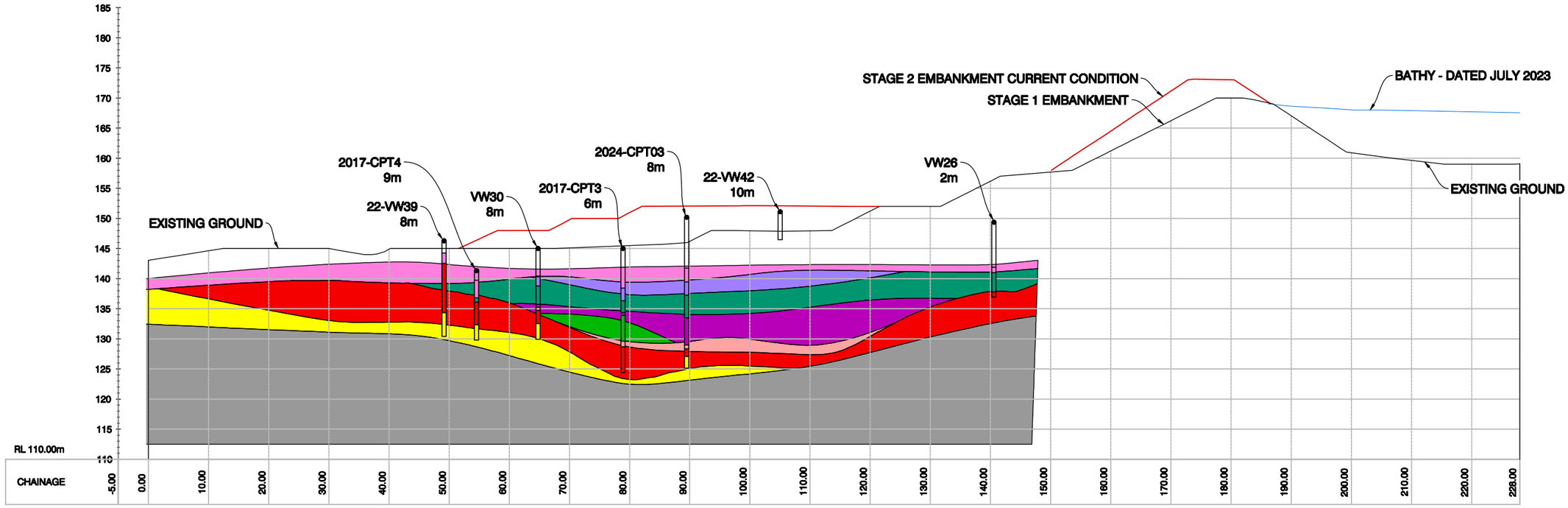
SHEET SIZE	A3	Rev.	A

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SHEET 1 OF 1

LEGEND:

- 1C
- 1a-1
- 2a-1
- 2a-2
- 2b-1
- 3a-1
- 4b-1
- 4c
- BEDROCK



CROSS-SECTION B GEOLOGICAL MODEL
SCALE 1:750 FIG 1

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No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:750
JOB No.	240412
DATE	14.05.25
DESIGN	MK
DRAWN	SP
CHECKED	MK
APPROVED	MK

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STAGE 2 EMBANKMENT (CURRENT CONDITION)
GEOLOGICAL MODEL
CROSS-SECTION B

DWG. No. FIGURE 2

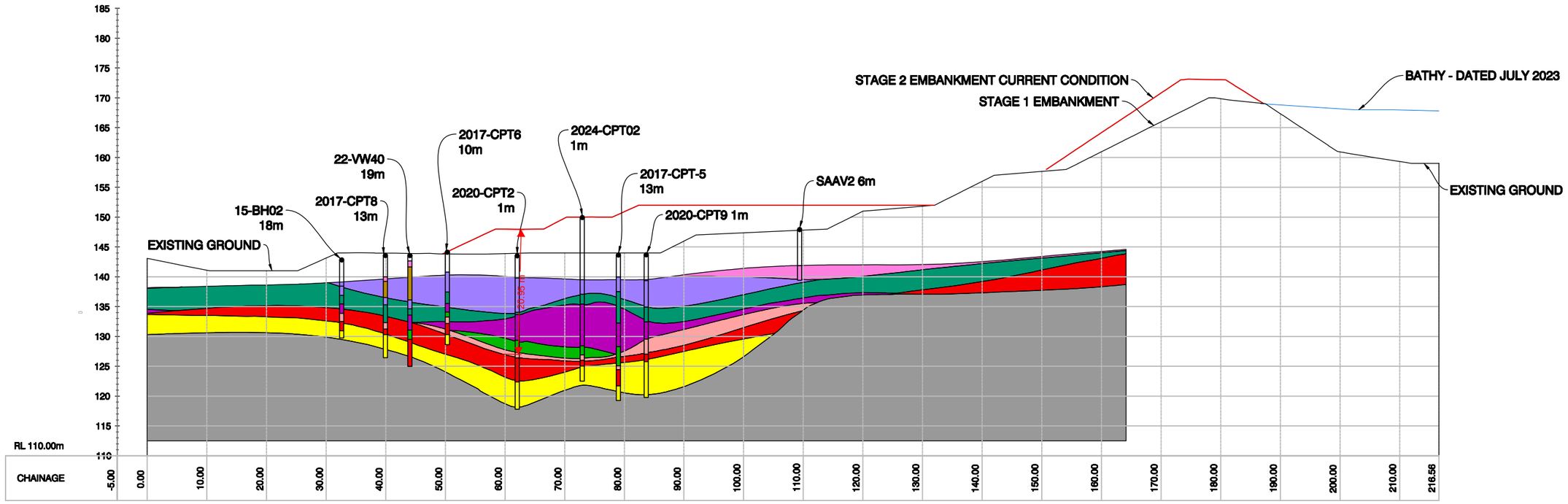
SHEET SIZE A3 Rev. A

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SHEET 1 OF 1

LEGEND:

- 1C
- 1a-1
- 1b-1
- 2a-1
- 2a-2
- 2b-1
- 3a-1
- 4b-1
- 4c
- BEDROCK



CROSS-SECTION D GEOLOGICAL MODEL
SCALE 1:750 FIG 1

FOR INFORMATION ONLY
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No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:750
JOB No.	240412
DATE	14.05.25
DESIGN	MK
DRAWN	SP
CHECKED	MK
APPROVED	MK

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STAGE 2 EMBANKMENT (CURRENT CONDITION)
GEOLOGICAL MODEL
CROSS-SECTION D

DWG. No.
FIGURE 3

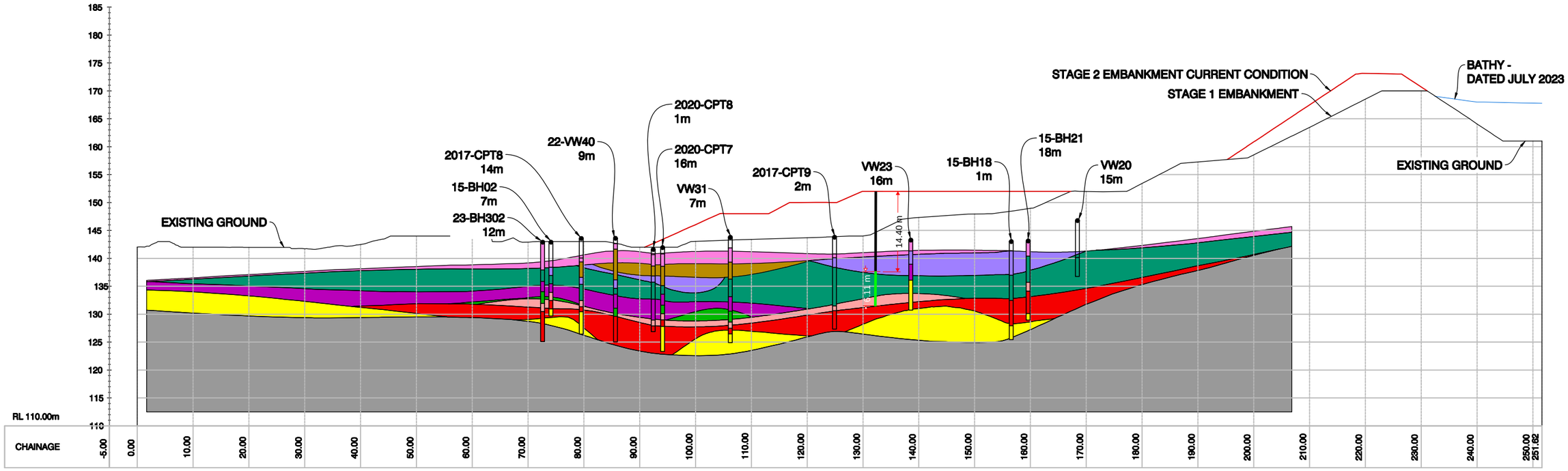
SHEET SIZE	A3	Rev.	A

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LEGEND:

- 1C
- 1a-1
- 1b-1
- 2a-1
- 2a-2
- 2b-1
- 3a-1
- 4b-1
- 4c
- BEDROCK



CROSS-SECTION E GEOLOGICAL MODEL
SCALE 1:750 FIG 1

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No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:750
JOB No.	240412
DATE	14.05.25
DESIGN	MK
DRAWN	SP
CHECKED	MK
APPROVED	MK

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STAGE 2 EMBANKMENT (CURRENT CONDITION)
GEOLOGICAL MODEL
CROSS-SECTION E

DWG. No. **FIGURE 4**

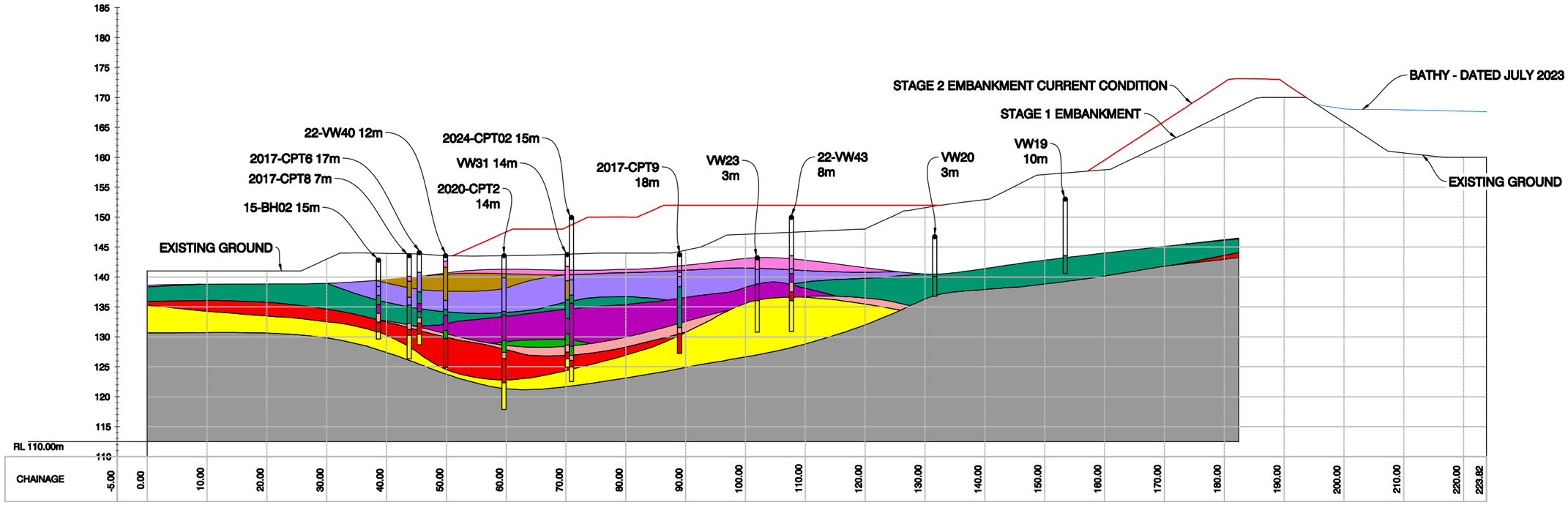
SHEET SIZE A3 Rev. A

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LEGEND:

- 1C
- 1a-1
- 1b-1
- 2a-1
- 2a-2
- 2b-1
- 3a-1
- 4b-1
- 4c
- BEDROCK



CROSS-SECTION F GEOLOGICAL MODEL
SCALE 1:750 FIG 1

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No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:750
JOB No.	240412
DATE	14.05.25
DESIGN	MK
DRAWN	SP
CHECKED	MK
APPROVED	MK

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STAGE 2 EMBANKMENT (CURRENT CONDITION)
GEOLOGICAL MODEL
CROSS-SECTION F

DWG. No. **FIGURE 5**

SHEET SIZE A3 Rev. A

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SHEET 1 OF 1

APPENDIX B – EXAMPLE OF FORTNIGHTLY EOR INSTRUMENTATION REVIEW

TAILINGS.WATER.WASTE.

From: Muhunthan Arunasalam
Sent: Tuesday, 10 June 2025 9:51 AM
To: Kevin Marshall; Scott Hay; Marty Viney; Steven Pickford; Laura Moore; Pamela Soto; John Plunkett; Craig Youd; Dean Smith1
Cc: Sailendra Subedi; Luke Eyles; Jedd Linke-Nagel; Brock Hanson; Mojtaba Karami
Subject: RE: Total Station and IC6 Screenshots, Northern Embankment Monitoring 10-06-2025
Attachments: 2025-06-10-Nemb Monitoring.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Hi All,

Attached are the 25 Dam Northern Embankment critical area instrument plots as of this morning (10/06/2025). No abnormal trends have been observed in any of the instrumentation plots. The 2/5 Dam Inspections and Finger Works, and Northern Embankment Geotechnical Investigation can be continued as usual, provided that:

- No abnormalities are identified during visual inspections (at least twice daily).
- Instrument plots are reviewed twice daily during the investigation for any abnormalities.
- No abnormalities found with radar monitoring.
- No alarms are triggered.

It should be noted that EoR does instrumentation reviews fortnightly on Tuesdays, just before the EoR fortnightly meeting with MMG.

Regards

Arun

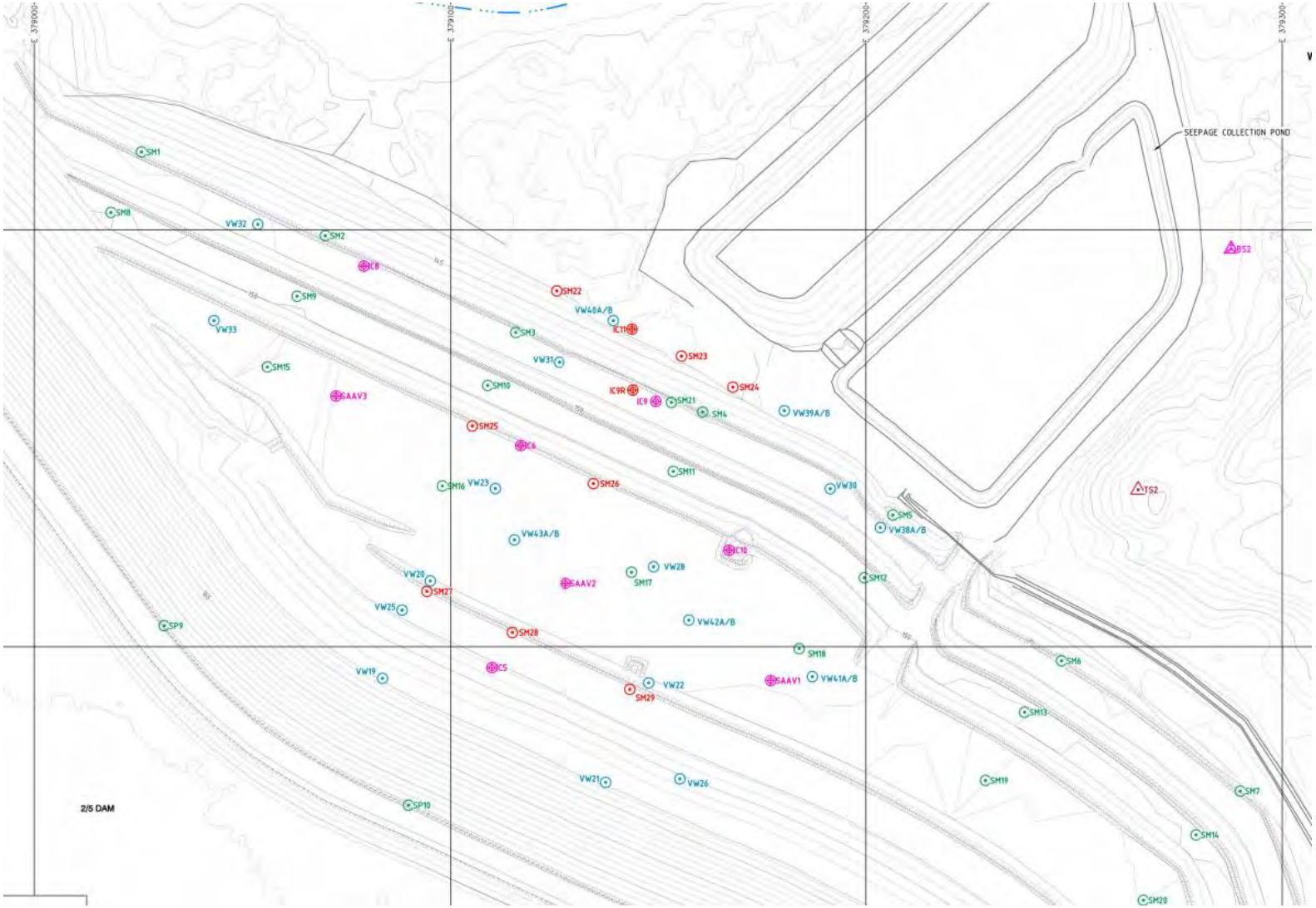
MUHUNTHAN ARUNASALAM
PRINCIPAL ENGINEER

t +613 8587 0900 **m** +61 430 020 987
e ArunM@atcwilliams.com.au

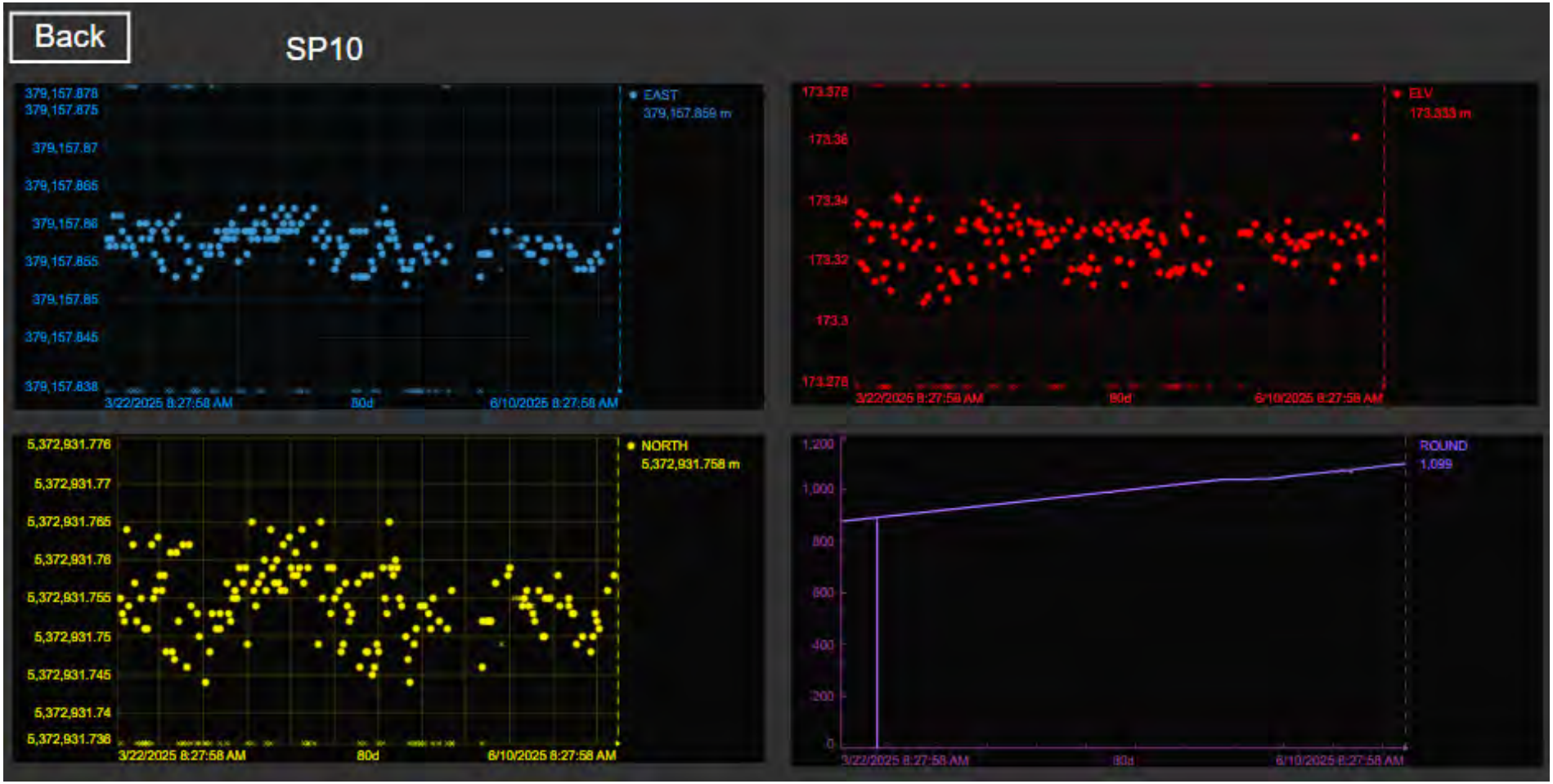
222-225 Beach Rd Mordialloc VIC 3195

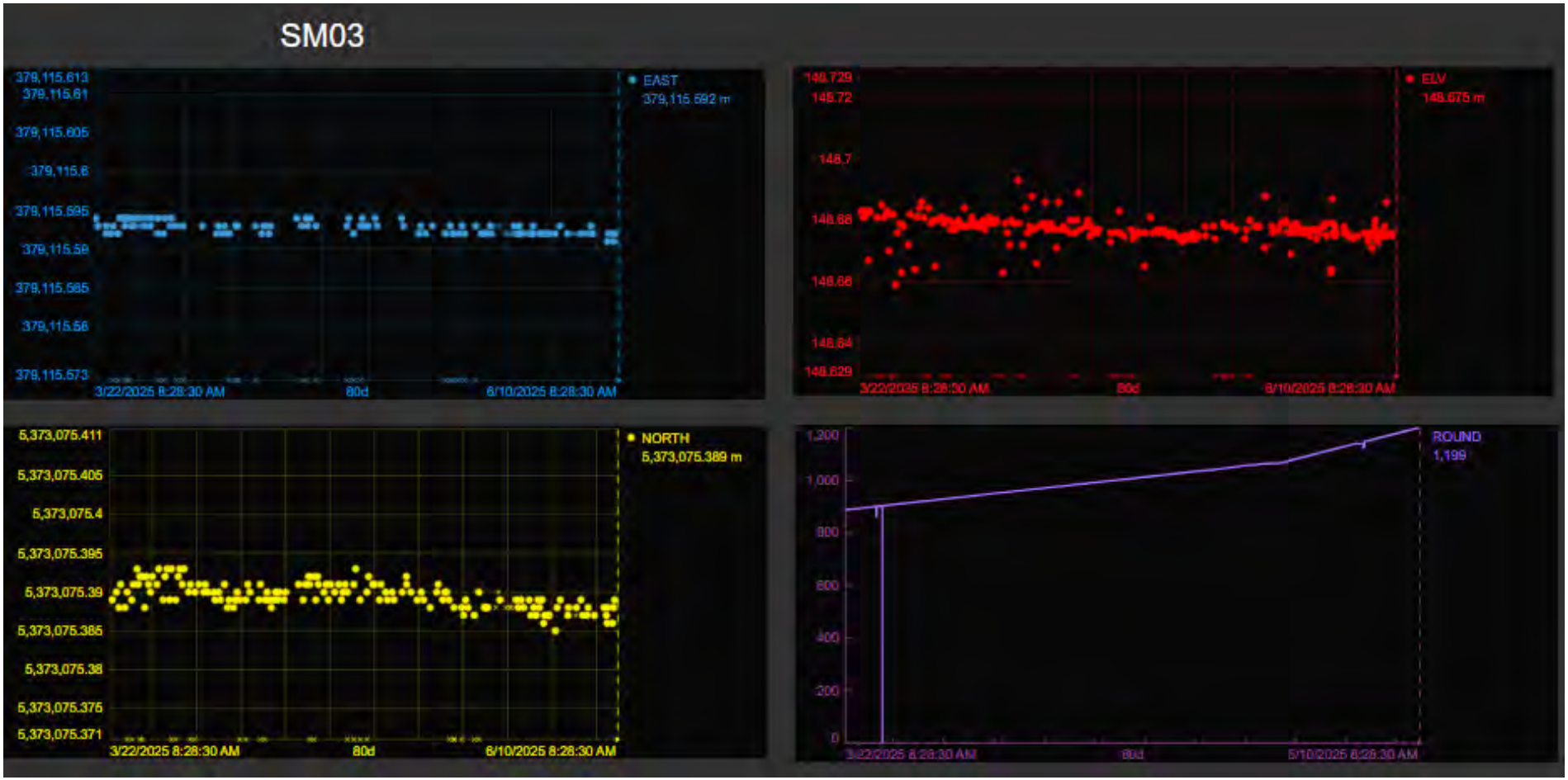
www.atcwilliams.com

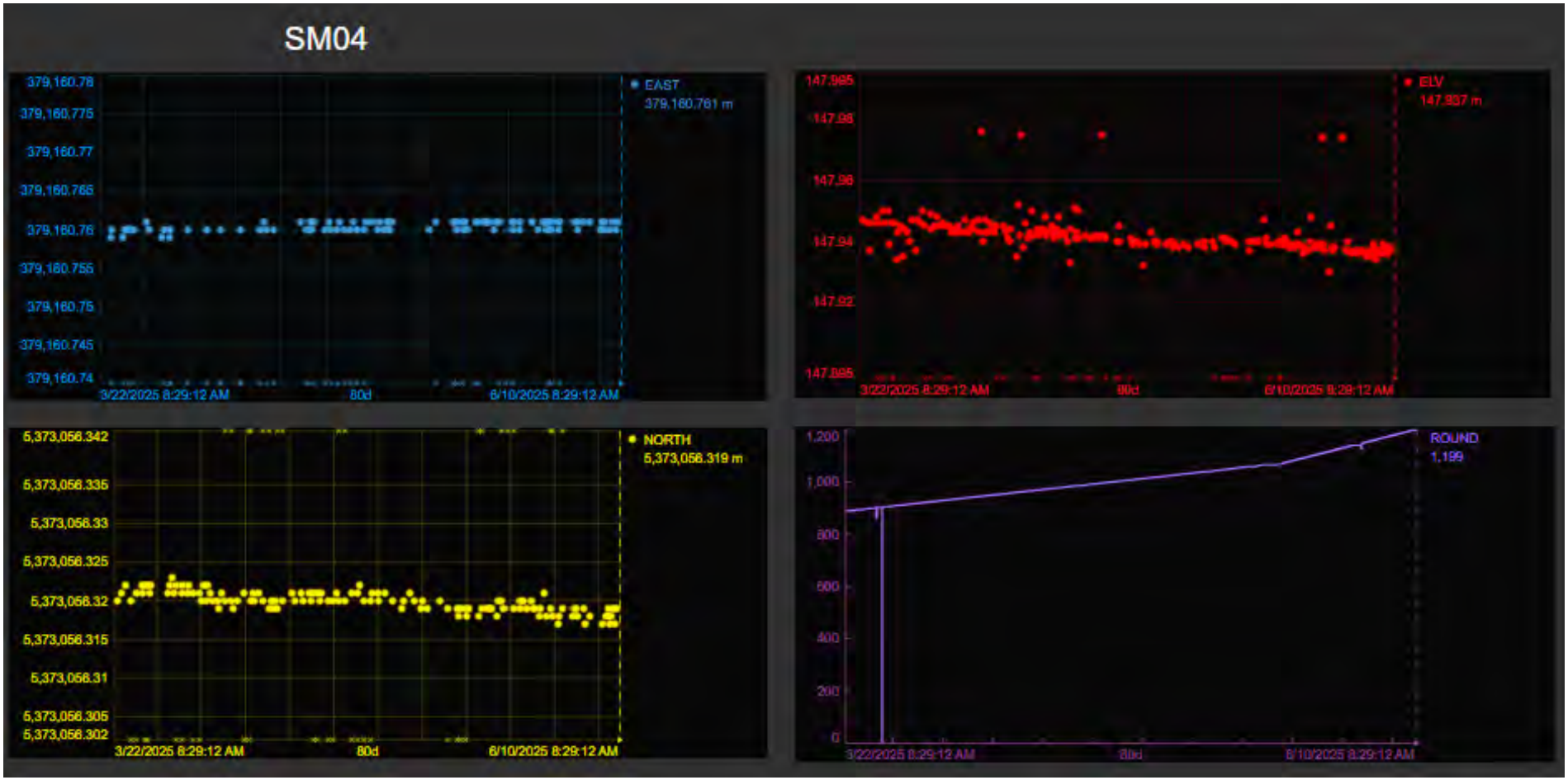
Layout

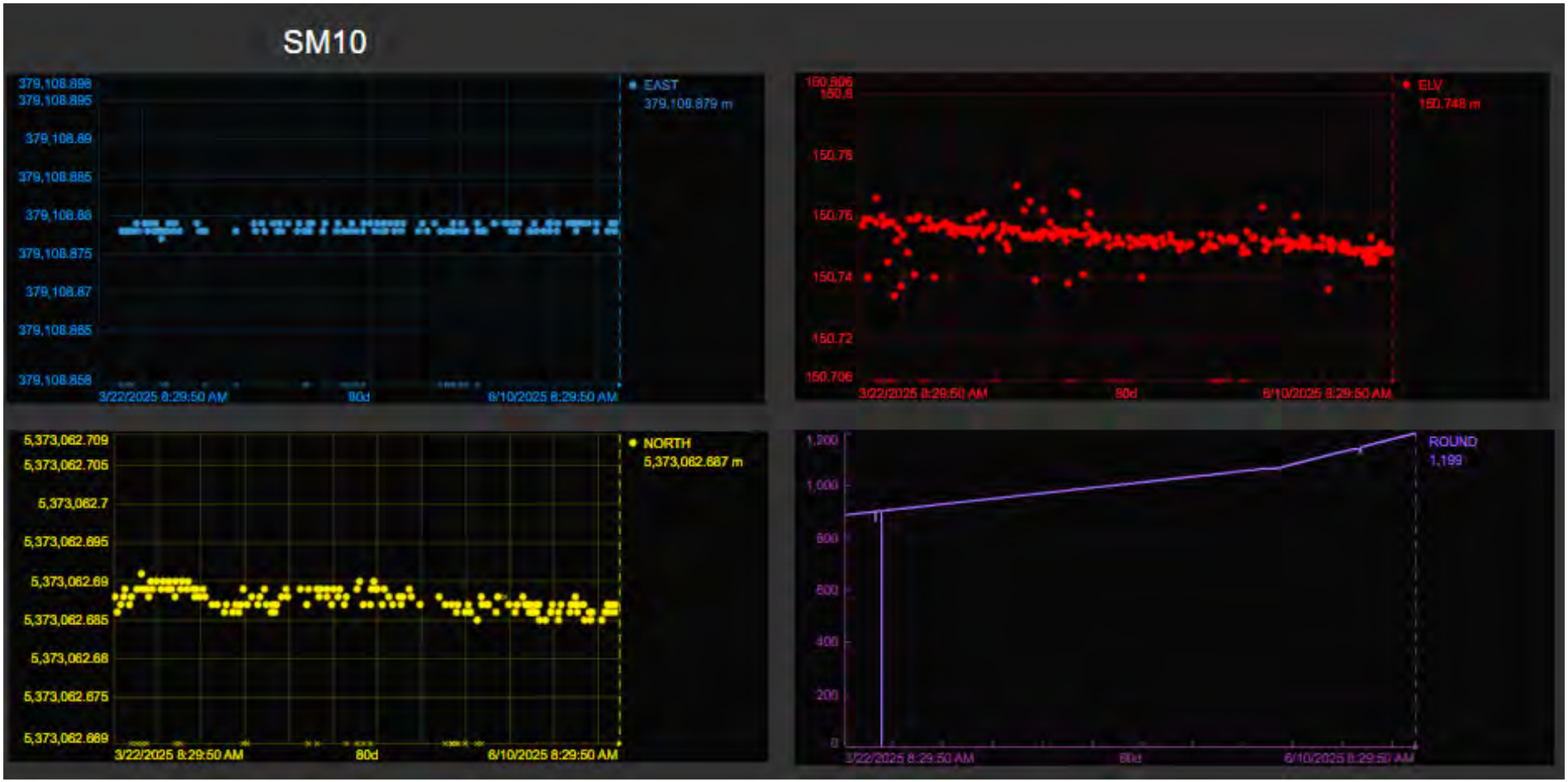

E 379000
E 379100
E 379200
E 379300
SEEPAGE COLLECTION POND
BS2
TS2
SM1
SM8
VW32
SM2
IC8
SM9
VW33
SM15
SAAV3
SM22
VW40A/B
IC11
SM3
VW31
SM23
SM24
IC9R
IC9
SM21
SM4
VW39A/B
SM10
SM25
IC6
SM16
VW23
SM26
SM11
VW30
SM5
VW38A/B
VW43A/B
IC10
VW28
SM17
SAAV2
SM12
VW20
SM27
VW25
SP9
VW42A/B
SM28
SM18
SM6
VW19
IC5
VW22
SM29
SAAV1
VW41A/B
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VW26
SM19
SM7
SP10
SM14
SM20
2/5 DAM

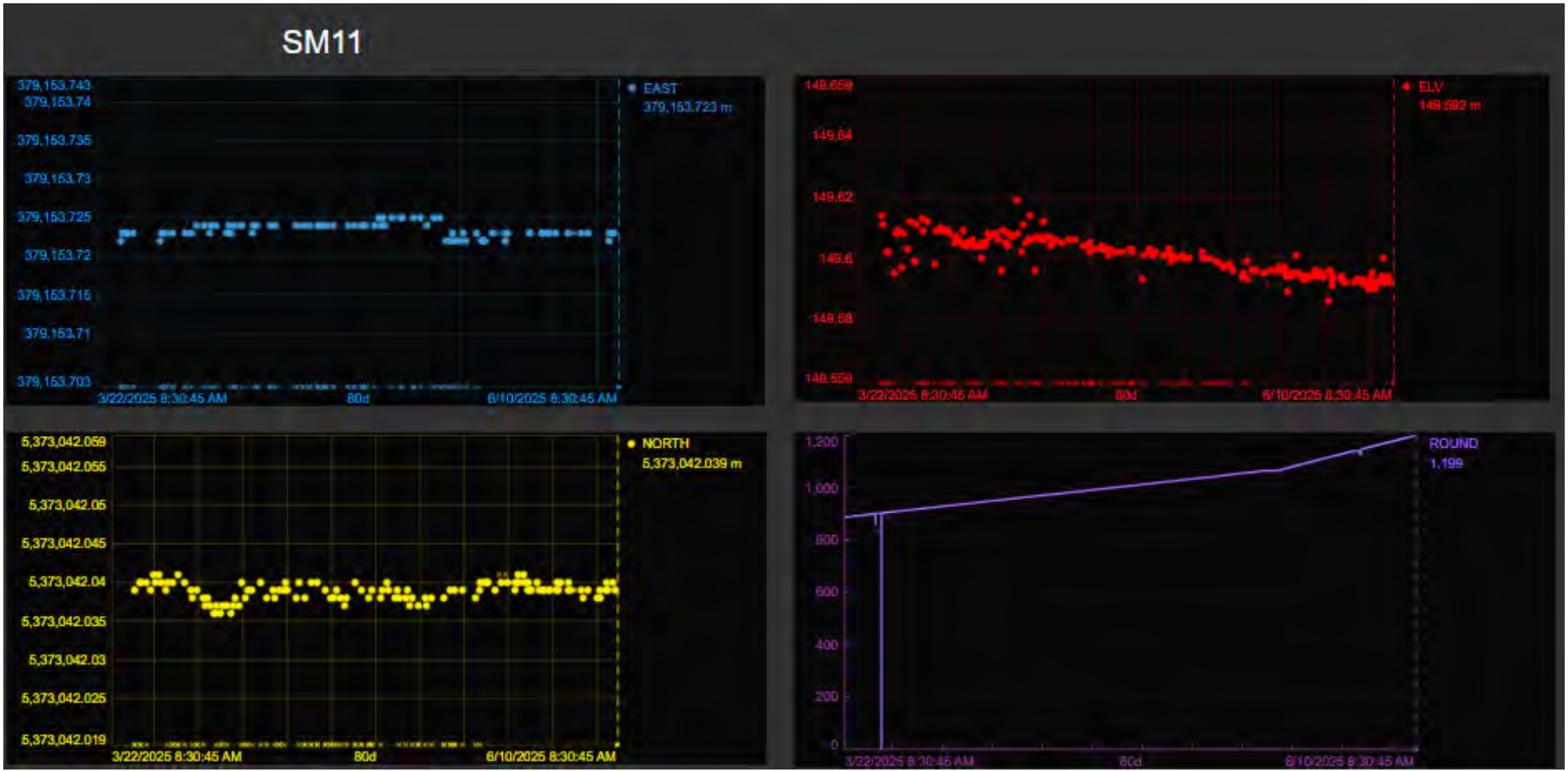
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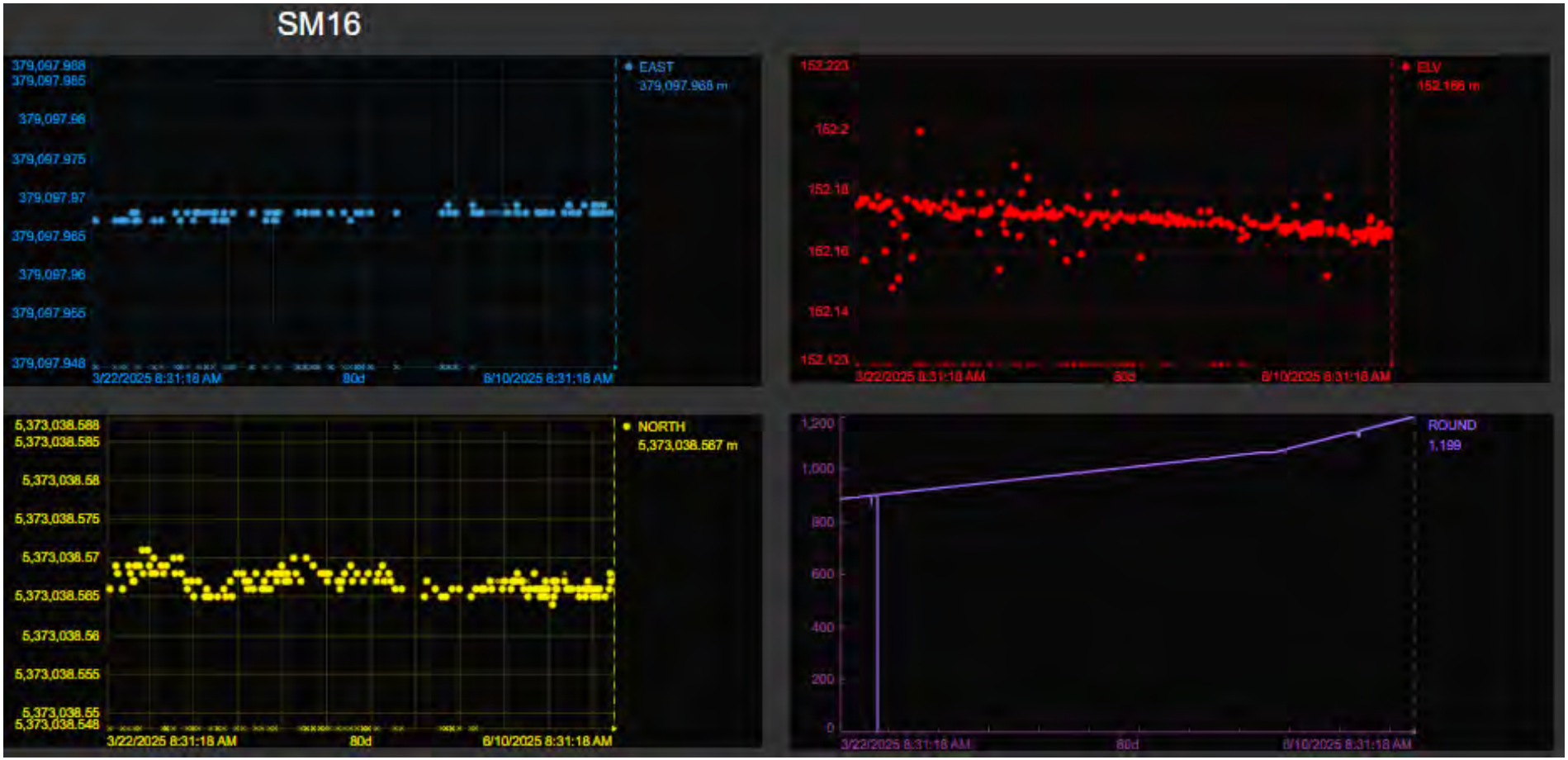

Back
SP10
379,157.878
379,157.875
379,157.87
379,157.865
379,157.86
379,157.855
379,157.85
379,157.845
379,157.838
EAST
379,157.859 m
3/22/2025 8:27:58 AM
80d
6/10/2025 8:27:58 AM
173.378
173.36
173.34
173.32
173.3
173.278
ELV
173.333 m
3/22/2025 8:27:58 AM
80d
6/10/2025 8:27:58 AM
5,372,931.776
5,372,931.77
5,372,931.765
5,372,931.76
5,372,931.755
5,372,931.75
5,372,931.745
5,372,931.74
5,372,931.736
NORTH
5,372,931.758 m
3/22/2025 8:27:58 AM
80d
6/10/2025 8:27:58 AM
1,200
1,000
800
600
400
200
0
ROUND
1,099
3/22/2025 8:27:58 AM
80d
6/10/2025 8:27:58 AM

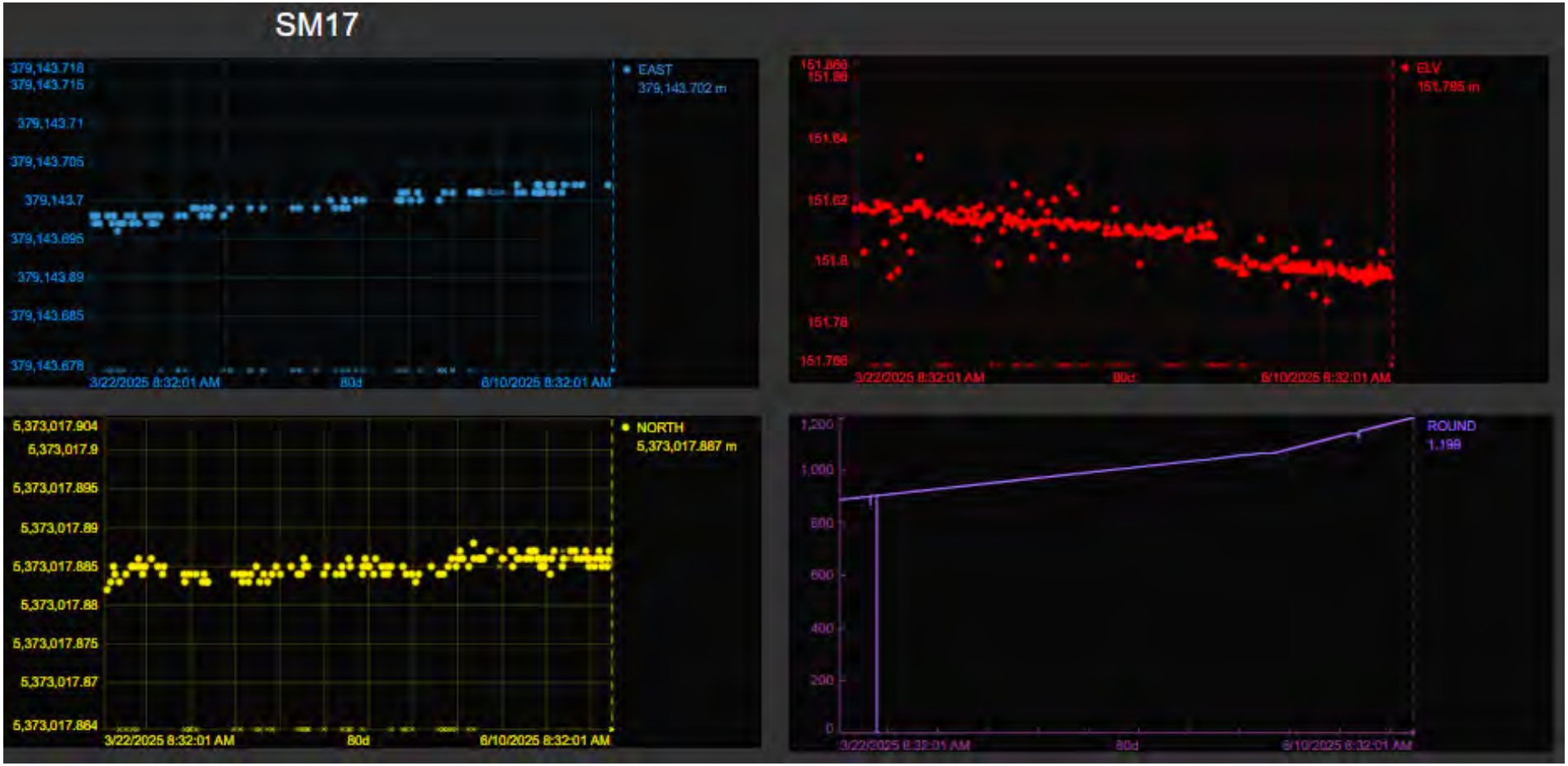

SM03
379,115.613
379,115.61
379,115.605
379,115.6
379,115.595
379,115.59
379,115.585
379,115.58
379,115.573
EAST
379,115.592 m
3/22/2025 8:28:30 AM
80d
6/10/2025 8:28:30 AM
148.729
148.72
148.7
148.68
148.66
148.64
148.629
ELV
148.675 m
3/22/2025 8:28:30 AM
80d
6/10/2025 8:28:30 AM
5,373,075.411
5,373,075.405
5,373,075.4
5,373,075.395
5,373,075.39
5,373,075.385
5,373,075.38
5,373,075.375
5,373,075.371
NORTH
5,373,075.389 m
3/22/2025 8:28:30 AM
80d
6/10/2025 8:28:30 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:28:30 AM
80d
5/10/2025 8:28:30 AM

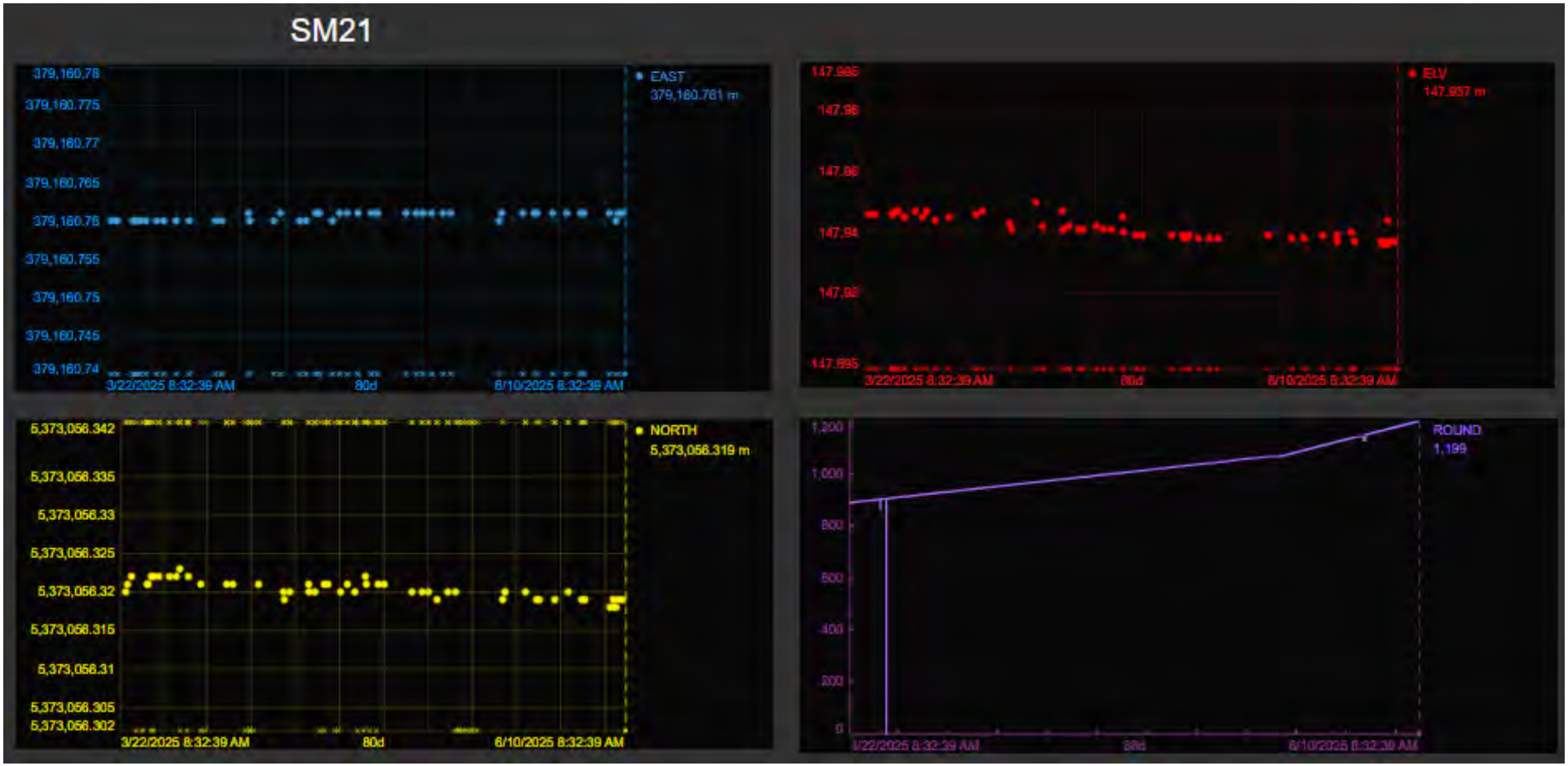

SM04
379,160.78
379,160.775
379,160.77
379,160.765
379,160.76
379,160.755
379,160.75
379,160.745
379,160.74
EAST
379,160.761 m
3/22/2025 8:29:12 AM
80d
6/10/2025 8:29:12 AM
147.985
147.98
147.96
147.94
147.92
147.885
ELV
147.937 m
3/22/2025 8:29:12 AM
80d
6/10/2025 8:29:12 AM
5,373,056.342
5,373,056.335
5,373,056.33
5,373,056.325
5,373,056.32
5,373,056.315
5,373,056.31
5,373,056.305
5,373,056.302
NORTH
5,373,056.319 m
3/22/2025 8:29:12 AM
80d
6/10/2025 8:29:12 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:29:12 AM
80d
6/10/2025 8:29:12 AM

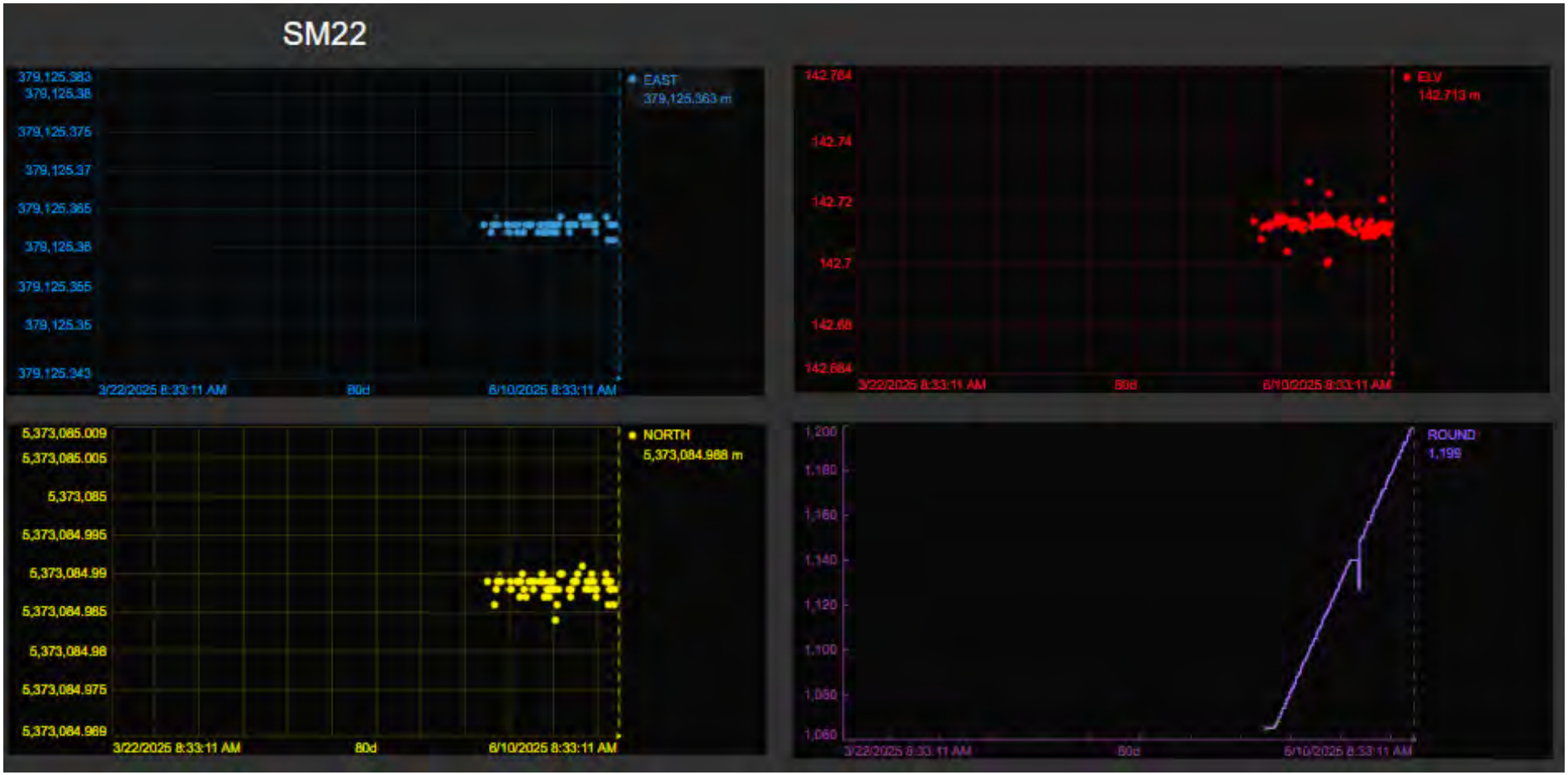

SM10
379,108.896
379,108.895
379,108.89
379,108.885
379,108.88
379,108.875
379,108.87
379,108.865
379,108.858
EAST
379,108.879 m
3/22/2025 8:29:50 AM
80d
6/10/2025 8:29:50 AM
160.806
150.8
150.78
150.76
150.74
150.72
150.706
ELV
160.748 m
3/22/2025 8:29:50 AM
80d
6/10/2025 8:29:50 AM
5,373,062.709
5,373,062.705
5,373,062.7
5,373,062.695
5,373,062.69
5,373,062.685
5,373,062.68
5,373,062.675
5,373,062.669
NORTH
5,373,062.687 m
3/22/2025 8:29:50 AM
80d
6/10/2025 8:29:50 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:29:50 AM
80d
6/10/2025 8:29:50 AM

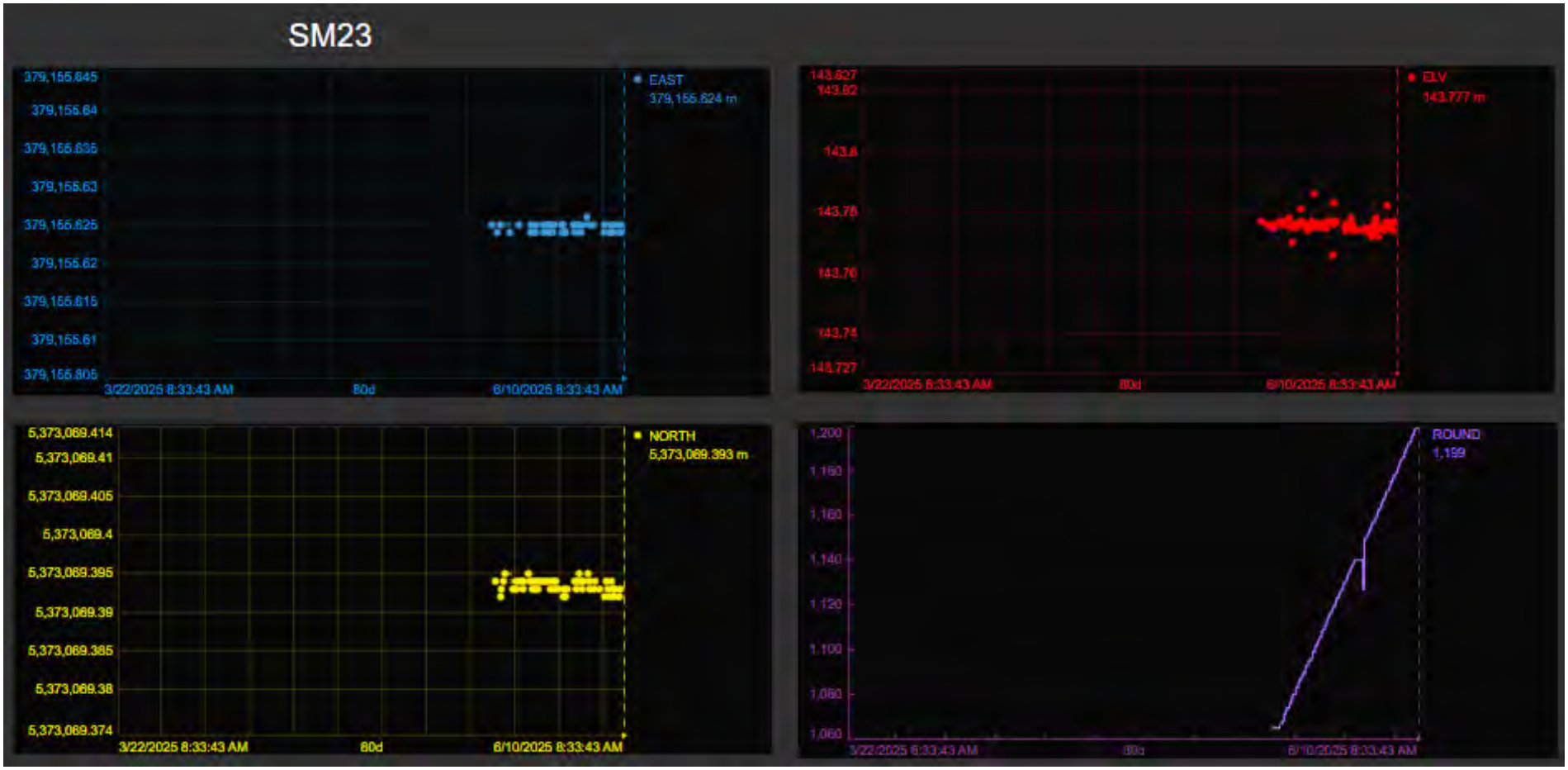

SM11
379,153.743
379,153.74
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379,153.725
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379,153.71
379,153.703
EAST
379,153.723 m
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60d
6/10/2025 8:30:45 AM
149.659
149.64
149.62
149.6
149.58
149.559
ELV
149.592 m
3/22/2025 8:30:45 AM
60d
6/10/2025 8:30:45 AM
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5,373,042.055
5,373,042.05
5,373,042.045
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5,373,042.035
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NORTH
5,373,042.039 m
3/22/2025 8:30:45 AM
60d
6/10/2025 8:30:45 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:30:45 AM
60d
6/10/2025 8:30:45 AM

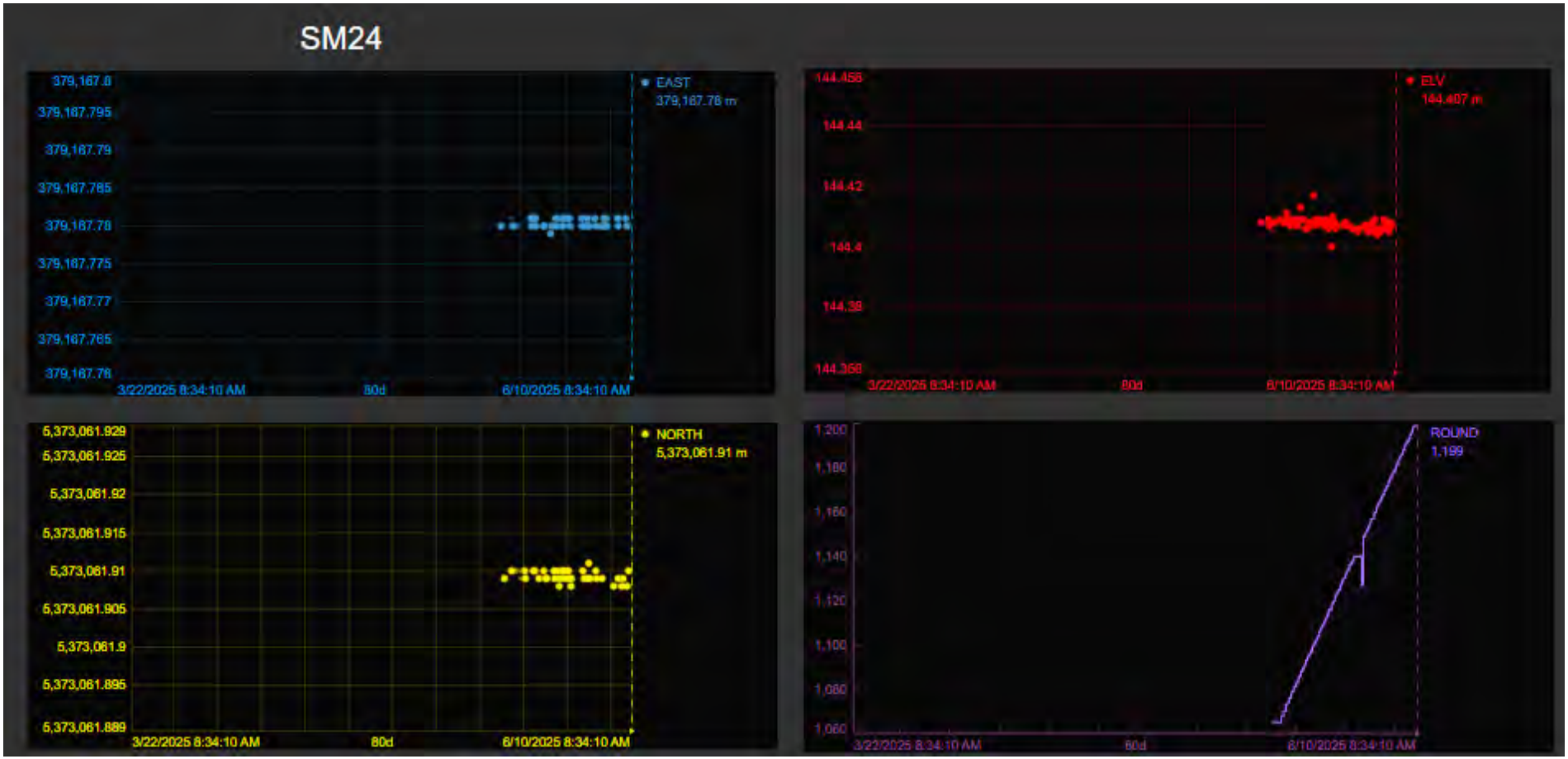

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379,097.948
EAST
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3/22/2025 8:31:18 AM
80d
6/10/2025 8:31:18 AM
152.223
152.2
152.18
152.16
152.14
152.123
ELV
152.186 m
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80d
6/10/2025 8:31:18 AM
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5,373,038.585
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5,373,038.565
5,373,038.56
5,373,038.555
5,373,038.55
5,373,038.548
NORTH
5,373,038.567 m
3/22/2025 8:31:18 AM
80d
6/10/2025 8:31:18 AM
1,200
1,000
800
600
400
200
0
ROUND
1.199
3/22/2025 8:31:18 AM
80d
6/10/2025 8:31:18 AM


SM17
379,143.718
379,143.715
379,143.71
379,143.705
379,143.7
379,143.695
379,143.69
379,143.685
379,143.678
EAST
379,143.702 m
3/22/2025 8:32:01 AM
80d
6/10/2025 8:32:01 AM
151.868
151.86
151.84
151.82
151.8
151.78
151.766
ELV
151.795 m
3/22/2025 8:32:01 AM
80d
6/10/2025 8:32:01 AM
5,373,017.904
5,373,017.9
5,373,017.895
5,373,017.89
5,373,017.885
5,373,017.88
5,373,017.875
5,373,017.87
5,373,017.864
NORTH
5,373,017.887 m
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80d
6/10/2025 8:32:01 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:32:01 AM
80d
6/10/2025 8:32:01 AM


SM21
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379,160.77
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379,160.76
379,160.755
379,160.75
379,160.745
379,160.74
EAST
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80d
6/10/2025 8:32:39 AM
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147.98
147.975
147.97
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147.96
ELV
147.937 m
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80d
6/10/2025 8:32:39 AM
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5,373,056.302
NORTH
5,373,056.319 m
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80d
6/10/2025 8:32:39 AM
1,200
1,000
800
600
400
200
0
ROUND
1,199
3/22/2025 8:32:39 AM
80d
6/10/2025 8:32:39 AM


SM22
379,125.383
379,125.38
379,125.375
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379,125.365
379,125.36
379,125.355
379,125.35
379,125.343
EAST
379,125.363 m
3/22/2025 8:33:11 AM
80d
6/10/2025 8:33:11 AM
142.784
142.74
142.72
142.7
142.68
142.664
ELV
142.713 m
3/22/2025 8:33:11 AM
80d
6/10/2025 8:33:11 AM
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5,373,085
5,373,084.995
5,373,084.99
5,373,084.985
5,373,084.98
5,373,084.975
5,373,084.969
NORTH
5,373,084.988 m
3/22/2025 8:33:11 AM
80d
6/10/2025 8:33:11 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:33:11 AM
80d
6/10/2025 8:33:11 AM

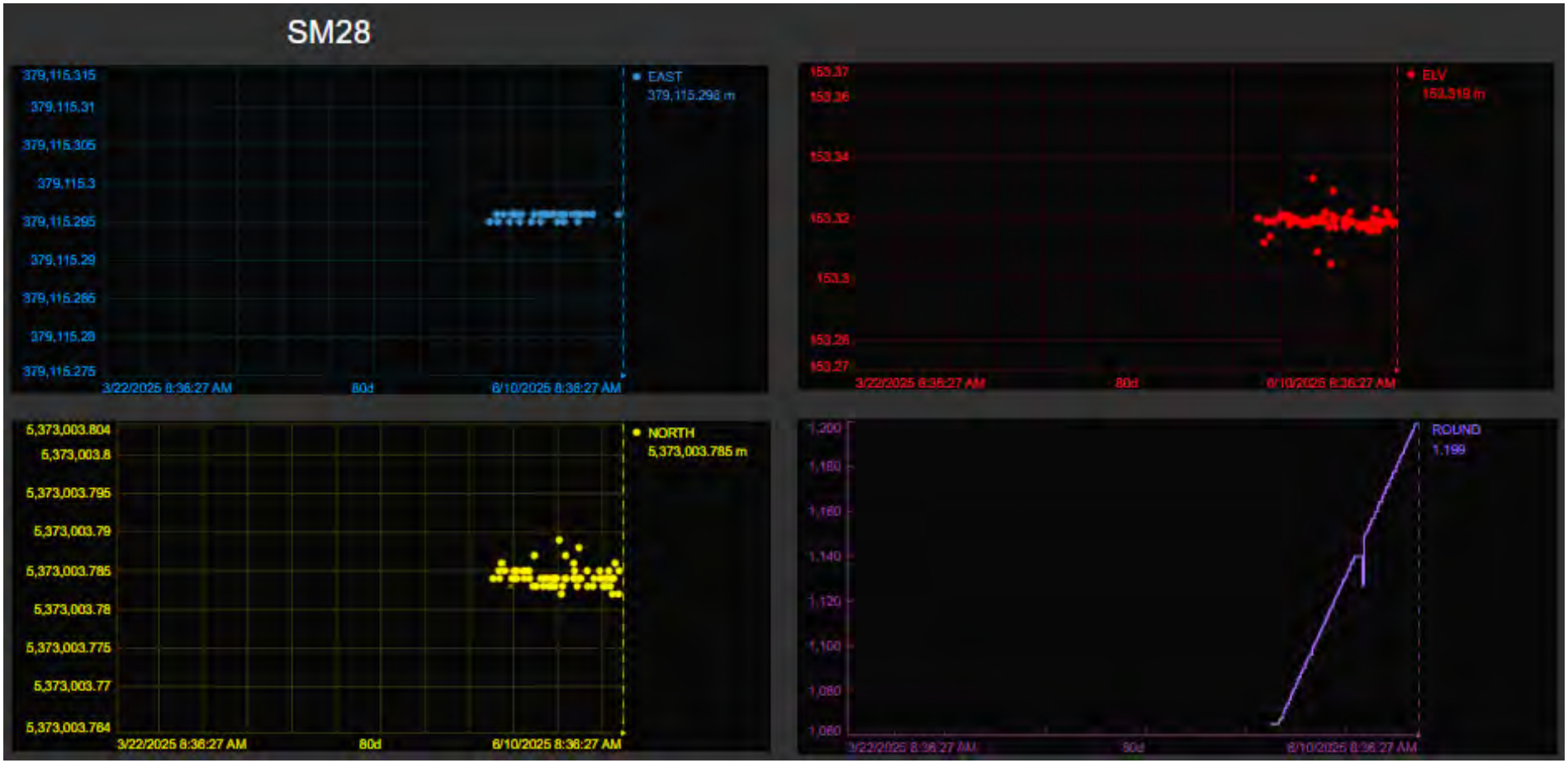

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379,155.805
EAST
379,155.824 m
3/22/2025 8:33:43 AM
80d
6/10/2025 8:33:43 AM
143.827
143.82
143.8
143.78
143.76
143.74
143.727
ELV
143.777 m
3/22/2025 8:33:43 AM
80d
6/10/2025 8:33:43 AM
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5,373,089.405
5,373,089.4
5,373,089.395
5,373,089.39
5,373,089.385
5,373,089.38
5,373,089.374
NORTH
5,373,089.393 m
3/22/2025 8:33:43 AM
80d
6/10/2025 8:33:43 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:33:43 AM
80d
6/10/2025 8:33:43 AM

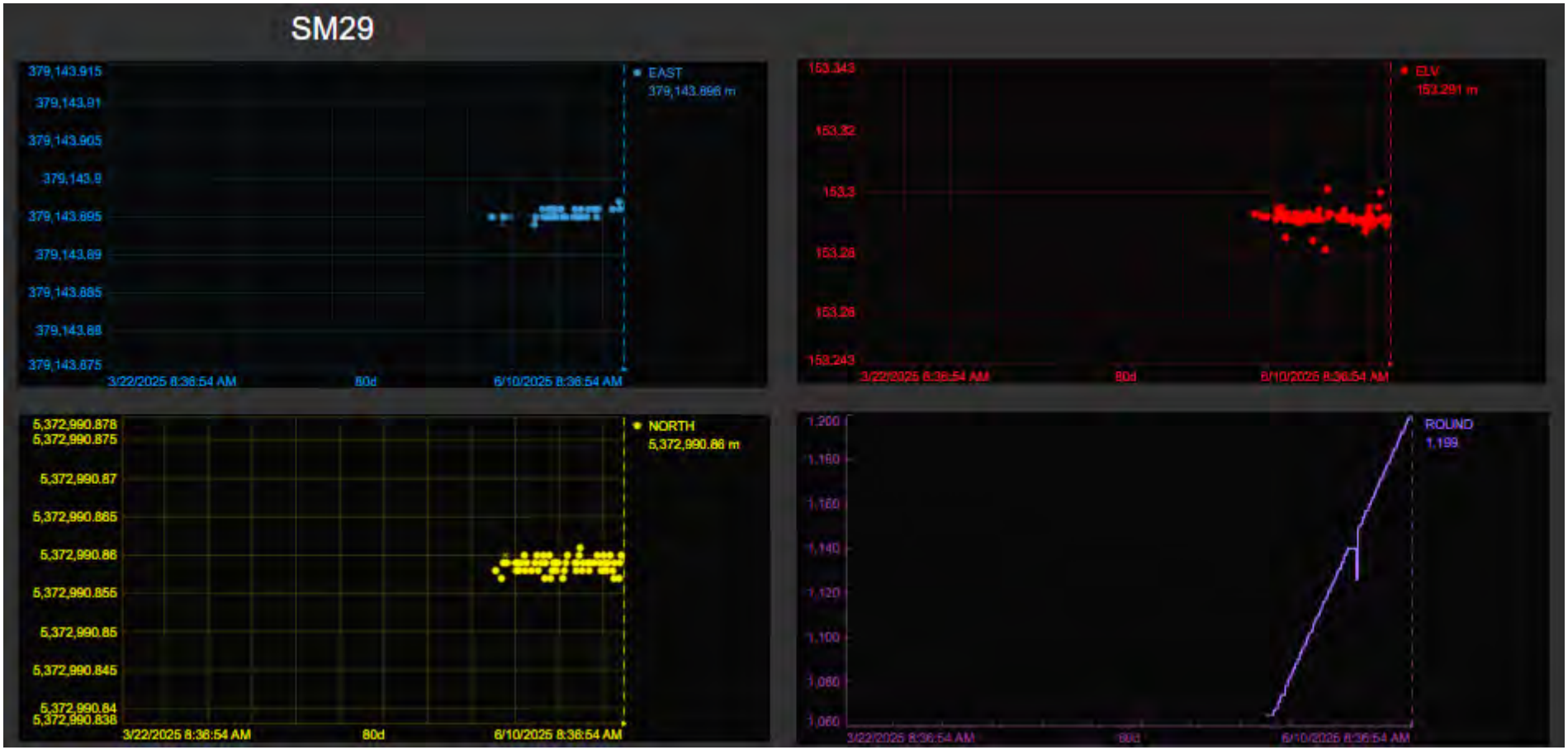

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379,167.78
379,167.775
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379,167.765
379,167.76
EAST
379,167.76 m
3/22/2025 8:34:10 AM
80d
6/10/2025 8:34:10 AM
144.456
144.44
144.42
144.4
144.38
144.368
ELV
144.407 m
3/22/2025 8:34:10 AM
80d
6/10/2025 8:34:10 AM
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5,373,061.925
5,373,061.92
5,373,061.915
5,373,061.91
5,373,061.905
5,373,061.9
5,373,061.895
5,373,061.889
NORTH
5,373,061.91 m
3/22/2025 8:34:10 AM
80d
6/10/2025 8:34:10 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:34:10 AM
80d
6/10/2025 8:34:10 AM


SM25
379,106.5
379,106.495
379,106.49
379,106.485
379,106.48
379,106.475
379,106.47
379,106.465
379,106.46
EAST
379,106.48 m
3/22/2025 8:34:42 AM
80d
6/10/2025 8:34:42 AM
152.254
152.24
152.22
152.2
152.18
152.16
152.154
ELV
152.200 m
3/22/2025 8:34:42 AM
80d
6/10/2025 8:34:42 AM
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5,373,053.385
5,373,053.38
5,373,053.375
5,373,053.37
5,373,053.365
5,373,053.36
5,373,053.355
5,373,053.352
NORTH
5,373,053.372 m
3/22/2025 8:34:42 AM
80d
6/10/2025 8:34:42 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:34:42 AM
80d
6/10/2025 8:34:42 AM


SM26
379,135.358
379,135.355
379,135.35
379,135.345
379,135.34
379,135.335
379,135.33
379,135.325
379,135.318
EAST
379,135.339 m
3/22/2025 8:35:18 AM
80d
8/10/2025 8:35:18 AM
152.088
152.08
152.06
152.04
152.02
152
151.998
ELV
152.084 m
3/22/2025 8:35:18 AM
80d
8/10/2025 8:35:18 AM
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5,373,040.265
5,373,040.26
5,373,040.255
5,373,040.25
5,373,040.245
5,373,040.243
NORTH
5,373,040.263 m
3/22/2025 8:35:18 AM
80d
8/10/2025 8:35:18 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:35:18 AM
80d
8/10/2025 8:35:18 AM


SM27
379,095.761
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379,095.75
379,095.745
379,095.74
379,095.735
379,095.73
379,095.725
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EAST
379,095.741 m
3/22/2025 8:35:55 AM
60d
6/10/2025 8:35:55 AM
153.359
153.34
153.32
153.3
153.28
153.259
ELV
153.308 m
3/22/2025 8:35:55 AM
60d
6/10/2025 8:35:55 AM
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5,373,013.465
5,373,013.46
5,373,013.455
5,373,013.45
5,373,013.448
NORTH
5,373,013.47 m
3/22/2025 8:35:55 AM
60d
6/10/2025 8:35:55 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:35:55 AM
60d
6/10/2025 8:35:55 AM


SM28
379,115.315
379,115.31
379,115.305
379,115.3
379,115.295
379,115.29
379,115.285
379,115.28
379,115.275
EAST
379,115.298 m
3/22/2025 8:36:27 AM
80d
6/10/2025 8:36:27 AM
153.37
153.36
153.34
153.32
153.3
153.28
153.27
ELV
153.319 m
3/22/2025 8:36:27 AM
80d
6/10/2025 8:36:27 AM
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5,373,003.8
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5,373,003.79
5,373,003.785
5,373,003.78
5,373,003.775
5,373,003.77
5,373,003.764
NORTH
5,373,003.785 m
3/22/2025 8:36:27 AM
80d
6/10/2025 8:36:27 AM
1,200
1,180
1,160
1,140
1,120
1,100
1,080
1,060
ROUND
1,199
3/22/2025 8:36:27 AM
80d
6/10/2025 8:36:27 AM


SM29
379,143.915
379,143.91
379,143.905
379,143.9
379,143.895
379,143.89
379,143.885
379,143.88
379,143.875
EAST
379,143.896 m
3/22/2025 8:36:54 AM
60d
6/10/2025 8:36:54 AM
153.343
153.32
153.3
153.28
153.26
153.243
ELV
153.291 m
3/22/2025 8:36:54 AM
60d
6/10/2025 8:36:54 AM
5,372,990.878
5,372,990.875
5,372,990.87
5,372,990.865
5,372,990.86
5,372,990.855
5,372,990.85
5,372,990.845
5,372,990.84
5,372,990.838
NORTH
5,372,990.86 m
3/22/2025 8:36:54 AM
60d
6/10/2025 8:36:54 AM
1.200
1.180
1.160
1.140
1.120
1.100
1.080
1.060
ROUND
1.199
3/22/2025 8:36:54 AM
60d
6/10/2025 8:36:54 AM

73AI084 (IC6)

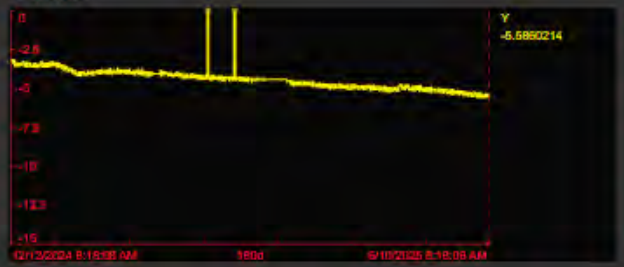
Back

Node 23

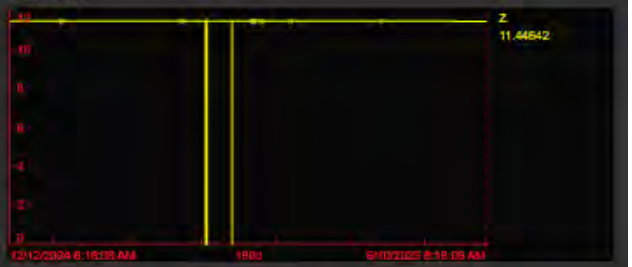
X Axis



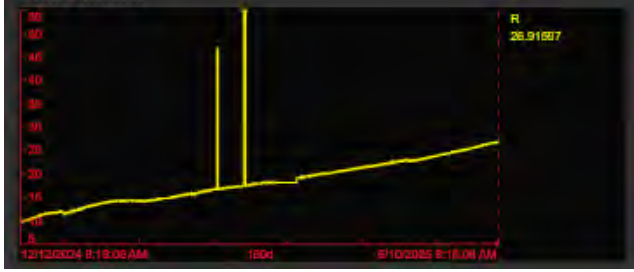
Y Axis



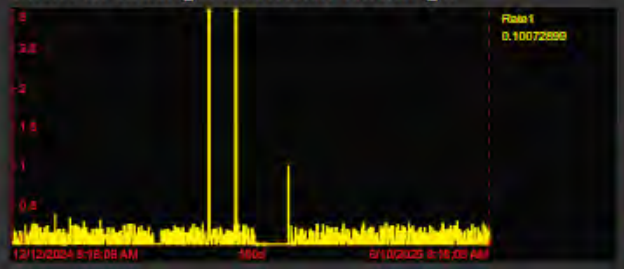
Z Axis



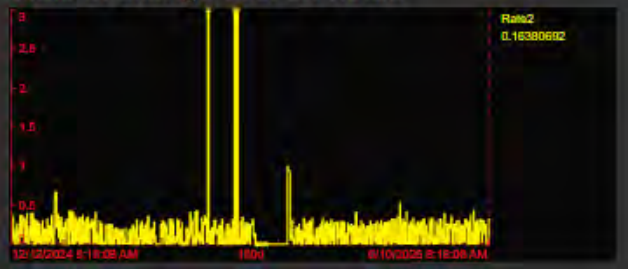
Resultant



Rate of change between readings

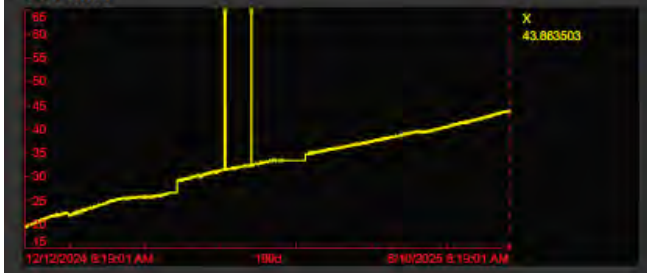


Rate of change over 24 hours

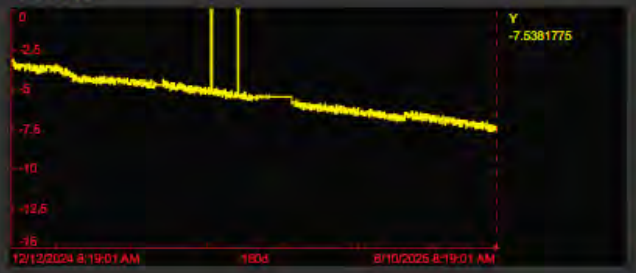


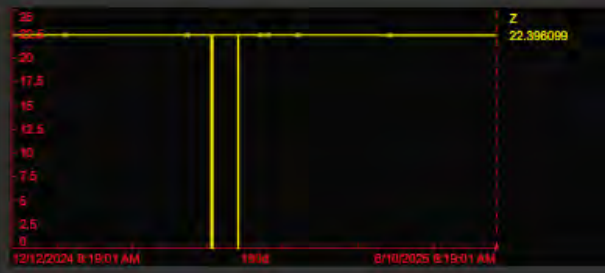
Node 45

X Axis

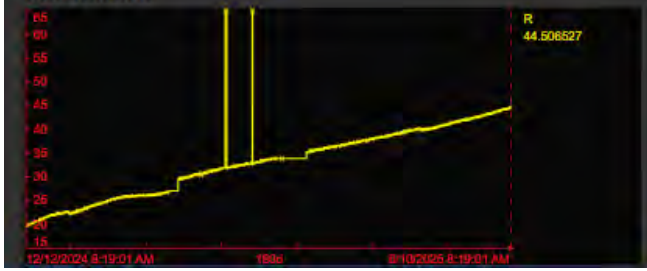


Y Axis

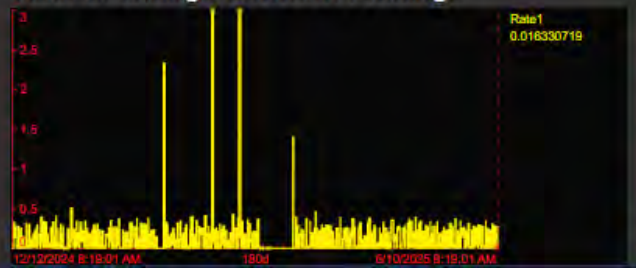




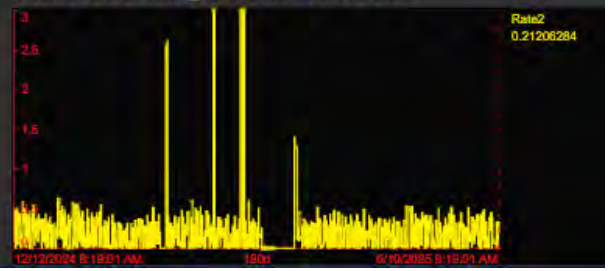
Resultant

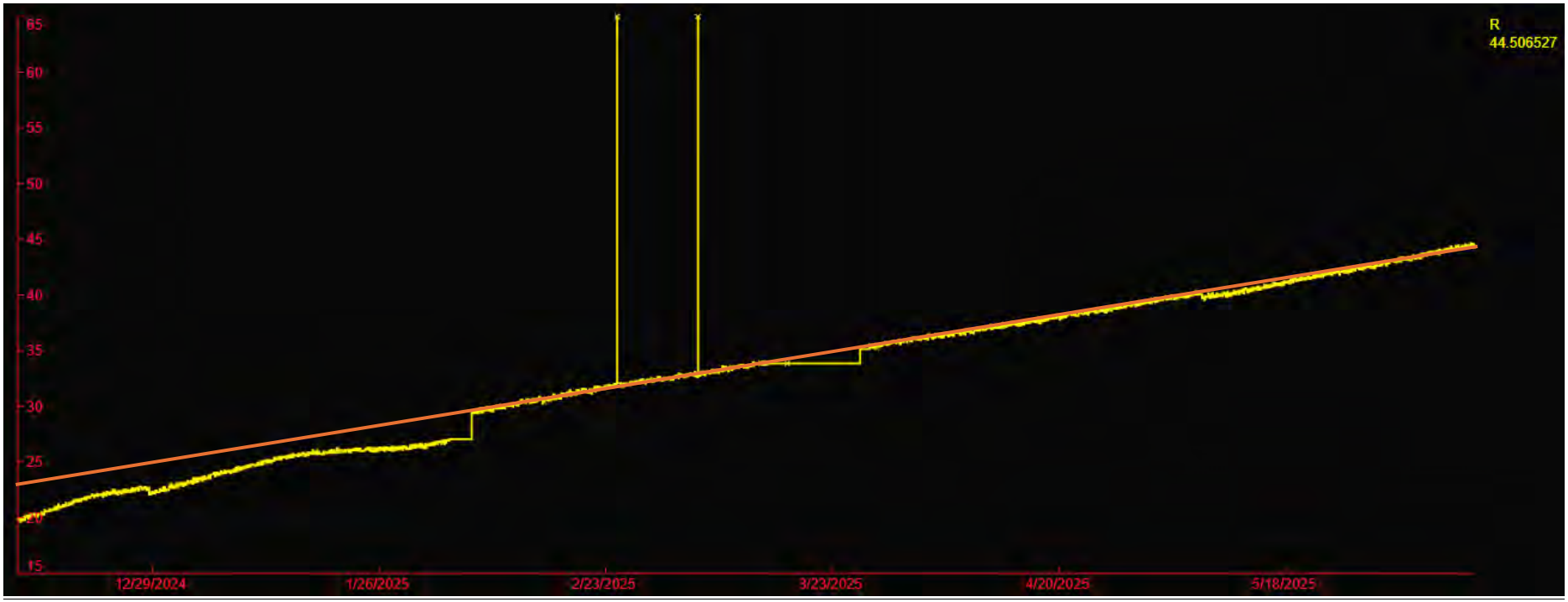


Rate of change between readings



Rate of change over 24 hours




R
44.506527
65
60
55
50
45
40
35
30
25
15
12/29/2024
1/26/2025
2/23/2025
3/23/2025
4/20/2025
5/18/2025

APPENDIX C – MATERIAL PARAMETERS

TAILINGS.WATER.WASTE.

Material	Drained Strength Parameters		Undrained Strength Parameters [1]	Post Liq/ Post Seismic Strength Parameters [3]	Bulk Unit Weight
	c' (kPa)	ϕ' (°)	S_u (kPa)	$S_{u(residual)}$ (kPa)	γ_{Bulk} (kN/m^3)
Tailings (Old and New)	-	-	$S_u/\sigma'_v = 0.2$ $S_{u\,(min)} = 10$ kPa	$S_u/\sigma'_v = 0.05$	18
Unit 1A (2017)[5]	0	36	18	14	15.8
Unit 1A (2024)	0	36	23	14	15.8
Unit 1B	0	37	C' = 0 kPa , ϕ' = 37° [4]	15	19.5
Unit 1C	0	36	C' = 0 kPa , ϕ' = 36° [4]	C' = 0 kPa , ϕ' = 30.2°	20
Unit 2A-1 (2017)[5]	0	25	43	16	16.3
Unit 2A-1 (2024)	0	25	54	16	16.3
Unit 2A-2 (2017)[5]	0	25	44	30	16.3
Unit 2A-2 (2024)	0	25	52	30	16.3
Unit 2B	0	27	56	17	12.2
Unit 3A (2017)[5]	0	34	21	15	17.5
Unit 3A (2024)	0	34	27	15	17.5
Unit 4B	0	35	C' = 0 kPa , ϕ' = 35° [4]	30	20.0
Unit 4C	0	35	C' = 0 kPa , ϕ' = 35° [4]	30	20.5
Clay/Waste rock (existing 2 dam)	5	30	40	32	20
Waste rock (existing 2 dam)	0	35	C' = 0 kPa , ϕ' = 35° [4]	C' = 0 kPa , ϕ' = 29.3°	20
Compacted Tailings (existing 2 dam)	0	30	C' = 0 kPa , ϕ' = 30° [4]	C' = 0 kPa , ϕ' = 24.8°	18
Landfill (Upstream toe of western embankment)	0	28	C' = 0 kPa , ϕ' = 28° [4]	C' = 0 kPa , ϕ' = 23°	12.5

Material	Drained Strength Parameters		Undrained Strength Parameters [1]	Post Liq/ Post Seismic Strength Parameters [3]	Bulk Unit Weight
	c' (kPa)	ϕ' (°)	S_u (kPa)	$S_{u(residual)}$ (kPa)	γ_{Bulk} (kN/m^3)
Glacial Fill (Zone A and B of existing 5 dam embankment)	5	30	$S_u/\sigma'_v = 0.5$ $S_{u\,(min)} = 40$ kPa	$S_u/\sigma'_v = 0.4$ $S_{u\,(min)} = 32$ kPa	18
Glacial Fill (Zone D of existing 5 dam)	2	33	C' = 2 kPa , ϕ' = 33° [4]	C' = 1.6 kPa , ϕ' = 27.4°	20
Filter (Zone C of existing 5 dam)	0	34	C' = 0 kPa , ϕ' = 34° [4]	C' = 0 kPa , ϕ' = 28.4°	19
Waste rock (Foundation – western embankment)	0	36	C' = 0 kPa , ϕ' = 36° [4]	C' = 0 kPa , ϕ' = 30.2°	20
Gravel	0	36	C' = 0 kPa , ϕ' = 36° [4]	C' = 0 kPa , ϕ' = 30.2°	20
Liner	0	20	C' = 0 kPa , ϕ' = 20° [4]	C' = 0 kPa , ϕ' = 16.2°	11
Jet Grout Curtain (Screening Bund)	500	0	500	400	16
NE Cement Bentonite Wall	95	0	95	76	16
Rockfill [2]	Shear Strength Function $\tau_u = fn(\sigma'_n)$ – Leps' average capped at 45°			C' = 0 kPa , ϕ' = 22 kPa	

APPENDIX D – LIMIT EQUILIBRIUM STABILITY RESULTS

TAILINGS.WATER.WASTE.

Color	Name	Model	Unit Weight	Strength Function	Minimum Strength	Tau/Sigma Ratio	Cohesion'	Phi'	Cohesion	Piezometric Line
	1A - Low Plasticity Silt (RESIDUAL)	Undrained (Phi=0)	15.8						14	1
	1B - Very Loose Sand	Mohr-Coulomb	19.5				0	37		1
	1C - Loose Gravel with Sand	Mohr-Coulomb	20				0	36		1
	2A-1 - High Plasticity Silt (Organic S-F) (RESIDUAL 0.14)	SHANSEP	16.3		16	0.14				1
	2A-2 - High Plasticity Silt (Organic S-F) (2017)	Undrained (Phi=0)	16.3						44	1
	2A-2 - High Plasticity Silt (Organic S-F) (2024)	Undrained (Phi=0)	16.3						52	1
	2B-1 - High Plasticity Silt (Organic VF - St) (2017)	Undrained (Phi=0)	12.2						56	1
	2B-1 - High Plasticity Silt (Organic VF - St) (2024)	Undrained (Phi=0)	12.2						56	1
	3A - High Plasticity Silt (VS - F) (2017)	Undrained (Phi=0)	17.5						21	1
	3A - High Plasticity Silt (VS - F) (2024)	Undrained (Phi=0)	17.5						27	1
	4B - Low Plasticity Silt (St - VSt)	Mohr-Coulomb	20				0	35		1
	4C - Low Plasticity Silt (St - H)	Mohr-Coulomb	20.5				0	35		1
	Bedrock	Bedrock (Impenetrable)								1
	Bentonite Curtain	Mohr-Coulomb	16				95	0		1
	Clay Waste Rock	Undrained (Phi=0)	20						40	1
	Compacted Tailings	Mohr-Coulomb	18				0	30		1
	Glacial Fill	SHANSEP	18		40	0.5				1
	Rockfill	Shear/Normal Fn.	22	Rockfill Peak						1
	Tailings (Old)	SHANSEP	18		10	0.2				1
	Tailings - New	SHANSEP	18		10	0.2				1
	Waste Rock	Mohr-Coulomb	20				0	35		1

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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - MATERIAL PARAMETERS - CASE 1

SHORT TERM - UNDRAINED - MATERIAL PARAMETERS

Date: 10/06/2025 Job No: 107031.87

FIGURE D1

Color	Name	Model	Unit Weight	Strength Function	Minimum Strength	Tau/Sigma Ratio	Cohesion'	Phi'	Cohesion	Piezometric Line
	1A - Low Plasticity Silt (RESIDUAL)	Undrained (Phi=0)	15.8						14	1
	1B - Very Loose Sand	Mohr-Coulomb	19.5				0	37		1
	1C - Loose Gravel with Sand	Mohr-Coulomb	20				0	36		1
	2A-1 - High Plasticity Silt (Organic S-F) (RESIDUAL 0.2)	SHANSEP	16.3		16	0.2				1
	2A-2 - High Plasticity Silt (Organic S-F) (2017)	Undrained (Phi=0)	16.3						44	1
	2A-2 - High Plasticity Silt (Organic S-F) (2024)	Undrained (Phi=0)	16.3						52	1
	2B-1 - High Plasticity Silt (Organic VF - St) (2017)	Undrained (Phi=0)	12.2						56	1
	2B-1 - High Plasticity Silt (Organic VF - St) (2024)	Undrained (Phi=0)	12.2						56	1
	3A - High Plasticity Silt (VS - F) (2017)	Undrained (Phi=0)	17.5						21	1
	3A - High Plasticity Silt (VS - F) (2024)	Undrained (Phi=0)	17.5						27	1
	4B - Low Plasticity Silt (St - VSt)	Mohr-Coulomb	20				0	35		1
	4C - Low Plasticity Silt (St - H)	Mohr-Coulomb	20.5				0	35		1
	Bedrock	Bedrock (Impenetrable)								1
	Bentonite Curtain	Mohr-Coulomb	16				95	0		1
	Clay Waste Rock	Undrained (Phi=0)	20						40	1
	Compacted Tailings	Mohr-Coulomb	18				0	30		1
	Glacial Fill	SHANSEP	18		40	0.5				1
	Rockfill	Shear/Normal Fn.	22	Rockfill Peak						1
	Tailings (Old)	SHANSEP	18		10	0.2				1
	Tailings - New	SHANSEP	18		10	0.2				1
	Waste Rock	Mohr-Coulomb	20				0	35		1

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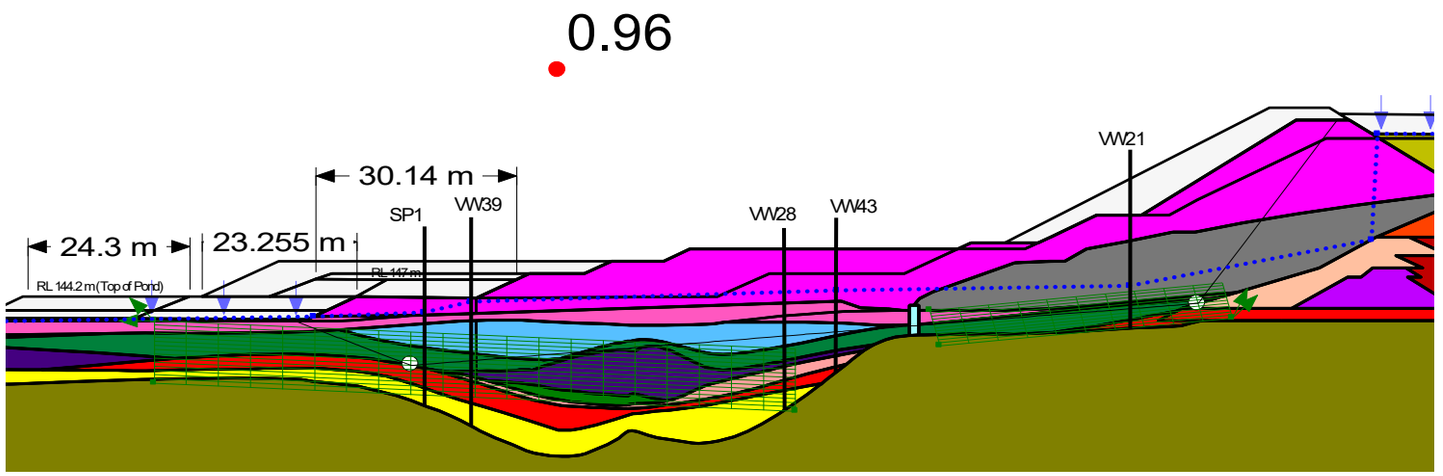
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

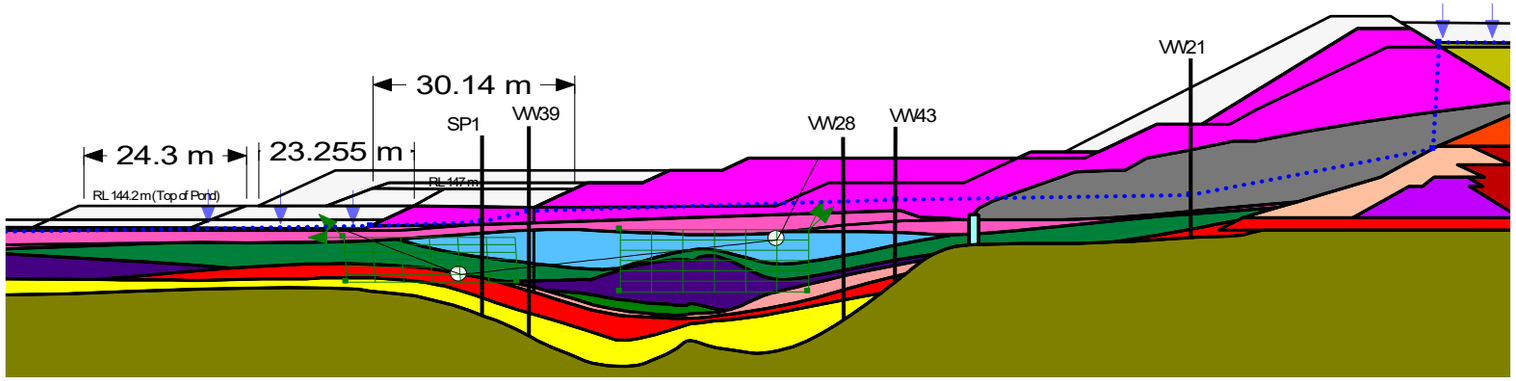
STABILITY ANALYSIS - END OF FILLING - MATERIAL PARAMETERS - CASE 2

SHORT TERM - UNDRAINED - MATERIAL PARAMETERS

Date: 10/06/2025 Job No: 107031.87

FIGURE D2





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STABILITY ANALYSIS - END OF FILLING - SECTION D - NO BUTTRESS - CASE 1 PARAMETERS

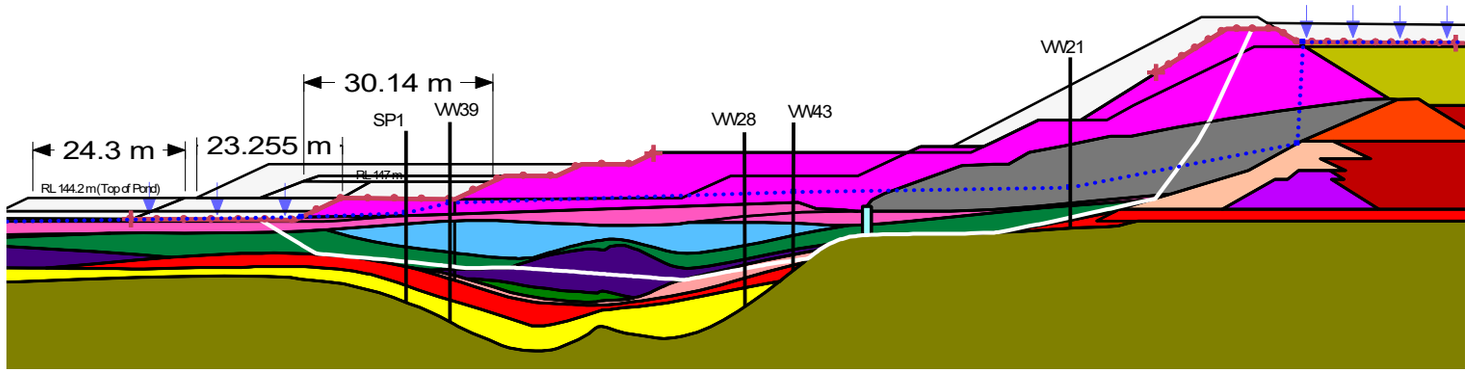
SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

Date: 10/06/2025 Job No: 107031.126

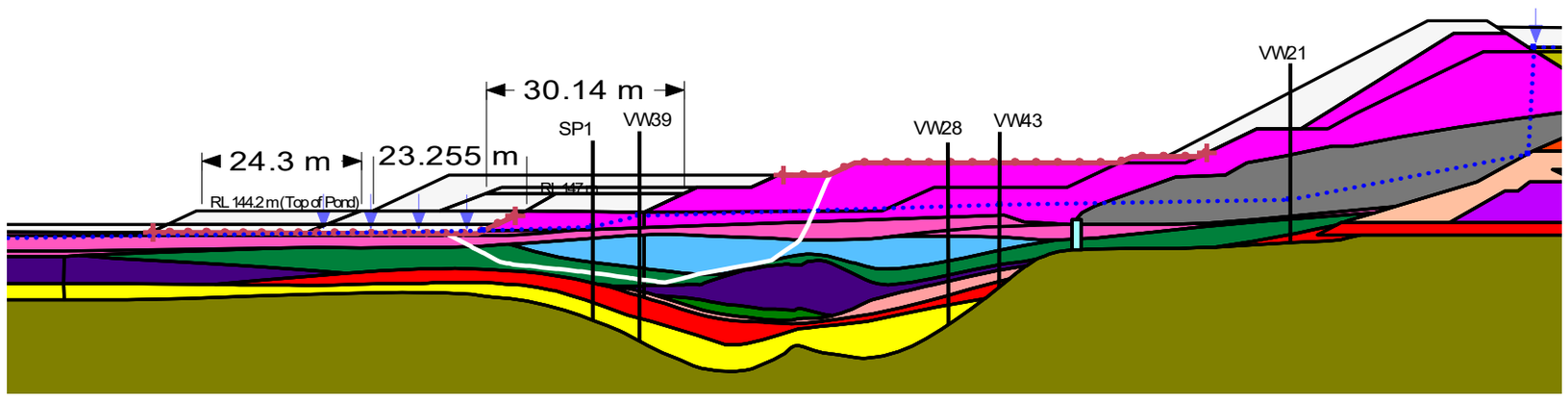
FIGURE D3

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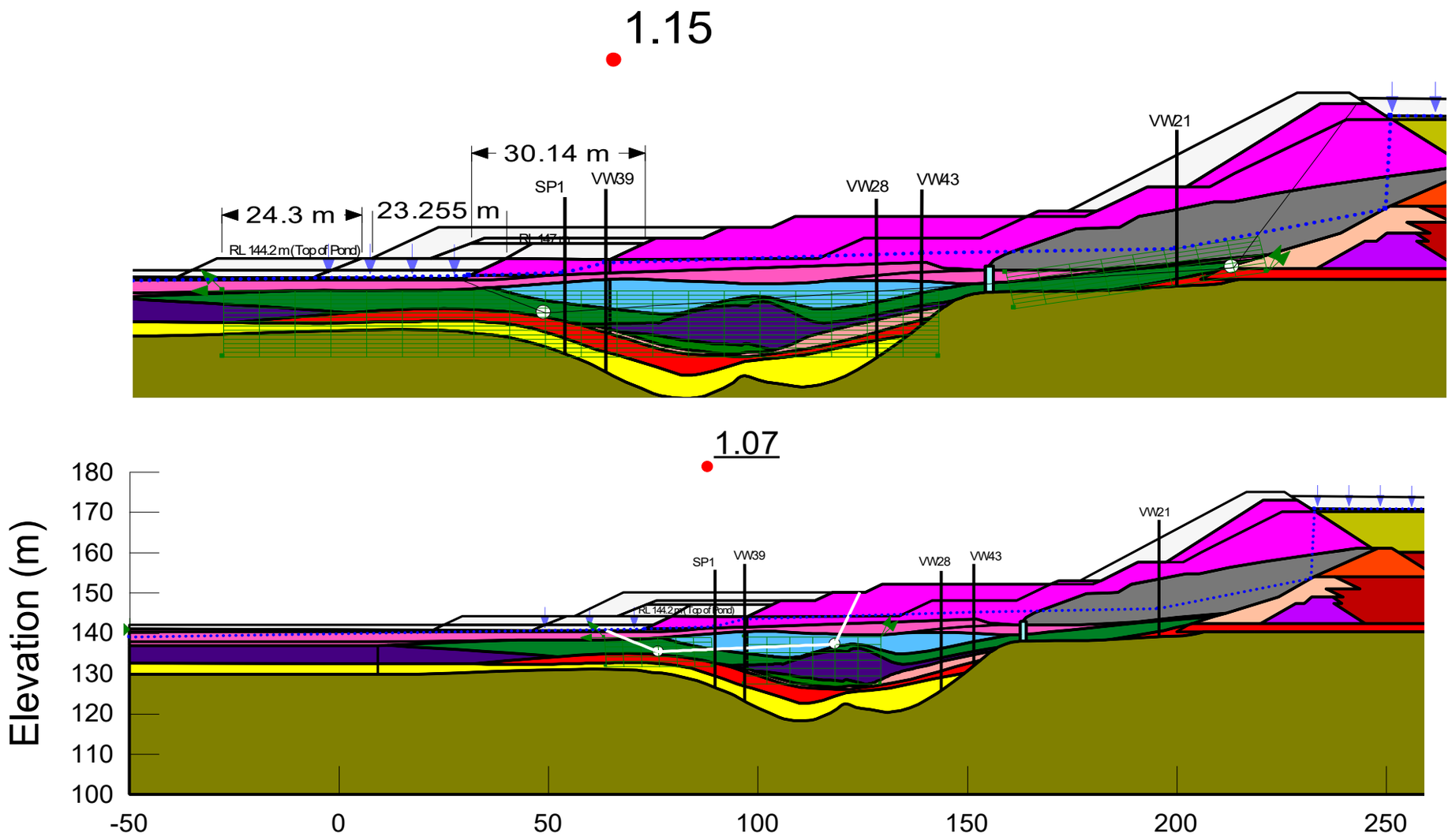
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION D - NO BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

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FIGURE D4



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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
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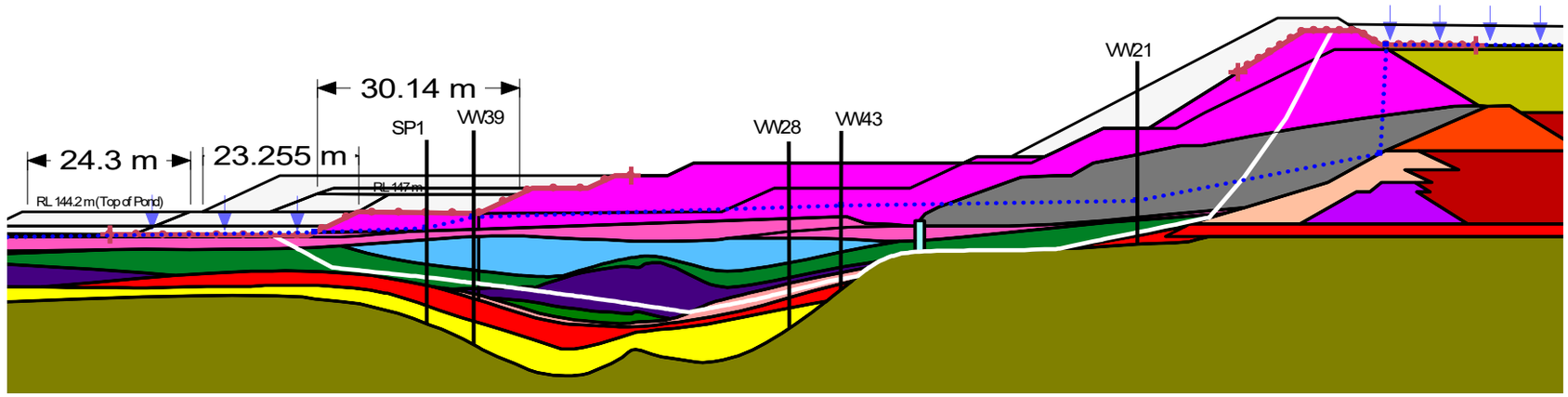
STABILITY ANALYSIS - END OF FILLING - SECTION D - NO BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

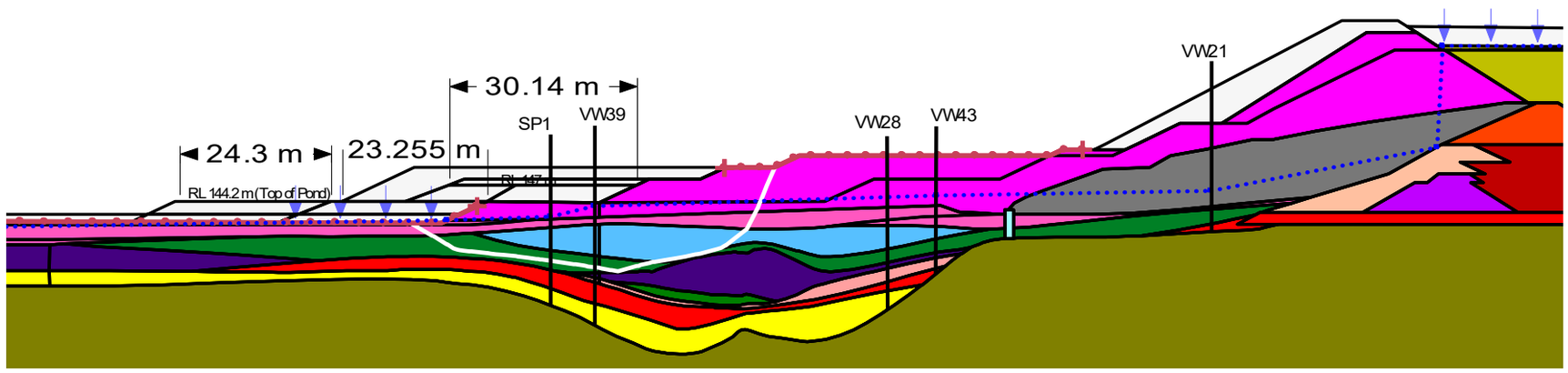
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FIGURE D5

1.17



0.98



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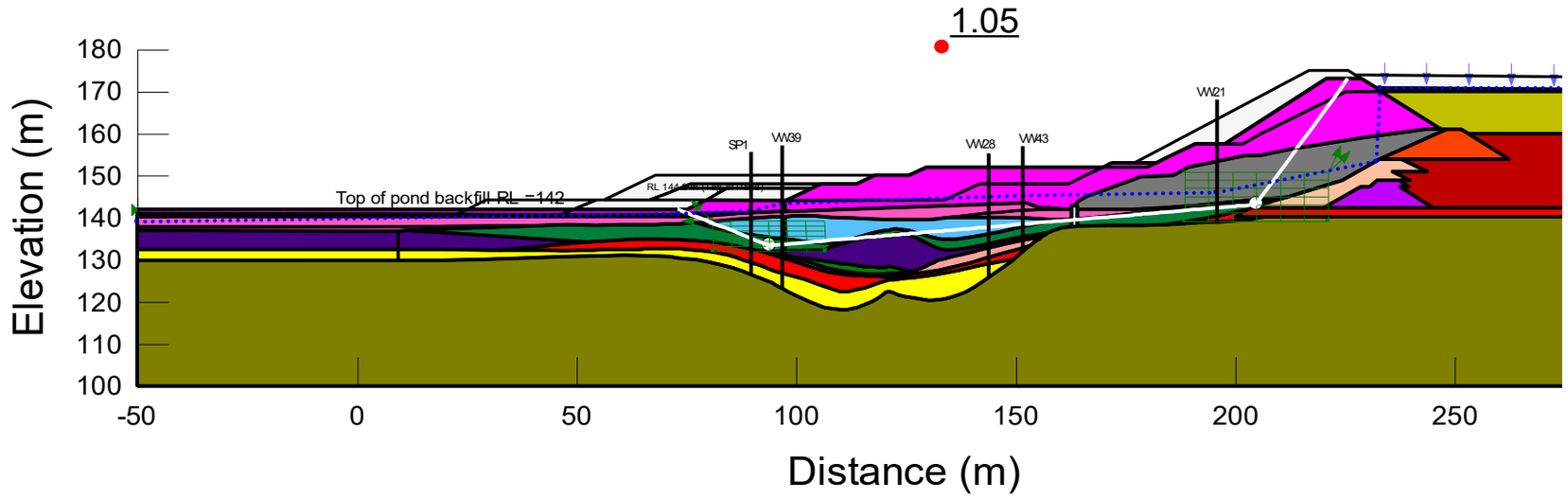
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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

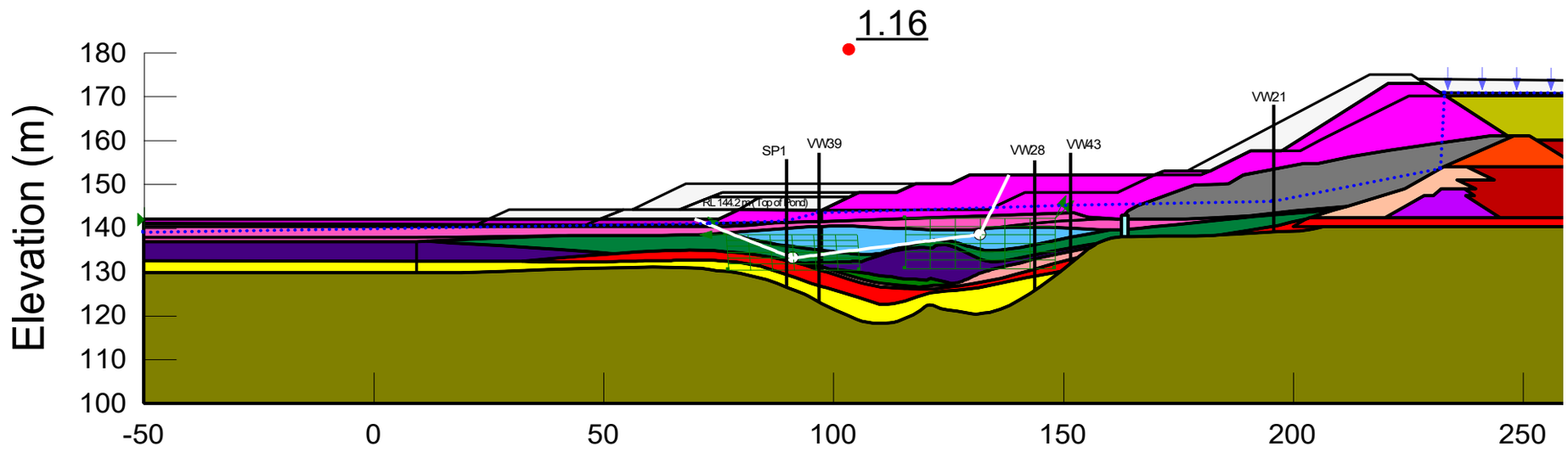
STABILITY ANALYSIS - END OF FILLING - SECTION D - NO BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

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FIGURE D6





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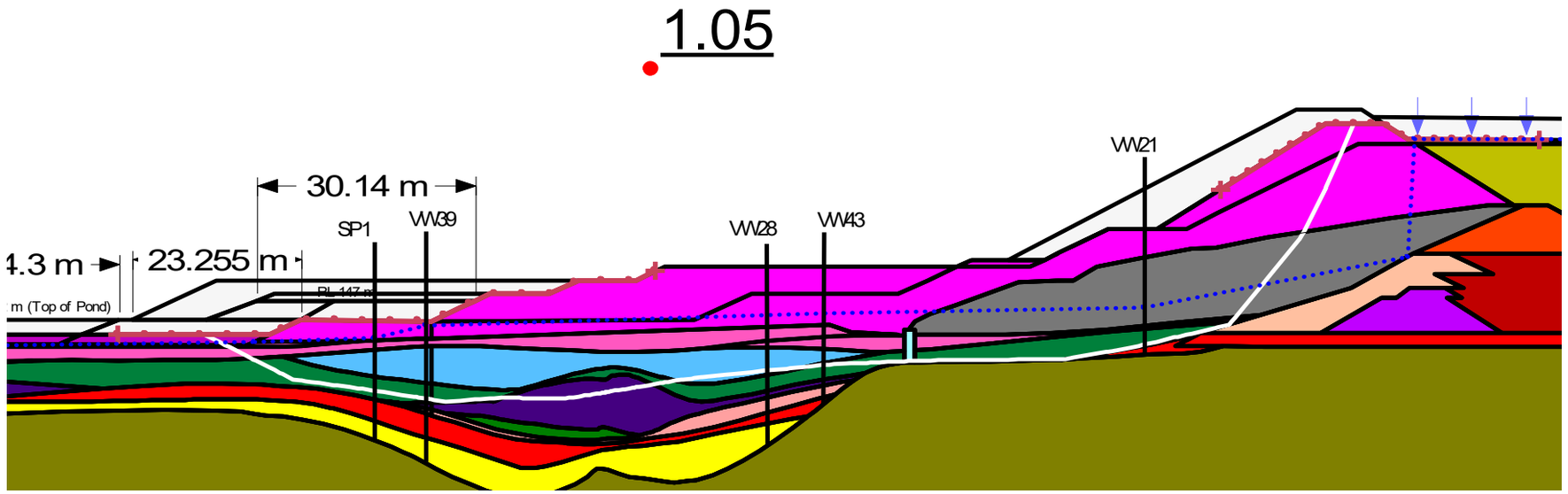
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION D - 1.5 m POND BACKFILL - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

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FIGURE D7



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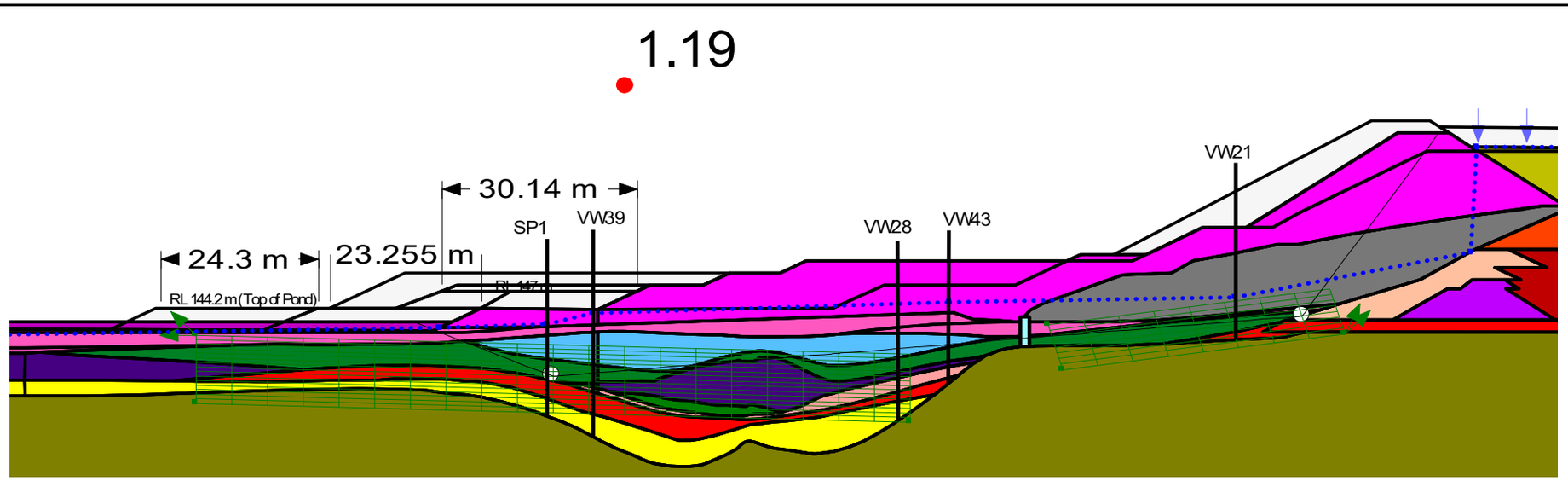
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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

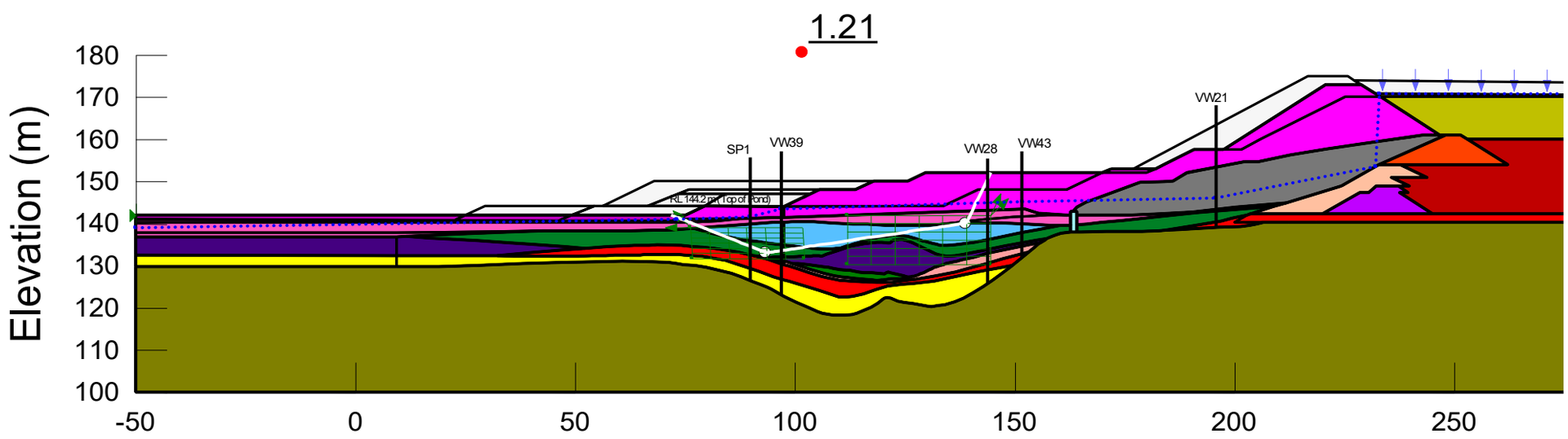
STABILITY ANALYSIS - END OF FILLING - SECTION D - 1.5 m POND BACKFILL - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

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FIGURE D8





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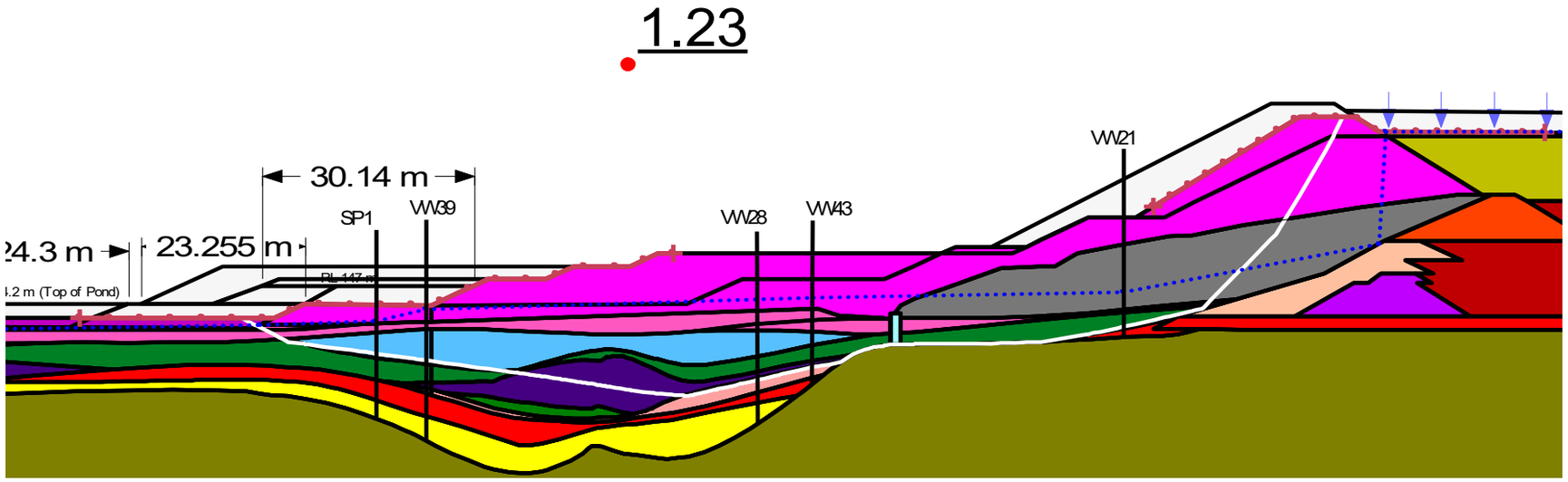
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

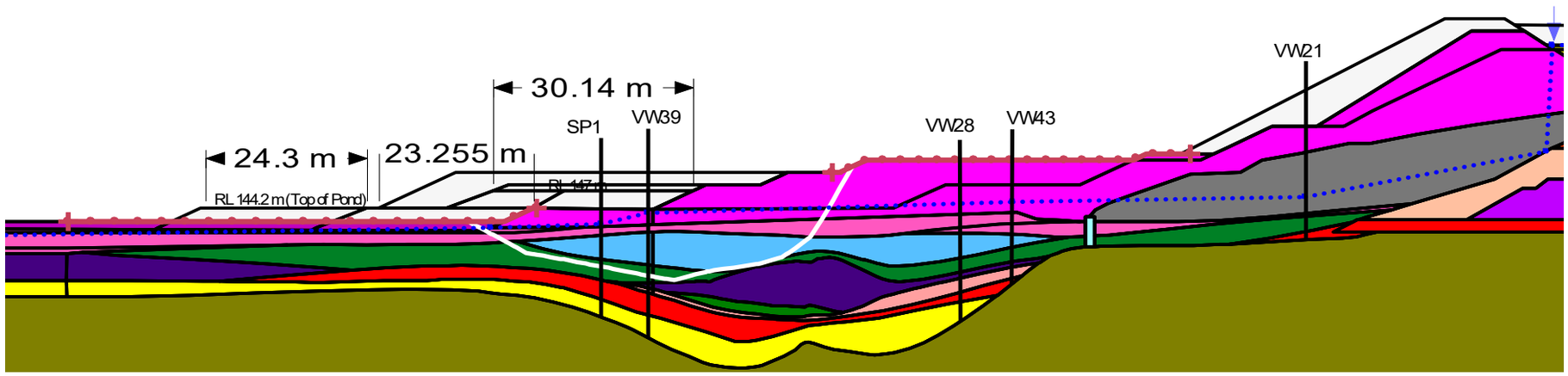
STABILITY ANALYSIS - END OF FILLING - SECTION D - 1.5 m POND BACKFILL - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

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FIGURE D9





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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

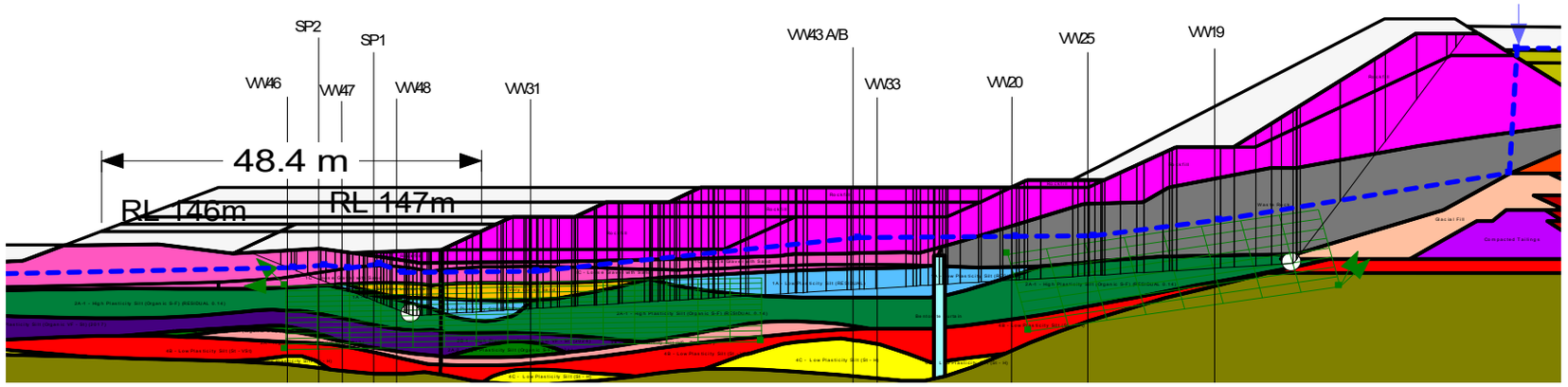
STABILITY ANALYSIS - END OF FILLING - SECTION D - 1.5 m POND BACKFILL - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

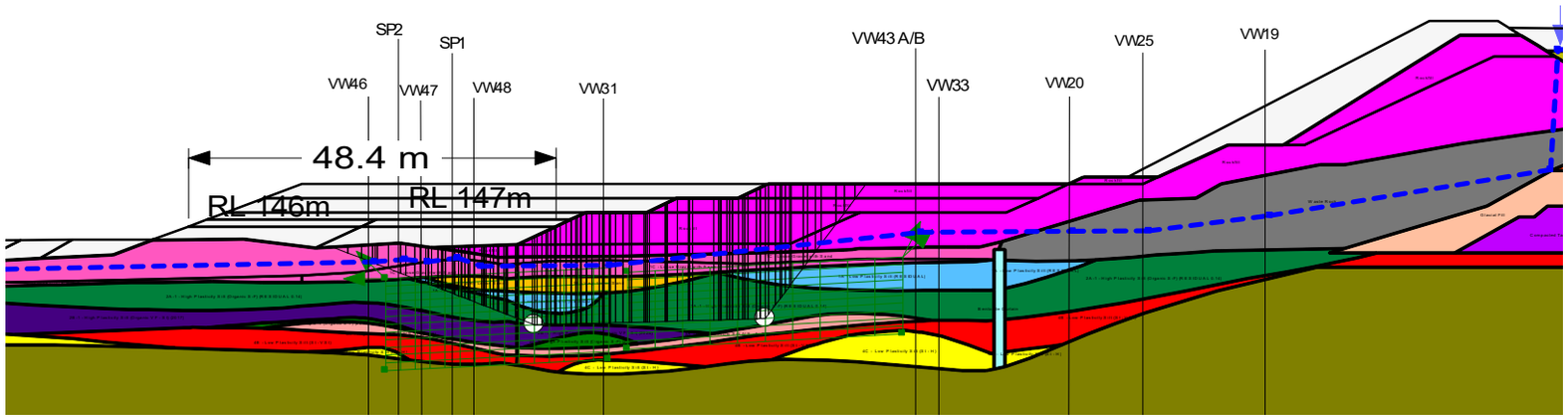
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FIGURE D10

1.11



1.38



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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

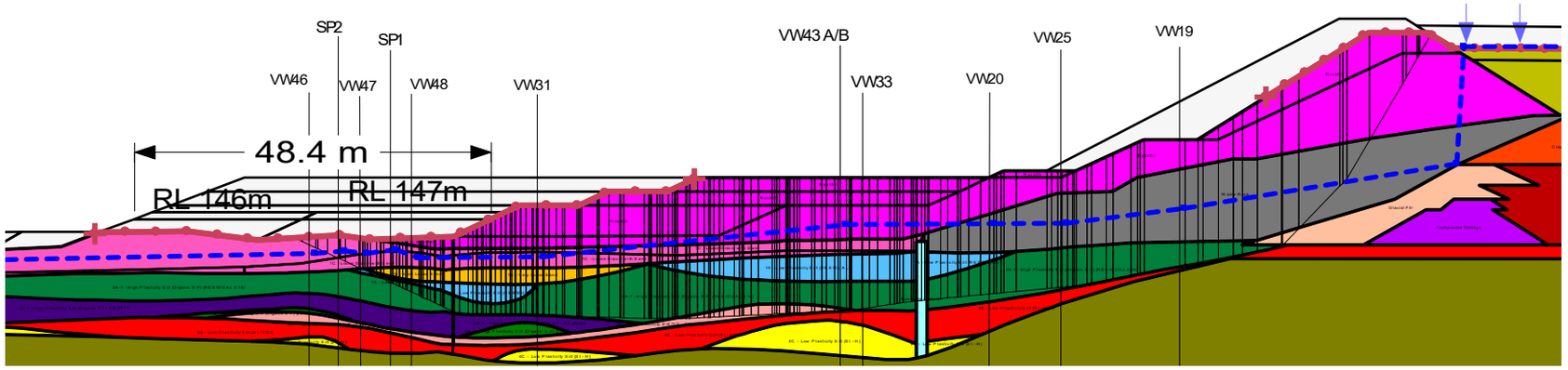
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - CIRCULAR FAILURE- LOCAL FAILURE

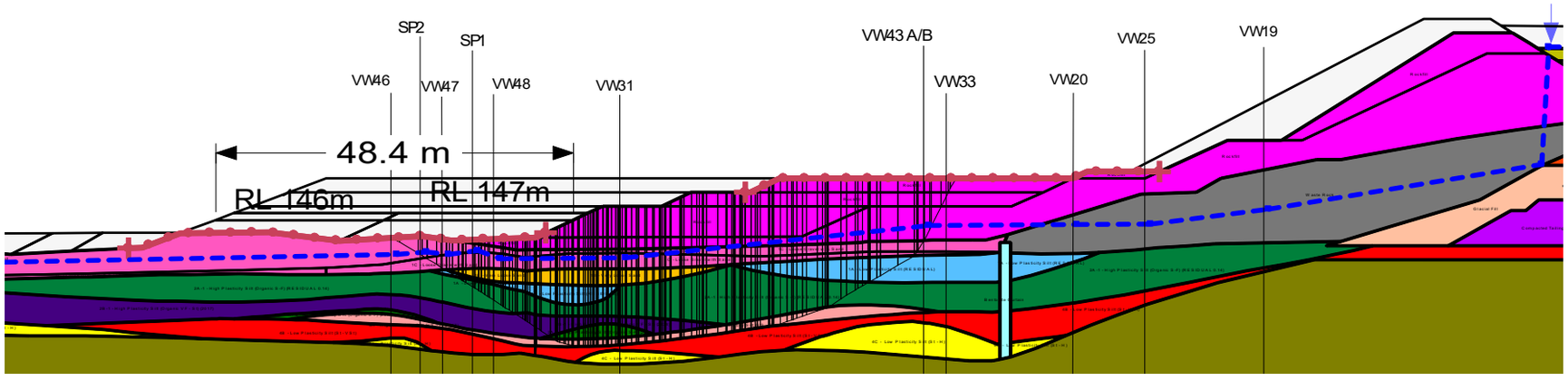
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FIGURE D11

1.06



1.14



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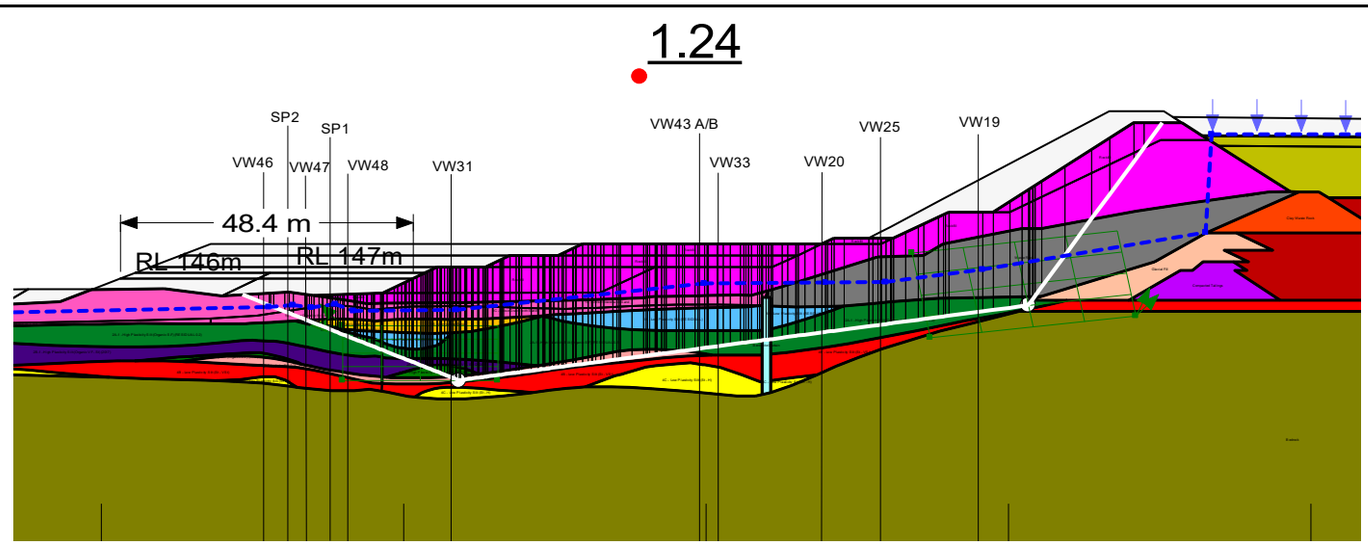
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

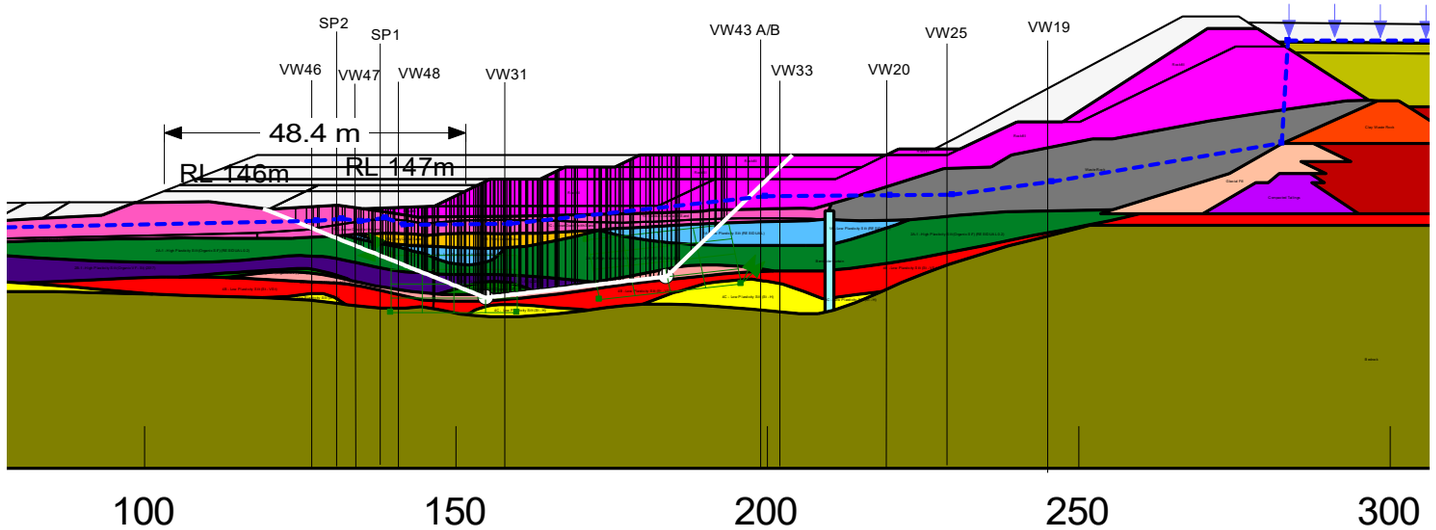
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

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FIGURE D12





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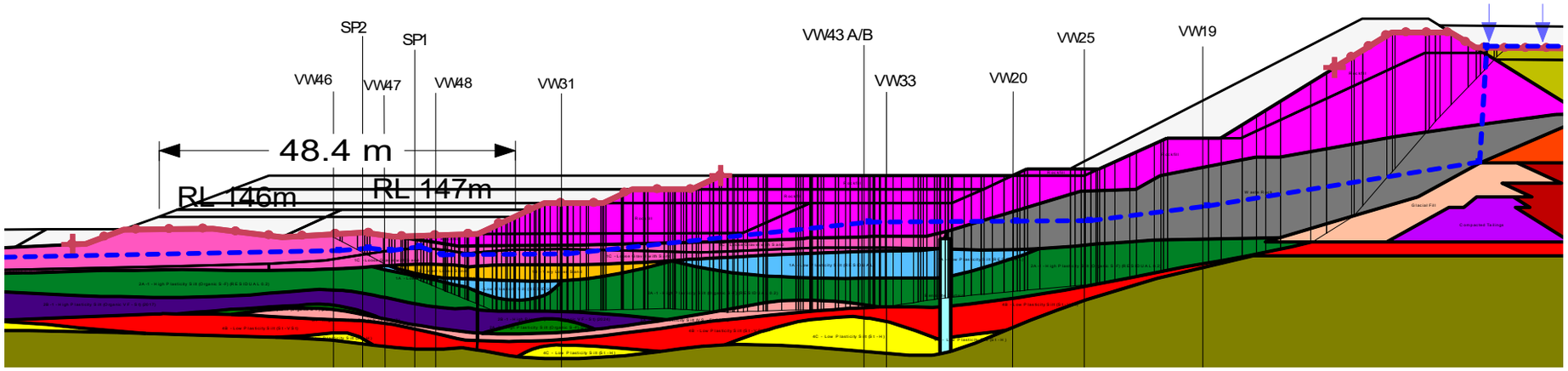
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

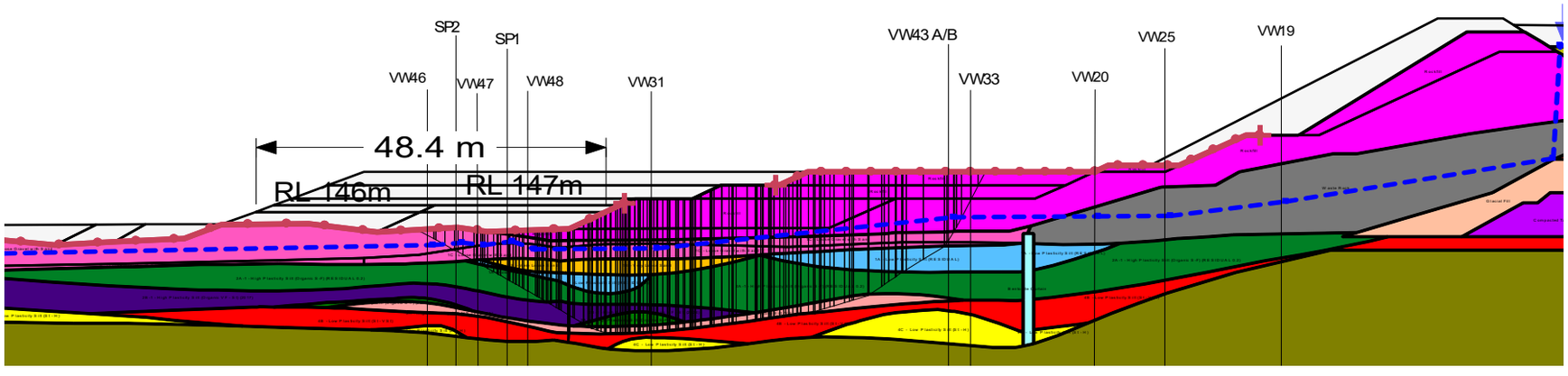
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FIGURE D13

1.27



1.20



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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

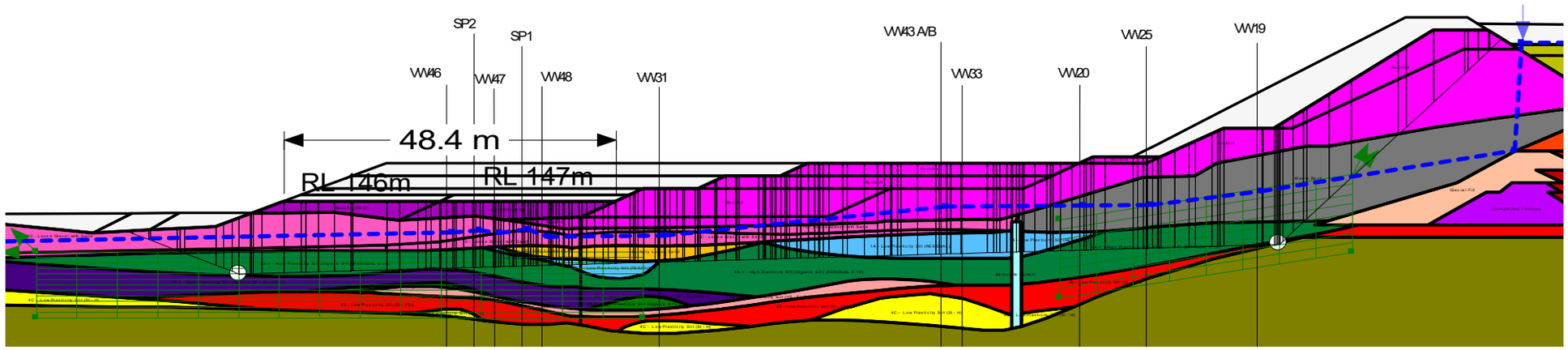
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

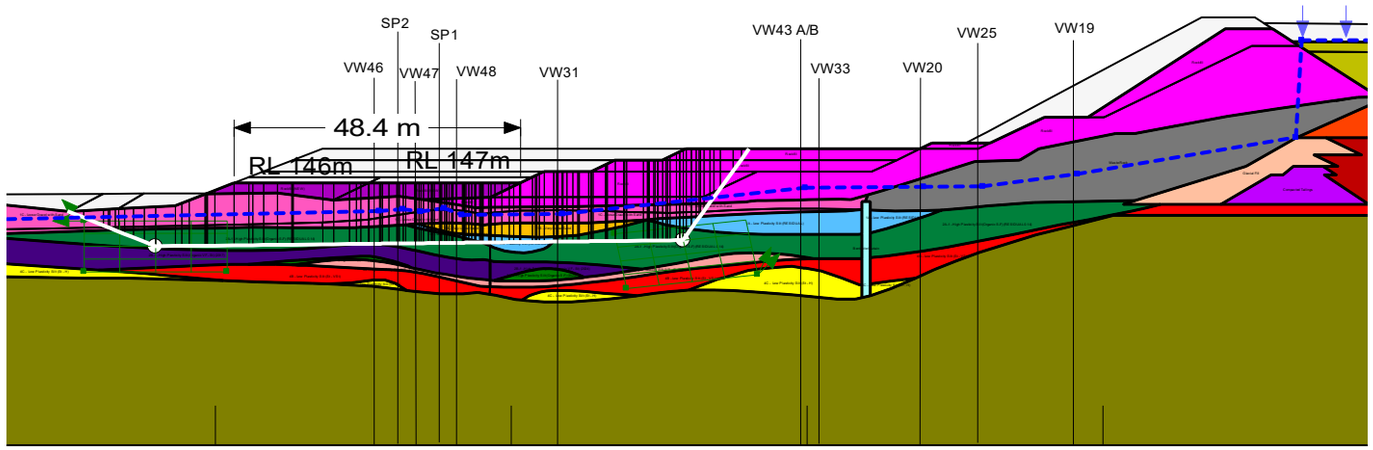
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FIGURE D14

1.31



1.66



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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

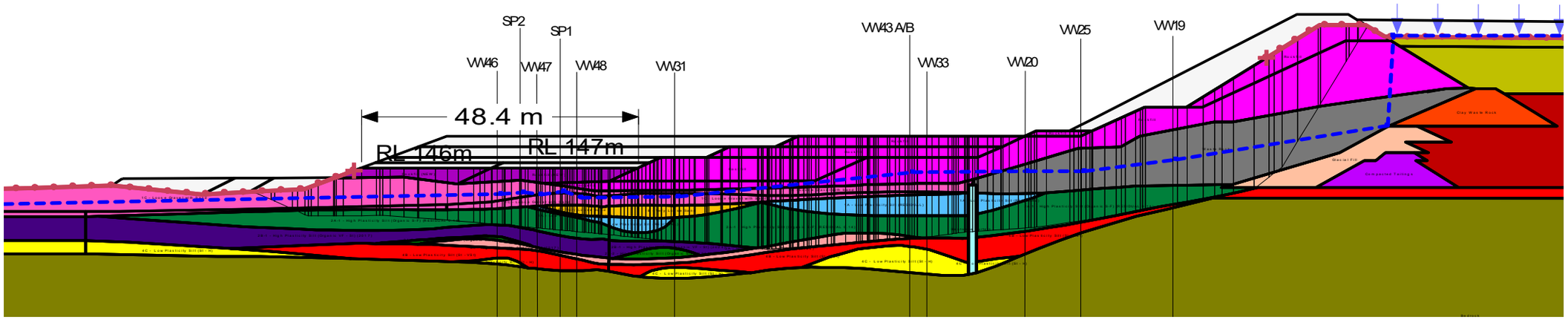
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

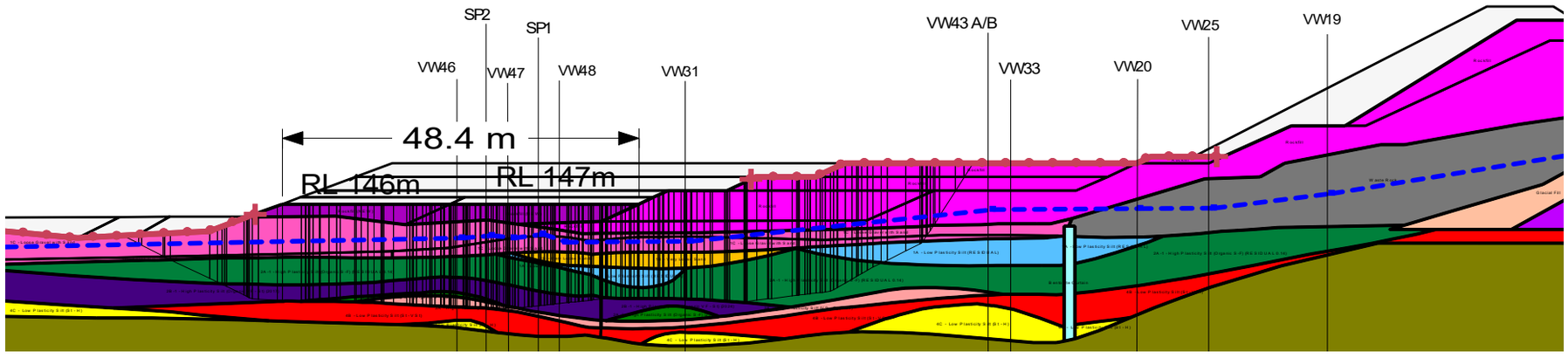
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FIGURE D15

1.14



1.81



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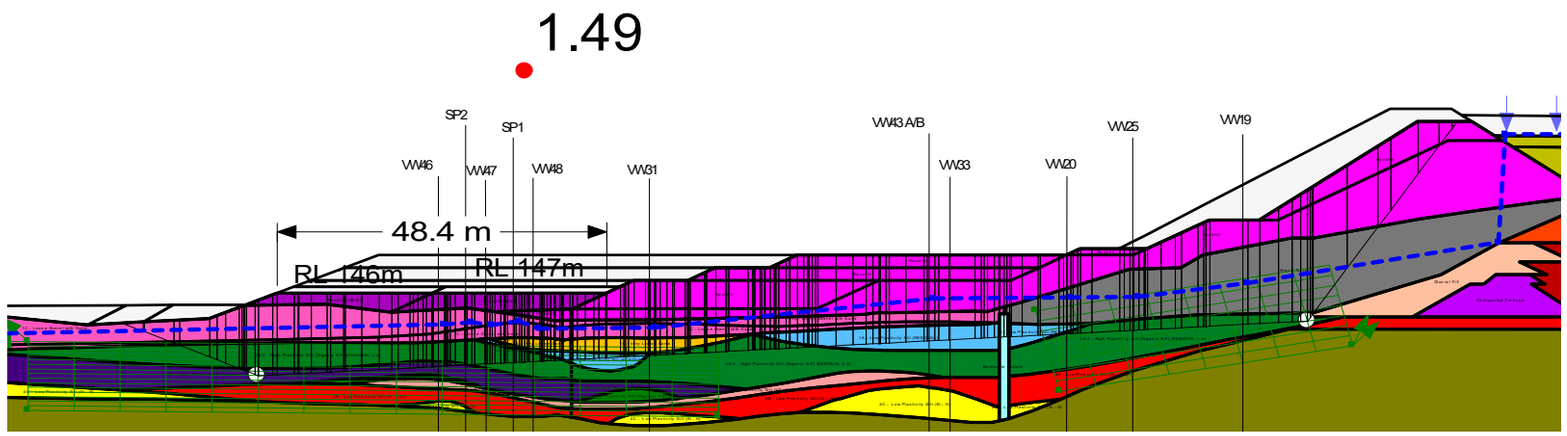
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - CASE 1 PARAMETERS

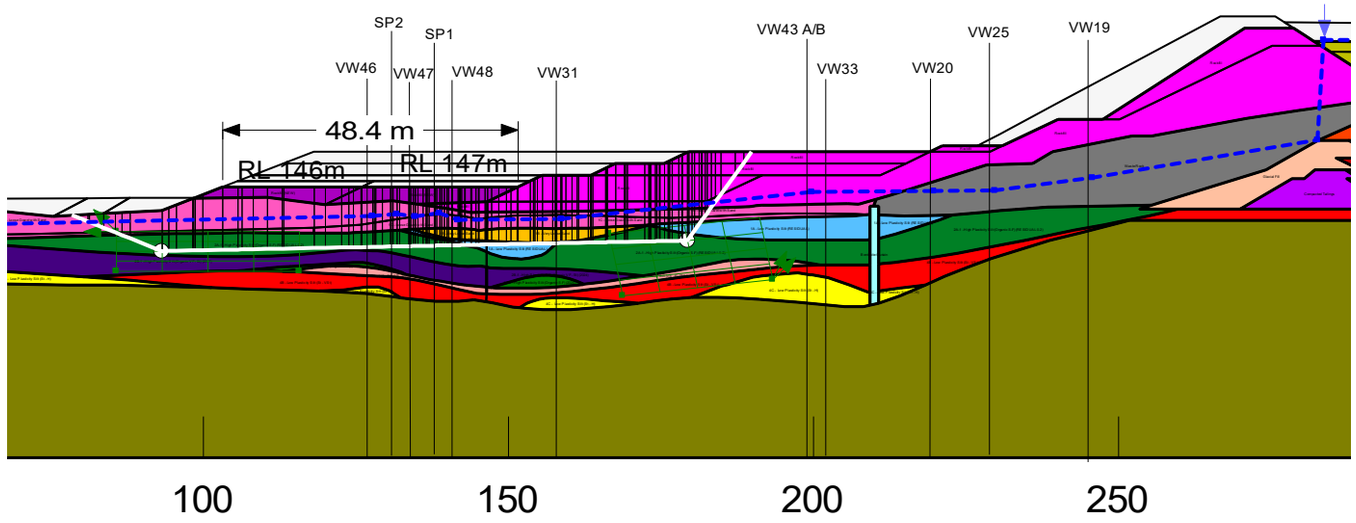
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

Date: 10/06/2025 Job No: 107031.126

FIGURE D16

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Documents\M03 - Stab Residuals\APPENDIX D - LE STABILITY\Results Summary Sec D-E_MN.xlsx N-E-ST-(Buttress RL 146 - 0 (2)





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MMG ROSEBERY MINE

2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

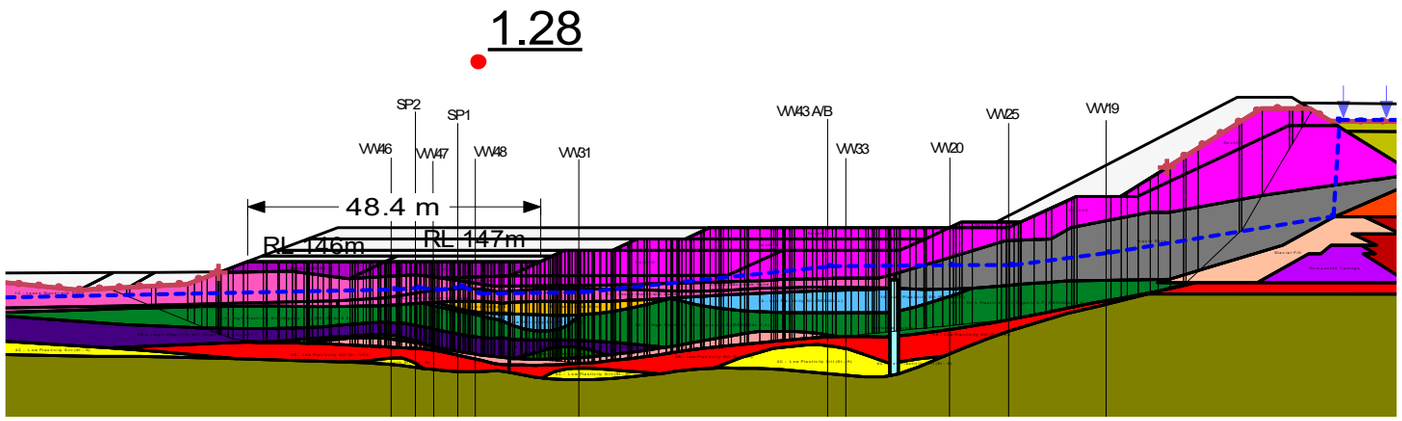
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - CASE 2 PARAMETERS

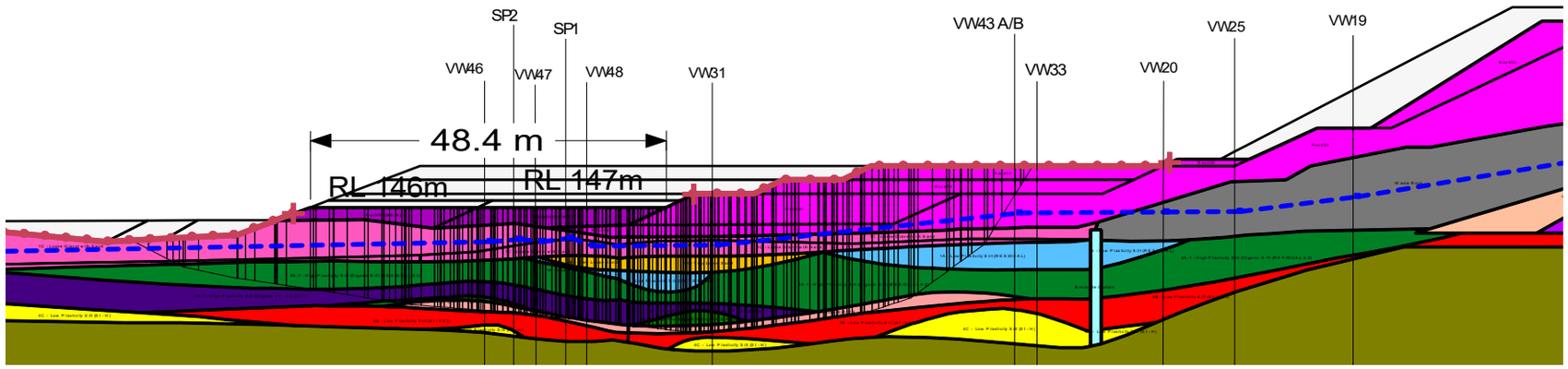
SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

Date: 10/06/2025 Job No: 107031.126

FIGURE D17

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Documents\M03 - Stab Residuals\APPENDIX D - LE STABILITY\Results Summary Sec D-E_MN.xlsx N-E-ST (Buttress RL 146 - 0.2)





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MMG ROSEBERY MINE

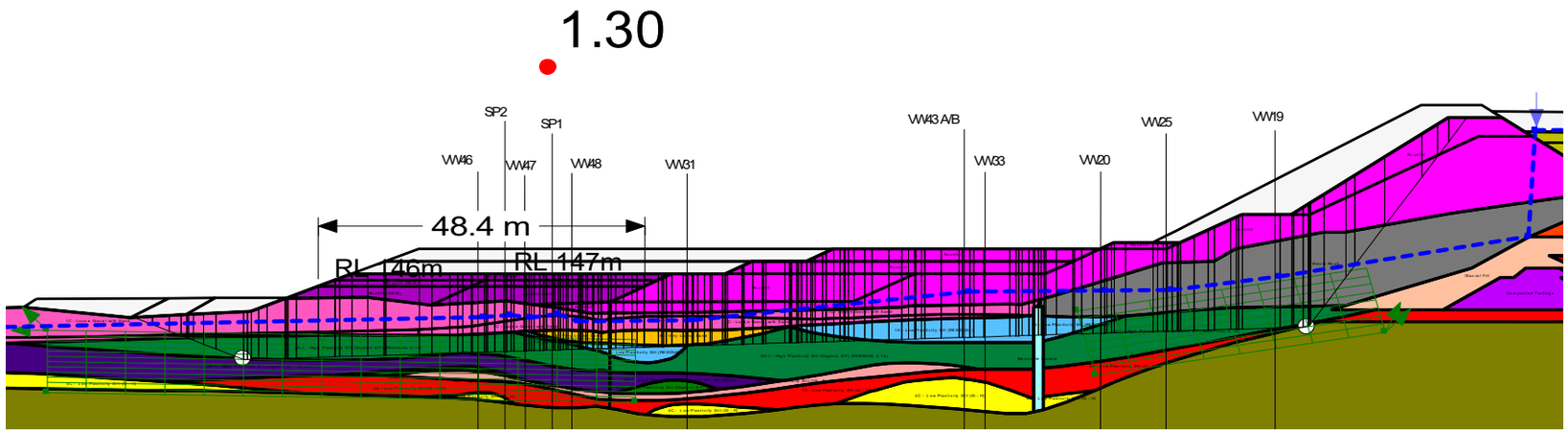
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NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

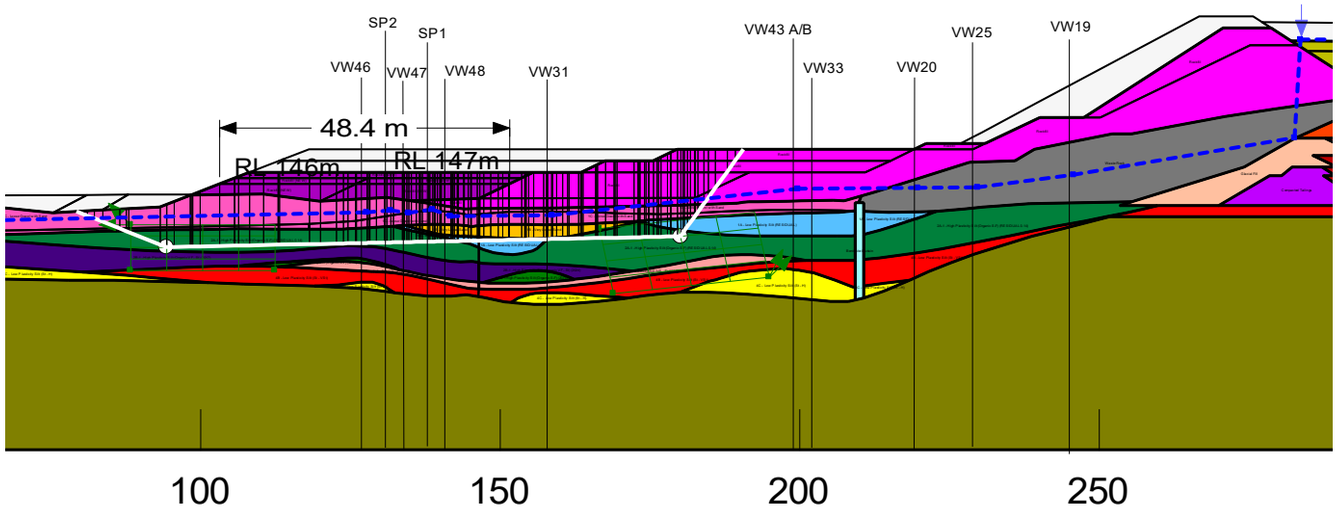
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

Date: 10/06/2025 Job No: 107031.126

FIGURE D18





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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

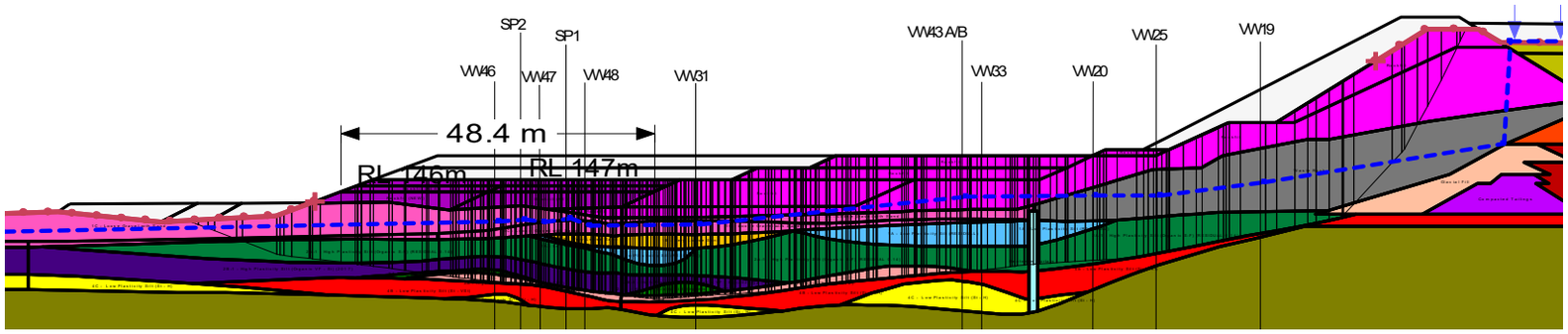
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

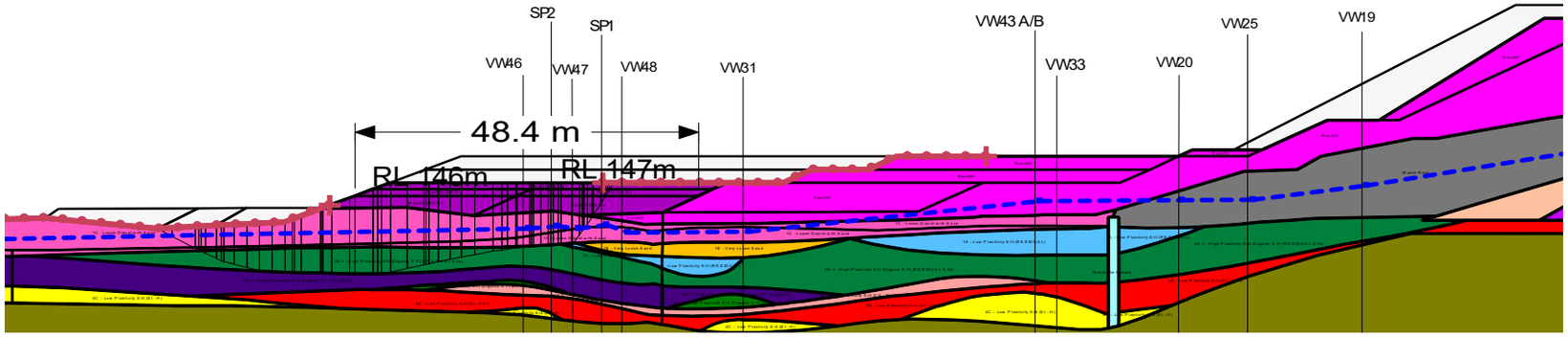
Date: 10/06/2025 Job No: 107031.126

FIGURE D19

1.15



1.58



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MMG ROSEBERY MINE

2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

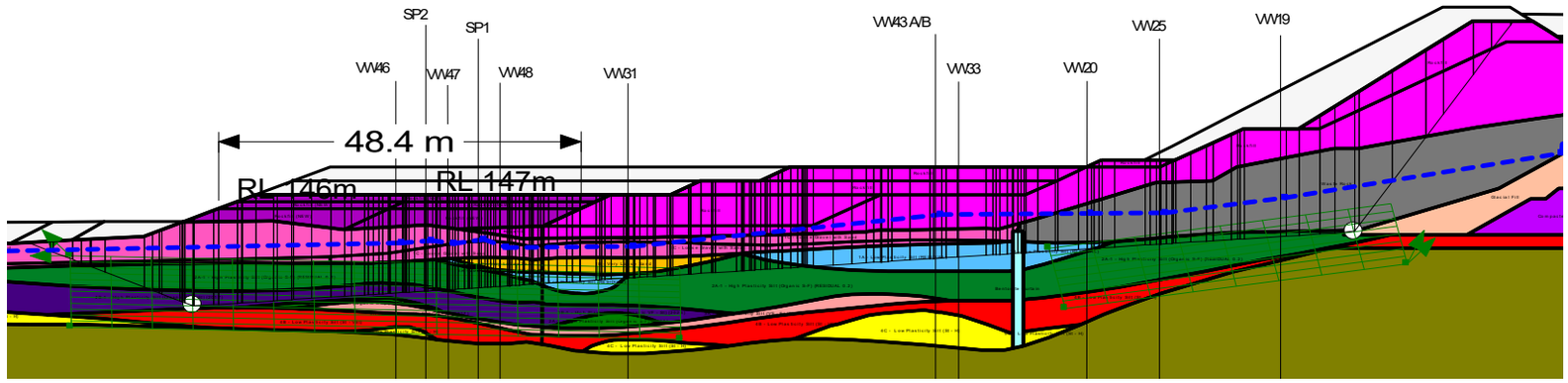
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - CASE 1 PARAMETERS

SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WOPTIMISED CIRCULAR- LOCAL FAILURE

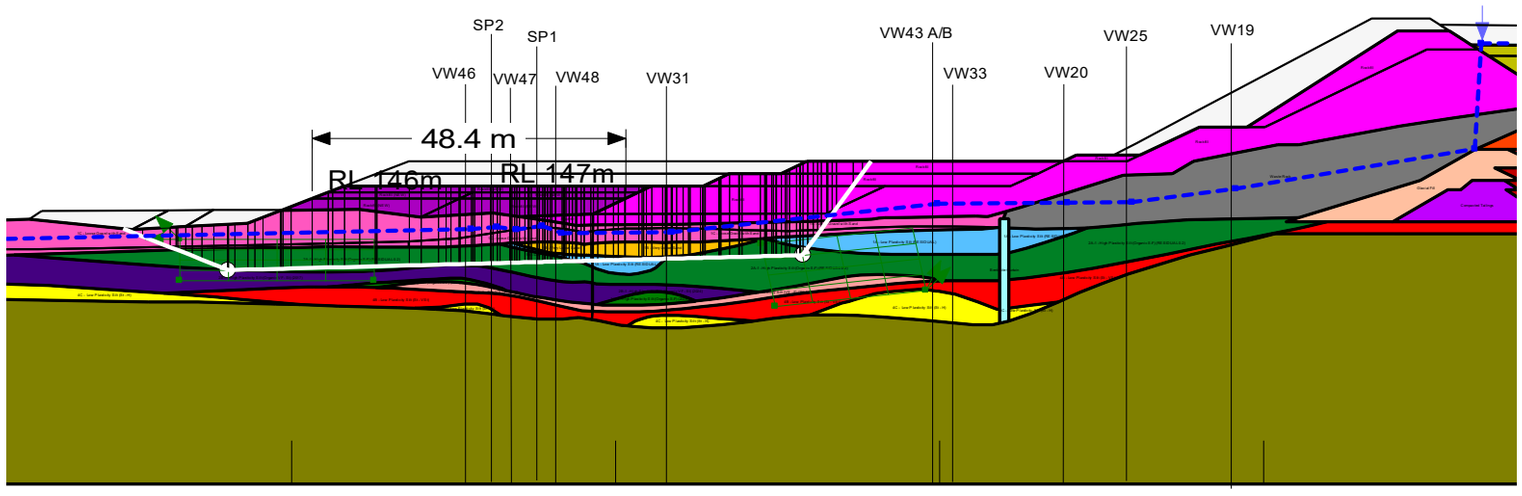
Date: 10/06/2025 Job No: 107031.126

FIGURE D20

1.48



2.14



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MMG ROSEBERY MINE

2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

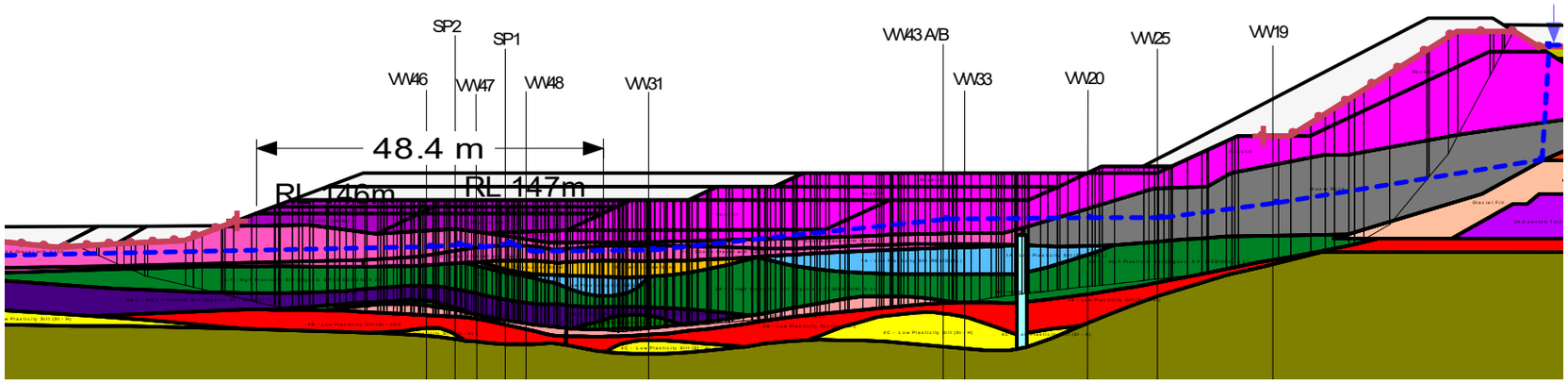
STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - CASE 2 PARAMETERS

SHORT TERM - UNDRAINED - WEDGE FAILURE- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - WEDGE FAILURE- LOCAL FAILURE

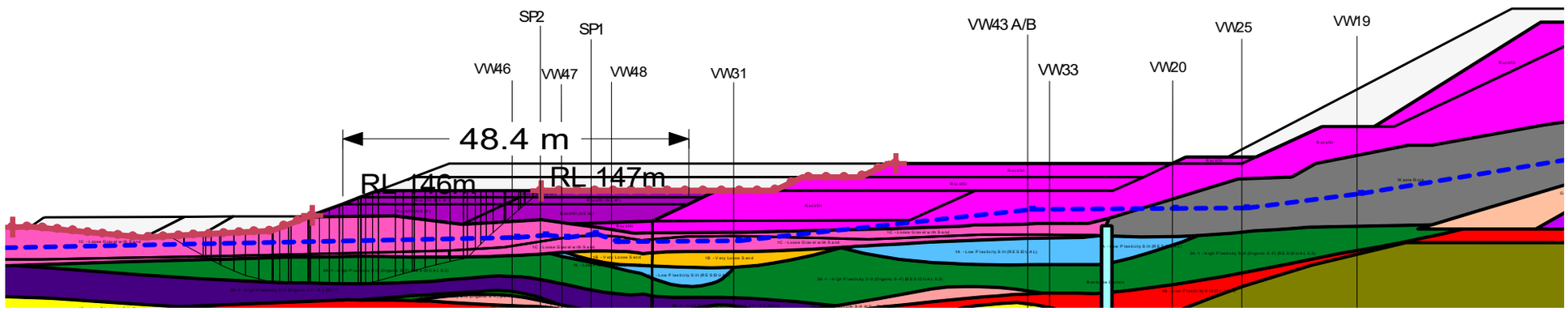
Date: 10/06/2025 Job No: 107031.126

FIGURE D21

1.29



1.72



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MMG ROSEBERY MINE

2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - CASE 2 PARAMETERS

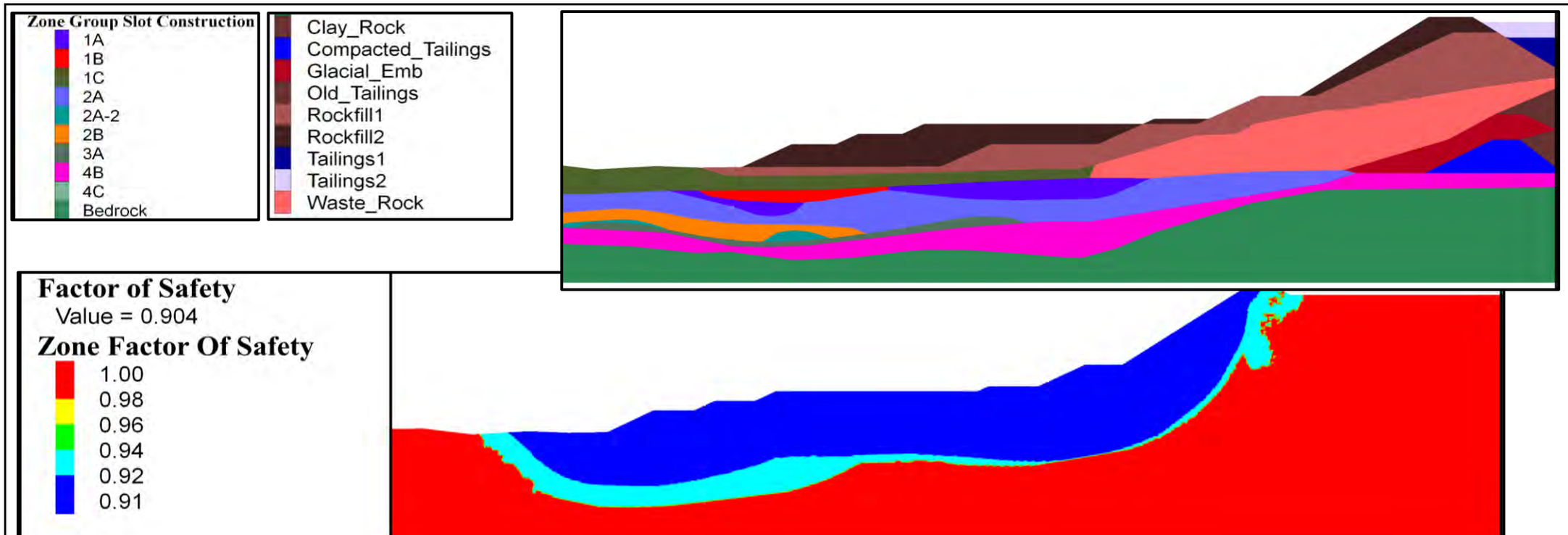
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- POTENTIAL LOSS OF CONTAINMENT - GLOBAL
SHORT TERM - UNDRAINED - OPTIMISED CIRCULAR- LOCAL FAILURE

Date: 10/06/2025 Job No: 107031.126

FIGURE D22

APPENDIX E – STRENGTH REDUCTION STABILITY RESULTS

TAILINGS.WATER.WASTE.



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MMG ROSEBERY MINE

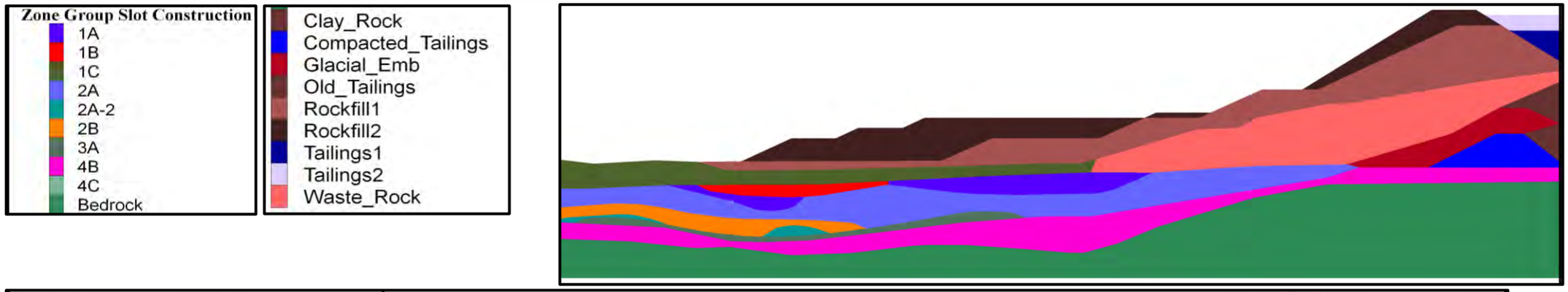
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

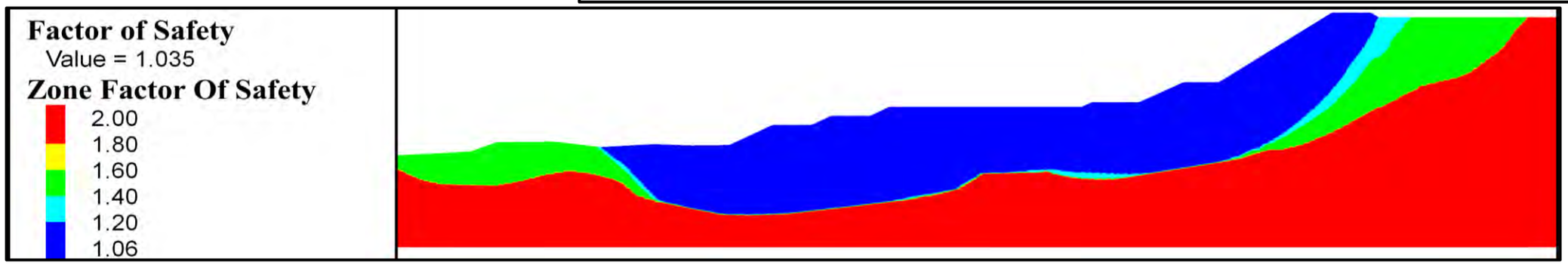
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - EASE 1 PARAMETERS

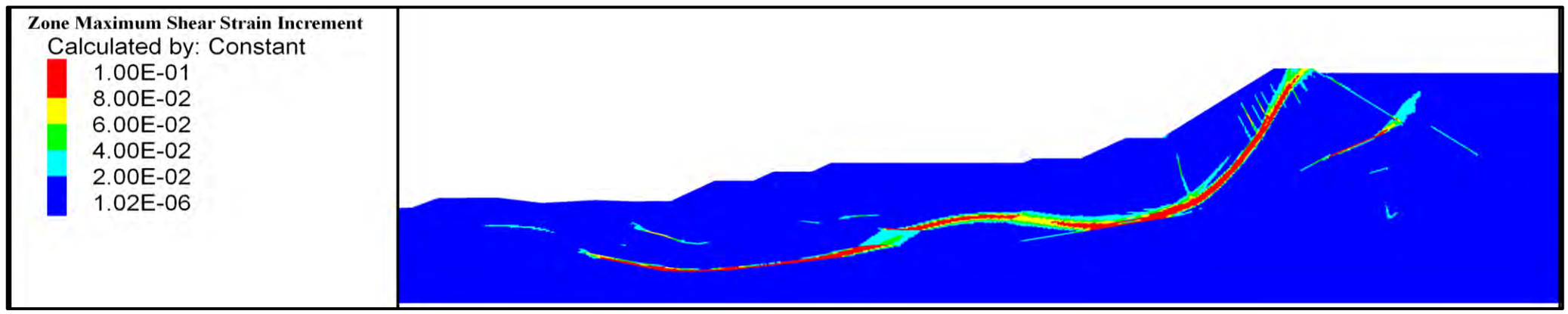
SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E1







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MMG ROSEBERY MINE

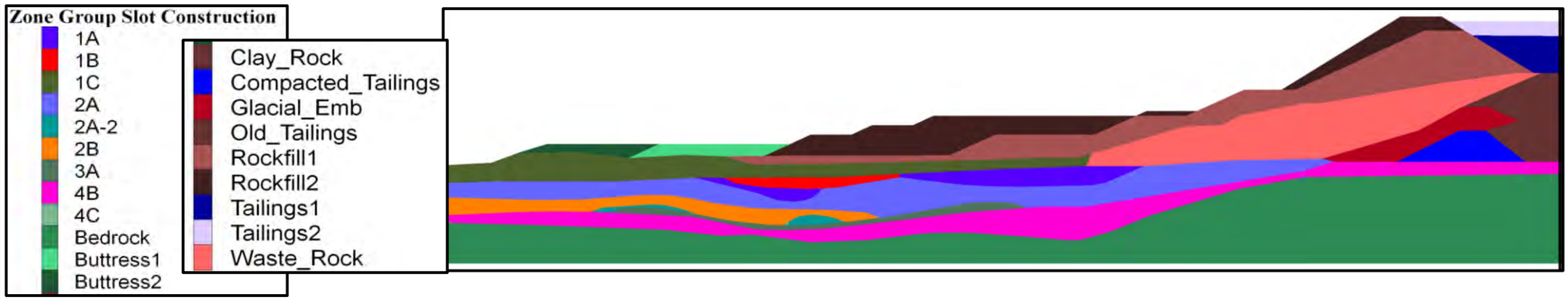
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

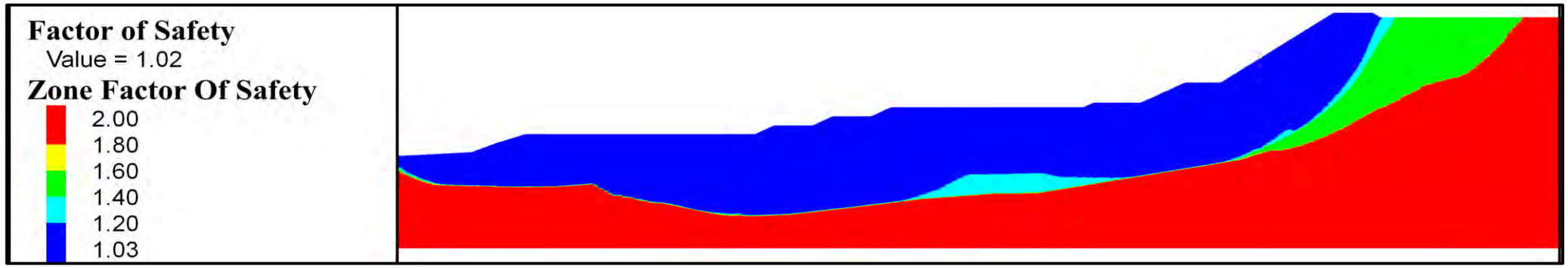
STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS - EASE 2 PARAMETERS

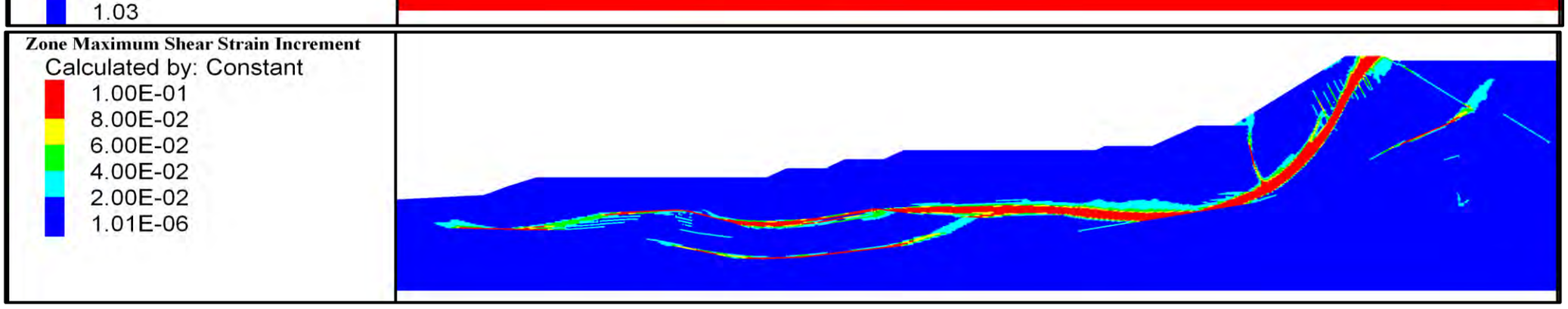
SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E2







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MMG ROSEBERY MINE

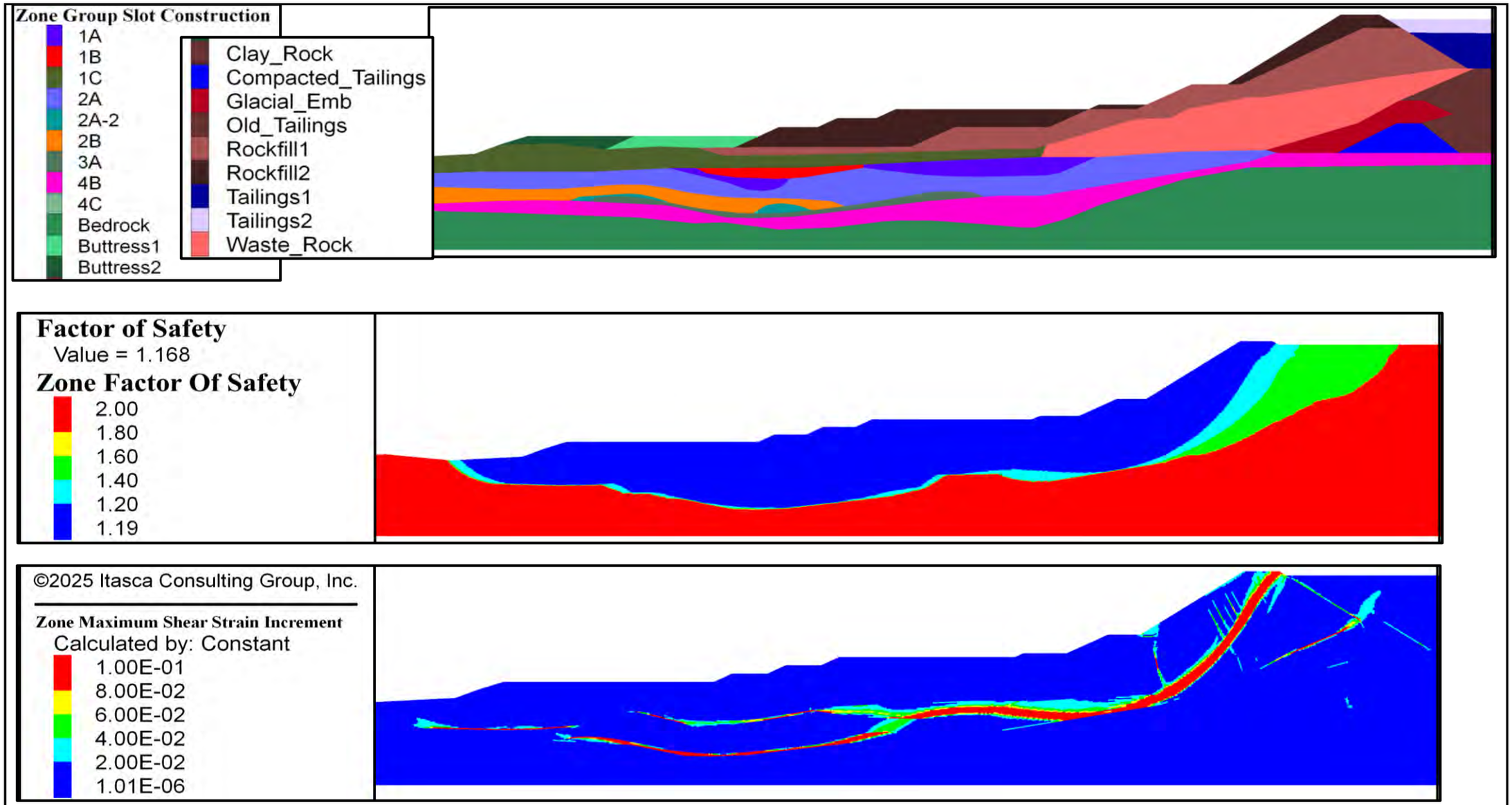
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - EASE 1 PARAMETERS

SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E3



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MMG ROSEBERY MINE

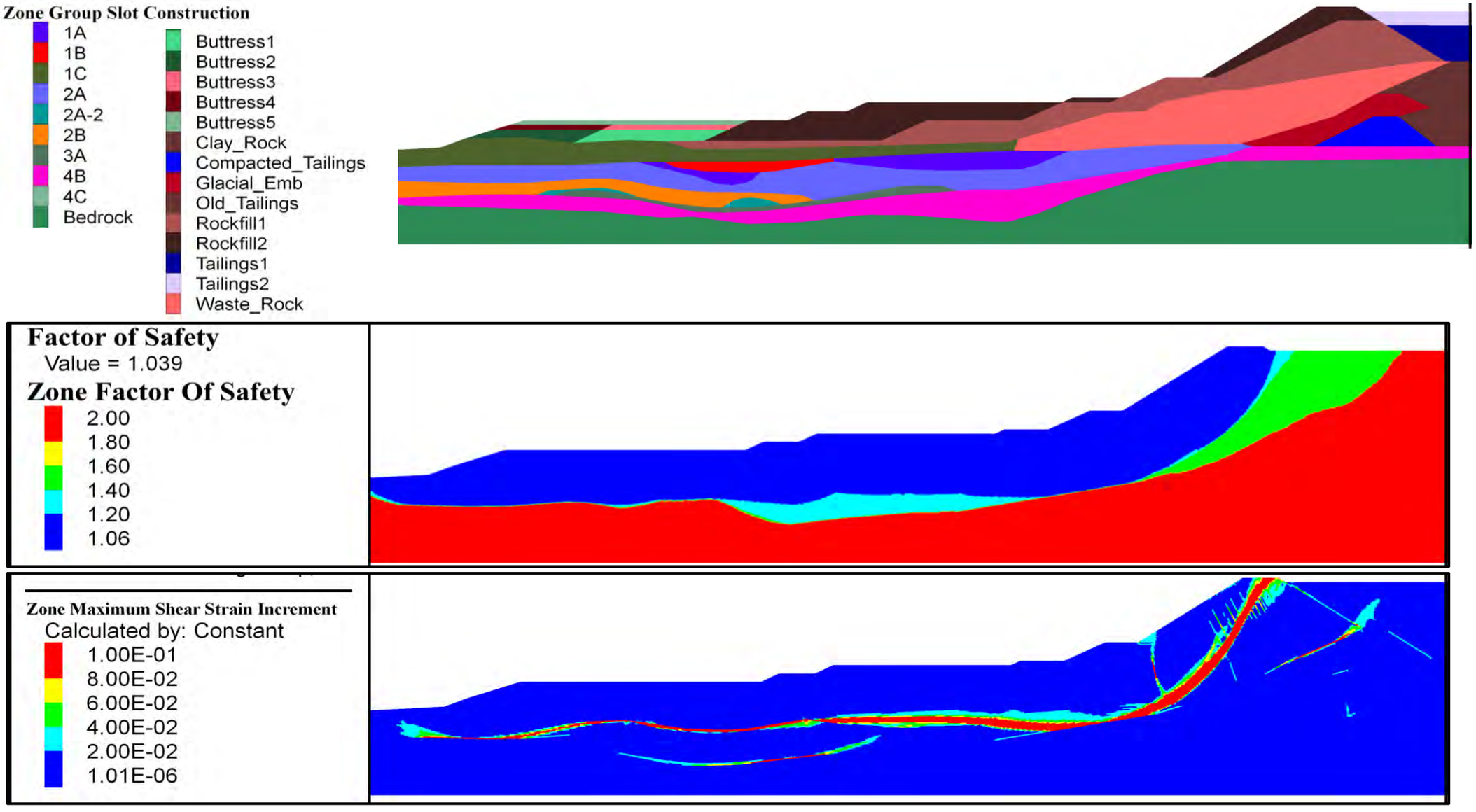
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS - EASE 2 PARAMETERS

SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E4



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MMG ROSEBERY MINE

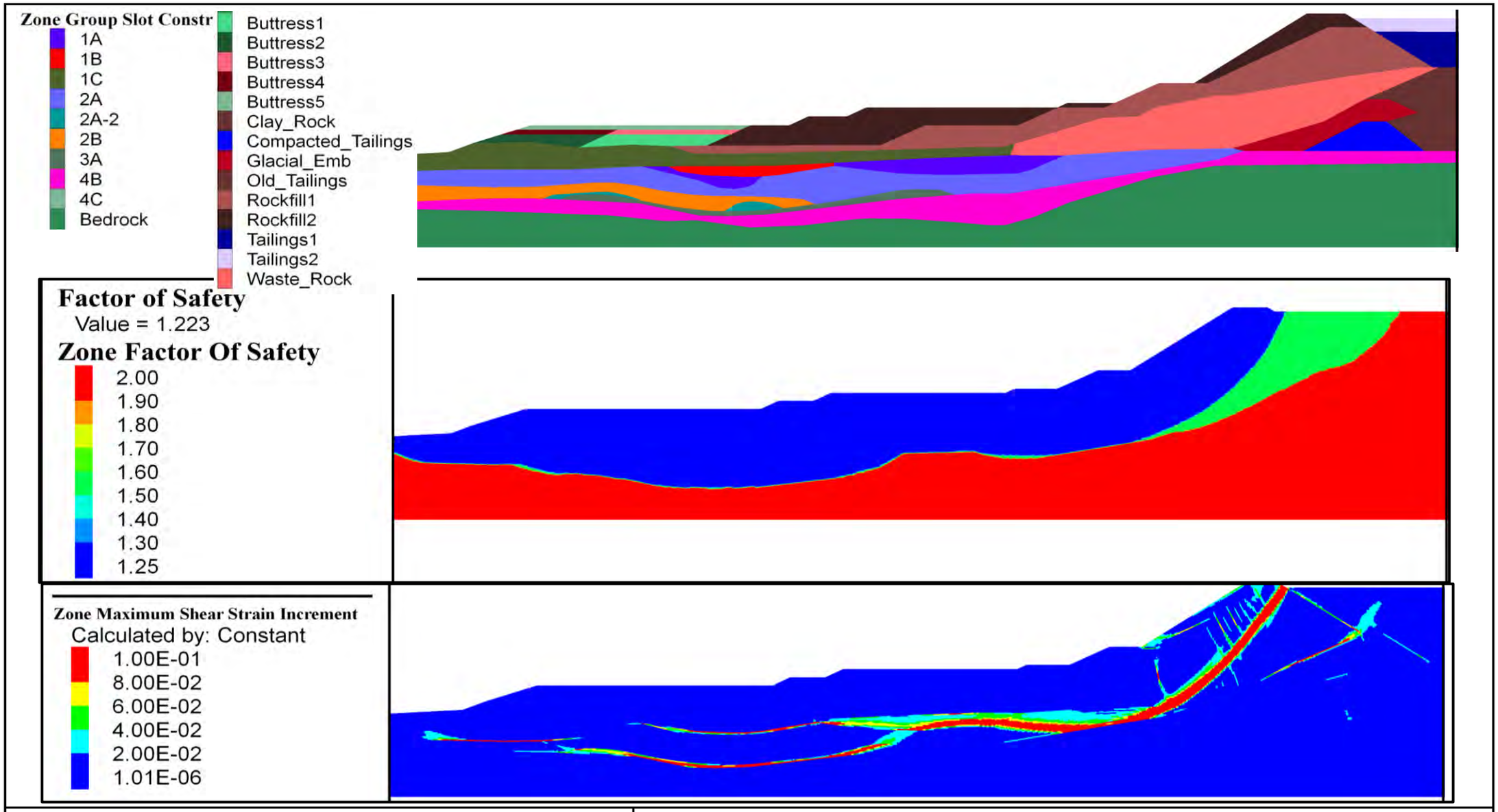
2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - EASE 1 PARAMETERS

SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E5



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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 148 m BUTTRESS - EASE 2 PARAMETERS

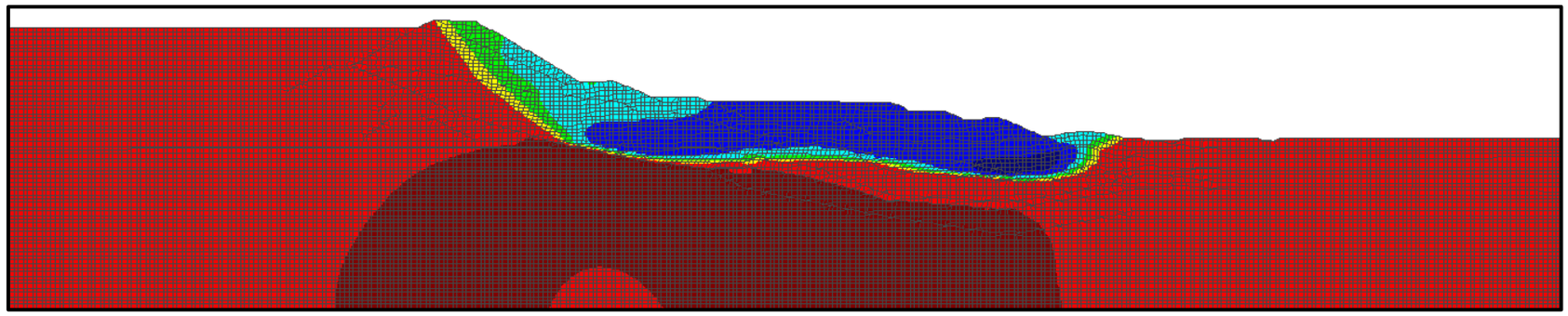
SHORT TERM - UNDRAINED

Date: 10/06/2025 Job No: 107031.126

FIGURE E6

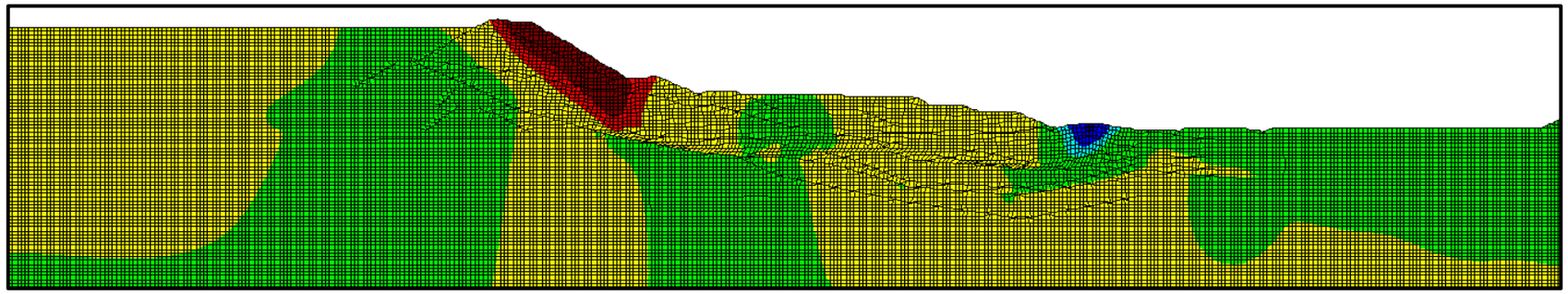
X-displacement contours

0.00E+00 (m)
4.00E-01
8.00E-01
1.20E+00
1.60E+00
2.00E+00



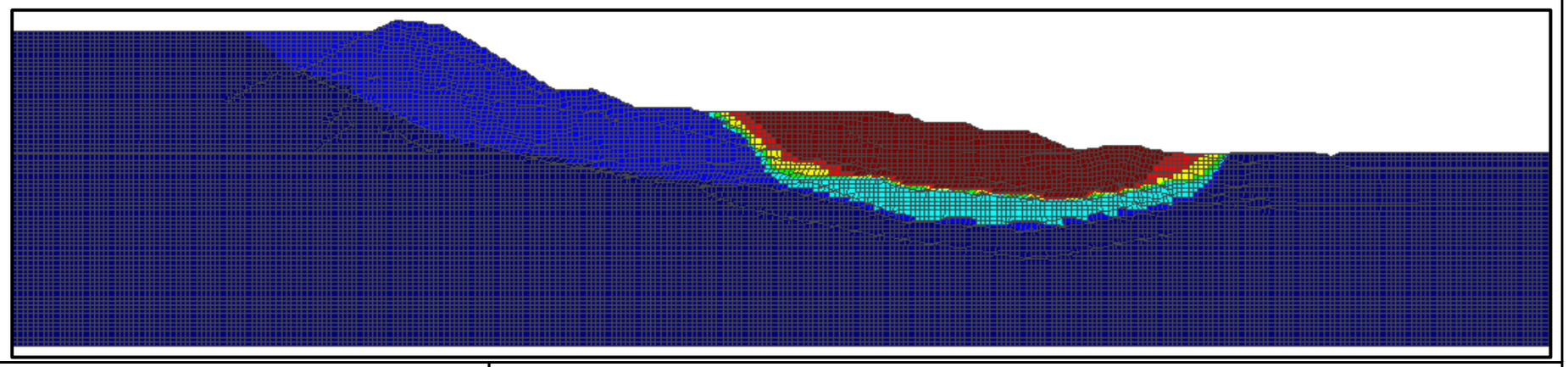
Y-displacement contours

-1.00E+00 (m)
-5.00E-01
0.00E+00
5.00E-01
1.00E+00
1.50E+00



FOS contours

1.10E+00
1.20E+00
1.30E+00
1.40E+00
1.50E+00
1.60E+00



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MMG ROSEBERY MINE

2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - NO BUTTRESS

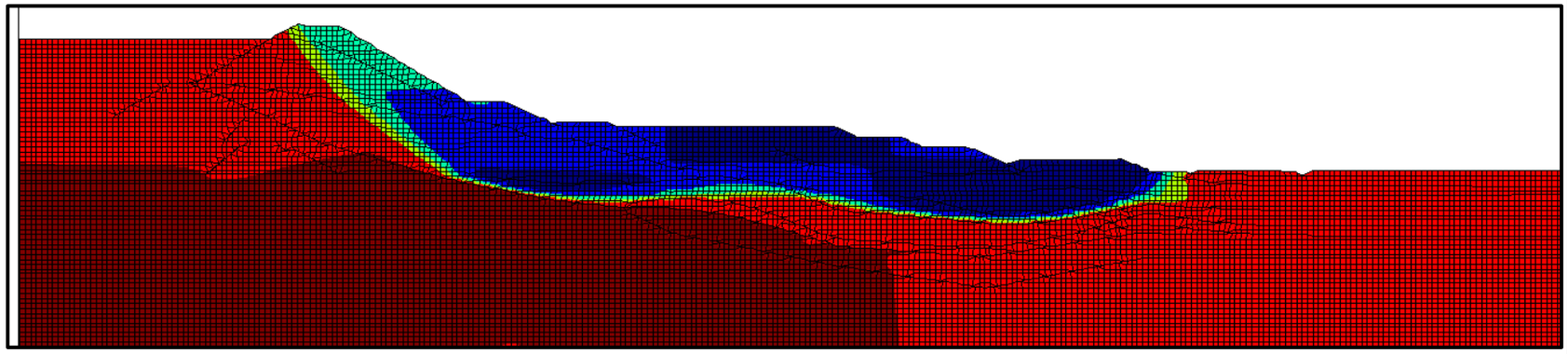
SHORT TERM - UNDRAINED - DEFORMED MESH

Date: 10/06/2025 Job No: 107031.126

FIGURE E7

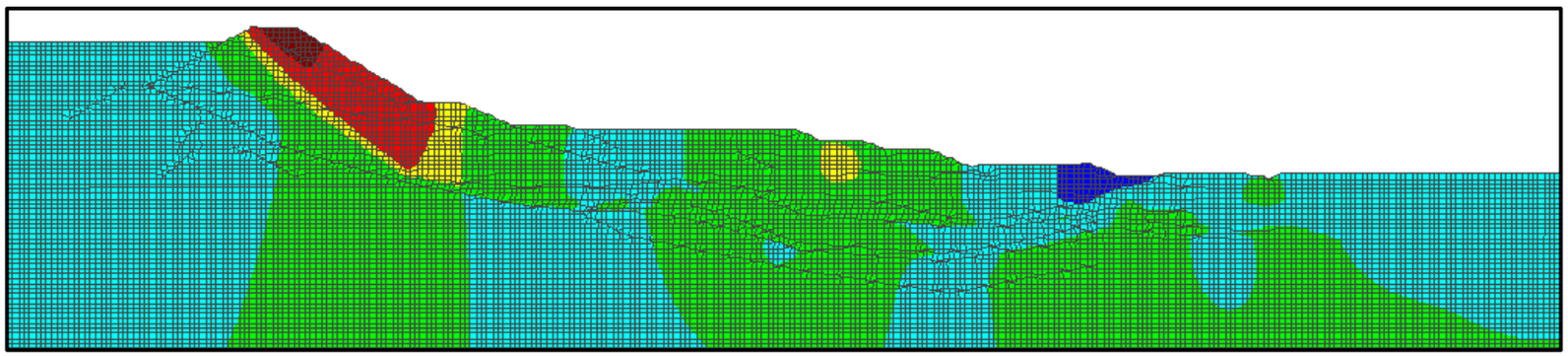
X-displacement contours

0.00E+00 (m)
1.00E-01
2.00E-01
3.00E-01
4.00E-01



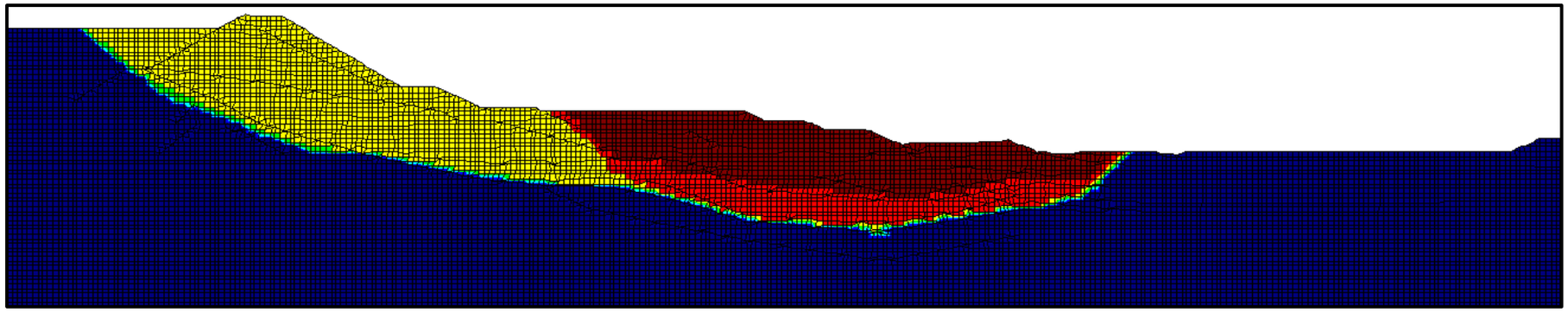
Y-displacement contours

-3.00E-01 (m)
-2.00E-01
-1.00E-01
0.00E+00
1.00E-01
2.00E-01



FOS contours

1.40E+00
1.50E+00
1.60E+00
1.70E+00
1.80E+00
1.90E+00



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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 146 m BUTTRESS

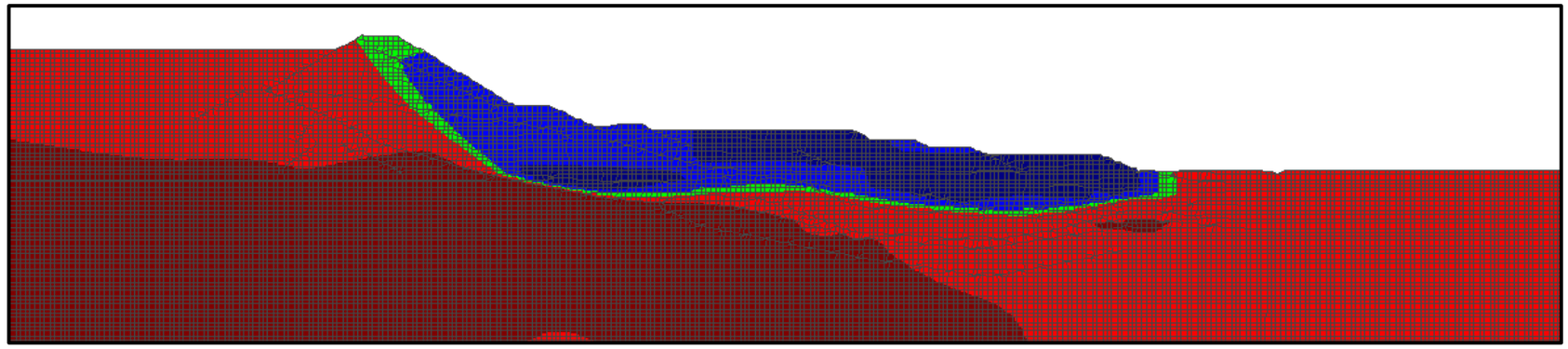
SHORT TERM - UNDRAINED - DEFORMED MESH

Date: 10/06/2025 Job No: 107031.126

FIGURE E8

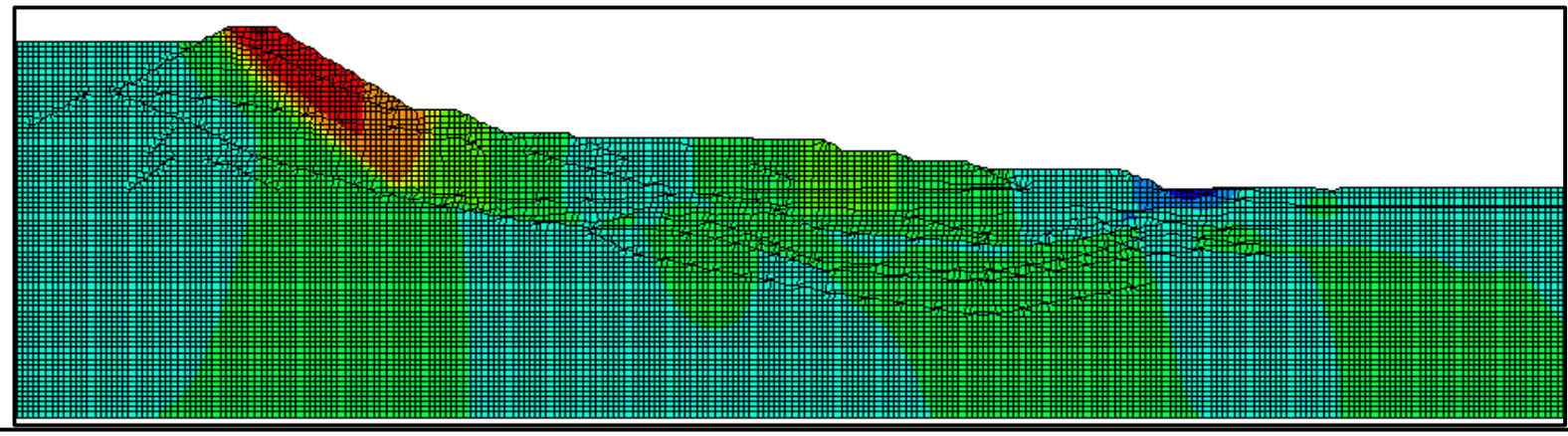
X-displacement contours

0.00E+00 (m)
1.00E-01
2.00E-01
3.00E-01



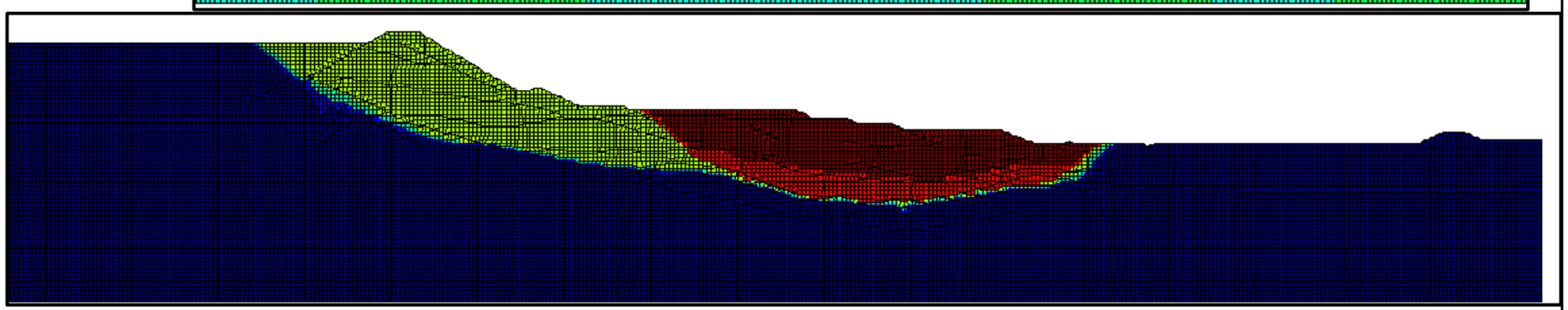
Y-displacement contours

-2.50E-01 (m)
-2.00E-01
-1.50E-01
-1.00E-01
-5.00E-02
0.00E+00
5.00E-02
1.00E-01
1.50E-01



FOS contours

1.40E+00
1.50E+00
1.60E+00
1.70E+00
1.80E+00



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2/5 DAM TAILINGS STORAGE FACILITY STAGE 2 - RL 173.0 m EMBANKMENT
NORTHERN EMBANKMENT RESIDUAL STRENGTH ANALYSIS

STABILITY ANALYSIS - END OF FILLING - SECTION E - RL 147 m BUTTRESS

SHORT TERM - UNDRAINED - DEFORMED MESH

Date: 10/06/2025 Job No: 107031.126

FIGURE E9

Appendix C Bobadil TSF and Polishing Pond 2024 Engineer of Record Annual Inspection (ATCW, 2025)

REPORT

MMG ROSEBERY MINE
ABN: 23 004 074 962

Bobadil TSF and Polishing Pond 2024 Engineer of Record Annual Audit

107031.126R01-RevA
AUGUST 2025



TAILINGS.WATER.WASTE.

Document Control

Project Name:	MMG Rosebery Mine
Document Title:	Bobadil TSF and Polishing Pond, 2024 Engineer of Record Annual Audit
File Location:	J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Documents\R01 Bobadil CY2024\Text\107031.126R01.docx
Project Number:	107031.126
Revision Status:	A

Revision History

Revision	Issue	Issue Date	Prepared by	Reviewed by
A	Draft Issue	29/08/2025	Arun Muhunthan / Jedd Linke-Nagel	Keith Seddon

Issue Register

Distribution List	Date
MMG Rosebery Mine	29/08/2025

ATC Williams Company Details

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Email:	melbourne@atcwilliams.com.au

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TAILINGS.WATER.WASTE.

EXECUTIVE SUMMARY

This Report documents the 2024 Intermediate Audit Inspection findings for the Bobadil Tailings Storage Facility (TSF) and Polishing Pond at the MMG Rosebery Mine, Rosebery Tasmania. This report covers the audit period December 2023 to January 2025.

The inspection has been carried out as part of the obligations of the EoR to MMG and provides an overview of the performance of the structures and adherence to the Operations and Maintenance Manual (O&MM). The inspection was conducted between the 4th and 6th of February 2025 by Arun Muhunthan (EoR) and Jedd Linke-Nagel (Senior Engineer) from ATC Williams (ATCW)

The facilities were observed to be in generally good condition at the time of the inspection. Discharge of tailings is split between the Bobadil TSF and 2/5 Dam. At times when discharge of tailings is directed to 2/5 Dam, Bobadil received treated mine water, as was observed at the time of inspection. Precipitates from mine water remain a concern to efficient operation, although the impacts have reduced compared to the period where Bobadil was only receiving mine water.

The main observations made during the inspection can be summarised as:

- Beaching is even and generally uniform, with most of the southern portion of the facility at, or near freeboard and remaining freeboard ranging from 0.1 m to 0.5 m in the northern portion of the facility. The eastern end of the northern embankment, in the vicinity of the sludge storage area has approximately 1 m of available freeboard.
- The seepage observed in the railway cutting has increased in extent since the previous annual audit.
- Seepage from the downstream slope of the Levee embankment has remained steady.
- Despite recent dredging works, precipitates were observed in Cells 1 to 3 of the Polishing Ponds, likely reducing the efficiency of the system.
- The monitoring system is yet to be fully automated, but all instrumentation is now providing data.

A number of recommendations have arisen from the 2024 EoR annual inspection. These are a combination of previous audit actions that have not been completed and new action items resulting from the inspection.

Recommendations have been developed based on the site visit, review of monitoring information and discussions with site personnel. Each recommendation has been assigned a priority as follows:

- High priority – A possible current threat to the integrity of the tailings storage facility due to direct evidence of a deficient and non-conformances against requirements; or not meeting expected MMG or industry requirements; or through urgency due to a limited window of opportunity to address a recommendation.
- Medium priority – A possible longer-term issue with the tailings storage facility management that may result in a future threat to the integrity of the facility.
- Low priority – Does not represent a threat and mainly associated with maintenance or operational aspects.

Table ES1 presents the recommendations stemming from the 2024 EoR annual inspection. The recommendations include currently open actions. Items such as routine monitoring, vegetation management, etc are not included as these items are well established standard operating activities.

Accepted recommendations should have an action plan developed.

TABLE ES1: RECOMMENDATIONS

Item	Aspect	Recommendation	Priority
1	Instrumentation	All electronic instrumentation should be connected to telemetry to allow real-time monitoring as soon as Stage 11 instrumentation has been installed.	High
2	Sludge storage void	All sludge stored within the Stage 11 embankment footprint should be removed and the void backfilled with compacted tailings, as part of the Stage 11 embankment raise foundation preparation work.	High
3	Seepage	Review geophysics results and develop a plan to investigate source and mechanism of seepage present at: • Southern embankment – No change since the last inspection • Levee embankment – The extent of seepage has slightly increased • Railway cutting - The extent of seepage has slightly increased	Medium
4		Seepage pipes and monitoring weirs should be maintained in the best possible condition so they can be accessed any time.	Low
5		Western toe drain needs grading in some areas to promote drainage.	Low
6		Consider adding sensors to key weirs as part of proposed rationalisation of the monitoring system.	Low
7		Remediation of leaking pit downstream of Lower Western Embankment should be completed.	Low
8	Polishing Ponds Storm Storage	The Polishing Pond spillway is undersized. An action plan should be developed that considers a risk-based approach to assess future requirements.	Medium
9	Quarry Diversion Drain	Fallen rocks in the Quarry Diversion Drain should be removed.	Low
10	Soil Cover	Consideration should be given to removing the large amount of accumulated windblown tailings within the soil cover drain.	Low
11	Western Buttress	Western buttress to be ripped to let water percolate through the rockfill. To be completed during Stage 11 works	Low
12	Decant channel and Toe Drains	Ongoing clearing of drains should be planned as part of routine maintenance.	Low

Based on the Inspection and a detailed review of all inspection and monitoring data, it is considered that Governance associated with the Bobadil TSF is of a high standard and it is being inspected and monitored in general accordance with the requirements of the overarching Operation and Maintenance Manual and in accordance with the TARPs, and relevant ANCOLD guidelines.

It is considered that the Bobadil TSF does not present a significant risk to the environment downstream of the facility and is suitable for the on-going storage of tailings generated at the Rosebery Mine.

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1 INTRODUCTION

This Report documents the 2024 Intermediate Audit inspection of the Bobadil Tailings Storage Facility (TSF) and Polishing Pond at the MMG Rosebery Mine, Rosebery, Tasmania.

The inspection has been carried out as part of the obligations of the Engineer of Record (EoR) to MMG and provides an overview of the performance of the structures and adherence to the Operations and Maintenance Manual (O&MM) **[7]**.

The previous annual inspection of the structures was a comprehensive audit and was carried out by ATC Williams (ATCW) in December 2023. This is documented in the 2023 Audit Report **[1]**.

The O&MM outlines the frequency of inspections, with intermediate audits to be completed annually by the design engineer / Engineer of Record (EoR) (ATCW) as well as comprehensive audits completed biannually. The next comprehensive audit is required for the 2025 calendar year.

This report covers the previous calendar year's monitoring data.

2 SCOPE OF WORK

The inspection was completed by the EoR in accordance with the requirements for intermediate inspections outlined in ANCOLD **[2]**.

3 BOBADIL TSF

3.1 General Information

3.1.1 Purpose of Dam

The Bobadil TSF is used to store tailings and treated mine water from the Rosebery Mine. The Bobadil Polishing Pond is used to condition decanted water from the Bobadil TSF prior to release to the Pieman River.

3.1.2 Operational Status

Tailings at Rosebery Mine are discharged into either Bobadil TSF or 2/5 Dam TSF. Bobadil facility received the full tailings flow for approximately 6% of the time during the audit period, with tailings directed to 2/5 Dam TSF for the remainer of the period. When tailings are discharged at 2/5 Dam, Bobadil receives treated mine water.

Tailings are typically discharged into the Bobadil TSF from 5 to 7 spigots from one of 4 pipelines located on the crest of the facility. For operational reasons discharge is generally split between the southern and northern portion of the facility to facilitate future construction stages.

The Polishing Pond is used to condition decanted water from the Bobadil TSF prior to release to the Pieman River. The discharge point from the Polishing Pond is MMG Rosebery Mine’s licensed discharge point for water from the Bobadil facility.

3.1.3 Physical Details

3.1.3.1 Location

The facility is located about 3 km from the mill area and is accessed via the flume road. The location of the Bobadil TSF and Polishing Pond, in relation to the mill is shown on **Figure 1**. A recent aerial photograph (January 2025) is presented as **Figure 2** which shows the general arrangement of the Bobadil TSF and Polishing Pond at the time of the inspection.

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3.1.3.2 Dam Type

Bobadil can be classified as a side-hill facility. There is a clean water diversion to the east of Bobadil to reduce inflow from the surrounding catchment area. The catchment area of Bobadil, downstream of the diversion drain, is approximately 65 hectares (ha).

Bobadil has been constructed in ten stages, commencing on the 1970's. Stage 1 and 2 were constructed as earthfill embankments. Stages 3 to 9, commencing in 1996 were all constructed using the upstream construction method, generally in 1 m to 3 m increments. A buttress was constructed downstream of the western embankment in 2005. The current Stage 10 embankment is a step in upstream raise and has a crest elevation of RL 201 m. The maximum embankment height is approximately 43 m along the western flank. The cross section varies around the facility as shown on **Figure 3**.

3.1.3.3 Geometry

The current geometry of the facility is presented on **Figure 2**, whilst typical sections are presented on **Figure 3**. The embankment currently has a uniform crest elevation of RL 201 m with a crest width of 8 m. The maximum embankment height is about 43 m adjacent to the western embankment.

Along the southern and western sides of the facility, a rock buttress has been constructed with a crest width of approximately 35 m at a current elevation of RL 193 m. The downstream slope of the buttress has been constructed at a slope of 1.5:1 (horizontal:vertical).

Along the levee section and northern embankment, the downstream slope has been constructed at slopes of between about 1.4:1 and 2.5:1 (horizontal:vertical) to provide stable overall embankment slopes.

Typical embankment sections are presented in **Figure 3**.

3.1.3.4 Storage Capacity

Total tailings tonnage discharge into Bobadil since commissioning in the 1970's is approximately 19.7 Mt. The current annual tailings production rate is approximately 0.8 Mt. Previous estimates of average dry density of the stored tailings are 1.5 t/m^3, indicating a volume of stored tailings of approximately 13.1 Mm^3.

Approximately a total 0.70 Mm^3 of tailings was discharged into the Bobadil TSF since the end of filling of Stage 9 embankment raise. The Stage 10 embankment raise facilitated the storage of an additional 1.0 Mt of tailings, to beach freeboard level of RL 200.7 m. The storage capacity of the Bobadil TSF has currently been extended by constructing fingers and extended finger deposition.

The facility has been filled to freeboard along the southern and western flanks, and adjacent to the Levee embankment.

The January 2025 survey of Bobadil indicates a remaining capacity (including extended deposition) of approximately 0.07 Mt at an average dry density of 1.5 t/m^3. At full Stage 10 capacity, the Bobadil TSF can cater for the design storm storage and freeboard.

3.1.3.5 Catchment Characteristics

The Bobadil TSF is an off-stream storage with a catchment of approximately 65 Ha. The catchment area comprises the tailings surface area (44 Ha) and the natural catchment including the old rock quarry that has been converted to the decant pond (21 Ha). There is a storm water diversion drain above the quarry and along the eastern flank of the facility that diverts rainfall runoff away from the facility.

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3.1.4 Consequence Category

3.1.4.1 ANCOLD Consequence Classification

The Consequence Category was last assessed as part of the Stage 11 design **[3]** in accordance with ANCOLD **[5]** and assigned a Consequence Category of HIGH C for Bobadil TSF. The Polishing Pond has previously been assigned a Consequence Category of Significant in accordance with ANCOLD, however as it forms part of an integrated system for water management, the same Consequence Category as Boabdil is adopted for operation and monitoring criteria.

3.1.4.2 GISTM Consequence Classification

A preliminary assessment of the GISTM Consequence Category **[4]** of Bobadil TSF was also conducted as part of the Stage 11 design **[3]**. A Consequence Category of "Very High" was assigned.

3.1.5 Flood Capacity

Water can be removed from the surface of the TSF via gravity decant structures or emergency spillways.

Bobadil has a decant located in the northern quarry void (**Figure 2**). An emergency spillway is also located in the north east corner of the facility and has been designed to pass a Probable Maximum Precipitation (PMP) event (15 m^3/s), assuming the pond is at the spillway invert level prior to the storm event, with a remaining freeboard of approximately 0.1 m **[8]**.

The Polishing Pond has two decants, which when operating at full capacity can discharge a 1:50 year AEP event. The facility has a spillway located at the southern end of cell 1 (**Figure 2**). The capacity of the spillway is approximately 1.4 m^3/s. It has previously been identified that the spillway is inadequate to discharge the design storm and that a second spillway should be constructed **[6]**. However, a risk assessment is currently underway to inform a final decision on the need for the second spillway.

3.1.6 Surveillance Programme

3.1.6.1 Frequency

ANCOLD **[5]** indicates that for a "High C" Consequence Category dam, routine visual inspections should be carried out on a daily to 3 times per week basis, that intermediate inspections are carried out annually and that comprehensive inspections are carried out at 2 yearly intervals, effectively alternating annually.

3.1.6.2 Routine Visual Inspections

Routine visual inspections of the Bobadil TSF and Polishing Pond are specified in the O&MM **[7]** and are required to be conducted on a shift, daily, weekly, and monthly basis. Refer to **Section 3.3.2** of this Report for a more detailed discussion of these inspections and their implementation.

3.1.6.3 Monitoring

The facilities are monitored on a monthly basis by ATCW and a report prepared to summarise the findings, is issued to MMG in the format of a monthly TARP report. Monitoring includes measurement of phreatic conditions (VWP and standpipe), in-place inclinometers, pond water levels, internal drainage discharge and seepage from the facility. These requirements are detailed in the O&MM **[7]**. A majority of the instrumentation is now remotely monitored.

Further details regarding monitoring, including a review of results for the audit period, are presented in **Section 3.4** of this Report.

Figure 4 presents the location of piezometers (Vibrating Wire Piezometers (VWP) and Standpipe Piezometers (SP)), whilst **Figure 5** presents internal drainage and seepage monitoring points. **Figure 6** presents the location of other instrumentation (inclinometers and GPS movement monitors).

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3.2 Surveillance Inspection

3.2.1 Details of Inspection

The Inspection was conducted between the 4th and 6th of February 2025 by Arun Muhunthan (EoR) and Jedd Linke-Nagel (Senior Engineer) from ATCW. Pamela Soto (MMG Manager Tailings & Water Australia) was also in attendance during parts of the inspection.

The weather during the inspection was mostly sunny and hot, with maximum temperature approximately 32°C. The weather conditions were not a factor during the inspection.

Details of the inspection, using the format of the Monthly checklist are presented in **Appendix A**. A summary of inspection observations is presented in **Figure 7**.

3.2.2 Photographic Record

Representative photographs taken during the audit inspection are referred to throughout the following sections and are presented in **Appendix B**. The approximate locations of the photographs are presented as **Figure 8**.

3.2.3 Freeboard, Tailings Beach and Pond Storage

The southern and western portions of the facility are either nearing minimum wall freeboard or are at minimum wall freeboard. The wall freeboard generally increases along the northern and levee embankments, with the largest freeboard towards the eastern end of the northern embankment. The available freeboard ranges from approximately 100 – 500 mm along the northern embankment, while freeboard on the levee embankment is estimated at approximately 300 mm.

Tailings are discharged on a campaign basis between Bobadil and 2/5 Dam, with Bobadil typically receiving tailings approximately 6% of the time and 2/5 Dam receiving tailings approximately 94% of the time throughout the inspection period. Bobadil received mine water from the ETP 100% of the time throughout the inspection period. At the time of the inspection, tailings were being deposited from 5 spigots along the northern embankment and discharge of mine water was observed from 5 spigots on the western embankment.

Review of recent aerial survey of the tailings beaches indicates a beach profile with slopes ranging from 2.5% to 0.5% near the head of beach, and 0.5% to 0.2% close to the decant pond. The achieved average beach slope is in general alignment with the design beach slope. **Figure 40** provides a comparison of the January 2025 tailings beach survey with the proposed end of filling design. Tailings levels at the north-eastern side and the position of decant pond are a reflection of the slightly lower freeboard and some remaining storage capacity in this area.

A pond level reading of RL 199.2 m was observed at a gauge board in the decant area and it is considered that the extent of the pond on the tailings surface is in general alignment with the design.

The next raise of the Bobadil TSF embankments (Stage 11) is currently in the construction phase at the time of writing. The raise will be completed in two parts. Stage 11A comprises raising the Southern and Western embankment, while Stage 11B comprises raising the Levee and Northern Embankments, as well as the filter wall and spillway. It is anticipated that majority of the tailings will be deposited to 2/5 Dam TSF and some into the northern half of the TSF during the construction of this raise.

3.2.4 Embankments

The Stage 10 embankment crests were observed to be in generally good condition. Some minor rutting and potholes are present and have increased slightly in depth and coverage over the inspection period. Windblown tailings are present on parts of the crest and in places on the downstream slope and trial cover.

The upstream batters are generally in good condition where exposed. Most of the upstream batters are covered by tailings.

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The downstream batters between the Stage 10 crest and the trial closure cover (Stage 9 tailings beach) were also observed to be in very good condition with some windblown tailing deposits present.

The Stage 9 (RL 199 m) embankment crests were also in good condition, with minor rutting and potholes observed.

3.2.5 Tailings Trial Cover

The trial cover area was observed to be in good condition. Vegetation coverage was generally good - and was observed to be dense on the southern portion of the trial cover, becoming slightly sparser on the western, levee and northern embankment regions (refer to **Photograph 4, 8, 11, 31**).

There have been some issues identified with uplift of the BGM lined drainage lines after rainfall events. This has previously been overcome by piercing the BGM liner just upstream of the perimeter road culvert crossings to depressurise the underside of the liner. The performance of the drains could not be assessed as they were completely dry at the time of inspection, with small areas of ponded water. However, the liner and headwalls were in good condition. Drain outlets at the bypass ramp were noted to be in reasonable condition. No significant obstructions were observed but windblown tailings were observed to be accumulating in parts of the drain, partially obstructing the drain outlet in some locations (refer to **Photograph 31 to 34**).

It is understood that the soil cover area is significantly contaminated with the root-rot fungus Phytophthora. In response, MMG has established on-site facilities for the washdown and disinfection of boots and vehicles to prevent further spread.

3.2.6 Western Buttress

The crest of the Western Buttress was in reasonable condition with evidence that water ponds develop in the low points adjacent to the downstream toe of the Stage 9 embankment, despite the surface being generally dry at the time of inspection (refer to **Photograph 9**). This is consistent with the observed condition of the Western Buttress during previous annual inspections. Water is thought to pond in low points in this area formed due to consolidation of the underlying tailings. Select areas were scarified during Stage 10 construction, however further works will be required to improve drainage.

The downstream face, between the crest and RL 199 m trial cover area was observed to be in good condition with windblown tailings deposits, oxidised in some locations, present in the southern portion of the facility. The downstream batter between the buttress crest and downstream toe was also observed to be in good condition with only minor, isolated vegetation present. The vegetation observed is of no concern.

3.2.7 Seepage

Seepage is limited to specific locations on the downstream face and toe of the facility. Changes were observed in the extent of impact of some of the seepages since the previous EoR inspection in December 2023. No new seepage was observed.

The observed seepage locations are as shown on **Figure 7** and summarised below.

- Southern seepage:
  - Seepage is present at the downstream toe from two discrete channelised areas, as well as a moss and algae covered area at the toe of the embankment, monitored via BDSP-01 which has reported a flow of between 16 l/min (summer) and 177 l/min (winter) and an average of 42 l/min over the 2024 inspection period. This is similar to the rates observed during the previous inspection period (2023 calendar year).
  - Seepage at the toe of the southern access ramp was first observed in 2020 and is located to the east and below the Low Lift Pump Station. The extent and flow rate of the seepage area appears to have remained steady over the inspection period, flowing at a low rate. Algae, reeds and salt are present in the area. Refer to **Photograph 17**.

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- There is a damp spot/weep at the abutment of the rockfill and natural ground, approximately 4 m up the slope. This did not appear to be flowing and the extent was bounded by moss and salt. This is at the approximate elevation of the southern access ramp seepage, suggesting a seepage front is possibly migrating through the glacial soils. Refer to **Photograph 17**.

- Levee Embankment:
  - Three areas of previous seepage, in the form of iron staining were observed on the downstream face towards the northern end of the Levee embankment. These appear to be originating between the Stage 4/5 and 5/6 raise interfaces and have previously been observed during monthly monitoring of the Bobadil TSF. As observed in the previous annual inspection, some active seeps were identified during the current inspection and the amount of active seepage appears to have increased. However, the extent of iron staining does not appear to have increased over a number of years. Refer to **Photograph 20**.
  - A concentrated seep is located towards the top of the levee embankment near the bypass ramp. This was observed in early 2021 and has been routinely monitored since this time. At the time of the inspection the seep was noted as mostly dry with some moist areas around the seep's origin. Refer to **Photograph 18**.
  - There is a broad area of seepage present at the southern end of the Levee embankment, possibly originating at the Stage 4 and 5 raise interface. The extent of the seepage is from the bypass ramp (south end) and extends to approximately 20 m north of the levee drainage pipes. There is a defined upper fringe to the seepage noted by salts and there are numerous locations where algae and weeping seeps are present approximately 5 m lower down the slope. The ground was soft and waterlogged under foot in some areas. Refer to Photograph 19.
  - Water was observed to be flowing from around the white (lowest) seepage drainage pipe during the January 2024 inspection. No water was observed flowing around the lower white or upper two black seepage pipes at the time of the current inspection.
- Northern Embankment:
  - Seepage at the northern embankment is located at the western end, emanating on the old ramp (approximate raise 5/6 interface). Seepage was observed flowing at a low rate, similar to the previous annual inspection, and there is extensive salt present at the origin and down the ramp. The upper fringe of the seep extends across the ramp to the top of the Railway cutting. Refer to **Photograph 36**.
- Railway cutting:
  - During the previous EoR inspection (December 2023), salt precipitates and seepage were observed at the northern end of the railway cutting at and just above the toe. The extent of seepage and salt appears to have increased slightly over the 12-month period, but seepage flow rates appear similar.
  - The extent of salt precipitates extends over a length of approximately 100 m and is generally limited to the lower 3 m of the slope.
  - A small toe drain collects and combines seepages in this area to mitigate pooling of water adjacent to the railway line.
  - Refer to **Photograph 37** that presents the seepage environment at the Railway cutting.

The changes in seepage need to be considered in more detail, primarily:

1. Southern seepage: investigate whether a seepage front is emanating through the natural glacial soils from the eastern side of the old railway cutting.

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2. Levee seepage: the extent of the seepage at the southern end has changed and become more extensive. This is likely a seepage front. An action plan will need to be developed to assess the risk this seepage poses.
3. Railway cutting: investigate whether a seepage front is starting to emanate through the natural glacial soils of the cutting.

It is recommended to review geophysics results and develop an action plan to investigate source and mechanism of seepages present at the above three areas are presented on **Figure 7**.

3.2.8 Erosion

Evident erosion is limited to the glacial fill between the top of the railway cutting and the Stage 5 bench of the Levee embankment (refer to **Photograph 24**). The erosion occurred some years ago due to breaks in the safety bund on the Stage 5 Levee bench and has not noticeably increased over the inspection period.

3.2.9 Toe and Seepage Drains

A toe drain is located downstream of the western and southern embankments. There is also a drain located along the downstream toe of the southern end of the Levee embankment. These drains discharge into either the decant drain or bypass drain (refer **Figure 2** for general layout). The decant channel is located at the downstream toe of the northern embankment which also accepts flow from seepage drains.

The inspection of the drains is summarised as follows:

- Levee Toe Drain:
  - The drain, located at the crest of the railway cutting predominantly collects water from the Levee beach drains (three outlet pipes). The drain contains a small amount of vegetation but is flowing freely.
- Western buttress toe drain:
  - The downstream toe drain was generally in a good condition. The drain contains a significant amount of vegetation, comprising mostly reeds, but was flow was not being impeded at the time of inspection (refer to Photograph 25).
  - The BDSP pipes predominately have algae below the outlets and in places algae growing within the pipe outlet, whilst the WB pipes predominantly have iron precipitates below the outlets and many of the pipe outlets are partially blocked by the same precipitates. These differences indicate differing water quality/chemistry from the two different elevations within the tailings.
  - Precipitates are present within the drain which is commonly observed.
  - Water is ponding in the drain in the area around BDSP10 to BDSP12 due to poor drainage.
  - There is dense vegetation restricting access around the outlets of BDSP9A and WB3.
- Southern toe drain:
  - The drain is mostly clear of vegetation and obstructions. However, some areas require regrading to improve flow.
  - There is a junction pit in the pipeline which runs under the railway line that is leaking. This has been observed during the monthly inspections (refer to Photograph 29). Glacial till has been backfilled downstream of the pit and water travels through a hole in the pipe leading to BDSP03. Further remediation works should be considered.

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  - The section of drain, between the pipes and its entry to the bypass drain, is overgrown and flow from the western drain outlet pipe is somewhat obstructed.
  - Vegetation at drainage outlets (from the western toe drain) is overgrown and should be removed.
- Bypass drain:
  - Is generally in good condition. Vegetation growth present on either side of the channel but there are no obstructions to flow.
  - Cipolletti weir CW4 has sediment build-up against its face and at its approach.
  - Cipolletti weir CW3 has precipitates on the weir. These precipitates affect measurement and hence ability to properly measure flow.
- Northern Drain, west of decant channel:
  - The drain is full of sediment meaning that the seepage monitoring pipes (BDSP20 - BDSP22) cannot be measured.

An action plan should be developed that considers the following:

1. Improve drainage in area of BDSP10 to BDSP11.
2. Clear sediment from upstream of weirs and pit inlets (general).
3. Complete the repair of leaking pit southern seepage drain.
4. Clear northern drain.
5. Clear vegetation around obstructed BDSP9A and WB3

The above areas of interest are presented on **Figure 7**.

3.2.10 Decant, Decant Channel and Bypass

The decant is located at the northern end of the northern quarry void. The inlet is currently at RL 195 m. At the time of the inspection, the decant was relatively clear and the entrance was observed to be clear of obstructions (refer to **Photograph 13**).

A decant filter wall was constructed as part of Stage 10 works. At the time of the inspection the filter wall was operating, however the flow through the wall was relatively low. Most of the water flow from the surface of Bobadil TSF is directed via a channel to the southern quarry void where it spills over into the northern quarry void. Filter bunds have been constructed within the channel to minimise sludge migration from the TSF (refer to **Photograph 12 and 14**). However, these are only partially effective and there is a considerable amount of sediment present in the southern quarry void.

The decant channel was clear from the decant outlet to the bypass channel. The railway culverts were clear of obstructions.

Cipolletti weir CW1 has precipitates on the weir, which should be descaled. These precipitates affect measurement and hence ability to properly measure flow.

The spillway drain outlet, located adjacent to the decant outlet pipe was flowing but measurement is not possible to due to sediment and vegetation. This should be cleared.

The BDSP outlet pipes, located in the old railway cutting downstream of the eastern end of the northern wall cannot be measured due to access and vegetation.

The bypass valve was open, directing decant discharge to Cell 1 of the Polishing Pond. The channels to both Cell 1 (beyond the diversion from the bypass drain) and Cell 3 are densely vegetated.

Figure 7 presents the above areas of interest.

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3.2.11 Railway Cutting

The Railway Cutting was observed to be in generally good condition with no evidence of slumping or cracking. Seepage on the railway cutting has resulted in the concentrated growth of reeds in some areas and evidence of tree stress associated with seepage and salt (refer **Section 3.2.7** for a discussion on seepage).

3.2.12 Spillway

The spillway was observed to be in good condition and clear of obstructions (refer to **Photograph 35**).

3.2.13 Sludge Storage Void

The dredged sludge from the Polishing Pond, which was pumped into geotube bags, has been placed and subsequently covered with tailings near the Spillway and in the northeast corner of the TSF. This placement was intended to occur outside the Stage 11 embankment footprint. However, it seems on site that this requirement was not followed.

As a result, all sludge located within the Stage 11 embankment footprint must be removed and the area should be backfilled with compacted tailings as part of the foundation preparation for the Stage 11 embankment.

3.2.14 Quarry Diversion Drain

A storm water diversion drain is located above the quarry and along the eastern flank of the facility that diverts rainfall away from the facility.

Photograph 47 provide an overview of the condition of the Quarry Diversion Drain.

The drain was generally in fair condition at the time of the inspection and was largely unchanged since the December 2023 inspection. Evidence of instability was noted at portions of the upstream cut slope that has resulted in slumped soils and fallen rocks partially blocking the flow path in some areas.

Around a third of the total length of the Diversion Drain is densely vegetated with mature trees and shrubs and could not be accessed by foot. This location is illustrated on **Figure 7**.

Maintenance of the channel is required to clear vegetation and fallen rocks to reinstate the flow capacity of the drain. It is understood that the Stage 11 embankment construction works present an opportunity to complete this maintenance.

3.3 Review of Surveillance

3.3.1 Review of Previous Surveillance Reports

3.3.1.1 Review of 2023 EoR Inspection Report

The 2023 EoR inspection report prepared by ATCW **[1]** was reviewed. Issues raised, and corrective action completed is presented in **Table 1**.

TABLE 1: ACTION ITEMS STATUS FOR 2023 INSPECTION – BOBADIL TSF

Item	Aspect	Recommendation	Priority	Status
1	Instrumentation	VWP's are connected to telemetry system but there remain concerns with the telemetry systems for the inclinometers, and the GPS positioning beacons currently provide no data.	High	Ongoing and expected to be completed at the end of Stage 11 works.

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Item	Aspect	Recommendation	Priority	Status
		All electronic instrumentation should be connected to telemetry to allow real-time monitoring. This is critical to dam safety.		
		Seepage pipes and monitoring weirs should be maintained in the best possible condition to provide correct measurements. Consider adding sensors to key weirs as part of proposed rationalisation of the monitoring system.	Low	Ongoing maintenance required. Rationalisation study has commenced.
		Western toe drain needs grading in some areas to promote drainage.	Low	Ongoing maintenance required.
2	Seepage	Investigate source and mechanism of seepage present at: • Southern embankment. • Levee embankment • Railway cutting	Medium	Geophysics study is complete. The geophysics report to be reviewed to assess whether any further investigation required.
3	Quarry Diversion Drain	Fallen rocks in Quarry Diversion Drain should be removed.	Low	Not yet actioned.
4	Mine Water Deposition	Consider depositing mine water from southernmost spigots to increase flow path to decant pond and improve sludge accumulation in the TSF.	Low	Actioned.

3.3.2 Routine Inspections

3.3.2.1 General

Routine Inspection procedures for the mandatory surveillance of the Bobadil TSF and Polishing Pond are specified in the Operation and Maintenance Manual **[7]**. The inspection requirements are as follows:

- Shift/Daily and Weekly Routine Inspections – relating to issues that may develop over time and impact on the safety of the dam or the environment.
- Monthly Routine Inspections – relating to issues that may develop over time and routine monitoring.

In addition to the above routine monitoring, the results are compiled into monthly TARP reports by ATCW to provide MMG with a summary of the performance of the facility.

3.3.2.2 Routine Shift/Daily and Weekly Inspections

The TSF Coordinator is responsible for coordinating the shift/daily and weekly inspections and reporting. The inspections are recorded electronically in the Effluent System Change Register which includes the checklists from the O&MM.

The previous review of the register was to 31 December 2023. The register was reviewed for compliance with the O&MM for the 12-month period ending 31 December 2024. The findings are summarised below:

- Daily Inspections – 365 daily inspections were recorded during the audit period (100% completion).

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- Weekly Inspection – 52 weekly inspections were recorded during the audit period (100% completion).

It is apparent that the high level of compliance with regard to inspections has been maintained throughout the 12-month period since the previous review.

Based on review of the register it is considered that the inspections are being carried out in accordance with the requirements of the O&MM.

3.3.2.3 Routine Monthly Inspections and Reports

Routine monthly inspections are the responsibility of the TSF Coordinator, who has contracted ATCW to complete the monitoring and inspections. Monthly inspections are stored by MMG within their electronic library. The inspections have been completed in accordance with the O&MM.

3.3.3 Non-scheduled Inspections and Corrective Action

There were no triggers for non-scheduled inspections during the audit period, and hence no reports were completed.

3.4 Monitoring

3.4.1 General

Routine monitoring of the facilities has been carried out daily / monthly during the period. The following monitoring was carried out:

- Bobadil Internal Drainage Discharge Monitoring (BDSP and WB) flow rate and water clarity (monthly).
- Phreatic surface within the facilities at varying frequency: (60 piezometers at Bobadil, excluding Polishing Pond piezometers) – standpipes monitored monthly and vibrating wire piezometers twice daily via remote system.
- Movement Monitoring – readings provided on an approximately 2-hourly basis.
- Inclinometers – readings taken on a 6-hourly basis.

The following sections provide a discussion and summary of the monitoring.

3.4.2 Monitoring Piezometer Water Levels

The locations of the piezometers are shown on **Figure 4**. The piezometers are grouped into section lines from upstream to downstream to allow an understanding of the phreatic conditions. The data is plotted monthly within the monitoring TARP as a phreatic surface cross section along with the time series for the piezometers. The time series levels for each of the sections plotted against rainfall are presented on **Figures 9** to **17**. **Figures 18** to **26** present the piezometric cross section as of the start of February 2025 and the TARP trigger levels.

Monitoring indicates that, over the past 12-month period, overall, the piezometers have remained relatively stable, with fluctuations influenced by mine water discharge, tailings deposition, and rainfall. Importantly, all readings stayed within TARP limits.

Tabulated monthly data and cross sections along each of the piezometer groups are presented in **Appendix C**.

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3.4.3 Monitoring Internal Drainage (Drainage and Seepage)

The locations of the internal drainage outlets, referenced as BDSP and WB, are shown on **Figure 5**.

The monitoring points are grouped into regions, these being the Northern, Levee, Western, Southern Embankments and Western Buttress. It is noted that flows are accounted for more than once in some locations and, as such, drainage and seepage monitoring at Bobadil TSF is best interpreted in terms of trends over time, rather than absolute values. The discharge by region plotted against rainfall is presented on **Figure 27** and the measured discharge rates over the previous 12 months are summarised below.

- Northern embankment: 20 – 31 l/min (average 25 l/min).
- Western embankment: 23 – 60 l/min (average 44 l/min).
- Southern embankment: 87 – 290 l/min (average 131 l/min).
- Levee drainage: 130 – 300 l/min (average 202 l/min).
- Western embankment filter drain (western buttress): 77 – 154 l/min (average 122 l/min).

Monitoring indicates that over the past 12-month period the internal drainage discharge has generally responded to rainfall – lower drainage rates apply during the drier summer months. This is suspected to have resulted in anomalous readings in some instances, with unusually high flow rates observed to have returned to baseline levels by the following reading. Generally, a slight upward trend in seepage rates has been observed since tailings deposition recommenced into the TSF in mid-2021, and this continued throughout the current inspection period. However, the measured rates are within the range of historical readings and are within expectations.

Tabulated monthly data is presented in **Appendix C**.

3.4.4 Settlement/Movement Monitoring

3.4.4.1 General

Inclinometers and GPS movement monitors currently installed on the Bobadil TSF are as follows:

- 4 No. in-place inclinometers (SAA01 - SAA04) were installed in April 2021 within the western buttress as part of the Stage 10 embankment works with the aim of monitoring construction induced movement. The inclinometer locations are presented on **Figure 6**.
- 17 No. GPS based NAVSTAR movement monitors were installed in February 2022 to allow for remote monitoring of movement on the raised embankments crest and western buttress as shown on **Figure 6.**

It is noted that, at the time of writing, several movement monitors have been removed from the Stage 10 embankment crest to facilitate Stage 11 construction works.

3.4.4.2 Inclinometer Monitoring

Inclinometers SAA01, SAA02 and SAA04 are equipped with in-place 0.5 m segments and data has been automatically recorded on a 6-hourly basis since August 31, 2023, with readings collected monthly. SAA03 was read manually until April 2024, before it was also equipped with in-place segments.

Review of the inclinometer information indicates:

- SAA01 is showing a small amount of consolidation to a depth of approximately 16 m since installation of in-place segments in August 2023. The overall rate of movement is very low, with maximum deflections of 2.5 mm reported within this zone. A minor inflection at around RL 185 – 186 m in both x and y directions may indicate a minor settlement-related bending.
- Movements at SAA02 are generally low (below 3.5 mm since installation of in-place segments in August 2023.) and uniform, with the exception of the top 1 m where deflections up to 10 mm have been recorded. This near-surface movement is localised and not of particular

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concern. A minor inflection similar to that observed in SAA01 at RL 185 – 186 m is also observed at approximately the same elevation in SAA02.

- SAA03 is showing fairly uniform displacement with the largest movements observed within the upper 10 m of material. However, movement in this area is less than 4 mm since installation of in-place segments in April 2024.
- SAA04 is showing fairly uniform displacement less than 2.5 mm since installation of in-place segments in August 2023. Displacement is largely one-dimensional in the x-direction.
- The inclinometer plots indicate that very minor movement of the embankment is occurring at a rates typically less than 2 mm/year. It is considered that the movements are likely due to ongoing consolidation of the underlying tailings within the western buttress.

The most recent inclinometer plots are presented in **Figures 31 to 34**.

3.4.4.3 Settlement and Movement Monitoring

The GPS based NAVSTAR monitors have been connected to the telemetry system and providing readings since October 2024. Readings are captured at varying timesteps, averaging approximately every 3 minutes and the data is extracted fortnightly.

The recorded data shows significant short-term fluctuations, ranging from -60 mm and +100 mm, which obscures the actual cumulative movement. However, no discernible long-term trends are evident, and overall movement is considered to be low.

Time series of the movement monitoring data are presented in **Figures 35 to 39**.

3.5 Operation, Maintenance and Emergency Management

The O&MM for the Bobadil TSF **[7]** was revised in January 2025 as part of the commitments associated with the Stage 11 embankment raise. It is considered that the O&MM adequately reflects the current condition of the Bobadil TSF.

3.6 Review of Dam Status

Based on the Inspection and a detailed review of all inspection and monitoring data, it is considered that Governance associated with the Bobadil TSF is of a high standard and it is being inspected and monitored in general accordance with the requirements of the Operation and Maintenance Manual and in accordance with relevant ANCOLD guidelines.

It is considered that the Bobadil TSF does not present an immediate significant risk to the environment downstream of the facility and is suitable for the on-going storage of tailings generated at the Rosebery Mine.

It is noted that there are some actions, particularly associated with seepage, that need to be addressed. These are summarised in **Section 5** of this report.

4 BOBADIL POLISHING POND

4.1 General Information

4.1.1 Purpose of Dam

The Polishing Pond is used to condition decant water from the Bobadil TSF prior to release to Lake Pieman. The discharge point from the Polishing Pond is MMG Rosebery Mine's licensed discharge point for water from the Bobadil facility.

The dam was engineered by consultant Smith, Sale & Burbury and constructed by Procter Contracting during the 1980's.

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The Polishing Pond was modified during 2013/2014 to improve water flow through the facility. The modifications were the construction of cross and longitudinal walls, including control structures to compartmentalise the pond and allow control of water flow, the redirection of the decant channel so that water is discharged into the eastern end of the facility and the construction of a second decant (Decant 2). As part of the modification works the water level within the pond was also lowered by some 2 m.

4.1.2 Physical Details

4.1.2.1 Location

The Polishing Pond is located to the southwest of Bobadil. The dam is formed by a single confining embankment constructed in a northwest to southeast direction. The northern side of the facility abuts natural ground.

A general locality plan is shown on the aerial photograph presented on **Figure 2**.

4.1.2.2 Dam Type

The dam is a compacted earth dam, although no design or construction document exists. It is understood that the embankment is either homogenous or of zoned homogenous cross section but without formal filters or internal drains. The embankment has been constructed from glacial till material. The cross walls installed during 2013/2014 are constructed from glacial soils and extremely weathered rock.

4.1.2.3 General Layout

The Polishing Pond consists of the following components:

- A main north west to south east embankment;
- Dividing embankments, consisting of longitudinal and cross walls with water control structures and internal spillways;
- Two decant structures (Decant 1 and 2); and
- Emergency Spillway.

4.1.2.4 Geometry

The main embankment has a maximum height of approximately 7 m adjacent to the original decant (southeast portion of the facility). The downstream batter has been constructed with a slope varying from about 3:1 to 2:1 (horizontal:vertical) but, around the environmental monitoring point towards the northern end of the facility (BO5), it flattens out to around 5:1. The upstream batter has been constructed with a slope of around 2:1 (horizontal:vertical). Internal longitudinal and cross walls have been constructed with batter slopes of approximately 1.5:1 (horizontal:vertical).

4.1.2.5 Storage Capacity

The design storage capacity of the Polishing Pond is approximately 66,500 m^3. It is noted that, despite recent dredging, accumulation of sludge within some of the cells continues to be an issue, and the actual storage capacity has likely been significantly reduced as a result.

4.1.2.6 Catchment Characteristics

The dam has a direct catchment area of about 15 Ha, but also accepts water from the Bobadil TSF. A 2015 review of the pond by Golder Associates **[9]** suggests this catchment area may be larger and hence this should be reviewed as it has an impact on the flood capacity of the system, as recommended in **Section 5**.

The ground cover between Bobadil and the Polishing Pond is covered with dense forest vegetation, with some cleared areas.

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4.1.2.7 Flood Capacity

The dam can discharge water via two decants or through the emergency spillway. The decants can discharge runoff from a rainfall event up to a 1 in 50 year return period.

The spillway is considered to operate as a broad crested weir, with a base width (parallel to the centreline of the embankment) of approximately 5 m and a length of about 10 m. The available depth of flow over the spillway is approximately 0.25 m, compared to the lowest point in the Polishing Pond crest. The estimated capacity of the spillway is about 1.43 m^3/s and is able to discharge runoff from a rainfall event of 1 in 1,000 year return period.

4.1.3 Consequence Category

The consequence of failure of the Polishing Pond would likely pose a considerable operational constraint on the Rosebery Mine and would likely lead to non-compliance of discharge waters to the environment. On this basis, the Polishing Pond has been assessed to have a Consequence Category of “Significant”, based on the requirements of ANCOLD **[5]**. However, given that the TSF and Polishing Pond are a linked system, the Consequence Category of “High C” adopted for the TSF is also adopted for the Polishing Pond, for monitoring and surveillance purposes.

4.1.4 Surveillance Programme

4.1.4.1 General

ANCOLD **[5]** indicates that for “Significant” Consequence Category dams, intermediate inspections should be carried out plus a comprehensive inspection every 5 years.

As noted above, the Polishing Pond forms part of the Rosebery Mines’ tailings and water management system and is considered to share a Consequence Category of “High C with Bobadil. As such, it is inspected at the same frequencies as that of Bobadil, as described in **Section 3.1.6**.

4.1.4.2 Routine Visual Inspections

Routine visual inspections of the Polishing Pond are specified in the Operation and Maintenance Manual **[7]** and are required to be conducted on a daily, weekly and monthly basis. Refer to **Section 3.1.6** of this Report for a more detailed discussion of these inspections and their implementation.

4.1.4.3 Monitoring

The Polishing Pond is monitored on a monthly basis as part of the monitoring of the Bobadil TSF. Monitoring includes measurement of water level, piezometers, v-notch weirs and visual seepage monitoring. The findings are summarised within the monthly reports prepared for the Bobadil TSF.

4.2 Surveillance Inspection

4.2.1 Details of Inspection

The Inspection was conducted at the same time as the Bobadil inspection between the 3rd and 6th of February 2025 by Arun Muhunthan (EoR) and Jedd Linke-Nagel (Senior Engineer) from ATCW.

Details of the inspection are presented in **Appendix A**.

4.2.2 Photographic Record

Representative photographs taken during the inspection are presented in **Appendix B**. Individual photos are discussed where appropriate in the following section of this Report.

Photographs 39 to 45 provide an overview of the condition of the Polishing Pond.

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4.2.3 Embankment

4.2.3.1 Condition

The Polishing Pond embankment was found to be in a similar condition to that observed in the January 2024 inspection. Seepage has remained relatively low, with flow rates recorded during the inspection period within the range observed since 2021, spiking in response to periods of intense rainfall.

4.2.3.2 Upstream Face

The upstream face of the embankment was well vegetated and comprised of reeds.

4.2.3.3 Embankment Crest

The crest of the embankment was in reasonable condition, similar to that observed in the January 2024 inspection. Gravel had recently been placed and the crest graded, but some isolated, minor potholes and undulations remained.

4.2.3.4 Downstream Face

At the time of the inspection the downstream surface was covered with grasses and bracken.

Where observable, the slope was generally in good condition.

A seepage source located mid-way up the embankment near Decant 1 has been marked with a stake for ongoing monitoring. At the time of inspection, the area was covered in moss and reeds, and was soft under foot. This suggests that the area has high moisture, and it is likely that the evaporation rate in warmer summer months counters the seepage rate to a certain degree. The seepage area appears similar in extent to that observed in the previous annual inspection.

4.2.3.5 Abutments and Foundations

The abutments appear to be in a good condition. There was no evidence to suggest movement or cracking of the embankment.

4.2.4 Cross and Longitudinal Walls

The cross and longitudinal walls were generally in good condition, with minor rutting on some crests and vegetation (mostly reeds) present on the batters. No erosion of the batters was observed. The water level, and therefore freeboard, varies within the various cells (formed by the walls) indicating that the walls and water control structures are performing well and are directing flow from the inlet in Cell 1 to Decant 1 in Cell 6.

4.2.5 Spillway

The spillway was observed to be clear of obstructions at the time of the inspection. There was no noticeable change in the condition of the spillway when compared to photographs taken during the 2023 inspection.

4.2.6 Decant System

The Polishing Pond has two decants as shown in **Figure 2**. Both decants were clear of obstructions. The main outlet channel from the southern decant was clear of obstructions. The outlet from the northern decant is generally clear with some saplings becoming established towards the southern end of the channel.

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4.3 Review of Surveillance

4.3.1 Review of Previous Surveillance

The 2023 audit report prepared by ATCW **[1]** was reviewed as part of the current audit. Issues raised and corrective actions completed are presented in **Table 2**.

TABLE 2: ACTION ITEMS STATUS FOR 2023 INSPECTION – POLISHING PONDS

Item	Aspect	Recommendation	Priority	Status
1	Polishing Ponds Storm Storage	The Polishing Pond spillway is undersized. An action plan should be developed that considers a risk-based approach to assess future requirements.	Medium	Risk assessment is in progress.

4.3.2 Routine Inspections

4.3.2.1 General

Routine Inspection procedures for the mandatory surveillance of the Polishing Pond are specified in the Operation and Maintenance Manual **[7]**. The inspection requirements are as follows:

- Daily and Weekly Routine Inspections – relating to issues which may develop over time and impact on the safety of the Polishing Pond or the environment.
- Monthly Routine Inspections – relating to issues that may develop over time and routine monitoring.

In addition to the above routine monitoring the results are compiled into quarterly reports to provide MMG with a summary of the performance of the facility.

4.3.2.2 Routine Shift/Daily and Weekly Inspections and Reports

The TSF Coordinator is responsible for coordinating the shift/daily and weekly inspections and reporting. The inspections are recorded in an electronic file which was reviewed as part of the inspection. The review indicated:

- Daily Inspections – 365 daily inspections were recorded during the audit period (100% completion).
- Weekly Inspection – 52 weekly inspections were recorded during the audit period (100% completion).

From discussions on site, and as evidenced by the inspection sheets, it is apparent that the high level of compliance with regard to inspections has been maintained throughout the audit period.

Based on review of the register it is considered that the inspections are being carried out in accordance with the requirements of the O&MM.

4.3.2.3 Routine Monthly Inspections and Reports

Routine monthly inspections are the responsibility of the Concentrator Department, who have contracted ATCW to complete the monitoring and inspections. During the audit period the monthly inspections were completed on 12 occasions.

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4.3.3 Non-scheduled Inspections and Corrective Action

There were no triggers for non-scheduled inspections during the audit period, and hence no reports were completed.

4.4 Monitoring

4.4.1 General

Routine monitoring of the facilities has been carried out regularly during the inspection period. The following monitoring was carried out.

- Water Level within the Polishing Pond at the decant. This is remotely measured on a daily basis.
- Polishing Pond seepage monitoring (VW 2 and VW 3) (monthly).
- Phreatic surface within the Polishing Pond on a monthly basis via 6 standpipe piezometers installed within monitoring bores at the Polishing Pond.

The following sections provide a discussion and summary of the monitoring.

4.4.2 Monitoring Piezometer Water Levels

The locations of the piezometers are shown on **Figure 4**. The piezometers are grouped in two sections (western and eastern) to allow an understanding of the phreatic conditions. The data is plotted monthly within the monitoring TARP as a time series. The time series levels for each of the sections plotted against rainfall are presented on **Figures 28** and **29**.

Monitoring indicates that the piezometers have remained relatively stable with an average variance of approximately 0.2 m for the duration of the reporting period, typically in response to rainfall.

All piezometers have remained below TARP limits and the phreatic conditions over the review period, with the exception of BH1A and BH5, which reached the maximum Green TARP level in September 2024. This was reviewed as part of the monthly audit and was suggested to be caused by an increase in the Polishing Pond level due to extended heavy rainfall. The overall phreatic surface was considered to be below the Green TARP level and phreatic levels decreased in subsequent inspections without the need for intervention. Overall, the piezometer water levels and trends have been within expectations.

Tabulated monthly data is presented in **Appendix C**.

4.4.3 Monitoring Seepage

Seepage is monitored at two V-notch weirs, referenced as VW2 and VW3, as shown on **Figure 5**.

The V-notch weir (VW2) installed downstream of the northwestern part of the Polishing Pond indicates that the seepage rate varies between approximately 35 L/min and 153 L/min, with an average of 62 l/min. The flowrate measured appears to cycle in response to rainfall and has remained in a similar range to that observed throughout the duration of the previous inspection period.

The V-notch weir (VW3) installed downstream of the southern part of the Polishing Pond was recorded to be dry with no seepage recorded for the entire reporting period.

A time series levels for the V-notch weirs is presented on **Figure 30**.

Tabulated monthly data is presented in **Appendix C**.

4.5 Review of Dam Status

Based on observations made during the Surveillance Inspection, as well as the monthly inspections, it is considered that the Bobadil Polishing Pond does not present a significant risk to the environment downstream of the facility and is suitable for use as a Polishing Pond.

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5 SUMMARY OF RECOMMENDATIONS

A number of recommendations have arisen from the 2024 EoR annual inspection. These are a combination of previous audit actions that have not been completed and new action items as a result of the inspection.

Recommendations have been developed based on the site visit, review of monitoring information and discussions with site personnel. Each recommendation has been assigned a priority as follows:

- High priority – A possible current threat to the integrity of the tailings storage facility due to direct evidence of a deficient and non-conformances against requirements; or not meeting expected MMG or industry requirements; or through urgency due to a limited window of opportunity to address a recommendation.
- Medium priority – A possible longer-term issue with the tailings storage facility management that may result in a future threat to the integrity of the facility.
- Low priority – Does not represent a threat and mainly associated with maintenance or operational aspects.

Table 3 presents the recommendations stemming from the 2024 EoR annual inspection. The recommendations include currently open actions. Items that are currently "in plan" such as routine monitoring, vegetation management, etc are not included as these items are well established standard operating activities.

All accepted recommendations should have an action plan developed.

TABLE 3: RECOMMENDATIONS

Item	Aspect	Recommendation	Priority
1	Instrumentation	All electronic instrumentation should be connected to telemetry to allow real-time monitoring as soon as Stage 11 instrumentation has been installed.	High
2	Sludge storage void	All sludges stored within the Stage 11 embankment footprint should be removed and the void backfilled with compacted tailings as part of the Stage 11 embankment raise foundation preparation work.	High
3	Seepage	Review geophysics results and develop a plan to investigate source and mechanism of seepage present at: • Southern embankment – No change since the last inspection • Levee embankment – The extent of seepage has slightly increased • Railway cutting - The extent of seepage has slightly increased	Medium
4		Seepage pipes and monitoring weirs should be maintained in the best possible condition so it can be accessed any time.	Low
5		Western toe drain needs grading in some areas to promote drainage.	Low
6		Consider adding sensors to key weirs as part of proposed rationalisation of the monitoring system.	Low

TAILINGS.WATER.WASTE.

Item	Aspect	Recommendation	Priority
7		Remediation of leaking pit downstream of Lower Western Embankment should be completed.	Low
8	Polishing Ponds Storm Storage	The Polishing Pond spillway is undersized. An action plan should be developed that considers a risk-based approach to assess future requirements.	Medium
9	Quarry Diversion Drain	Fallen rocks in Quarry Diversion Drain should be removed.	Low
10	Soil Cover	Consideration should be given to remove the large amount of accumulated windblown tailings within the soil cover drain.	Low
11	Western Buttress	Western buttress to be ripped to let water percolate through the rockfill. To be completed during Stage 11 works	Low
12	Decant channel and Toe Drains	Ongoing clearing of drains should be planned as part of routine maintenance.	Low

6 CLOSURE

Based on the outcomes of the surveillance inspection, the Bobadil TSF has been deemed to be in a safe operable condition, with operations able to continue despite the recommendations stated above. Connection of instrumentation to telemetry to allow real-time monitoring should be prioritised, however, with the exception of this, the facility was found to be performing in accordance with the design expectations, and in line with current best practice.

Your attention is drawn to the “Conditions of Report” which appear at the end of this report.

TAILINGS.WATER.WASTE.

REFERENCES

[1] ATC Williams Pty Ltd (2024). Bobadil TSF and Polishing Pond, 2023 Comprehensive Audit, Reference 107031.68R11, August.

[2] ANCOLD (2019). Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure, Revision 1 July 2019 (Reprinted 2020 with Amendments). July.

[3] ATC Williams Pty Ltd (2023). Bobadil TSF Stage 11 Dam Break Failure Impact Assessment, Reference 107031.98-R02, March.

[4] GISTM (2020), Global Industry Standard of Tailings Management, August 2020.

[5] ANCOLD (2012). Guidelines on the Consequence Category for Dams. October.

[6] ATC Williams Pty Ltd (2017). Bobadil Polishing Pond Spillway Capacity Assessment, Reference 107031.42-001, January.

[7] ATC Williams Pty Ltd (2025). MMG Rosebery Mine, Bobadil Tailings Storage Facility Operating Manual, Rev 9, Reference 107031R03, January.

[8] ATC Williams Pty Ltd (2020). MMG Rosebery Mine, Bobadil Tailings Storage Facility, Stage 10 Embankment Raise Detailed Design, Reference 107031.60R01, July.

[9] Golder Associates (2015). Bobadil Tailings Storage Facility Surveillance and Embankment Stability Third Party Review. Reference 1413717-001-R-RevA. June.

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FIGURES

NOTE:

1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- 2-5 DAM TSF IMAGE DATED APRIL 2025
3.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



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MMG ROSEBERY MINE
2024 EOR INSPECTION

GENERAL LOCATION PLAN

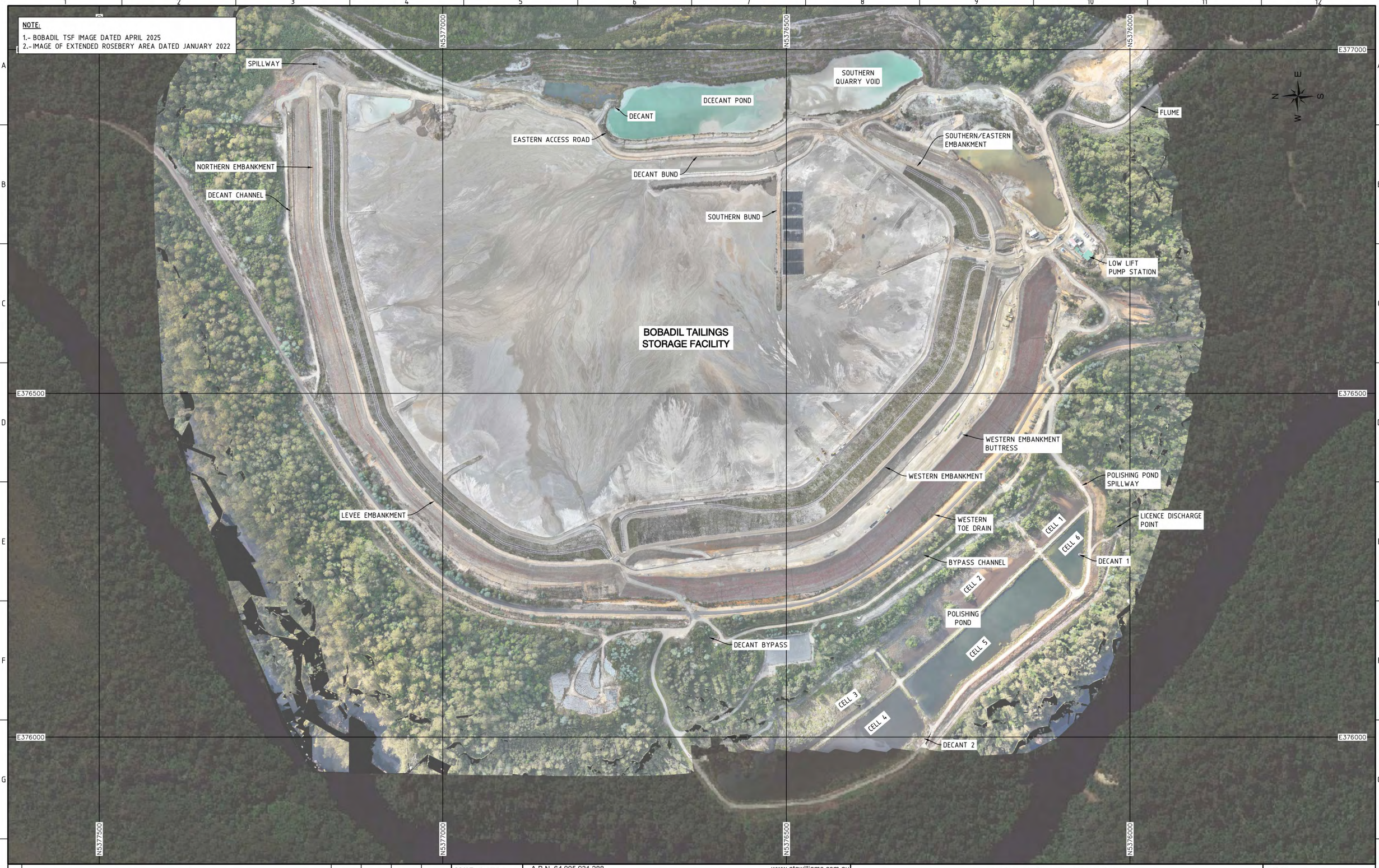
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FIGURE 1

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NOTE:
1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



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BOBADIL TSF AND POLISHING POND
AERIAL PHOTOGRAPH

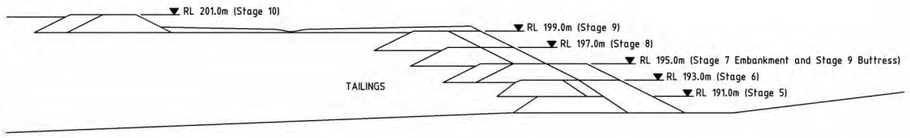
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FIGURE 2

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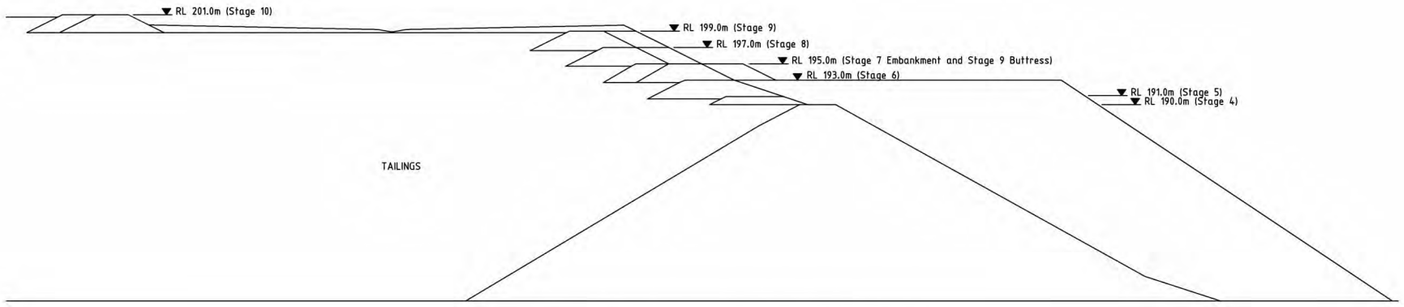
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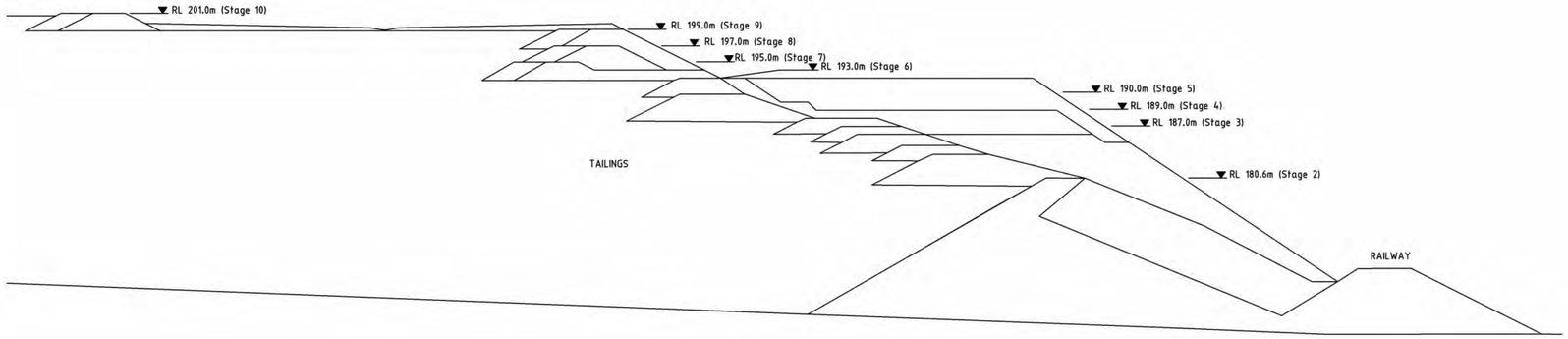
J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\CADD\CAD\2024 Audit\Bobadil\Figure 2 - MMG Aerial Photograph Bobadil.dwg Thursday, 20 September 2018 4:26:19 PM



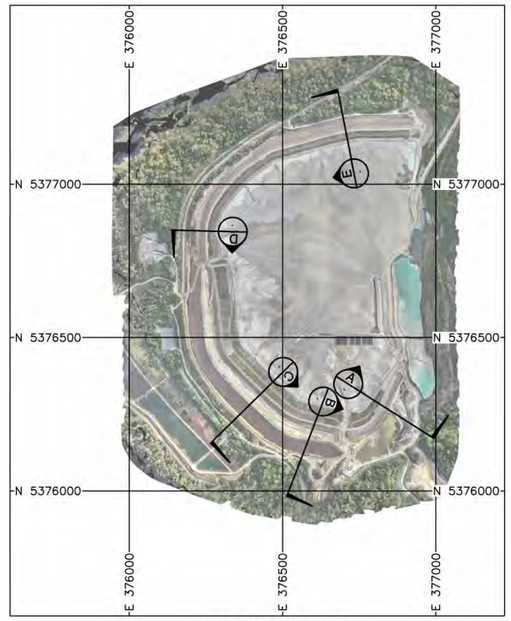
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SCALE 1:500



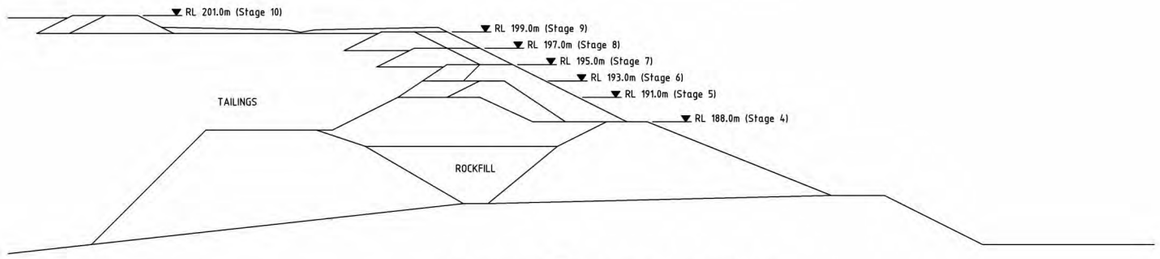
SECTION B LOWER WESTERN EMBANKMENT
SCALE 1:500



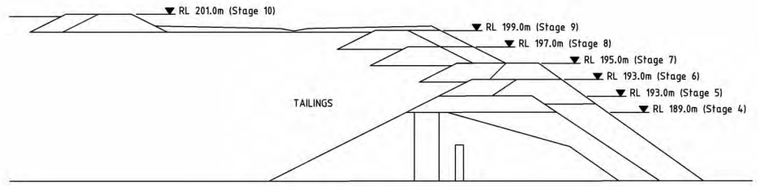
SECTION C WESTERN EMBANKMENT
SCALE 1:500



SECTION LAYOUT
SCALE 1:20,000



SECTION D LEVEE EMBANKMENT
SCALE 1:500



SECTION E NORTHERN EMBANKMENT
SCALE 1:500

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BOBADIL TSF
TYPICAL EMBANKMENT SECTIONS

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FIGURE 3

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J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\CADD\CAD\2024 Audit\Bobadil\Figure 3 - MMG Bobadil Typical Embankment Sections.dwg Thursday, 20 September 2018 10:34:31 AM

NOTE:
1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

TAILINGS STORAGE FACILITY

POLISHING POND

N5 VWNB VW1 VWNA N3 VWNC VW2 N2 N1 VWLB VWLA VW3 S2 VW6 VWF F1 F2 F3 VWE VW5 E1 E2 E3 E5 E4 VW8 VWD1 VWD2 VWD3 D2 D1 D4 D7 D5 D8 VWC1 VW4 VWC2 C1 C2 VWB VWA1 VWA2 B2 B1 C6 C5 BH1A/B BH2A/B A2 A1 B4 VW7 A4 B6 B5 B7 B8 A5 A7 A6 BH5 BH4

N 5377000 N 5376500 N 5376000 E 376500 E 376000

LEGEND:
- EXISTING STANDPIPE PIEZOMETER
- EXISTING VIBRATING WIRE PIEZOMETER
- VIBRATING WIRE PIEZOMETER INSTALLED IN EXISTING STANDPIPE

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BOBADIL TSF AND POLISHING POND
PIEZOMETER LOCATION PLAN

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FIGURE 4

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J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\CADD\CAD\2024 Audit\Bobadil\Figure 4 - MMG Bobadil and Polishing Pond Piezometer Location Plan.dwg Wednesday 27, August 2025 14:37:09

NOTE:
1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

E377000
N5377000
N5376500
N5376000
E376500
E376000
N5377500

BDSP32
BDSP30
BDSP31
CW01

BDSP31
BDSP30
BDSP32 (CANNOT BE LOCATED)

BDSP29
BDSP28
BDSP27
BDSP26
BLACK PIPE
BDSP25
BDSP24
BDSP23
BDSP21
BDSP20A
BDSP20B

BDSP20B
BDSP20A

BOBADIL TAILINGS STORAGE FACILITY

WHITE HDPE PIPE
LOWER BLACK HDPE PIPE
BLACK HDPE PIPE

BDSP01 V-NOTCH
BDSP05
BDSP06
WB01
BDSP07
BDSP04
BDSP03 V-NOTCH
BDSP08
CW04
WB02
WB03
BDSP09A
VW3
BDSP09B
WB04
BDSP10
WB05
BDSP12A
DECANT 1
POLISHING POND
BDSP14
WB07
BDSP18
LEVEE EMBANKMENT PIPES
VW01
BDSP19
BDSP17
CW02
BDSP15
BDSP16
WB06
BDSP13
BDSP12B
CW03
BDSP11
DECANT 2
VW2
BD5

DECOMMISSIONED DECANT PIPE
BDSP19

N E S W

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BOBADIL TSF AND POLISHING POND
DRAINAGE MONITORING LOCATION PLAN

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FIGURE 5

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J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\CADD\CAD\2024 Audit\Bobadil\Figure 5 - MMG Bobadil and Polishing Pond Monitoring Location Plan.dwg Thursday, 20 September 2018 12:53:00 PM

NOTE:
1.- BOBADIL TSF IMAGE DATED APRIL 2025
2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022

N5377000 N5376500 N5376000
E377000 E376500 E376000

NE1 NE2 NE3 NE4
LE1 LE2 LE3 LE4
WE1 WE2 WE3 WE4 WE5 WE6
SE1
LWE1 LWE2
SAA1 SAA2 SAA3 SAA4

BOBADIL TAILINGS STORAGE FACILITY

POLISHING POND

LEGEND:
- NAVSTAR GMS 600 MOVEMENT MONITORING LOCATION
- SHAPE ARRAY LOCATION

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BOBADIL TSF AND POLISHING POND
OTHER INSTRUMENTATION LOCATION PLAN

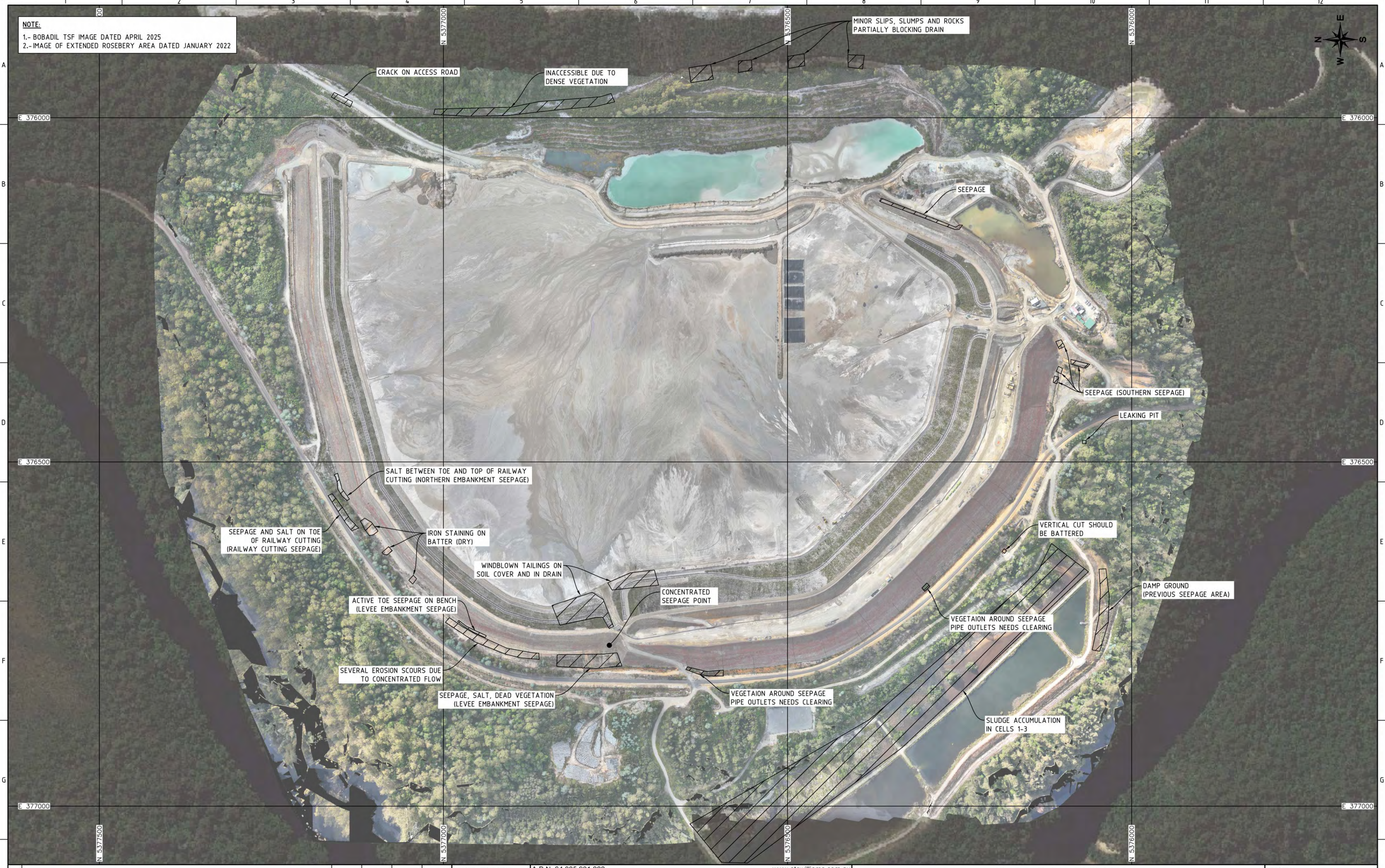
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FIGURE 6

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NOTE:
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2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



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BOBADIL TSF AND POLISHING POND INSPECTION OBSERVATIONS

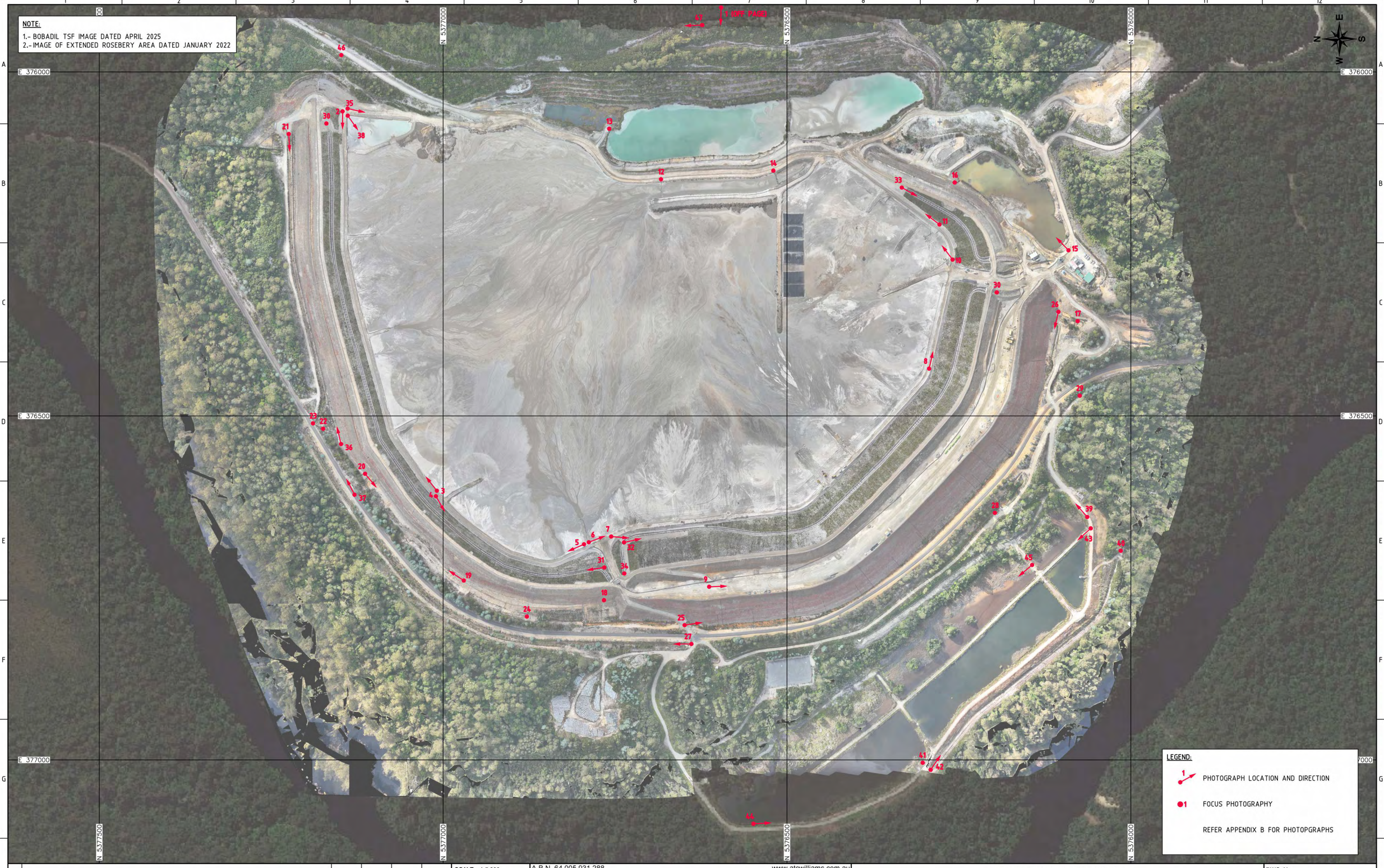
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FIGURE 7

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NOTE:
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2.- IMAGE OF EXTENDED ROSEBERY AREA DATED JANUARY 2022



LEGEND:
- 1 — PHOTOGRAPH LOCATION AND DIRECTION
- ●1 — FOCUS PHOTOGRAPHY
- REFER APPENDIX B FOR PHOTOPGRAPHS

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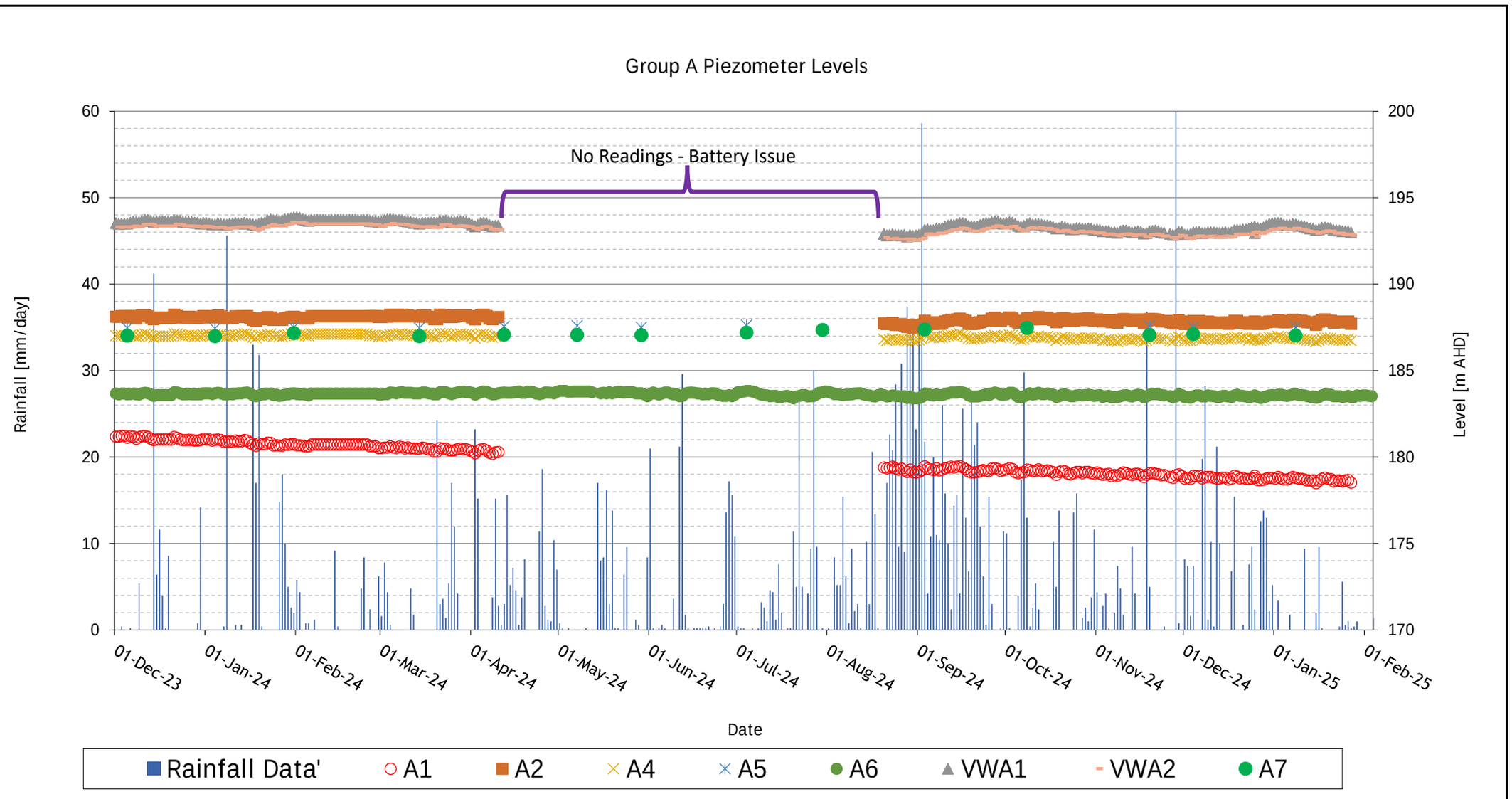
BOBADIL TSF AND POLISHING POND
PHOTOGRAPH LOCATIONS

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FIGURE 8

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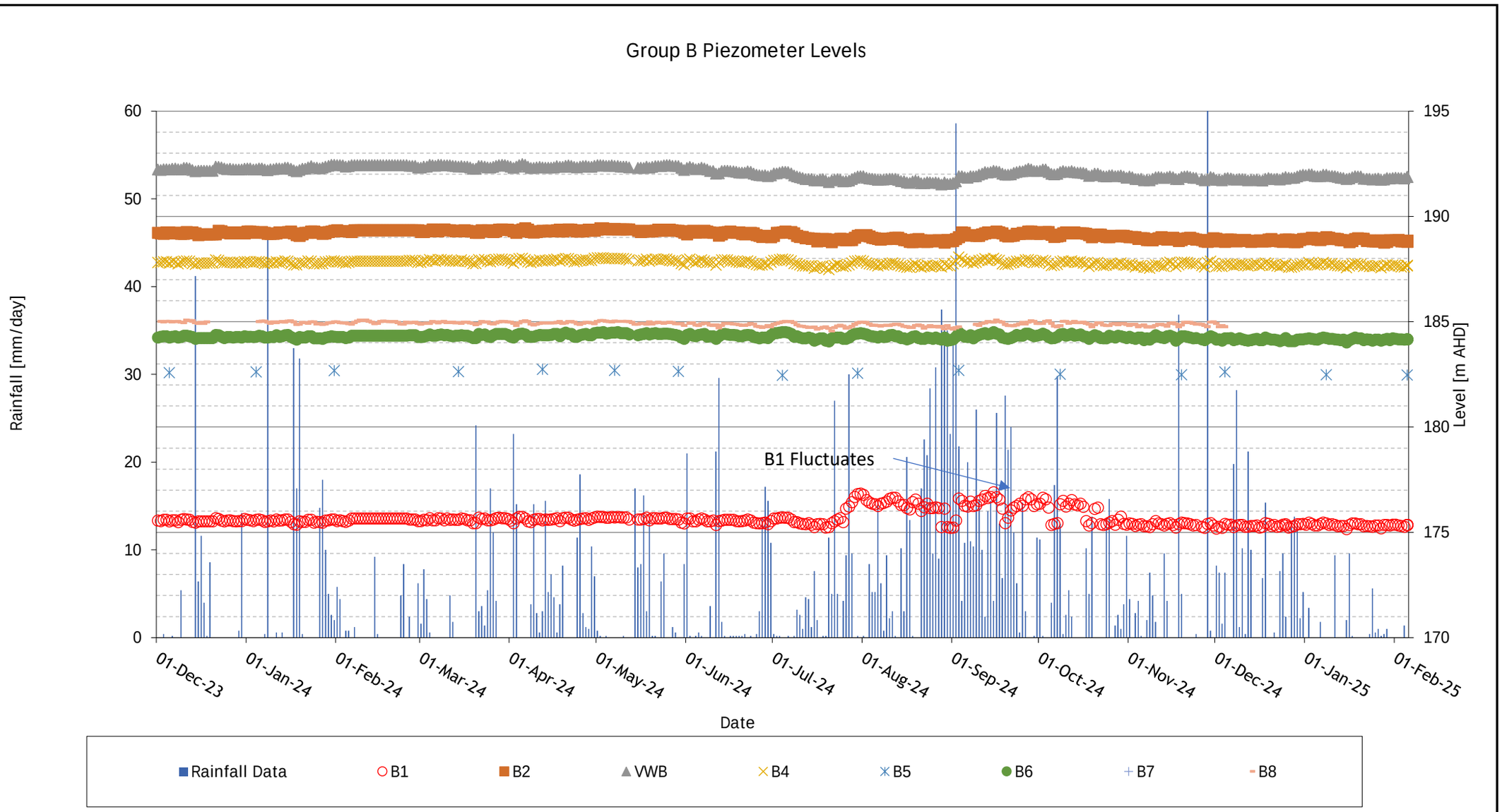
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL TSF - GROUP A PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 9**



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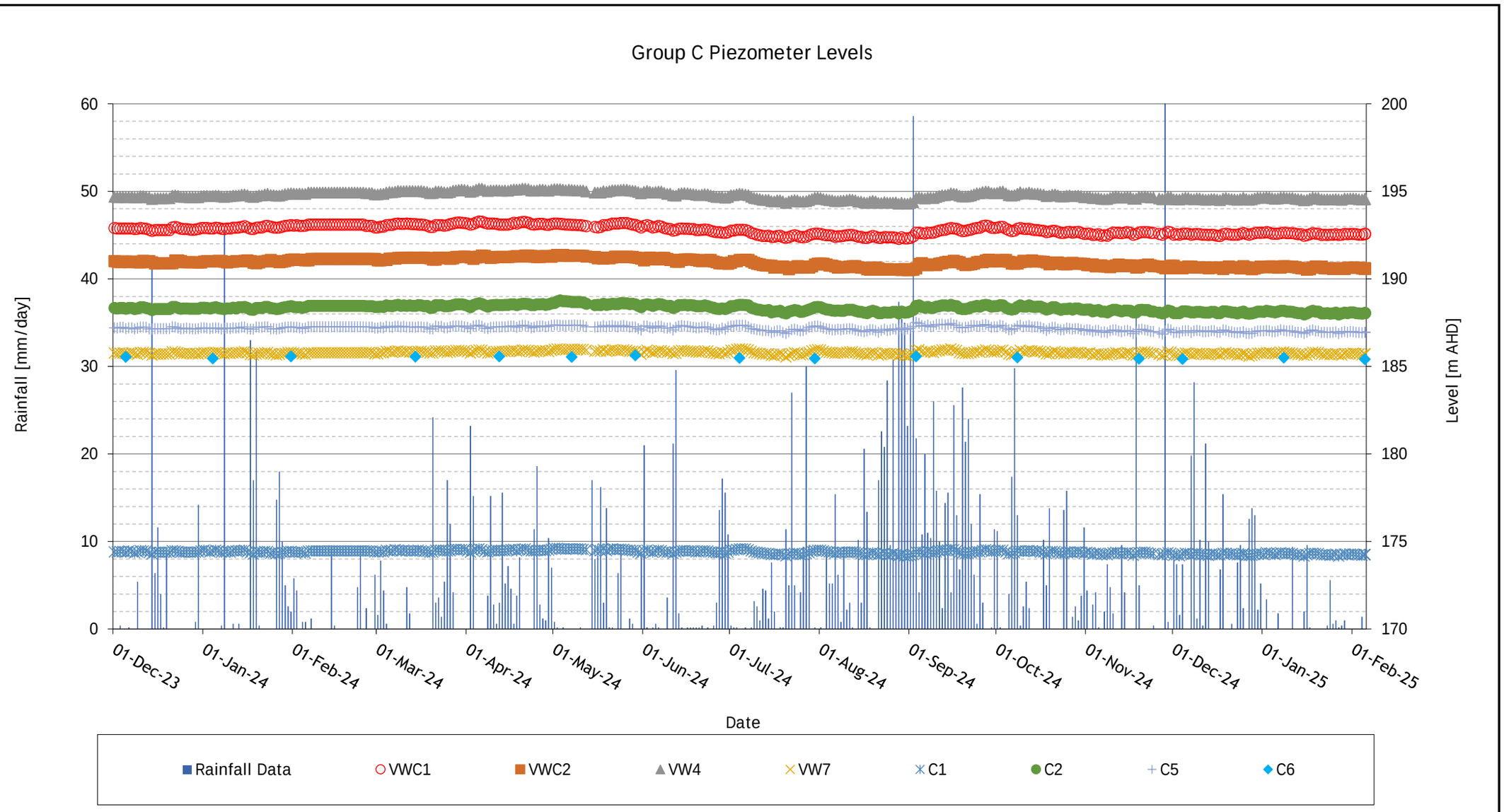
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL TSF - GROUP B PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 10**



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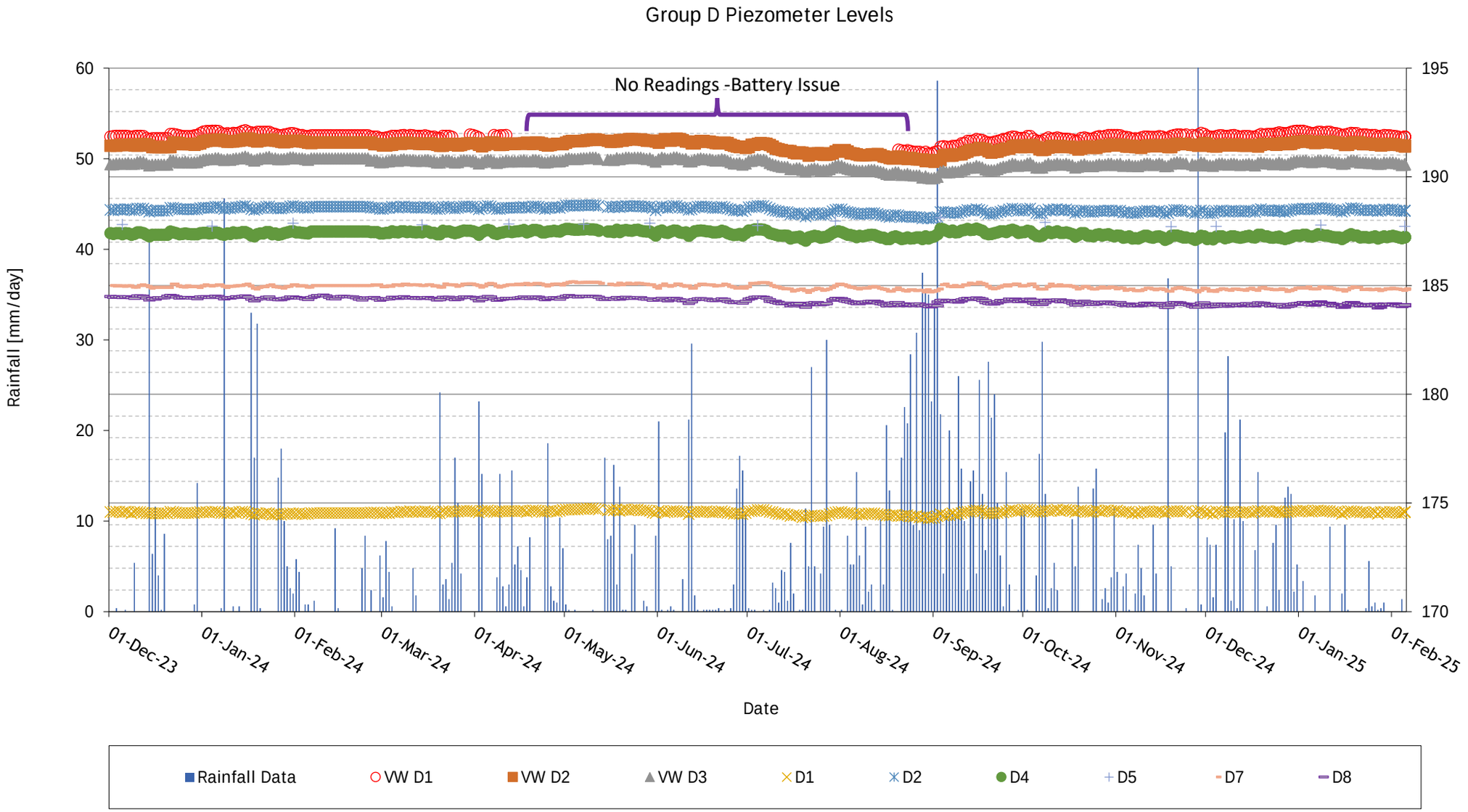
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL TSF - GROUP C PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 11**



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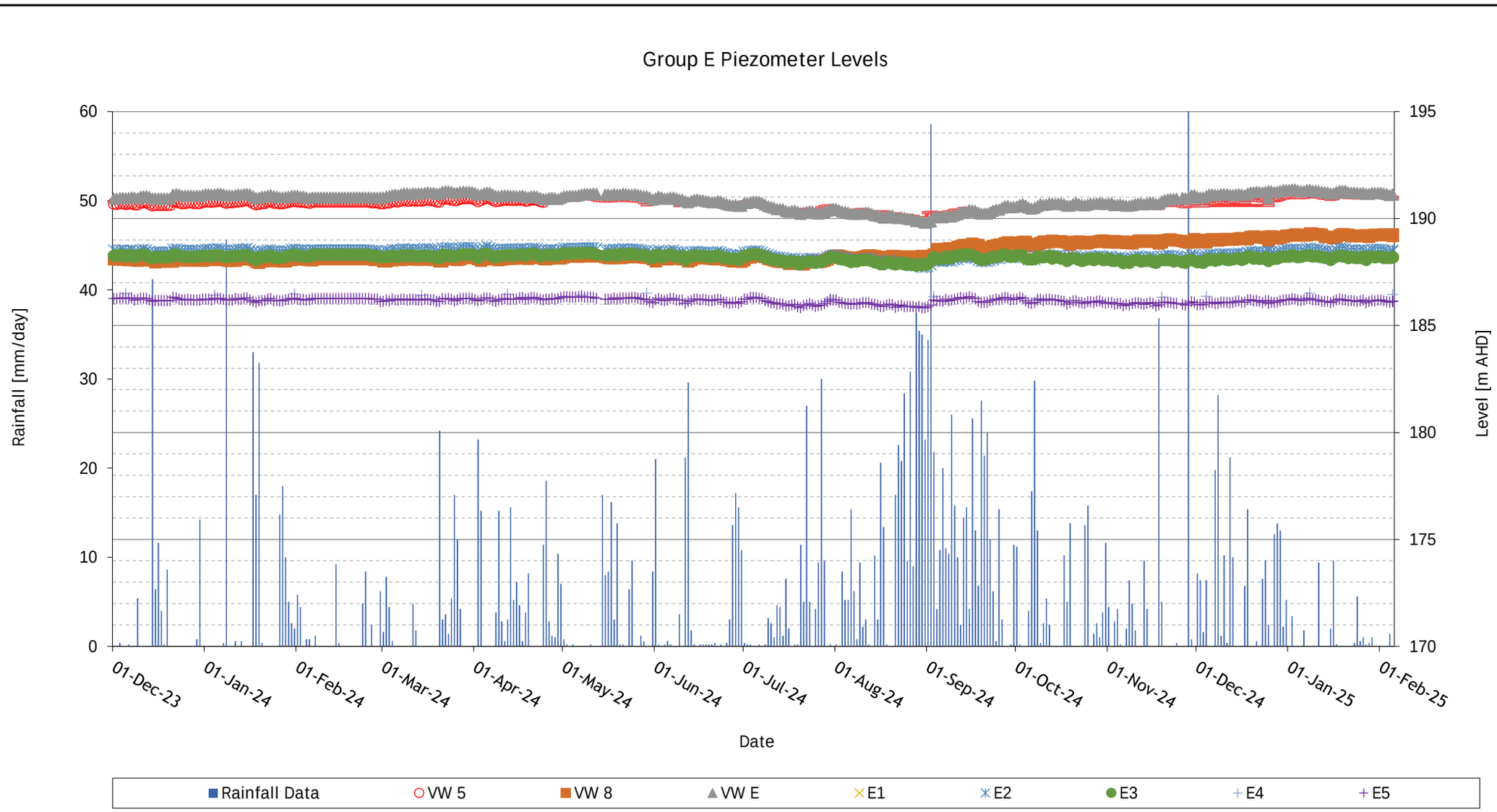
2024 EOR INSPECTION

BOBADIL TSF - GROUP D PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date: 9/07/2025 **Job No:** 107031.126

FIGURE 12



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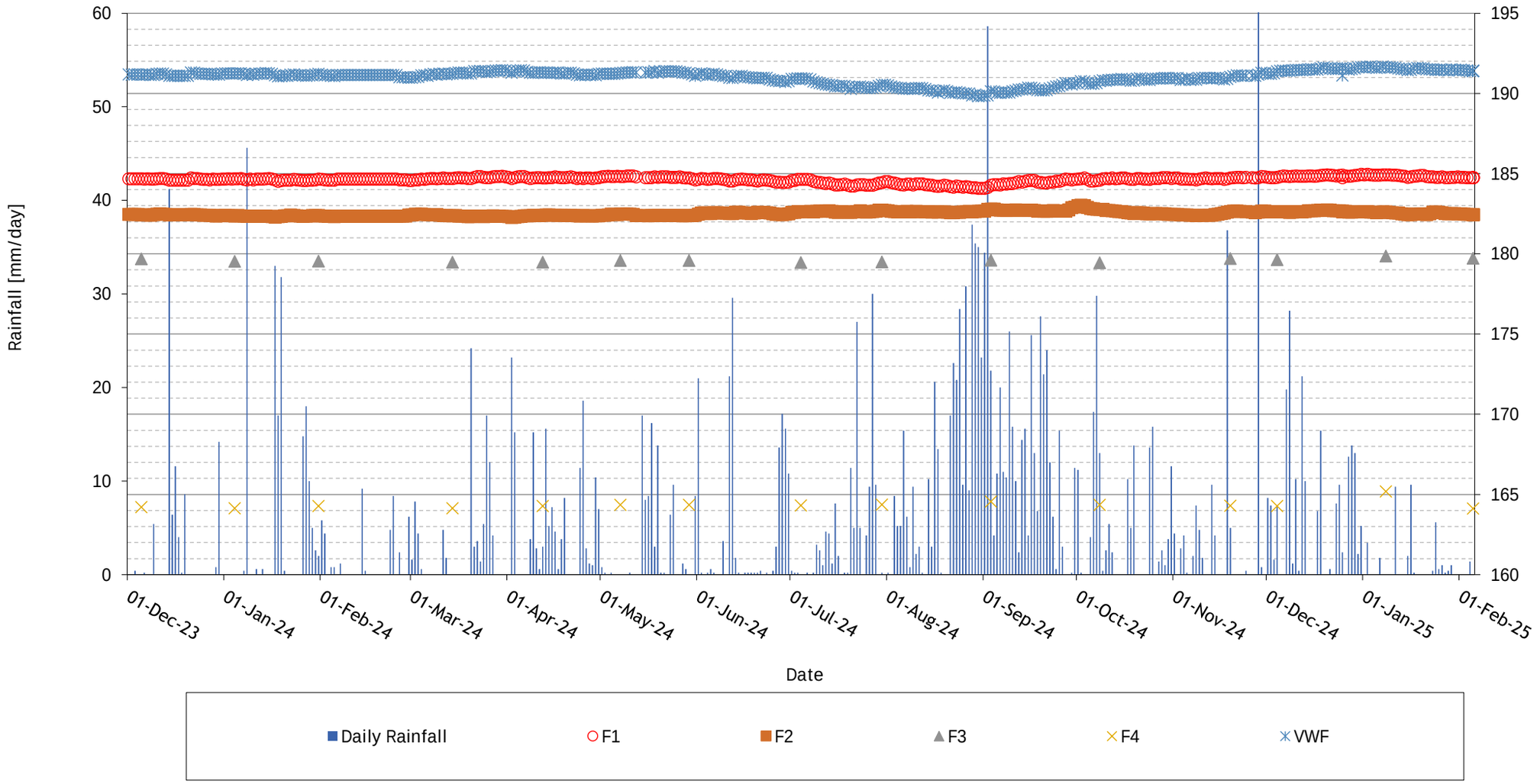
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL TSF - GROUP E PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 13**



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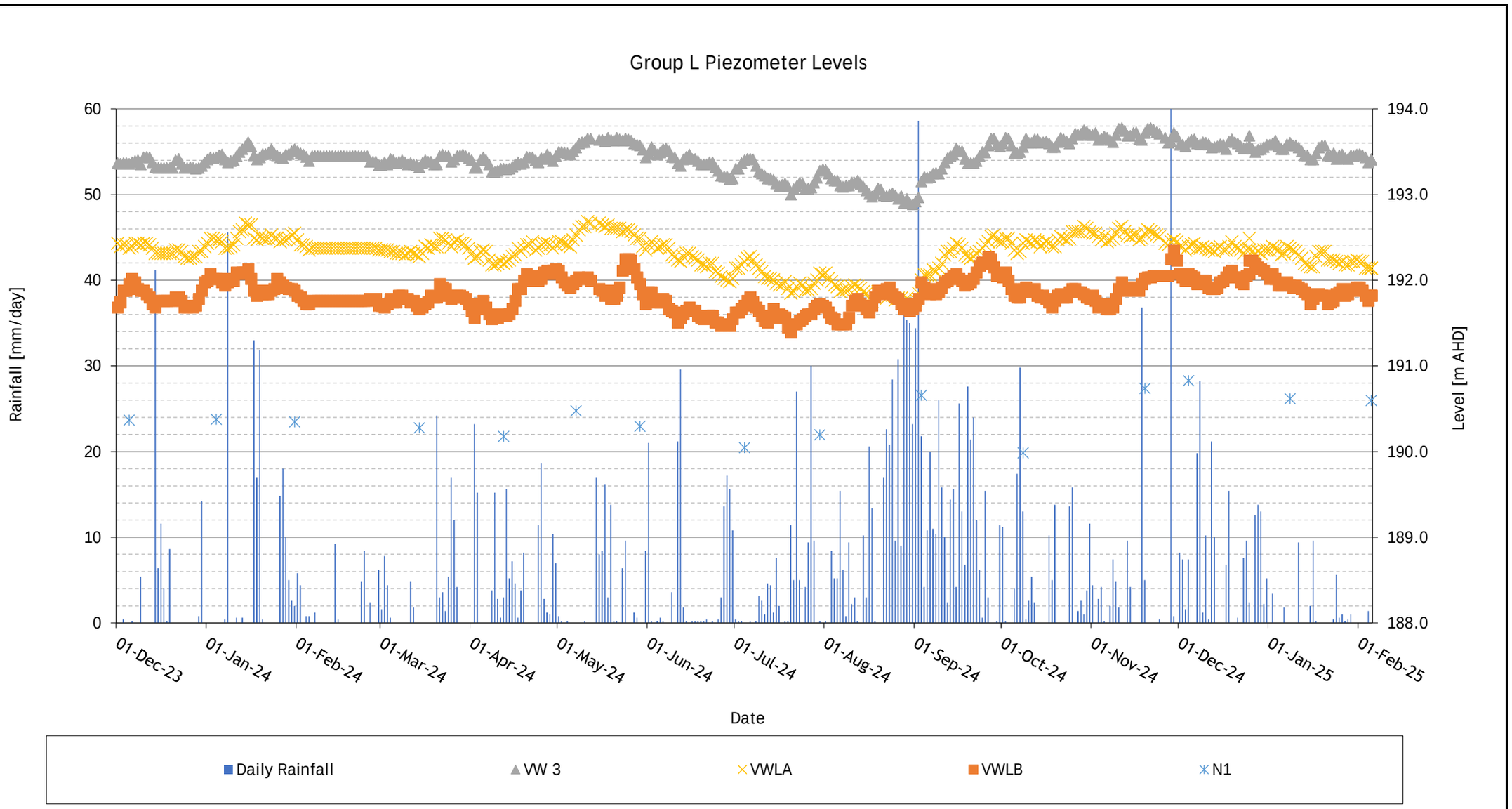
MMG ROSEBERY MINE

2024 EOR INSPECTION

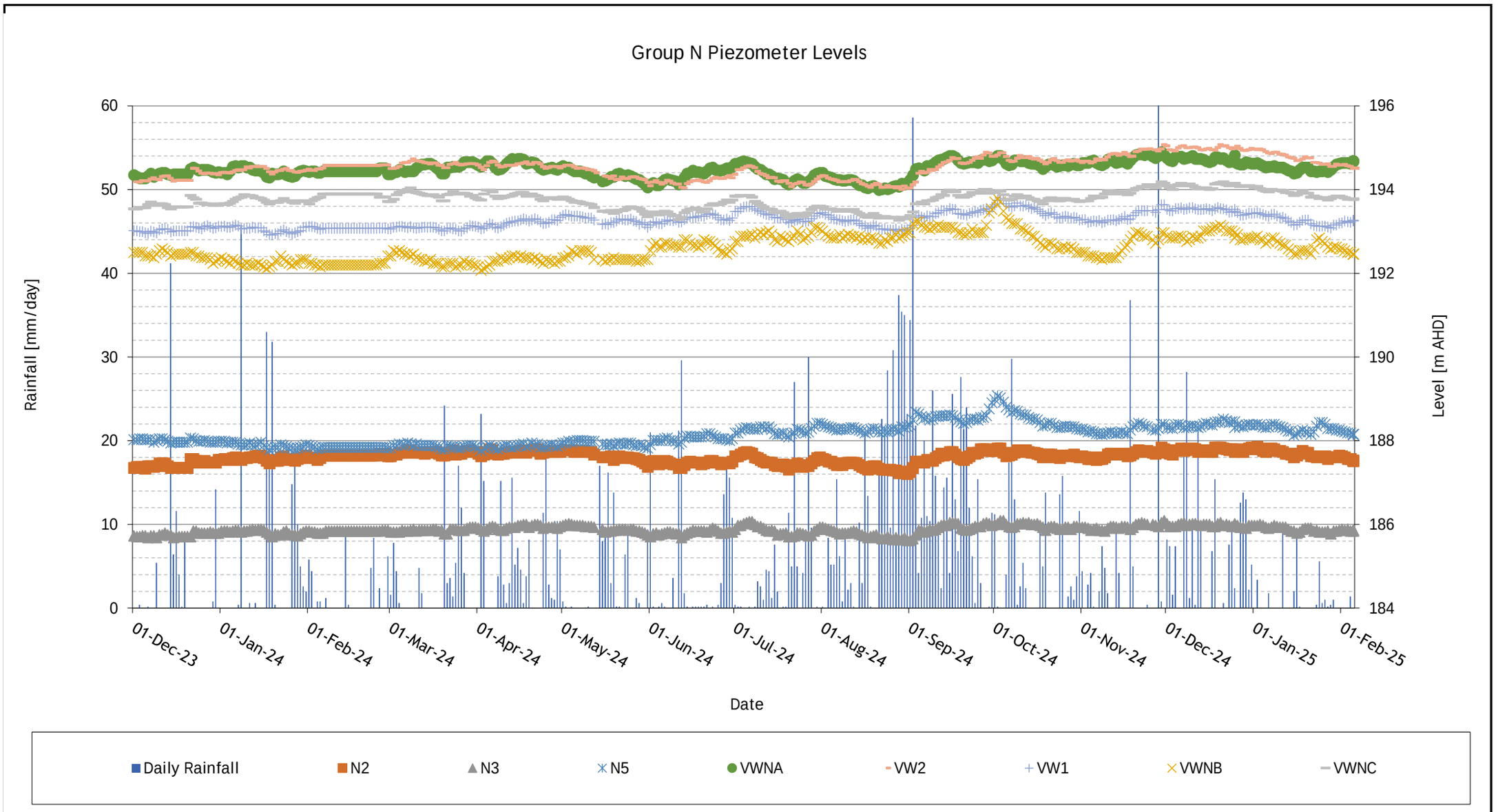
BOBADIL TSF - GROUP F PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 14**



ATC WILLIAMS www.atcwilliams.com.au	**MMG ROSEBERY MINE** **2024 EOR INSPECTION** **BOBADIL TSF - GROUP L PIEZOMETER LEVELS** **DECEMBER 2023 - FEBRUARY 2025**			
	Date:	9/07/2025	**Job No:**	107031.126
	FIGURE 15			



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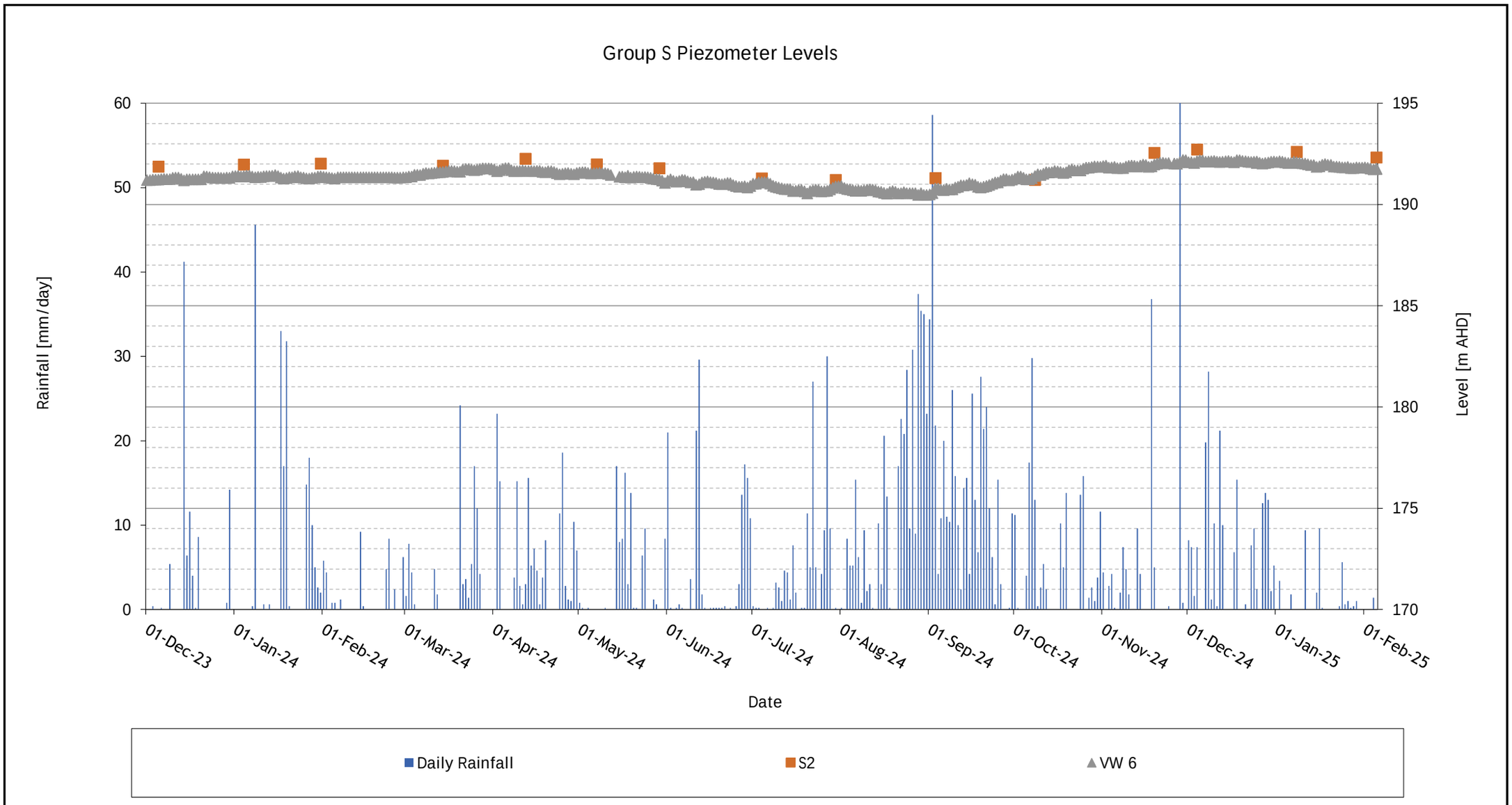
2024 EOR INSPECTION

BOBADIL TSF - GROUP N PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date: 9/07/2025 **Job No:** 107031.126

FIGURE 16



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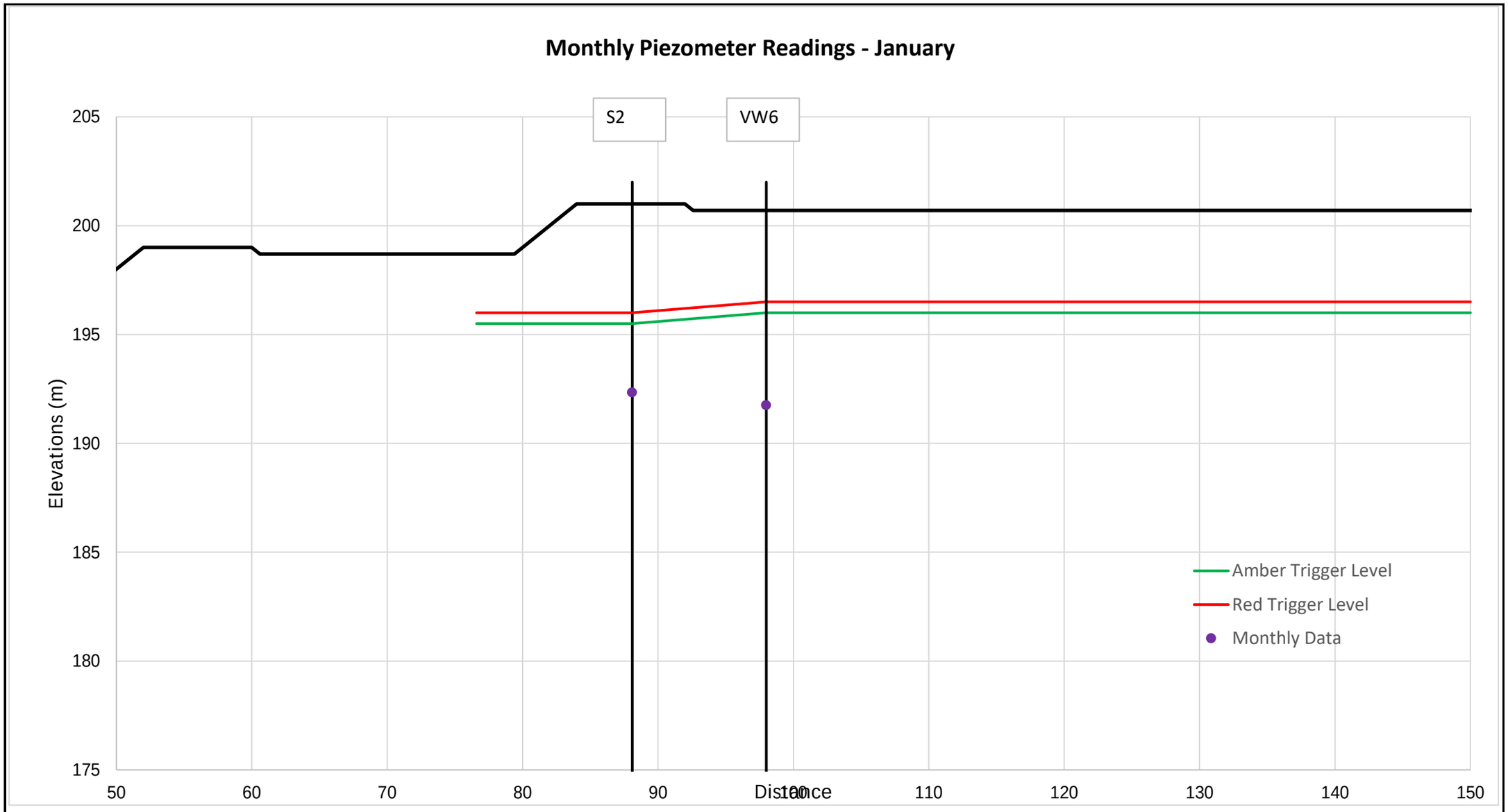
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL TSF - GROUP S PIEZOMETER LEVELS

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 17**



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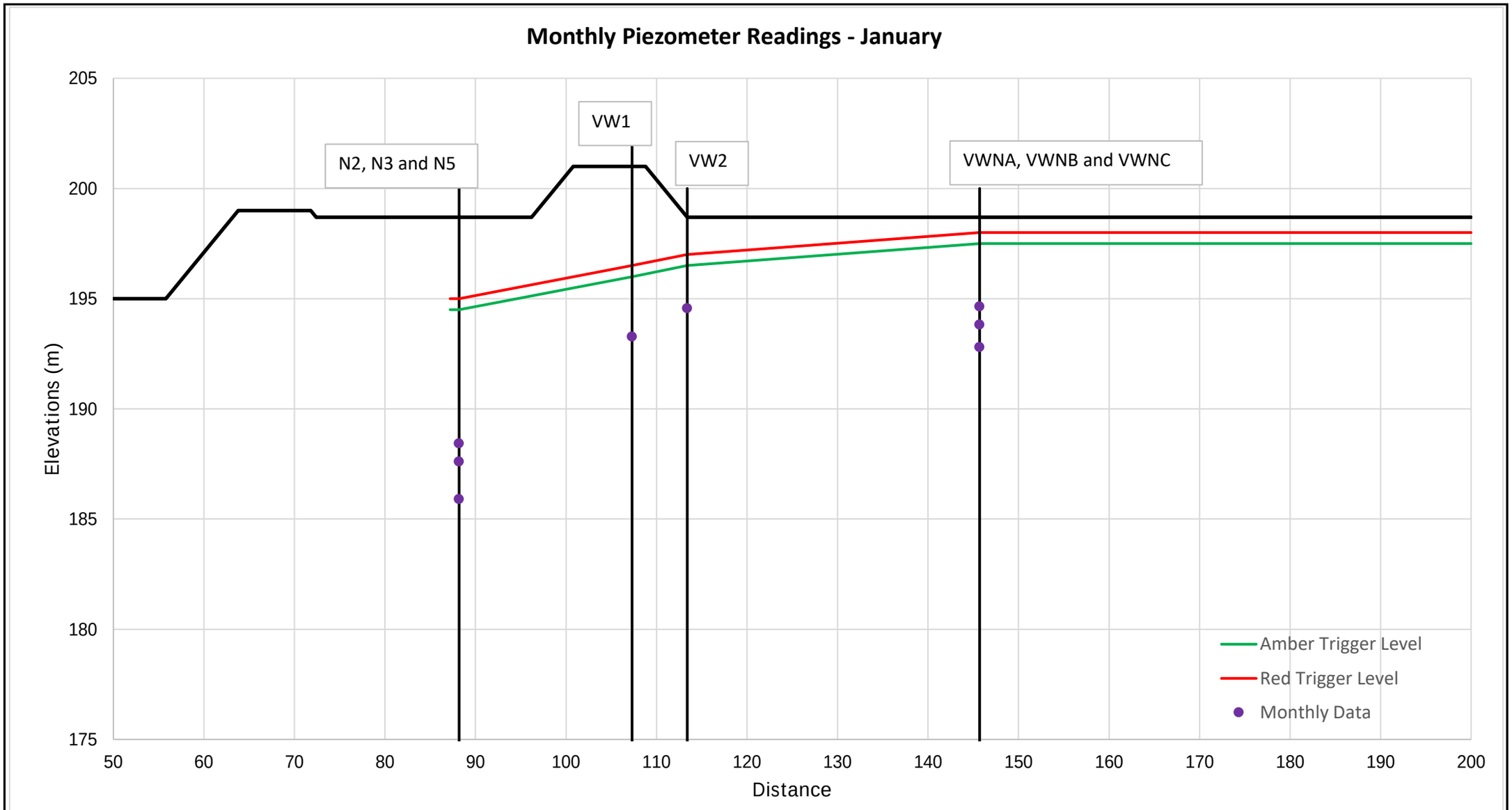
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP S PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 18**



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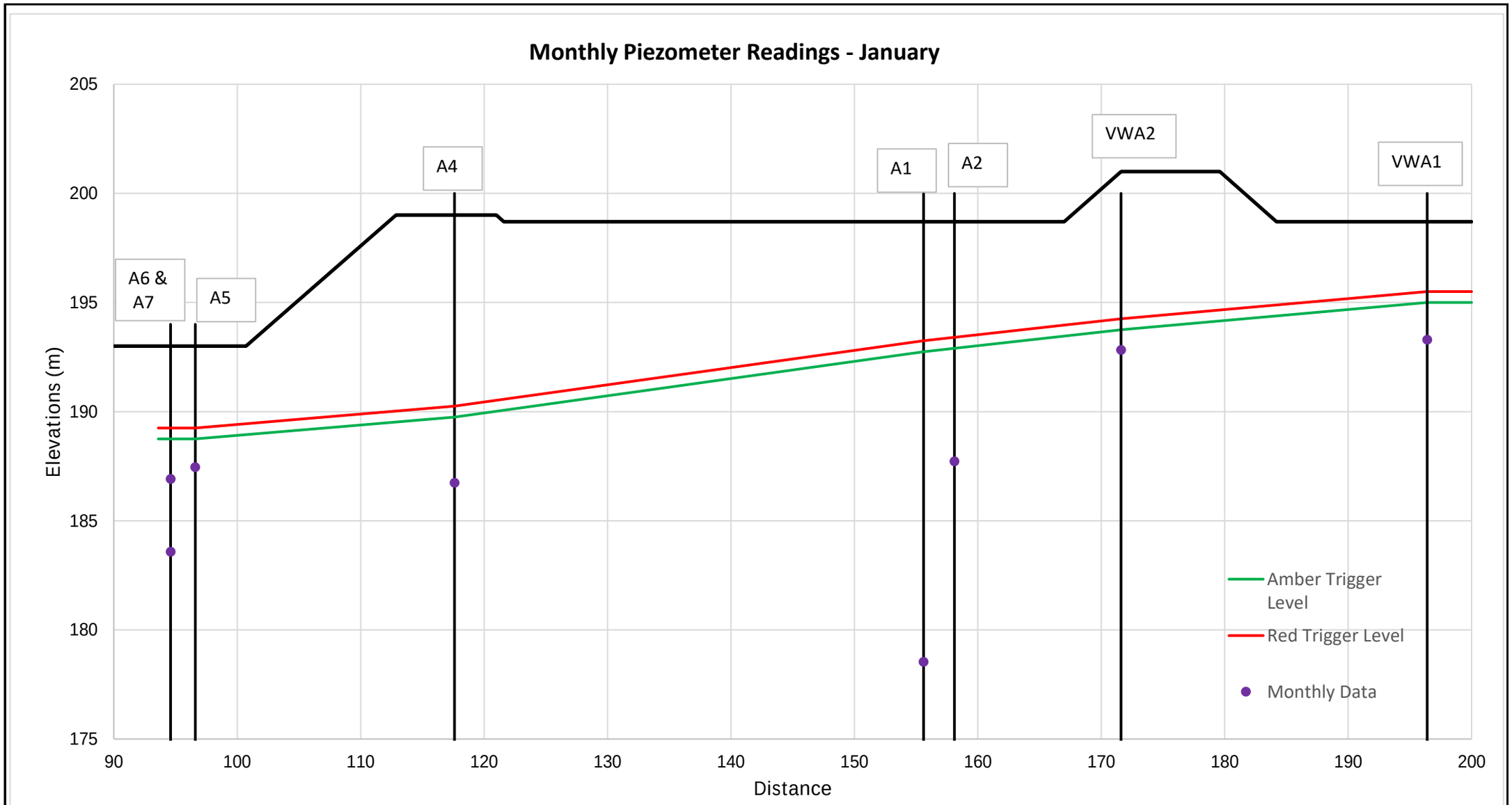
BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP N PIEZOMETER LEVELS

Date: 27/08/2025 **Job No:** 240479

FIGURE 19



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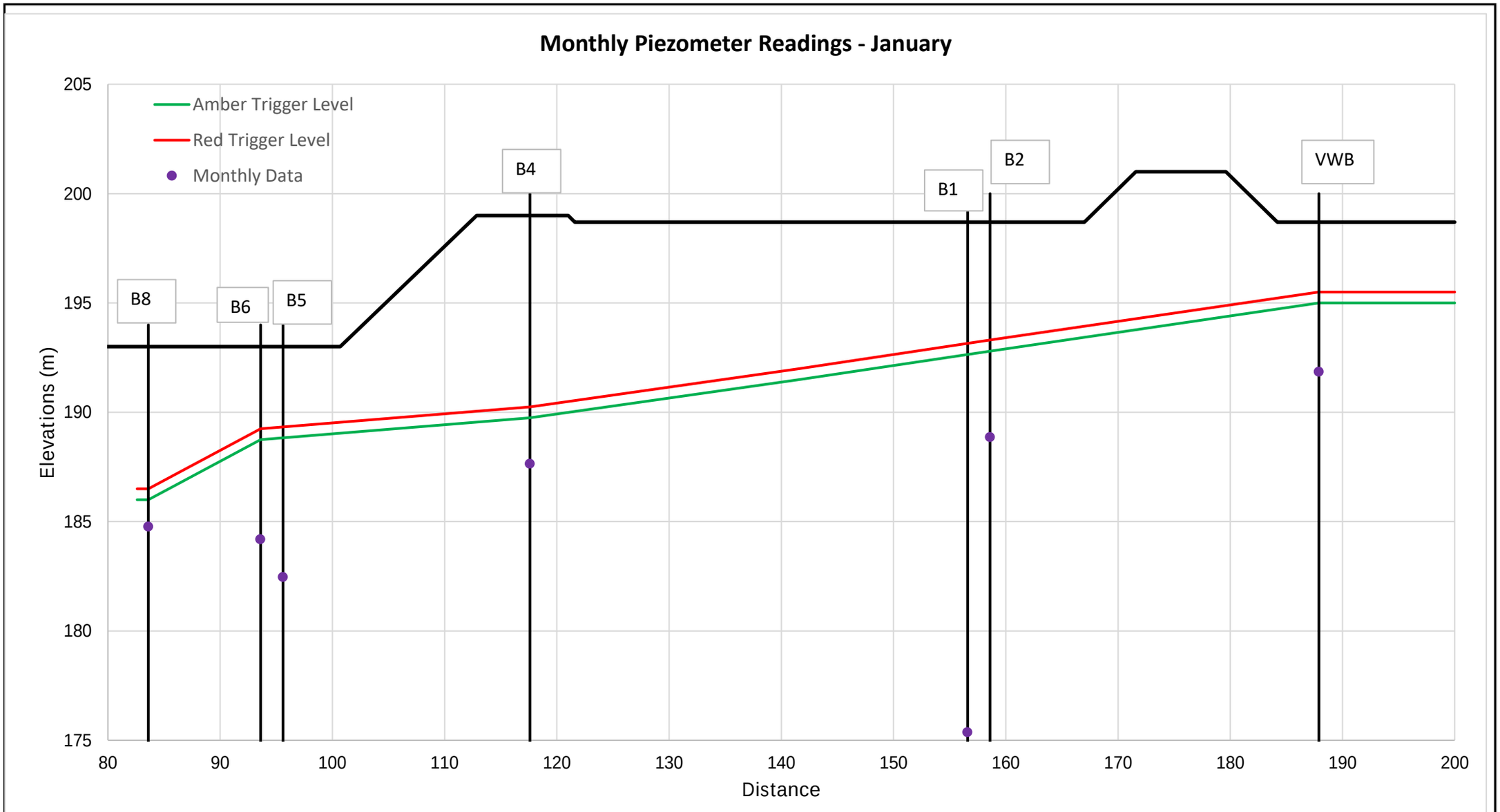
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP A PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 20**



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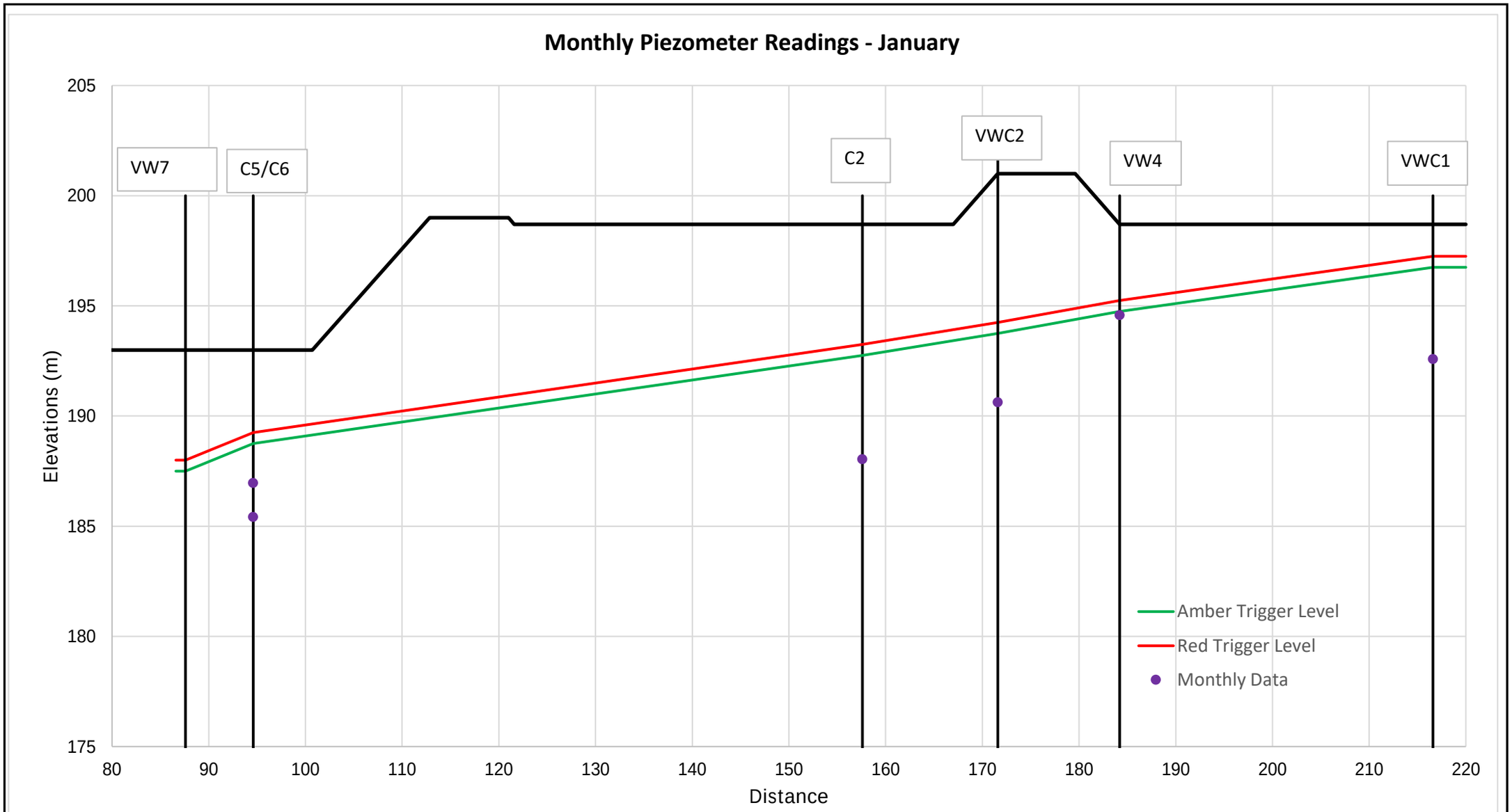
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP B PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 21**



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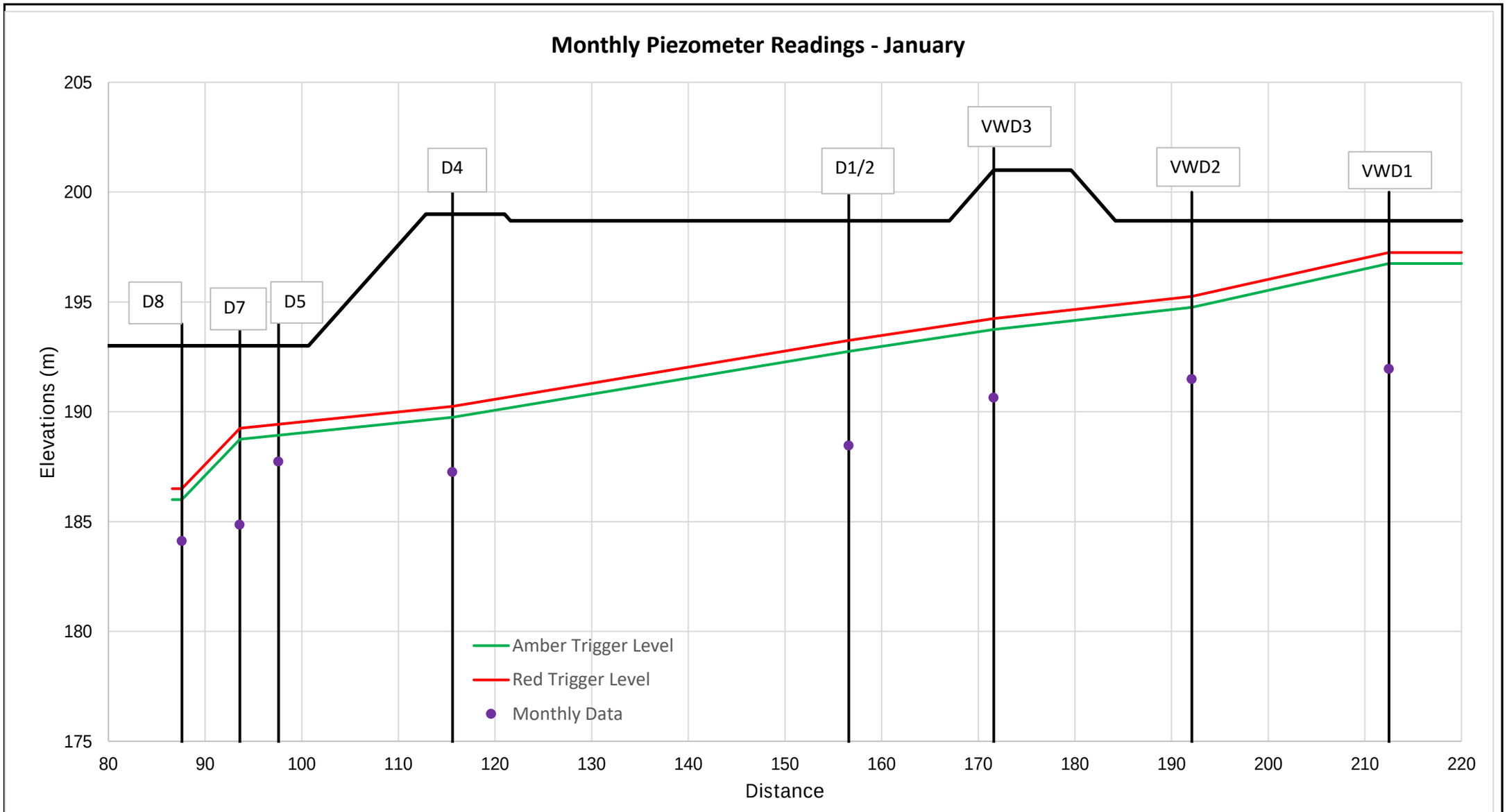
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP C PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 22**



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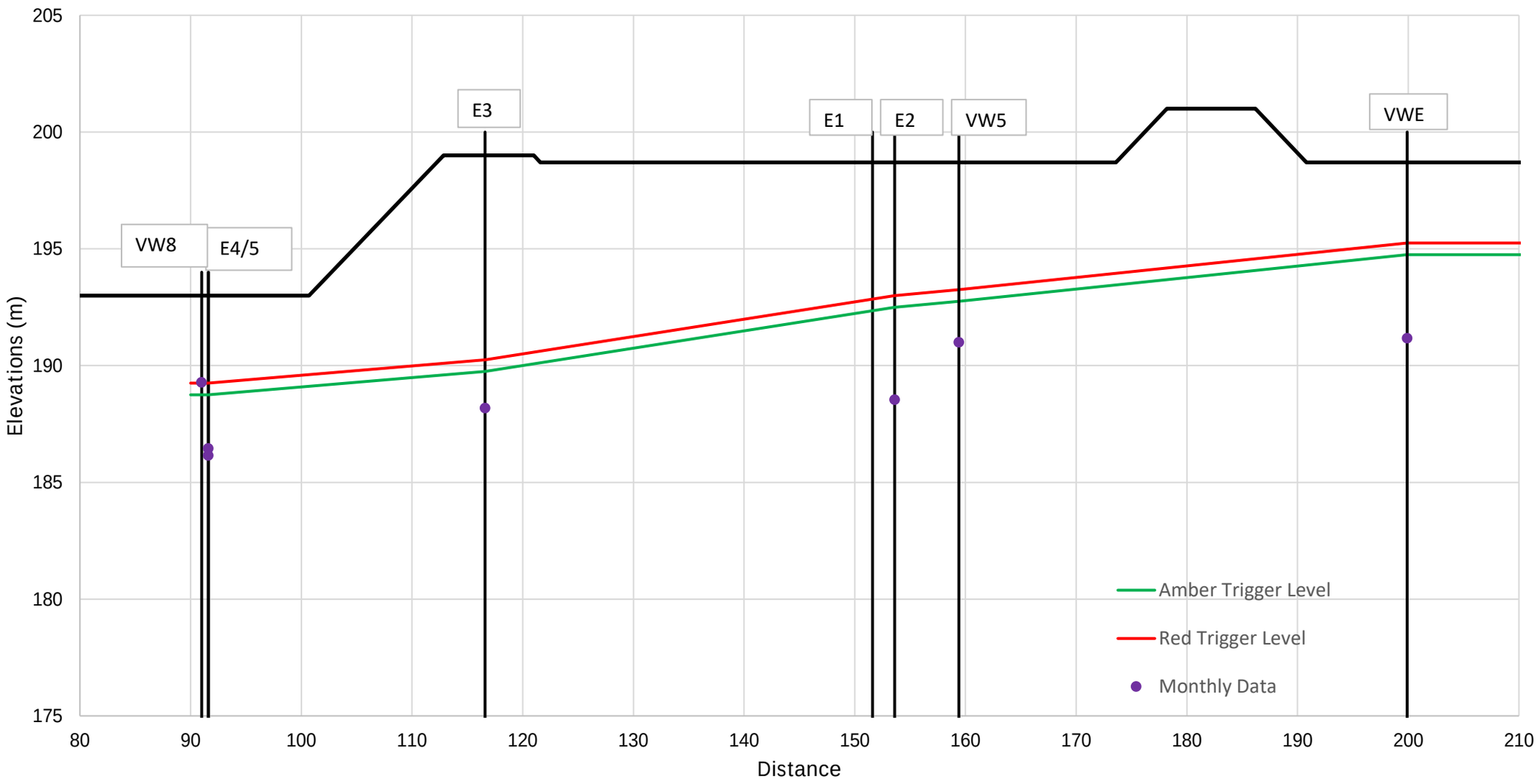
BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP D PIEZOMETER LEVELS

Date: 27/08/2025 **Job No:** 240479

FIGURE 23



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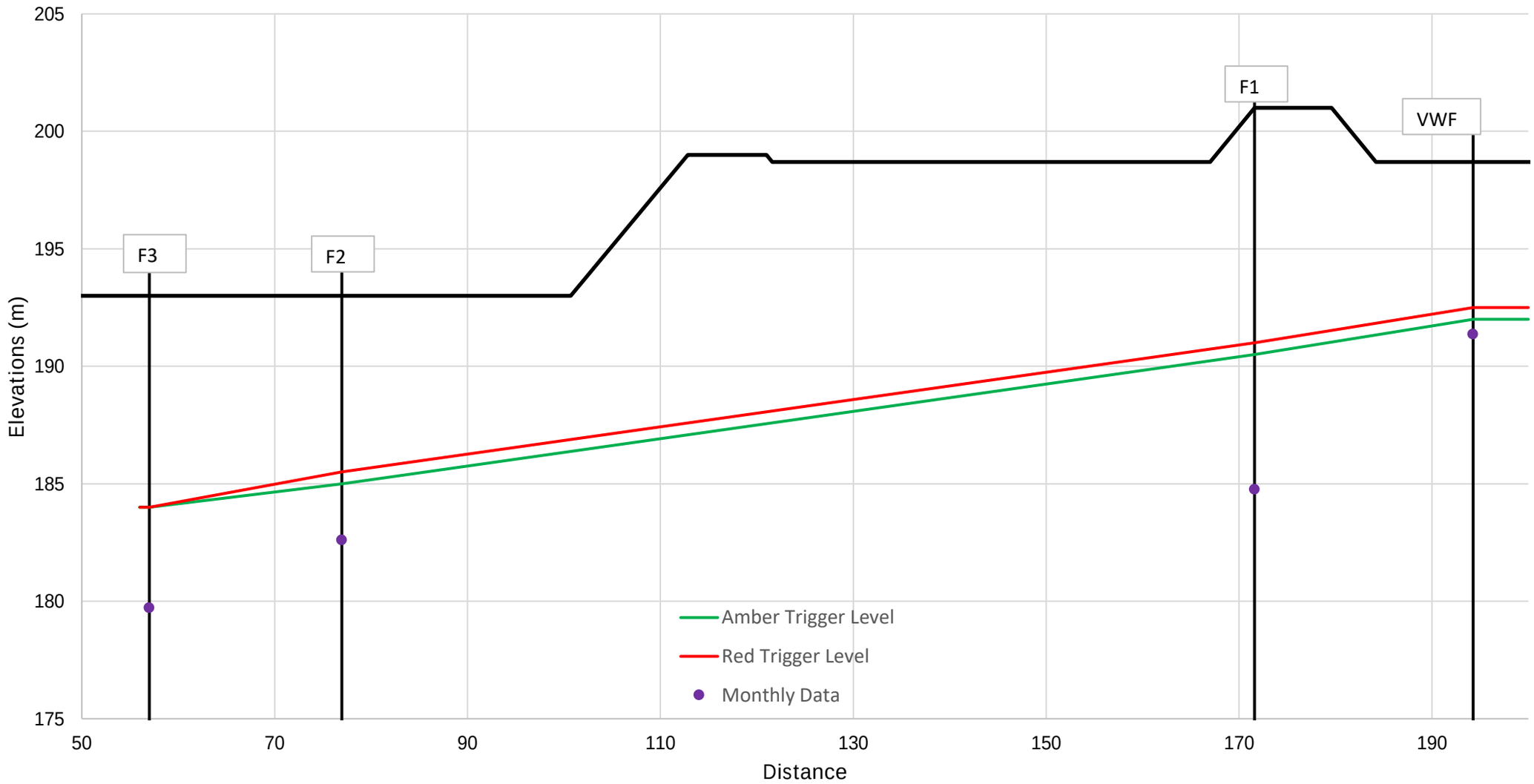
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP E PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 24**



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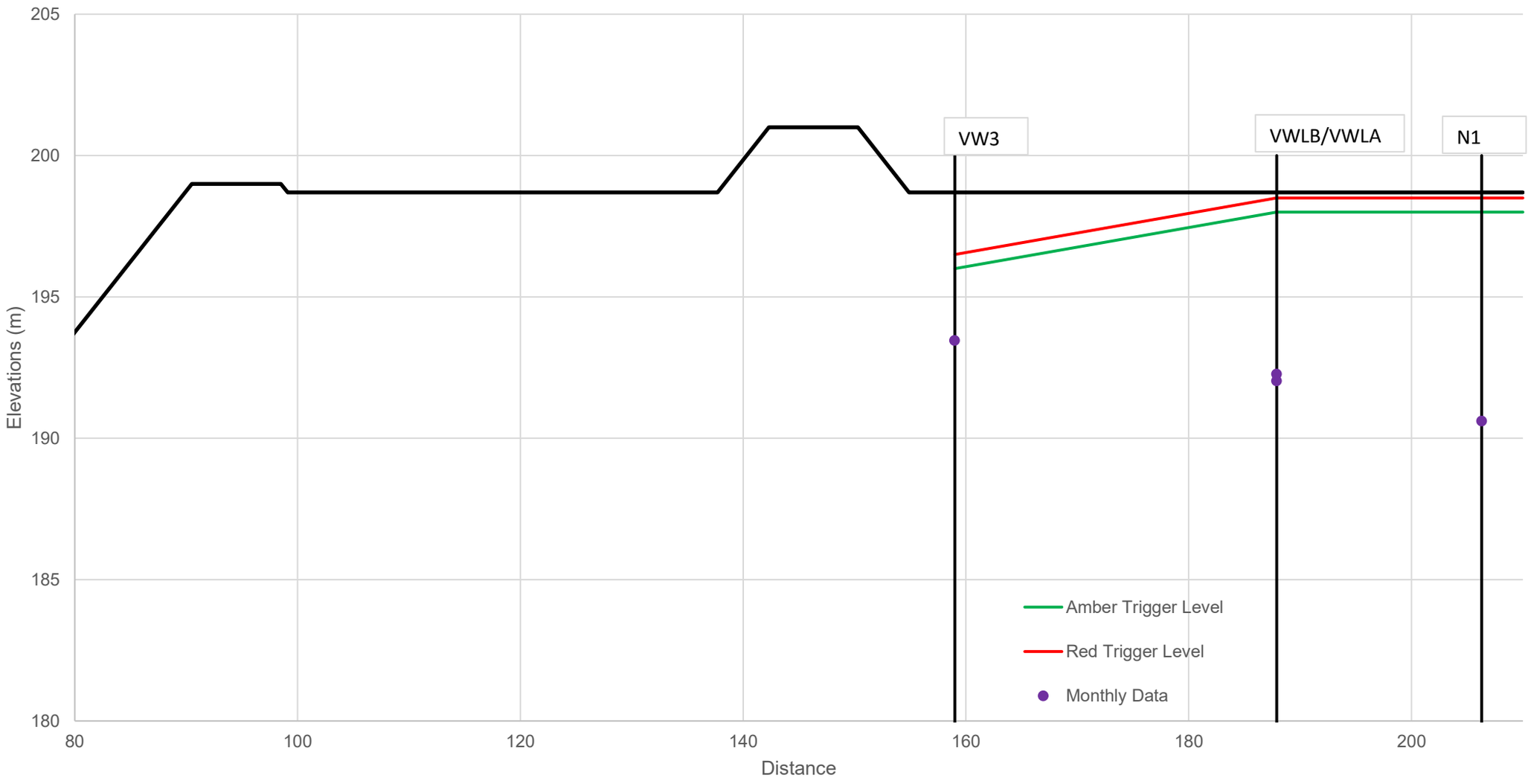
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP F PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 25**



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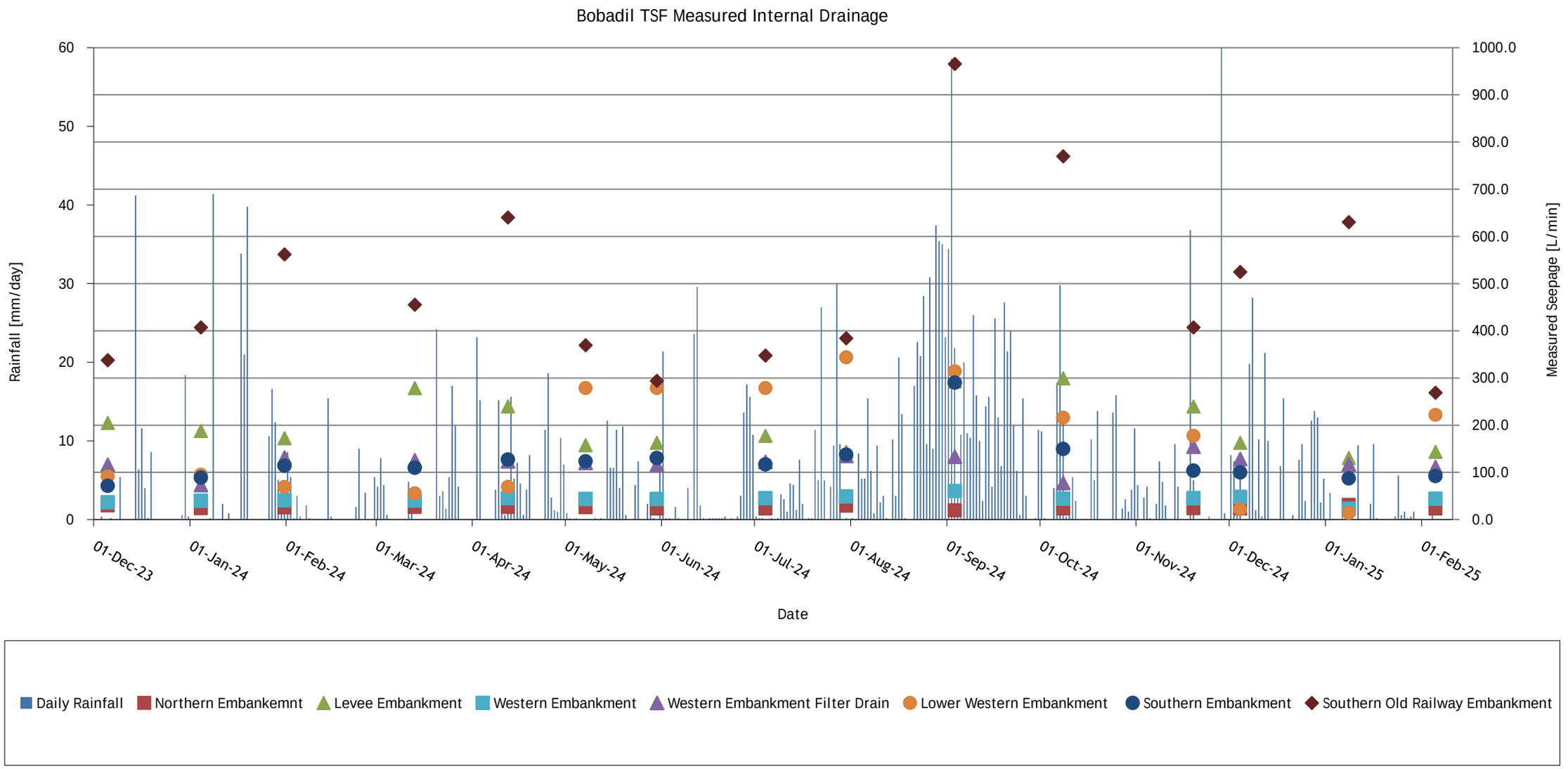
MMG ROSEBERY MINE

BOBADIL TSF

MONTHLY AUDIT 2025

BOBADIL TSF - GROUP L PIEZOMETER LEVELS

Date:	27/08/2025	**Job No:**	240479	**FIGURE 26**



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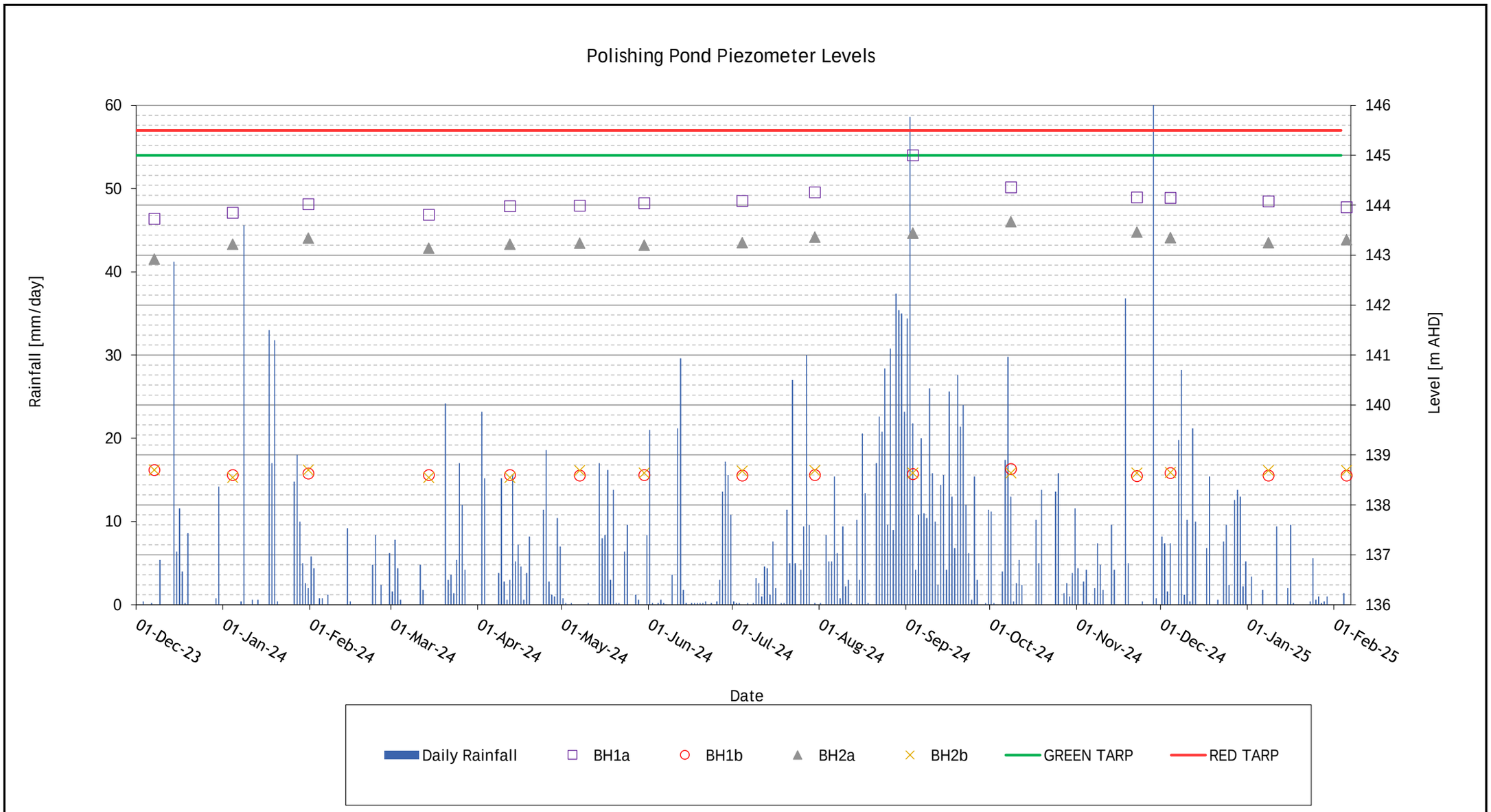
2024 EOR INSPECTION

BOBADIL TSF - MEASURED INTERNAL DRAINAGE DISCHARGE RATES

DECEMBER 2023 - FEBRUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 27**

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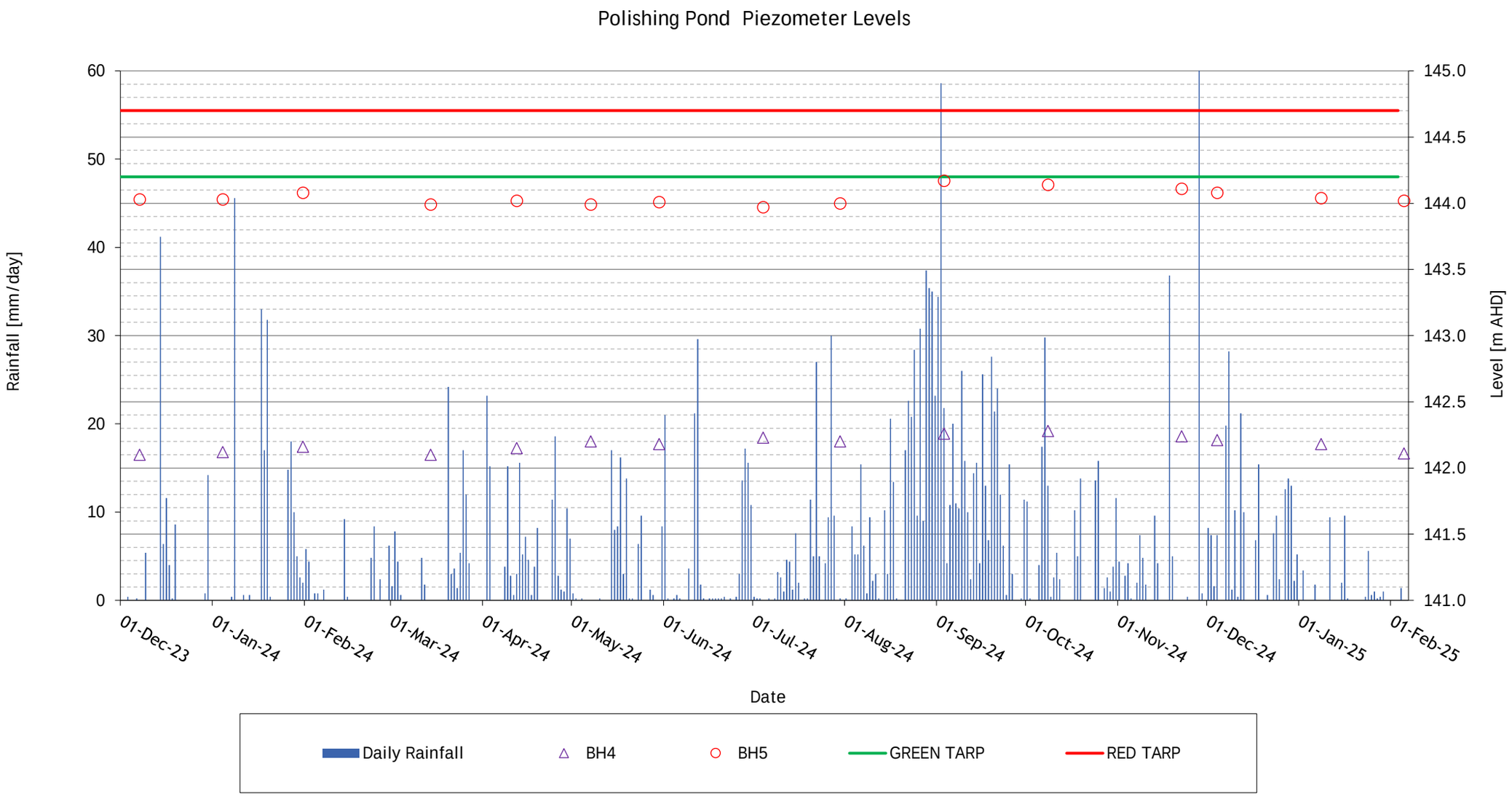
2024 EOR INSPECTION

BOBADIL POLISHING POND - EASTERN SECTION

DECEMBER 2023 - JANUARY 2025

Date: 9/07/2025 **Job No:** 107031.126

FIGURE 28



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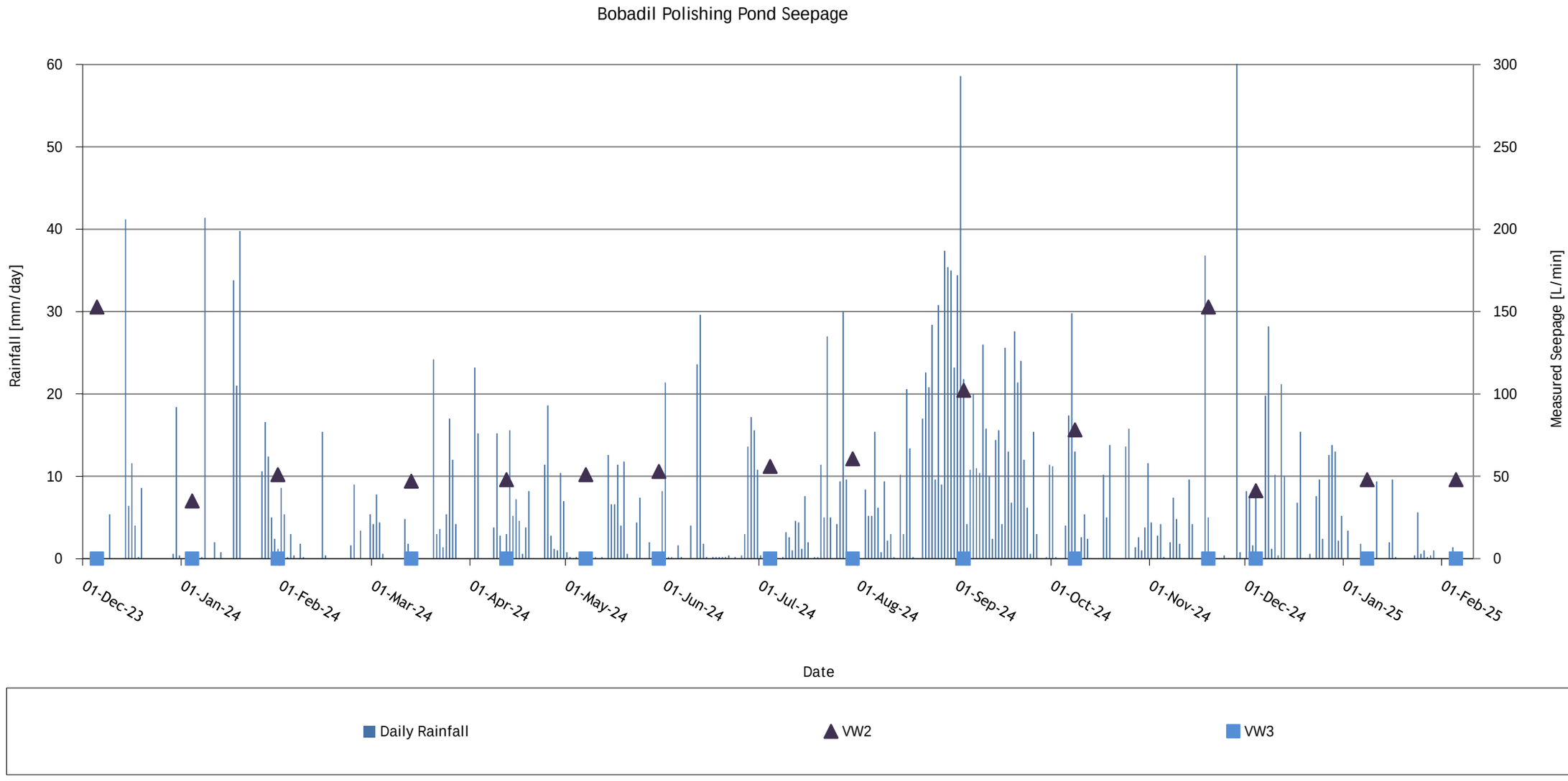
MMG ROSEBERY MINE

2024 EOR INSPECTION

BOBADIL POLISHING POND - WESTERN SECTION

DECEMBER 2023 - JANUARY 2025

Date:	9/07/2025	**Job No:**	107031.126	**FIGURE 29**



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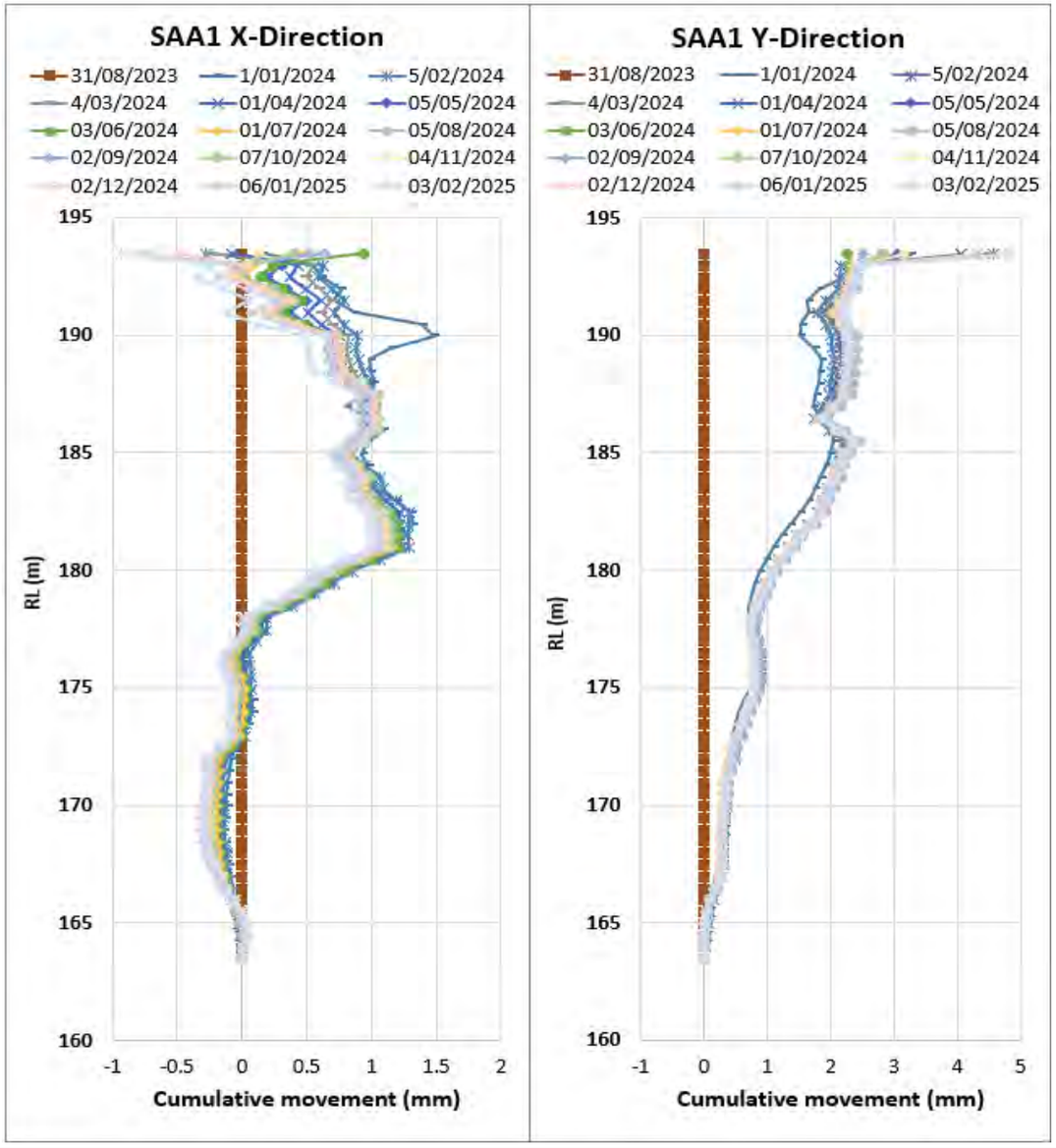
2024 EOR INSPECTION

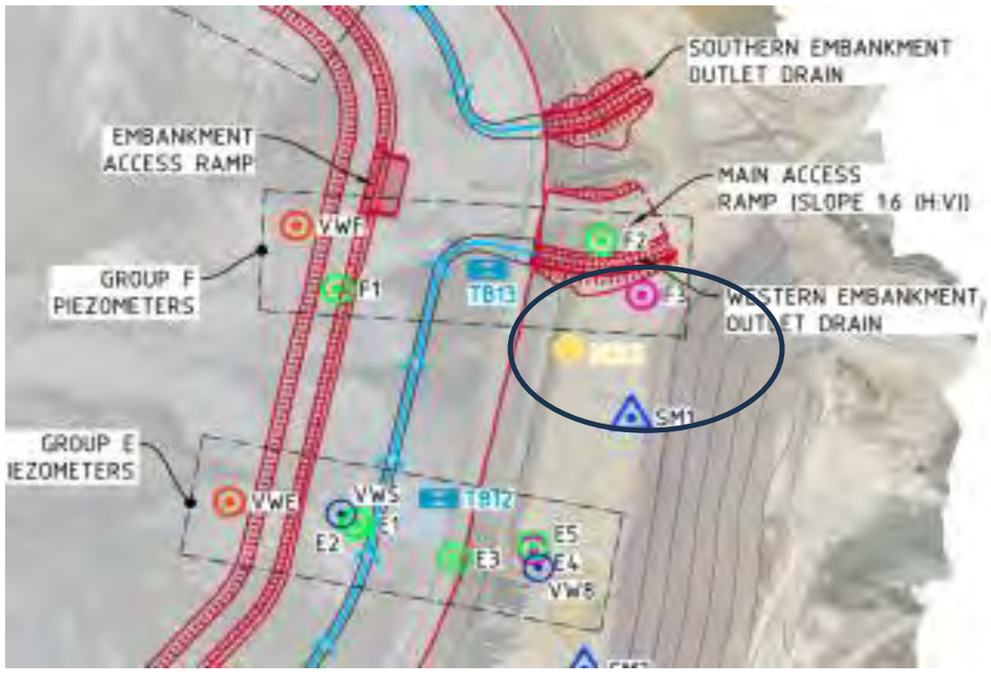
BOBADIL TSF - MEASURED POLISHING POND DISCHARGE RATES

DECEMBER 2023 - FEBRUARY 2025

Date: 9/07/2025	**Job No:** 107031.126	**FIGURE 30**

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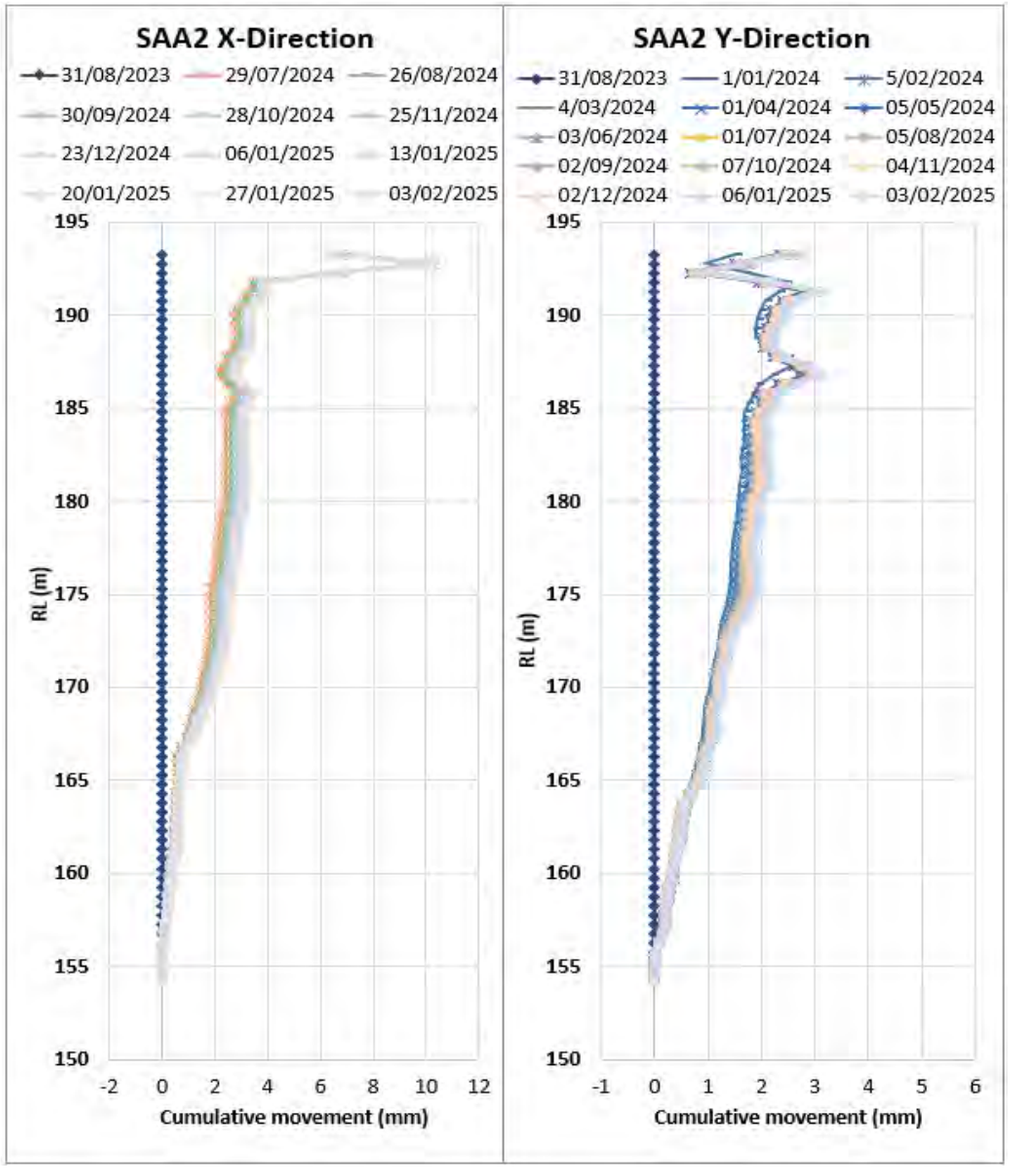
MMG ROSEBERY MINE

2024 EOR INSPECTION

INCLINOMETERS

SAA1 - PROFILE CHANGE

Date: 9/07/2025	**Job No:** 107031.126	**FIGURE 31**





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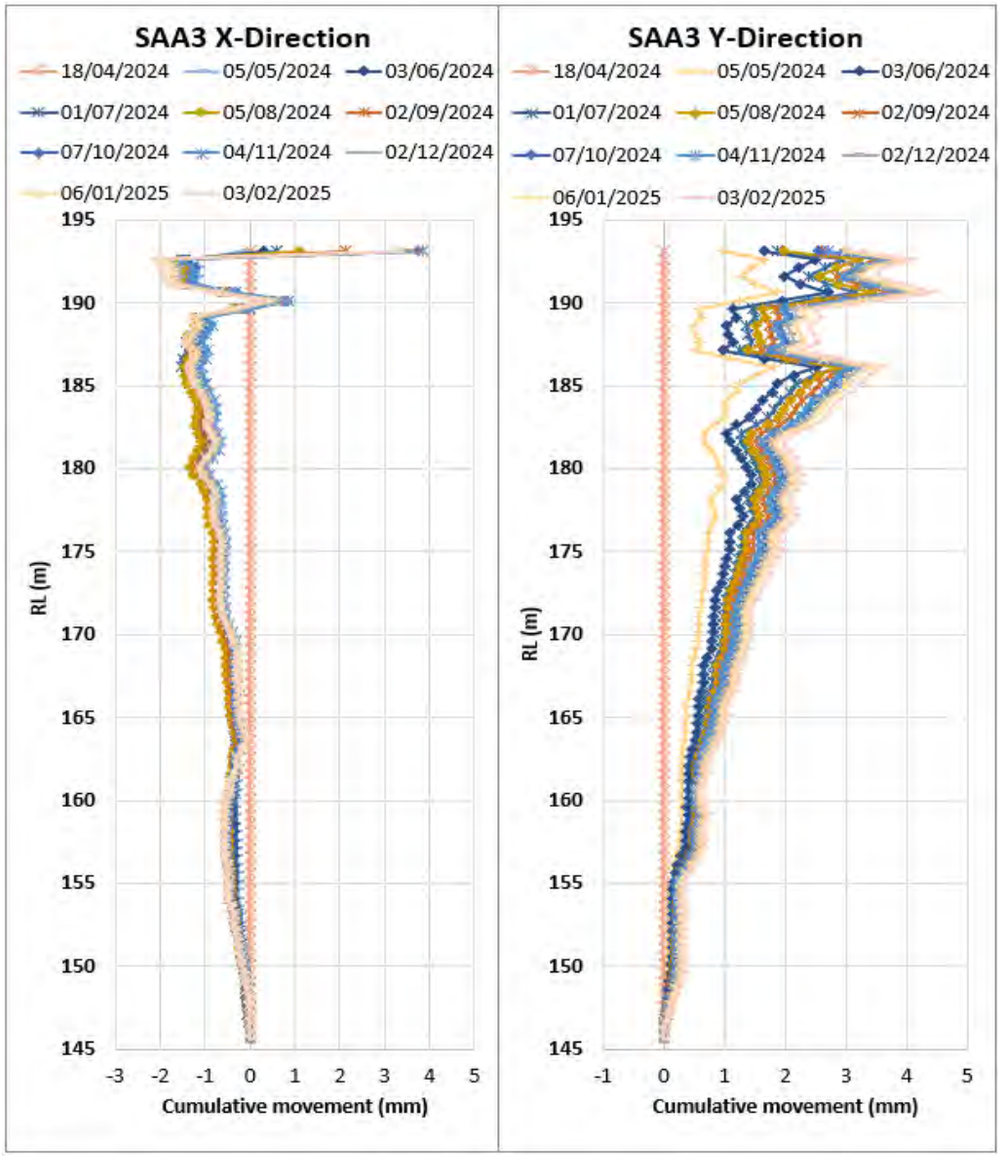
MMG ROSEBERY MINE

2024 EOR INSPECTION

INCLINOMETERS

SAA2 - PROFILE CHANGE

Date: 9/07/2025	**Job No:** 107031.126	**FIGURE 32**





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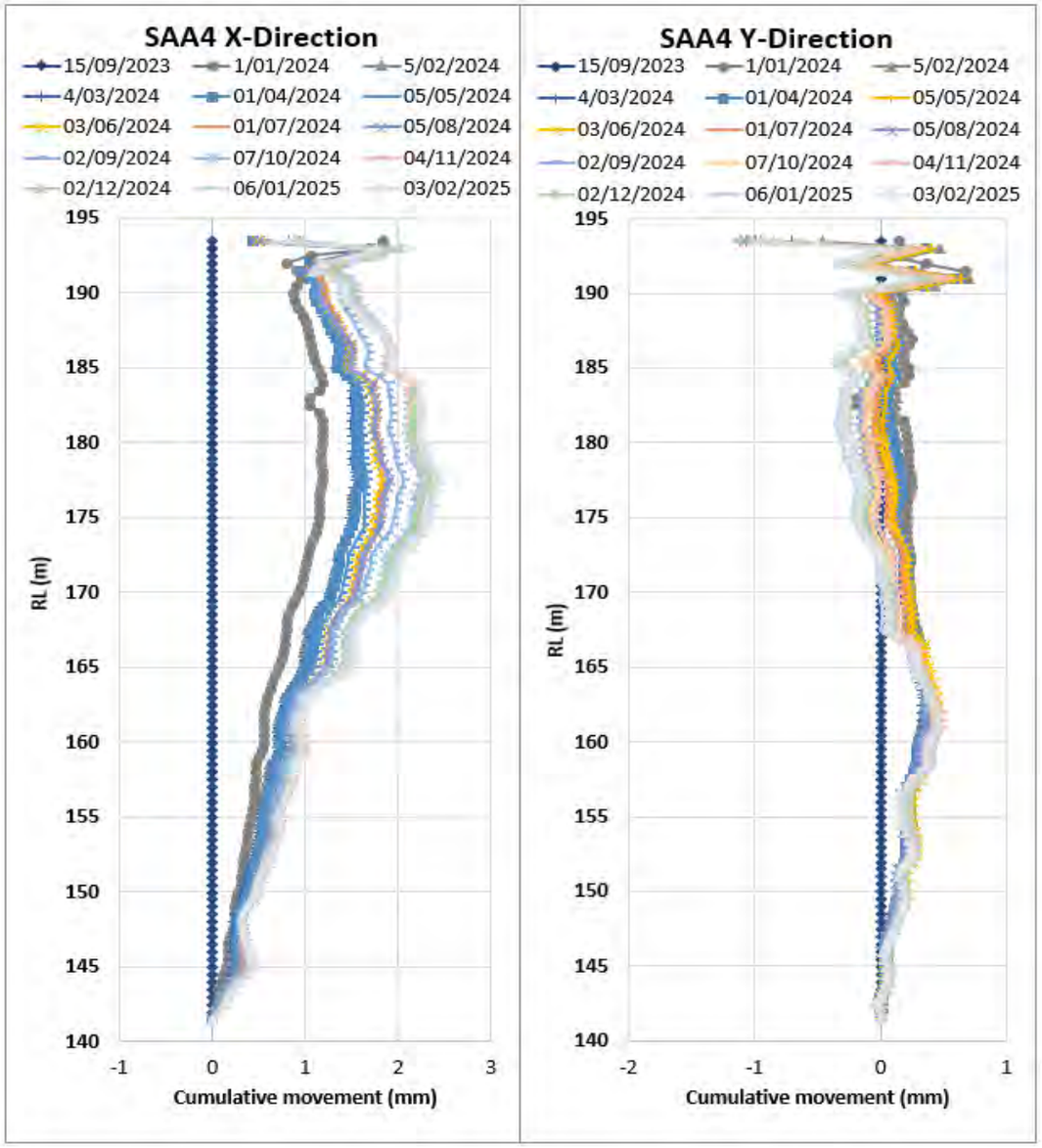
MMG ROSEBERY MINE

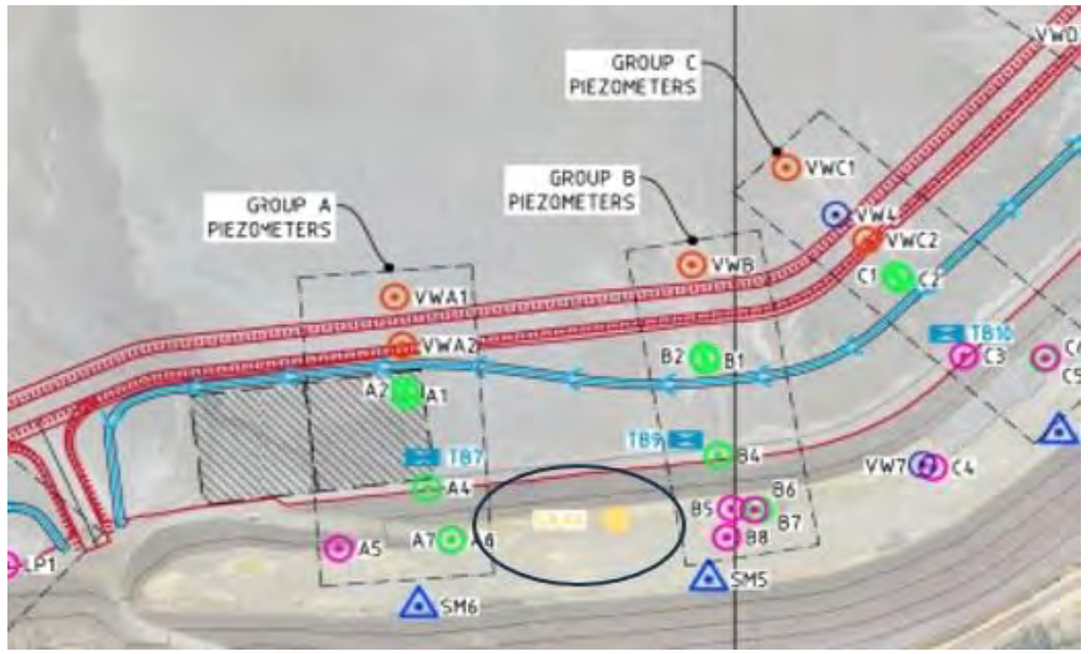
2024 EOR INSPECTION

INCLINOMETERS

SAA3 - PROFILE CHANGE

Date: 9/07/2025	**Job No:** 107031.126	**FIGURE 32**





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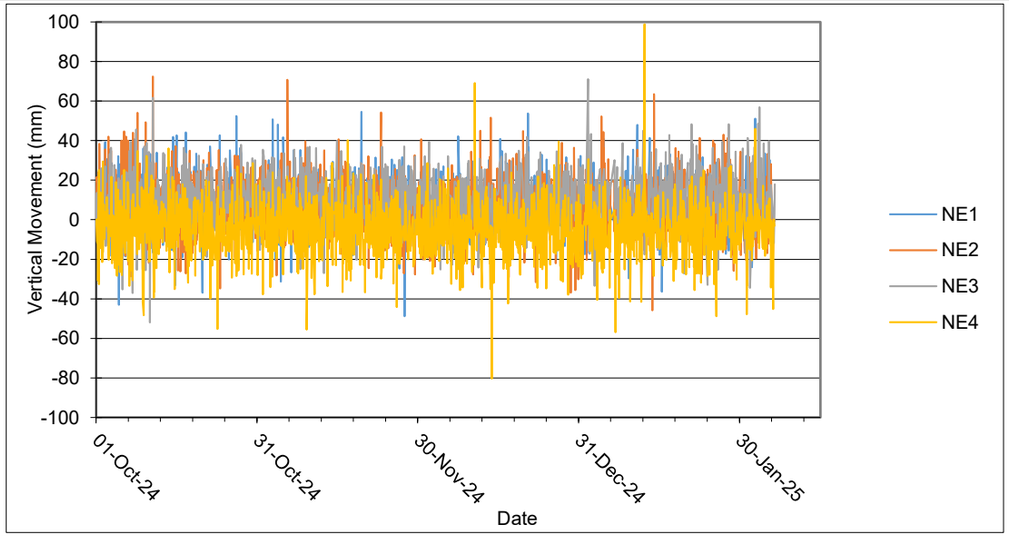
MMG ROSEBERY MINE

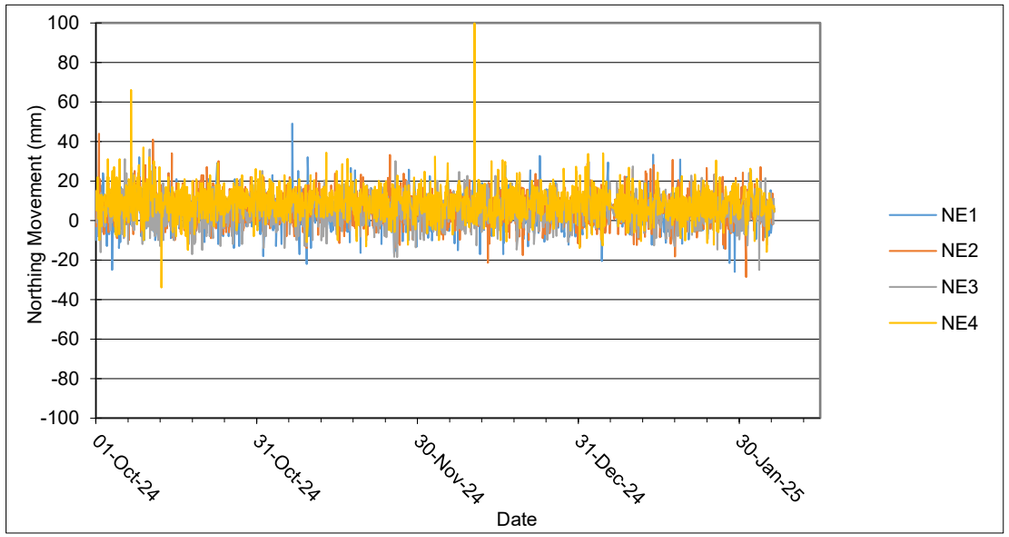
2024 EOR INSPECTION

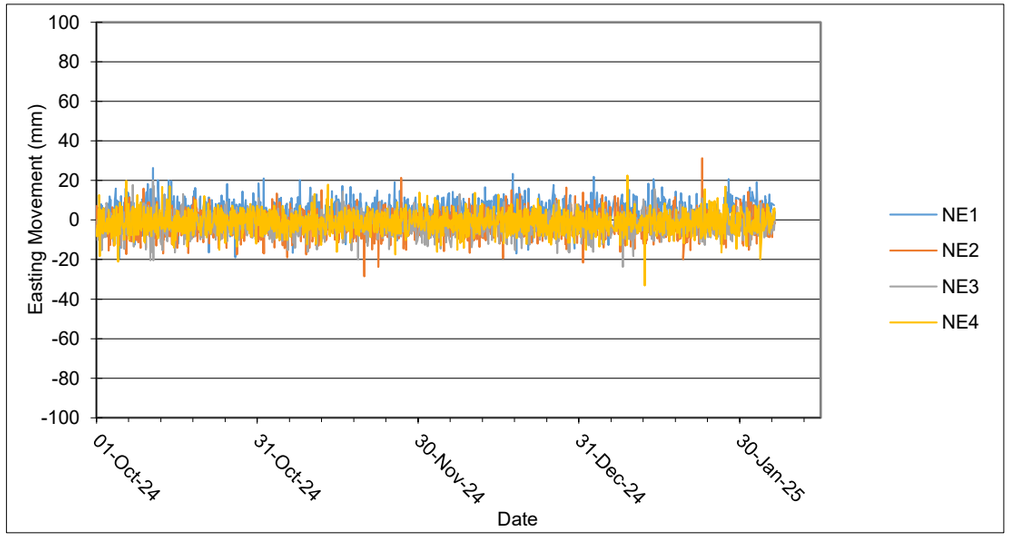
INCLINOMETERS

SAA4 - PROFILE CHANGE

Date:	9/07/2025	Job No:	107031.126	FIGURE 34







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2025 MONTHLY INSPECTION

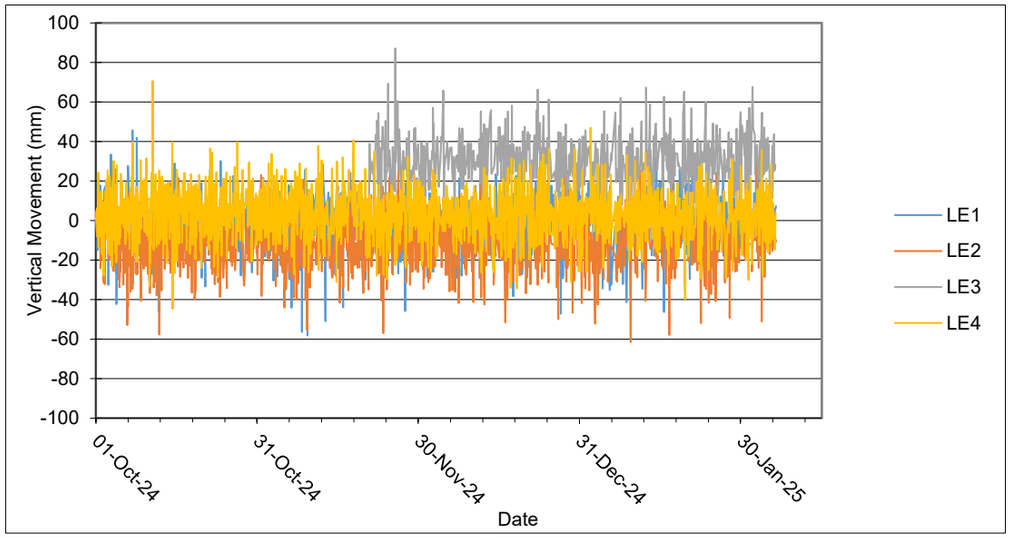
BOBADIL TSF - MOVEMENT MONITORS

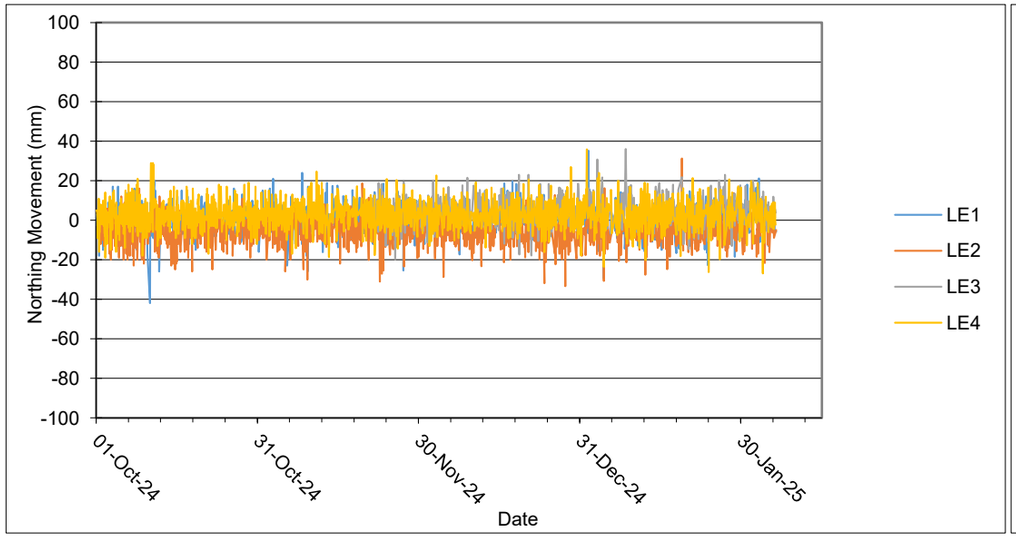
MOVEMENT MONITORS - NORTHERN EMBANKMENT

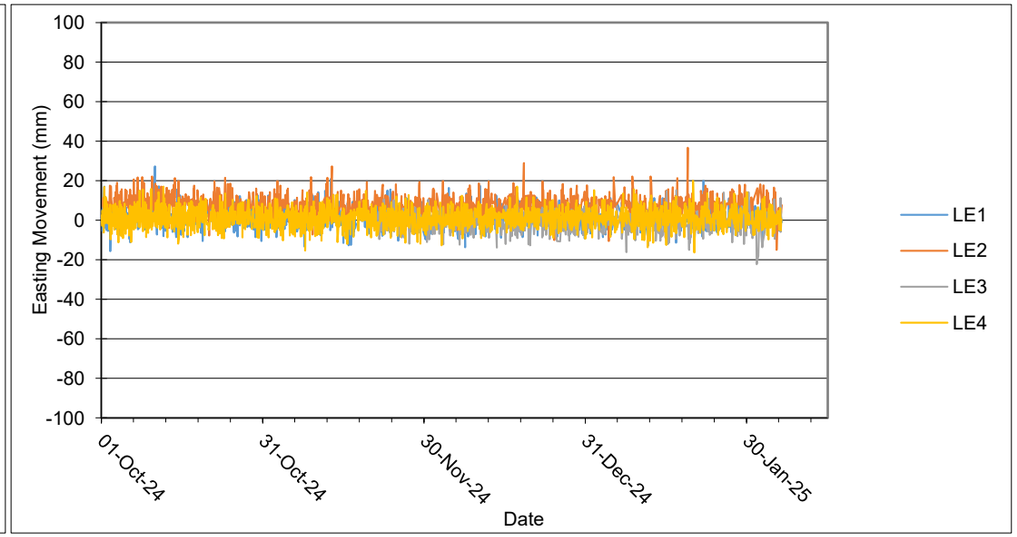
Date: 9/07/2025 **Job No:** 103071.126

FIGURE 35

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\Bobadil\EOR 2024 Monuments.xlsx FIG A2







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2025 MONTHLY INSPECTION

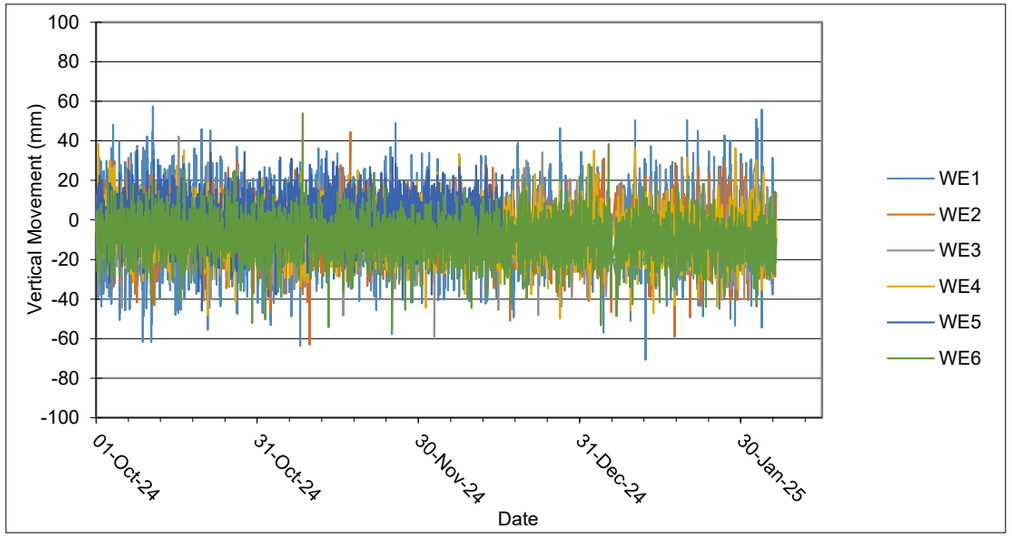
BOBADIL TSF - MOVEMENT MONITORS

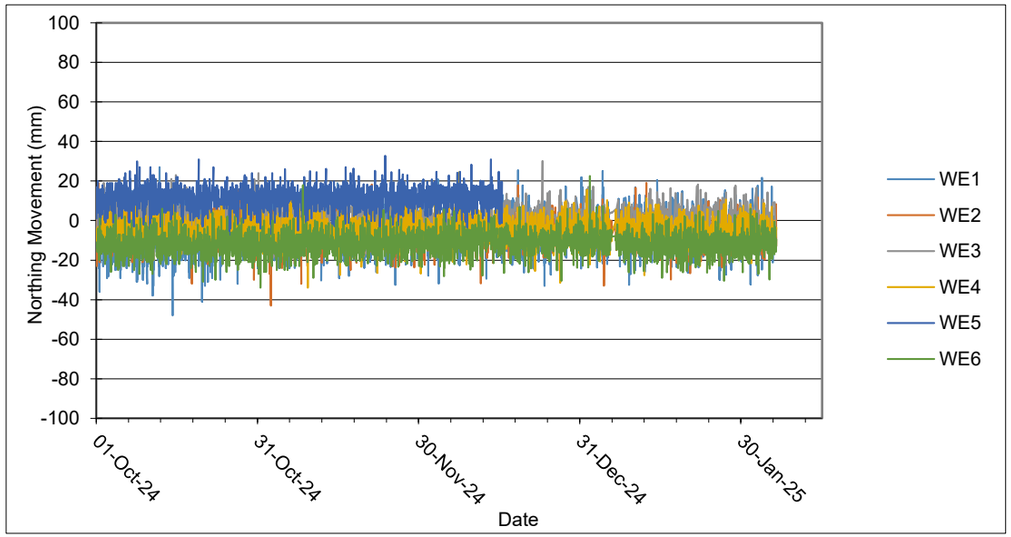
MOVEMENT MONITORS - LEVEE EMBANKMENT

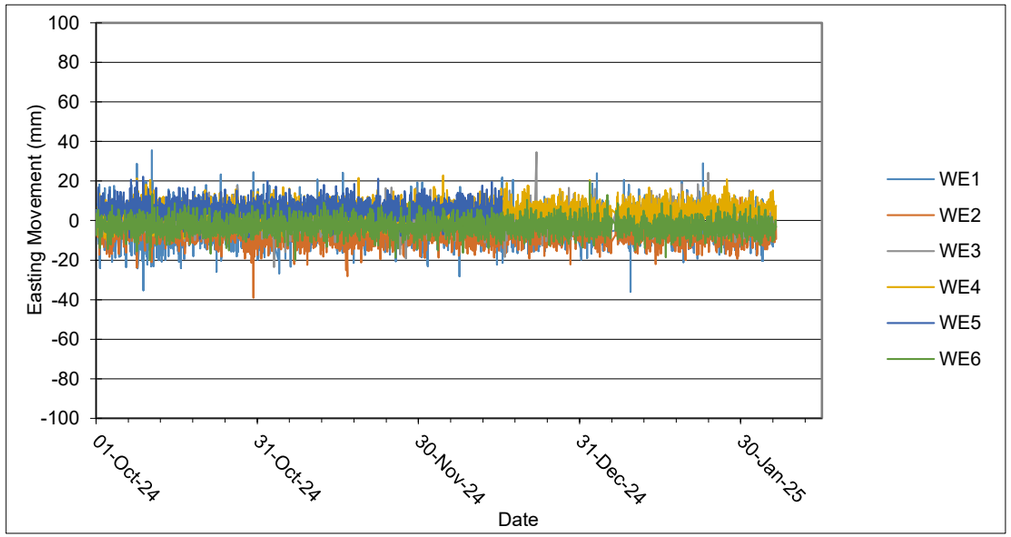
Date: 9/07/2025 **Job No:** 103071.126

FIGURE 36

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\Bobadil\EOR 2024 Monuments.xlsx FIG A3







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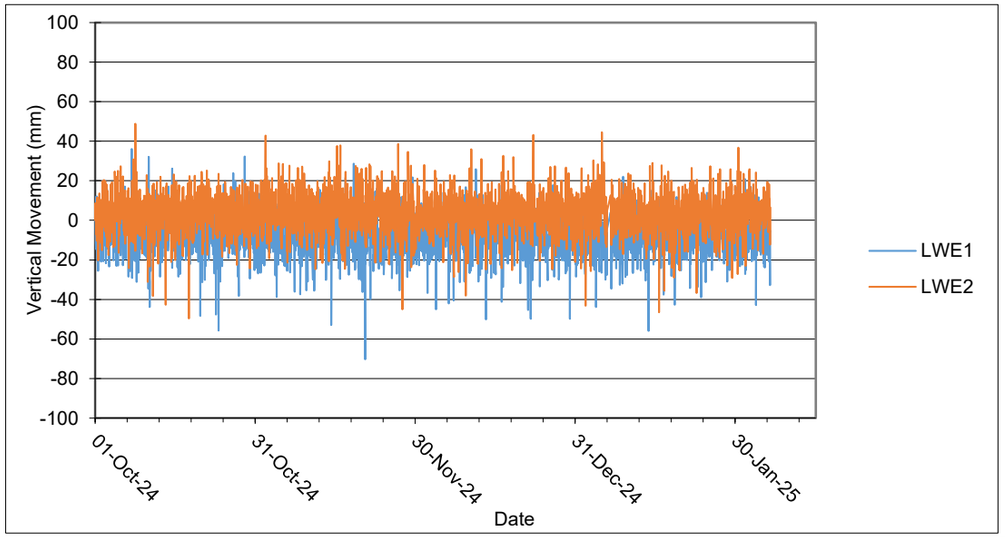
2025 MONTHLY INSPECTION

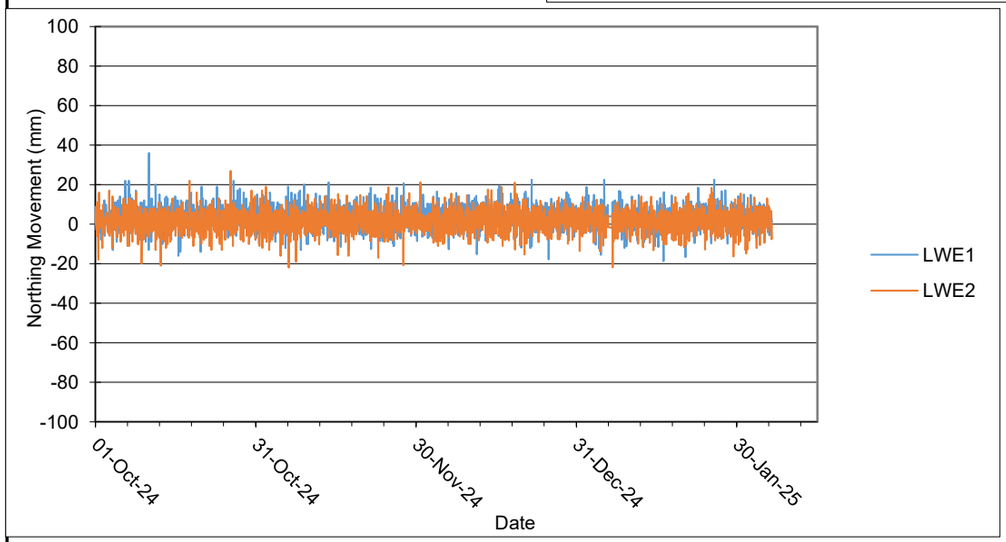
BOBADIL TSF - MOVEMENT MONITORS

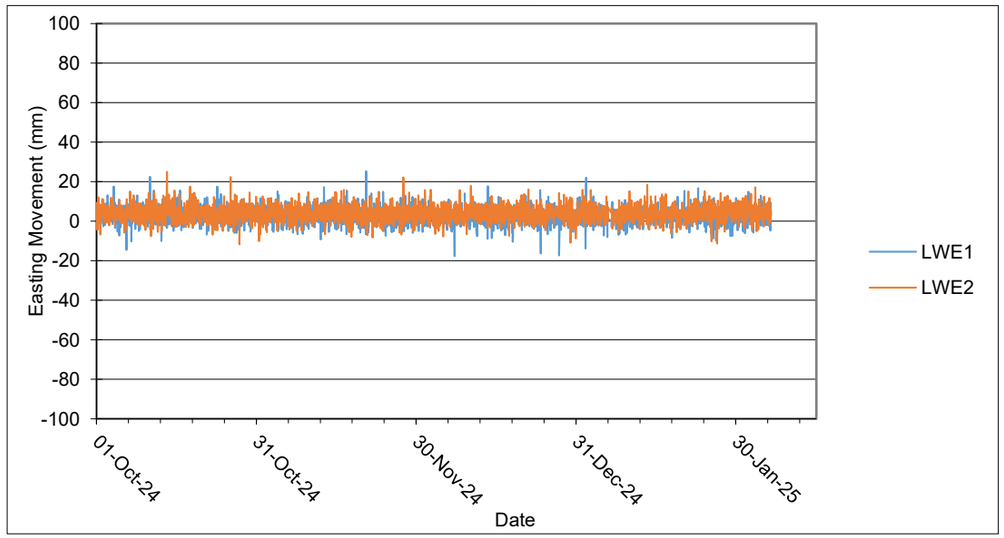
MOVEMENT MONITORS - WESTERN EMBANKMENT

Date: 9/07/2025 **Job No:** 103071.126

FIGURE 37







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MMG ROSEBERY MINE

2025 MONTHLY INSPECTION

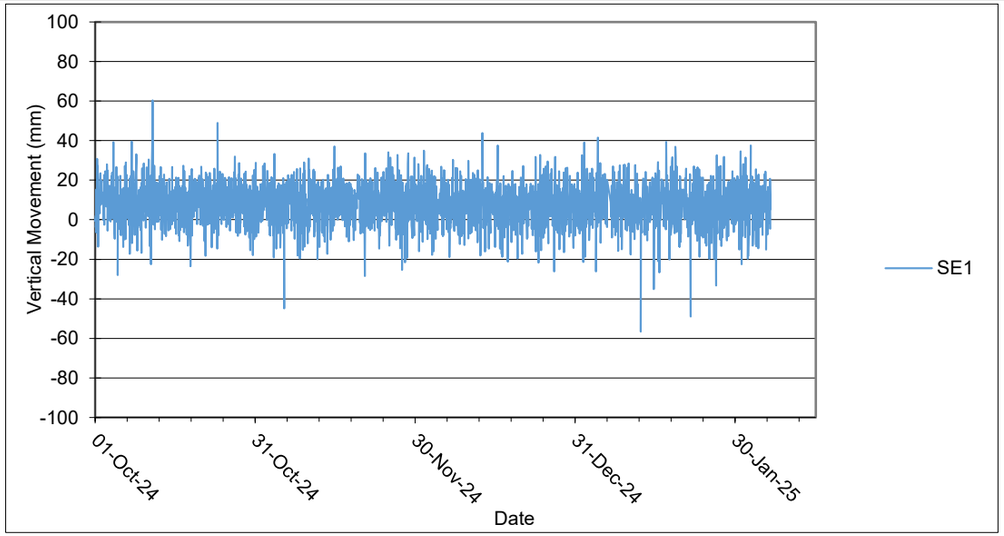
BOBADIL TSF - MOVEMENT MONITORS

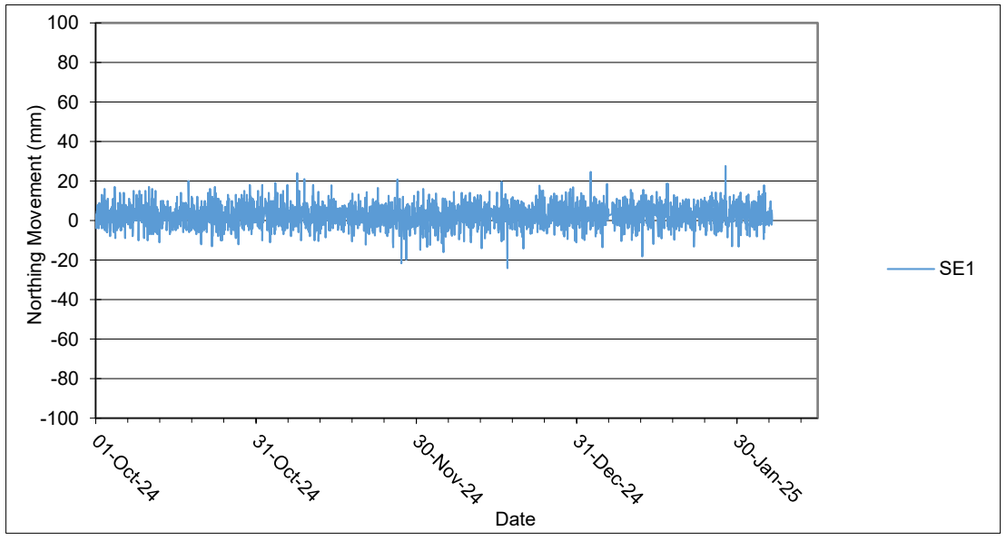
MOVEMENT MONITORS - LOWER WESTERN EMBANKMENT

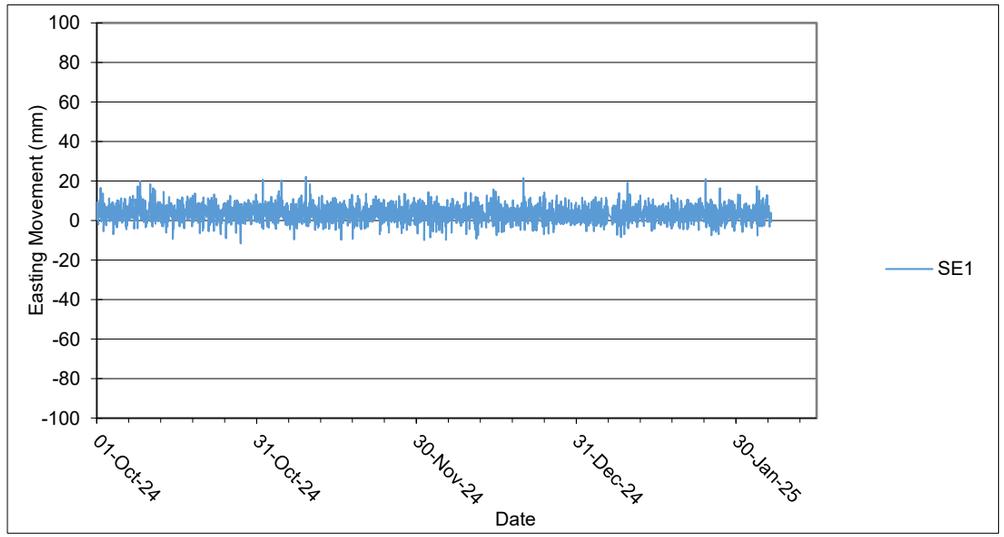
Date: 9/07/2025 **Job No:** 103071.126

FIGURE 38

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\Bobadil\EOR 2024 Monuments.xlsx FIG A5







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2025 MONTHLY INSPECTION

BOBADIL TSF - MOVEMENT MONITORS

MOVEMENT MONITORS - SOUTHERN EMBANKMENT

Date: 9/07/2025 **Job No:** 103071.126

FIGURE 39

J:\2007\107031 Rosebery Bobadil FY 07-09\126 EOR 2024\Instrumentation\Bobadil\EOR 2024 Monuments.xlsx FIG A6

NOTE:

1.- VOLUME TO FINAL STAGE 10 DESIGN BEACH = 6,623 m³ (DISCHARGE @ RL200.7m)

LEGEND:

AVAILABLE TAILINGS STORAGE CAPACITY



No.	DESCRIPTION	DATE	DRAWN	CHECK'D	APPR'D

SCALE:	1:4000
JOB No.	240479
DATE	05.03.25
DESIGN	JLN
DRAWN	JLN
CHECKED	AM
APPROVED	AM

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MMG ROSEBERY MINE
2024 EOR INSPECTION

BOBADIL TSF AND POLISHING POND
COMPARISON OF JANUARY 2025 SURVEY WITH DESIGN TAILINGS BEACH

DWG. No.

FIGURE 40

SHEET SIZE	A3	Rev.	A

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SHEET 1 OF 1

S:\Rbry\240479 2025 Monthly Audits\CADD\CAD\Figure 2 - Bobadil Tailings January 2025.dwg Wednesday, 27 August 2025 03:09:05 PM

APPENDICES

APPENDIX A – EOR INSPECTION CHECKLIST

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	5th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

NORTH EMBANKMENT

Item	Criteria	Checked	Comment
RL 201 m Crest	Condition of surface	Y	Generally good. Some minor potholes present on the crest.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 201 to RL 199 m)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage	Y	nil
	Tree / shrub growth	Y	The trial rehabilitation area has grown well. Some minor sparse growth on the stage 10 downstream batter.
Upstream batter	Slumps, bulging or erosion	Y	Several minor erosions beneath the A14 separation geotextile, and minor tears identified next to the northern finger. No concern.
	Wave erosion	Y	nil
Tailings Beach	Location of beach development	Y	Available freeboard varies from 0.1 m - 0.5 m. 1.0 m in sludge storage area.
	Operating spigots at time of inspection	Y	5 spigots discharging tailings.
RL 199 Bench	Condition of peat cover	Y	Good, trial rehabilitation area has grown well.
	Condition of drain	Y	Good. No flow.
	Condition of perimeter road	Y	Good.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 199 m to toe)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage / soft spots	Y	nil
	Tree / shrub growth	Y	Some minor vegetation.
Other Comments	1. Crest pipeline snaking is present on the western end due to thermal expansion. Rockfill pipe ballast is falling on the upstream face separation geotextile due to the movement. 2. CW01 at the start of the decant channel toe drain needs descaling.		

SPILLWAY

Item	Criteria	Checked	Comment
RL 200.4 m Spillway Crest	Obstructions or erosion	Y	nil
Spillway Channel	Stability of side slopes	Y	Good condition.
	Seepage in channel base	Y	nil
Other Comments	Significant freeboard available in sludge storage area (eastern end of Northern Embankment). Tailings deposition should recommence as soon as possible to allow time for drying and consolidation prior to Stage 11 embankment construction.		

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

BYPASS CHANNEL

Item	Criteria	Checked	Comment
Bypass Valve	Check if operational	Y	Operational and full flow was directed to cell 1.
Bypass channel	Obstructions and vegetation growth	Y	There is some vegetation growth on either side of the channel but no obstructions to the flow.
Other Comments	1. Discrete flow into bypass channel at 2 x pipes discharging water from the western toe drain. 2. New BDSP03 v-notch is not symmetrical. 3. CW04 needs sediment removed.		

RAILWAY CUTTING

Item	Criteria	Checked	Comment
	Slumps, bulging or erosion	Y	Several points of localised very minor erosion associated with low points in the levee embankment bench at the top of the cutting.
	Stability of railway cutting	Y	Good condition.
	Vegetation growth on railway cutting	Y	Generally healthy vegetation comprising a mix of saplings and mature trees. Increased vegetation at the location of seepage.
	Seepage / soft spots	Y	Contact seepage at the northern end spanning ~70m along railway cutting 1m above toe. Minor water pooling in the low points.
Other Comments	Previously identified seepage in the railway cutting towards the northern end. This requires further investigation.		

DECANT CHANNEL

Item	Criteria	Checked	Comment
From Decant pipe to railway crossing	Stability of side wall	Y	Good condition
	Condition of BDSP internal drainage discharge points	Y	Reasonable condition. BDSP 19, 20, and 21 are covered with sludge and cannot be monitored. BDSP 8, 9A, 11, 12B, 13 and 14 are covered with vegetation growth and clearing is required for continued monitoring. BDSP 06 and 08 have had their signs altered and should be reinstated.
	Obstructions to culvert under railway	Y	Clear, no-obstruction.
From railway crossing to Polishing Pond culvert crossing	Stability of side wall	Y	Good condition.
	Obstructions to culvert under access to Polishing Pond	Y	Clear, no-obstruction.
Decommissioned Decant Channel from headwall to BDSP14	Stability of side wall	Y	Good condition.
	Obstructions and vegetation growth	Y	Minor vegetation growth around the channel and reduction in channel depth to fines flowing in from Levee seepages pipes. BDSP 19 is inundated and cannot be monitored to increased channel floor level.
Other Comments	1. Sludge accumulation and vegetation growth around BDSP pipes should be removed for monitoring. 2. Vegetation growth around CW03 and CW04 should be cleared for easier access to the flow measurement.		

LEVEE EMBANKMENT

Item	Criteria	Checked	Comment
RL 201 m Crest	Condition of surface	Y	Generally good.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 201 to RL 199 m)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage	Y	nil
	Tree/shrub growth	Y	nil. Significatnt amount of wind blown tailings accumulating on the batter within the central region.
Upstream batter	Slumps, bulging or erosion	Y	Minor erosion under the separation geotextile. No concern.
	Wave erosion	Y	nil

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

Tailings Beach	Location of beach development	Y	Available Freeboard varies from 0.1 m to 0.3 m.
	Operating Spigots at time of inspection	Y	None.
RL 199 Bench	Condition of peat cover	Y	Good. Good vegetation growth in trial cover area. Saplings growing within the trial rehabilitation area. Thick vegetation around the outlets.
	Condition of drain	Y	Good. No flow.
	Condition of perimeter road	Y	Good. Some minor potholes.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 199 m to top of railway cutting)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage / soft spots	Y	1. Iron staining on the downstream slope at 3 locations at the interface of Stage 6/7 raises, unchanged from previous inspections. Moist.
			2. Previous concentrated seep towards the southern end of the batter at ~ RL 188 m was moist.
			3. Broad seepage/damp ground over a broad area between bypass ramp and levee pipes at ~ RL 186 m is still present.
			4. Water is leaking from the large black and white Levee Embankment seepage pipes, at its highest point where it protrudes from the embankment.
			5. Minor seepage occurring on the bench with iron staining below and salt at fringes
	Tree / shrub growth	Y	Sparse vegetation, mostly dead.
Other Comments	1. Seepage items 1 & 3 need to be investigated as the seepage is becoming more widespread. The area has become one large contact seepage region.		
	2. The lower batter below the southern seepage point at the southern end was identified as moist to wet, while the area above was generally dry.		

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

WESTERN EMBANKMENT

Item	Criteria	Checked	Comment
RL 201 m Crest	Condition of surface	Y	Good, some potholes present.
	Condition of safety bund	Y	Good
Downstream Batter (RL 201 to RL 199 m)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage	Y	nil
	Tree / shrub growth	Y	Wind-blown tailings identified on the stage 10 downstream batter slope and accumulating along the downstream toe. Batter slope is completely covered in some regions.
Upstream batter	Slumps, bulging or erosion	Y	nil
	Wave erosion	Y	nil
Tailings Beach	Location of beach development	Y	The beach freeboard varies between 0 m - 0.1 m. Majority is at freeboard level.
	Operating spigots at time of inspection	Y	Mine water discharged from 5 perimeter spigots.
RL 199 Bench	Condition of peat cover	Y	Good. Heavily vegetated on the southern half. Wind-blown tailings evident on the soil cover area and drains towards the central region and northern end. Saplings growing within the peat cover region, vegetation sparse in some areas, likely due to tailings.
	Condition of drain	Y	Good. No flow.
	Condition of perimeter road	Y	Good.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 199 m to crest of Western Buttress)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage / soft spots	Y	nil
	Tree / shrub growth	Y	Minor vegetation growth.
Other Comments	Vegetation around BDSP pipes should be cleared.		

WESTERN BUTTRESS

Item	Criteria	Checked	Comment
Buttress Crest	Condition of surface	Y	Reasonable. Some low points with evidence of previously pooling water.
	Condition of safety bund	Y	Good.
Buttress Downstream Batter	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage / soft spots	Y	nil
	Seepage at downstream toe	Y	nil
	Tree / shrub growth	Y	Minor vegetation growth.
Downstream Toe Drain	Vegetation growth	Y	Generally good, vegetation (mostly reeds) present. No growth noticed.
	Obstructions and impeded flow.	Y	No obstructions, some regrading and deepening of drain required to improve flow in some locations
Other Comments	1. SAA 01, 02, 03, and 04 inclinometers are currently functional, and data is being manually downloaded monthly. SAA 01 has 3 of 4 moisture packs completely hardened. These should be removed and replaced to prevent future damage to the logger. 2. Previously installed VWP's B8 and D8 are providing data from VW Mini logger boxes. They will need to be connected to permanent logger boxes in the future and connected to the telemetry system. B8 was producing limited and erroneous data during the inspection. Batteries may need to be replaced to extract data. No data was recorded for this month's audit.		

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

SOUTHERN EMBANKMENT

Item	Criteria	Checked	Comment
RL 201 m Crest	Condition of surface	Y	Generally good, some minor crest potholes.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 201 to RL 199 m)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage	Y	nil
	Tree / shrub growth	Y	nil
Upstream batter	Slumps, bulging or erosion	Y	nil
	Wave erosion	Y	nil
Tailings Beach	Location of beach development	Y	Beach at freeboard level. Further deposition can be undertaken from the fingers. No ponding near the embankment crest observed.
	Operating spigots at time of inspection	Y	nil
RL 199 Bench	Condition of peat cover	Y	Good. Well vegetated.
	Condition of drain	Y	Good. No flow. Some sediment upstream of drain outlets, not impeding flow.
	Condition of safety bund	Y	Good.
Downstream Batter (RL 199 m to toe)	Slumps, bulging or rilling of rockfill	Y	nil
	Seepage / soft spots	Y	1. The known seepage point was flowing minimally, with no visible changes comparing to the previous inspection. 2. Historical seepage downstream of the southern access ramp was moist. There was no visible flow on the bench. 3. Seepage point downstream to the southern ramp, at the corner of the Western buttress and the southern access has decreased in flow from the previous audit. The area around the corner was generally dry.
	Tree / shrub growth	Y	Some minor vegetation on the batter slopes and at the toe.
Other Comments	Remediation works have been partially undertaken at the pit downstream of the railway line in the area where BDSP 01 is located. Glacial till backfilling was carried out downstream of the pit, the previously placed material over the hole in the pipe was removed. All seeps are flowing out through the hole leading to BDSP03. Consideration should be given to cover the hole with a separation geotextile and drainage aggregate with a minimum diameter greater than hole to minimise fine particle/sediment migration into the pipe. The remediation sequence should be photographed.		

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

DECANT

Item	Criteria	Checked	Comment
Approach Channel to Southern Pond	Obstructions or tailings build-up	Y	Sludge continues to accumulate in the approach channel.
	Pipes into pond	Y	Ok.
Filter wall	Obstructions or blockages	Y	Generally good condition.
	Flow	Y	Minimal flow at the Northern end, majority of flow in approach channel to Southern Pond.
Decant	Obstructions or blockages	Y	No obstructions.
	Decant pond clarity	Y	Generally clear water in the decant pond. Decant chute flowing with clear water to the downstream decant channel.
	Obstructions to flow at decant pipe outlet	Y	No obstructions.
	Location of Decant pond	Y	Against upstream side of filter wall and extends towards the Spillway but away from the perimeter embankments.
Other comments	Pond level is at RL 199.20 m. No change since the last inspection.		

BORROW PIT / TAILINGS BYPASS

Item	Criteria	Checked	Comment
Water Level	Water level	Y	Moderate
Tailings	Are tailings exposed?	Y	Yes, some exposure around the deposition area.
Other comments	The pond level was similar to the previous inspection. Channeling occuring through exposed tailings.		

MMG ROSEBERY MINE EOR INSPECTION
BOBADIL TAILINGS STORAGE FACILITY AND POLISHING POND

Monitored By :	Jedd Linke-Nagel & Arun Muhunthan (EOR)
Date of Inspection :	4th - 6th February 2025
Weather Conditions :	Sunny, max temp 32° C
Rainfall :	None

POLISHING POND

Item	Criteria	Checked	Comment
Crest	Condition of surface	Y	Fair. Some potholes.
	Condition of downstream safety bund	Y	Good.
Dividing Embankments	General condition	Y	Fair.
Downstream Batter	Slumps, bulging, rilling of rockfill	Y	nil
	Seepage / soft spots	Y	Previously identified (staked) location soft under foot.
	Tree / shrub growth	Y	Minor growth, dense at toe of batter and near seepage.
Upstream batter	Slumps, bulging or erosion	Y	nil
	Wave erosion	Y	None observed.
Decant	Obstructions or blockages to original decant	Y	No obstruction.
	Obstructions or blockages to new decant	Y	No obstruction.
Spillway	Obstructions to spillway	Y	No obstruction.
Freeboard	Estimate of spillway freeboard	Y	1.5 m below the spillway invert.
Other comments	1. Pond level similar to the last inspection, flow between adjacent cells is maintained within weirs and not overtopping. 2. All decant flow is directed to Cell 1 with the bypass valve fully open. 3. The black max pipe used for the decant flow road crossing into cell 1 has become blocked with vegetation. Water is overflowing the access road and into cell 1. The pipes should be cleared and access road reinstated if significant erosion has occurred.		

APPENDIX B – PHOTOGRAPHIC SUMMARY

TAILINGS.WATER.WASTE.



Photograph 1 – Bobadil TSF overview.



Photograph 2 – Northern Embankment crest and downstream face, looking west.



Photograph 3 – Northern Embankment crest and tailings beach, looking east.



Photograph 4 – Levee embankment crest and downstream face, looking west.



Photograph 5 – Levee embankment crest and tailings beach, looking north.



Photograph 6 – Western Embankment crest and tailings beach looking south.



Photograph 7 – Western embankment crest, downstream face, surface drain and wind blown tailings evidient – looking south.



Photograph 8 – Lower Western embankment crest, downstream face – looking south.



Photograph 9 – Western Buttress, looking south.



Photograph 10 – Southern Embankment crest and upstream tailings beack, looking east.



Photograph 11 – Crest and downstream face of the Southern Embankment, looking east.



Photograph 12 – Sludge deposited around newly constructed decant channel filter bund



Photograph 13 – Clearwater exiting decant pond.



Photograph 14 – Decant approach channel filter bund.



Photograph 15 – Old clay borrow pit and exposed tailings, looking east.



Photograph 16 – Southern Embankment toe seepage and newly constructed toe drain, looking east.



Photograph 17 – Southern access ramp seepage.



Photograph 18 – Levee embankment southern end seepage and batter.



Photograph 19 – Levee Embankment contact seep area.



Photograph 20 – Levee Embankment northern end seepage.



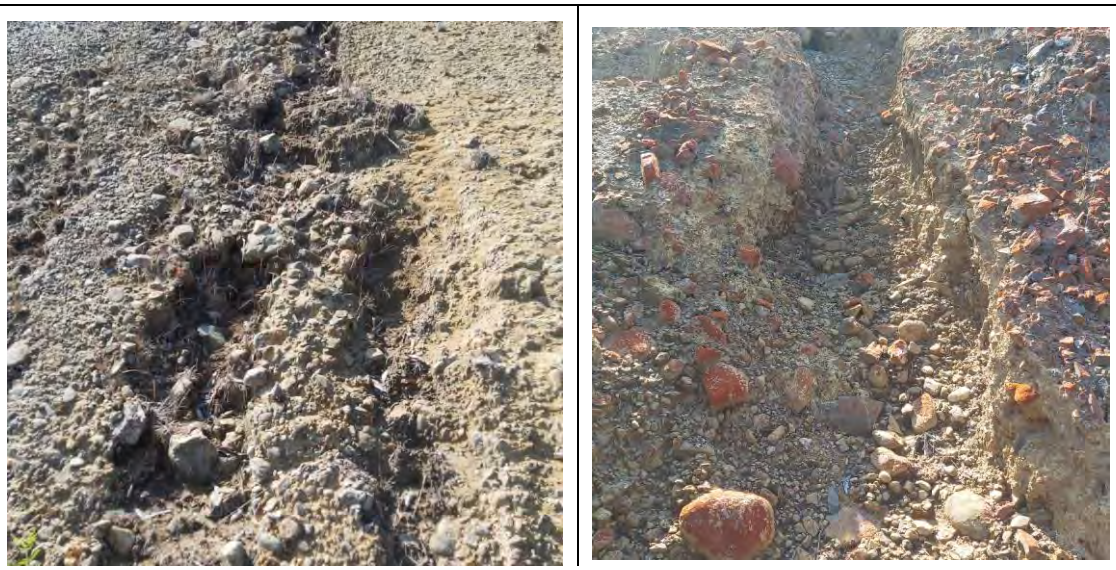
Photograph 21 – Northern Embankment downstream toe drain, Decant outlet, newly extended northern surface drainage outlet – looking west.



Photograph 22 – Sludge accumulated around BDSP 20 area



Photograph 23 – Decant pipe culvert crossing the railway line, clear of flow obstruction.



Photograph 24 – Historical erosion downstream of the Levee embankment.



Photograph 25 – Western embankment seepage collection toe drain and vegetation growth, looking south.



Photograph 26 – Lower seepage toe drain and embankment downstream face, looking north.



Photograph 27 – Decant/seepage collection toe drain at the western ramp, looking north



Photograph 28 – Sludge deposition, iron staining around CW04.



Photograph 29 – Leaking pit downstream of Western Embankment.



Photograph 30 – Soil Cover the surface drain discharge pipe outlet



Photograph 31 – Soil cover surface drain and vegetation growth, looking north from western ramp.



Photograph 32 – Soil covers surface drain at the downstream of the western embankment; wind-blown tailings accumulated at the drain.



Photograph 33 – Soil cover the surface drain and vegetation growth, looking west from Eastern end of southern buttress.



Photograph 34 – soil cover surface drain outlet at the western end



Photograph 35 – Spillway



Photograph 36 – Northern embankment old ramp seepage



Photograph 37 – Railway cutting seepage



Photograph 38 – Sludge deposition at the void, upstream to the spillway.



Photograph 39 – Polishing Ponds, spillway.



Photograph 40 – Polishing Pond decant 1 outlet flowing into river.



Photograph 41 – vegetation growth around the Polishing Pond Decant 2 inlet structure.



Photograph 42 – Polishing Pond Decant 2 outlet and drain, vegetation growth at the pipe outlet.



Photograph 43 – Polishing Pond view looking north.



Photograph 44 – Polishing Pond view, looking south.



Photograph 45 – Polishing Pond Cell 2, vegetation growth, looking north.



Photograph 46 – Quarry access track bund crack.



Photograph 47 – Fallen Rocks in the diversion channel.

APPENDIX C – MONITORING SUMMARY

TAILINGS.WATER.WASTE.

APPENDIX C1
BOBADIL TSF PIEZOMETER READINGS
AUDIT PERIOD DECEMBER 2023 - JANUARY 2025

Piezometer Name	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25
	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water	RL (m) Water
SPA5	187.45	187.51	187.47	187.55	187.60	187.50	187.62	CAP STUCK	187.47	187.51	187.58	187.50	187.50	187.45
SPA7	186.99	187.17	186.99	187.08	187.07	187.06	187.21	187.36	187.39	187.48	187.07	187.11	187.04	186.91
SPB5	182.61	182.68	182.62	182.74	182.69	182.64	182.45	182.55	182.69	182.50	182.48	182.61	182.48	182.46
SPB8VWP	184.99	184.99	184.93	184.99	184.90	184.83	184.75	184.97	184.69	184.92	184.87	184.99	184.77	184.77
SPC6	185.45	185.56	185.55	185.56	185.53	185.63	185.48	185.45	185.56	185.50	185.44	185.42	185.49	185.41
SPD5	187.73	187.86	187.79	187.83	187.82	187.87	187.76	187.96	188.12	187.90	187.71	187.72	187.78	187.72
SPD8VWP	184.40	184.47	184.40	184.46	184.38	184.33	184.19	184.39	184.03	184.26	184.16	184.19	184.16	184.12
SPD9	150.38	150.56	150.48	150.53	150.56	150.56	150.64	150.55	150.66	150.56	150.55	150.55	150.41	150.54
SPE4	186.40	186.47	186.41	186.45	186.42	186.51	186.32	186.26	186.34	186.26	186.32	186.36	186.51	186.44
SPF3	179.53	179.55	179.48	179.47	179.59	179.59	179.46	179.50	179.60	179.44	179.71	179.64	179.86	179.72
SPF4	164.13	164.27	164.14	164.27	164.35	164.34	164.31	164.37	164.55	164.35	164.29	164.27	165.18	164.12
SPN1	190.38	190.35	190.28	190.18	190.48	190.30	190.05	190.20	190.66	189.99	190.74	190.83	190.62	190.60
SPS2	191.97	192.03	191.92	192.27	191.99	191.80	191.29	191.22	191.31	191.22	192.55	192.72	192.61	192.33
VW1	193.12	193.11	193.06	193.12	193.34	193.10	193.32	193.44	193.05	193.58	193.27	193.64	193.43	193.20
VW2	194.40	194.49	194.50	194.59	194.56	194.10	194.37	194.34	194.04	194.80	194.65	195.04	194.96	194.59
VW3	193.37	193.53	193.34	193.42	193.45	193.43	193.19	193.29	192.88	193.56	193.69	193.68	193.58	193.46
VW4	194.71	194.89	194.83	195.07	195.08	194.88	194.68	194.64	194.29	194.89	194.66	194.66	194.63	194.58
VW5	190.79	190.84	190.72	190.95	190.86	190.82	190.72	190.51	190.04	190.55	190.52	190.68	190.98	191.01
VW6	191.40	191.40	191.34	191.78	191.56	191.06	190.91	190.90	190.48	191.23	191.86	192.19	192.13	191.83
VW7	185.76	185.80	185.72	185.88	185.91	185.68	185.80	185.95	185.61	185.82	185.72	185.80	185.75	185.72
VW8	188.09	188.13	188.01	188.15	188.20	188.00	188.06	188.26	188.22	188.82	188.89	189.00	189.21	189.24
VWA1	193.55	193.86	193.61	193.55	ERROR	ERROR	ERROR	ERROR	192.83	193.51	193.15	193.02	193.53	ERROR
VWA2	193.35	193.56	193.37	193.31	ERROR	ERROR	ERROR	ERROR	192.54	193.26	192.95	192.81	193.21	ERROR
VWB	192.26	192.45	192.31	192.40	192.40	192.20	191.94	191.90	191.55	192.15	191.83	191.83	191.98	191.82
VWC1	192.91	193.07	192.95	193.18	193.12	192.95	192.67	192.59	192.31	192.91	192.57	192.65	192.63	192.57
VWC2	191.00	191.12	191.06	191.26	191.32	191.06	190.92	190.88	190.51	191.00	190.79	190.75	190.67	190.63
VWD1	192.00	192.00	191.79	191.93	ERROR	ERROR	ERROR	ERROR	191.07	191.79	191.93	191.97	192.12	191.91
VWD2	191.61	191.67	191.44	191.54	191.57	191.57	191.37	191.22	190.70	191.37	191.44	191.52	191.63	191.50
VWD3	190.75	190.89	190.67	190.73	190.75	190.69	190.62	190.52	189.93	190.52	190.54	190.63	190.73	190.65
VWE	191.09	191.07	190.99	191.23	190.97	190.89	190.60	190.45	189.81	190.53	190.67	191.10	191.33	191.20
VWF	191.23	191.21	190.98	191.43	191.21	191.09	190.76	190.54	189.84	190.62	190.92	191.27	191.64	191.45
VWLA	192.39	192.55	192.35	192.37	192.41	192.35	192.02	192.06	191.73	192.45	192.57	192.45	192.35	192.24
VWLB	191.97	191.88	191.70	191.72	192.13	191.72	191.55	191.70	191.66	192.05	191.78	192.23	192.07	191.92
VWNA	194.42	194.44	194.36	194.62	194.53	194.05	194.55	194.40	194.16	194.70	194.59	194.83	194.62	194.62
VWNB	192.33	192.33	192.41	192.20	192.29	192.33	192.59	193.06	192.97	193.53	192.50	192.97	192.84	192.59
VWNC	193.64	193.72	193.72	193.81	193.81	193.36	193.75	193.61	193.30	193.93	193.72	194.15	194.08	193.84
VWSPA1	181.06	180.76	180.54	180.41	ERROR	ERROR	ERROR	ERROR	179.12	179.27	179.06	178.91	178.81	ERROR
VWSPA2	188.17	188.13	188.10	188.15	ERROR	ERROR	ERROR	ERROR	187.54	187.97	187.90	187.83	187.86	ERROR
VWSPA4	187.06	187.11	186.98	187.06	ERROR	ERROR	ERROR	ERROR	186.74	186.98	186.82	186.87	186.93	ERROR
VWSPA6	183.71	183.71	183.62	183.77	183.79	183.54	183.62	183.81	183.41	183.62	183.56	183.60	183.60	183.58
VWSPB1	175.64	175.62	175.54	175.64	175.71	175.42	175.54	176.84	175.21	176.34	175.37	175.33	175.41	175.37
VWSPB2	189.28	189.34	189.26	189.34	189.36	189.15	189.07	189.11	188.84	189.18	189.01	188.94	188.92	188.86
VWSPB4	187.84	187.88	187.82	187.90	188.01	187.70	187.82	187.90	187.64	187.82	187.68	187.74	187.72	187.68
VWSPB6	184.31	184.29	184.27	184.38	184.46	184.19	184.36	184.46	184.13	184.34	184.23	184.25	184.17	184.21
VWSPC1	174.45	174.43	174.40	174.53	174.55	174.33	174.38	174.50	174.18	174.45	174.30	174.33	174.30	174.28
VWSPC2	188.36	188.44	188.40	188.52	188.60	188.38	188.34	188.40	188.09	188.44	188.24	188.15	188.13	188.09
VWSPC5	187.20	187.26	187.18	187.26	187.35	187.08	187.24	187.30	187.14	187.26	187.06	187.08	187.02	186.99
VWSPD1	174.58	174.52	174.52	174.62	174.68	174.54	174.54	174.58	174.31	174.64	174.62	174.58	174.64	174.58
VWSPD2	188.56	188.66	188.52	188.62	188.62	188.46	188.48	188.50	188.09	188.46	188.39	188.44	188.52	188.48
VWSPD4	187.41	187.50	187.39	187.50	187.55	187.31	187.41	187.50	187.23	187.45	187.27	187.27	187.31	187.27
VWSPD7	184.98	185.04	184.94	185.04	185.09	184.87	184.94	185.06	184.72	184.98	184.85	184.85	184.89	184.87
VWSPE2	188.53	188.57	188.43	188.62	188.55	188.35	188.28	188.28	187.72	188.18	188.18	188.30	188.55	188.55
VWSPE3	188.27	188.31	188.19	188.31	188.35	188.17	188.17	188.19	187.83	188.23	188.07	188.01	188.21	188.21
VWSPE5	186.23	186.27	186.12	186.25	186.31	186.05	186.11	186.18	185.82	186.21	186.03	186.07	186.20	186.18
VWSPF1	184.66	184.66	184.57	184.80	184.75	184.62	184.48	184.51	184.10	184.64	184.71	184.80	184.96	184.80
VWSPF2	182.39	182.39	182.43	182.34	182.37	182.41	182.51	182.72	182.68	182.92	182.47	182.68	182.62	182.51
VWSPN2	187.55	187.65	187.63	187.73	187.73	187.38	187.50	187.61	187.21	187.76	187.61	187.80	187.84	187.65
VWSPN3	185.84	185.84	185.82	185.91	185.98	185.71	185.89	185.93	185.62	186.00	185.93	186.02	185.98	185.89
VWSPN5	187.99	187.90	187.82	187.86	187.90	187.82	188.05	188.41	188.33	188.90	188.27	188.39	188.37	188.25

Note: All Elevations are in m AHD

Indicates instances where the reading has exceeded the trigger level

APPENDIX C2

BOBADIL TSF AND POLISHING POND DISCHARGE MONITORING

AUDIT PERIOD DECEMBER 2023 - JANUARY 2025

Monitoring Point	December 2023	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024	July 2024	August 2024	September 2024	October 2024	November 2024	December 2024	January 2025
Southern Embankment Toe														
BDSP01 (V-notch) (L/min)	16.1	24.5	31.3	35.1	35.1	39.1	29.5	37.0	177.5	66.2	27.8	21.5	29.5	18.7
BDSP05 (L/min)	9.9	10.4	11.4	11.7	11.0	11.2	10.6	10.6	12.0	10.8	11.4	11.7	11.3	11.5
BDSP06 (L/min)	10.4	10.7	11.2	12.4	11.6	12.1	11.7	11.5	12.0	11.2	10.5	9.5	1.0	10.4
BDSP07 (L/min)	TRICKLE	0.3	0.2	0.3	0.4	0.4	0.4	0.6	0.5	0.4	0.3	0.3	0.4	0.4
BDSP08 (L/min)	5.5	5.5	5.9	6.2	5.6	5.7	5.2	5.8	3.8	2.2	0.4	0.4	4.3	SUBMERGED
BDSP09A (L/min)	11.1	15.2	11.8	14.6	14.6	15.6	15.2	20.6	25.3	17.0	13.5	13.5	13.5	13.5
BDSP09B (L/min)	15.0	20.1	15.6	18.9	17.5	16.8	16.4	18.9	19.1	16.9	16.4	16.5	14.7	14.7
BDSP10 (L/min)	11.4	15.9	11.9	15.1	15.0	16.0	15.0	17.3	22.9	13.0	11.4	12.0	1.3	11.7
BDSP11 (L/min)	9.2	11.6	10.2	12.7	12.5	13.7	12.9	15.1	16.9	12.0	12.0	14.3	11.3	11.3
Total (L/min)	88.6	114.1	109.4	126.9	123.2	130.5	116.9	137.3	289.9	149.6	103.7	99.7	87.4	92.1
Western Embankment Toe														
BDSP12A (L/min)	24.0	24.8	23.0	27.1	24.6	23.3	26.8	29.1	37.0	22.6	22.0	25.3	2.3	24.3
BDSP12B (L/min)	2.1	2.3	2.2	2.4	2.0	1.9	1.8	1.9	1.9	1.4	1.5	1.6	1.5	1.6
BDSP13 (L/min)	0.7	0.7	0.7	0.8	0.8	0.7	0.4	0.8	0.9	0.8	0.6	0.8	0.6	0.8
BDSP14 (L/min)	12.9	12.9	14.2	14.8	15.8	17.7	16.0	17.1	20.2	19.1	21.0	19.9	18.2	17.4
Total (L/min)	39.7	40.8	40.2	44.9	43.2	43.6	44.9	48.9	60.1	43.9	45.1	47.6	22.5	44.0
Levee Bank Drainage														
Black PE (160mm pipe)	MED FLOW	MED FLOW	MED FLOW	MED FLOW	18.4	MED FLOW	MED FLOW	18.8	MED FLOW	MED FLOW	MED FLOW	MED FLOW	22.2	MED FLOW
White Sewer pipe	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW
Black PE (200mm pipe)	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	HIGH FLOW	24.2	LOW FLOW
BDSP15 (L/min)	DRY	DRY	DRY	DRY	Drip	Drip	cant see	Dry	wet	wet	wet	wet	Drip	Drip
BDSP16 (L/min)	WET	WET	WET	WET	Trickle	Trickle	Trickle	Dry	wet	wet	wet	wet	Drip	Drip
BDSP17 (L/min)	WET	WET	WET	WET	Trickle	Trickle	Trickle	Trickle	0.1	wet/tri	wet/tri	Tri	Trickle	Trickle
BDSP18 (L/min)	DRY	DRY	DRY	WET	Dry	Dry	dry	Dry	wet	wet	wet	wet	Trickle	Trickle
BDSP19 (L/min)	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED
V-notch Weir (VW1) (L/min)	188.0	172.4	278.8	239.9	157.5	162.4	177.5	143.5	292.5	299.5	239.9	162.4	130.3	143.5
Total (L/min)	188.0	172.4	278.8	239.9	157.5	162.4	177.5	143.5	292.5	299.5	239.9	162.4	130.3	143.5
Northern Embankment Toe														
BDSP20A (L/min)	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED
BDSP20B (L/min)	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED
BDSP21 (L/min)	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	DNE	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED
BDSP23 (L/min)	6.7	7.2	6.9	6.4	7.0	6.5	5.9	6.4	SUBMERGED	6.1	5.6	5.5	5.6	6.7
BDSP24 (L/min)	Trickle	Trickle	Trickle	Trickle	Trickle	trickle	trickle	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	SUBMERGED	Trickle	SUBMERGED
BDSP25 (L/min)	10.0	9.8	9.4	9.1	9.4	8.9	8.8	13.1	9.0	9.0	9.6	9.6	10.1	7.7
BDSP26 (L/min)	3.8	4.1	4.0	4.1	4.1	3.7	4.2	4.3	4.0	3.8	4.3	4.1	4.9	4.1
BDSP27 (L/min)	0.5	0.8	0.8	1.1	1.2	0.8	0.8	0.9	0.7	0.8	0.7	0.8	2.5	0.7
BDSP28 (L/min)	2.9	3.4	5.4	6.0	4.3	3.5	3.3	3.2	6.0	3.3	3.2	3.5	5.5	2.7
BDSP29 (L/min)	DRY	Trickle	Trickle	DRY	Dry	trickle	trickle	1.1	SUBMERGED	Trickle	0.4	Dry	Dry	Dry
BDSP30 (L/min)	Trickle	Trickle	Trickle	Trickle	Trickle	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Covered
BDSP31 (L/min)	Covered	Covered	Covered	Covered	Covered	Covered	Covered	Trickle	Trickle	Trickle	Trickle	Trickle	2.3	1.5
Total (L/min)	23.8	25.2	26.4	26.6	25.9	23.3	22.9	29.0	19.5	23.0	23.7	23.4	30.9	23.4
Western Buttress Filter Drains														
WB01 (L/min)	2.7	2.7	2.7	2.8	2.6	2.6	2.5	2.4	2.6	2.5	2.4	2.2	2.1	2.4
WB02 (L/min)	16.7	15.3	16.9	16.3	15.2	16.7	17.0	16.0	16.6	16.7	21.3	17.1	17.3	20.6
WB03 (L/min)	24.0	25.0	27.6	28.1	27.5	24.4	28.6	33.3	29.2	25.7	30.0	24.3	24.4	11.8
WB04 (L/min)	HIGH FLOW	60.0	50.0	46.5	46.2	44.5	42.6	54.5	52.3	high flow	68.2	52.2	44.4	35.3
WB05 (L/min)	23.7	22.6	22.7	23.4	22.7	22.2	25.6	23.0	26.0	26.3	26.3	26.2	23.0	35.4
WB06 (L/min)	5.6	5.8	5.7	6.2	5.8	5.1	6.0	5.6	6.3	6.0	6.0	6.2	5.7	5.6
WB07 (L/min)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Total (L/min)	72.7	131.5	125.6	123.3	119.9	115.5	122.2	134.9	133.0	77.2	154.2	128.2	116.9	111.1
Total Monitored Flow (L/min)	**413**	**484**	**580**	**562**	**470**	**475**	**484**	**494**	**795**	**593**	**567**	**461**	**388**	**414**

The following weirs collect drainage from the western and southern toe drains and the partial flows are accounted for in the above table.

Bypass Drain from Northern Toe Drain													
Cipolletti Weir (CW1)	5134.1	5330.8	3496.6	5531.9	6006.2	5989.6	6089.1	6808.2	6851.6	8083.7	6113.3	6165.4	3716.8	5134.1
Cipolletti Weir (CW2)	4216.3	4320.7	3166.7	4941.8	4941.8	5613.6	6006.2	6251.9	6282.8	7174.4	6165.4	5989.6	4462.4	1208.1
Cipolletti Weir (CW3)	0.0	0.0	12.8	5212.2	5251.6	5696.1	5989.6	5370.6	5410.7	7635.0	4753.9	4979.9	4391.2	1468.1
Bypass Drain from Western Toe Drain														
Cipolletti Weir (CW4)	95.0	69.1	55.4	69.1	278.8	278.8	278.8	343.8	313.9	215.9	177.5	21.5	13.8	221.7
Southern Drain (From Old Railway Embankment)														
V-notch Weir (BDSP3)	407.0	561.7	455.3	640.2	369.3	293.8	347.7	384.1	965.2	769.7	407.0	524.7	630.1	268.9
Polishing Pond														
V-notch Weir (VW2) (L/min)	35.1	50.4	41.2	43.4	50.4	55.4	63.4	60.6	102.3	78.2	152.8	41.2	48.0	48.0
V-notch Weir (VW3) (L/min)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix D Compliance against PCE 11514

PCE 11514 Condition	Title	Status
G7(1)	Notification prior to commencement	Submitted 24/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-33914/011).
A4(1)	Dust Mitigation Plan	Submitted 13/03/25, approved 13/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-45358).
A5(1.1)	Air Monitoring Station – Baillieu Street	Submitted 24/02/25, approved 13/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-45358).
A5(1.4)	Air Monitoring Station – Baillieu Street	Real-time air monitors and DDG installed 17th March 2025, prior to start of construction works.
A5(1.5)	Air Monitoring Station – Baillieu Street	EPA extension received (EPA ref. EN-EM-PE-EX-038147-024 | D25-134581).
A8(2)	Reporting of monitoring	Dust reports are compiled internally on a monthly basis and are available upon request from the Director.
B2	Blast Management Plan	Submitted 18/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-44365/001).
CN3(1)	Bobadil Borrow Pit Management Plan	Submitted 18/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-44365/001).
CN1-3	Borrow Pit Operations Manual	Submitted 18/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-44365/001).
DC4(1)	Early Closure Plan	Due 16/12/25, currently being developed.
FF1	Protection of threatened species potential habitat	Clearing began after 01/03/25.
FF2(1-2)	Avian Fauna Clearance Plan	Submitted 06/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-33914/011).
FF4(1-2)	Survey and management of Tasmanian wedge-tailed eagle and white bellied sea eagle	Survey complete. No clearing after 05/04/25.

FF5(1) & FF5(3)	Survey and management of Tasmanian devil and spotted quoll	Submitted 12/02/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-33914/011). Natural Values Assessment also submitted to support and inform FF5. Submitted 24/05/25, approved 06/03/25 (EN-EM-PE-EX-038147-024 | D25-33914/011).
M3(1)	Groundwater Monitoring Plan and Report	Submitted 13/06/25, not yet approved, awaiting EPA correspondence.
M3(5)	Groundwater Monitoring Plan and Report	Yet to be developed.
OP1(1)	Weed and Disease Management Plan	Submitted 24/01/25, approved 06/03/25 (EPA ref. EN-EM-PE-EX-038147-024 | D25-44365/001).
WM2(3)	Contaminated Landfill Waste Management	Due 16/12/25, currently being developed.

Appendix E Annual Meteorological Report – FY24/25 (EY, 2025)

Annual Meteorological Report - FY24/25

MMG Rosebery Mine

6 August 2025

The better the question.
The better the answer.
The better the world works.

Shape the future
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RELEASE NOTICE

Ernst & Young ("**EY**") was engaged on the instructions of MMG Rosebery Mine ("**Client**") to review the meteorological data in regard to their EPN and PCE conditions ("**Project**"), in accordance with the engagement agreement dated 20 June 2025 ("the **Engagement Agreement**").

The results of EY's work, including the assumptions and qualifications made in preparing the report, are set out in EY's report dated 6 August 2025 ("**Report**"). You should read the Report in its entirety including any disclaimers and attachments. A reference to the Report includes any part of the Report. No further work has been undertaken by EY since the date of the Report to update it.

Unless otherwise agreed in writing with EY, any party accessing the Report or obtaining a copy of the Report ("Recipient") agrees that its access to the Report is provided by EY subject to the following terms:

1. The Report cannot be altered.
2. The Recipient acknowledges that the Report has been prepared for the Client using data provided by the Client and may not be disclosed to any other party or used by any other party or relied upon by any other party without the prior written consent of EY.
3. EY disclaims all liability in relation to any party other than the Client who seeks to rely upon the Report or any of its contents.
4. EY has acted in accordance with the instructions of the Client in conducting its work and preparing the Report, and, in doing so, has prepared the Report for the benefit of the Client, and has considered only the interests of the Client. EY has not been engaged to act, and has not acted, as advisor to any other party. Accordingly, EY makes no representations as to the appropriateness, accuracy or completeness of the Report for any other party's purposes.
5. No reliance may be placed upon the Report or any of its contents by any party other than the Client. A Recipient must make and rely on their own enquiries in relation to the issues to which the Report relates, the contents of the Report and all matters arising from or relating to or in any way connected with the Report or its contents.
6. EY have consented to the Report being provided to the regulator, upon their request. EY have not consented to distribution or disclosure of the Report beyond this.
7. No duty of care is owed by EY to any Recipient in respect of any use that the Recipient may make of the Report.
8. EY disclaims all liability, and takes no responsibility, for any document issued by any other party in connection with the Project.
9. A Recipient must not name EY in any report or document which will be publicly available or lodged or filed with any regulator without EY's prior written consent, which may be granted at EY's absolute discretion.
10. A Recipient:
    (a) may not make any claim or demand or bring any action or proceedings against EY or any of its partners, principals, directors, officers or employees or any other Ernst & Young firm which is a member of the global network of Ernst & Young firms or any of their partners, principals, directors, officers or employees ("**EY Parties**") arising from or connected with the contents of the Report or the provision of the Report to the recipient; and
    (b) must release and forever discharge the EY Parties from any such claim, demand, action or proceedings.
11. If a Recipient discloses the Report to a third party in breach of this notice, it will be liable for all claims, demands, actions, proceedings, costs, expenses, loss, damage and liability made or brought against or incurred by the EY Parties, arising from or connected with such disclosure.
12. If a Recipient wishes to rely upon the Report that party must inform EY and, if EY agrees, sign and return to EY a standard form of EY's reliance letter. A copy of the reliance letter can be obtained from EY. The Recipient's reliance upon the Report will be governed by the terms of that reliance letter.

Ernst & Young's liability is limited by a scheme approved under Professional Standards Legislation.

Executive Summary

MMG Rosebery Mine has an obligation under its Environmental Protection Notice (EPN 7153/3, PCE 9084 & Rosebery Dust Mitigation Management Plan) to report annually on aspects of its meteorological monitoring programmes undertaken in their EPN and PCE (EPN 7153/3 conditions A4, G7 2.7 & PCE 9084 conditions G6 2.6 and 2.7).

As per EPN Condition A4-3, an analysis of the annual climate is required and is contained in this report. MMG Rosebery Mine operates three meteorological stations with 10 metre (m) masts that are located close to the mining operation. The analysis of data from these stations for 1 July 2024 to 30 June 2025 (FY24/25) shows that westerly winds dominate during the afternoon hours. The high percentage of calm conditions and low wind speeds observed at all stations are likely due to the surrounding terrain which modifies the prevailing westerly winds and shelters the areas containing the mining operations. Temperature, relative humidity and rainfall data for FY24/25 indicates that the mine experiences a cool, wet and humid climate with wetter winter and autumn months and drier summers.

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1. Introduction

MMG Rosebery Mine has an obligation under its Environmental Protection Notice (EPN 7153/3, PCE 9084 & Rosebery Dust Mitigation Management Plan) to report annually on aspects of its meteorological monitoring programmes undertaken in their EPN and PCE (EPN 7153/3 conditions A4, G7 2.6 and 2.7 & PCE 9084 conditions G6).

As per EPN Condition A4-3, an analysis of the annual climate is required. MMG Rosebery Mine engaged EY to complete the annual report for 1 July 2024 to 30 June 2025 (FY24/25). MMG Rosebery Mine operates three meteorological stations with 10 metre (m) masts that are located close to the mining operations. This report provides a summary of the recorded annual meteorological data, compares the variability between the three meteorological stations and the diurnal and seasonal variability of wind speed and direction, temperature, relative humidity, and rainfall. This report also includes a high-level qualitative risk assessment of the possible climatic conditions for the FY25/26 summer period.

2. Monitoring Station Locations

MMG Rosebery Mine operates three 10 metre (m) masts meteorological (weather) stations, named Bobadil, Carpark and 2/5 Dam, that are located close to the mining operations, as shown in Figure 1.

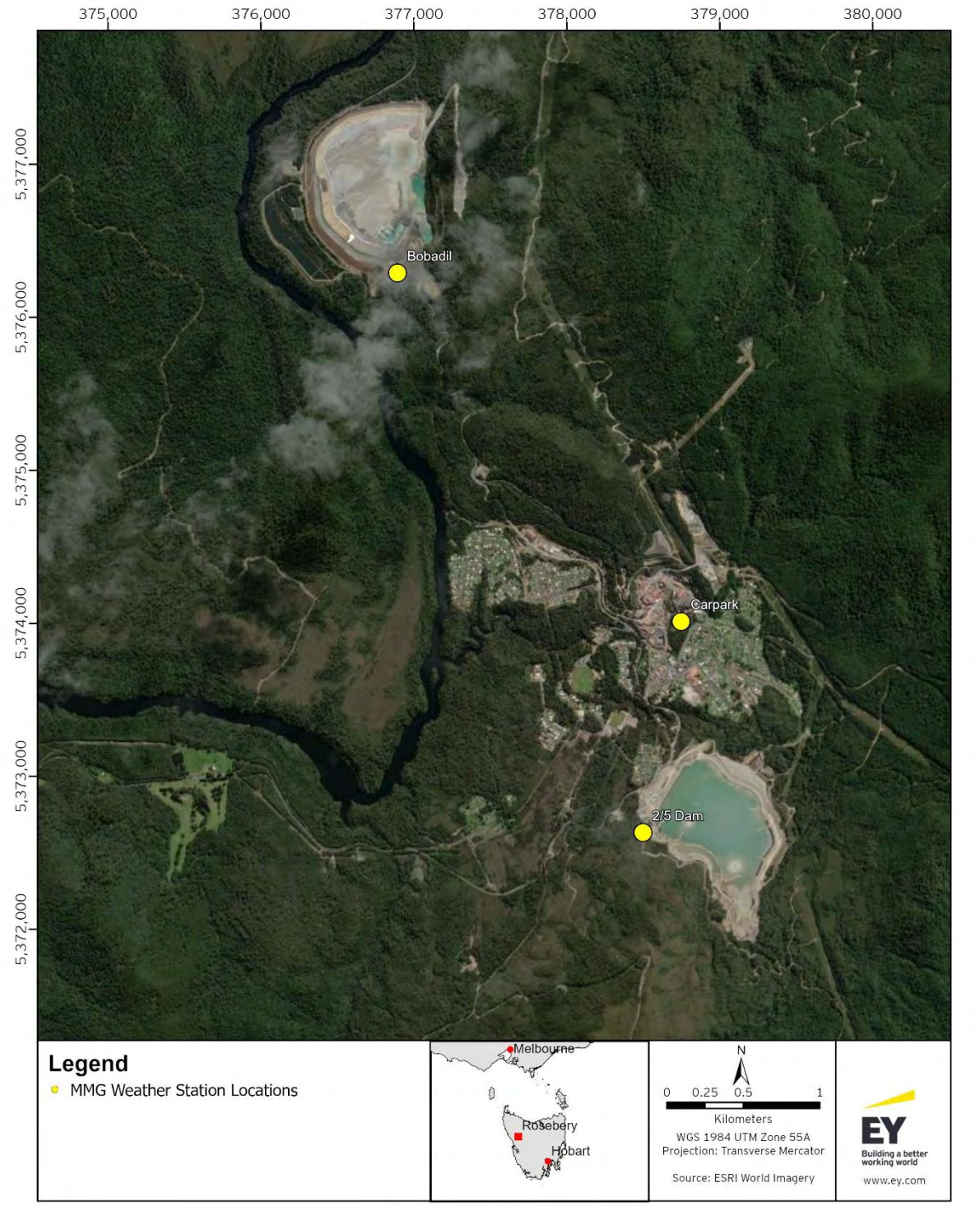


Figure 1: Meteorological (weather) station locations

3. Meteorological Analysis

The meteorological stations at the MMG Rosebery Mine record wind speed and direction, temperature, relative humidity and rainfall with values reported on a 10 minute and hourly average basis.

Previously, a comparison exercise was completed to confirm the averaging technique for the hourly data for the FY19 annual meteorological report (ERM, 2019) . The comparison showed that the hourly vector averaging technique was considered appropriate for use in the data analysis. This methodology is still currently used by MMG Rosebery Mine, and the hourly averaged data was used in this report.

3.1 Comparison of Data

The meteorological dataset was analysed taking into consideration calibrations, data statistics and comparison to historical data. The comparison steps considered the following from the Australian Standards AS3580.19:2020 – *Methods for sampling and analysis of ambient air* (Standards Australia 2020):

- All data shall be treated as "valid"[1] unless there is evidence or sound scientific principles that support the 'invalidation' of the data;
- When data are invalidated, it should be confirmed that previous reported data are not affected;
- When critical criteria or operational criteria exceed the specified control limits, data shall be invalidated back to the most recent calibration or valid measurements; and
- Identify causes of invalidation of data, such as power failure or instrument malfunction.

All three meteorological stations were calibrated in August 2024 (Environdata, 2024a; Environdata, 2024b; Environdata, 2024c). The 2/5 Dam station passed the calibration tests and the Bobadil and Carpark stations passed the post-calibration tests. The rain gauges at the Bobadil and Carpark stations did not pass the initial calibrations. The rainfall data was compared against the Bureau of Meteorology (BoM) Rosebery weather station with no significant differences observed. Additionally, a minor issue with the true north set up for the wind direction sensor at the Bobadil station was found. This data has not been updated. A summary of the FY24/25 meteorological data status is presented in Table 1.

Table 1: Summary of Meteorological Review – FY24/25

Summary and Meteorological Parameter		Station		
		2/5 Dam	Bobadil	Carpark
Data Capture (%)	Wind speed and direction	99.97%	99.99%	99.99%
	Temperature	99.97%	99.99%	99.99%
	Relative Humidity	99.97%	99.99%	99.99%
	Rainfall	99.97%	99.99%	99.99%
Data Quality [a]	Wind speed and direction	High	High	High
	Temperature	High	High	High
	Relative Humidity	High	High	High
	Rainfall	High	High	High
Variability between stations	Wind speed and direction	Predominant westerlies	Predominant northerlies and south westerlies	Predominant north westerlies
	Temperature	Little variability between the three stations with the warmest monthly mean temperatures observed in January and February 2025 and coolest mean temperatures observed in July 2024.		

[1] AS 3580.19-2020 defines valid as accurate, complete or meets specified criteria. This expands on the typical definition that means to be correctly formatted and stored.

Summary and Meteorological Parameter		Station		
		2/5 Dam	Bobadil	Carpark
	Relative Humidity	Little variability between the three stations with higher humidity observed in winter and lower humidity observed in summer.		
	Rainfall	Similar trends were observed between the three stations with September 2024 recording the highest monthly rainfall. The highest recorded rainfall was observed at the Carpark station.		

Notes:
a. Data quality is based on instrument maintenance and calibrations as per manufacturer's standards. High data quality is defined as less than 10% of data removal required outside of known errors or issues, medium data quality is defined as more than 10% and less than 25% data removal and low data quality is defined as more than 25% of data removal.

3.2 Wind Speed and Wind Direction

Wind roses were used to understand the dominant wind patterns at MMG Rosebery Mine. Wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points (N, NNE, NE, etc.). The bar at each wind direction in the wind rose represents winds blowing from that direction, e.g., north. The length of the bar represents the frequency of occurrence of winds in that direction, while colour of the bar corresponds to wind speed category. With the resulting figure, it is possible to visualise how often winds of a certain direction and strength occur over a long period, either for all hours of the day, or for particular periods during the day.

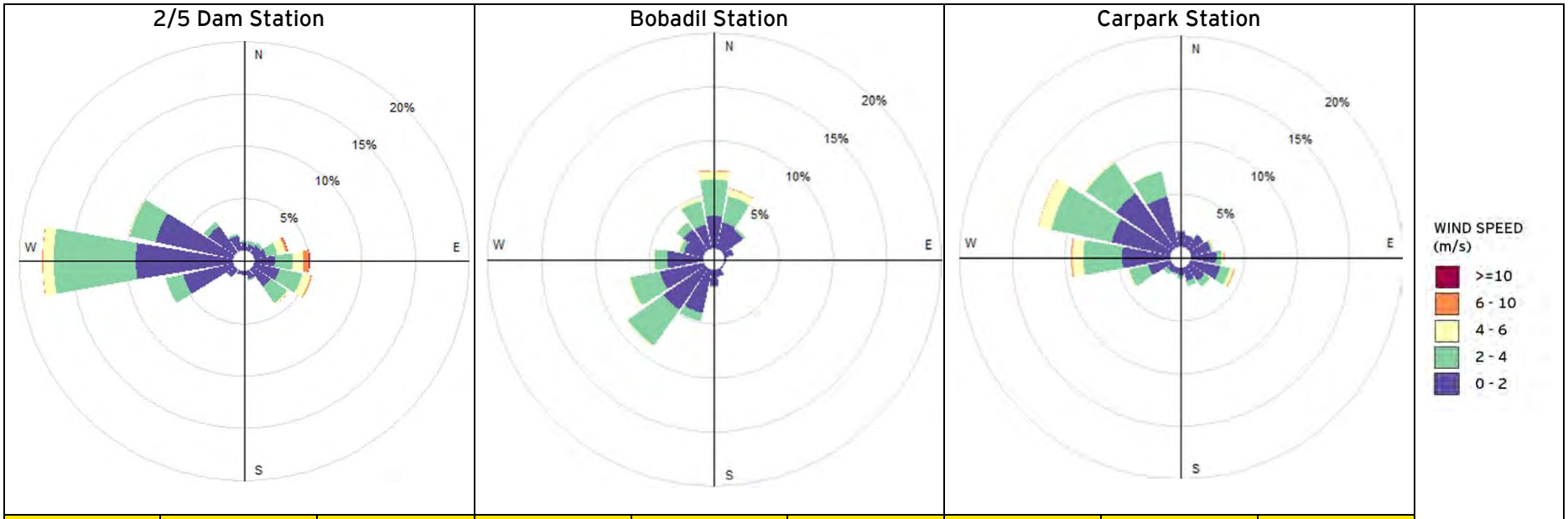
The annual wind roses for FY24/25 for the three onsite stations are presented in Figure 2. The 2/5 Dam and Carpark station wind roses show predominate westerly and north westerly wind directions with infrequent, but occasionally strong, easterlies. The Bobadil station wind rose shows the predominate winds were south westerly and northerly. The differences in the dominant wind directions observed between the stations are most likely a consequence of the surrounding terrain, with the dominant westerly flow in the region being slightly modified by the surrounding hills. A comparison of the predominant wind directions to FY24/25 showed consistency across all the stations.

The wind roses indicate that wind speeds were very low at MMG Rosebery Mine for FY24/25, with a high frequency of calm conditions[2]. This trend has been observed historically at the three sites. The low wind speeds observed at all stations are likely a result of the surrounding elevated terrain that shelter the MMG Rosebery Mine site from winds.

Seasonal wind roses for each meteorological station are shown in Figure 3 to Figure 5. Calmer conditions were observed at all stations in autumn and winter with minimal seasonal variation in wind directions. Westerlies were more common in summer and spring at 2/5 Dam. North westerlies were observed at the Carpark station with westerlies more common in summer. South westerly winds dominated at the Bobadil station during summer, autumn, and spring, with a smaller frequency of northerly winds observed in winter.

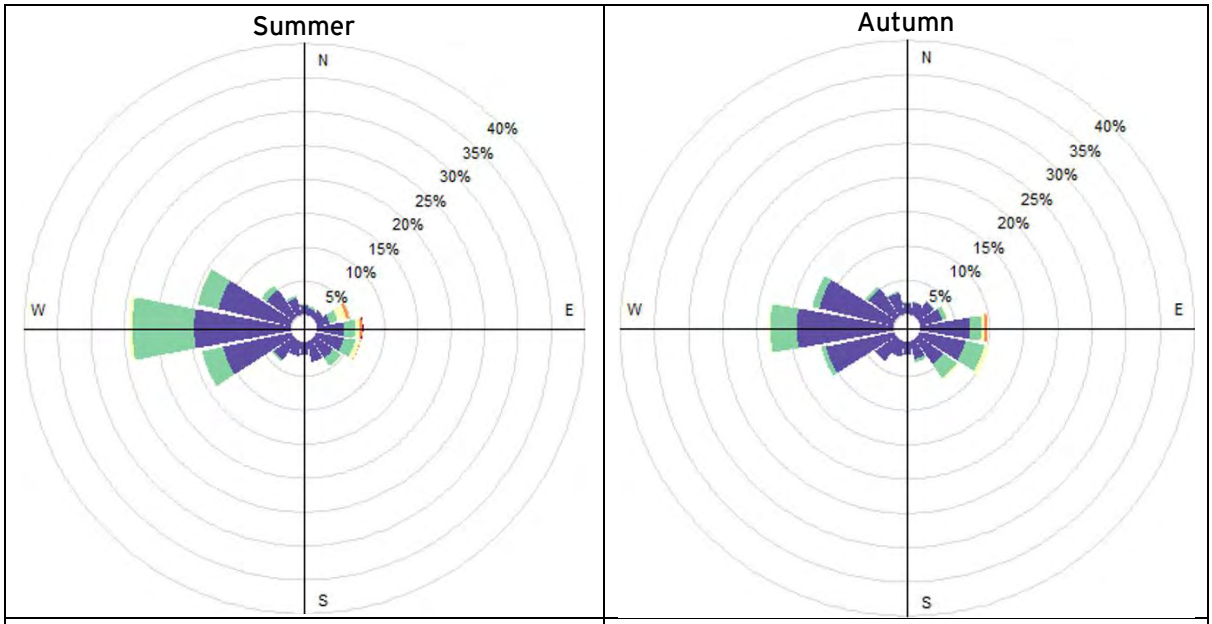
The time of day wind roses are shown in Figure 6 to Figure 8. Slightly higher wind speeds, westerly winds and less calm conditions were observed in the afternoon (12pm to 6pm) at all stations. Lower wind speeds and calmer conditions are observed in overnight and morning conditions (12am to 12pm).

[2] Calm conditions are defined with a wind speed less than 0.5 m/s.



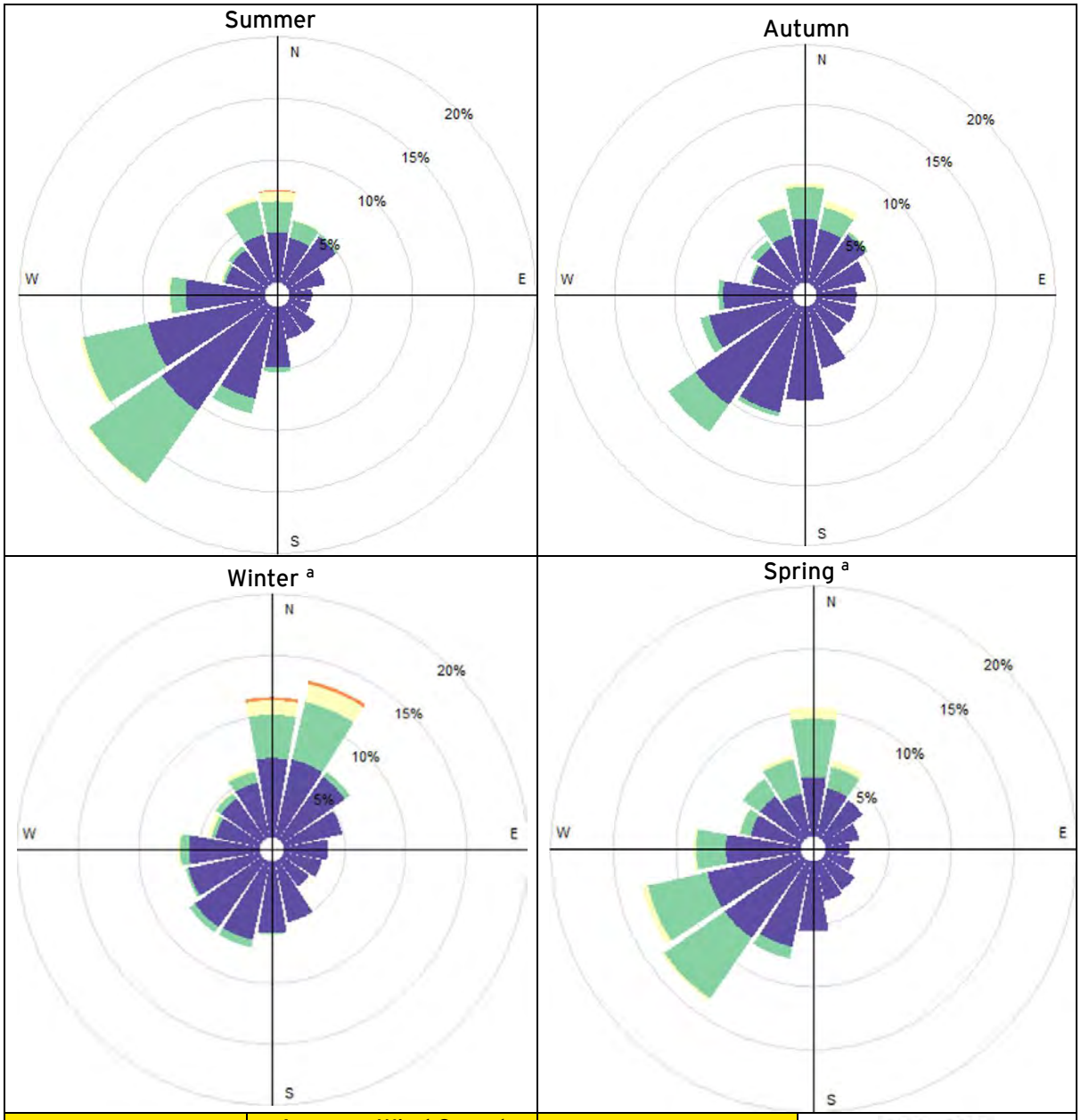
Average Wind Speed (m/s)	Calm Winds (%)	Data Availability (%)	Average Wind Speed (m/s)	Calm Winds (%)	Data Availability (%)	Average Wind Speed (m/s)	Calm Winds (%)	Data Availability (%)
1.4	35	99.9	1.1	44	99.9	1.3	35	99.9

Figure 2: Annual wind roses for FY24/25



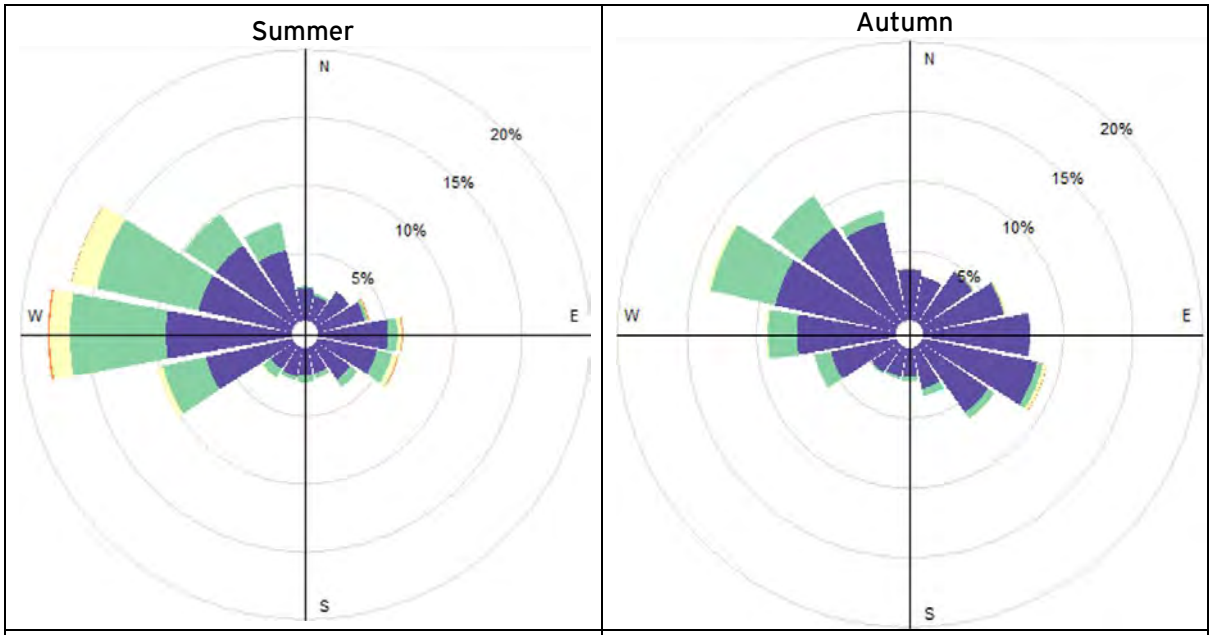
Season	Average Wind Speed (m/s)	Calm Winds (%)
Summer	1.4	29
Autumn	1.0	44
Winter	1.2	43
Spring	1.8	24

Figure 3: Seasonal wind roses - 2/5 Dam



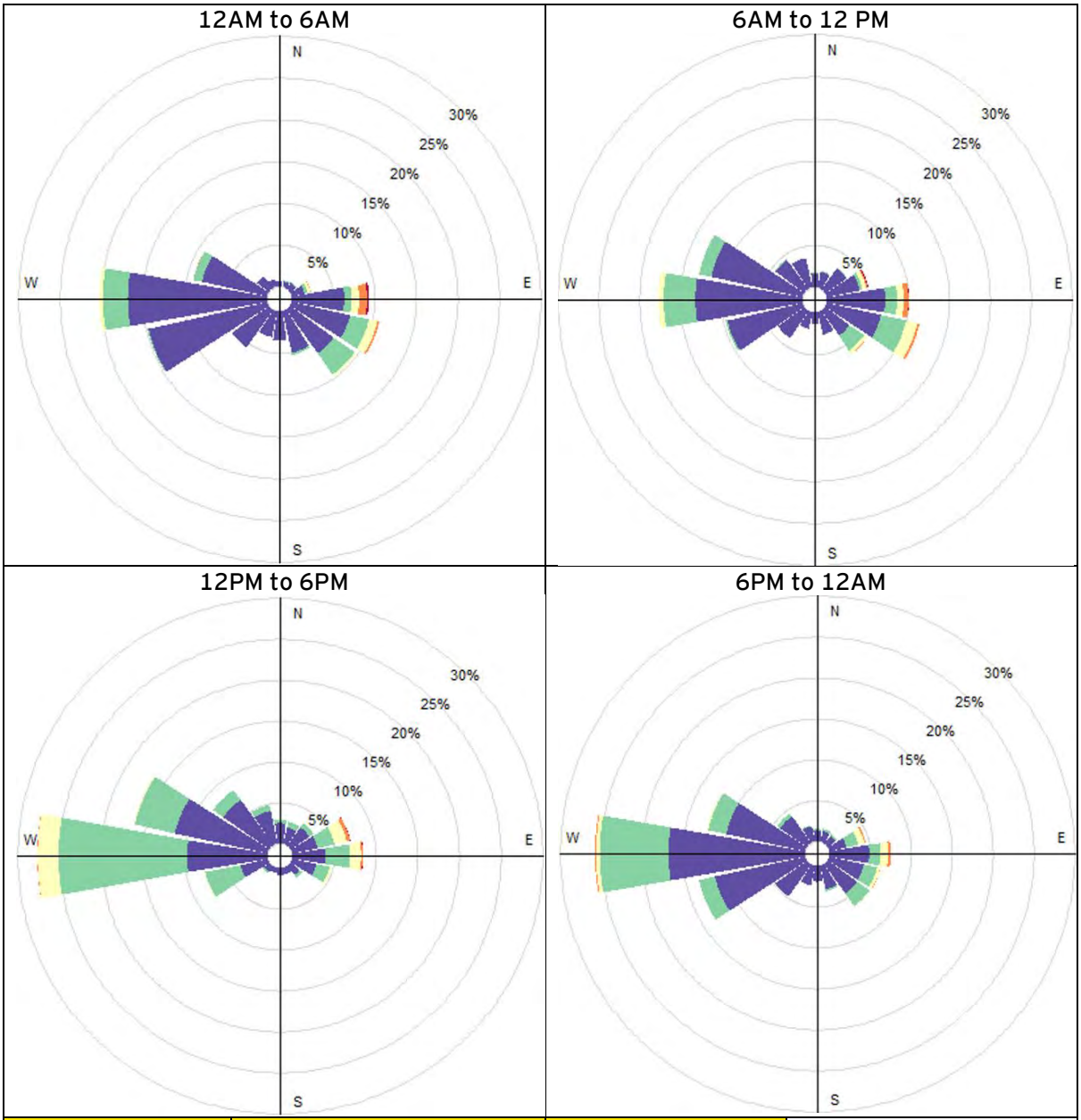
Season	Average Wind Speed (m/s)	Calm Winds (%)
Summer	1.2	38
Autumn	0.9	53
Winter	1.0	55
Spring	1.4	33

Figure 4: Seasonal wind roses - Bobadil



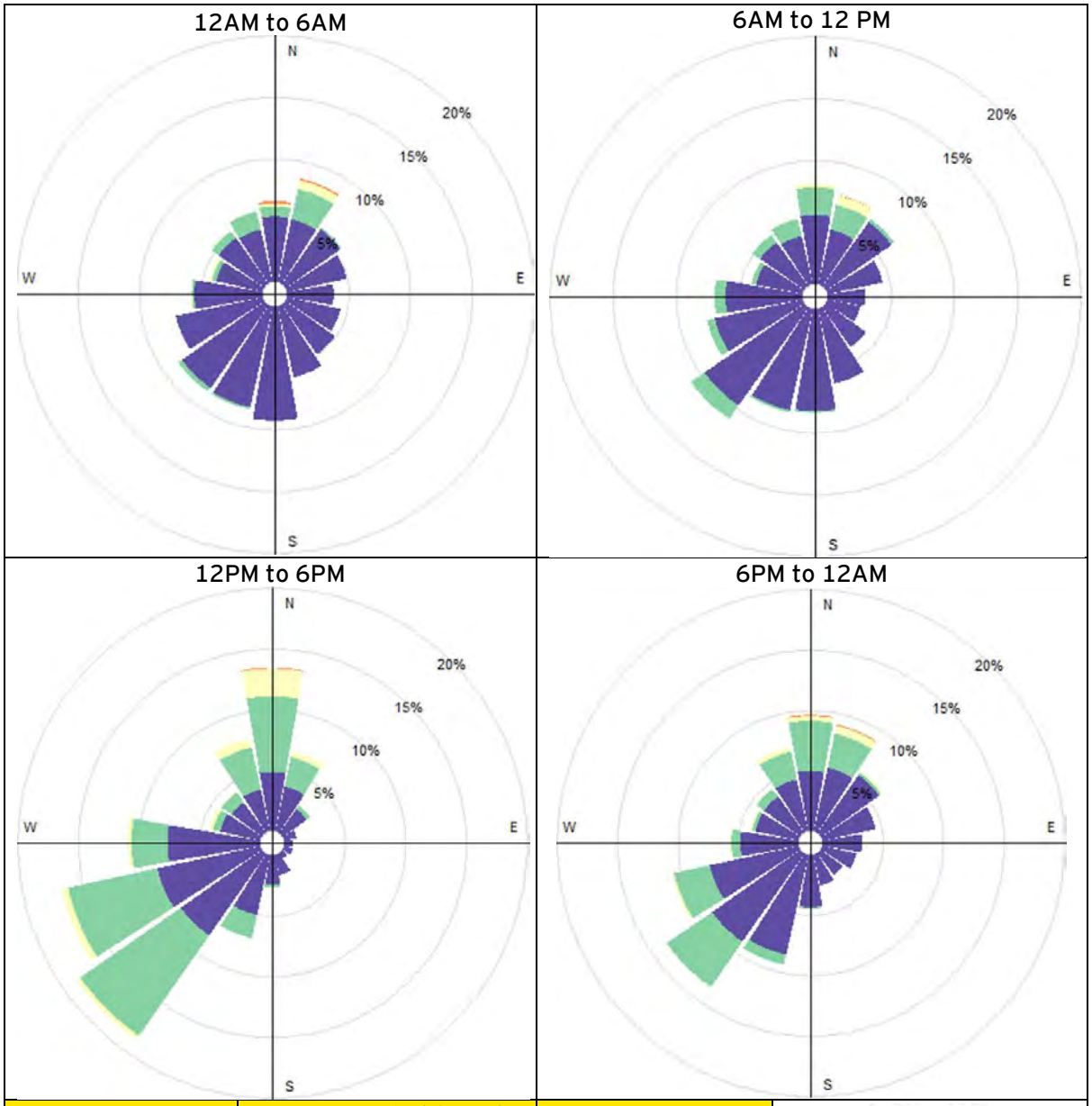
Season	Average Wind Speed (m/s)	Calm Winds (%)
Summer	1.6	26
Autumn	1.0	42
Winter	1.0	47
Spring	1.7	24

Figure 5: Seasonal wind roses - Carpark



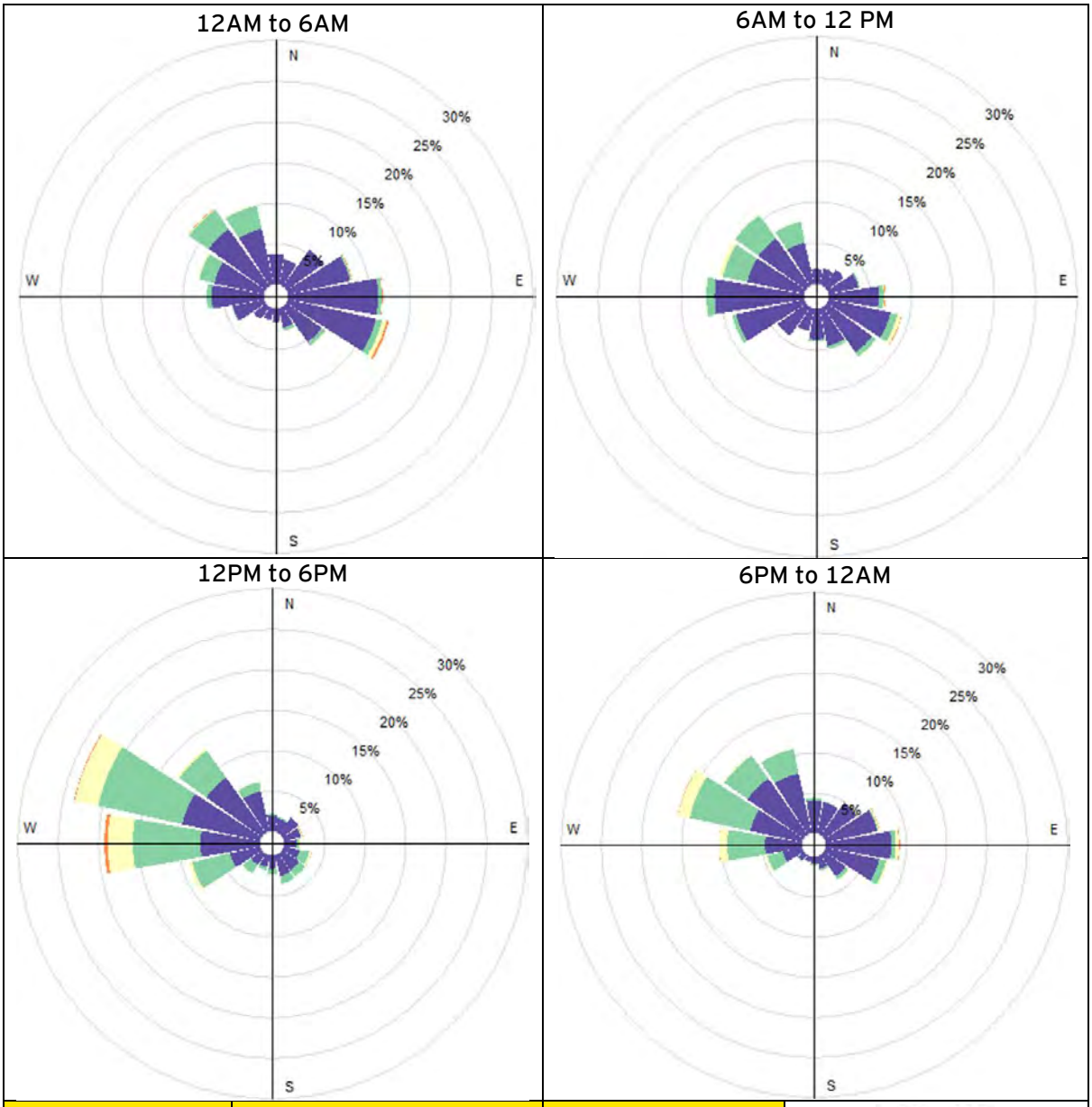
Season	Average Wind Speed (m/s)	Calm Winds (%)
12AM to 6AM	1.0	52
6AM to 12PM	1.1	45
12PM to 6PM	1.9	10
6PM to 12AM	1.3	34

Figure 6: Time of day wind roses - 2/5 Dam



Season	Average Wind Speed (m/s)	Calm Winds (%)
12AM to 6AM	0.7	66
6AM to 12PM	0.8	57
12PM to 6PM	1.8	16
6PM to 12AM	1.2	41

Figure 7: Time of day wind roses - Bobadil



Season	Average Wind Speed (m/s)	Calm Winds (%)
12AM to 6AM	0.9	53
6AM to 12PM	1.0	48
12PM to 6PM	2.0	10
6PM to 12AM	1.4	28

Figure 8: Time of day wind roses - Carpark

3.3 Temperature

The monthly mean, maximum and minimum temperatures at the three weather stations are presented in Figure 9, Figure 10 and Figure 11. These figures show that the MMG Rosebery Mine experiences a cool climate with the warmest mean temperatures occurring in January 2025 (~16°C) and the coolest mean temperatures occurring in July 2024 (~ 6°C). The maximum temperatures occurred in February 2025 (~35 °C) with the minimum temperatures occurring in July 2024 (~-2 °C). This is consistent with trends observed in previous years however, higher maximum temperatures were observed in FY24/25 compared with historical data. Included in Figure 9 is the 10 year mean temperature observed at each station. The trend with hotter summer conditions and cooler winter conditions is consistent with historical data.

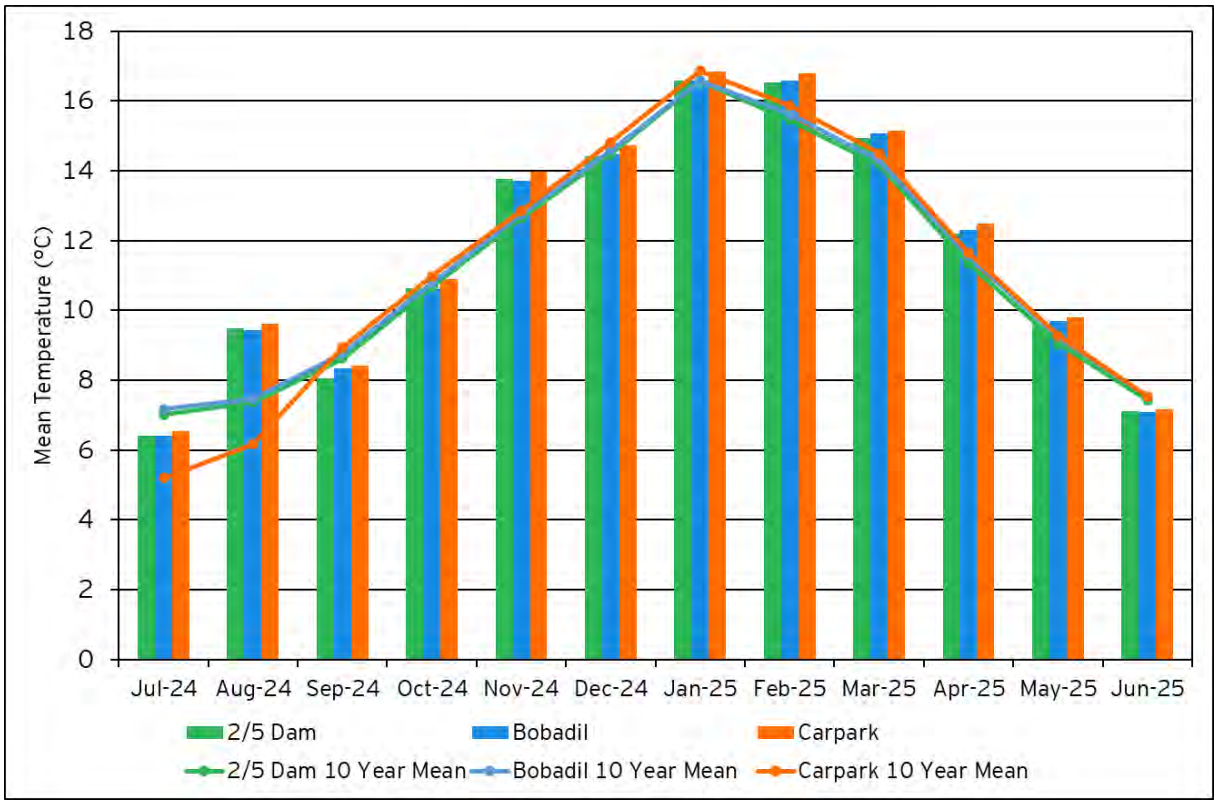


Figure 9: Mean monthly temperatures for FY24/25 and 10 year mean at all stations

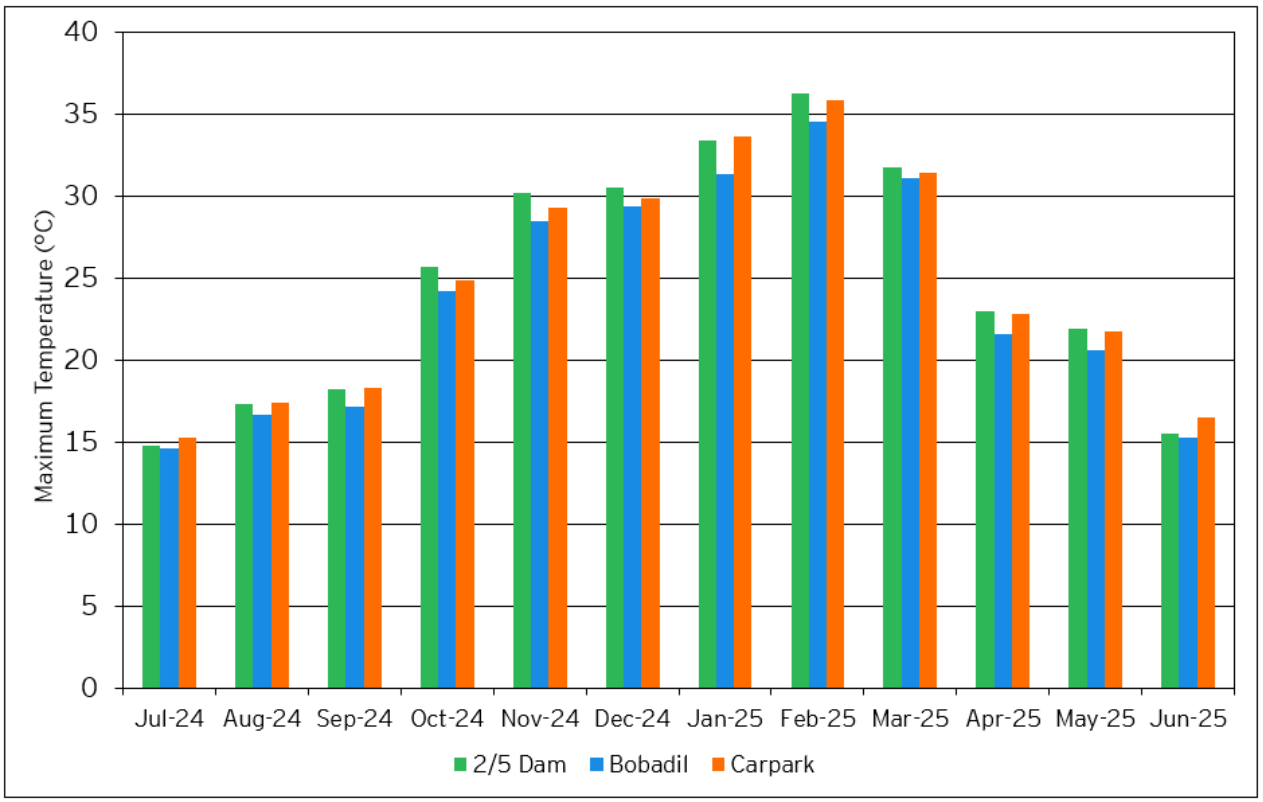


Figure 10: Maximum monthly temperatures for FY24/25 at all stations

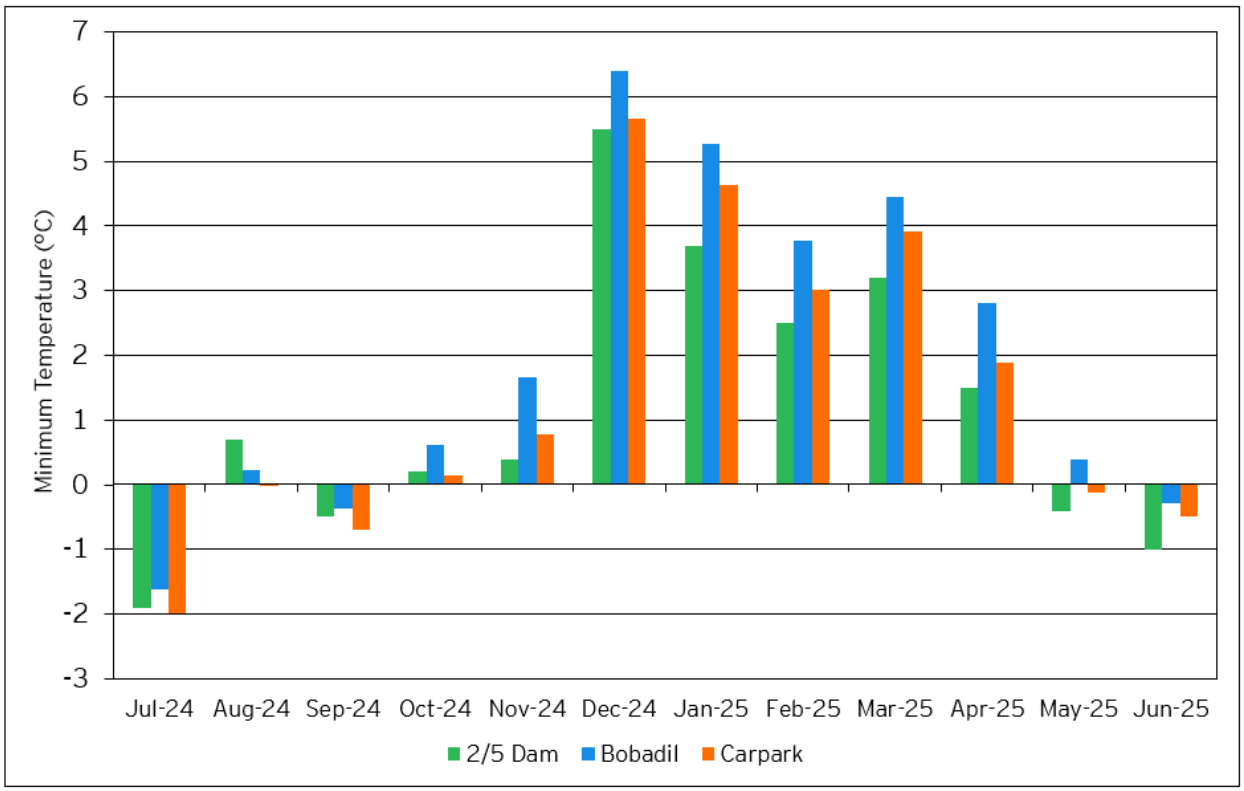


Figure 11: Minimum monthly temperatures for FY24/25 at all stations

3.4 Relative Humidity

The mean relative humidity at the three weather stations is presented in Figure 12. Humidity was highest in winter months (~90%) and lowest during the spring and summer months (~70%). The notable exception is December 2024 at all stations, which is correlated with increased rainfall throughout this month. This observed trend is consistent with the historic data observed at all stations.

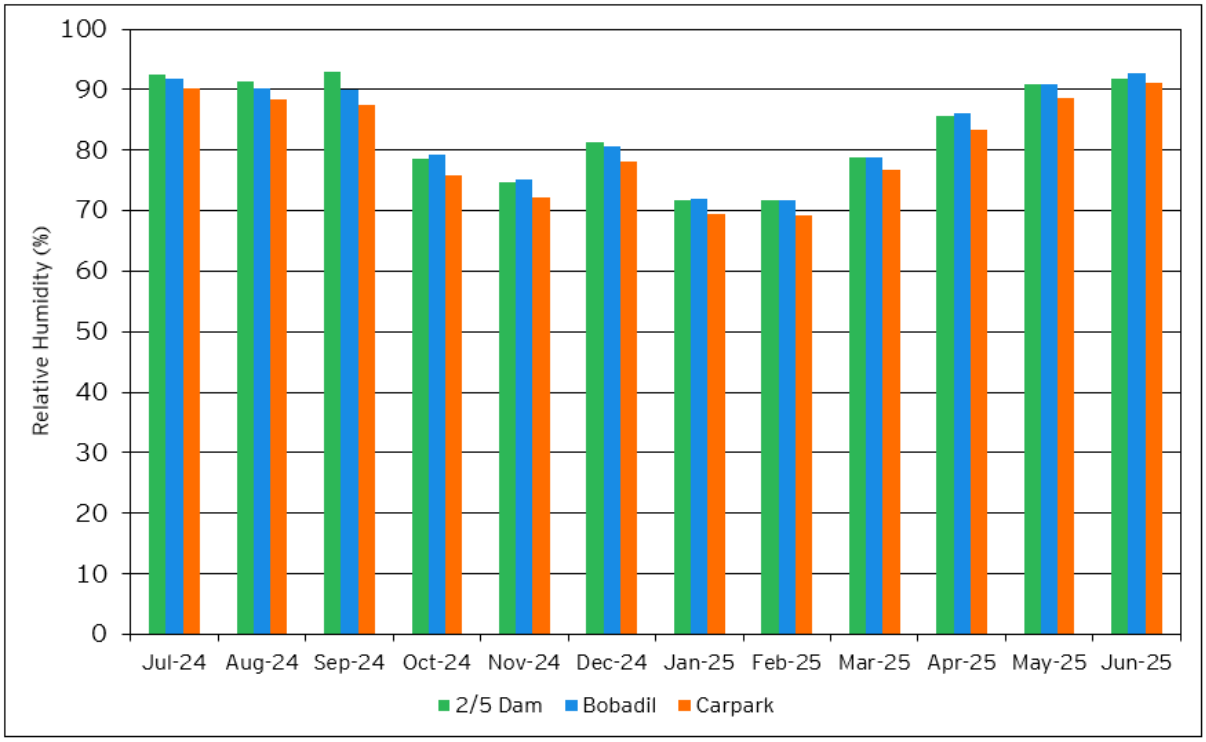


Figure 12: FY24/25 Mean monthly relative humidity at all stations

3.5 Rainfall

The total monthly rainfall at the three weather stations is presented in Figure 13. This figure indicates the site experienced significant rainfall in August and September 2024, but reduced rainfall between January and April 2025. The highest rainfall was observed for all stations in September 2024. The lowest was observed for all stations in January 2025. The total monthly rainfall trends at the three weather stations followed the trends observed at the BoM Rosebery weather station (BoM, 2025) for the same period.

Rainfall was generally lower at the Bobadil station for FY24/25 compared to the other two stations, which was also observed in prior years. More rainfall was recorded compared to the FY23/24 period, which was also observed at the BoM Rosebery weather station. Also included in Figure 13 is the mean rainfall for the last 10 years at all stations including the BoM Rosebery weather station. Higher rainfall was experienced in August, September and December 2024 compared with historical averages, with lower rainfall observed in July 2024 and January to June 2025.

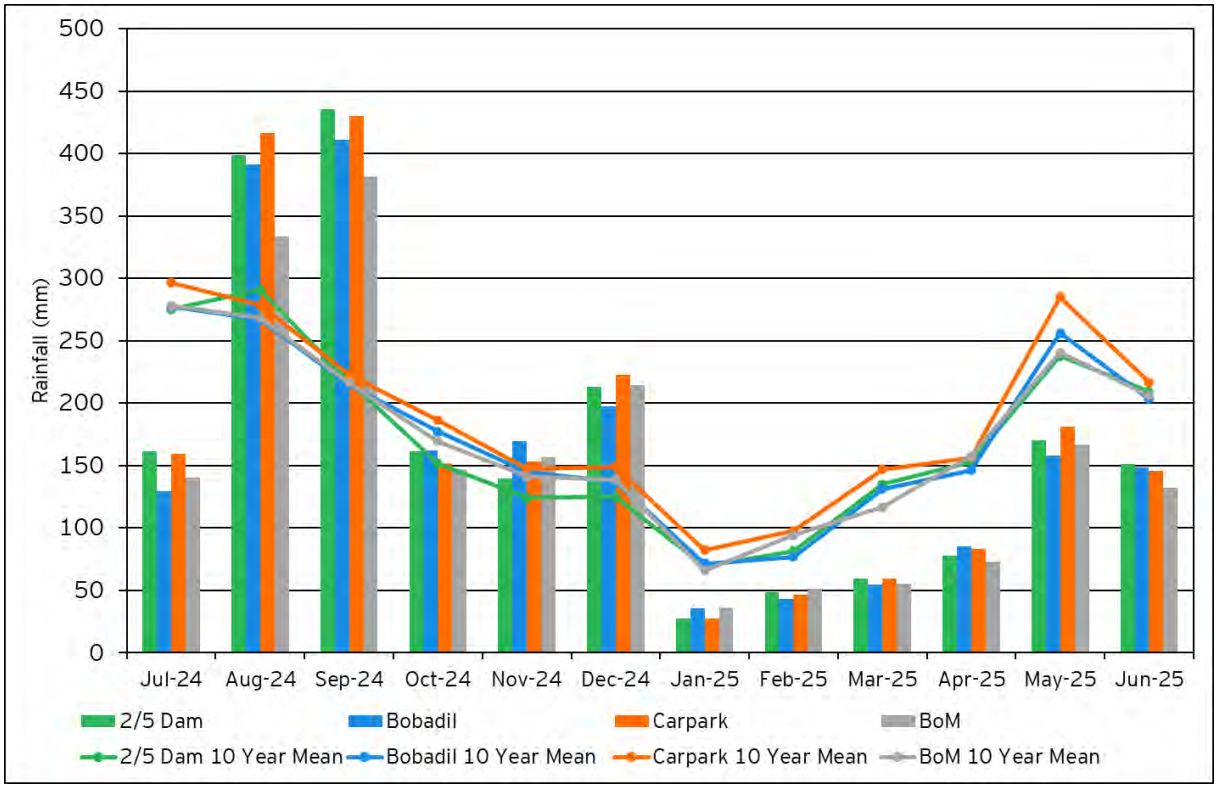


Figure 13: Total monthly rainfall for FY24/25and 10 year mean at all stations

4. Meteorological Summary

A summary of the meteorological parameters for the FY24/25 period for all stations is provided in Table 2.

The meteorological report for FY24/25 shows that westerly winds dominate during the afternoon hours at MMG Rosebery Mine, particularly at the 2/5 Dam and Carpark stations. The high percentage of calm conditions and low wind speeds observed at all sites are likely due to the surrounding terrain that modifies the prevailing westerly winds and shelters the areas containing the mining operations. Temperature, relative humidity and rainfall data for FY24/25 indicated that the MMG Rosebery Mine experiences a cool, wet and humid climate with wetter winter and spring months and drier summer and autumn months. Compared to FY23/24 period, higher average and maximum temperatures are observed. More rainfall was also observed in FY23/24 compared to FY24/25.

Table 2: FY24/25 meteorological data summary

Station	Mean air temperature (°C)	Maximum air temperature (°C)	Minimum air temperature (°C)	Average wind speed (m/s)	Average relative humidity (%)	Total Rainfall (mm)
2/5 Dam	11.6	36.3	-1.9	1.35	84	2,045
Bobadil	11.7	34.6	-1.6	1.12	83	1,987
Carpark	11.8	35.9	-2.0	1.31	81	2,078
Average	11.7	36.3	-2.0	1.26	83	2,037

5. Operational Risk Assessment for Summer Conditions

The predicted FY25/26 summer conditions at MMG Rosebery Mine are higher temperatures with higher maximums, reduced rainfalls and increased wind gusts. These conditions are likely to reduce the moisture content of exposed materials such as tailings and stockpiled materials. This can increase the potential for wind erosion, particularly when the material has been freshly disturbed. This risk may be further exacerbated by stronger wind speeds causing an increased risk of dust lift-off from exposed surfaces.

A high-level operational risk assessment has been completed to understand the possible impacts of the changes due to summer conditions at site, as show in Table 3. The risk assessment followed the corporate MMG Risk Management Procedure (MMG, 2019). Additional details on the likelihood, consequence and risk rating are provided in Appendix A. The table also includes the resulting risk rating after the application of additional dust mitigation measures and the controls detailed in MMG Rosebery Mine's Dust Mitigation Management Plan (MMG, 2025).

MMG Rosebery Mine implements a Dust Mitigation Management Plan which includes details the real-time monitoring network across the town, with inspection and mitigation alerts to allow for additional mitigation during rising dust trends. The Dust Mitigation Management Plan also includes a list of mitigation measures, a dust trigger action response plan (Dust TARP) with additional dust control actions as required.

The dust controls and additional controls within the Dust TARP are sufficient for controlling the possible dust emissions from site due to summer meteorological conditions.

Table 3: Summary of meteorological changes over summer and their associated risk ratings

Expected Summer Conditions	Impact of Summer Conditions	Emissions Outcome	Before Dust Controls			Dust Control	After Dust Controls		
			Likelihood of Emission [a]	Consequence of Emission [a]	Risk Rating [a]		Likelihood of Emission [a]	Consequence of Emission [a]	Risk Rating [a]
Increasing temperatures and higher maximum temperatures	Accelerated drying of surfaces	Reduced effectiveness of water sprays and increased dust lift-off potential	F	2	Medium	Increasing the use of water sprays on dryer materials Dust Mitigation Plan including inspection and mitigation trigger alerts	D	1	Low
Reduced rainfall	Reduced moisture in material	Higher susceptibility to wind erosion and dust generation	F	2	Medium	Increasing the use of water sprays on dryer materials Dust Mitigation Plan including inspection and mitigation trigger alerts	D	1	Low
Stronger wind gusts	Higher wind erosion potential	Elevated risk of dust lift-off from tailings, stockpiles, and haul roads	F	2	Medium	Increasing the use of water sprays on dryer materials and haul roads Reducing the speed on haul roads Dust Mitigation Plan including inspection and mitigation trigger alerts	E	1	Low
	Greater off-site transport	Risk of impacts at receptors further from site	F	2	Medium	Dust Mitigation Plan including inspection and mitigation trigger alerts	D	1	Low

a. Likelihood, consequence and risk rating has been taken from the MMG Risk Management Procedure (MMG, 2019). Please see Appendix A for further details.

6. References

Environdata. (2024b). *Field Calibration Report – MMG 2 to 5 Dam*. Environdata Weather Stations Pty Ltd .

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MMG. (2019). *Risk Management - Procedure - Common*. MMG.

MMG. (2025). *Dust Mitigation Plan - Management Plan - Rosebery Mine*. MMG.

Appendix A Meteorological Risk Matrix

Table 4: Likelihood category and relevant description

Likelihood	Likelihood Category	Description
Almost Certain	F	Could be incurred more than once in a year
Likely	E	Could be incurred over a 1-2 year period
Possible	D	Could be incurred over a 5 year period
Unlikely	C	Could be incurred over a 5-20 year period
Rare	B	Could be incurred over a 20-50 year period
Very Rare	A	Could be incurred in a period > 50 years

Source: (MMG, 2019)

Table 5: Consequence rating

Rating	Consequence - Environment
6	- Regional, offsite environmental impact requiring long-term recovery (years) with irreversible residual damage. - Species extinction or permanent impairment of ecosystem function or biodiversity value within site. - Irreversible loss/damage to site or item of significant cultural heritage value.
5	- Prolonged or severe, offsite environmental impact requiring long-term clean-up (years). - Extensive unconfined, on lease impact requiring long-term clean-up (months-years) leaving residual damage. - Change to ecosystem function or biodiversity value within site. - Irreversible damage to site or item of significant cultural heritage value.
4	- Major, offsite, environmental impact requiring medium-term clean-up (months). - Onsite confined impact requiring significant clean-up effort (years). - Temporary impairment of an ecosystem function or any kill/loss of a listed or protected species. - Repairable damage to site or item of significant cultural heritage value.
3	- Reversible offsite environmental impact, requiring short-term clean-up (weeks). - Onsite, confined, reversible environmental impact, requiring medium term (weeks-months) clean-up.
2	- Low, confined, reversible environmental impact. - Short term (less than a week) clean-up.
1	- Very low, reversible environmental impact confined to a small area within operations. - Prompt (within a shift) clean-up.

Source: (MMG, 2019)

Table 6: Risk rating of emissions sources

Likelihood Rating	F	Medium	Medium	High	Very High	Very High	Very High
	E	Low	Medium	High	High	Very High	Very High
	D	Low	Medium	Medium	High	High	Very High
	C	Low	Low	Medium	Medium	High	High
	B	Low	Low	Low	Medium	Medium	High
	A	Low	Low	Low	Low	Medium	Medium
		1	2	3	4	5	6
		Consequence Rating					

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Appendix F MMG Rosebery Annual Water Quality Monitoring Review 2024-2025 (Koehnken, 2025) – Including surface water and groundwater monitoring results and review for 3 Level Waste Rock Dump

MMG Rosebery Annual Water Quality Monitoring Review 2024-2025

FINAL

27 August 2025

A Report to MMG Rosebery

Lois Koehnken

Technical Advice on Water

DOCUMENT TYPE:	Report	
TITLE:	MMG Rosebery Annual Water Quality Monitoring Review 2024-2025	
VERSION:	Final	
CLIENT:	MMG Rosebery	
PREPARED BY:	Lois Koehnken	Final:27 August 2025 Draft: 8 August 2025
DISTRIBUTED TO:	Danielle Zanetto, MMG Amelia Gallagher, MMG	Electronic .doc

Limitation of Liability

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1 Introduction

The following tables and graphs summarise water quality results from MMG Rosebery for the monitoring period 1 July 2024 to 30 June 2025. Table 1-1 summarises chemical parameter names and acronyms used in the presentation and description of water quality results.

Table 1-1. Summary of terms and water quality parameter names.

Name	Description/Definition
2/5	Redeveloped 2 and 5 Tailings Storage Facility (TSF)
Al	Aluminium
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
BO	Bobadil Outfall monitoring point (licenced discharge point for MMG)
BTEX	Volatile organic compounds: benzene, toluene, ethylbenzene, and xylene
Cd	Cadmium
Cu	Copper
CN	Cyanide
D&S	Deep and shallow ground water bores
DO	Dissolved Oxygen – measured in either mg/l or percent saturation (%Sat)
EC	Electrical conductivity, measured in the units µS/cm
ETP	Effluent Treatment Plant
EPA	Environment Protection Authority Tasmania
EPN	Environmental Protection Notice
Fe	Iron
GB	Groundwater bore
LoR	Limit of laboratory reporting
mbgl	Metres below ground level
Mn	Manganese
NATA	National Association of Testing Authorities (Australia)
NOEC	No Observable Effects Concentration
PAF	Potentially acid forming
PCE	Permit Conditions - Environmental
Pb	Lead
pH	Measure of concentration of hydrogen ions in water
T	Temperature
TN	Total nitrogen
TP	Total phosphorus
TPH	Total Petroleum Hydrocarbons
TSF	Tailings Storage Facility
TSS	Total suspended solids
WAD-CN	Weak acid dissociable cyanide - the component of cyanide that is most biologically available and reactive
WRD	Waste Rock Dump
Zn	Zinc

1.1 Changes to water management since EPN 7153/3 was issued

The MMG Rosebery site, including the decommissioned Hercules site, operates under EPN 7153/3 which was issued in October 2011. Since that time, substantial changes to water management at MMG Rosebery have occurred, including improved stormwater collection and treatment, and re-development of the 2/5 Dam TSF. This has resulted in the following:

- Much of the stormwater that is monitored at the EPN listed sites is now captured, directed to the Effluent Treatment Plant (ETP) for treatment, and discharged via the licenced discharge point Bobadil Outfall (BO), or is monitored at locations further downstream in the catchment. This includes sites AC1, PC2, FPC1 and FPC2.
- The 2/5 TSF is now the primary location for tailings deposition at Rosebery. Water quality monitoring at the 2/5 Dam TSF is governed by a water quality monitoring plan that was revised and approved by the EPA in July 2021. Since approval of the plan additional water management works at the 2/5 TSF have included the construction of a seepage collection system along the western screening wall that captures TSF seepage and returns it to the TSF, resulting in the water collected at the MHS2 monitoring site derived from stormwater rather than seepage. An additional seep has been captured from the eastern embankment of the 2/5 TSF and is directed to the Seepage Collection Pond (SCP01) and pumped back into the TSF with the other seepage flows.
- Most tailings are discharged and stored in the 2/5 TSF. During the 2024 to 2025 monitoring year about 93% of the process tailings were stored in the 2/5 TSF with the remaining <10% discharged to the Bobadil TSF. The process water, seepage return water and any additional water required for tailings conveyance to the 2/5 Dam TSF is returned to the ETP for lime-dosing and discharge to Lake Pieman via the Bobadil TSF and BO. Stormwater runoff and mine water continue to be collected, treated at the ETP, and discharged via the Bobadil TSF. The licenced discharge point, Bobadil Outfall (BO) remains unchanged.

1.2 Revision of monitoring requirements

In December 2024, MMG Rosebery was issued a permit from the West Coast Council (DA 2024/0032) to raise the embankment of the Bobadil TSF and operate the TSF. The permit includes Permit Conditions Environmental (PCE 11514) that outlines the environmental requirements for the operation of the Bobadil tailings facility (TSF) including monitoring requirements for surface water, groundwater and dam seepage. The monitoring requirements supersede the requirements contained in EPN 7153/3 for the Bobadil TSF, but do not affect the monitoring requirements for other areas (e.g. Hercules, 2/5 TSF, site stormwater).

The monitoring requirements of PCE 11514 are similar to those contained within EPN 7153/3. Differences include eliminating the requirement to monitor thermotolerant coliforms in the Bobadil discharge and increasing monitoring requirements at some sites to include both total and filtered metals, and WAD and Total CN. The PCE also requires development of a new groundwater monitoring plan which is being formulated.

This Annual Review is based on the monitoring requirements listed in EPN 7153/3 as the revised monitoring requirements have been progressively implemented during the second half of the 2024 to 2025 monitoring year. The revised monitoring requirements will form the basis for the 2025 to 2026 Annual Review.

1.3 Note on presentation of results

The MMG 2024 to 2025 monitoring results are presented in a range of graphical formats, including boxplots. Where the recent monitoring results are being compared to the EPN discharge limits at BO, or to long-term historic results such as storm water monitoring, boxplots encompassing the 5th to 95th percentile values are used. Where monitoring results are presented to summarise recent monitoring results at sites without discharge limits or

show long-term trends, boxplots encompassing the 25th to 75th percentile values are used to provide more detail of the distribution of results.

2 Environmental incidents in the July 2024 to June 2025 monitoring year

One environmental incident occurred on the MMG Rosebery site in the 2024 to 2025 monitoring year and was reported to the EPA. Details of this are described below. The EPA was also notified about a potential total nitrogen exceedance at BO however the reported result was attributable to a laboratory error and total nitrogen did not exceed the PCE limit or 95th percentile trigger value.

An investigation into total nitrogen concentrations exceeding the 95th percentile trigger value based on a 12-month rolling data set was conducted by MMG in April to July 2025. This is discussed in Section 3, Bobadil TSF Discharge.

2.1 Environmental incident – damage to flume due to light vehicle collision

On the night of September 2, 2024, a light vehicle had a minor collision with the flume that transports tailings and treated mine and stormwater from the ETP to the Bobadil TSF. At the time of the incident it was estimated that ~400 l/s of treated water was being transported to the TSF with a solids load of only 1.5%. The incident occurred on a bend in the Chasm Creek catchment, resulting in much of the flow continuing to be transported down the flume as the rupture was on the inside of the bend, and most flow is transported on the outside bend of the flume. The geometry of the site combined with the flume bunding and road drain prevented the direct release of material to Chasm Creek. Water and a minor quantity of solids entered the road drain with an unrecorded volume of water entering the environment. The solids were observed to be retained within ~50 m of the incident in the drain, with no solids observed in nearby stormwater culverts. The site was contained within 30 minutes and the flume was repaired within a few hours. The EPA was notified of the incident on September 3, 2024.

3 Bobadil Tailings Storage Facility Discharge

Treated water from the ETP and variable volumes of tailings are discharged to the Bobadil TSF via a gravity flume system. Within the TSF, tailings are deposited subaerially on beaches and water drains into the Decant Ponds and is directed to the Polishing Ponds via the Decant Channel (Figure 3-1). The water flows sequentially through the cells in the Polishing Ponds before being discharged to Lake Pieman via the licenced discharge point, Bobadil Outfall (BO). During the 2024-2025 monitoring year the location of the BO water quality sampling site was moved approximately 10 meters downstream to coincide with the location of the continuous monitoring flow, pH, EC and temperature probes to ensure consistency between field and continuous readings.

In the 2024 to 2025 monitoring year approximately 62,000 dry tonnes of tailings, equivalent to 7% of the total tails produced at Rosebery, were discharged to the Bobadil TSF, along with all of the treated mine and stormwater and return decant water from the 2/5 TSF. A summary of the monitoring results collected during the 2024-2025 monitoring period at BO is contained in Table 3-1.



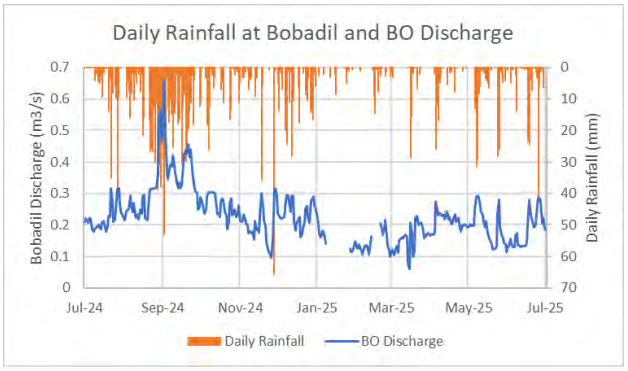
Figure 3-1. Bobadil TSF showing the main dam, Decant Ponds, decant line, Polishing Ponds, and the licenced discharge point from the Polishing Pond (BO).

Table 3-1. Bobadil tailings discharge monitoring results during the 2024 to 2025 monitoring year.

Requirement	Findings
Monitoring Frequency	Continuous, weekly, and monthly parameters were monitored as per the requirements in the EPN with the following exceptions (notwithstanding contradictions in EPN, e.g., nutrients listed as both weekly and monthly): • There is a gap in the Entura continuous flow monitoring between 8 January and 16 April 2025 (Figure 3-2). • There are several gaps in the Entura continuous pH, EC and temperature monitoring results between 8 – 15 January 2025, and 21 January to 1 April 2025. MMG maintain a duplicate pH probe at BO which recorded during the gaps (Figure 3-3). Weekly monitoring of the parameters was completed throughout the year. • All parameters required to be determined weekly were completed. On 47 occasions sampling was completed at 7-day intervals. The intervals between monitoring for the other 5 weeks ranged from 5 to 9 days and corresponded to holiday periods.
Compliance with EPN discharge limits	• Rainfall during the 2024-2025 monitoring year was highly variable, with the 2024 winter having very high rainfall, and the 2024/2025 summer and autumn being unusually dry. Overall, the annual rainfall total at Bobadil was 2,078 mm in 2024-2025, which is slightly lower than the long-term average of 2,224 mm (1911 – 2018 at Renison Bell, Tasmania, Figure 3-2). • The maximum discharge rate at BO was 0.68 m^3/s which was driven by a period of extended high rainfall. The rest of the year was characterised by moderate to low flow with an average hourly discharge of 0.23 m^3/s, and a median hourly flow of 0.22 m^3/s (Figure 3-2).

	• The Entura and MMG continuous pH readings and the field pH measurements remained well above discharge limits in the TSF, with the lab results consistently one or more pH units lower (Figure 3-3). The continuous MMG probe recorded lower values as compared to the Entura probed during the first half of the year, with good agreement following re-instatement of the Entura probes in April. • Three laboratory pH readings were below the EPN limit of 6.5, but the 95th percentile value was 6.5. The corresponding field and continuous results were all above pH 6.5 on the same dates. The pH decline post sampling indicates ongoing reactions within the sample, and aging of the sample, but does not affect metal concentrations as the metals have already been removed and captured in the TSF. Metal concentrations were below the EPN reporting and investigative triggers on all sampling dates (Figure 3-6). • At Bobadil, the low summer discharge did not result in weekly EC or sulphate values increasing above EPN limits or investigative triggers (Figure 3-4, Figure 3-5). The Entura continuous EC probe recorded values above the 95th percentile trigger when it came back online in April 2024, but the 95th percentile value for the data set remained below 1700 μS/cm, and the high readings are questionable given the field and lab results. The MMG continuous EC results were all below the 95th percentile target. Similar to previous years the Field EC is frequently lower than the Laboratory EC values. Whether this is due to dissolution reactions in the sample post-sampling increasing EC, or a difference in calibration is unknown. The reason for the discrepancy between the MMG and Entura continuous EC results is unknown. • All metals and other parameters were below the discharge limits in all weekly samples during the monitoring year (e.g. Figure 3-6)
Comparison with EPN investigation trigger levels	• The 95th percentile values of the samples collected in the 2024 to 2025 monitoring year were below the 95th percentile investigative triggers for all parameters except total nitrogen. The 95th percentile value for TN was 5.7 mg/l, slightly higher than the 5.5 mg/l 95th percentile target, with the highest values recorded during March and April 2025 (Figure 3-7). MMG investigated total nitrogen inputs to Bobadil in the last quarter of the monitoring year and identified a number of potentially contributing factors, including increased blasting underground, increased blasting in shallower areas of the mine resulting in less dilution of blasting residue prior to entering the waste water streams, placement of recently blasted rock that likely contains nitrogen containing residue within Bobadil as part of the TSF wall rise, and lower than average rainfall reducing inflows to Bobadil. The exceedance of the 95th percentile poses a low risk to the receiving environment due to: o The 95th percentile value being generic in nature and not linked with known ecosystem processes in the receiving environment. At the TasWater site located on the flooded arm of the Stitt River which also enters Lake Pieman the median limit for TN is 7 mg/l with a 90th percentile limit of 10 mg/l; o The high level of initial and ongoing dilution provided in Lake Pieman for the BO discharge rapidly decreases concentrations in the mixing zone;

	○ The high water velocities and turbulent nature of flow in the receiving environment when the power station is operating prevents algal growth; and, ○ The naturally dark colour of Lake Pieman water restricts light penetration and impedes algal growth.
Significant trends - reporting period	• Metal retention in the TSF continues to be highly efficient due to the strict pH control, resulting in low metal concentrations in the discharge from BO over the monitoring year (Figure 3-6). Mercury, TPH and Thermotolerant coliforms were below the LoR (limit of laboratory reporting) for all monitoring periods, consistent with previous years.
Significant trends - longer period	• Zinc concentrations remain within historic ranges (Figure 3-8, Figure 3-9). The median value for the present monitoring year was 0.026 mg/l, compared to 0.034 mg/l during the previous year. • The median sulphate concentration in the 2024 to 2025 monitoring year was also slightly lower (654 mg/l) as compared to the previous year (692 mg/l; Figure 3-10).
Comment	The monitoring requirements in PCE 11514 at BO should be refined to be internally consistent and better reflect the conditions at the site. Suggested changes include: • The frequency of monitoring should be clarified for parameters listed as both weekly and monthly (e.g. nutrients) or monthly and six-monthly (e.g. TPH) • The requirement for the laboratory analysis of pH should be eliminated as the analysis is frequently completed outside of the holding time of the samples, and the field results are more applicable to management of the TSF. • Mercury should be removed from the sampling schedule as results have been <LoR for over a decade for both total and filtered mercury. • Monitoring frequency should be included in the review based on the large number of parameters that are consistently below discharge targets. Consideration should be given to reducing the frequency of monitoring for parameters that have been below the LoR levels for multiple years. • The 95th percentile investigative trigger for total nitrogen should be reviewed for the reasons discussed above. The discrepancy between the Entura and MMG continuous EC results should be investigated. It is recommended that as a first step the two continuous probes and the MMG field probes should all be calibrated using the same EC standard on a regular basis.



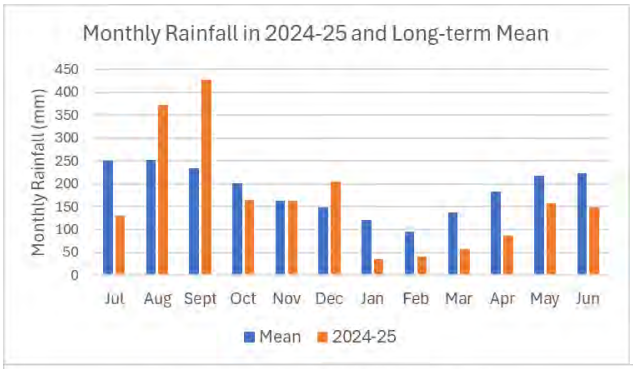


Figure 3-2. (top) Daily rainfall at Bobadil and discharge at BO 1 July 2024 to 30 June 2025, and (bottom) 2024-2025 monthly rainfall at Bobadil weather station compared to long-term (1911-2018) monthly averages at Renison Bell (Renison data from BOM).

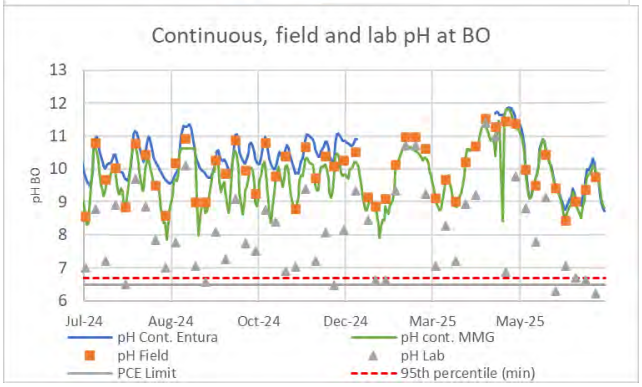


Figure 3-3. Weekly field, laboratory, and continuous pH (daily averaged) results from BO, July 2024 to June 2025. Continuous results are from Entura maintained probes and from MMG maintained PI system.

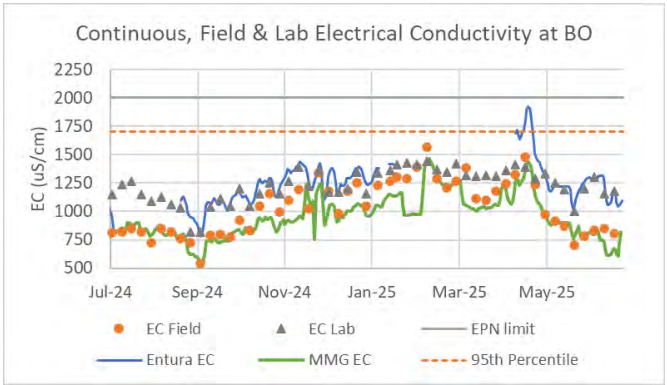


Figure 3-4. Weekly field, laboratory and continuous Entura and MMG EC results from BO, July 2024 to June 2025. All EC results are temperature compensated to 25 °C.

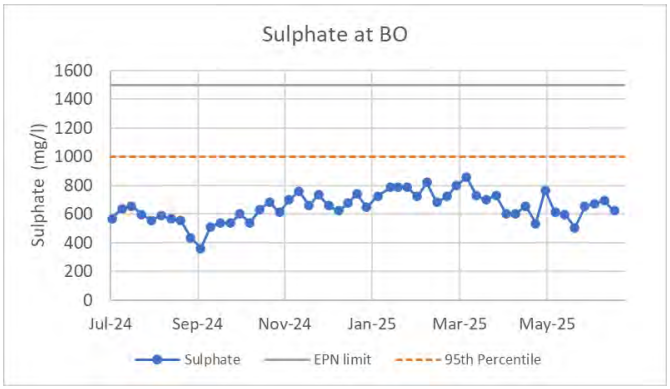


Figure 3-5. Weekly sulphate at BO from July 2024 to June 2025 with EPN discharge limits for sulphate indicated.

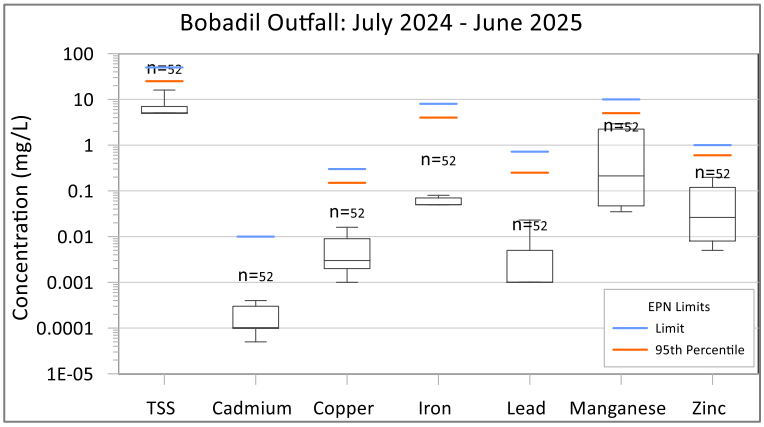


Figure 3-6. Box and whisker plot of TSS and total metal monitoring results at BO for July 2024 to June 2025 compared to EPN limits and 95th percentile trigger. The box encompasses 5th to 95th percentile values, with minimum and maximum values indicated by the whiskers.

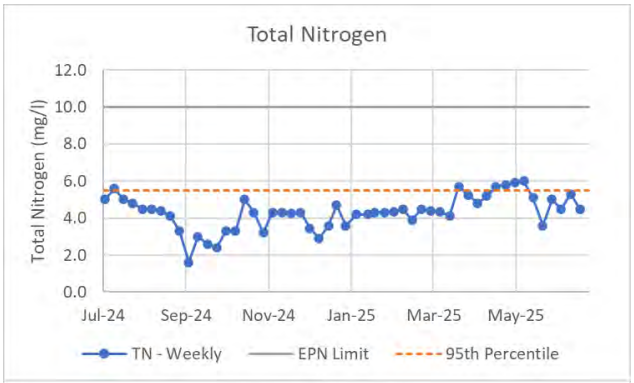


Figure 3-7. Total nitrogen concentrations in July 2024 to June 2025.

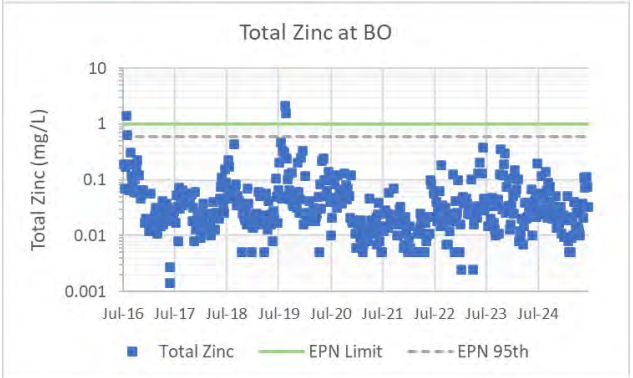


Figure 3-8. Total zinc concentrations from July 2015 to June 2025.

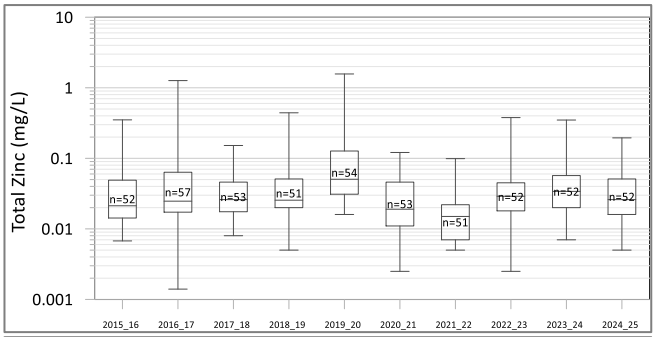


Figure 3-9. Comparison of total zinc concentrations at BO over the past 10 monitoring years (July to June). The box encompasses the 25th to 75th percentile values, and the 'whiskers' extend to the minimum and maximum values.

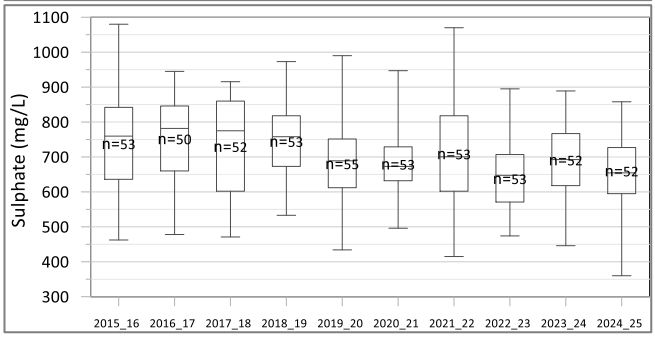


Figure 3-10. Comparison of sulphate concentrations at BO over the past 10 years. The box encompasses the 25th to 75th percentile values, and the 'whiskers' extend to the minimum and maximum values.

4 Internal Bobadil TSF Monitoring (BI and BF)

The monitoring locations for internal sites BI (Bobadil Intermediate) and BF (Bobadil Flume) are shown in Figure 4-1, and the results are summarised in Table 4-1. BF is located at the head of the flume that transports tailings and treated water to the Bobadil TSF, and BI is at the outlet of the decant pond.



Figure 4-1. Internal monitoring locations BF (head of Flume) and BI (Bobadil intermediate). The discharge point BO is also indicated.

Table 4-1. Summary of monitoring results from internal monitoring sites at Bobadil TSF for the 2024 to 2025 monitoring year.

Requirement	Findings
Monitoring Frequency	At BI and BF all parameters were monitored monthly as required. The cyanide parameters and field parameters were monitored more frequently than required, generally on a weekly basis.
Significant trends reporting period	• pH trends are similar to previous years with pH declining between BF, BI and BO, with the largest decline between BI and BO as the water moves through the polishing pond (Figure 4-2). • In contrast, EC values are similar at BI and BO and higher at BF. This is likely due to on going precipitation reactions occurring between BF and BI removing anions and cations from the discharge, such as gypsum precipitation. • Sulphate concentrations at the sites ranged from 300 mg/l to 900 mg/l between the sites over the year (Figure 4-4). Median values increased between the sites, from 530 mg/l at BF, to 595 mg/l at BI and 655 mg/l at BO), recognising the difference in sample numbers. The increase is likely attributable to tailings water draining into BI, and from seepage entering the Polishing Pond from the main TSF (Figure 4-4). • TSS results show that 10 g/l to 100 g/l of tailings and sludge were being transported at BF during each monitoring run. TSS at BI was <100 mg/l on all monitoring dates, demonstrating a high retention of solids in the main TSF (Figure 4-5). TSS in the Bobadil outfall were below the EPN limit and 95th percentile investigative trigger on all occasions due to the ongoing trapping of solids in the Polishing Pond.
Comment	The monthly results from BF and BI are not used for day-to-day management of the site but are useful for identifying potential changes following the reduction in tailings deposition. To date Bobadil continues to efficiently retain solids and metals even with the reduction in tailings input.

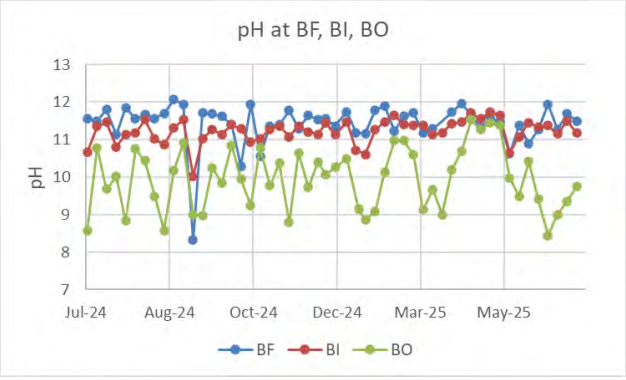


Figure 4-2 Comparison of Field pH at BF, BI and BO for July 2024-June 2025.

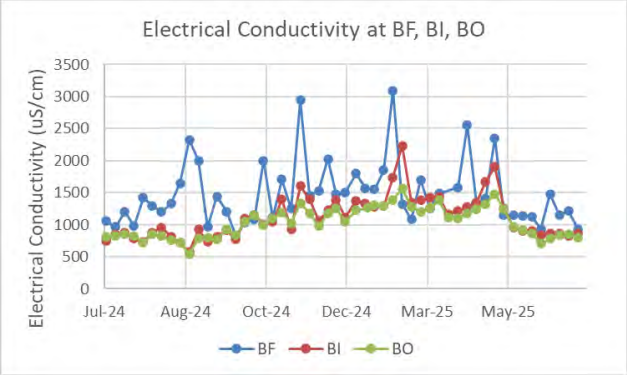
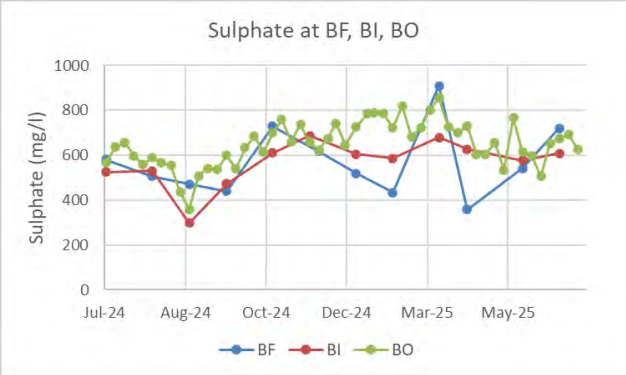


Figure 4-3 Comparison of Field EC results at BF, BI and BO for July 2024 to June 2025



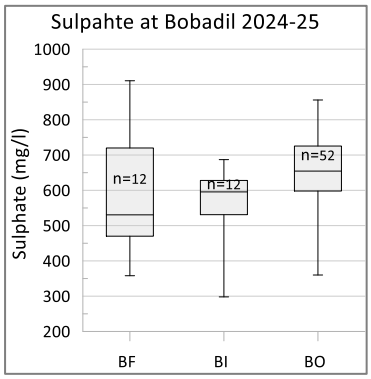


Figure 4-4. (left) Time series of sulphate at BF, BI and BO July 2024-June 2025 (right) box and whisker plots comparing concentrations at BI and BO. Boxes contain the 25th to 75th percentile values, with the minimum and maximum indicated by the 'whiskers.

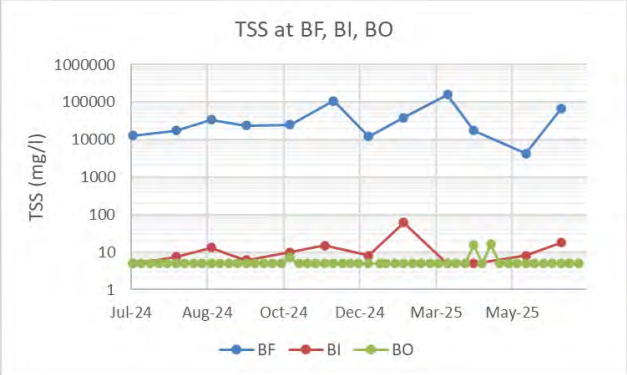


Figure 4-5. TSS at BF, BI and BO July 2024 – June 2025. The LoR is 5 mg/l. Values below this level are shown as 5 mg/l.

5 Bobadil TSF Seeps

EPN 7153/3 includes a requirement to monitor seepage from the Bobadil TSF based on observations of seepage flows at the time the EPN was issued in 2011. The intention of seepage monitoring is to understand diffuse inputs to the environment from the TSF. Since issuance of the EPN, several lifts of the dam wall have been completed, and the sub-surface hydrology of the site has altered, as evidenced by the lack of flow in several historic seepage points. Seep BD4 has been eliminated by expansion of the TSF. In January 2025 monitoring of seep BD3 was discontinued due to the seep only being accessible from Lake Pieman, and access being dangerous due to debris on the lake shore. This change was approved by the EPA. The locations of the seeps monitored in the 2024 to 2025 monitoring year are shown in Figure 5-1 with a summary of the monitoring results contained in Table 5-1.



Figure 5-1. Seepage monitoring locations at Bobadil TSF.

Table 5-1. Summary of monitoring results from Bobadil TSF seeps in the 2024 to 2025 monitoring year.

Requirement	Findings
Monitoring Frequency	Quarterly monitoring was completed as required. BD3 was only sampled in Sept and Dec 2024 as previously discussed. Samples were not collected at sites BD2 in March or June 2025 due to lack of water at the site. Quarterly sampling was completed at BD1 and BD5 as required. Flow rates of zero were recorded at several sites where water quality samples were collected. This suggests the samples were collected from stagnant water pooled upstream of the v-notch rather than flowing seepage.
Compliance with EPN	All parameters were determined on the collected samples as required. Flow rates at BD1 and BD3 ranged from 0 to 0.2 l/s, and at 0.1 to 1.4 l/s at BD5. No flow was recorded at BD2 on any sampling occasion.
Significant trends - reporting period	• Overall, the water quality results are within the same range as previous years. • Seep BD5 continues to have the highest pH values of any of the seeps, ranging between 6 and 7 during the monitoring year. pH values at BD1 and BD2 are lower and range between 4 and 6 in the quarterly samples (Figure 5-2). • Total zinc values in BD1 and BD2 continue to be elevated as compared to seeps BD3 and BD5 (Figure 5-3), with BD1 recording very high concentrations during the dry summer. Zinc concentrations at BD5 in September were the highest recorded in many years, and in March 2025 were the lowest recorded at the site, highlighting the variability in the seeps. • Total lead results remain in the range of previous results (Figure 5-4). • Sulphate concentrations in BD3 and BD5 continue to be elevated and show low variability (Figure 5-5). The sulphate concentration at BD1 in March 2025 was the highest recorded, but the flow rate was 0.05 l/s reflecting the dry conditions. Sulphate concentrations in seep BD2

	continue to be lower, <60 mg/L, suggesting the seep receives clean catchment surface or groundwater as well as seepage from the TSF. • Similar to previous years, the DO at BD5 is low, and iron and manganese concentrations are elevated, consistent with the seep being fed by groundwater (Fe = 7 – 11 mg/l; Mn= 5-7 mg/l). The DO at the other sites is higher suggesting contact with the atmosphere upstream of the monitoring location. • Zinc fluxes at BD5 ranged from 4 to 7 g/day (n=4), and sulphate fluxes ranged from 4 to 75 kg/day (n=4).
Comments	• Seepage monitoring at Bobadil should be revised to target active seeps entering the environment as the water quality results from BD1 and BD2 generally reflect pooled water. The similarity between BD3 and BD5 seeps is suspected to be due to the same water being monitored near the TSF (BD5) and as it enters Lake Pieman (BD3), as the BD3 seep was erroneously being monitored downstream of the original monitoring location. This was rectified in September 2024, but the correct BD3 location is no longer accessible from Lake Pieman due to fallen trees.

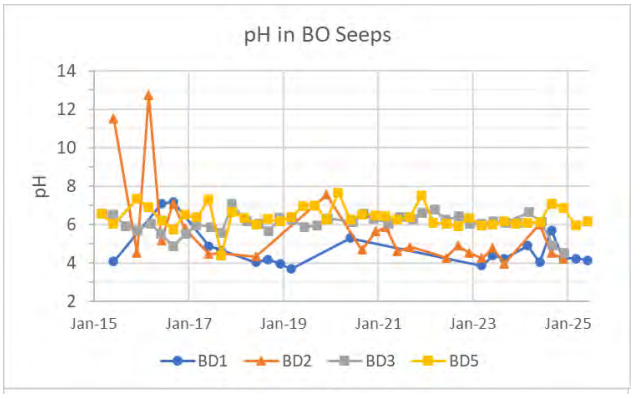


Figure 5-2. pH results from Bobadil seeps, June 2015 to June 2025.

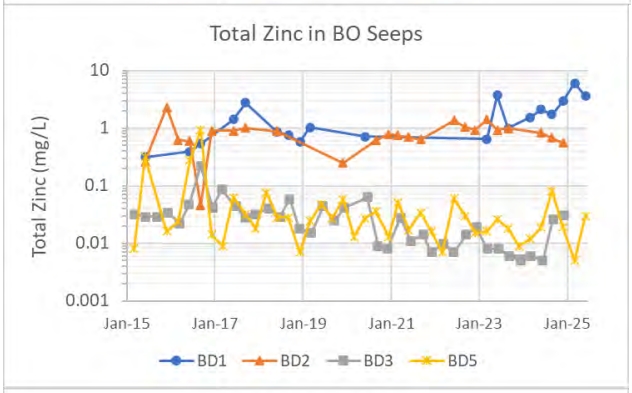


Figure 5-3. Total zinc results from Bobadil seeps, June 2015 to June 2025. Note log scale.

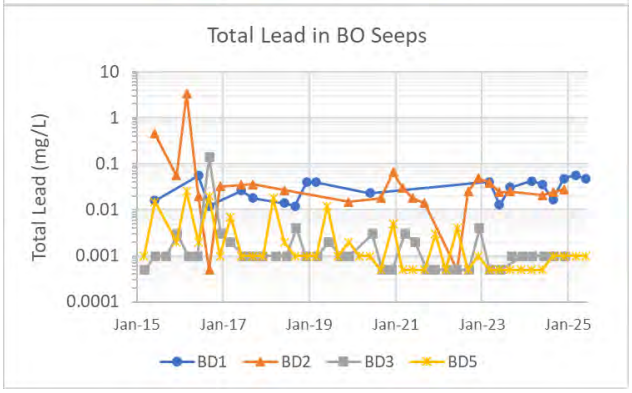


Figure 5-4 Total lead results from Bobadil seeps, June 2015 to June 2025. Note log scale.

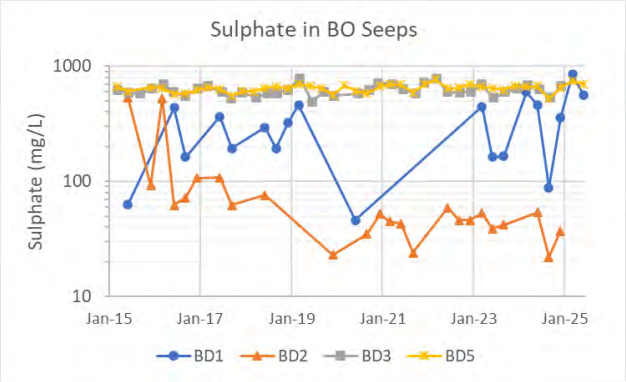


Figure 5-5 Sulphate concentrations in the Bobadil seeps June 2015 to June 2025. Note log scale.

6 Bobadil TSF Groundwater Monitoring

The location of groundwater monitoring bores listed in EPN 7153/3 near the Bobadil TSF shown in Figure 6-1. PCE 11514 requires development of a revised groundwater monitoring plan at Bobadil. The plan is being developed by MMG and will be implemented in the 2025 – 2026 monitoring year. A summary of groundwater monitoring results as compared to the requirements of EPN 7153/3 is contained in Table 6-1.



Figure 6-1. Location of groundwater monitoring bores near the Bobadil TSF.

Table 6-1. Summary of the 2024 to 2025 monitoring results from the groundwater bores located near the Bobadil TSF.

Requirement	Findings
Monitoring Frequency	• Monitoring of bores GB4, GB6 (D&S), GB7 (D&S), and GB8 (D&S) was completed in October 2024 and April 2025 as required. • Bore GB5 no longer exists due to expansion of the TSF facility.

	• Bore GB9 was decommissioned in September 2020 following approval from the EPA to discontinue monitoring at the site due to sampling difficulties.
Compliance with EPN	All parameters were determined as specified in the EPN, with some additional parameters also determined.
Significant trends - reporting period	• The results are consistent with previous monitoring. The deeper bores (GB6D, GB7D, GB8D, depth 20 to 55 mbgl) tend to have higher pH and higher concentrations of alkalinity (Figure 6-2, Figure 6-3) as compared to the shallower bores (all <15 mbgl), with alkalinity in the deeper bores exceeding the acidity concentrations in the same bores. This may reflect limited impact from seepage from the TSF entering the deeper aquifers. • The shallow bores (GB4, GB6S, 7S, and 8S) generally have higher concentrations of zinc, manganese and sulphate as compared to the deeper bores, and higher acidity concentrations consistent with the TSF being a source to these bores (Figure 6-4 to Figure 6-6). • Bore GB7S, located between the northern extent of the dam and Lake Pieman continues to record the highest total zinc levels. The deep water in the bore (GB7D) contains comparatively low levels of zinc and sulphate. • TPH (C_{10} – C_{36} total) was 3.6 mg/l at site GB8S in April 2025. The sample was not re-tested using a silica gel cleanup so it is unknown if the readings are due to TPH or natural inputs. GB8 is a shallow bore (5 m) located between the main TSF and the Polishing Pond near an area used to store core and other equipment. TPH has been detected in previous samples collected in April but has ben below the LoR in the intervening samples collected in October. • The results continue to support a conceptual model of the shallow aquifer, composed of glacial till, being hydraulically connected to the dam, with elevated zinc, manganese and sulphate derived from the TSF seepage. The deeper groundwater system appears to be largely isolated from TSF impacts.
Other comments	The revised groundwater monitoring plan will include a larger number of bores and provide a better understanding of the relationship between groundwater and the Bobadil TSF.
Recommen-dations	If TPH is above the LoR at GB8S in April 2026 it is recommended a silica gel cleanup be applied and the sample is re-run to ascertain whether the result is due to TPH or natural organic acids.

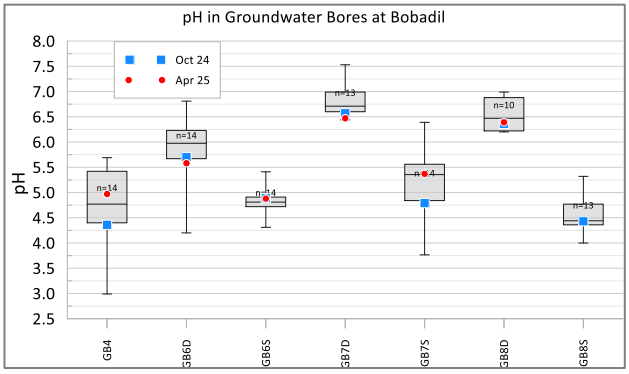


Figure 6-2. pH in groundwater samples collected near Bobadil TSF October 2017 to April 2025. Results from October 2017 to April 2024 are shown as a box plot with the Oct 2024 and April 2025 results shown as data points. The box encompasses the 25th to 75th percentile results with the maximum, median and minimum indicated by lines. The number of samples included in the analysis is also shown (n=).

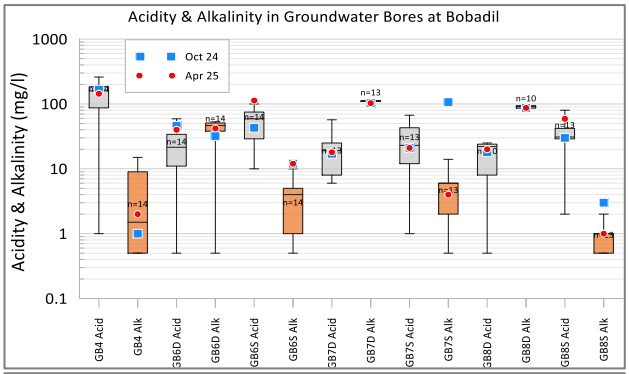


Figure 6-3. Alkalinity and acidity in groundwater samples collected near Bobadil TSF Oct 2017 to April 2025. Acidity at each site is shown as a grey box with alkalinity shaded orange.

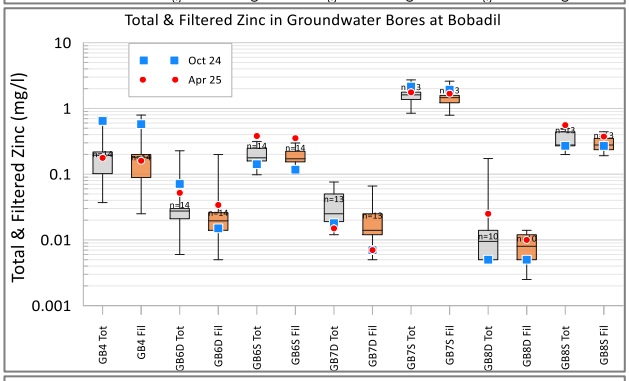


Figure 6-4. Total and filtered zinc results from groundwater samples collected near Bobadil TSF, October 2017 to April 2025. Total zinc at each site is shown in grey with filtered results shown in orange. The box contains the 2017 to 2024 results with the 2024 to 2025 results indicated by data points.

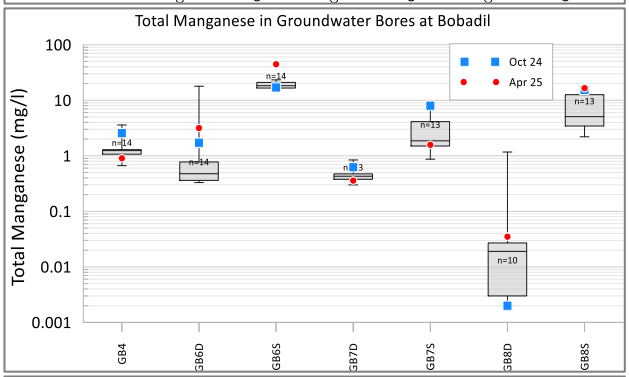


Figure 6-5. Total manganese results from groundwater samples collected near Bobadil TSF, October 2017 to April 2025.

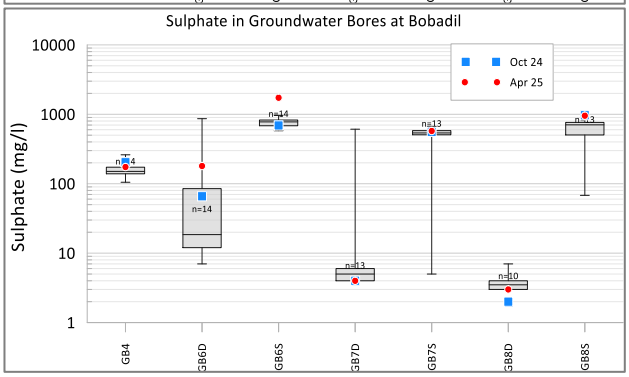


Figure 6-6. Sulphate results from groundwater samples collected near Bobadil TSF October 2017 to April 2025.

7 2/5 Dam TSF Monitoring Results

The redevelopment of the 2/5 Dam TSF required a revision to the water quality monitoring regime listed in EPN 7153/3. The monitoring strategy has been amended twice, once in February 2018 and most recently in July 2021 based on the Pitt & Sherry (April 2021) monitoring plan. The water quality monitoring sites related to the 2/5 Dam TSF that were sampled in July 2024 to June 2025 are listed in Table 7-1. Whereas sites MHS2 and MHS3 were initially both indicative of seepage emanating from the redeveloped 2/5 TSF, installation of a

French drain and sump system in 2022-2023 has resulted in seepage from the TSF being isolated from local stormwater and pumped back to the TSF. Site MHS2 now collects stormwater which continues to be pumped back to the ETP. The seepage at MHS3 continues to be derived from stormwater and seepage from between the 2/5 TSF and Stitt Park area.

The location of the U/S Pie site was moved approximately 20 m upstream in 2025 to allow sampling to be completed from a bridge rather than accessing the river via a steep track. This change is consistent with MMG's policy of Working Around Large Bodies of Water Procedure. MMG monitored both sites for 11 months. A statistical analysis of the data sets found no difference due to the change in sampling location.

During the 2024 to 2025 monitoring year there was no discharge of decant water from the 2/5 Dam TSF to the Stitt River, nor spillage of seepage water from the Seepage Pond to the Stitt river. Compliance water quality monitoring is based on the sites listed in Table 7-1 and Figure 7-2. The 2/5 TSF results are reported in four parts. Section 7.1 describes the surface water and seepage results associated with the TSF, Section 7.2 describes the water quality in the Stitt River receiving environment, Section 7.3 summarises the groundwater monitoring results, and Section 7.4 presents the results of stormwater monitoring along the Murchison Highway.

Table 7-1. Summary of water quality monitoring at 2/5 dam since redevelopment of the TSF as approved by the EPA in 2021.

Water	Type of Monitoring or Location	Station Names in MMG Database
Surface Water	**Grab samples**	
	Decant Return	DW01
	Clean Water Diversion upstream of TSF	CWDD01
	Seepage Collection Drain	SCD01, SCD02
	Seepage Collection Pond	SCP01
	Discharge to Stitt River*	SD
	Stitt River upstream of 2/5	WL8
	Stitt River downstream of TSF	SR02
	Stitt River upstream of Stitt Falls	SR03
	Stitt River upstream of L Pieman (downstream of Rosebery Ck)	U/S Pie
	Originally seepage from TSF emanating along Murchison Highway mixed with stormwater. Since July 2022 only stormwater reports to this site	MHS2
	Seepage from downstream TSF emanating along Murchison Highway	MHS3
Groundwater**	Pumped from groundwater bores	GB12, 13, 14S, 14D, 15, 16, 21H, 22H, 23H, 25H, 26H, 27H, 28H, 60[&], 61[&]

***Only monitored if there is overflow from the TSF. None occurred in the 2024-2025 monitoring year.**
***Groundwater bores previously designated as GB21 – GB28 are now designated as GB21H-GB28H to avoid confusion with bores located near the 3 Level Open Cut with the same numbering.**
[&]Bores established in 2024 to provide background information



Figure 7-1. Tailings decant and surface water monitoring associated with the 2/5 Dam TSF . Monitoring site U/S Pie is located downstream of SR03, off the aerial photo. Note the MHS2 and MHS3 sites monitor local stormwater with seepage from the collected from the western embankment returned to the TSF.



Figure 7-2. Groundwater bore monitoring locations associated with the 2/5 Dam TSF.

7.1 Trends in the 2 and 5 dam TSF surface waters

The monitoring results for the TSF inflows and decant return are described in Table 7-2.

Table 7-2. Summary of monitoring results related to the 2 and 5 Dam in 2024-2025.

Requirement	Findings
Compliance with Water Quality Monitoring Strategy	Monitoring at 2/5 Dam was completed as required under the July 2021 Monitoring Plan with samples collected from all sites except for the following: • SD: Spillway- No water quality results were collected because no water was discharged from the 2/5 Dam TSF into the Stitt River. Parameters in addition to those listed in the monitoring strategy were reported for many of the surface water sites.
Significant trends during reporting period	TSF Decant water: • The behaviour of zinc in the TSF is consistent with previous results, with total zinc concentrations decreasing when pH is higher than 7 (Figure 7-3). Total zinc in the TSF ranged from 0.25 mg/L to 1.75 mg/L as pH varied from ~7.2 to 5.6. The zinc concentrations have no impact on the environment as all return water is treated in the ETP. • Sulphate and EC (Figure 7-4) showed similar seasonal trends, with EC varying between ~400 to 1050 µS/cm and sulphate between 200 to 525 mg/l. Concentrations of sulphate in the 2/5 Dam TSF are lower as compared to the discharge at BO (sulphate range = 400 – 800 mg/l), with the higher values at BO attributable to the addition of mine water, storm water and seepage from the BO TSF. • In December 2024 the sulphate result from DW01 was reported as 1 mg/l. This result is inconsistent with the EC reading and is considered an outlier likely attributable to laboratory error. Seepage: • Seepage from the dam at site SCD01 shows a stronger response to rainfall as compared to SCD02 during the high winter rainfall period, consistent with the seep including surface runoff from the dam wall (Figure 7-5). Seep SCD02 had uniform flows through the year of about 6 l/s, consistent with the seep being fed from groundwater within the TSF. Monthly seepage rates at the two sites ranged from 2 l/s to 31 l/s. • PCE 9084 requires MMG to report any significant increase in seepage flow. MMG monitor this by calculating the percent change in flow relative to the previous monthly measurement. If flow has increased greater than 50% relative to the previous measurement an investigation is completed. At SCD02 this condition was met in July 2024 even though the seepage flow was only 5.6 l/s, which is well within the historic range. At SCD01, the condition was met in July, Aug and Sept 2024, and in May 2025 due to the high variability of flows at the site. Flows in July, Aug and May were within the historic range. Flow in September 2024 was 31 l/s which is the highest rate recorded by the monthly monitoring but is consistent with the extended high rainfall prior to monitoring. A similar flow rate was recorded in October at the site, which is also attributable to the prolonged wet winter. • There is reasonable agreement between the flow rates recorded at the seepage collection points and return flow from the SCP01 to the TSF. The flow data suggests that the storage was filled during the wet winter and the water level was drawn down in November 2024 (Figure 7-6).

	• The volumetric contribution of seepage pumped back from SCP01 relative to the volume of water pumped back to the ETP from the 2/5 Dam TSF is relatively small. The average seepage return flow is~9 l/s and the average DW01 return flow is ~69 l/s (Figure 7-7). The return flow to the ETP includes seepage collected along the western and eastern embankments, the SCP inflow, catchment runoff and the conveyance water used to transport the tailings to the TSF. • pH values in the seeps, seepage pond and return water were in the range of ~6 to 7 throughout the monitoring year, except for higher and lower values recorded at DW01 in May 2025. pH at SCP01 is consistent with the mixing of inflows from SCD01 and SCD02 (Figure 7-8). The pH range in 2024 to 2025 is consistent with the results from previous years. • Total zinc concentrations in SCD01 showed strong seasonality over the 2024 to 2025 year, with the highest values coinciding with the very wet winter period. The high inflow from this site resulted in decreased zinc concentrations in SCP01 over the same period. SCD02 continues to show low variability compared to the other sites. DW01 showed reduced seasonality as compared to the past two years, with concentrations ranging from 0.3 mg/l to 1.7 mg/l (Figure 7-9). These results are consistent with the conceptual model that the SCD01 seep is derived from recent tailings water in the TSF and runoff from the dam wall, and SCD02 is derived from tailings and waste at depth within the TSF. • Sulphate shows similar trends, with SCD02 having the highest concentrations and SCD01 showing seasonal changes. In contrast to total zinc, sulphate concentrations are highest in the summer rather than the winter due to lower rainwater inputs (Figure 7-10). In March and April 2025 sulphate levels in DW01 were >500 mg/l which are the highest concentrations recorded at the site. Elevated levels were also recorded in the summer of 2024 suggesting the results are attributable to the dry summer and possibly the recycling of water for dust suppression over the exposed tailings beaches. • Iron concentrations in SCD01, SCD02 and SCP01 are similar to previous years. Total iron results in the DW01 return flow show an increase in concentrations and variability since the 2021 to 2022 monitoring year (Figure 7-11). The reason for this is unknown but could be related to water level fluctuations flushing pore water from the tailings deposits, or runoff from dust suppression measures (Figure 7-12). • Manganese results show similar trends to total zinc, with high variability at SCD01 and higher concentrations at SCD02 and in the DW01 return (Figure 7-13).

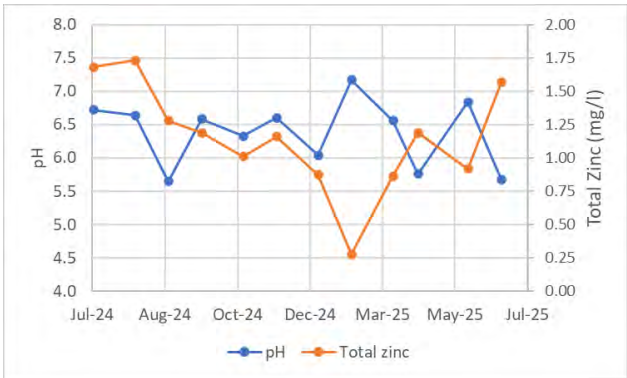


Figure 7-3. pH and total zinc in 2/5 Dam TSF decant return (DW01), July 2024 to June 2025.

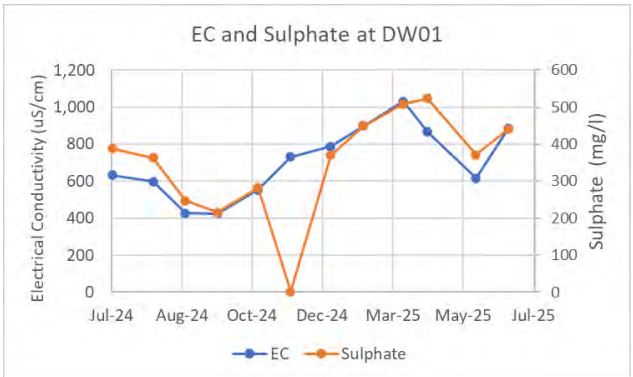


Figure 7-4. Sulphate and EC in the 2/5 Dam TSF decant return, July 2024 to June 2025.

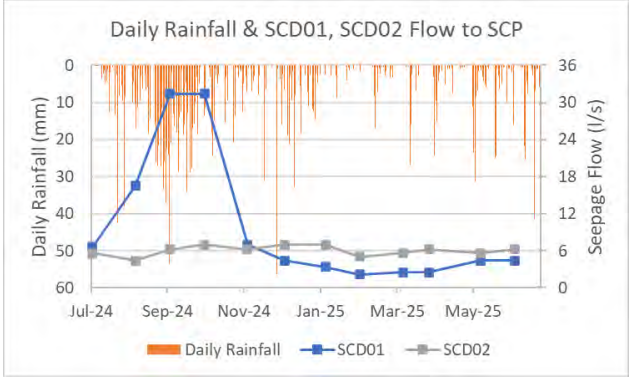


Figure 7-5. Average daily flow rates in SCD01 and SCD02 compared to daily rainfall at the 2/5 Dam TSF 1 July 2024 to 1 July 2025.

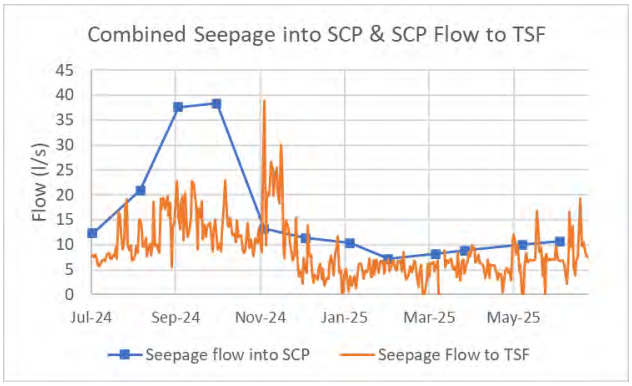


Figure 7-6. Comparison of combined flow rates in SCD01 and SCD02 with average daily return flow from SCP01 to 2/5 dam from July 2024 to July 2025.

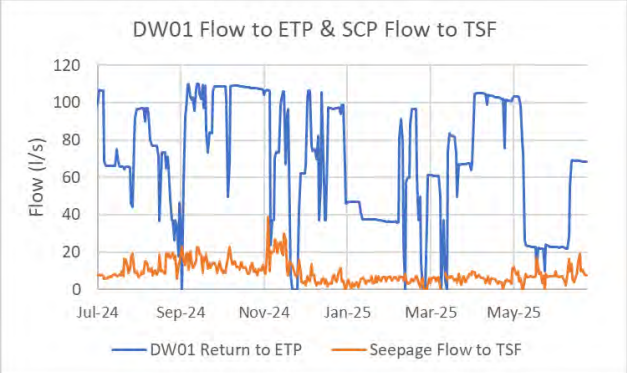
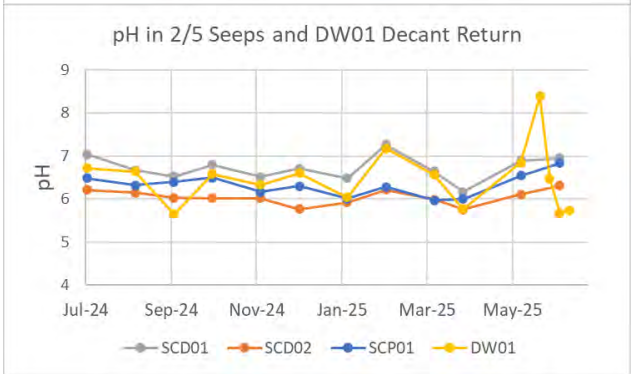


Figure 7-7. Comparison of seepage inflow to 2/5 Dam TSF and Decant return from 2/5 dam to ETP. Decant return includes SCD01, 02, and 03 Seeps.



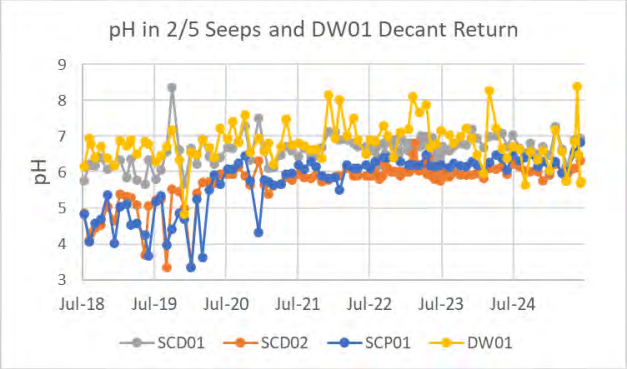


Figure 7-8. (top) pH in 2/5 seepage drains SCD01 and SCD02 and in the seepage collection pond SCP01 July 2024 to June 2025 (bottom) pH time-series from 2018 to June 2025.

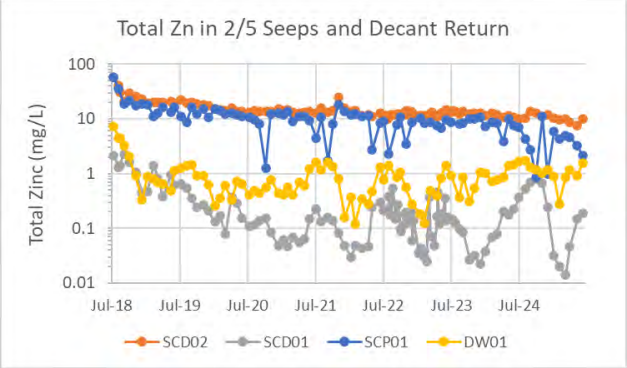


Figure 7-9. Total Zinc in 2/5 seepage drains SCD01 and SCD02, in the seepage collection pond SCP01 and the DW01 decant return to ETP July 2018 to June 2025. Note log scale.

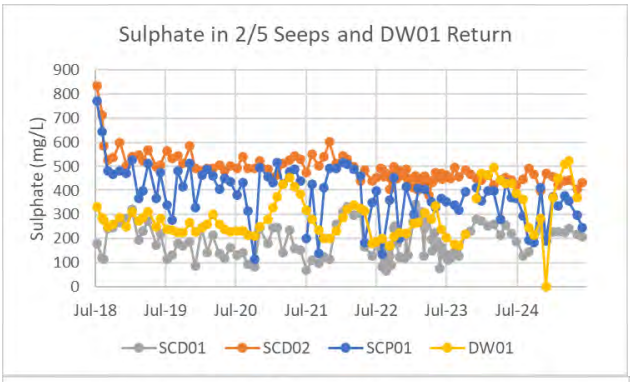


Figure 7-10. Sulphate in 2/5 seepage drains SCD01 and SCD02, in the seepage collection pond SCP01 and the DW01 decant July 2018 to June 2025.

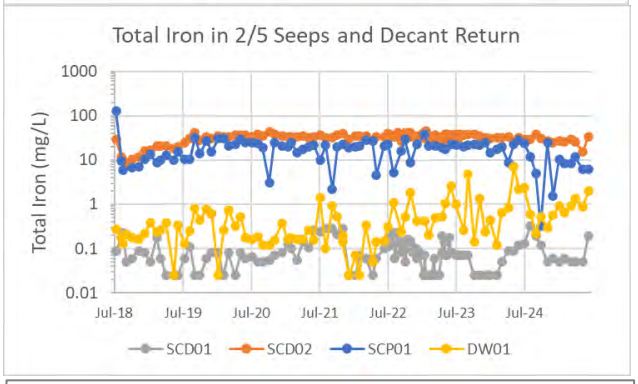


Figure 7-11. Total iron in 2/5 seepage drains SCD01 and SCD02, in the seepage collection pond SCP01 and the DW01 decant July 2018 to June 2025. Note log scale.

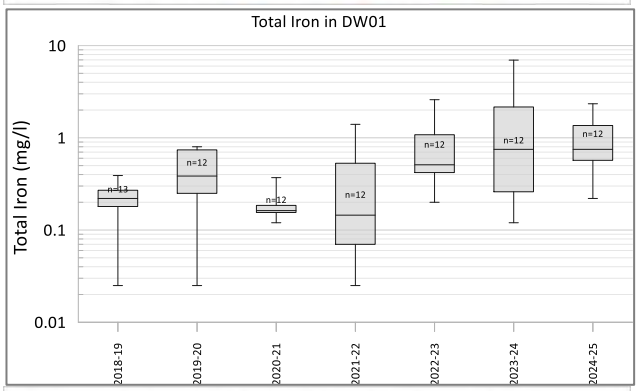


Figure 7-12. Total iron in DW01 return water 2018 – 2025. Note log scale.

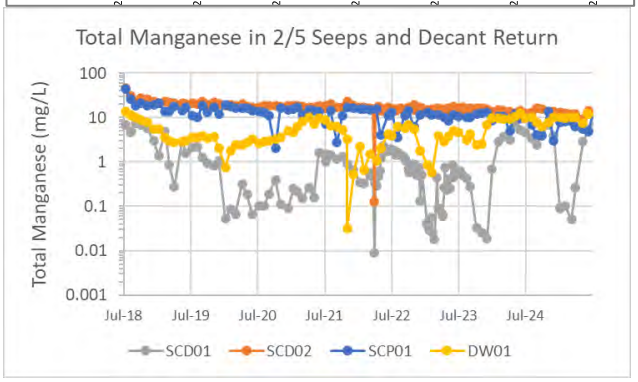


Figure 7-13. Total manganese in 2/5 seepage drains SCD01 and SCD02, in the seepage collection pond SCP01 and the DW01 decant. July 2018 to July 2025. Note log scale.

7.2 Trends in the Stitt River

Additional analysis of the Stitt River at WL8 is provided in Section 8. This section relates to the potential impact of the 2/5 TSF on the Sitt River

Requirement	Findings
Significant trends during	The 2024 to 2025 monitoring results show the following trends in the Stitt River:

reporting period	• Flow at the CWDD01 site has the same pattern as in the Stitt River, reflecting rainfall and surface runoff. Flows in the drain range from <1 l/s to 930 l/s. • pH levels at the Stitt sites are generally lowest in the Clean Water Diversion (CWDD01) upstream of the Stitt River and highest in the Stitt River at WL8 (Figure 7-15). pH values downstream of WL8 were similar through the year. The lowest pH at all sites coincided with the period of very high rainfall in August and September 2024. The 2024 to 2025 results are consistent with previous years. • Total zinc at CWDD01 is consistently higher than in the Stitt at WL8, with the two sites showing a similar pattern (Figure 7-16). The input at CWDD01 comprises a small percentage of the zinc load at WL8 so other inputs to WL8 must also be responding to rainfall. • Zinc concentrations consistently increase between WL8 and the upstream Lake Pieman (U/S Pie) site. Median values increase by 0.05 mg/l between WL8 and SR02, and 0.04 mg/l between SR02 and SR03. The largest increase occurs between SR03 and U/S Pie, with median values increasing by 0.21 mg/l. Increases in zinc downstream of WL8 are attributable to seepage and groundwater inputs from the 2/5 TSF, stormwater, diffuse inputs from the fill surrounding and underlying Stitt Park, developments on both sides of the river and inflow from Rosebery Creek, including stormwater from the township (Figure 7-16). • Sulphate concentrations increased in a downstream direction in the Stitt but overall remained low in 2024-2025 at ≤14 mg/l (Figure 7-17). • Total zinc fluxes have been estimated for the sites in the Stitt River using flow and water quality at CWDD01 to calculate inputs from the diversion drain, flow at WL1 to estimate fluxes at WL1, SR02, and SR03 and the combined flow at WL1 and Rosebery Creek to estimate U/S Pie fluxes. The results for each sampling run are shown in Figure 7-18, and show increases with distance downstream, with a very small percentage of the load attributable to the CWDD01 site. • In Figure 7-19, the average increase in zinc flux between each site is shown. These average results show that the largest increase in zinc occurs downstream of the 2/5 TSF between the SR03 and U/S Pie monitoring sites, with ~15 kg/day entering from Rosebery Creek. Near the TSF, between WL8 and SR02 an average increase of ~4 kg/day occurs which is likely associated with diffuse emissions from the TSF. The inputs from the Clean Water Diversion Drain (CWDD01) were lower in 2024 to 2025 compared to the previous year, possibly due to less construction activity on the southern side of the TSF in the recent monitoring year.

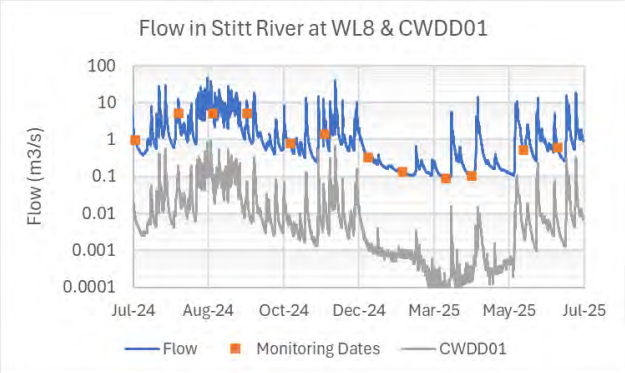


Figure 7-14. Flow in the Clean Water Diversion Drain (CWDD01) compared to flow in the Stitt River at WL8 during the July 2024 to June 2025 monitoring year. Monitoring dates are indicated. Note log scale.

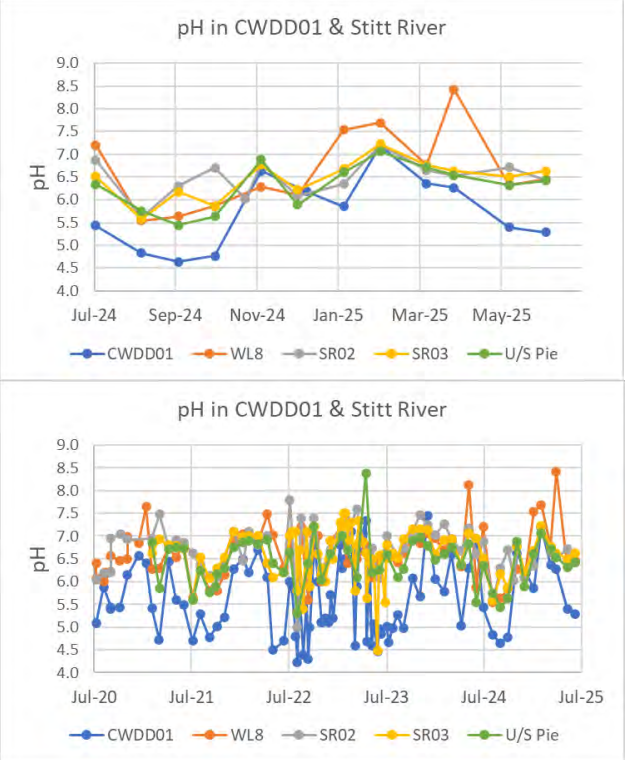
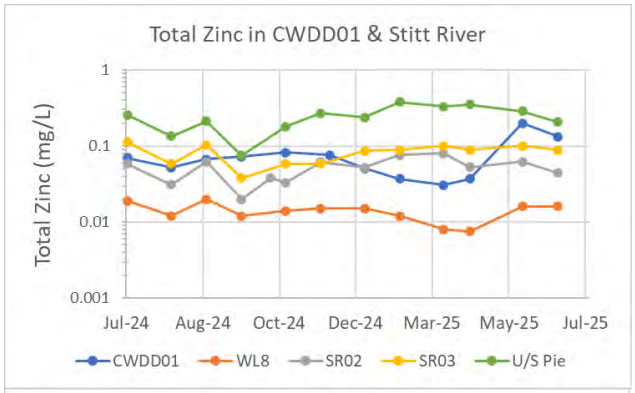


Figure 7-15. (top) pH at Clean Water Diversion Drain and the Stitt River at WL8, SR02, SR03 and U/S Pie from July 2024 to June 2025 (bottom) long-term time series of pH at the Stitt River sites.



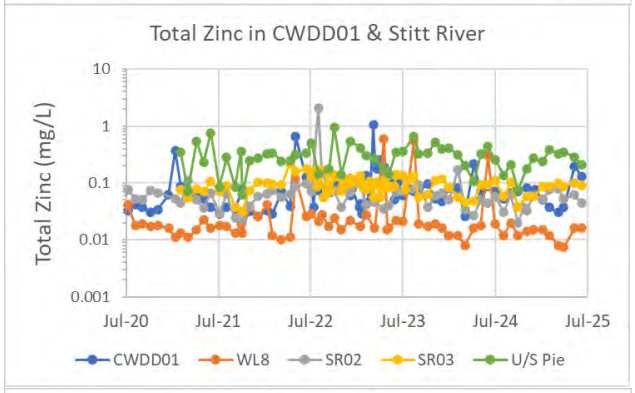
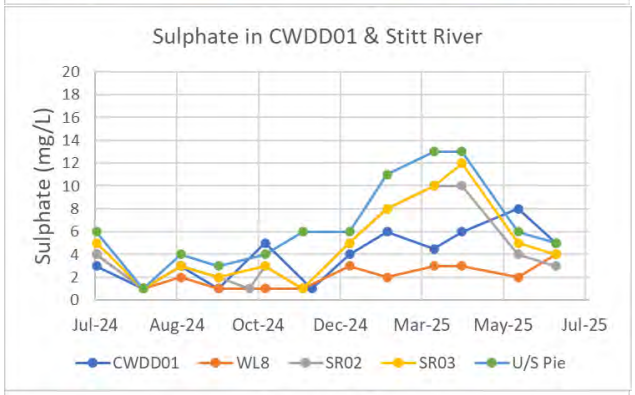


Figure 7-16. (top) Total zinc concentration in the Clean Water Diversion Drain and the Stitt River at WL8, SR02, SR03 and U/S Pie from July 2024 to June 2025 (bottom) Long-term time-series of total zinc in the Stitt River. Note log scale.



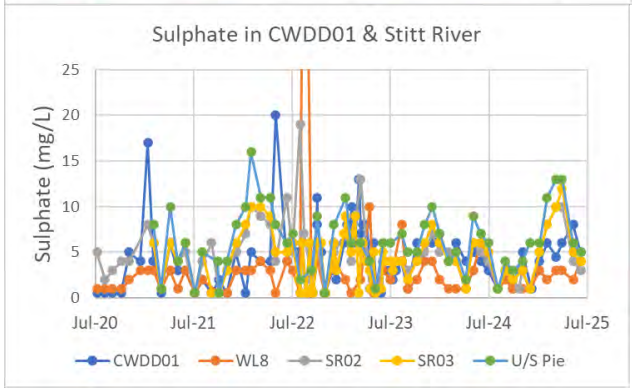


Figure 7-17. (top) Sulphate concentrations in the Clean Water Diversion and the Stitt River at WL8, SR02, SR03 and U/S Pie from July 2024 to June 2025 (bottom) Long-term time series of sulphate at the Stitt River sites.

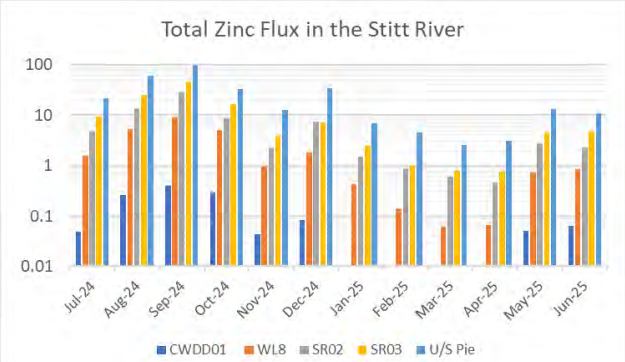


Figure 7-18. Total zinc fluxes at each of the monitoring sites during each monthly monitoring run. Note log scale.

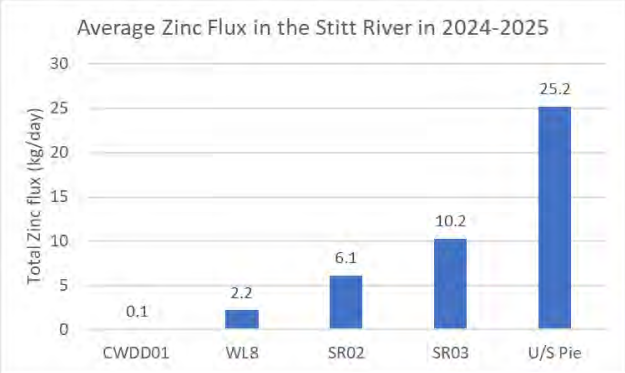


Figure 7-19. Average zinc fluxes at monitoring sites in the Stitt River in 2024 – 2025.

7.3 Groundwater at 2/5 TSF

Requirement	Findings
Compliance with monitoring requirements	Modifications to monitoring include: • Groundwater bore GB21H was decommissioned and is no longer being monitored. • Two new groundwater bores were established at the western end of the screening wall to provide information about background water quality. The bores have been monitored three times since May 2024. All sites were monitored for the required parameters at the required frequency.
Significant trends during reporting period	Trends in Groundwater at 2/5 TSF: • The water quality results from newly installed bores GB60 and GB61 aim to capture background water quality from the deeper bedrock (GB60) and shallow glacial till (GB61) aquifers. • The results (Table 7-3) shows the pH and alkalinity in GB60 has decreased, with the initial readings considered to be due to contamination from materials used during installation. • Results show higher levels of metals in the deep bedrock aquifer as compared to the shallow till. Both bores show low levels of sulphate. • pH results from the groundwater bores surrounding the 2/5 Dam TSF were within the range of previous results (Figure 7-20). At most sites located long the northern and eastern margines of the TSF pH values were in the lower range of previous results. The lowest pH values continue to be recorded at site 12S in an area previously affected by a tailings leak from deep within the TSF. It is possible that a groundwater connection exists between this bore and historic tailings in the TSF.

	• The total zinc results for bores 22H and 23H were lower or similar to the previously recorded lowest values. The zinc concentrations were below historic values for both monitoring periods at 23H. This decrease may be due to the previous works that completed along the Murchison Highway to maximise the capture of seepage. • Low zinc concentrations were also recorded at sites along the northern and eastern embankment. The decrease at site 12S may be linked to the capture and redirection of seepage from this area into the SCP (Figure 7-21). Many of the concentrations recorded at the bores along the northern and eastern impoundment are similar to the zinc levels measured in background bores GB60 and GB61. • Sulphate levels in all bores were within previous ranges except at GB23H and GB16 where the November samples were lower than previously recorded, and 12S where sulphate levels were considerably higher than previous results (Figure 7-22). The decrease at 23H is consistent with the decrease in zinc and likely related to the improved capture of seepage from the western wall area. The source of the elevated sulphate in 12S is unknown. • All BTEX values were below the LoR. • TPH was recorded at site GB14S in November 2024, with 0.15 mg/l reported for the C_{10}-C_{36} fraction. The increase is attributable to the C_{15}-C_{28} fraction which may be derived from diesel fuel. The sample was not run with a silica cleanup prior to analysis so it is also possible the TPH is a false positive related to natural organic acids in the groundwater as commonly occurs at MMG.

Table 7-3. Water quality results from newly established GB60 and GB61. Results from May 2024 to May 2025.

May 2024	Date	pH	EC µS/cm	Alk mg/l	Tot Cu mg/l	Tot Fe mg/l	Tot Pb mg/l	Tot Mn mg/l	Tot Zn mg/l	SO_4 mg/l
GB60-Bedrock	May 24	11.2	178	118	0.032	7.5	0.037	0.54	0.072	4
	Nov 24	7.3	149	112	0.037	8.2	0.036	0.95	0.062	3
	May 25	5.7	92	16	0.010	6.1	0.022	0.51	0.073	10
GB61-Glacial till	May 24	5.0	82	13	0.016	0.9	0.018	0.05	0.091	5
	Nov 24	4.9	57	8	0.008	0.68	0.008	0.04	0.038	3
	May 25	4.9	80	2	0.019	0.47	0.014	0.09	0.136	13

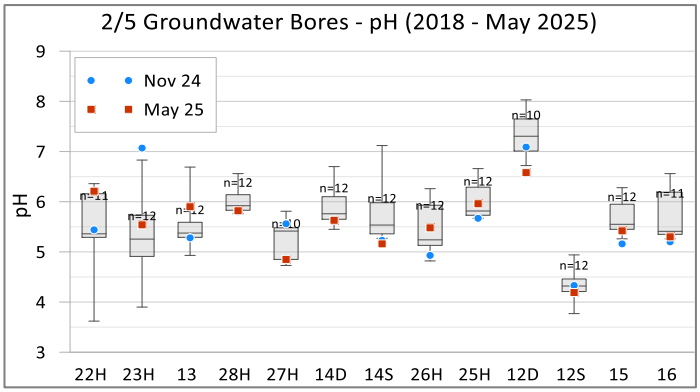


Figure 7-20. pH in the 2/5 Dam TSF ground water bores. Sites are shown in clockwise direction beginning at site GB22H, located on the southern side of the impoundment. Sites GB15 and GB16 are located east of the Stitt River. pH results from October 18 to May 2024 are summarised in the box and whisker plots (box shows the 25th to 75th percentile results, with minimum and maximum shown by the whiskers). Results collected in November 2024 and May 2025 are shown as data points.

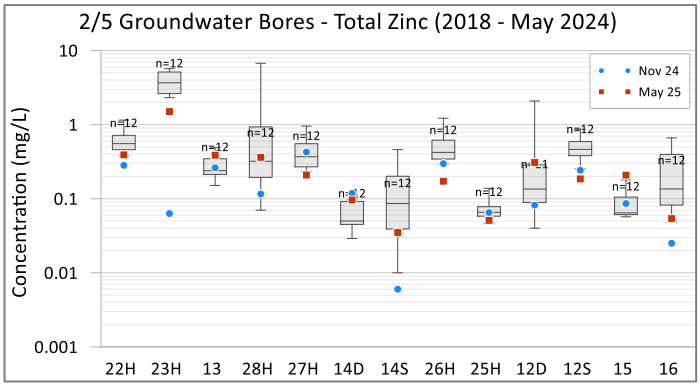


Figure 7-21. Total zinc in 2 and 5 groundwater bores. Description as per Figure 7-20

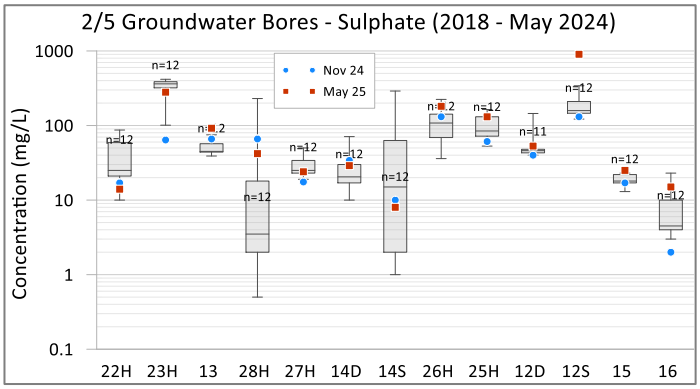


Figure 7-22. Sulphate in 2 and 5 groundwater bores. impoundment. Description as per Figure 7-20

7.4 Trends at Murchison stormwater site MHS2 and seepage site MHS3

Requirement	Findings
Significant trends during reporting period	Trends in the Murchison Highway Stormwater and Seeps (MHS2, MHS3): • MHS2 monitoring site collects local stormwater that is piped to the ETP for treatment. The separation and removal of TSF seepage from this site in 2021 - 2022 has resulted in decreases in metal concentrations, sulphate and acidity in the MHS2 stream (Figure 7-23, Figure 7-24). • Sulphate, acidity, iron and manganese at MHS2 are higher during the summer when rainfall is lower. pH is consistently between 6 and 7 throughout the year. • The concentrations of parameters are consistently lower since installation of the seepage collection system, consistent with the water at MHS2 being derived from local stormwater inflow. • Seepage at MHS3 is derived from the local fill around Stitt Park. Sulphate shows strong seasonality due to higher rates of infiltration

	in the wet months producing lower concentrations. The metal concentrations in the 2024 – 2025 monitoring results are similar to the previous year (Figure 7-25, Figure 7-26).
Recommendations	• Site MHS2 and MHS3 are now stormwater sites. It is recommended this site be monitored on a quarterly basis consistent with the other stormwater monitoring sites. It is also recommended that the direct discharge of the MHS2 seep to the Stitt River be considered due to the flow largely consisting of municipal stormwater.

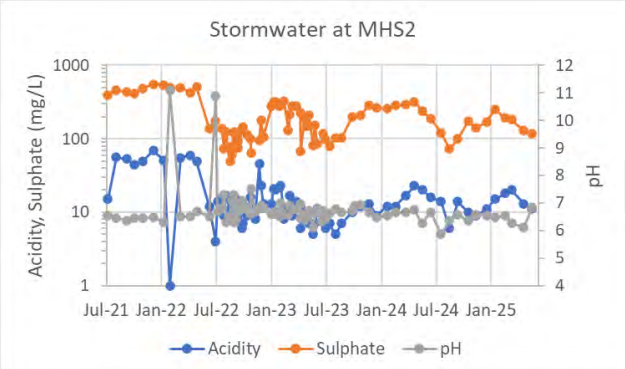


Figure 7-23. Acidity, sulphate, and pH in the MHS2 Seep, July 2021 – June 2025. Note log scale.

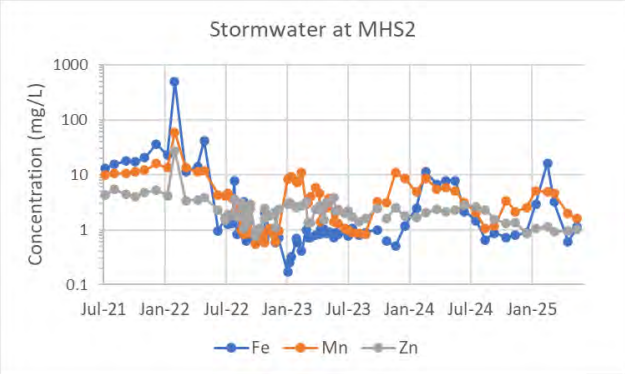


Figure 7-24. Total iron, manganese, zinc, and arsenic in the MHS2 Seep, July 2021 – June 2025. Note log scale.

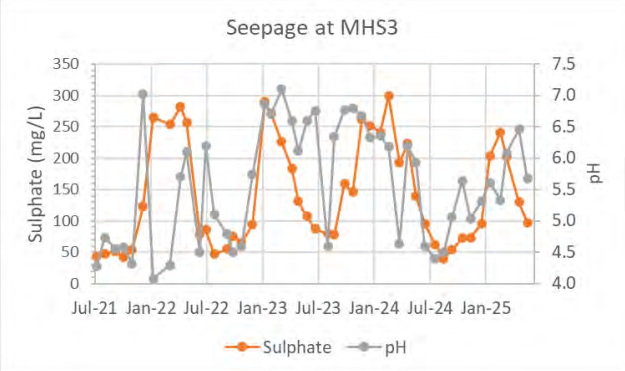


Figure 7-25. Sulphate and pH in the MHS3 Seep, July 2021 – June 2025.

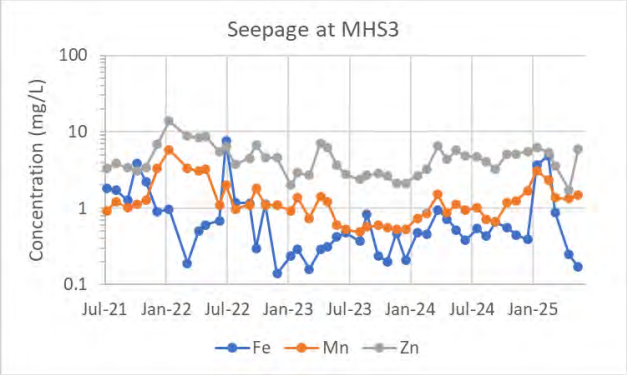


Figure 7-26. Total iron, manganese, and zinc in the MHS3 Seep, July 2021 – June 2025.

8 Stitt River upstream of 2 and 5 Dam

A summary of the monitoring results collected at site WL8 upstream of the 2/5 Dam TSF is contained in Table 8-1.

Table 8-1. Summary of monitoring results from the Stitt River upstream of 2 and 5 Dam in 2024-2025.

Requirement	Findings
Monitoring Frequency	Monitoring requirements were amended in July 2021 under the revised 2/5 Dam TSF Water Quality Monitoring Plan. • Continuous river flow, pH, EC and temperature are recorded in the Stitt River at site WL8/ML04 site, and monitored monthly (Figure 8-1 - Figure 8-4). • All other parameters were monitored on a monthly basis as required.
Compliance with EPN	All parameters were determined at the required frequency.
Significant trends reporting period	• Flow in the Stitt River is characterised by short duration high flow events superimposed on seasonal baseflow changes. Flow in the spring of 2024 was high, frequently exceeding 10 m^3/s. Median hourly flow in the river was 0.7 m^3/s, and the annual average hourly flow was 2.0 m^3/s. Monitoring coincided with flow rates of 0.10 to 5.2 m^3/s through the year, with three samples collected at flows >5 m^3/s so high flow events are well represented in the data set (Figure 8-1). • Continuous pH ranged between 4.5 and 7.1 with the monthly values ranging from 5.5 to 8.4. There is reasonable agreement between the continuous and weekly values except in January and February 2025 when the field pH readings were one full pH unit higher than the continuous. The range of pH recorded in the river is within the natural range of west coast rivers (Figure 8-2). • Electrical conductivity shows lower EC values during periods of high rainfall, consistent with high surface runoff. The continuous EC values are higher than the weekly values through March 2025. The reason for this is unknown, but both data sets indicate very low conductivity in the river (Figure 8-3). • Continuous temperature shows seasonal warming of the river (Figure 8-4) with temperatures ranging from ~5 to 18 °C as would be expected in an undisturbed river catchment. • Metal concentrations were generally low and similar to previous years.

	• Nickel and arsenic results in 2024 to 25-were below the LoR and not shown in Figure 8-5. • Low levels of acidity (1 – 11 mg/l $CaCO_3$) and alkalinity (2 – 18 mg/l $CaCO_3$) were present in WL8, consistent with west coast clean waterways. • Sulphate concentrations were ≤4 mg/l throughout the year.
Long-term trends	The water quality results at WL8 are consistent with the historic results and typical of west coast rivers.

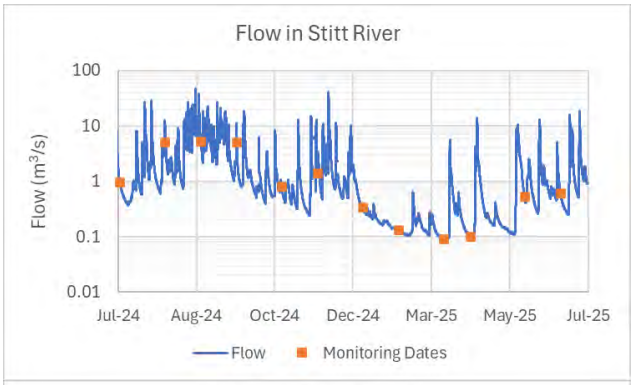


Figure 8-1. Discharge in the Stitt River at WL8 July 2024 to June 2025. Sampling dates are indicated by orange markers.

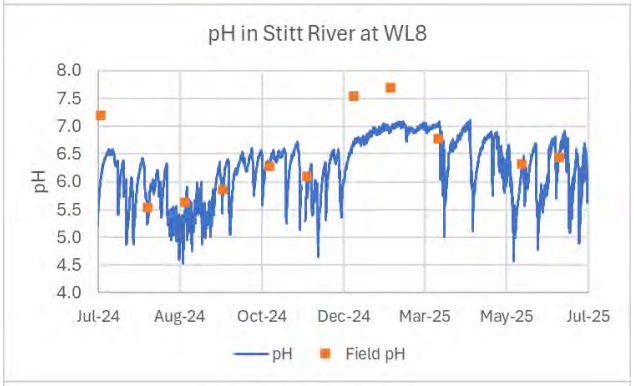


Figure 8-2. Continuous and field pH results from WL8 July 2024 – June 2025.

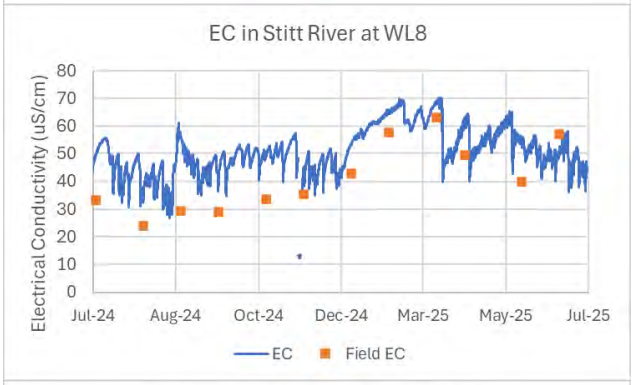


Figure 8-3. Continuous and monthly electrical conductivity and sulphate readings at WL8 2024 – 2025.

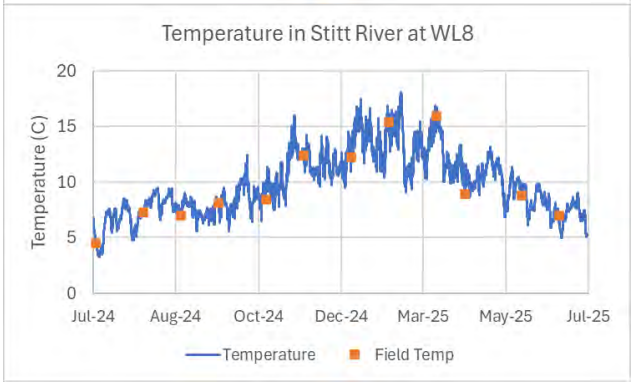


Figure 8-4. Continuous and monthly water temperature at WL8 2024 – 2025.

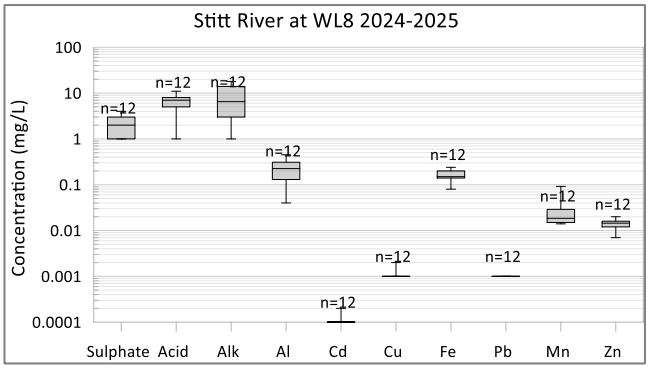


Figure 8-5. Box and whisker graph of sulphate, alkalinity, acidity and total metals in Stitt River upstream of 2 and 5 dam (WL8) for July 2024 to June 2025. Box and whisker plot as described in Figure 3-6, with the box encompassing the 25th to 75th percentile values.

9 Hercules Monitoring

Monitoring sites on the Hercules site are shown in Figure 9-1. Monitoring site Ring at Highway (RAH) is located downstream on the Ring River at the Murchison Highway, north of the extent of the photo. Monitoring site MPW is associated with the South Hercules EPN and is discussed in Section 15. A summary of the monitoring results for Hercules is contained in Table 9-1.



Figure 9-1. Surface water monitoring locations at the Hercules Mine site. Monitoring site Ring at Highway (RAH) is located downstream on the Ring River at the Murchison Highway, north of the extent of the photo.

Table 9-1. Summary of monitoring results from the Hercules Mine site collected in 2024 to 2025.

Requirement	Findings
Monitoring Frequency	All sites were monitored for the required parameters, at the required frequency with the following exceptions: • Data is missing for multiple intervals for the continuous recording parameters at 7Level, BC2 and RRusBC. At BC2 and RRusBC this is primarily due to the probes being buried in sediment following high

	flow events and not recording readings from flowing water. These gaps are evident on the time-series shown in Figure 9-2 to Figure 9-7. • At 7Level the EC probe recorded very high values during the dry summer months, when flows were <1 l/s. The unreliable values have been removed from the data series.
Compliance with EPN	Monitoring frequency and parameters determined are the only requirements in the EPN. With the exception of the previously listed data gaps all monitoring was completed as required.
Significant trends - reporting period	• Average flow at 7Level was 3.0 l/s whereas average flows at BC2 and RRusBC were 113 l/s and 305 l/s, respectively. These values are similar to the previous monitoring year (Figure 9-2 to Figure 9-7). • Flow, pH and EC show different trends at the sites. At BC2, pH increases during rain events presumably due to the inflow of relatively clean surface runoff as compared to the acid drainage impacted base flow, whereas at 7Level and RRusBC, pH decreases as flow increases. This is consistent with rainfall resulting in the flushing of acid drainage from the underground workings at 7L, and diffuse acid drainage entering the 'clean' Ring River. In contrast, EC decreases in both BC2 and 7L during rain events but increase in RRusBC. This reflects the low ionic strength of the Ring River baseflow in the absence of acid drainage inputs, and the dominance of acidic water under baseflow conditions at the other two sites. • There is variable agreement between the monthly field results for EC and pH and the continuous recording results. As previously noted, the burying of probes at BC2 and RRusBC have reduced the accuracy of the instruments. • Water temperature results from the three monitoring sites show that temperatures decrease during periods of rainfall, and temperatures remain lower at 7Level during the dry summer months. This is likely due to the predominant groundwater input at 7L maintaining more uniform temperatures throughout the year (Figure 9-8). • The range of monthly metal concentrations is similar to previous years at 7Level and BC2 with the 7Level Composite having the highest concentrations but lowest flow rates (Figure 9-9). The concentrations in Baker Creek are lower than at 7L but flow rates are substantially higher. • Concentrations at RRusBC decreased in the 2023 to 2024 monitoring year due to diversion of the WSP flow into Baker Creek rather than the Ring River above the RRusBC monitoring site. The results in 2024 to 2025 year are similar to the concentrations recorded at the upstream site of Ring@Bridge with the exception of zinc which is higher at the RRusBC site (Figure 9-10). • The net change in water quality in the catchment is evident by comparing the results from Ring@Hwy (Figure 9-11, Figure 9-12) with Ring@Bridge (Figure 9-10). Median total zinc concentrations increase from 0.7 to 3.5 mg/l between the most upstream and downstream sites. • Seasonal patterns continue to be present in the time-series of metal concentrations, with the highest concentrations occurring during the drier summer months (Figure 9-12). Down the length of the Ring River the zinc concentrations increase, but the increase between Ring at Bridge and RRusBC is small now that the WSP has been decommissioned.

	• Metal and sulphate loads based on the water quality results and flow rate at the time of sampling are lower than the previous year at BC2 and similar or lower at RRusBC (Figure 9-13). The variability between years is most likely attributable to the range of flow rates monitored within a given year. • The average daily zinc and sulphate fluxes from the site are estimated at 0.30 tonnes/day of zinc and 1.1 tonnes/day respectively, with Baker Creek transporting most of the loads. • A comparison of the zinc and sulphate fluxes at the Ring@HWY site with the sum of the BC2 and RRusBC fluxes is shown in Figure 9-14 and Figure 9-15. There is a good balance for zinc between the sites considering the high variability of flow over short periods. The sulphate balance shows larger discrepancies suggesting additional inputs are contributing as the flux at RAH is frequently higher than the inputs from Hercules. These results are consistent with previous results and suggest that the Hercules site is the predominant source of zinc to the river, but other sources historic acid drainage inputs are contributing sulphate.
Comments	• If continuous monitoring is to be continued at BC2 and RRusBC an investigation should be conducted into ways the probes could be deployed without being repeatedly buried following high flow events. Intercalibration of the continuous and field probes for EC and pH is also recommended. • 7Level is contributing a low percentage of the zinc and sulphate load at BC2. If possible, flows from the upper levels (e.g. 6L) should be directed to 7L to capture a greater proportion of the metal loads prior to entering Baker Creek. This would help refine the understanding of the distribution of sources between the underground workings and the waste rock dump within the Baker Creek catchment.

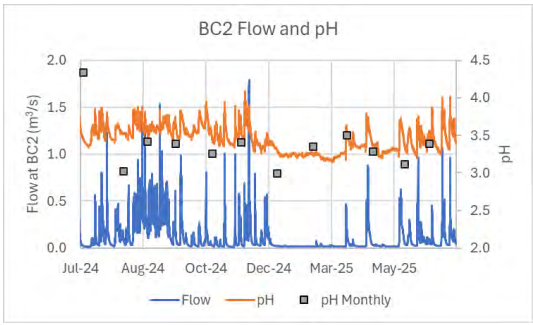


Figure 9-2. Continuous flow, pH, and monthly field pH results in Baker Creek upstream of the Ring River.

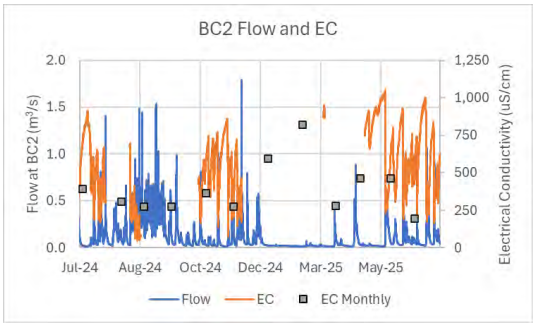


Figure 9-3. Continuous flow, EC, and monthly field EC results in Baker Creek upstream of the Ring River.

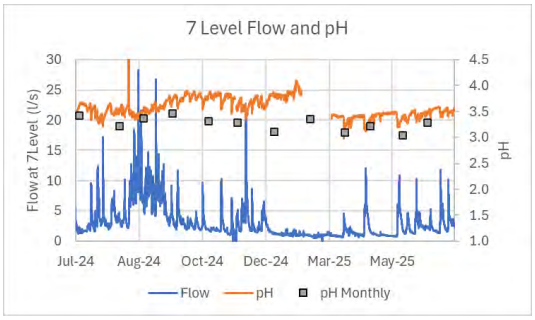


Figure 9-4. Continuous flow, pH, and monthly field pH results at 7Level.

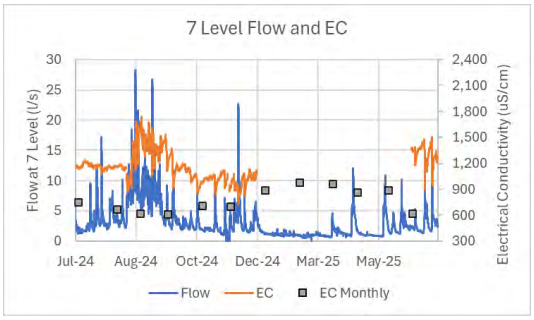


Figure 9-5. Continuous flow, EC and monthly EC at 7Level

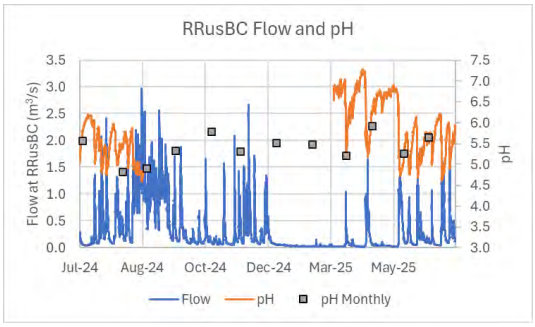


Figure 9-6. Continuous flow, pH, and monthly field pH results in the Ring River upstream of Baker Creek.

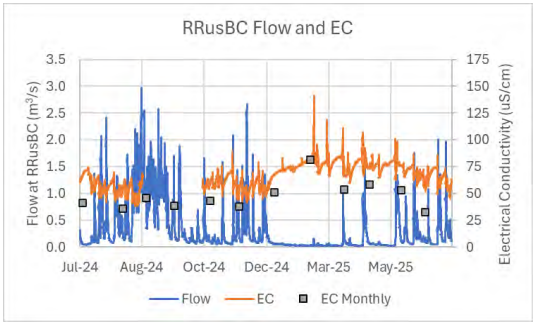


Figure 9-7. Continuous flow, EC, and monthly field EC results in the Ring River upstream of Baker Creek.

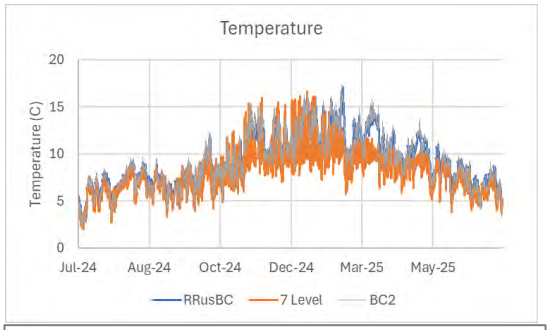


Figure 9-8. Comparison of water temperature at RRusBC, BC2 and 7Level.

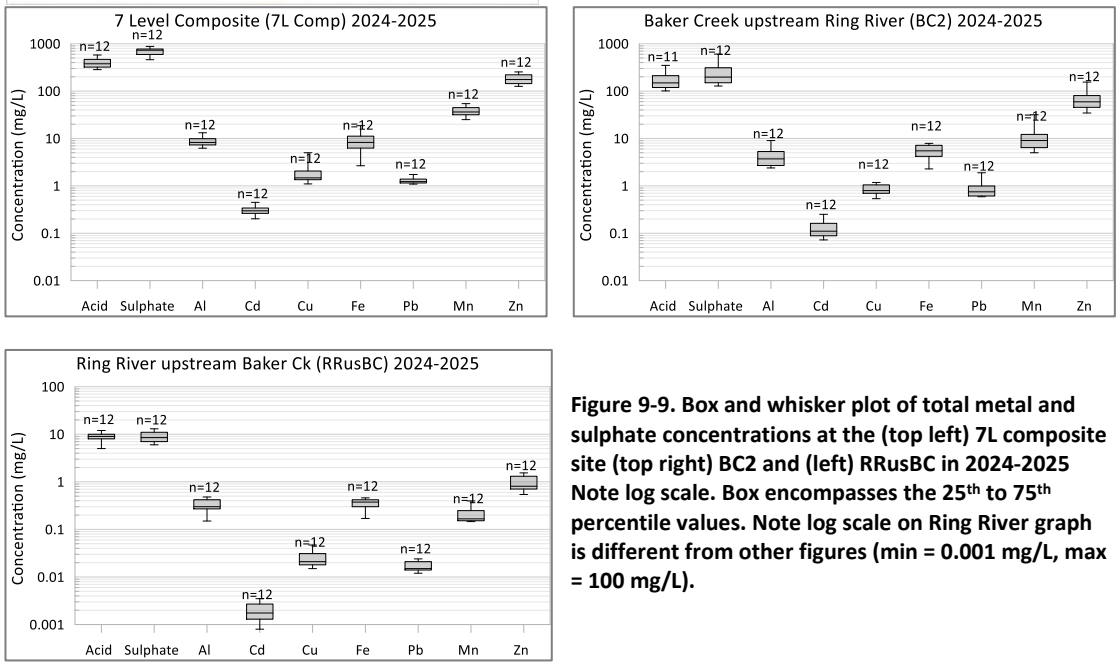


Figure 9-9. Box and whisker plot of total metal and sulphate concentrations at the (top left) 7L composite site (top right) BC2 and (left) RRusBC in 2024-2025 Note log scale. Box encompasses the 25th to 75th percentile values. Note log scale on Ring River graph is different from other figures (min = 0.001 mg/L, max = 100 mg/L).

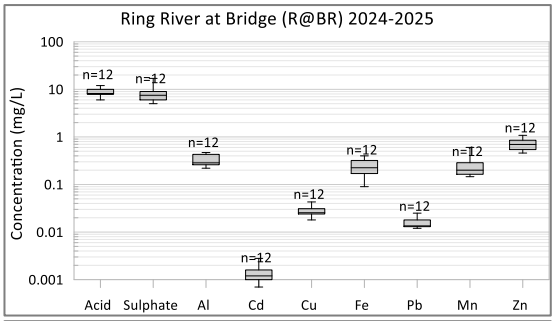


Figure 9-10. Water quality results from Ring at Bridge upstream of the Hercules mine site July 2024 – June 2025. Note log scale.

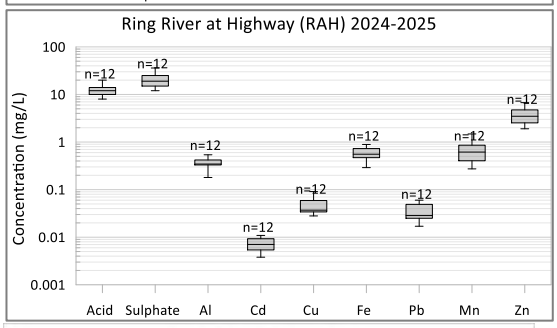


Figure 9-11. Water quality results from Ring at Highway in lower Ring River catchment July 2024 – June 2025. Note log scale.

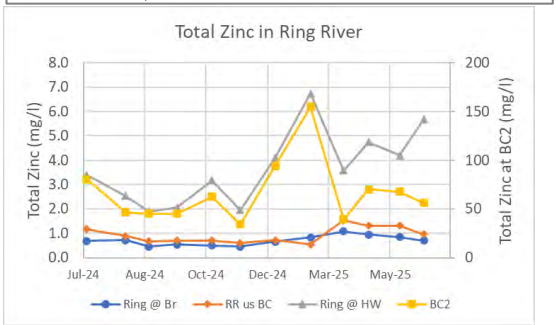
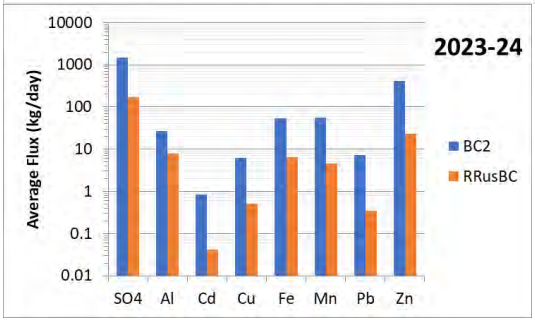


Figure 9-12. Total zinc at Ring at Bridge (upper catchment), upstream of confluence with Baker Creek (RR us BC), in Baker Creek upstream of Ring River and at the Murchison Highway (Ring at HW). Note Baker Creek scale is 20-times greater than Ring River scale



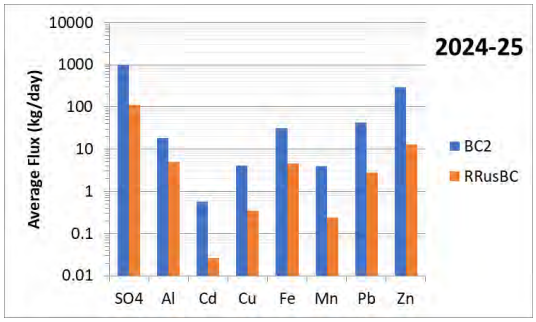


Figure 9-13. Average sulphate and total metal loads in Baker Creek and the Ring River above Baker Creek based on the monthly monitoring results and flow on the monitoring date (left) 2023-2024 and (right) 2024-2025. Note log scale.

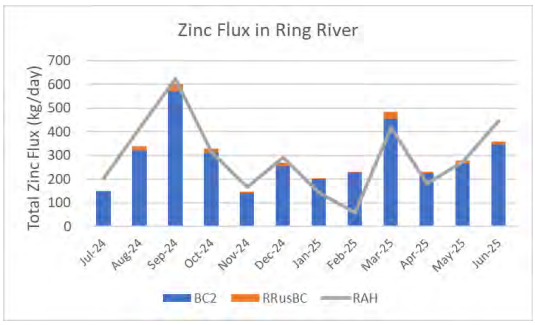


Figure 9-14. Comparison of combined zinc fluxes in Baker Creek and Ring River above Baker Creek, with the

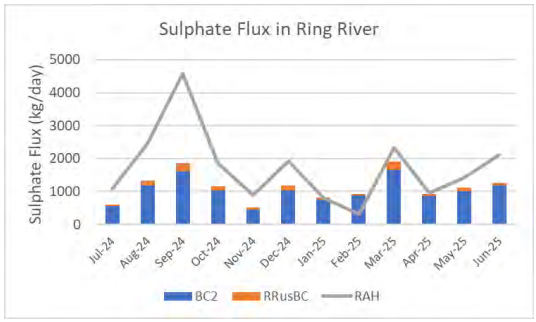


Figure 9-15. Comparison of combined sulphate fluxes in Baker Creek and Ring River above Baker Creek,

zinc flux at Ring River at Murchison Highway July 2024 to June 2025.

with the sulphate flux at Ring River at Murchison Highway July 2024 to June 2025.

10 Stormwater monitoring

Stormwater monitoring sites at Rosebery are shown in Figure 10-1, and a summary of the monitoring results collected in 2024-2025 is contained in Table 10-1. The improved collection and treatment of stormwater from the operational areas over the past years has resulted in a large reduction of runoff from the site. Stormwater runoff sampled at Filter Plant Creek sites FPC1 and FPC2, and at Primrose Creek site PC2 is collected and directed to the ETP for treatment. Site FPC3 is located downstream of the Filter Plant ponds and collects predominantly runoff from the residential area, including inflows from historic waste rock located around the residential area. Filter Plant Creek ultimately enters Lake Pieman in the flooded arm of the Stitt River.

Upper Assay Creek, which is impacted by runoff from the Northern Open Cut Area, is monitored at AC1. This water is diverted around the WRD and monitored at AC2 before being discharged off site to Primrose Creek downstream of PC1. Additional runoff from the Pieman tanks area also enters Assay Creek in this area. Water that has come in contact with the Assay Creek WRD area is collected and directed to the ETP for treatment upstream of the AC2 site.

Rosebery Creek is relatively undisturbed in its headwaters and has been diverted around the current MMG operational area in its middle reaches. The lower reaches drain areas containing waste rock and historic fill and receives stormwater from the township. Rosebery Creek flows into the Stitt River upstream of Stitt Falls and with the Rosebery Creek contribution to the Stitt measured at the U/S Pie site.



Figure 10-1. Stormwater monitoring sites at MMG Rosebery.

Table 10-1. Summary of stormwater monitoring results collected on the Rosebery mine lease in 2024 to 2025.

Requirement	Findings
Monitoring Frequency	Quarterly sampling was completed at all stormwater sites as required.
Compliance with EPN	All sites were monitored for the required parameters at the required frequency when water was present. FPC2 was not monitored in March 2025 due to a lack of flow at the site. There were no unintentional releases of stormwater from the site in the monitoring year
Significant trends - reporting period	• Stormwater monitoring in September 2024 was completed during a wet period, with flows of 19 l/s and 153 l/s recorded at AC2 and RC2, respectively (Figure 10-2). Recorded flow rates during the remaining sampling periods were low (Table 10-2). • The metal and sulphate results at AC1 continue to be higher as compared to AC2, due to clean water inflow to Assay Creek between the two monitoring sites. Results at AC1 were within historic ranges. At AC2 concentrations were towards the lower range of results, with the lowest zinc concentration at the site since at least 2015 in March 2025r (Figure 10-3). • In Primrose Creek, the results were within the historic range of results (Figure 10-4). The flow at PC2 is collected and diverted for treatment so does not enter the environment. PC1 does enter the environment, but additional catchment inflow enter downstream of the monitoring site, so the results do not reflect the concentration of water released from site. • In Filter Plant Creek, results were within historic ranges at FPC1 and FPC2 which are collected and treated. At FPC3, located in the lower catchment, the concentrations recorded in September 2024 were the lowest recorded since at least 2015. This sampling coincided with a period of very high rainfall (Figure 10-5). • In Rosebery Creek, RC1 continues to have low metal and sulphate levels with an increase recorded at RC2 due to the influx of stormwater and other diffuse inputs, consistent with previous results (Figure 10-6). All results at both sites were within historic ranges. • Flow at RC2 ranged from~2 l/s to 1140 l/s over the year (Figure 10-7). • pH at RC2 was between 5 and 6 for most of the year but decreased to <4 during the extended dry period in February and March 2025. During the same period EC values increased substantially. There results are consistent with acidic groundwater seepage continuing to enter the creek and the absence of surface runoff. • Total zinc fluxes at the site ranged from 4.9 kg/day to 37.8 kg/day with an average of 16.0 kg/day over the four monitoring dates. The highest flux was associated with the prolonged period of high flow in September 2024 (Figure 10-7). • Average zinc loads in Rosebery Creek upstream of the Stitt based on the 43 quarterly stormwater monitoring results obtained since September 2014 are 19 kg/day, with a median value of 12 kg/day. The long-term average is lower than the 2024 to 2025 average due to the very high flow in September.

	• The long-term average total zinc load is consistent with the Stitt River zinc balance that shows an input of ~15 kg Zn_{tot}/day between site SR03 and site U/S Pie, which is below the confluence of the Stitt River and Rosebery Creek (Figure 7-19).
Comments	Stormwater monitoring should be revised to reflect water streams leaving the lease site rather than streams that are collected within the lease site and directed to the ETP. Ideally stormwater monitoring should aim to capture a range of flow rates each monitoring year although it is recognised this is difficult to schedule.

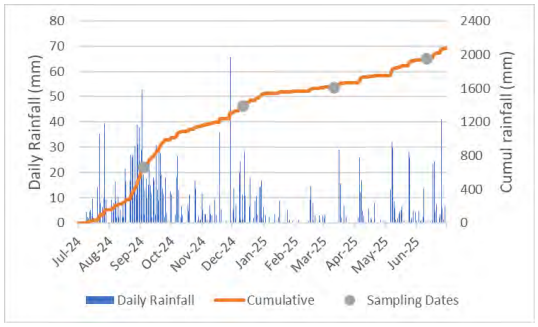


Figure 10-2. Daily and cumulative rainfall at the MMG Carpark during monitoring year and dates of quarterly stormwater sampling.

Site	Number of flows recorded n=	Range of flow rates (l/s)
AC1	1	0.2
AC2	4	0.8 – 19.1
PC1	1	0.2
PC2	0	
FPC1	1	<0.001
FPC2	0	
FPC3	0	
RC1	0	
RC2	4	2 - 153

Table 10-2. Summary of flow rates during stormwater monitoring.

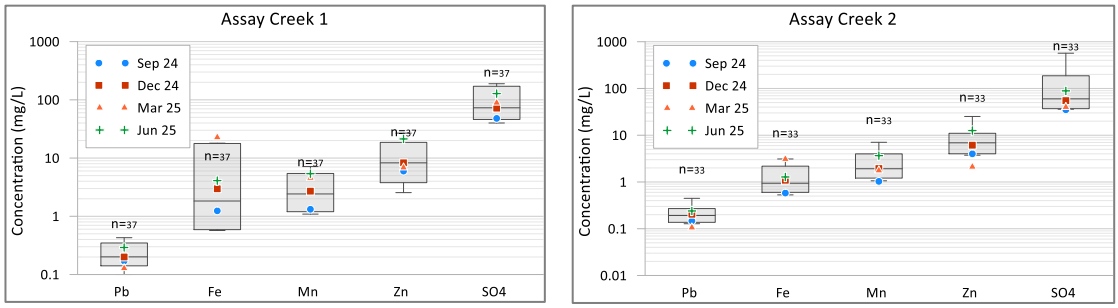


Figure 10-3. Total lead, iron, manganese, zinc and sulphate concentrations in Assay Creek 1 and Assay Creek 2 stormwater sites. The boxes encompass the 5th to 95th percentile monitoring results collected between January 2015 and June 2024, and the monitoring results collected from July 2024 to June 2025 are shown as data points.

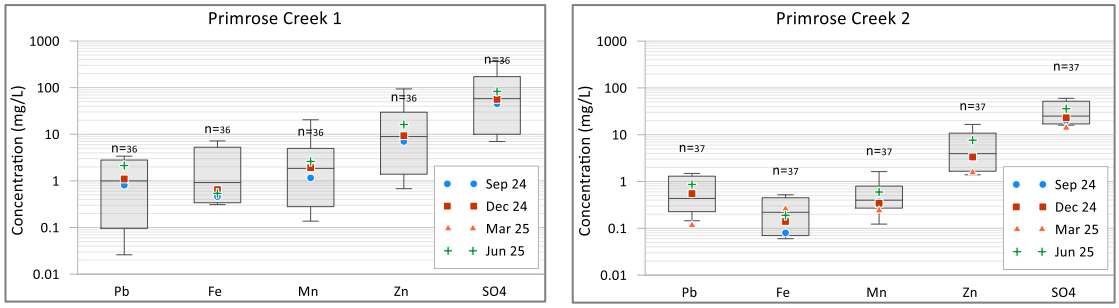
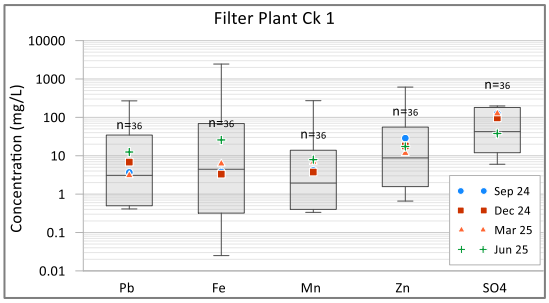
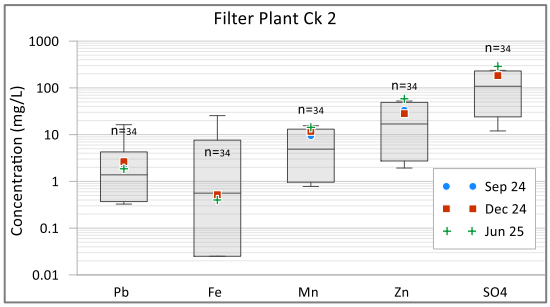


Figure 10-4. Total lead, iron, manganese, zinc, and sulphate concentrations in Primrose Creek stormwater sites PC1 and PC2. Description as per Figure 10-3.





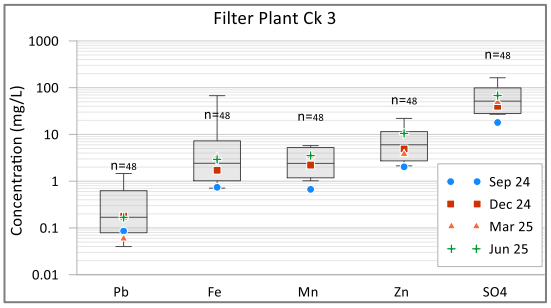
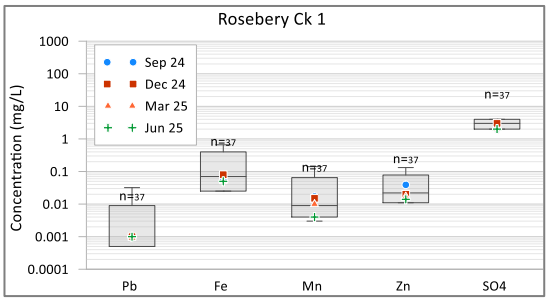


Figure 10-5. Total lead, iron, manganese, zinc, and sulphate concentrations in Filter Plant Creek stormwater sites FPC1, FPC2 and FPC3. Description as per Figure 10-3

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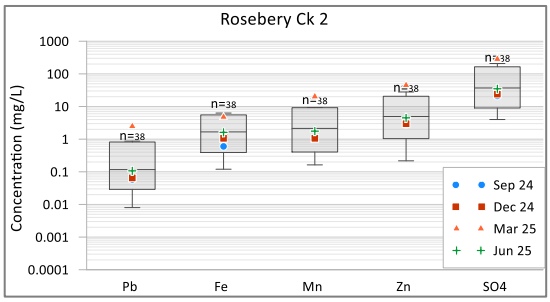
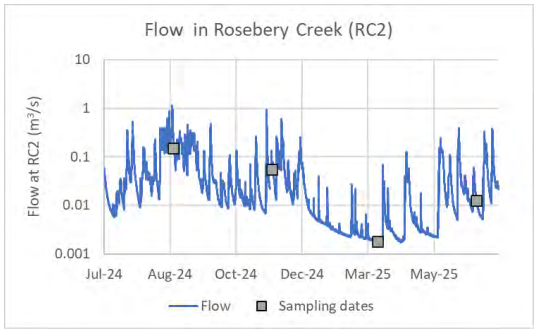
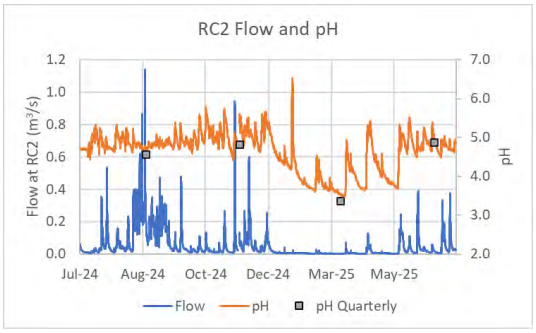
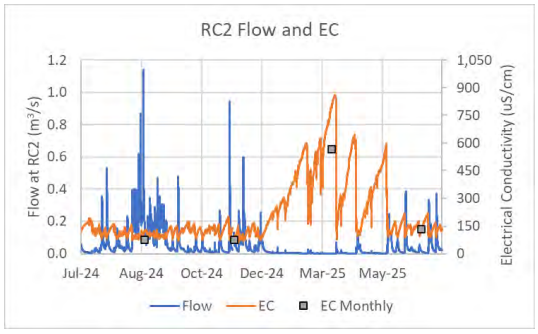


Figure 10-6. Total lead, iron, manganese, zinc, and sulphate concentrations in Rosebery Creek stormwater sites RC1 and RC2. Description as per Figure 10-3. Note different minimum scale on RC graphs as compared to other sites.







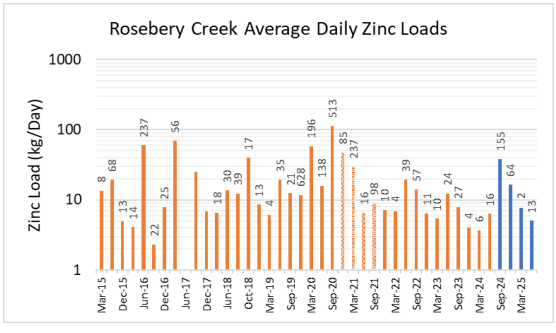


Figure 10-7. (top left) Hourly discharge in Rosebery Creek (RC2) July 2024 to June 2025 with monitoring days indicated; (top right) flow and continuous and field pH at RC2; (bottom left) flow and continuous and field EC (bottom right). Estimated zinc loads at RC2 based on flow measurement at Rosebery Creek gauging site on stormwater monitoring days. Data labels indicate the flow rate in Rosebery Creek in l/s on the sampling day. Stippled fill indicates estimated flow; blue bars show July 2024 to June 2025 results.

11 Underground Mine Water Monitoring

The underground mine water monitoring locations are shown in Figure 11-1, and a summary of the monitoring results is contained in Table 11-1.



Figure 11-1. Underground mine water monitoring sites.

Table 11-1. Summary of underground mine water monitoring results for 2024 to 2025.

Requirement	Findings
Monitoring Frequency	Monthly sampling was completed at all sites as required.
Compliance with EPN	All sites were monitored for the required parameters at the required frequency.
Comments	Monitoring results were within historic ranges at 17 Level, 8 Level and HOR. In the Northern Exploration Drive (NED) relatively lower concentrations of metals were present in the dry summer months of 2025 (Figure 11-2). NED continued to show higher variability as compared to pre-2023-2024 results.

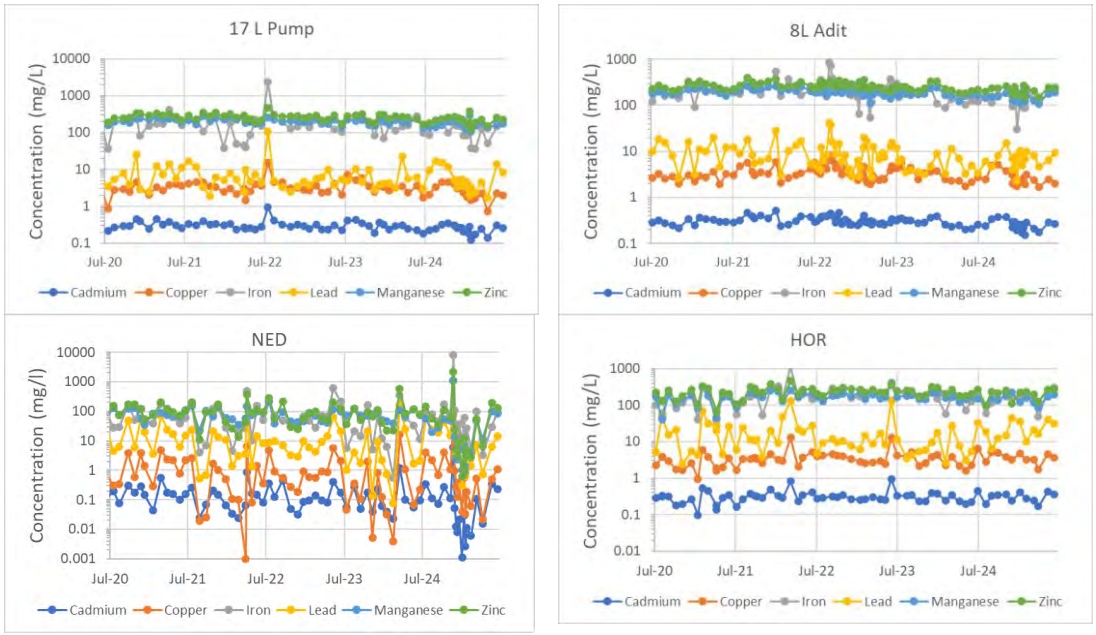


Figure 11-2. Total metal concentrations at underground sites from July 2020 to July 2025. Note different concentration scales.

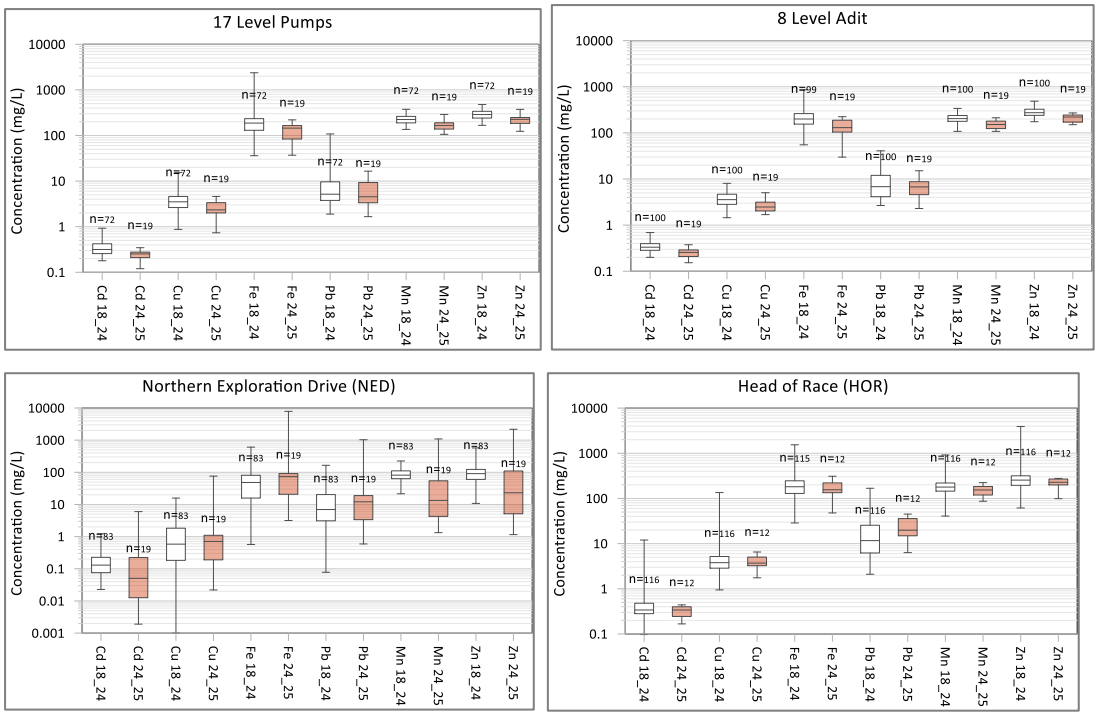


Figure 11-3. Comparison of total metal concentrations the underground sites in 2024-2025 with results collected between July 2018 and June 2024. The white boxes show the 2018 to 2024 results with the monthly 2024 to 2025 results shown by the orange box. The box encompasses the 25th to 75th percentile results. Note different concentration scales.

12 Lake Pieman Monitoring

Monitoring locations in Lake Pieman are shown in Figure 12-1. At each site water column profiles of physico-chemical parameters are collected (pH, EC, Temperature, DO, turbidity), and water quality samples are collected from three depths (surface, mid-depth and deep). A summary of the monitoring results collected from Lake Pieman is contained in Table 12-1.



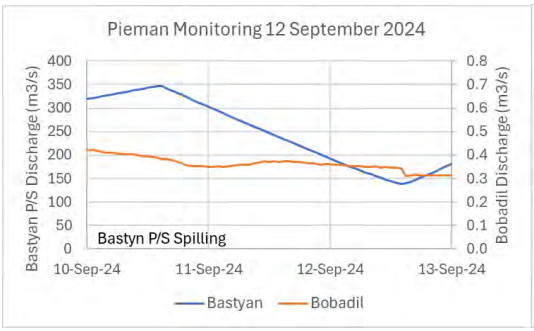
Figure 12-1. Monitoring locations in Lake Pieman. Samples are collected at the surface (S), mid-depth (M) and near the bed (D).

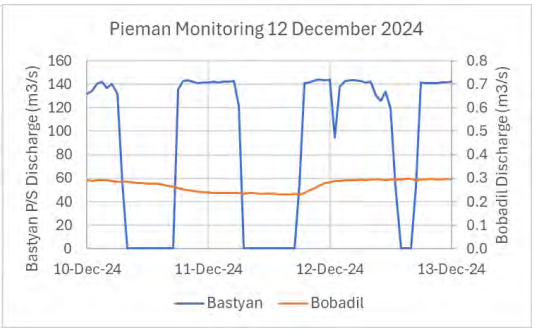
Table 12-1. Summary of monitoring results from Lake Pieman in 2024-2025.

Requirement	Findings
Monitoring Frequency	Quarterly water quality sampling and lake profiling was completed as specified in the EPN.
Compliance with EPN	There are no requirements in the EPN other than monitoring frequency and parameters determined. All parameters were determined as required with the exception of dissolved oxygen, which was not profiled in September 2024 at sites PBS2, 3, 5 or 6.
Significant trends - reporting period	Discharge at BO ranged up to 0.43 m^3/s during the wet September monitoring period but was otherwise ≤0.3 m^3/s during the other monitoring run. The Bastyan Power station operated differently over the four monitoring periods (Figure 12-2) resulting in changes to the EC profiles at the sites (Figure 12-3). • In September 2024 the Bastyan Power station was spilling, with up to 350 m^3/s of water entering upper Lake Pieman. This produced a well mixed water column at every site with uniform and low EC values. • The power station in December 2025 was operated daily for at least 12 hours. This inflow also produced a uniform water column at all sites except PBS2, located immediately downstream of the BO discharge point, where EC values were low, but slightly higher than the very low values at the other sites.

	• In March 2025, the station operated intermittently prior to monitoring, with only 35 hours of operation recorded in the 2 weeks prior to monitoring. This resulted in a thermally stratified water column and an EC maxima at the thermocline. The stratified water column showed decreasing pH with depth, except at site PBS2 where pH increased with depth (Figure 12-4). The increase in EC and pH at this suggest suggests BO discharge water was entering and mixing below the warm surface layer. • Power station operation in June 2025 was similar to December, with the power station operating intermittently for over 12 hours per day. The water column was uniform and well mixed at all sites with respect to EC, including at PBS2. • Dissolved oxygen levels were ≥7 mg/l on all sampling runs at all depths except for the deepest water at site PBS5 in March 2025 where DO values ranged from 5.8 mg/l to 6.8 mg/l. • Total zinc results show a generally increasing trend downstream as has been previously observed, with the highest concentrations generally occurring at PBS5, downstream of the Stitt River inflow (Figure 12-5). The March 2025 total zinc results are higher in the surface and bottom waters as compared to the other monitoring periods, consistent with the reduced flow in the system. The highest zinc concentration was detected in the surface waters at PBS4 in December 2024; the reason for this is unknown. • Sulphate concentrations (Figure 12-6) do not show a continuous increase in concentration with distance downstream, with PBS2 having the highest concentrations in several samples. The sulphate levels in March 2025 are considerably higher than recorded during the other monitoring run, consistent with very low flow through the lake. These results suggest that the sources of sulphate and zinc differ, with sulphate entering upstream of PBS2 and zinc entering lower in the catchment. This is consistent with the BO discharge having high sulphate concentrations, but low zinc concentrations with higher levels of zinc entering from diffuse sources downstream. • Compared to the long-term results, the 2024 to 2025 total zinc results are within previous ranges (Figure 12-7), with the March 2025 and PBS5 results towards the higher range. The higher PBS5 results may be due to the PBS5 monitoring location being checked and adjusted as the buoy marking the spot had shifted. The sample is now being collected slightly further downstream of the confluence with the Stitt River. • The long-term surface sulphate results also show the March 2025 concentrations were elevated compared to previous results, with the other sampling results well within previous ranges (Figure 12-8). • Comparing total and filtered zinc results at PBS6 and PBS3 shows that in March 2025, filtered results are similar to or less than the total as expected, demonstrating that most of the zinc is present in the dissolved form. At PBS3, there are several filtered results that are higher than the total values. This may be due to variability in the lake, or filtering or laboratory errors. • The median and 95th percentile values for total zinc across all sites were 0.021 mg/l and 0.042 mg/l respectively, which are above the

	ANZG (2018) 95th percentile trigger value of 0.008 mg/L. These results are well below the No Observable Effects (NOEC) levels of 0.23 mg/L obtained through site specific acute toxicity testing by MMG using Pieman water and a local *Ceriodaphnia* in 2006. The median and 95th percentile total copper values in 2024 to 2025 were 0.002 mg/l and 0.003 mg/l, respectively, which are slightly higher than the 95th percentile ANZG (2018) 95th percentile trigger value of 0.0014 mg/l. Copper is known to be complexed by the organic compounds in Lake Pieman and the copper levels are likely to pose a low risk to the modified aquatic ecosystem. The copper concentrations in Lake Pieman are below copper guideline values of 0.0034 mg/l that include consideration of dissolved organic carbon and hardness (Gadd et al., 2024). • The median (0.001 mg/l) and 95th percentile (0.002 mg/l) values for lead are below the ANZG (2018) 95th percentile trigger value of 0.0034 mg/l. • The 95th percentile total cadmium result of 0.0003 mg/l exceeds the ANZG trigger by 0.0001 mg/l. This is a conservative comparison as the values that are reported as <LoR are included in the data set as 0.0001 mg/l, equivalent to the LoR. The filtered results at sites PBS3 and PBS6 are below the trigger value.
Longer term trends	The results from 2024-2025 are consistent with the understanding of mixing within Lake Pieman, and highlight the role hydrology, and especially the power station operations play in mixing in the lake.
Comments	The need for maintaining accurate and consistent monitoring locations is highlighted by the apparent increase in zinc concentrations following re-establishment of the monitoring site in the correct location. The monitoring sites should be checked by GPS prior to sample collection during each monitoring period, with the GPS locations recorded on the field monitoring sheets.





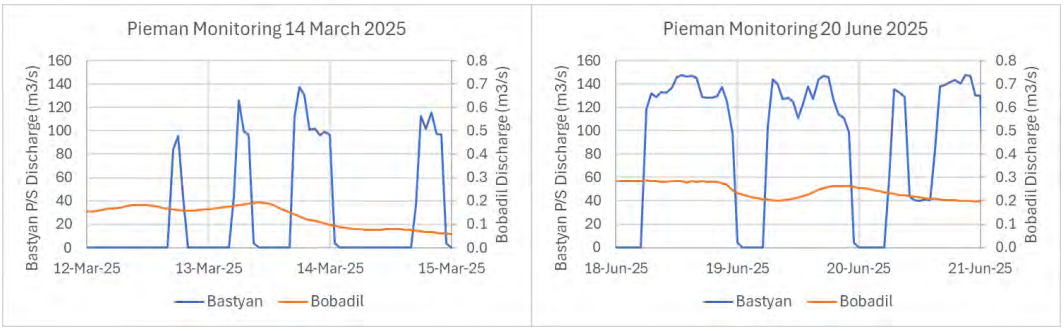


Figure 12-2. Discharge at Bastyan Power Station and Bobadil TSF the two days prior to, and on the day of, Lake Pieman monitoring (sampling dates shown on each graph). On September 2024 graph the difference in scales between Bastyan and BO is 500-fold; on the other graphs the difference is 200-fold.

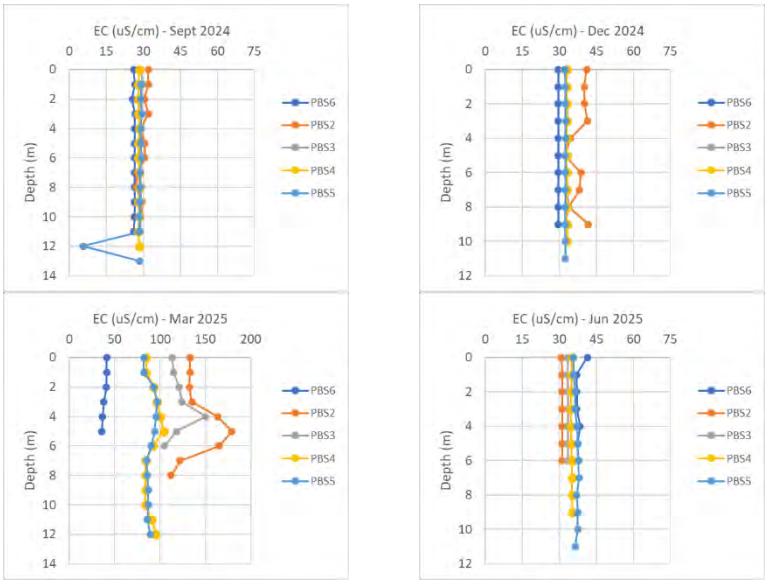


Figure 12-3. Electrical conductivity results for Lake Pieman monitoring sites on each monitoring date in 2024-2025. Results are listed in a downstream direction, e.g., PBS6 is at the upstream end of L Pieman.

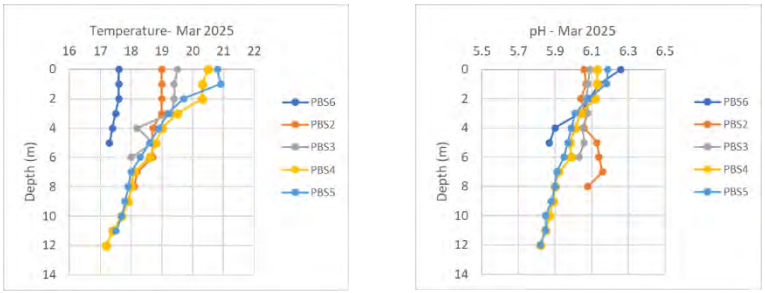
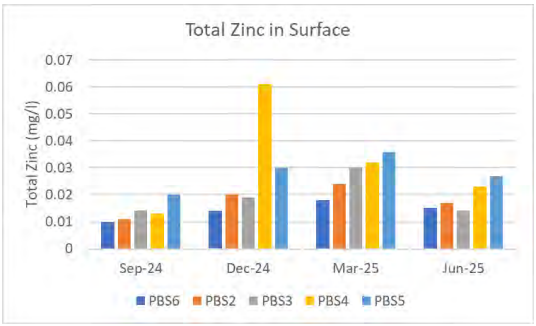
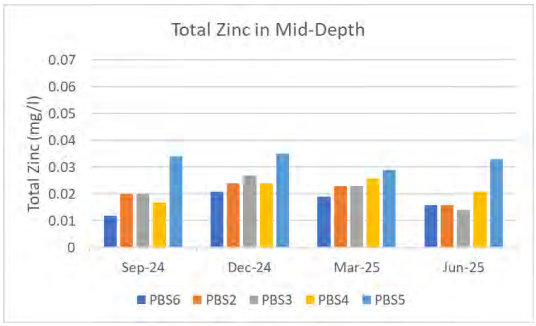


Figure 12-4. Temperature and pH profiles at monitoring sites in March 2025 showing thermal stratification and decreasing pH with depth except at PBS2.





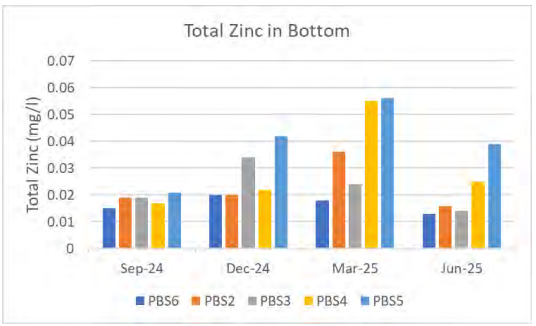
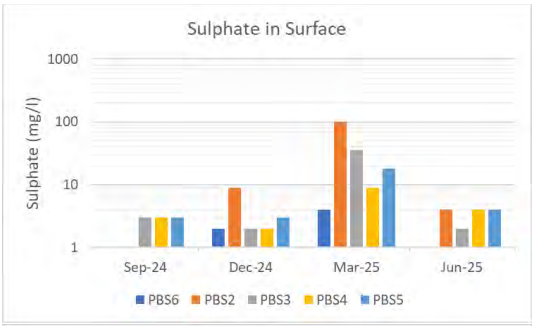
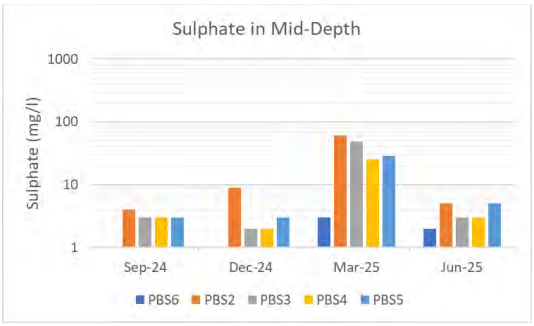


Figure 12-5. Total zinc concentrations in surface, mid-depth, and bottom water samples in Lake Pieman in July 2024 to June 2025.





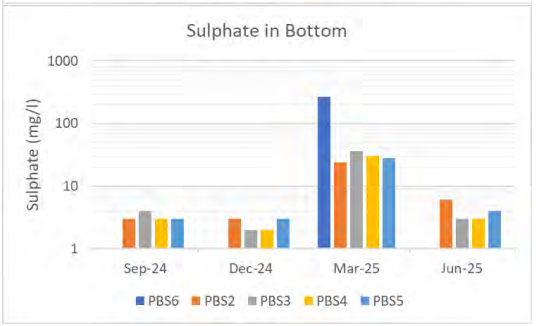
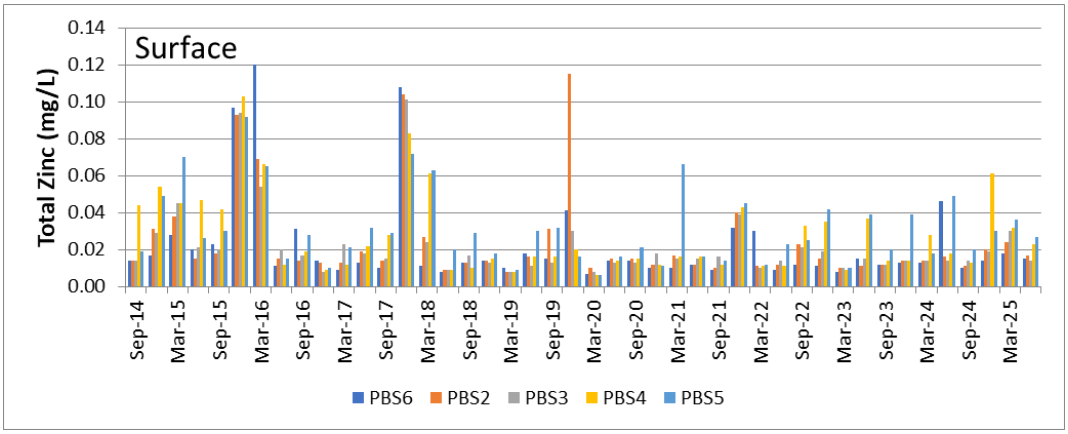


Figure 12-6. Sulphate concentrations in surface, mid-depth, and bottom water samples in Lake Pieman in July 2024 to June 2025. Where no result is shown for PBS6 the concentration was ≤1 mg/l.



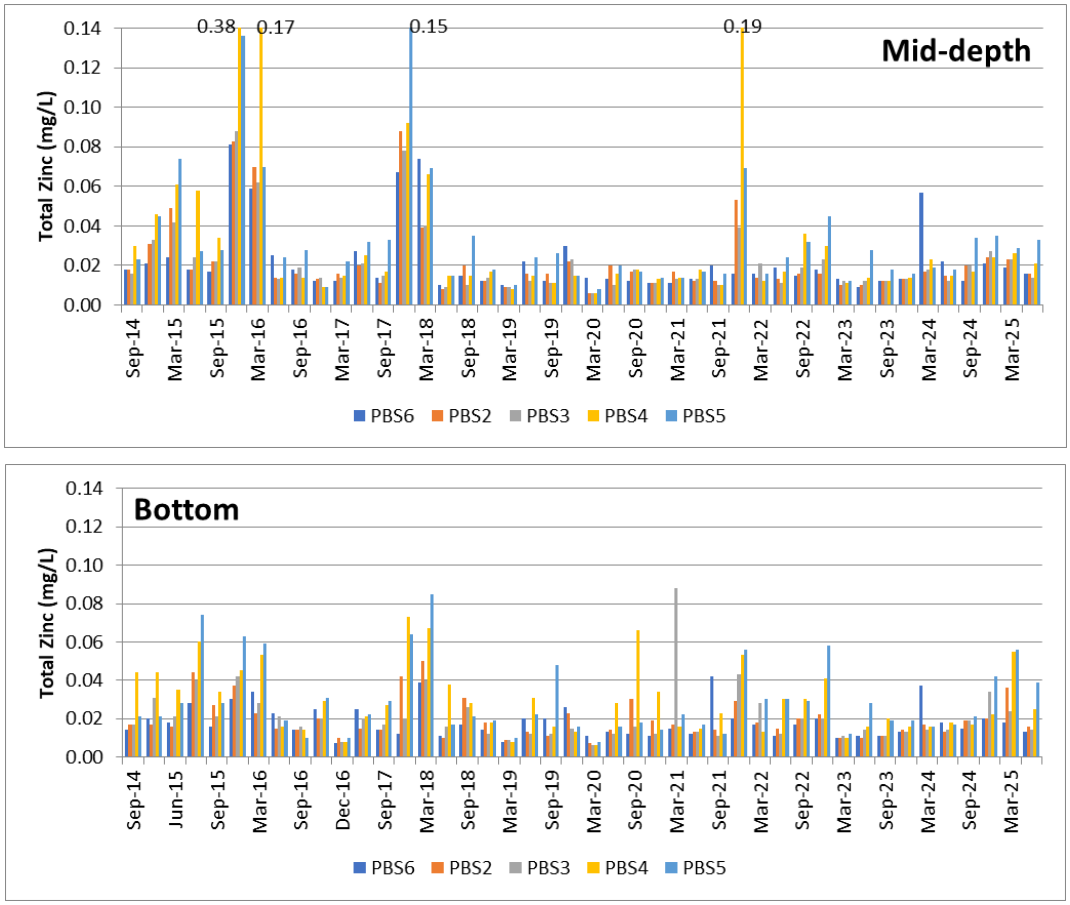


Figure 12-7. Total zinc in surface (top), mid-depth (middle) and bottom water (bottom) samples from September 2014 to June 2025. Labels indicate concentrations that extend beyond the limit of the graph in mid-depth graph.

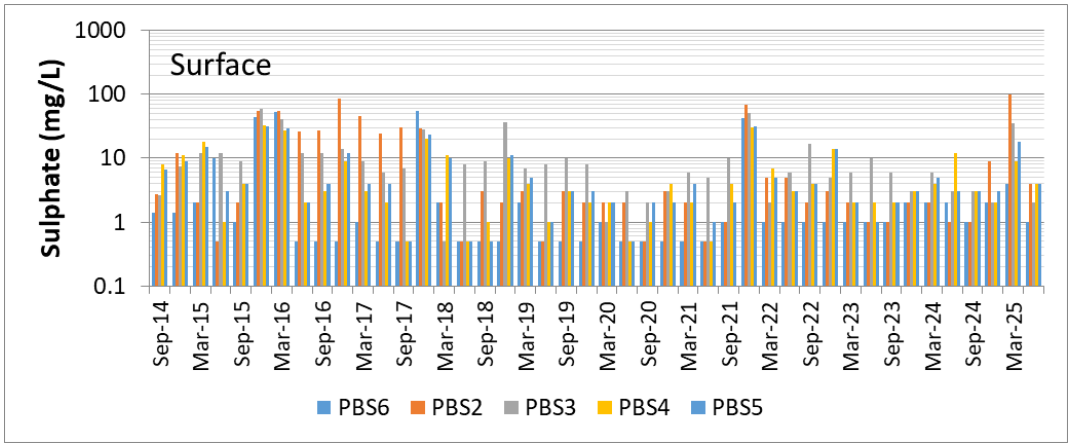
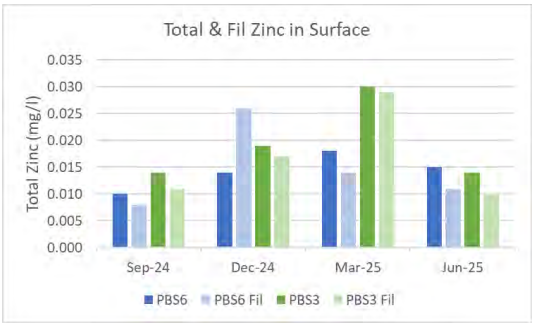
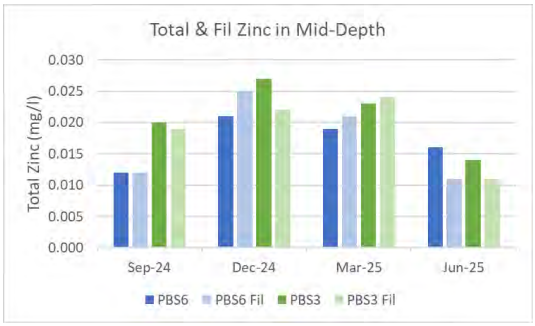


Figure 12-8. Sulphate concentrations in Lake Pieman surface water samples 2014 – 2025.





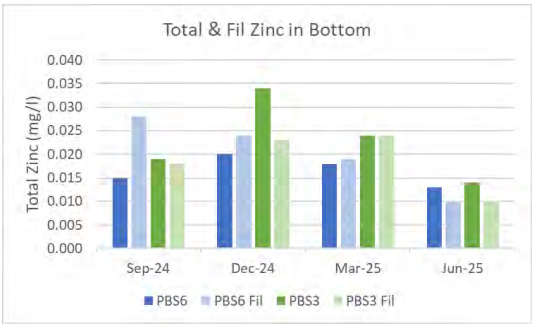


Figure 12-9. Comparison of total and filtered zinc results from PBS6 (upstream BO inflow) and PBS3 (downstream BO inflow) between Sept 2024 and June 2025.

13 Review of Sampling Procedures and QA/QC of water quality monitoring

Item 2.6 under condition G7 of EPN 7153/3 lists a requirement that the Annual Review include a review of field monitoring procedures, and accuracy of analytical procedures. MMG Rosebery has provided the information upon which the summary in Table 13-1 is based.

Monitoring information provided by MMG Rosebery includes Surface Water and Ground Water Monitoring Procedures that clearly outline the roles and responsibilities of each team member involved in monitoring, data management and reporting, and provides references to the standard methods that are to be adopted for the collection of samples, and reporting of results. The procedures include timelines for completing tasks to ensure that reporting requirements under the EPN can be met, and to ensure that management is aware of potential environmental issues as they arise.

L Koehnken completed several site visits in the 2024 to 2025 monitoring year to MMG Rosebery and visited most monitoring sites included in the EPN, and reviewed monitoring strategies and techniques with MMG staff and contractors. All monitoring locations have remained unchanged since the previous review, except for the inclusion of the new bores at the 2/5 Dam TSF to replace ones that have been removed due to expansion of the TSF, and a small shift to site BO to align with the location of the continuous monitoring probes, a small upstream shift to site U/S Pie for safety reasons, and realignment of the Lake Pieman monitoring sites. The staff have confirmed that there have been no changes to the monitoring procedures or contractors in the 2024 to 2025 year.

The onsite QA/QC system, implemented in 2019/2020, ensures consistency between all environmental field technicians. The program consists of a series of field tasks and observations to verify both technician competency and compliance with site procedures. Results are recorded and analysed with feedback provided to improve sampling consistency.

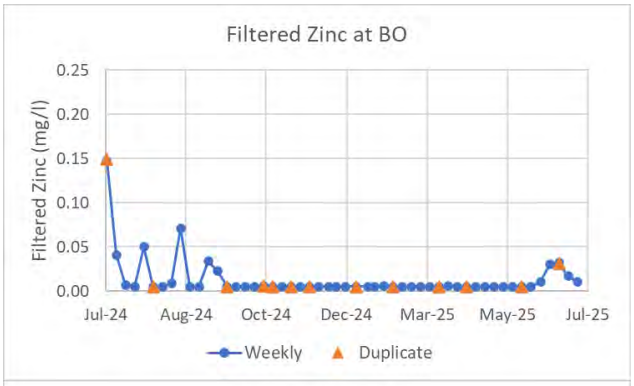
No laboratory visit or audit of analytical methods has been included as part of this review aside from the comparisons provided below. All laboratory analyses included in this review

were completed in a NATA certified laboratory (ALS) that is subject to ongoing review and QA/QC checks under the NATA certification process. The laboratory runs duplicates of 1 in every 20 samples that must pass the internal QA/QC limits of the laboratory. Based on this, much of the discrepancies between the Compliance and Field duplicate samples are likely attributable to environmental variability rather than errors in sampling or analysis.

Table 13-1. Summary of field monitoring practices, applicability of monitoring sites and monitoring frequency, and analytical methods used by MMG Rosebery during the 2024-2025 monitoring year.

Requirement	Findings
Accuracy of the Sampling Procedures	• Water quality samples are collected by trained environmental contractors or the professional environmental staff at MMG Rosebery according to the standard monitoring procedures established by MMG. Samples required for EPN compliance are collected and submitted to a NATA approved lab using appropriate Chain of Control (ALS Melbourne). Field duplicates are collected at a rate of 1 per 20 samples and are also submitted to the primary lab with the duplicate locations selected on a random basis. The Relative Percent Difference (RPD) between the primary and duplicate sample results are tracked, and all discrepancies greater than 50% are noted in the data base. For compliance samples the laboratory is contacted and asked to confirm the result and / or re-run the sample. • A comparison of the weekly compliance results with field duplicates for a total and filtered metal (total and filtered zinc), nutrient (total nitrogen) and a 'general' parameter (total calcium) collected at BO are shown in Figure 13-1 through Figure 13-3. • The compliance and duplicate samples show good agreement for all parameters. All duplicates were within 10% of the weekly values except for 2 total zinc values which differed by 20% and 25%, respectively. The actual difference in the total zinc results in both samples was 0.002 mg/l, so the elevated percentages are attributable to statistics of small numbers. Given that these are total zinc results that include suspended solids in the sample, this level of variability is not unusual. • The MMG Rosebery Mill personnel are responsible for maintenance of one set of pH and EC probes used for continuous monitoring. The probes are calibrated weekly. A second set of continuously monitoring EC and pH probes were established in the 2024 – 2025 monitoring year to provide backup for the Mill. The new probes are maintained by Entura. • MMG also contract Entura to manage the water level probe at BO, and water level and water quality probes at numerous sites around the lease (clean water diversion drain (CWDD), Stitt River, Ring River upstream Baker Creek, Baker Creek, 7 Level, Ring River at Murchison Highway, Rosebery Creek). • Field probes are calibrated weekly as part of the routine monitoring by monitoring personnel according to the

	established procedures. Backup field instruments are calibrated and maintained on site.
Applicability of sampling schedule and monitoring locations	• The sampling schedule at the BO outfall is suitable for capturing the water quality variability at the point of discharge. The continuous pH measurements at BO guides management of the ETP and provides an accurate indicator of the discharge water quality. • The monitoring plan and supplementary monitoring carried out by MMG for 2/5 dam is adequate to capture environmental releases from the dam to the environment should they occur, and to guide internal management. • There are inconsistencies within the EPN with respect to monitoring frequency at a number of sites, with parameters required to be monitored on both weekly and monthly, or monthly and 6-monthly basis. These should be reviewed and corrected. • The monitoring schedule and parameters required to be determined at all sites should be reviewed to ensure the information gained is relevant to present operations and providing useful information. The review should identify parameters at BO that are consistently below the discharge limits and could be considered for less frequent monitoring or elimination from the monitoring schedule.
Accuracy of analytical test methods	• All field and analytical methods used in the determination of water quality parameters are consistent with established and appropriate methods. Analytical results are determined by independent NATA registered laboratories, and all water quality results provided by the labs incorporate QA/QC information, including results for field and lab blanks and replicates. The results from all internal and laboratory duplicate analyses are maintained within MMG's water quality database (ESDAT) along with the primary sample results enabling comparison of results. • NATA registered laboratories only report results which are within the internal QA/QC limits of the laboratory, so the laboratory analyses are considered accurate within the context of NATA testing.
Recommendations	There are sporadic discrepancies between field EC or pH measurements and continuous readings. Intercalibration between the continuous probes and the field and laboratory probes should be routinely conducted to minimise the occurrences.



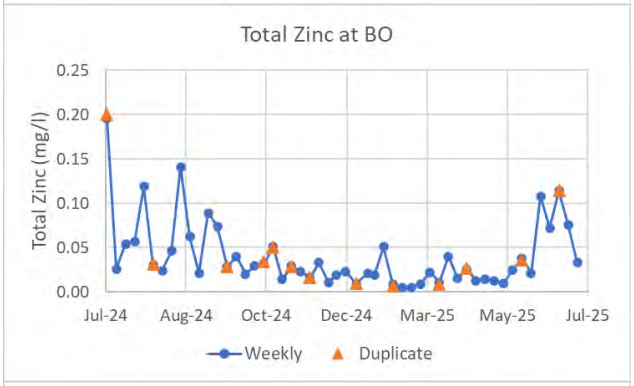


Figure 13-1. Comparison of weekly compliance sampling with field duplicates in (top) total zinc and (bottom) filtered zinc results collected at BO 2024-2025.

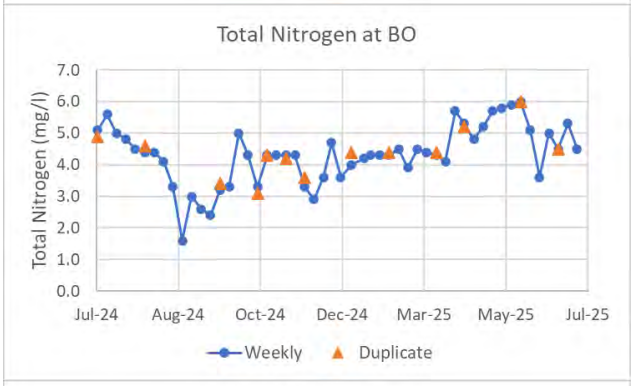


Figure 13-2. Comparison of total nitrogen results at BO in weekly compliance monitoring and Field duplicate samples collected in 2024-2025.

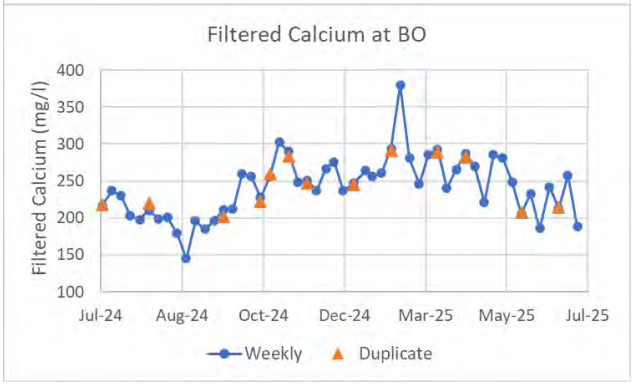


Figure 13-3. Comparison of total calcium at BO in weekly compliance monitoring and in field duplicate samples collected in 2024-2025.

14 3 Level Waste Rock Dump (EPN 8815/2)

In the 2024 to 2025 monitoring year 2,475 tonnes of waste rock was added to the 3 Level WRD. The waste rock was sampled in accordance with EPN 8815 and NAG7 did not exceed 8 kg H_2SO_4 per tonne for all samples (SGME, 2025).

14.1 Surface water monitoring

Monitoring locations at the 3 Level WRD are shown in Figure 14-1 and a summary of the monitoring results is contained in Table 14-1.



Figure 14-1. Surface water and groundwater monitoring locations associated with the 3 Level WRD.

Table 14-1. Summary of surface water monitoring results for 3 Level WRD in 2024 to 2025.

Requirement	Findings
Monitoring Frequency and Parameters	Surface water monitoring is required to be completed on a quarterly basis as the 2015 EPN specifies monthly monitoring for three years, followed by quarterly thereafter. Monitoring was completed as required at all sites for all parameters when water was present. • No sample was collected at OC3 in March 2025 due to a lack of flow.
Compliance with EPN – Assessment of surface water impacts from the 3 Level WRD	The EPN requires an assessment of surface water impacts associated with 3 Level WRD. • Surface water impacts beyond the immediate area of the WRD are limited as surface runoff from the 3 Level WRD is collected at the 4 Level settlement pond and directed to the ETP for treatment and discharge via the Bobadil TSF. There were no discharges from the settlement pond to Rosebery Creek during the 2024-2025 monitoring year.

	• pH results from OC3, OC4 and OC5 are within the range of previous results, with OC3, located at the toe of the WRD continuing to have the lowest pH, and surface runoff at OC4 the highest pH (Figure 14-2). • Zinc values are also within previous ranges (Figure 14-3), with OC4 and OC5 showing high variability. Similar to the 2023-2024 monitoring year OC4 recorded low zinc concentrations in the summer period. Total Zinc at OC3 continues to be higher than at the other sites and ranged from 68 mg/l to 77 mg/l in 2024 to 2025. • Total zinc and sulphate increase in Rosebery Creek with distance downstream, reflecting diffuse inputs rather than surface discharge from the WRD or open cut as all runoff is collected and directed for treatment (Figure 14-4, Figure 14-5). Inputs also include runoff from the township of Rosebery. • A time-series of total zinc upstream (RC1) and downstream of the 3L WRD area (RC2) is shown in more detail in (Figure 14-6). The concentrations at RC1 have ranged between 0.01 mg/l and 0.06 mg/l since 2015, with no apparent trend. Concentrations at RC2 ranged from 2.9 mg/l to 45 mg/l in the monitoring year, which is the highest value recorded at the site. The elevated result is attributable to the prolonged dry summer and low flow conditions at RC2 where flow was recorded as 2 l/s on the March 2025 sampling day. • Sulphate and the other metals results recorded in March 2025 were also the highest recorded at RC2. The results from the other sampling runs were similar to or less than the long-term median results (Figure 14-7).
Significant trends - longer period	All surface runoff from the 3L WRD continues to be collected and directed to the ETP for treatment. The downstream increase in zinc and sulphate in Rosebery Creek is attributable to diffuse sources in addition to any groundwater inputs that may be entering from the 3L WRD.

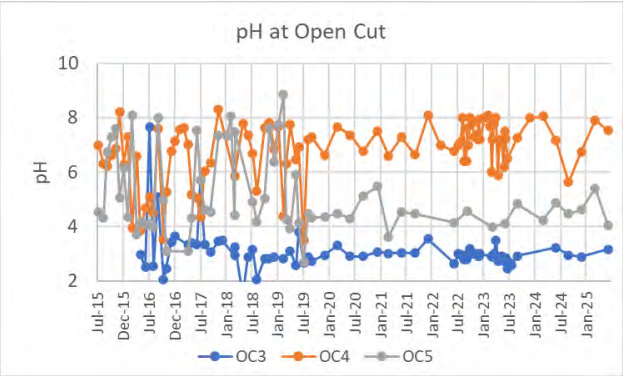


Figure 14-2. Time-series of pH in OC sites June 2015 – June 2025.

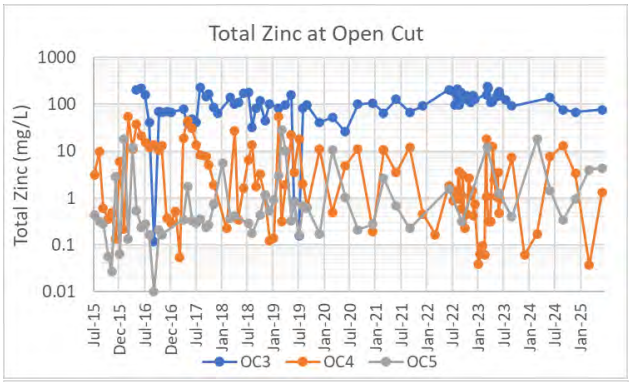


Figure 14-3. Time-series of total zinc in OC sites June 2015 to June 2025. Note log scale.

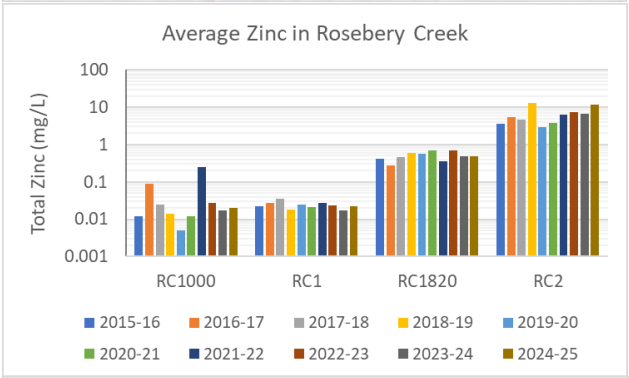


Figure 14-4. Average total zinc concentrations in Rosebery Creek in 2015 – 2025 monitoring years RC1000=background, RC1=upstream of WRD and open cut, RC1820 downstream of 3L WRD and open cut, RC2=upstream of confluence with Stitt River below all mine and diffuse inputs. Note log scale.

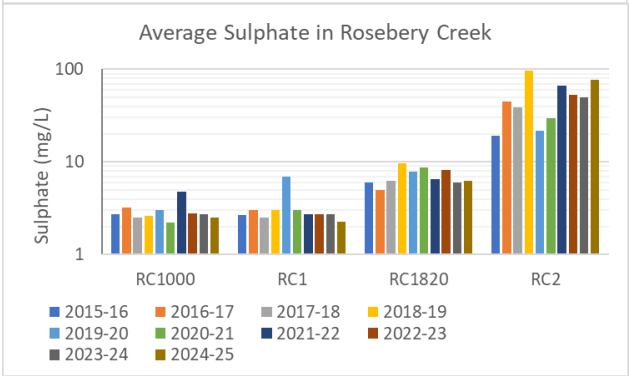


Figure 14-5. Average sulphate concentrations in Rosebery Creek in 2015 – 2025 monitoring years. Note log scale.

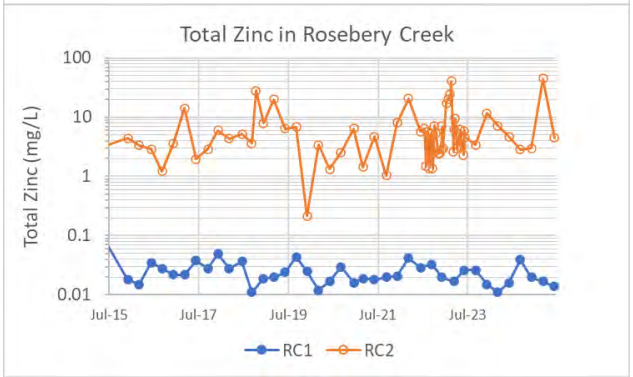


Figure 14-6. Comparison of total zinc concentrations at RC1 and RC2 from July 2015 to June 2025. Note log scale.

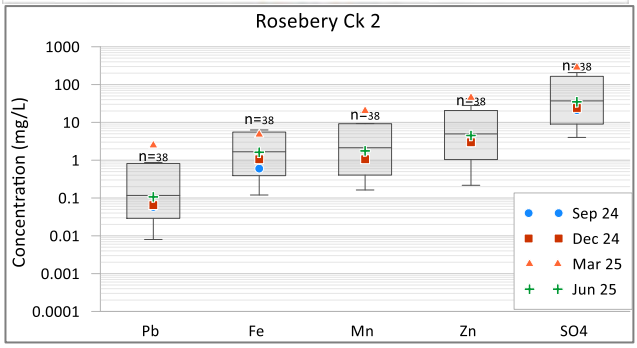


Figure 14-7. Total metals and sulphate at RC2 in 2024-2025 compared to results from Jan 2015 to June 2024. The boxes encompass the 5th to 95th percentile values.

14.2 Groundwater monitoring

A summary of the monitoring results collected from ground water sampling sites is contained in Table 14-2.

Table 14-2. Summary of groundwater monitoring results at 3 Level WRD 2024 to 2025.

Requirement	Findings
Monitoring Frequency and Parameters	Groundwater sampling at the 3 Level WRD was completed on a six-monthly basis as required. Parameters were determined as required when water was able to be collected from the bores. • GB25D was removed from the monitoring schedule following approval by the EPA for decommissioning in September 2020. • GB26 and GB45 continue to be dry and are not able to be monitored. This has occurred for many years. • GB36 and GB44 were not sampled in Apr/May 2025 due to a lack of water in the bores
Compliance with EPN – Assessment of groundwater impacts from the 3 Level WRD	The EPN requires an assessment of groundwater impacts associated with 3 Level WRD. The relative position of the groundwater bores is shown in Figure 14-1. • Monitoring results were within the range of previous results for pH, sulphate, and zinc (Figure 14-8 to Figure 14-10) except at GB24S where zinc in April 2025 was higher than previously recorded (15 mg/l). In GB27 the copper concentration in October 2024 was lower than previously recorded (0.69 mg/l). • Bores near the top of the valley (GB21-GB25) continue to have higher pH and lower zinc and sulphate concentrations as compared to bores located downslope of the WRD and open cut. • The bores at the base of the WRD (GB27, GB36, GB44, GB46) are characterised by low pH and elevated zinc and sulphate concentrations. • Bore GB27, located within the PAF material in the WRD has consistently recorded the highest concentrations with iron, manganese, and zinc levels of 1-2 g/L, sulphate concentrations of ~10 g/L (Figure 14-11) and the lowest pH values. • Water levels in the groundwater bores show seasonal trends, with water levels higher in (e.g., decrease in depth to water surface) in October/November, and lower in April, following the dry summer months. Water level changes recorded in bore GB25S continue to show rapid change. Water level changes ranged from -1.4 m to +4.0 m at the sites (Figure 14-12, Figure 14-13).
Significant trends - longer period	Bore GB23 continues to record elevated zinc (11-14 mg/L) and sulphate (103-126 mg/L) concentrations even though it is located well above the open cut and WRD. This bore is in the Northern Open Cut Area and is presumably impacted by the historic workings.

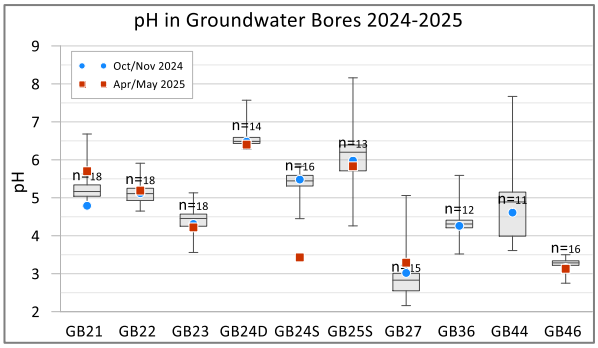


Figure 14-8. pH in groundwater at 3 Level WRD. Box encompasses the 25th to 75th percentile values from 2015 to June 2024, with the 2024-2025 results shown as data points. No data points indicate pH was not recorded at the site on the monitoring run.

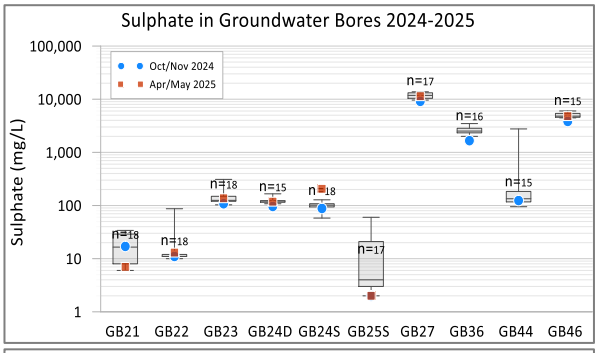


Figure 14-9. Sulphate in groundwater at 3 Level WRD. Box encompasses the 25th to 75th percentile values from 2015 to June 2024, with the 2024-2025 results shown as data points.

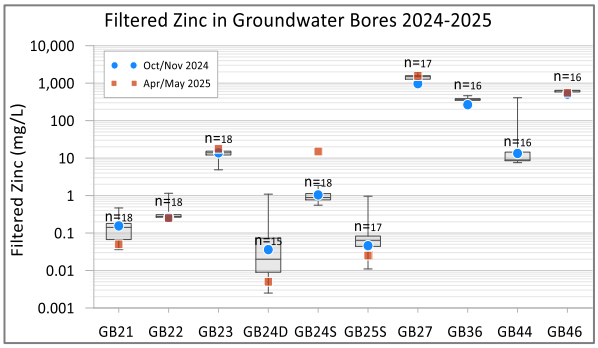


Figure 14-10. Dissolved zinc in groundwater at 3 Level WRD. Box encompasses the 25th to 75th percentile values from 2015 to June 2024, with the 2024-2025 results shown as data points.

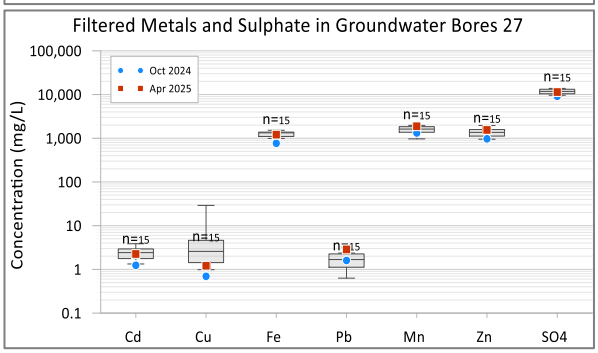


Figure 14-11. Filtered metals in GB27. Box encompasses the 25th to 75th values from 2015 to June 2024. Data points show values recorded in October 2024 and April 2025.

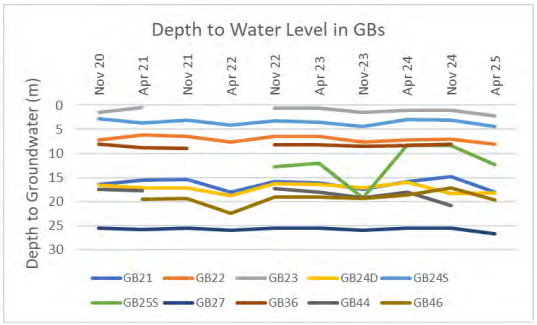


Figure 14-12. Recorded water depth below ground surface at the 3 Level groundwater bores;

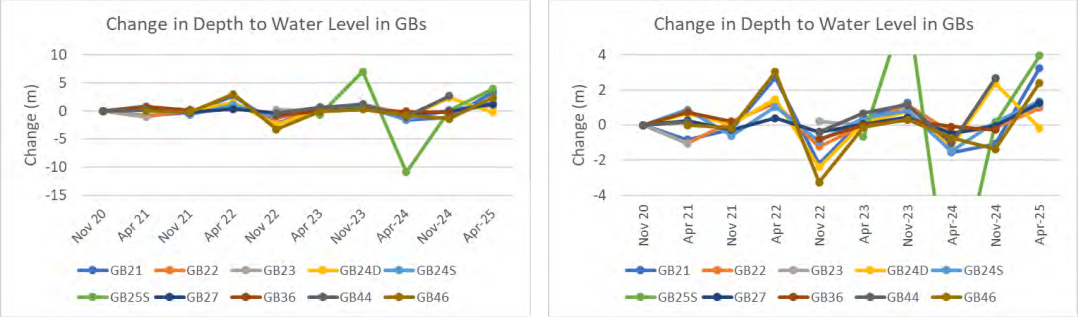


Figure 14-13. Change in the depth to the groundwater surface in the bores between sampling dates. A positive change indicates lower water level (e.g., greater depth to water surface). If no result is shown it indicates water level was not reported for the monitoring period. Both graphs show the same results at a different vertical scale.

14.3 Lysimeter Gas Sampling

A summary of the gas monitoring results collected from the lysimeters in the 3 Level WRD is presented in Table 14-3.

Table 14-3. Summary of lysimeter gas monitoring results from 3 Level WRD in 2024 to 2025.

Requirement	Findings
Monitoring Frequency and Parameters	Gas monitoring is required to be implemented at six horizontal gas monitoring pipes over the full construction of the WRD. Only the Stage 2 gas lysimeter has been installed. There are gas lysimeters installed in the Test Pads, but they do not reflect what is occurring within the main dump. Monitoring of the Test Pad ceased in October 2020, and the results until that date are only included here to provide an indication of changes over time within the material. The gas lysimeters were reviewed by an external consultant, SGME, in December of 2024 and found to be functioning properly. Monthly monitoring for O_2, CO_2 and SO_2 was completed at the Stage 2 G1 lysimeter as required.
Compliance with EPN	The EPN sets a Preliminary Performance Objective of <3% *in situ* O_2 for the gas lysimeters. • All reported O_2 concentrations at the Stage 2 G1 lysimeter exceeded this value during the July 2024 – June 2025 monitoring period (Figure 14-14) indicating oxygen is not being excluded from the waste rock dump. The concentration in the lysimeter is similar to the atmospheric value of 20.95 %. Sulphide oxidation is not inhibited at these oxygen levels. • CO_2 levels in the Stage 2 gas lysimeter varied from 0% to 0.03% over the 12-months (Figure 14-15). • No SO_2 was detected in the gas lysimeter.
Significant trends	The results indicate that the WRD is not preventing the ingress of oxygen nor oxidation of sulphide. The results suggest that the placement of the cap on the WRD in 2024 has not as of yet had an impact on oxygen ingress .

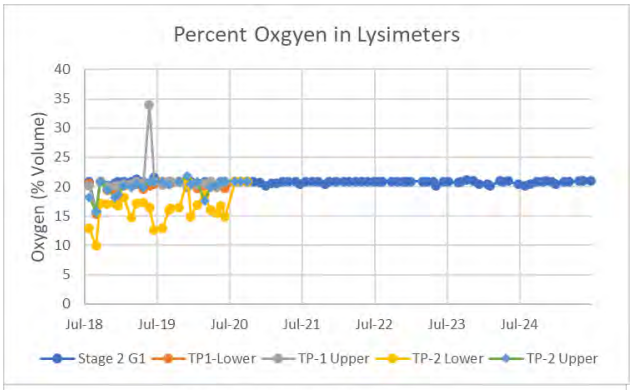


Figure 14-14. Oxygen results from the lysimeters installed in the 3L WRD July 2018 to June 2025.

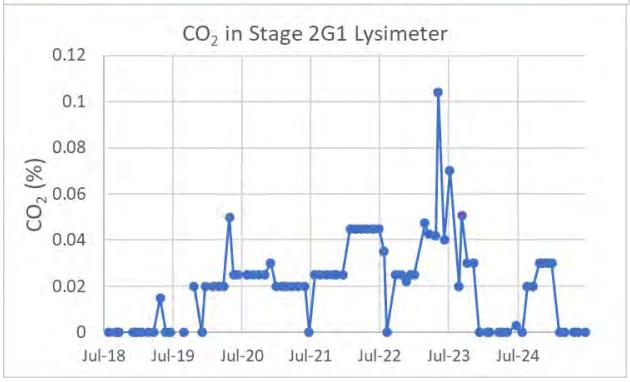


Figure 14-15. Carbon dioxide concentration in Stage 2 gas lysimeter, July 2018 to June 2025.

14.4 Lysimeter Water Sampling

A summary of the water quality monitoring results collected from the lysimeters installed in the 3 Level WRD is presented in Table 14-4.

Table 14-4. Summary of water quality results from lysimeters in 3 Level WRD in 2024 to 2025.

Requirement	Findings
Monitoring Frequency and Parameters	Water testing is required to be completed at six lysimeters across the completed footprint of the 3 Level WRD. To date, two lysimeters have been installed. In the 2024-2025 monitoring year MMG commissioned a review of the lysimeters by SGME, an independent consultant. The review concluded that Stage 1 L2 was not functioning properly, the water quality results were inaccurate, and the lysimeter should be decommissioned and replaced with a new unit. The review also found the existing monitoring methodology was potentially monitoring old drainage water rather active seepage and changes to the monitoring protocol were recommended and implemented. MMG shared the consultant's report with the EPA in December 2024. Due to the findings of this review only results from Stage 1 L1 are presented. All parameters were monitored at the required frequency at the Stage 1 L1 lysimeter.
-Compliance with EPN	The EPN sets Preliminary Performance Objectives for pH, EC, Acidity and Alkalinity as indicated in Table 14-5. • At the Stage 1 L1 lysimeter, the pH and alkalinity results achieve the Performance Objectives. • All EC values continue to exceed the Performance Objective at the Stage 1 L1 lysimeter.

- One acidity value exceeded the Performance Objective of 50 mg/l $CaCO_3$, with the remaining 11 monthly results below the target.
- Sulphate in Stage 1 L1 ranged from 879 mg/L to 1390 mg/L.
- The pH and alkalinity values in the Stage 1 lysimeter combined with the elevated sulphate concentrations at the site are consistent with the WRD creating neutral mine drainage. The generated sulphate contributes to the elevated EC value.

Table 14-5. Summary of water quality in lysimeters measured between July 2024-June 2025. L= lab result, F = Field reading

	Min pH	Max EC	Max Acidity	Min Alkalinity	Comment
Prelim. Perf Target	>4.5 pH unit	<600 µS/cm	<50 mg$CaCO_3$	>1 mg$CaCO_3$	
Stage 1-L1	6.7 L 6.3 F n=12	2390 L 2260 F n=12	214 n=12	39 n=12	Only 1 acidity value>50; Max alkalinity = 153 mg $CaCO_3$/l

- Cadmium, copper manganese and zinc increased in the 2024 – 2025 monitoring year as compared to the previous year (Figure 14-16, Figure 14-17). Zinc concentrations showed the largest increase, with concentrations increasing from <0.1 mg/l to a maximum of 20.4 mg/l in June 2025. The reason for this increase is unknown but it may be related to the revision of monitoring procedures at the site, or a change in flow pathways or disturbance associated with the recent placement of a cover on the surface of the WRD. Iron and aluminium concentrations remained near or below the LoR throughout the year, consistent with the pH of WRD being sufficient to promote the precipitation and retention of these metals.

Significant trends	The water quality results continue to be consistent with sulphide oxidation occurring within the waste rock dump and being neutralised by carbonate to produce neutral rock drainage. The increase in metal concentrations in the present monitoring year is a substantial change from previous results. Given the time frame of the change, it is likely the increases are due to changes in the sampling methodology. Ongoing sampling will establish whether the increase in metals reflects an isolated pulse of stored water with elevated concentrations, or a sustained and more accurate reflection of the conditions within the WRD.
Recommendations	It is recommended that monthly monitoring be maintained, and that SGME be consulted as to whether the increase in metals could be attributable to the change in sampling methodology.

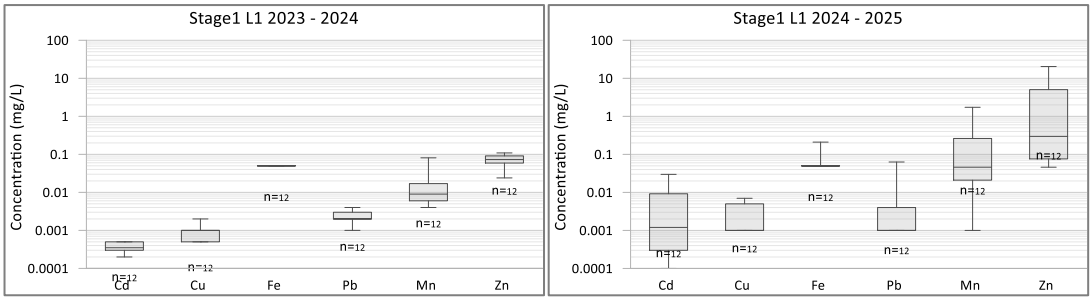


Figure 14-16.Filtered metal concentrations the Stage 1 L1 lysimeter (left) July 2023 – June 2024 and (right) 2024-2025. The box encompasses the 25th to 75th percentile values.

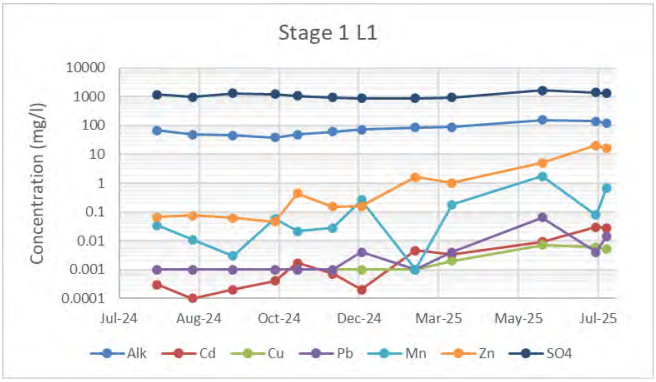


Figure 14-17. alkalinity, sulphate and filtered metal concentrations in the Stage 1 L1 lysimeter between July 2024 and July 2025. Note log scale.

4

15 South Hercules Mine Phase 1 (EPN 8034/1)

South Hercules is governed by EPN 8034/1 and is presently under a Care and Maintenance Plan approved by the EPA Tasmania in May 2015. No mining activity was undertaken within the July 2024 to June 2025 reporting period.

15.1 Surface water monitoring

A summary of the monitoring results collected from surface water sampling sites is contained in Table 15-1.

Table 15-1. Summary of surface water monitoring results for South Hercules July 2024 to June 2025.

Requirement	Findings
Monitoring Frequency and Parameters	MMG monitored surface water on a monthly basis at sites MPW and BC2 consistent with the Closure Plan (GHD 2015). All parameters were monitored on a monthly basis as required.
Compliance with EPN – Assessment of surface water impacts from S. Hercules	• The only compliance criteria in the Closure Plan are monitoring. • pH values were within the historic range at both sites and showed less variability in 2024-2025 as compared to 2023-2024. pH values at BC2 remain lower than at MPW due to the influx of acidic water from the decommissioned Hercules mine site (Figure 15-1). • Zinc, and manganese results are within the range of previous results at both sites (Figure 15-2, Figure 15-3). Minimum values at BC2 are higher than in previous years and likely attributable to the redirection of water from the 7Level into Baker Creek rather than the WSP and Ring River upstream of the confluence with Baker Creek. • There is a substantial increase in metal concentrations between the MPW and BC2 monitoring sites due to inflows from the decommissioned Hercules site, which enter Baker Creek downstream of the South Hercules site (Figure 15-4).
Significant trends - longer period & comments	The water quality results are consistent with previous results since the site entered care and maintenance. The monitoring requirement should be reviewed as many parameters have shown long-term stability and could be eliminated from the monitoring schedule or reduced in monitoring frequency (e.g., mercury, nutrients, major ions).

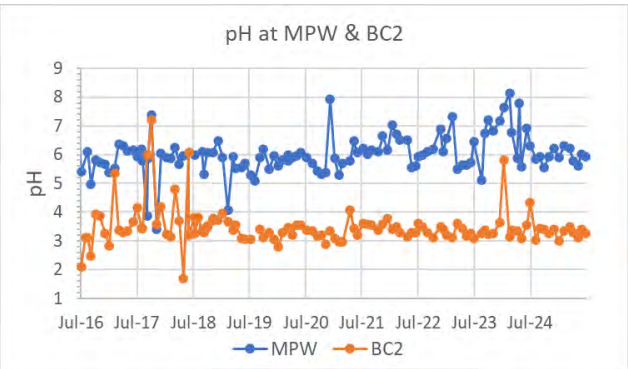


Figure 15-1. pH at the South Hercules surface water monitoring sites MPW and BC2, July 2015 to June 2025.

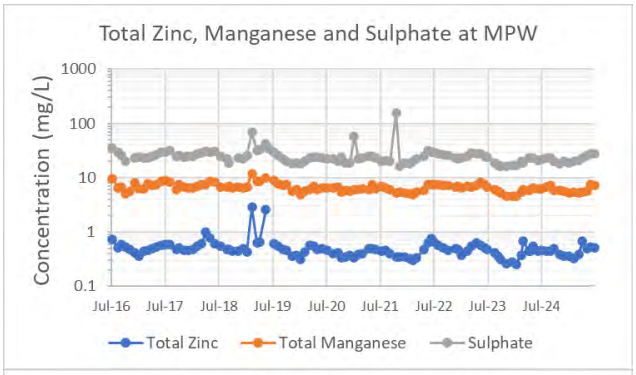


Figure 15-2 total zinc, manganese, and sulphate concentrations in the Mine Pit Water at the South Hercules 2016 to June 2025. Note log scale.

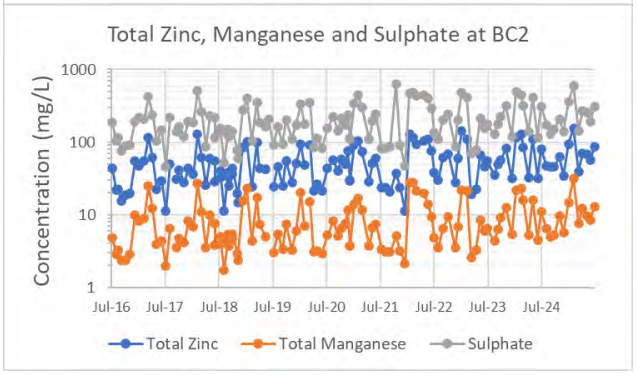


Figure 15-3 Total zinc, manganese, and sulphate concentrations at Bakers Creek above Ring River (BC2), July 2016 to June 2025. Note log scale.

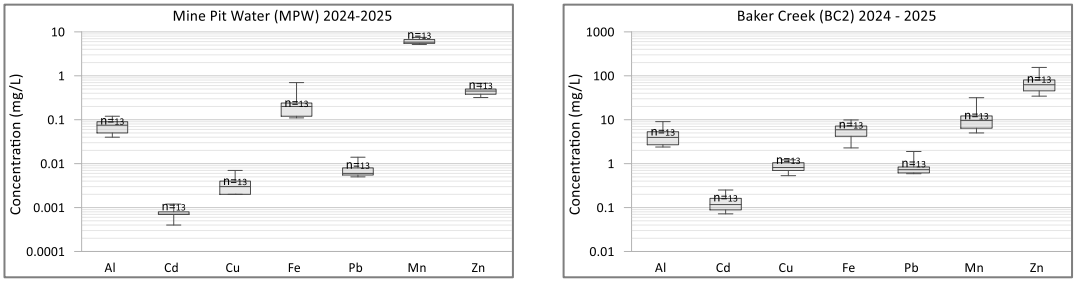


Figure 15-4. Total metal concentrations in the Mine Pit Water at South Hercules (left) and Baker Creek above Ring River (right). The box encompasses the 25th to 75th percentile values. Note different log scales on the two graphs with the Baker Creek scale 100-times higher than MPW.

References

ANZECC & ARMCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

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Appendix G Lake Pieman Biomonitoring – Bobadil discharge 2024 survey (Entura, 2025)

entura

Lake Pieman Biomonitoring

Bobadil discharge: spring 2024 survey

29 August 2025

Prepared by Hydro-Electric Corporation ABN48 072 377 158

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Document information

Title	Lake Pieman Biomonitoring
	Bobadil discharge: spring 2024 survey
Client organisation	MMG
Client contact	Danielle Zanetto
Document number	
Project manager	Will Elvey
Project reference	

Revision history

Revision 0.1 - Final report

Revision description			
Prepared by	William Elvey		29/08/2025
Reviewed by	Raymond Brereton		29/08/2025
Approved by	Raymond Brereton		29/08/2025
	(name)	(signature)	(date)
Distributed to	Danielle Zanetto (name)	MMG (organisation)	 (date)

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Executive summary

The results of the biomonitoring in November 2024 show no evidence of toxicological impacts from the discharge from the Bobadil outfall on algal biomass and macroinvertebrate communities along the shoreline adjacent to the outfall.

There was little variation in algal biomass between sites and the biomass was very low at all sites. The overall mean for algal biomass across all sites was the second lowest that has been recorded over the 19 years of monitoring. The low biomass of algae for the November 2024 survey was likely because sampling proceeded an approximate 0.35 metre rise in lake level in the 24 hours leading to the survey and thus the samples were likely collected from areas which had only recently been inundated.

The abundance and diversity of macroinvertebrates was uniformly low across all sites and was the lowest recorded over the entire monitoring program. It seems likely that the prolonged and large spill events in the months prior to survey may have scoured invertebrates from the lake shoreline and that the communities had not recovered to levels which occur during more stable conditions.

Biomonitoring of shoreline habitats in hydro-storages with large operating ranges, like Lake Pieman, is strongly impacted by the overwhelming influence of lake level changes on habitat availability and quality. Lake level changes also impact the ability to sample consistently between sites and within sites over time. Overall, frequent lake level changes make it difficult for direct comparison of the data from previous sampling years and this is likely to hamper the ability of the program to detect any impacts from the Bobadil outfall. However, a strong signal of impact from the outfall should still be detectable if it was present.

Habitat data collected in 2023 and 2024 indicates that there is large variation in shoreline slope, shoreline inorganic and organic material. Variation in habitat conditions would influence the macroinvertebrate communities present and may further complicate detecting any impacts from the Bobadil outfall.

The method used for sampling algae is highly inaccurate due to: 1) variation in the availability and position of snags at each site; 2) the influence of variation in lake level on the conditions in which algae grows directly prior to a survey; and 3) inherent inaccuracies in the method. Collecting algal scrapes from submerged surfaces is no longer the recommended method by NRE Tas. An alternative method using tiles suspended from an anchored buoy was trialled in November 2024. Although eight of the tiles were removed during the large spill event in 2024, the trial of this method indicated that it removes the influence of lake level on algal sampling and is more consistent with the new method recommended by NRE Tas for sampling benthic algae.

1. Introduction

MMG have an annual requirement to survey algal biomass and shoreline macroinvertebrates at 15 sites along the shore of Lake Pieman. The sampling is conducted as per condition E3 of EPN 7153/3, to "document on-going environmental conditions in the Lake, increase understanding of temporal, spatial and seasonal biological changes, and progress the development of site-specific toxicity guidelines for sulphate and zinc in Lake Pieman". The monitoring sites are located up and down the lake from where discharge from the Bobadil Polishing Pond facility enters on the eastern shore (Figure 1.1). The surveys have been undertaken since 2004 except for 2021. Prior to 2011 the surveys were undertaken in autumn and spring each year; however, since 2010, MMG has been required to report on a single annual survey. This report presents the results of the survey conducted in November 2024.

1.1 Background

Lake Pieman is the most downstream artificial storage in the Anthony-Pieman hydropower scheme. The Bobadil discharge enters the eastern shore of Lake Pieman approximately 3.8 km downstream from Bastyan Dam on Lake Rosebery. The upstream end of Lake Pieman experiences large and fluctuating flow rates from the discharge of the Bastyan Power Station which releases up to 150 m^3/s of water into the confined valley of the storage (Figure 1.2). Since 2005, the Bastyan Power Station has operated for 57 percent of the time (Figure 1.3). Lake Pieman has an operating range of nearly five metres and water levels fluctuate up and down frequently throughout the year (Figure 1.4).

1.1.1 Bobadil outfall

When operating, the outflow from Bastyan Power Station flows down the narrow confines of the lake (60 - 70 m) in the vicinity of the Bobadil outflow and provides conditions similar to a broad river. Therefore, discharge from the Bobadil outfall would be rapidly dispersed and diluted downstream when the power station is operating and there is likely to be minimal dispersion up the lake.

When the power station is not operating, the water movement in the lake is less uni-directional and local pooling and multidirectional dispersion would occur from the Bobadil outfall, especially in near surface waters. At these times localized biological effects of these discharges may be evident both up and down lake from the outfall.

Bobadil Dam received wastewater from the Rosebery sewage system prior to 2016 (Davies et al. 2005). The contribution of nutrients from town sewage into the Bobadil discharge represented an increase in the nutrient resource which could have to the potential to locally enhance benthic algal production and lead to shifts in macroinvertebrate fauna in the lake. Analysis of data in the pilot study in autumn 2005 led to the conclusion that the shore fauna and algal density in the vicinity of the Bobadil discharge was a balance between eutrophication effects of raised nutrient levels (increased algae), and potential toxicity of the discharge from mine contaminants leading to reduced diversity of macroinvertebrates (Davies et al. 2005). The toxicological impact of the Bobadil discharge on macroinvertebrate diversity and abundance, while observable was considered minor (Davies et al. 2005). With the commissioning of the Rosebery Wastewater Treatment Plant (WWTP) in 2016, sewage wastewater has been diverted away from the Bobadil dam to the Taswater WWTP which discharges into the lower reaches of the Stitt River.



Figure 1.1: Distribution of monitoring sites for the Lake Pieman biomonitoring program.



Figure 1.2: Discharge from the Bastyan Power station November 2023 to November 2024.

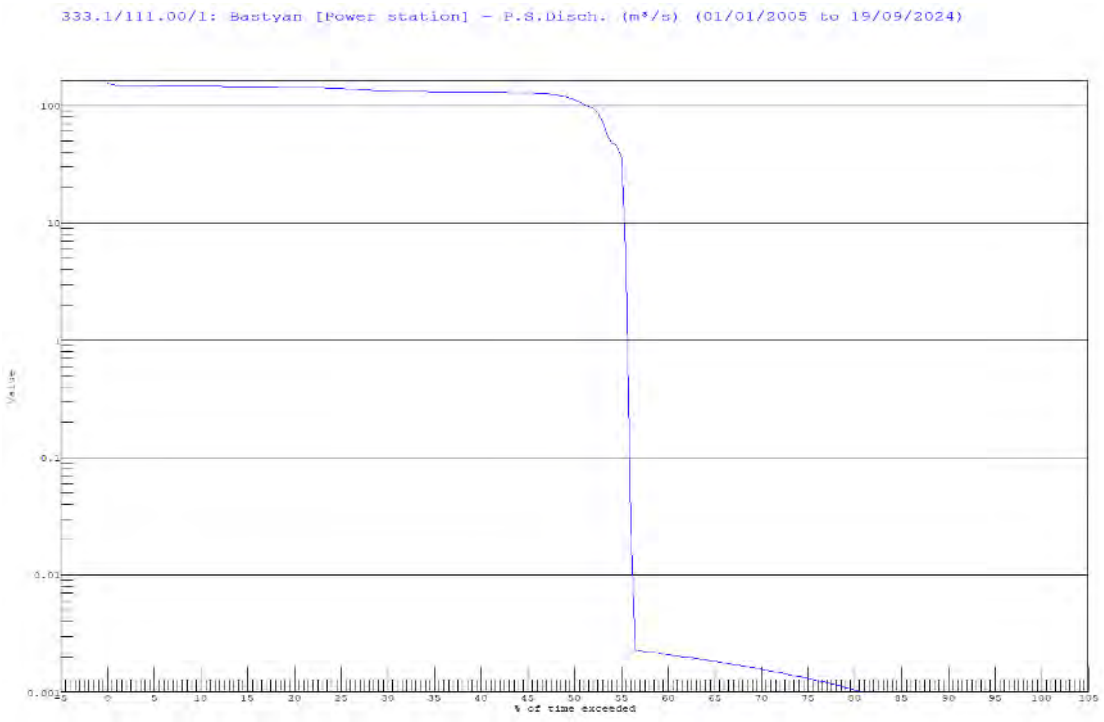


Figure 1.3: Flow duration curve (log) for the Bastyan Power Station from 2005 to 2024

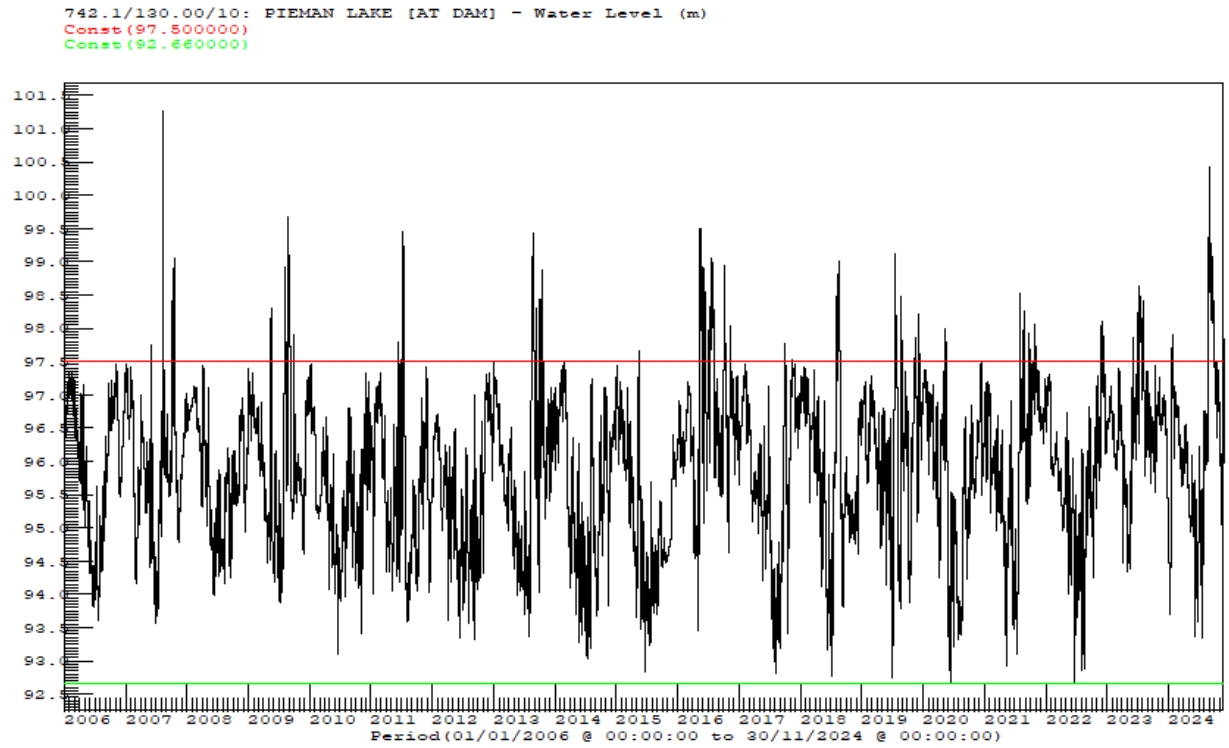


Figure 1.4: Water levels in Lake Pieman from 2006 to 2024. Red line shows full supply level (exceedance is spill) and green line shows the minimum operating level)

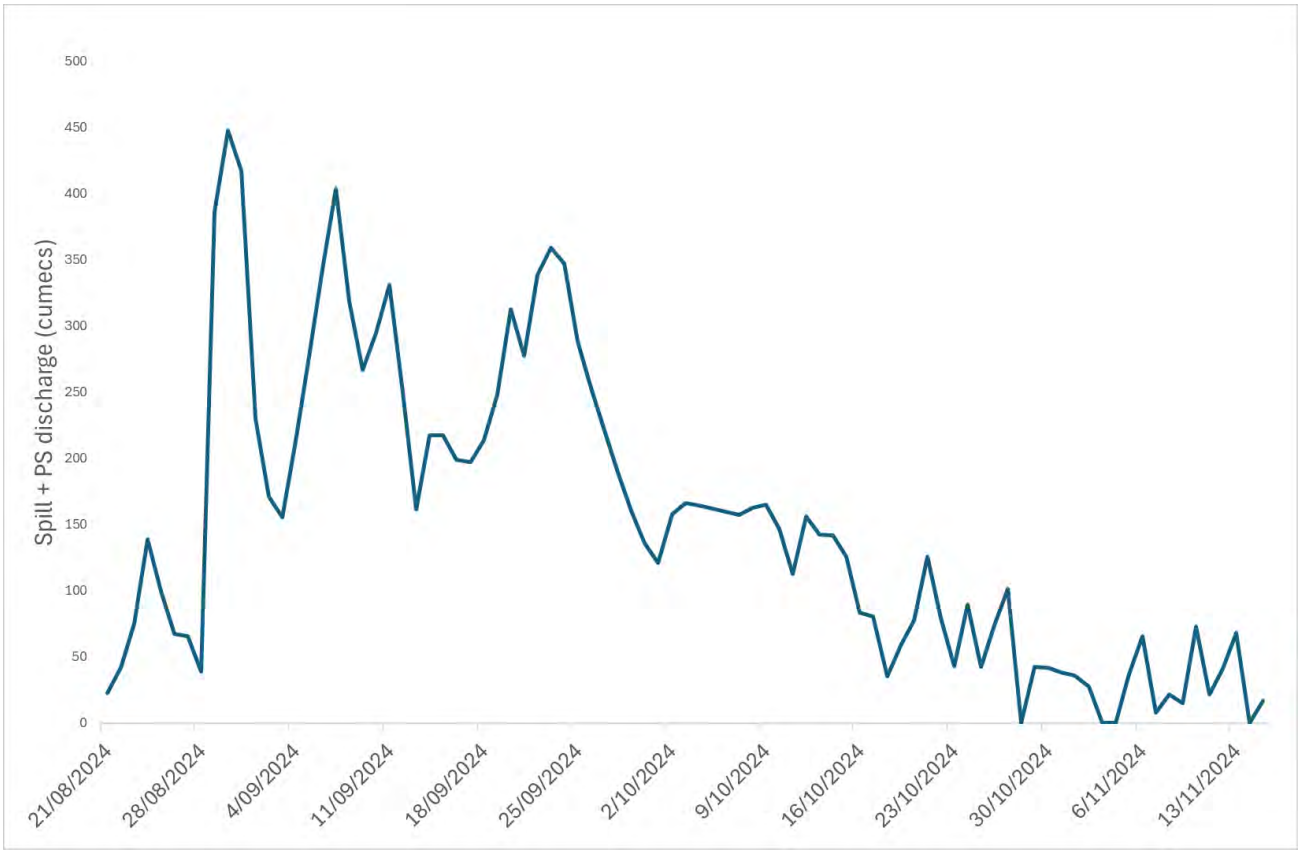


Figure 1.5: Large spill from Bastyan Dam to Lake Pieman in 2024 prior to the survey

2. Methods

The survey was conducted on the 14th of November 2024. Fourteen[1] locations on the eastern shore of Lake Pieman[2] were accessed by boat. The sampling methods were consistent with the previous biomonitoring surveys undertaken in Lake Piemen.

Sites 1 to 3 are 2 - 2.7 km upstream from the discharge point and are close to the reference sites MMG use to measure background water quality conditions as part of their other monitoring commitments (Table 2.1; Figure 1.1). Sites 4 – 7 are within 300 metres upstream of the outfall, while sites 8 – 12 are within 460 metres downstream of the outfall and upstream of Bobadil Creek (Table 2.1; Figure 1.1). Sites 13 – 15 are downstream Bobadil Creek and are 0.72 – 1.5 km downstream from the outfall (Table 2.1; Figure 1.1). During development of the monitoring program, it was deemed that site 15 was the most downstream location that could be sampled without the potential for a sustained upstream influence of water quality from the Stitt River (Davies et al. 2011).

Table 2.1: Site groups, site numbers, grid refence and distance from the Bobadil outfall

	Site	Easting	Northing	Distance from outfall (m)
Reference	1	376914	5377951	2670
	2	376744	5377727	2400
	3	376397	5377546	2000
Immediately upstream outfall	4	376229	5376187	290
	5	376313	5376115	180
	6	376396	5376081	90
	7	376457	5376035	20
Immediately downstream outfall	8	376491	5376003	25
	9	376535	5375973	90
	10	376593	5375947	140
	11	376710	5375746	380
	12	376765	5375672	460
Downstream Bobadil Creek	13	376862	5375437	720
	14	377004	5375113	1070
	15	377197	5374778	1460

[1] The most upstream reference site was not sampled during the November 2024 survey due to erroneous GPS coordinates.

[2] Since 2006/07, sampling has only been conducted at eastern shore locations, as analyses of previous results indicated that the eastern shore was the only location likely to be affected by the discharge (Davies et al. 2011).

2.1 Benthic algae

At each site, five benthic algae scrapes were collected from submerged tree snags/large woody debris (LWD). Each scrape was collected by usings a fixed-area benthic pad scourer (Davies and Gee 1993) on the surface of tree snags approximately 30 – 50 cm from the water surface. Individual sample units were analysed for total chlorophyll-*a* (by a modified acetone extraction-spectrophotometric method - APHA 1993). Statistical differences in mean abundances within the site groups were tested via two-way t-tests and non-parametric Mann–Whitney U tests.

The same scrape method was also used to the sample the suspended tile system in November 2024.

2.2 Benthic macroinvertebrates

A single benthic sample was collected per site by using a standard AUSRIVAS kick net (250-micron mesh) to conduct a kick and sweep along a 10 m section of the shoreline. This method is consistent with the collection of edge sampling in riverine habitats during AUSRIVAS sampling. The material collected was placed in zip locked bags and preserved in 70% ethanol.

In the laboratory, each sample was floated in a saturated calcium chloride solution, with hand-sorting of the residue. The floated material was sub-sampled to 20% using a Marchant box-sub-sampler (Marchant 1989). The sub-sample was hand-sorted under a stereo microscope. All macroinvertebrates were counted and identified to family level, with the exception of Nematodes, Oligochaetes, Turbellaria, and Acarina which were not resolved to lower taxonomic levels.

The macroinvertebrate data were analysed as patterns in diversity (number of taxa), abundance and community composition. Statistical differences in mean abundances within the site groups were tested via two-way t-tests.

3. Results

3.1 Preceding lake level conditions, power station and spill conditions

Bastyan Dam on Lake Rosebery experienced a large spill from late August to early October 2024. This prolonged period of spill peaked at approximately 430 m^3/s (Figure 1.5). Over this period the lake was above the FSL but steadily declined and was below FSL from late September and declined by 1.5 metres in the two weeks prior to the survey but then increased by approximately 35 cm in the day leading up to the survey (Figure 3.1).

3.2 Shoreline habitat conditions

The following sections describe the habitat conditions (estimate of bank slope, bank materials, snags/LWD, detritus and aquatic macrophytes) described during the survey in March 2024. Site photos are provided in Appendix A. The lake level was approximately 0.6 metres lower than the survey conducted in March 2024 but overall, the habitat conditions were similar.

3.2.1 Reference sites (Sites 2 - 3)

Sites 2 and 3 had steep bank profiles of approximately 30 – 50° (Table 3.4; Appendix A.1). The shore material at sites 2 was bedrock, boulder and cobble dominated with overlying sand and silt while site 3 had mainly consolidated clay with embedded boulder and exposed bedrock. Detritus cover was low at sites 2 and 3 (Table 3.4). Large woody debris (LWD) was rare at site 2 but abundant at site 3.

3.2.2 Sites immediately upstream Bobadil outfall (Sites 4 – 7)

All the shorelines were steep (~40 – 80°) at sites 4 to 7 with bank materials mainly comprised of consolidated clay with a low cover of overlying gravels, sands and silts at all sites and occasional cobble and pebbles at sites 6 and 7 (Table 3.4; Appendix A.2). The cover of fine detritus was low at sites 5 to 7 but was abundant at site 4. LWD was abundant at all sites and the aquatic plant *Isolepis* sp. was present at sites 4 and 5.

3.2.3 Sites immediately downstream Bobadil outfall (Sites 8 – 12)

The five sites downstream the Bobadil outfall all had steep banks of consolidated clay with little structural diversity from larger substrate. These sites had a low cover of fine detritus and a low to moderate cover of LWD except for site 12 where LWD was abundant (Table 3.4; Appendix A.3).

3.2.4 Sites downstream Bobadil Creek (Sites 13 – 15)

Of the three sites downstream Bobadil Creek, site 13 was situated on a low sloping bench of consolidated clay with an overlaying cover of loose silt, abundant detritus and the aquatic plant *Isolepis* sp. (Table 3.4; Appendix A.4). Sites 14 and 15 had steep banks with the substrate at site 14 consisting of cobble and pebble embedded in clay with a moderate cover of detritus. The aquatic plant *Isolepis* sp. was also present at site 14.

The substrate at site 15 was mainly comprised of an armoured layer of cobble and pebble (i.e., no fine sediments were visible beneath the coarse rock surface) and a low abundance of detritus (Table 3.4; Section A.1). LWD was abundant at sites 13 and 14 but was scarce at site 15.

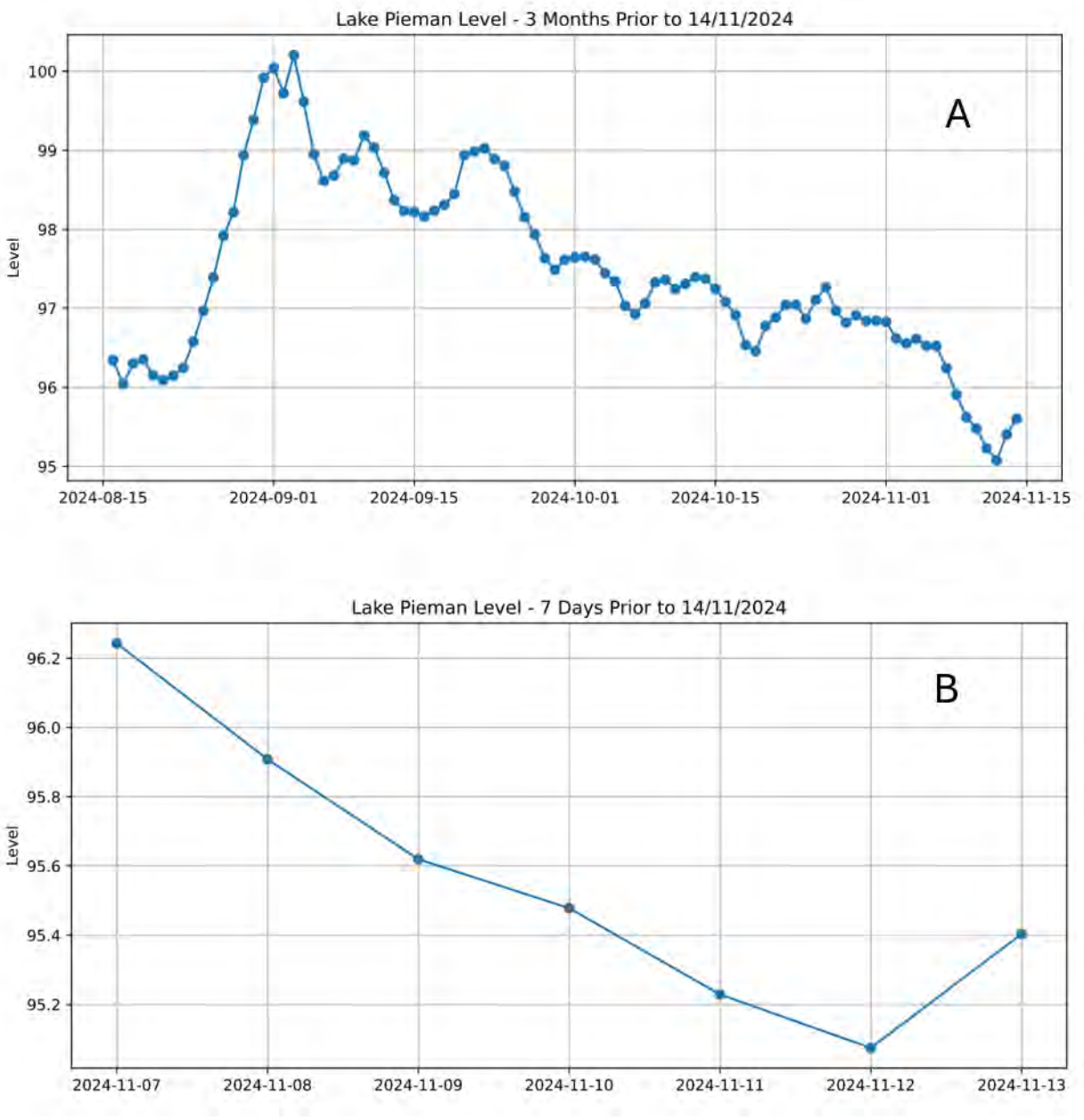


Figure 3.1: Lake level in the three months (A) and week (B) prior to sampling in November 2024

3.3 Conductivity

Conductivity ranged from 38.6 to 63.9 µS/cm with levels increasing with distance downstream particularly from sites 13 – 16 (Table 3.4). By contrast, the highest conductivity during the 2023 survey was at site 9 a short distance down-lake from the outfall (Figure 3.2), and the conductivities were higher at all sites in March 2024 relative to 2023 and November 2024 (Figure 3.3). The Bastyan Power Station was operating during the survey in 2023 but was not operating during the survey in March 2024. The power station was operating in the early morning of the day of the survey in November 2024 but was not operating at the time the survey was conducted. It is not known how long the power station discharge increases water velocity in the reaches of the sampling sites once the discharge stops (i.e. the transit time of the discharged water is not known). The conductivity results on the day of the survey in March 2024 suggests that high conductivity water from the outfall disperses up-lake as well as down-lake. The conductivity results in November 2024 may suggest that there was still a current from power

station operation past the survey sites. Continuous conductivity loggers would be required to understand the relationship between power station operation and conductivity in the vicinity of the outfall site. Hydrodynamic modelling could also be used to understand dispersion patterns from the outfall under different power station outflows.



Figure 3.2: Bobadil discharge into Lake Pieman between sites 7 and 8.

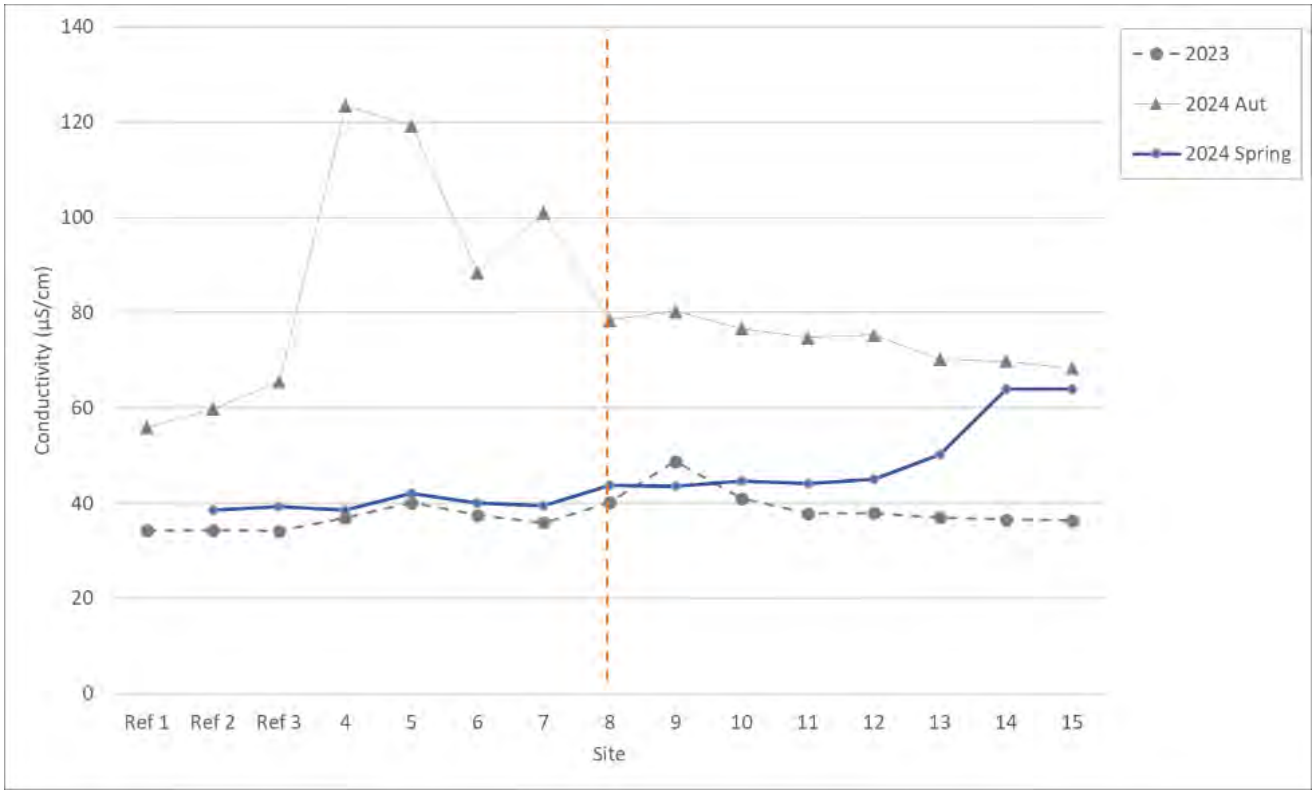


Figure 3.3: Spot conductivity measurements at the monitoring sites during the biomonitoring surveys in 2023, autumn2024 and spring 2024. Red dashed lines show the position of the outfall from Bobadil Polishing Ponds.

3.4 Benthic algae

The mean chlorophyll-*a* concentration for each site for the November 2024 survey are provided in Table 3.1. Table B.1 provides the results for all the years of monitoring. In contrast to previous years, there was little variability in chlorophyll-*a* concentrations between the sites (Table B.1). Overall, the results in November 2024 show very low algal biomass at all sites, with the highest recorded at site 5 (1.6 mg/m^2). To put this in context the average mean annual maximum algal biomass over the course of the monitoring program is 15 mg/m^2. The overall mean across all the sites in November 2024 was 0.7 mg/m^2 (range of 0 – 1.6 mg/m^2) which is the second lowest overall mean in the 20 surveys over the 19 years of the program (Table B.1).

The mean concentration of chlorophyll-a was highest at the reference sites (mean = 1.1; SD = 0.27), followed by the three sites downstream Bobadil Creek (mean = 1.0; SD = 0.34); immediately upstream of the Bobadil outfall (mean = 0.61; SD = 0.62) and immediately downstream of the Bobadil outfall (mean = 0.44; SD = 0.37) (Figure 3.4). Welch's t-tests showed no statistically significant differences in mean chlorophyll-*a* concentrations between the site groups but note that the reduced number of reference sites sampled in November 2024 meant that the test was invalid for this site group. A non-parametric significance test (Mann–Whitney U test) which does not require equal sample sizes was also run. The Mann–Whitney U test did not find any statistically significant differences between the site groups.

The system of sampling benthic algae from suspended tiles (Entura 2024) was trialled during the November 2024 survey. However, the large spill event which preceded the survey removed the tiles from 8 of the sites. Table 3.2 provides a comparison of algal biomass sampled from the tiles and from

the LWD at the sites where the tiles were still present. In most instances the biomass of algae was higher than from the corresponding LWD, including at site 10 where no chlorophyll-*a* was recorded from the LWD. These results were expected because the suspended tiles, unlike the LWD, are never dewatered and therefore the issues which limit the usefulness of snag sampling (discussed in detail in Section 4.2) are eliminated. Post the November 2024 survey the missing tiles were replaced and all tiles were made more secure to reduce the potential for their loss during large spill events.

3.4.1 Long term algal trends

Over the entire monitoring program, the mean chlorophyll-*a* concentration has been highest at the reference sites but this is mainly due to some very high outlying results at individual sites between 2015 and 2017 (Figure 3.5; Table B.1). The mean chlorophyll-*a* values are similar between the other site groups, although the next highest mean has been at the sites downstream from Bobadil Creek and again this is mainly due to some high outliers in individual years (Figure 3.5; Table B.1).

The median (which better represents the central tendency of the scores than the mean as the median is less influenced by outlying results) chlorophyll-*a* values over the entire monitoring program are similar between the site groups (median show as the horizontal line in the boxes in Figure 3.5) and between individual sites with the exception of site 15 which has generally had low chlorophyll-*a* values compared to the other sites (Table B.1). Potential reasons for variable patterns in chlorophyll-*a* values between sites, within sites and between sampling years is provided in Section 4.

The availability of sunlight is a major determinant for the growth of benthic algae in lakes and rivers. The three reference sites have a predominantly north and west facing aspect. The remaining sites, particularly those immediately up and downstream the Bobadil outlet, have a more easterly facing aspect and therefore are more shaded than the reference sites. It is highly likely that the higher mean concentration of chlorophyll-a at the reference sites over the entire program is related to increased light availability.

Table 3.1: Chlorophyll-*a* biomass recorded during the survey in November 2024.

Site group	Site	Chl-*a* (mg/l)
Reference	1	-
	2	0.82
	3	1.36
Immediately upstream outfall	4	0.54
	5	1.63
	6	0.00
	7	0.27
Immediately downstream outfall	8	0.82
	9	0.82
	10	0.00
	11	0.00
	12	0.54
Downstream Bobadil Creek	13	1.09
	14	1.36
	15	0.54

Table 3.2: Chlorophyll-*a* biomass recorded from suspended tiles and LWD in November 2024

Site	Tile	LWD
	Chl-*a* (mg/l)	
5	1.09	1.63
8	2.99	0.82
9	2.72	0.82
10	1.91	0
12	2.18	0.54
13	0.82	1.09
14	1.91	0.54

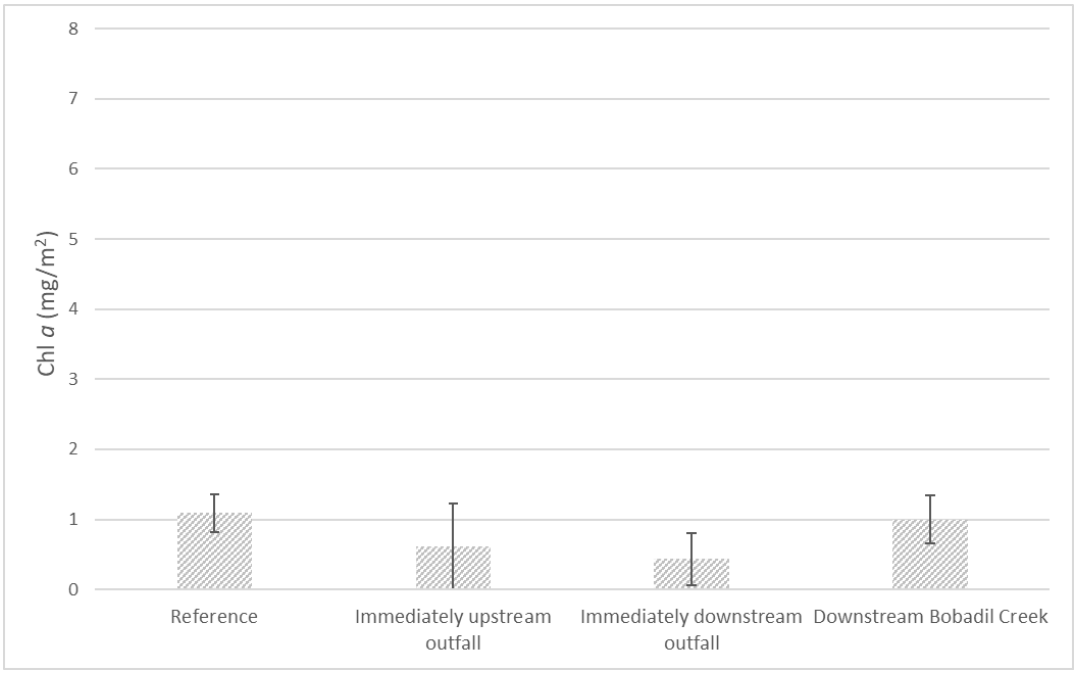


Figure 3.4: Mean chlorophyll-*a* biomass recorded among the site groups in November 2024. Standard deviation bars are shown.

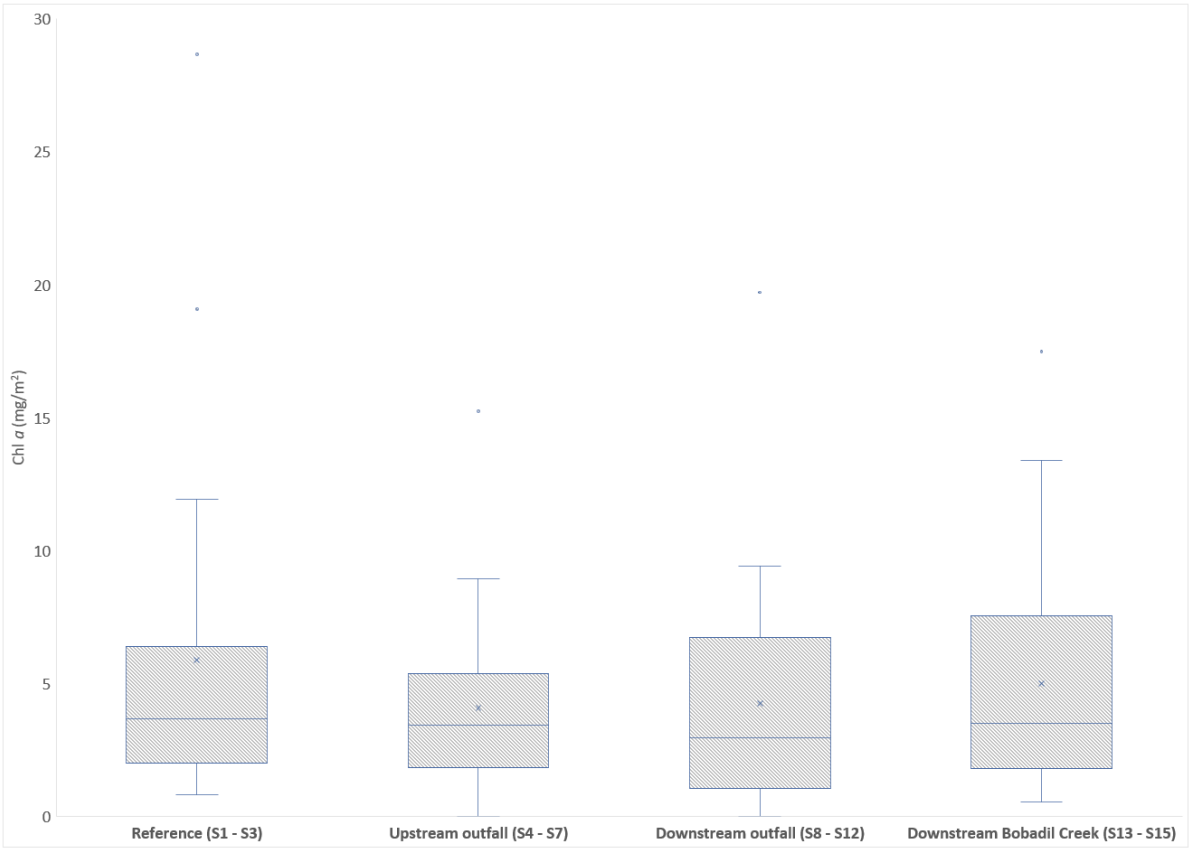


Figure 3.5: Box plot of mean chlorophyll-*a* biomass recorded over the entire monitoring program (2006 – Nov 2024). Plot shows the monthly median (grey line), mean (x mark), the spread between the 25th and 75th quartiles (extent of the bar). The whiskers represent 1.5 the interquartile range and dots represent outlying points.

3.5 Benthic macroinvertebrates

The diversity and abundance of macroinvertebrates was extremely low at all sites and the lowest recorded during the biomonitoring program (Table 3.3; Table 3.5; Figure 3.6; Figure 3.7; Figure 3.8; Figure 3.9). No invertebrates were recorded at three of the sites and all other sites except for site 12 (9 animals) had total abundance ≤ 5 (Table 3.5). A total of 13 taxa were recorded across the sites with an average diversity of 1.6 taxa per site and average abundance of 2.5 individuals (Table 3.3).

The Mann–Whitney U test did not find any statistically significant differences in abundance or diversity between the site groups. However, the low numbers of sites, and uneven site numbers between the site groups provide a low power for statistical testing.

Most of the taxa recorded belonged to insect families; however, the crustacean *Paratya australiensis*, a decapod shrimp in the Atyidae family, was the most frequently sampled invertebrate but was still only recorded at four of the sites (Table 3.5).

Table 3.3: Mean abundance and diversity at the site groups from the November 2024 survey

Site group	Total abundance	Diversity
All sites	2.5	1.6
Reference	2.50	2.00
Immediately upstream outfall	2.50	2.25
Immediately downstream outfall	3.00	1.20
Downstream Bobadil Creek	1.67	1.00

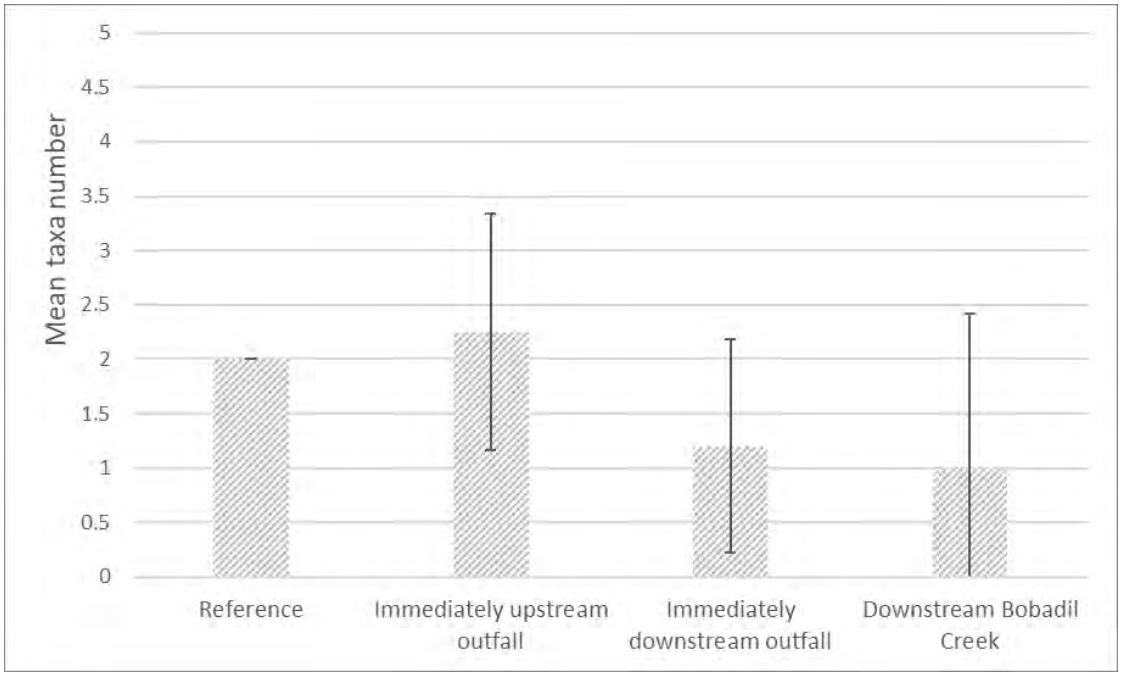


Figure 3.6: Mean number of taxa at each site group from the November 2024 survey. Error bars show the standard deviation.

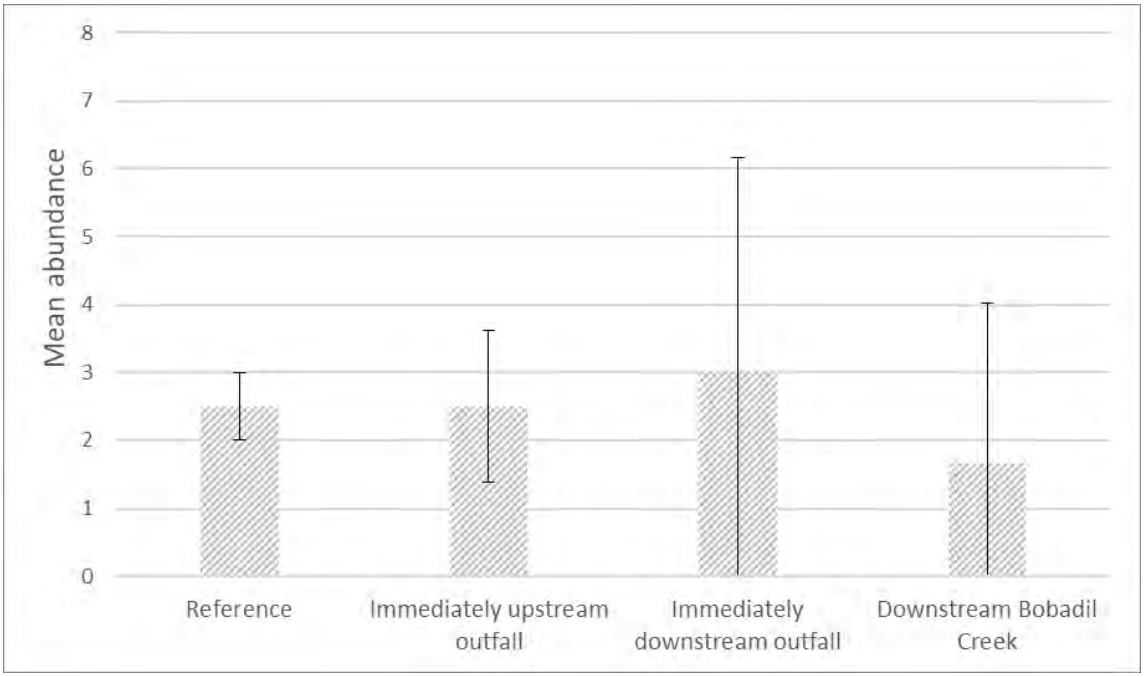


Figure 3.7: Mean abundance at each site group from the November 2024 survey. Error bars show the standard deviation

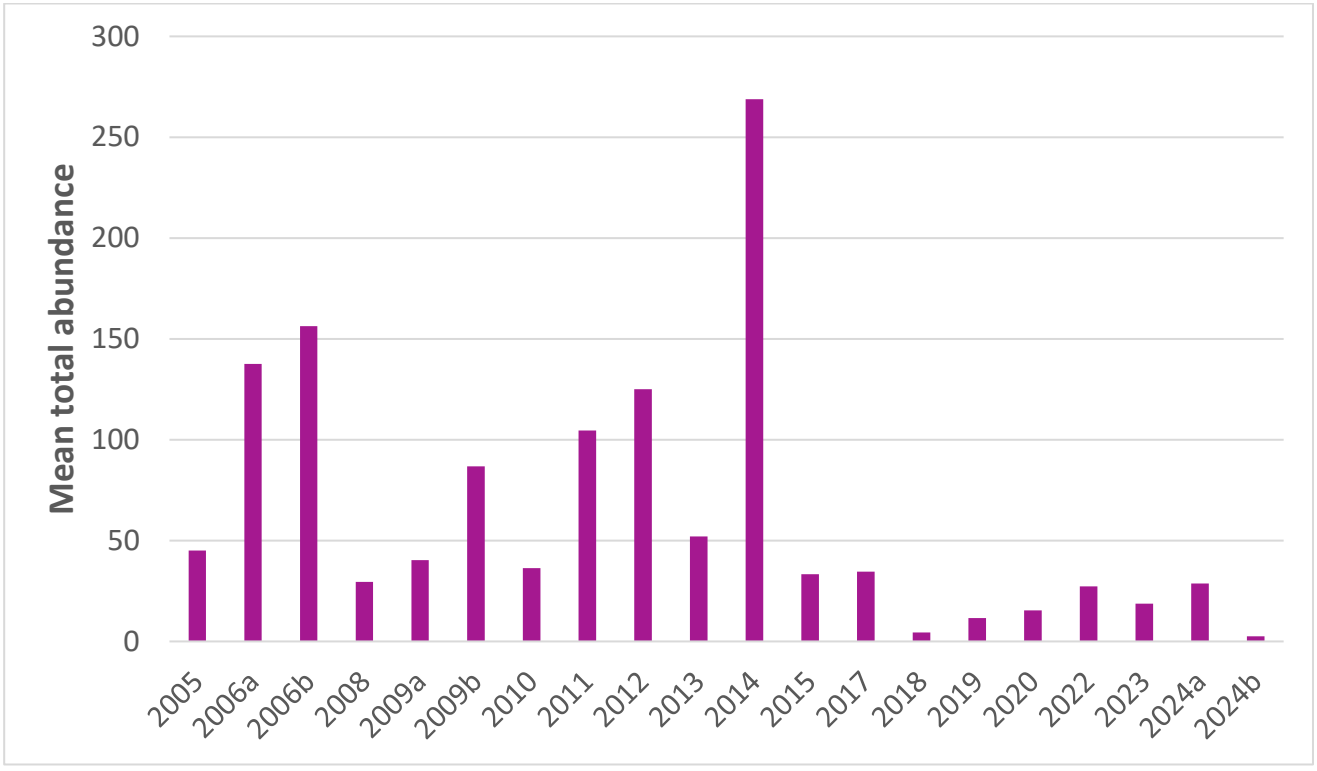


Figure 3.8: Mean total abundance of macroinvertebrates across all sites from 2005 to 2024

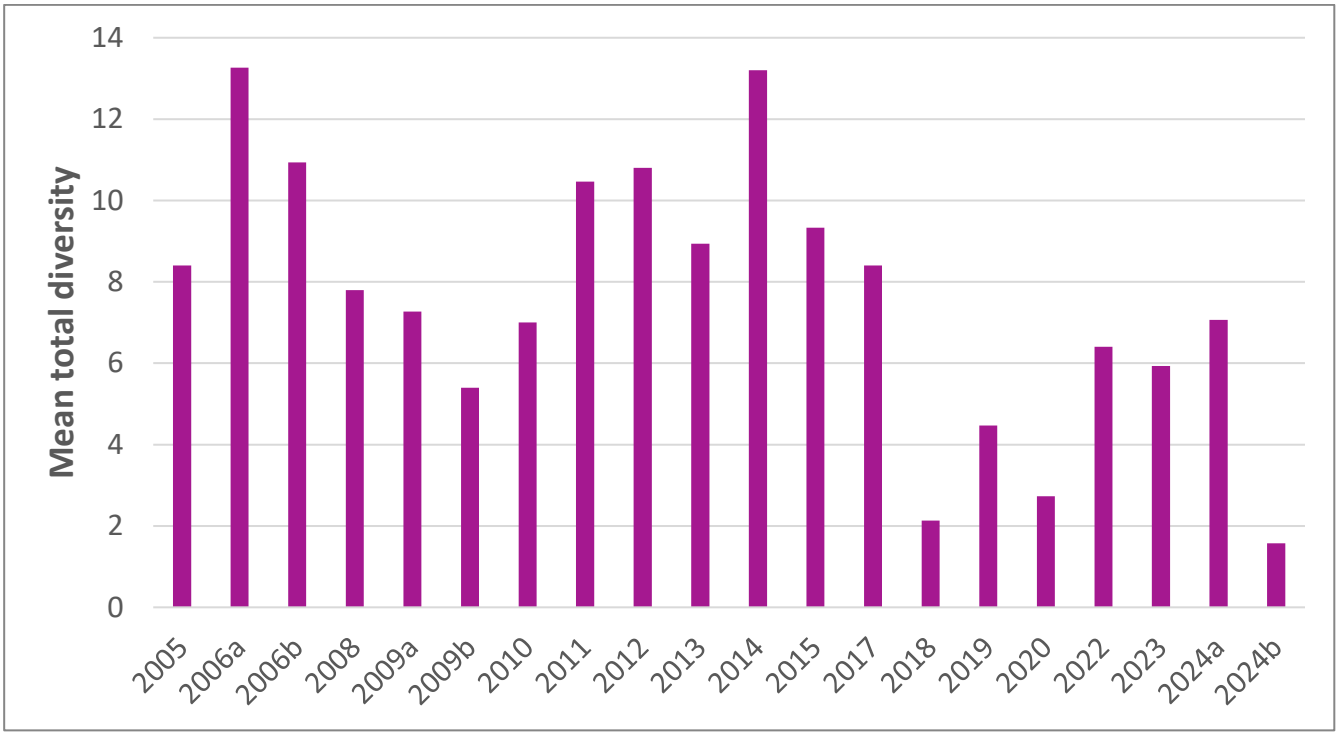


Figure 3.9: Mean total diversity of macroinvertebrates across all sites from 2005 to 2024

Table 3.4: Habitat conditions recorded at the sites in 2024.

Site group	Site No.	Bank slope	Bed material in sampling zone	Large woody debris
Reference	1	Steep: 30 - 50	Bedrock, boulder, cobble, sand and silt with moderate cover of detritus	Occasional fallen trees, diagonally
	2	Steep: 40 - 50	Boulder, cobble, pebble, gravel, sand and silt with low cover of overlying detritus	Low abundance, single fallen tree in sampling area
	3	Steep 70 - 90 slope	Bedrock and boulder embedded in clay, low cover of detritus	Abundant LWD
Immediately upstream outfall	4	Steep 40-60	Gravels, sand silt and compacted clay; abundant cover of detritus; *Isolepis* present	Abundant LWD
	5	Steep 40-60	Silt and compacted clay, Isolepis present, low cover of detritus, *Isolepis* present	Abundant LWD both fallen and standing dead trees
	6	Steep 60-80	Pebbles, gravels, sand, silts on compacted clay, low cover of detritus	Abundant LWD both fallen and standing dead trees
	7	Steep 40-60	Occasional cobbles, pebbles, silts and sands on consolidated clay, low cover of detritus	Moderately abundant LWD comprising fallen logs
Immediately downstream outfall	8	Steep 70 - 80	Occasional boulders, cobbles, pebbles and silt on consolidated clay, low cover of detritus	Mod abundance of LWD fallen and standing trees
	9	Steep 70 - 80		Mod abundance of LWD fallen and standing trees
	10	Steep 80 - 90		Mod abundance of LWD fallen and standing trees
	11	Steep 70 - 80		Mod abundance of LWD fallen and standing trees
	12	Steep 70 - 80		Mod abundance of LWD fallen and standing trees
Downstream Bobadil Creek	13	Flatter bench 5 - 20 in sampling area	Silty substrate, abundant detritus and *Isolepis* sp.	Abundant LWD both fallen and standing dead trees
	14	Steep slope 40 - 60	Cobble and pebble embedded in clay, moderate detritus	Abundant LWD both fallen and standing dead trees
	15	Steep slope 60 - 80	Cobble and pebble, mostly from revetment for offtake, low detritus cover.	Low abundance of fallen and standing trees

Table 3.5: Macroinvertebrate taxa recorded at the sites in November 2024.

Class	Order	Family	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15
Platyhelminthes	Turbellaria					1										
Mollusca		Glacidorbidae		1												
Annelida	Oligochaeta		1				1			1						
Crustacea	Decapoda	Atyidae									3	2	7	3		
	Isopoda	Janiridae				1										
Insecta	Diptera	subfam: Chironominae												1		
		subfam: Orthocladiinae		1				1								
		Ceratopogonidae						1					1	1		
		Dip. Unid. Pup.				1										
	Trichoptera	Ecnomidae					2									
		Leptoceridae											1			
	Coleoptera	Elmidae			1											
	Coleoptera	Dytiscidae	2			1										
		Total abundance	**3**	**2**	**1**	**4**	**3**	**2**	**0**	**1**	**3**	**2**	**9**	**5**	**0**	**0**
		Taxa number	**2**	**2**	**1**	**4**	**2**	**2**	**0**	**1**	**1**	**1**	**3**	**3**	**0**	**0**

4. Discussion

Overall, the data from the survey in November 2024 provides no evidence for a toxicological impact from the Bobadil outfall on algal biomass and macroinvertebrate communities along the shoreline adjacent to the outfall.

Unlike most previous years, there was little site to site variation in algal biomass which was very low at all sites and the overall mean was the second lowest in the 19 years of monitoring. The low abundance of algal biomass in November 2024 may be because the lake had risen approximately 0.35 metres in the day prior to the survey and hence some of the LWD surfaces sampled may have only been very recently inundated.

The extremely low diversity and abundance of macroinvertebrates across the sites is likely related to the very large spill which occurred from August to the end of September. A prolonged spill of 300 to 450 cumecs is likely to have scoured many invertebrates from the shores of the lake and recolonisation through reproduction and migration is likely to require several months to reach the population levels present prior to the spill event. The process of recolonisation would take significantly longer in a hydro-impoundment like Lake Pieman were the frequently fluctuating water levels provide a poor shoreline habitat for macroinvertebrates (discussed further below).

Total abundance have previously been low in years where large spill events had occurred in the month prior to sampling (2018, 2019 and 2023). However, a large spill event occurred in the month prior to sampling in 2009 and the mean abundance was relatively high in that year.

Any toxicological impacts should be greatest at the sites immediately downstream from the outfall because of the influence of flow from Bastyan Power Station moving water down the lake towards these sites. However, when the power station is not operating (operation occurs for approximately 55% of the time (Figure 1.3) the discharge would disperse up and down from the outfall – as evidenced by the higher conductivities at the sites immediately upstream from the outfall during the March 2024 survey.

In November 2024, the mean abundance of taxa was slightly higher at the sites downstream from the outfall; however, the diversity of macroinvertebrates was also slightly lower than the reference sites and site immediately upstream from the outfall. However, the overall abundance and diversity across all sites was so low that attributing a meaningful trend or potential causation is pointless.

Other investigations which may assist understanding of any impacts from the Bobadil discharge includes targeted toxicological testing of the water and sediments directly at the site locations. Hydrodynamic modelling of the dispersal of water from the Bobadil outfall under a range of power station operation may also assist in understanding dispersal patterns and potential impacts.

4.1 Issues with sampling benthic algae and invertebrates in a hydro-electric storage

Biomonitoring of shoreline habitats in hydro-storages with large operating ranges, like Lake Pieman, is strongly impacted by the influence of lake level changes on habitat availability and quality.

Algal growth is limited to a narrow photic range in lakes on the west coast of Tasmania because the tannin-stained water limits light penetration. Frequent lake level changes and a narrow photic range mean that the surveys have had little consistency in sampling conditions to allow a meaningful

comparison between years. The algal data from this program therefore has little to no ability to detect any toxicological impacts from the Bobadil outfall. An improved method for sampling algae will be conducted in 2025 as discussed below.

The shoreline macroinvertebrate communities in Lake Pieman would be strongly affected by changing lake levels, although to a lesser degree than benthic algae as macroinvertebrates can move with receding and increasing lake levels. The highest recorded diversity and abundance of macroinvertebrates recorded at a single site in 2024 is still very low compared to what would be expected from natural lakes and Hydro-electric storages with a relatively stable lake level regime (Will Elvey, Entura, personal observation).

It is likely that populations of shoreline macroinvertebrates in Lake Pieman increase when the lake is steady over several weeks or months. That is, detritus is both habitat and a food source for macroinvertebrates and areas of stable and shallow habitat would increase the accumulation and availability of coarse and fine detritus. Stable lake levels would also increase the growth and availability of algal food resources for macroinvertebrates. Therefore, rapidly receding, or rising, lake levels are likely to temporarily decrease habitats and food resources for shoreline macroinvertebrates.

Overall, frequent lake level changes make it difficult for direct comparison of algae and macroinvertebrates with previous sampling years and this is likely to hamper the ability of the program to detect any impacts from the Bobadil outfall. However, a strong signal of impact from the outfall should still be detectable if it was present.

Lake Pieman has an operating range of nearly five metres and lake levels rise and fall frequently and rapidly. Like many hydro storages in Tasmania, the creation of an impoundment alters the surface and groundwater levels. Inundation and fluctuating water levels promote the drowning and water logging of terrestrial vegetation, which is eventually lost. The fluctuating wet / dry conditions within the operating range of the lake are not conducive to the establishment of aquatic macrophytes, or water tolerant riparian vegetation, and this zone is often bare.

Once the terrestrial vegetation is gone, the exposed soils are more prone to erosion through a range of processes including the repeated wetting and drying that weakens soil structure, wind and wave erosion, raindrop impact and freezing and thawing. Bedrock is frequently exposed, particularly on steep shorelines, or shorelines are comprised of hard consolidated earth with occasional rock substrate. For these reasons, the habitat complexity is often low in the shorelines within the operating zones of the storage (Entura 2023).

Another factor which reduces habitat complexity and stability in hydro storages with large operating ranges is that they are typically poor habitat for aquatic macrophytes. Macrophytes often provide the most productive habitat for macroinvertebrates and benthic algal growth in lakes; however, Lake Pieman has limited areas where aquatic macrophytes can grow due to rapidly changing water levels, steep eroded banks and a limited photic zone.

Overall, the processes and habitat conditions described above create unstable habitat conditions with low complexity which limits the areas of productivity and suitability for benthic algae and aquatic macroinvertebrates. This is particularly true for the steep sided shorelines, which dominate the region of Lake Pieman immediately downstream from Bastyan Dam and in the vicinity of the Bobadil outfall. These unstable and variable shoreline conditions are likely to significantly weaken the ability of the biomonitoring program to detect any impacts from the Bobadil outfall.

4.2 Issues with the algal scrape method

NRE Tas has recently reviewed the algal scrape method developed used by the Lake Pieman monitoring program and developed by Davies and Gee (1994). Following this review, NRE, and other environmental agencies, no longer use it for their own monitoring programs due to inaccuracies inherent in the method. For example, studies in New Zealand established that 30 – 50 % of the chlorophyll was often lost in the process of removing the pad from the substrate and pulling it up through the water column. The preferred method being promoted by NRE is to remove rocks from the water before collecting algae from a known surface area. This method would not be possible for submerged snags in a lake environment unless there were enough small snags which could be lifted out which is not the case.

Another issue with algal sampling in Lake Pieman is the variable composition of snag habitat at each site. At some sites, only horizontally lying snags were present, while other sites only had standing dead trees. There is considerable variation across the sites in the orientation of the snag material able to be sampled and in relation to the distance from the bank (distance from the bank would influence the degree of shading from terrestrial vegetation).

4.3 Other sampling modalities

Mallick (2020) discussed alternative sampling strategies which could be used to overcome some of the issues with shoreline monitoring in Lake Pieman which included planktonic and benthic sampling. However, as summarised in Mallick (2020) none of these are likely to be suitable as a biomonitoring tool for assessing ecological impacts from the Bobadil outfall.

4.4 Recommendations

Improvements in methods for sampling algae

As discussed above, there are numerous issues with the method used to collect algae. A new method was established in 2024 which uses a suspended tile at each site (Figure 4.1). The tiles are anchored to the substrate and will rise and fall with the lake and thus allow a surface which is constantly submerged. This system will offer the same sampling conditions (surface type, surface orientation and sampling depth) at each site and will allow the scrape to be collected after the substrate has been removed from the water which is consistent with current recommendations by NRE Tas.

This method was only partially successful in November 2024 due to the loss of 8 of the tiles during the large spill event. The tiles were securely tethered within the crates post the November 2024 survey and the tiles will be resampled during the next sampling run.

Timing of sampling

On average, water levels in Lake Pieman are most stable in December and January (Figure 4.2) and the timing of surveys should target these months. However, lake levels can change in any month and lake levels need to be monitored in the weeks prior to sampling. It is recommended that sampling is delayed by a minimum of 1 week if the lake has risen or fallen > ~0.5 metres in the days prior to the planned date. If the method used for algal sampling is modified to that described above, then changes in lake level will have no influence on algal sampling. Lake levels changes prior to sampling are less critical for macroinvertebrate sampling; however, it is still recommended to wait a week if the lake has risen by more than ~0.5 metres in the days prior to the planned date.



Figure 4.1: Example of the system deployed for sampling algae in Lake Pieman in 2024.

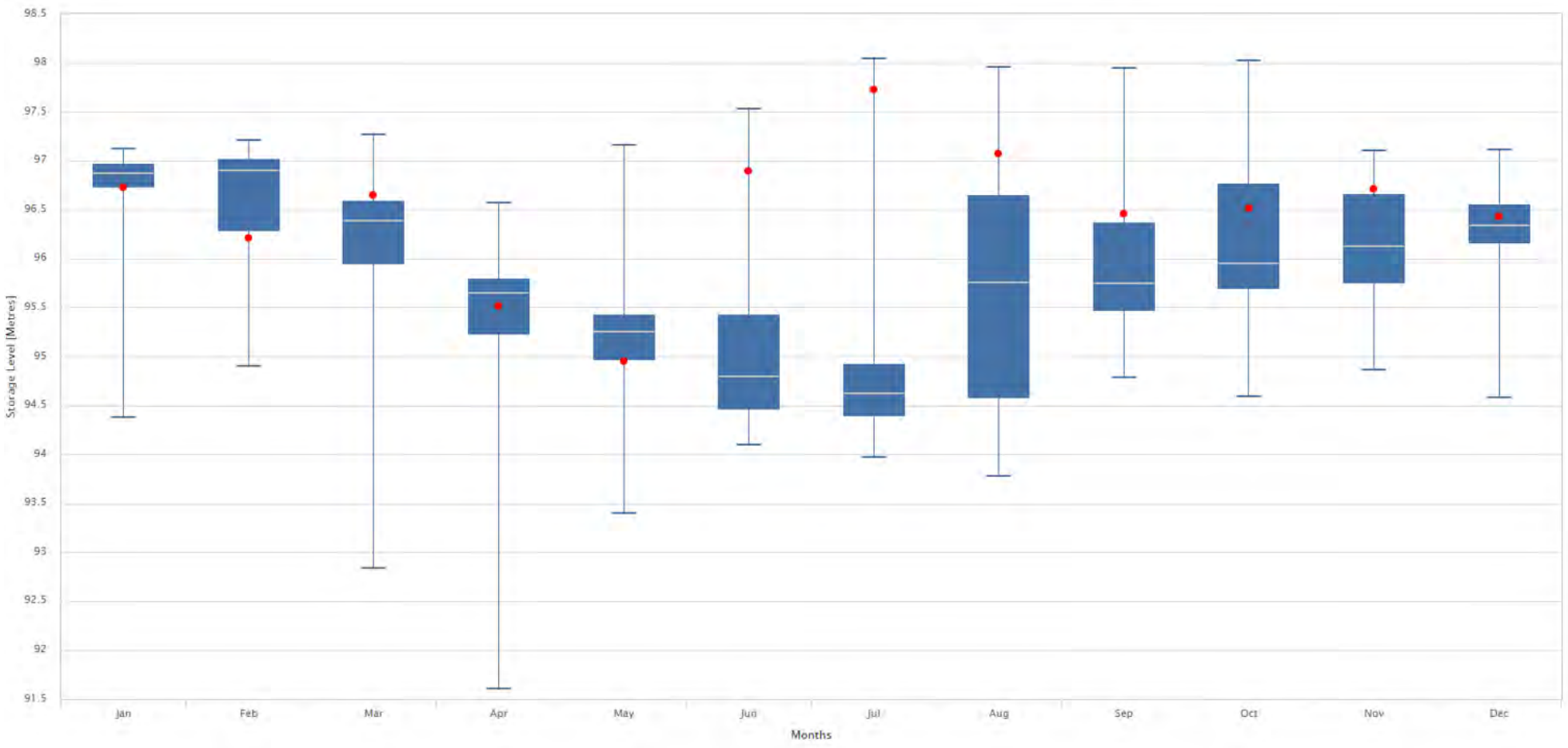


Figure 4.2: Box plot of monthly lake levels in Lake Pieman. Plot shows the monthly median (grey line), mean (x mark), the spread between the 25th and 75th quartiles (upper and lower extent of the box). The whiskers represent maximum and minimum lake levels and the red dots are the average lake level in 2023.

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Appendices

A Site photos

A.1 Reference sites



Figure A.1: Site 1



Figure A.2: Site 2



Figure A.3: Site 3

A.2 Sites immediately upstream the Bobadil outfall



Figure A.4: Site 4



Figure A.5: Site 5



Figure A.6: Site 6



Figure A.7: Site 7

A.3 Sites immediately downstream the Bobadil outfall



Figure A.8: Site 8 (Bobadil outfall can be seen in the background)



Figure A.9: Site 9



Figure A.10: Site 10



Figure A.11: Site 11



Figure A.12: Site 12

A.4 Sites downstream Bobadil Creek



Figure A.13: Site 13



Figure A.14: Site 14



Figure A.15: Site 15

B Benthic algae data

Table B.1: Chlorophyll-*a* concentrations at each site (mg/m2) from 2005 to 2024

Site group	Location	2005	2006 (April)	2006 (Oct)	2008	2009	2009 (Sept)	2010 (May)	2011 (April)	2012 (March)	2013 (April)	2014 (April)	2015 (April)	2017 (May)	2018 (Oct)	2019 (Oct)	2020 (Oct)	Feb (2022)	Sept (2023)	March (2024)	Nov (2024)
Reference	1	2.45	1.8	3.81	0.65	1.52	1.14	6.7	6.42	6.32	8.87	17.8	2.99	33.48	2.99	3.54	0	11.43	8.4	1.6	NS
	2	2.77	7.51	1.09	10.34	2.89	0.49	3.97	2.99	7.84	10.34	21.01	2.18	36.2	1.63	4.36	2.18	11.16	2.4	0.4	0.82
	3	0.76	5.01	1.69	5.5	1.63	1.53	5.61	5.17	5.93	16.55	18.46	3.54	16.33	1.91	2.99	0.82	0.82	0.36	0.36	1.36
Immediately upstream outfall	4	1.2	5.33	2.5	0.76	2.67	1.74	9.96	10.73	2.29	6.42	6.32	1.09	3.81	3.54	1.63	0.54	2.72	0.4	0.4	0.54
	5	2.67	10.07	4.19	0.76	7.57	2.5	12.68	9.53	5.93	5.12	14.92	4.36	2.45	1.91	1.36	1.36	2.18	5.6	0.8	1.63
	6	0.82	6.42	5.06	1.63	2.18	3.75	3.48	16.5	5.93	3.65	6.15	1.09	2.45	2.18	1.09	10.62	1.63	0.36	0.36	0.00
	7	3.05	7.08	9.04	1.85	3.7	6.75	9.64	24.17	8.06	0.98	2.99	1.36	3.54	13.61	3.54	0.27	11.43	3.6	1.2	0.27
Immediately downstream outfall	8	4.19	4.96	4.74	1.79	5.23	11.49	2.39	9.09	2.99	2.01	5.12	2.18	3.27	0.82	3.81	1.91	3.81	0.8	0.36	0.82
	9	18.95	3.38	4.25	3.92	19.71	5.88	18.02	32.23	1.2	3.43	7.84	2.18	2.99	0	0.82	0	3.27	2.4	0.8	0.82
	10	11.54	1.91	5.01	20.96	7.29	2.45	6.75	19.16	0.98	1.36	9.04	2.99	2.99	0.54	0	0	1.91	0.8	0.4	0.00
	11	1.47	6.64	3.43	1.96	2.88	7.78	7.18	16.77	2.07	1.58	3.48	8.17	2.45	2.99	1.09	1.91	0	2	0.4	0.00
	12	1.74	2.67	4.79	4.95	5.06	2.89	4.74	21.29	4.46	3.21	21.61	7.08	2.99	2.18	2.99	1.36	13.07	0.4	0.36	0.54
Downstream Bobadil Creek	13	8.87	3.76	3.97	16.11	4.46	2.89	10.45	17.2	2.34	7.62	19.87	1.91	2.72	4.9	0.27	3.54	21.23	1.6	0.8	1.09
	14	5.88	5.94	4.36	8.82	6.75	2.62	6.42	17.31	7.02	5.01	13.66	5.99	20.42	0.82	0.82	3.54	2.99	0.36	0.36	1.36
	15	0.6	0.76	1.74	2.72	0.82	1.25	0.82	17.96	1.63	0.38	6.59	1.91	6.26	1.09	1.09	0	7.08	0.36	0.36	0.54
	Mean per year	4.5	4.9	4.0	5.5	5.0	3.7	7.3	15.1	4.3	5.1	11.7	3.3	9.5	2.7	2.0	1.9	6.3	2.0	0.6	0.7

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Appendix H Biological Condition of the Ring and Stitt Rivers: Spring 2024 and Autumn 2025 (Entura, 2025)

Biological condition of the Ring and Stitt rivers

Spring 2024 and autumn 2025 surveys

12 September 2025

Prepared by Hydro-Electric Corporation ABN48 072 377 158

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Document information

Title	Biological condition of the Ring and Stitt rivers
	Spring 2024 and autumn 2025 surveys
Client organisation	MMG
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Document number	
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Project reference	519965

Revision history

Revision 0.1

Revision description	Final report		
Prepared by	Will Elvey		12/9/2025
Reviewed by	Raymond Brereton		29/8/2025
Approved by	Raymond Brereton		29/8/2025
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Distributed to	Danielle Zanetto	MMG	

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Executive summary

Macroinvertebrates and fish were surveyed in the Ring and Stitt rivers in spring 2024 and autumn 2025 for MMG's riverine monitoring program.

The legacy of pollution from the Hercules mine area, particularly via Baker Creek, continues to impact the Ring River catchment, with the sites mostly rated as significantly to extremely impaired by the AusRivAS assessments and as poor to very poor by the TRCI Aquatic Life Index. Although still impaired, the results were consistent with previous surveys which indicate that the two sites upstream of the Baker Creek inflow are in better condition than the sites downstream of the creek inflow. In spring 2024 and autumn 2025, the AusRivAS outputs provided the strongest evidence for better condition at R1 and R2 with substantially higher overall O/E scores than the sites downstream from Baker Creek.

In contrast to the 2023/24 survey period, the pattern of total abundance, and diversity between the sites and the SIGNAL data for taxa which are highly sensitive to poor water quality, were more ambiguous than the AusRivAS results although the total abundance at site R2 was substantially higher than all other sites in autumn 2024.

The Stitt River is in significantly better condition than the Ring River. Only the most downstream site on the Stitt River (site R6) received an impaired AusRivAS score in spring 2024 and sites S5 and S6 received impaired scores in autumn 2025. Overall, the AusRivAS outputs suggest that all the sites downstream the sources of MRCs (mining related contaminants) are improving, particularly site S3 and S4 which have had five consecutive reference condition scores from autumn 2023 to autumn 2025. Prior to this, these sites have never had consecutive reference condition scores since the use of the O/Epa model began in 2015.

The surber data for total abundances in spring 2024 is difficult to interpret because the macroinvertebrate communities were highly likely to be affected by high flows preceding the survey. However, the total abundance data in autumn 2025 is consistent with impaired condition at the two most downstream sites on the Stitt River (S5 and S6). By contrast the total abundance at sites S3 was similar to that recorded at the reference sites and the abundance at S4 was the highest recorded of all sites.

All of the sites other than S1 (good) and S6 (poor) were rated as moderate by the TRCI Aquatic Life Index in spring 2024 despite all, except for site S6, being rated high for the Expectedness and Composition components of the index. The moderate scores were because the total abundances were below the threshold set for reference condition. The low abundances in spring 2024 were highly likely caused by the very high flows preceding the survey. Overall, the TRCI Aquatic Life Index is heavily influenced by abundance data but the logic behind a threshold which does not consider regional differences in productivity is questionable. The Water Management Branch of NRE Tas do not recommend that the TRCI Aquatic Life Index is used because of several flaws in the rule sets that it uses.

Since 2021, the abundance of brown trout has increased at the Stitt River sites downstream the sources of MRCs. Overall, the fish monitoring is consistent with evidence from the macroinvertebrate sampling that river health is improving in the Stitt River downstream from sources of MRCs.

1. Introduction

MMG is required to undertake biological monitoring in the Stitt and Ring rivers in spring and autumn each year under their main Environmental Protection Notice (EPN 7153/3). The monitoring comprises physico-chemical spot water quality measures; instream habitat assessments; qualitative fish surveys; quantitative macroinvertebrate sampling (Surber sampling); and qualitative macroinvertebrate sampling (AusRivAS method).

The monitoring program was established in 2004 (Davies et al. 2004) and has been undertaken in most years since then. The overall design of the program has remained the same although some parameters and analyses have changed over time.

The specific aims of the surveys are to:

- describe the condition of the habitat, water quality and biological communities in the Stitt and Ring rivers;
- evaluate changes over time which may be attributable to habitat and water quality conditions that are influenced by management actions associated with MMG's operations.

The Ring River has been found to be in a highly degraded ecological condition with low abundances and diversity of macroinvertebrates throughout, and a complete absence of fish (Davies et al. 2005a, b; 2006a; 2007 – 2017). The ecological condition of the Stitt River has consistently been less impaired than the Ring, though sites in the lowest reaches have also been rated as impaired, particularly prior to improvements in tailings and water management.

This report presents the results of biomonitoring undertaken in spring 2024 and autumn 2025 including analysis and discussion of the 2024/25 results with previous monitoring periods.

1.1 Water Quality Background

1.1.1 Stitt River

Since 2011, there have been substantial changes to water management at MMG Rosebery, including improved stormwater collection and treatment, and re-development of the 2/5 Dam TSF. Most of the stormwater that is monitored at the EPN listed sites is now captured, directed to the Effluent Treatment Plant (ETP) for treatment, and discharged via the licenced discharge point (Koehnken 2024). There is no active discharge from the 2/5 TSF to the Stitt River. However, some seepage continues to enter the Stitt River from the northern embankment of the 2/5 Dam (Lois Koehnken, personal communication).

Additional water management works occurred at the 2/5 TSF in 2023 and include the construction of a seepage collection system to capture seepage from the eastern embankment of the 2/5 TSF and direct it to the Seepage Collection Pond (SCD01) (Koehnken 2024).

Other sources of mine related pollutants which enter the Stitt River include:

- Rosebery Creek which has been diverted around the eastern boundary of the active mine site and enters the Stitt River just downstream of biomonitoring site S5 but upstream site S6. The lower reaches drain areas containing waste rock and historic fill, and receive stormwater from the township;
- Drainage through the historic placement of waste rock/fill near Rosebery Park;

- Stormwater drainage from the town of Rosebery where waste rock/fill was previously deposited around residential areas (Lois Koehnken, personal communication). There has been improved collection and treatment of stormwater in recent years (Koehnken 2024).

1.1.2 Ring River

The Ring River is impacted from historical mining operations from the decommissioned Hercules site which was an underground and open cut mine located on the western side of Mount Hamilton, approximately 10 kilometres (km) south of Rosebery. The mine operated from the late 1800's until 1999 and MMG took ownership of the Rosebery mine lease 28M/1993 in 2009 which includes the Hercules site (Coffey 2021).

Baker Creek is the main watercourse draining from the Hercules site. Baker Creek receives runoff from across the disturbed mine area as well as acid mine drainage (AMD) discharge or runoff from the various adits and waste rock dumps (Coffey 2021). Baker Creek enters the Ring River between biomonitoring sites R2 and R3.

Baker Creek is the principal source of contaminants for the Ring River; however, other smaller watercourses drain contaminated water from the Hercules mine site, including Scotts Creek which is a highly altered creek that drains the western slope of Mount Hamilton and the former Williamsford township area. A branch of Scotts Creek receives road runoff and AMD discharged from the Hercules site and enters the Ring River between biomonitoring sites R1 and R2 (Coffey 2021).

The Ring River flows for approximately nine kilometres northwest from the Baker Creek inflow before entering Lake Pieman.

2. Methods

2.1 Field survey

The monitoring program comprises 15 sites in the following locations:

- Seven monitoring sites in the Ring River catchment which are impacted by historical mining operation and include five sites in the main river, one site in Baker Creek which enters between sites R2 and R3 and one site in Dolcoath Creek which enters between R5 and R6 (Table 2.1; Figure 2.1; Figure 2.2; Figure 2.3).
- Seven monitoring sites in the Stitt River catchment (Table 2.1; Figure 2.1):
  - Three reference sites in the Stitt River (Sites S0, S1, S2) (Figure 2.4);
  - Four impact sites in the Stitt River (Sites S3, S4, S5 and S6) (Figure 2.5);
- One reference site in the Sterling River (Table 2.1; Figure 2.1; Figure 2.4).

As discussed above, there are multiple sources of mine related contaminants to the lower Stitt River which include impacts from current operation (seepage from the 2/5 TSF), Rosebery Creek, stormwater, and seepage from other areas around Rosebery where mine waste rock/fill has previously been deposited. The term "mine related contaminants" (MRCs) will used in this report to describe the position of sites upstream (S0 to S2) and downstream (S3 – S6) of the main sources of MRCs.

The survey methods were identical at each site as described below. The survey was conducted from November 11 – 15 in 2024 2024 and March 10 to 14 in 2025. Dolcoath Creek was dry during the survey in autumn 2025 and was not sampled.

2.1.1 Stream habitat and water conductivity

A suite of habitat variables was collected at each site to describe and interpret riparian and instream conditions. Some of the habitat variables are also required as predictor variables in the AusRivAS models.

Parameters recorded include:

- stream geomorphology (flow types, gradient, bank character; instream substrate types);
- aquatic plants, algal cover; detritus and large woody debris;
- riparian condition (density; vegetation type; dominant species; stream shading);
- spot testing of water conductivity;
- Site photos.

Table 2.1: Monitoring site details

Site	Code	Location[1]	Easting	Northing	Catchment Area (km2)	Elevation	Site category/impact source
Ring River	R1	Williamsford Rd	376394	5368482	2.3	415	Historical impact upstream Baker and Scotts Ck. inflows
	R2	Upstream Baker Creek inflow	375588	5367984	5.2	330	Historical impact downstream Scotts Ck. inflow
	R3	Downstream Baker Creek inflow	375544	5367898	7.1	325	Historical impact downstream Baker Ck inflow
	R5	Upstream Dolcoath Creek	371389	5370908	30.8	130	
	R6	Upstream Murchison Highway	371315	5371478	34.7	125	
Baker Creek	B1	Upstream Ring River junction	375538	5367925	1.7	328	Historical impact – Hercules Mine
Dolcoath Creek	D1	Upstream Ring River junction	371267	5371043	3.4	130	Historical impact
Sterling River	STR1	Upstream Murchison Highway	384432	5374891	16.5	165	Reference site
Stitt River	S0	At top bridge	379456	5371759	23.8	165	Reference – upstream MRCs
	S1	Upstream Mountain Creek	379676	5372833	33.5	180	
	S2	Upstream 2/5 Dam TSF Emergency Spillway	379338	5373188	35.9	180	
	S3	Downstream 2/5 Dam TSF Emergency Spillway	379064	5373171	36.6	160	Downstream MRCs
	S4	Upstream Rosebery Park footbridge	378292	5373518	36.6	160	
	S5	Upstream Park Road bridge and Rosebery Creek	378216	5373830	37.0	150	
	S6	Downstream Stitt Falls and Rosebery Creek	377901	5373828	37.0	150	

[1] The location names have been kept the same as previous assessments for consistency; however, the terms upstream and downstream tailings discharge may no longer be appropriate given there are no deliberate discharges from the 2/5 TSF under current operation.

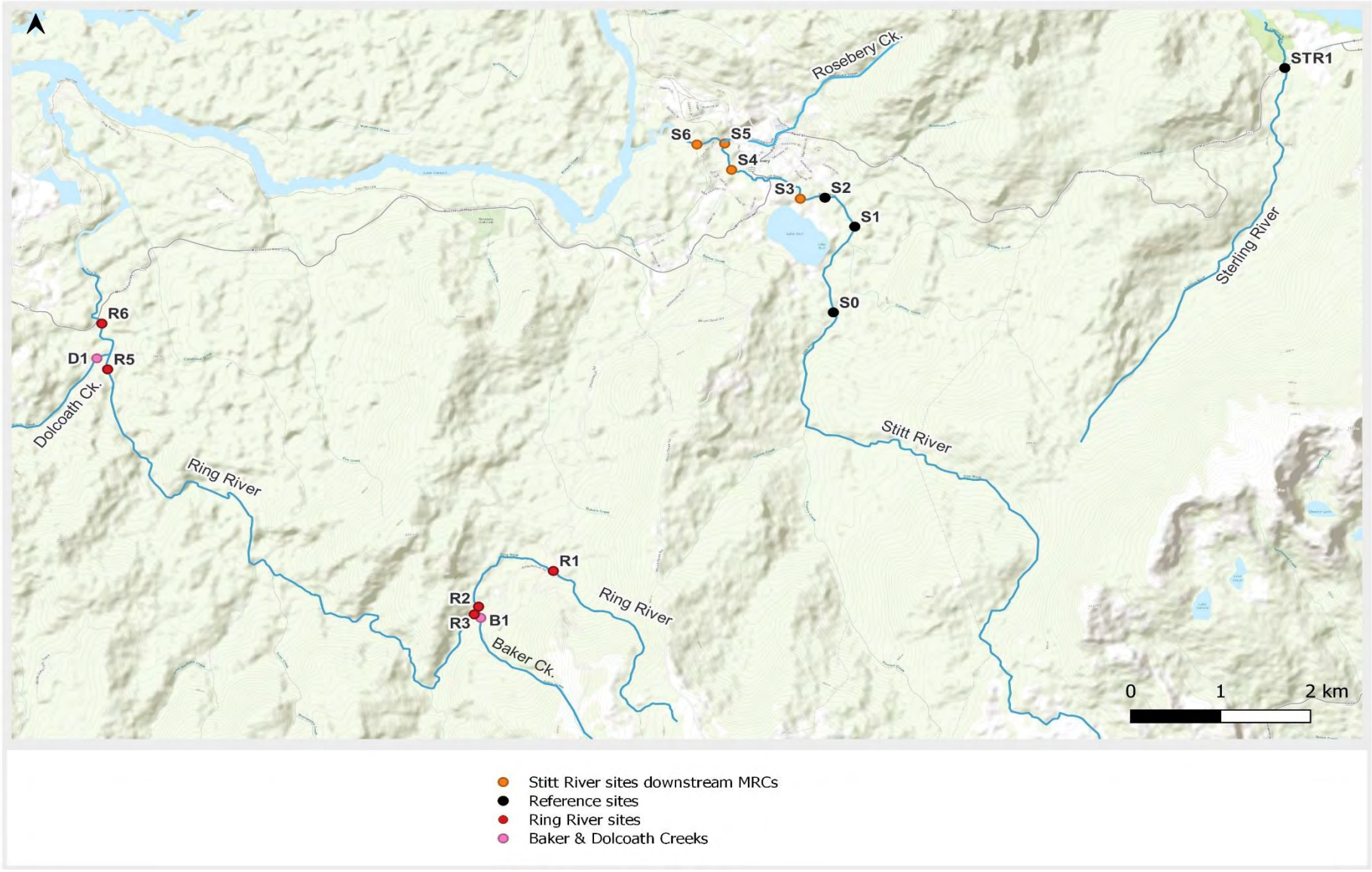


Figure 2.1: Location of monitoring sites in the Ring River catchment, Stitt River, and the Sterling River.



Figure 2.2: Ring River catchment sites R1, R2, B1 and R3

Ring River (R5):



Dolcoath Creek (D1):



Ring River (R6):



Figure 2.3: Ring River catchment sites R5, D1 and R6

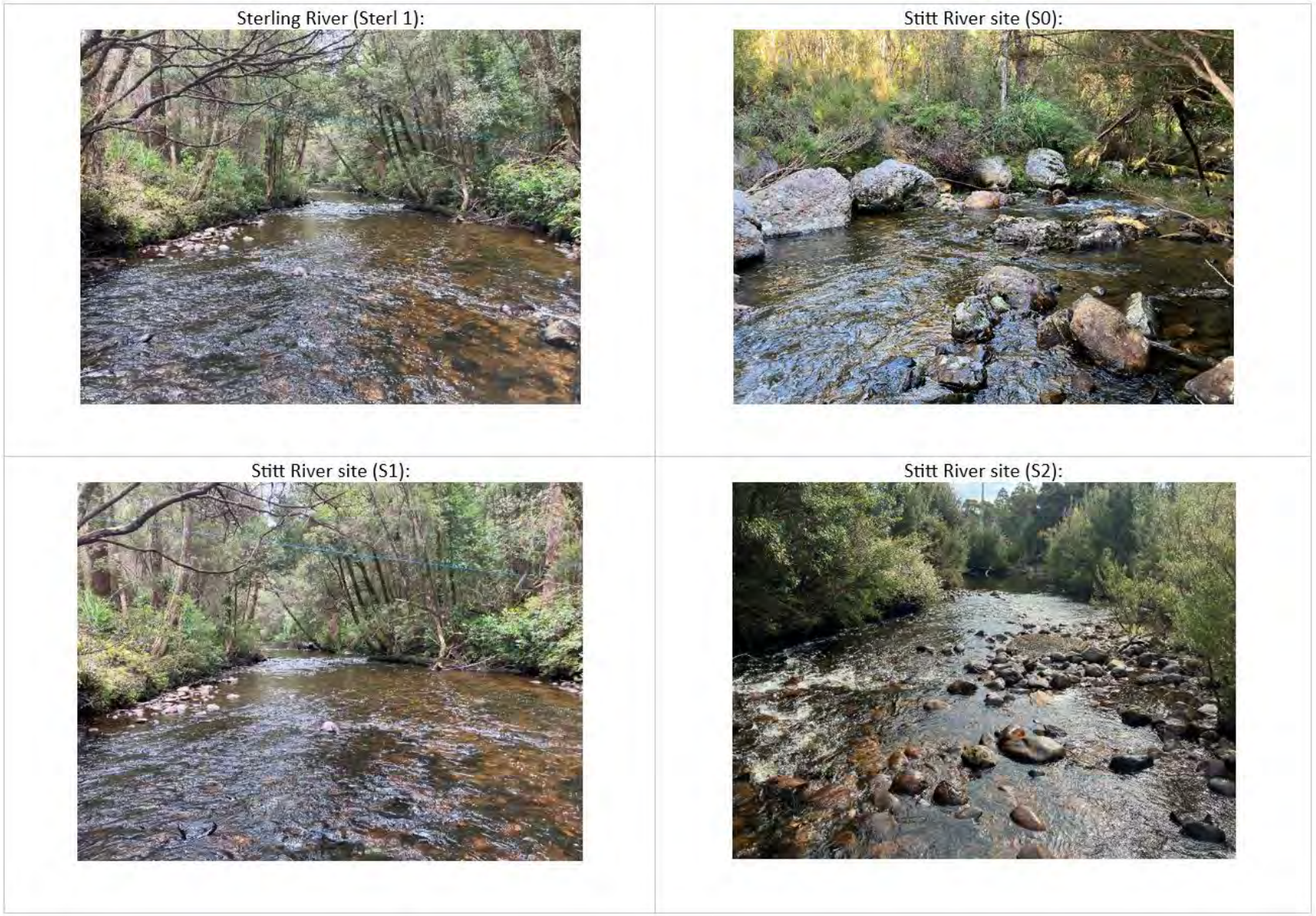


Figure 2.4: Sterling River and Stitt River sites S0, S1 and S2.

Stitt River site (S3):



Stitt River site (S4):



Stitt River site (S5):



Stitt River site (S6):



Figure 2.5: Stitt River sites S3, S4, S5 and S6

2.1.2 Macroinvertebrates

Quantitative Surber sampling and semi-quantitative AusRivAS sampling was conducted at each site. Surber data provides an estimate of total abundance per unit area and this method is likely to improve the ability to detect rare taxa compared to the kick sampling and live pick methods used by AusRivAS (Storey et al. 1991). AusRivAS sampling provides indices of difference in community composition from an 'expected' fauna under undisturbed 'reference' conditions (Section 2.1.4.2).

2.1.2.1 Quantitative Surber sampling

At each site, 10 samples were taken from areas of riffles using a Surber sampler. Within the 30 x 30 cm quadrat of the sampler, the substrate is disturbed by hand to a maximum depth of 10 cm. The river slow washed the suspended detritus and invertebrates into the 500-micron mesh net which is attached directly downstream from the quadrat. The ten samples were pooled at each site to provide a single composite sample which was then placed in a zip lock back and preserved with 70% ethanol.

Surber samples were collected from Dolcoath Creek during the spring 2023 and autumn 2024 survey period; however, Surber sampling has not previously been conducted at this site as the low abundance of coarse substrate in this creek renders the method less suitable. Surber sampling was not conducted at this site during the spring 2024 and autumn 2025 surveys.

2.1.2.2 AusRivAS kick sampling

Two kick samples were collected from riffle habitats (i.e., relatively high gradient, shallow, fast moving broken water over large pebbles, cobble or boulder substrate) at each site using the standard AusRivAS method (ausrivas.ewater.org.au).

Each sample was live picked onsite, which involved transferring the sample from each net into a flat, white tray and picking individuals from the sample over a set time (thirty minutes); ensuring that the sample is representative of the relative abundance of each faunal group. Samples were stored in a 70% ethanol, 5% glycerol solution.

2.1.3 Fish

A fish survey was undertaken in the Sterling River and at the Stitt Rivers sites using a Smith-Root LR-20B or LR-24 backpack electrofisher (duty time using the 20-min CPUE method) within wadable areas at each site. All fish caught were identified, counted, measured, and then released back into the river at the site of capture. All fish were caught and handled under the relevant permits:

- *Inland Fisheries Act 1995* exemption permit (No. D23-266898)
- *Animal Welfare Act 1993* animal research approval certificate (Animal Ethics Committee project no 4/2023-24).

The sites in the Ring River catchment were not electro- fished in 2024/25. Previous assessments have not recorded fish in the Ring River.

2.1.4 Laboratory

2.1.4.1 Surber samples

Each Surber sample was:

- floated in a calcium carbonate solution to separate inorganic and organic fractions;
- sub-sampled to 20% using a Marchant Box sub-sampler, representing a quadrat area of 0.36 m^2 (Marchant 1989);
- picked to remove all macroinvertebrates from the organic fractions;
- taxa collected were identified using stereo microscopy to the family and sub-family level required which is consistent with previous MMG bioassessment sampling events.

2.1.4.2 AusRivAS samples

The AusRivAS samples were identified to family level using stereo microscopy to the family or sub-family level except for Hirudinea, Oligochaeta, Nematoda and Arachnida which were identified to order. The level of identification depending on the type of taxa is consistent with the standard AusRivAS method (CEPA 1994; Krasnicki et al. 2002).

2.1.5 Analysis

The data from the Surber and AusRivAS samples were used to describe broad community patterns (diversity, composition and abundance) and two methods for rating river health: 1) outputs from the AusRivAS models, and 2) condition scores from the Tasmanian River Condition Index (TRCI) Aquatic Life. Note that the TRCI Aquatic Life Condition Assessment used in this assessment is an abridged version which only used outputs from the macroinvertebrate data for the reasons outlined below (Section 2.1.5.3)

2.1.5.1 Diversity, composition, and abundance measures

Diversity (number of families) and community composition was derived from the Surber and AusRivAS data. Total abundance data was derived from Surber data.

Diversity and proportional abundance of families in sensitive aquatic insect orders; Ephemeroptera, Plectoptera and Trichoptera (EPT). EPTs are generally considered sensitive to changes in habitat or water quality and can therefore be used to detect impacts.

Signal scores

The Stream Invertebrate Grade Number Average Level (SIGNAL) is a scoring system developed by Chessman (1995; 2003) based on the sensitivities of macroinvertebrate families to common types of pollution. Each family of macroinvertebrates is assigned a grade (Pollution Sensitivity Grade Number) according to their tolerance, where a grade of 10 represents a high sensitivity to pollution and a grade of 1 represents a high tolerance to pollution.

The outputs for the AusRivAS O/Epa model include an O/E SIGNAL score as discussed below (Section 2.1.5.2). The Surber data was used to identify the taxa present which are classed as highly sensitive to poor water quality. The raw SIGNAL scores for families (Chessman 2003) were used to

define a threshold for high sensitivity (SIGNAL SCORE ≥ 7). The families with high sensitivity were used to calculate two metrics for each site: 1) the proportion of the abundance of sensitive taxa to the total abundance; and 2) the proportion of the number of sensitive families to total family number.

2.1.5.2 Ausrivas models

The Tasmanian AusRivAS state-wide predictive models for presence absence were used to assess the biological health of each site. AusRivAS presence/absence (O/PA) models are based on large 'reference' site datasets that contain macroinvertebrate and habitat data from a set of unpolluted, 'least disturbed' reference sites (DPIPWE 2018). The model then generates a list of macroinvertebrate taxa expected to occur at the test site in the absence of environmental stress, such as pollution or habitat degradation (DPIPWE 2018).

The single-season spring and autumn models were used to derive an O/E (observed/expected) score (ausrivas.ewater.org.au), where the expected taxa were calculated using the probability of reference group membership in the predictive models that were most likely to represent the monitoring site in a 'natural' condition based on 'predictor' variables (i.e. habitat and topographic features of the site). The O/E scores were calculated as the ratio of observed/expected values. The O/E scores were divided into O/E bands that describe the relative health of the river (based on macroinvertebrate community composition) compared to the reference streams (Davies 2002, Table 2.2).

The other AusRivAS output, O/E SIGNAL, is the O/E ratio calculated for the site using the overall SIGNAL scores calculated from the lists of expected taxa and observed taxa and is an input to the TRCI. O/E SIGNAL weights the families by their sensitivity to water pollution. Accordingly, O/E SIGNAL can detect situations where water pollution has resulted in the loss of only a few, but very sensitive, families of macroinvertebrates.

Table 2.2: NRE Tas AusRivAS state-wide seasonal models O/E presence absence lower band of river health within riffle habitats

Band	DPIPWE AusRivAS state-wide seasonal model (Autumn O/PA) – lower band bound	Description
X	1.15	More diverse than reference
A	0.86	Equivalent to reference condition
B	0.58	*Significantly impaired or modified.*
C	0.3	*Severely impaired or highly modified.*
D	0	Extremely impaired

In previous assessments for this program, the presence absence model was not run until (or not reported on) the autumn 2015 survey. The analyses done prior to 2015 reported on the AusRivAS rank abundance models (O/Erk). Presence absence models (O/Epa) were run in autumn 2015 because this was the first time that the Tasmania River Condition Index (TRCI) was used in the analysis and TRCI uses the outputs from the AusRivAS O/Epa models. The O/Erk and the O/Epa models were reported on in the 2017/18 report, but the subsequent reports have only provided outputs for the O/Epa model.

2.1.5.3 Tasmanian River Condition Index (TRCI)

For the TRCI assessment, sampling and data analysis followed the protocol described by NRM South (2009, 2009a). The TRCI Aquatic Life Macroinvertebrate Indicator (MI) provides an integrated score for the condition of benthic macroinvertebrate communities. The score considers three aspects of the macroinvertebrate community as summarised below and in Table 2.3:

- Expectedness - the proportion of taxa expected to occur at the site under unimpaired conditions that are actually observed at the site (O/Epa scores), combined with the ratio of observed to expected scores for pollution sensitivity of the sampled community - the 'SIGNAL' score;
- Abundance - the density of individuals per unit area of riverbed derived from the Surber data;
- Composition - the proportion of environmentally sensitive taxa from the 'EPT' taxonomic grouping in the sample.

The above values were entered into the TRCI aquatic life condition scoring and integration algorithm (NRM South 2009) to generate scores for individual metrics and integrated scores and ratings for the overall condition of macroinvertebrates.

The intention of the TRCI Life score method was to combine metrics from macroinvertebrates, fish communities, and benthic algae data to provide an overall condition score. However, the native fish community at most riverine sites in Tasmania is heavily influenced by the presence of introduced trout which limit and or exclude native fish through predation and competition. Native fish are also often excluded from river sites due to the presence of barriers to upstream migration, particularly large instream hydropower dams. The native fish population in the Stitt River is influenced by both downstream barriers to migration and the presence of introduced brown trout (*Salmo trutta*) and hydropower dams in the Pieman River catchment.

Quantitative benthic algae sampling was undertaken in 2014/2015 to obtain estimates of chlorophyll-*a* per unit area; however, quantitative algal sampling has not been undertaken in subsequent surveys. Regardless, the method used to collect benthic algae for TRCI has recently been reviewed by NRE Tasmania and is no longer considered valid.

Table 2.3: Summary of metrics used to derive the TRCI macroinvertebrate condition rating.

Metric	What is it?	Reference condition
O/E : Observed to expected ratio	Proportion of expected families found (observed) in sample (based on presence/absence data). Range: 0 – approx. 1.3	Expected family list generated from reference site data set by AUSRIVAS model.
SIGNAL O/E: SIGNAL score Observed to expected ratio	Ratio of observed to expected (reference) SIGNAL score. Range: 0 – approx.. 1.3	Expected SIGNAL score generated from reference family list by AUSRIVAS model.
EPT Propn : Proportion of all families from the EPT orders.	The proportion of all families in sample occurring in the EPT orders. Range: 0 – 1.0	EPT scores observed at reference sites. Bound = lower 10 percentile.
Total abundance : Density of all macro-invertebrates	Abundance per m^2 of stream bed of all macroinvertebrates. Range: 0 - 20,000+	Abundance values from reference site data set. Bounds = 90 and 10 percentile values.

3. Results

3.1 Flow conditions prior to the surveys

Flow conditions were very high in the Stitt River catchment in the three months prior to the survey in November 2024 (Figure 3.1). A peak flow event of approximately 50 cumecs occurred at the end of August and several events > 20 cumecs occurred from September to mid-October. A smaller ~10 cumec event occurred in the week prior to the survey. High flow events can temporarily reduce the abundance and diversity of macroinvertebrates.

By contrast, flows were very low from January until the autumn survey in March 2025 and were < 0.5 cumecs over most of that period (Figure 3.2). Prolonged periods of low flows can also reduce the abundance and diversity of macroinvertebrates. It is likely that very similar flow patterns occurred in the Ring River over the same period.

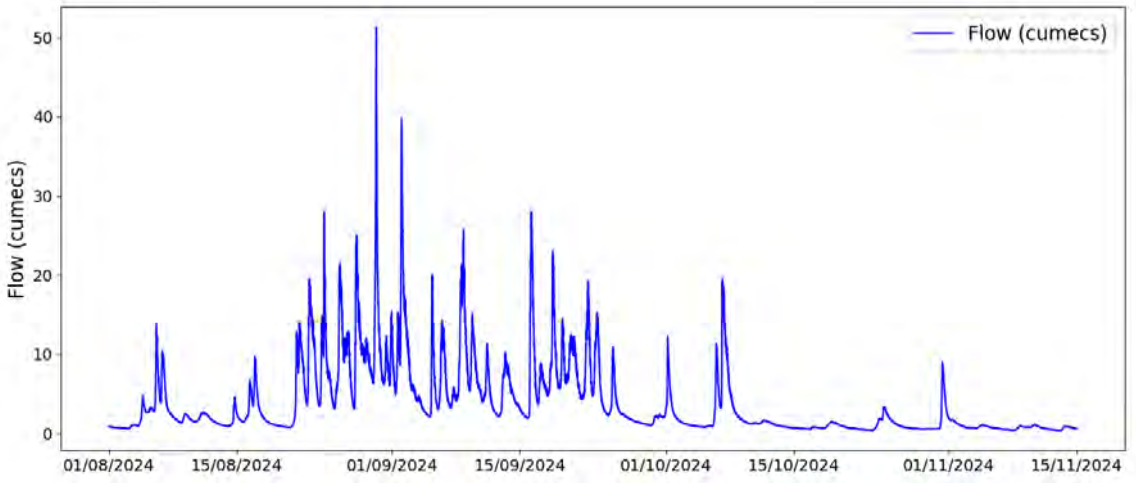


Figure 3.1: Flow hydrograph of the Stitt River above Rosebery for the three months prior to the Spring 2024 survey

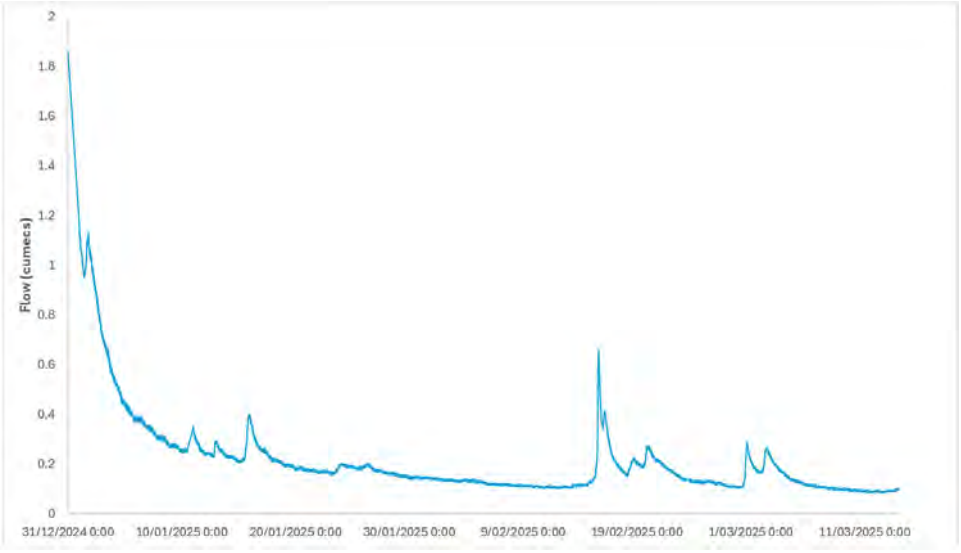


Figure 3.2: Flow hydrograph of the Stitt River above Rosebery for the three months prior to the autumn 2025 survey

3.2 Ring River

3.2.1 Conductivity

Conductivity levels in the Ring River ranged between 55 to 240 µS/cm in spring 2024 and between 62 to 245 µS/cm in autumn 2024 (Figure 3.3).

As for all previous surveys, conductivity increased substantially at the Ring River site (R3) immediately downstream the Baker Creek inflow in both spring and autumn (4 times higher than site R2) (Figure 3.3). Conductivity declines further downstream at sites R5 and R6 but was still 1.5 times higher than the Ring River sites upstream from Baker Creek in spring 2024 and 2.5 times higher than these sites in autumn 2025 (Figure 3.3).

Conductivity in Baker Creek was high in both seasons (598 µS/cm in spring 2024 and 604 µS/cm in autumn 2025 (Figure 3.3). Conductivity in Dolcoath Creek (223 µS/cm) was higher than all other Ring River sites other than R3 in spring 2024 (Figure 3.3).

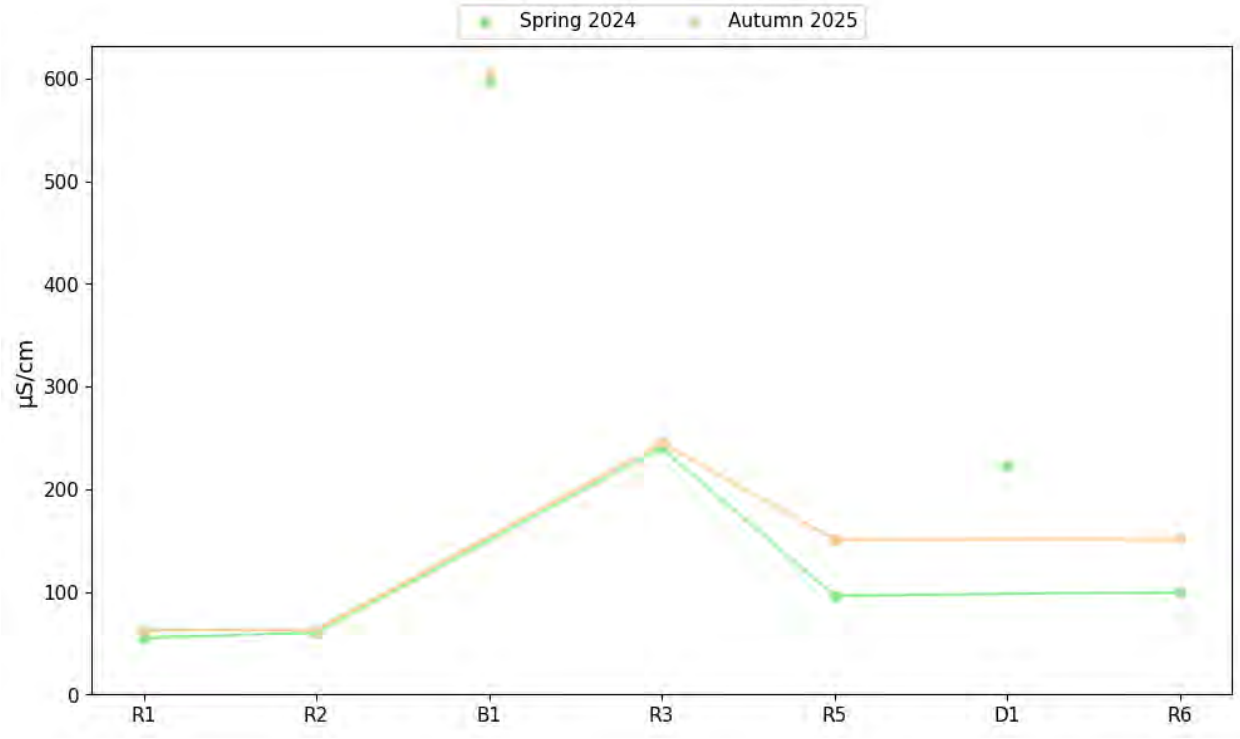


Figure 3.3: Conductivity (µS/cm) in spring 2024 and autumn 2025 at sampling sites in the Ring River catchment.

3.2.2 Macroinvertebrates

3.2.2.1 Abundance

The total abundance of macroinvertebrates was consistently low across all sites compared to what would be expected from a healthy river (i.e. at least 700 animals/m^2) (Figure 3.4). Ring River Site 2 (R2) had the highest abundance in spring 2024 and autumn 2025 (340 – 350 animals/m^2). The most upstream site on the Ring River (R1) had consistently low abundances in spring and autumn as did Ring River site 3 (R3) which had the lowest abundances of all Ring River sites. R3 is the most impacted site on the Ring

River as it is directly downstream from the heavily mine impacted inflow of Bakers Creek (site B1). Total abundance was also low at R5 in both seasons and R6 in autumn 2025 but the abundance at R6 in spring 2024 was relatively high (330 animals/m^2) (Figure 3.4). Total abundance was very low at Bakers Creek in spring 2024 (30 animals/m^2) and no animals were recorded at this site during the autumn 2024 survey (Figure 3.4).

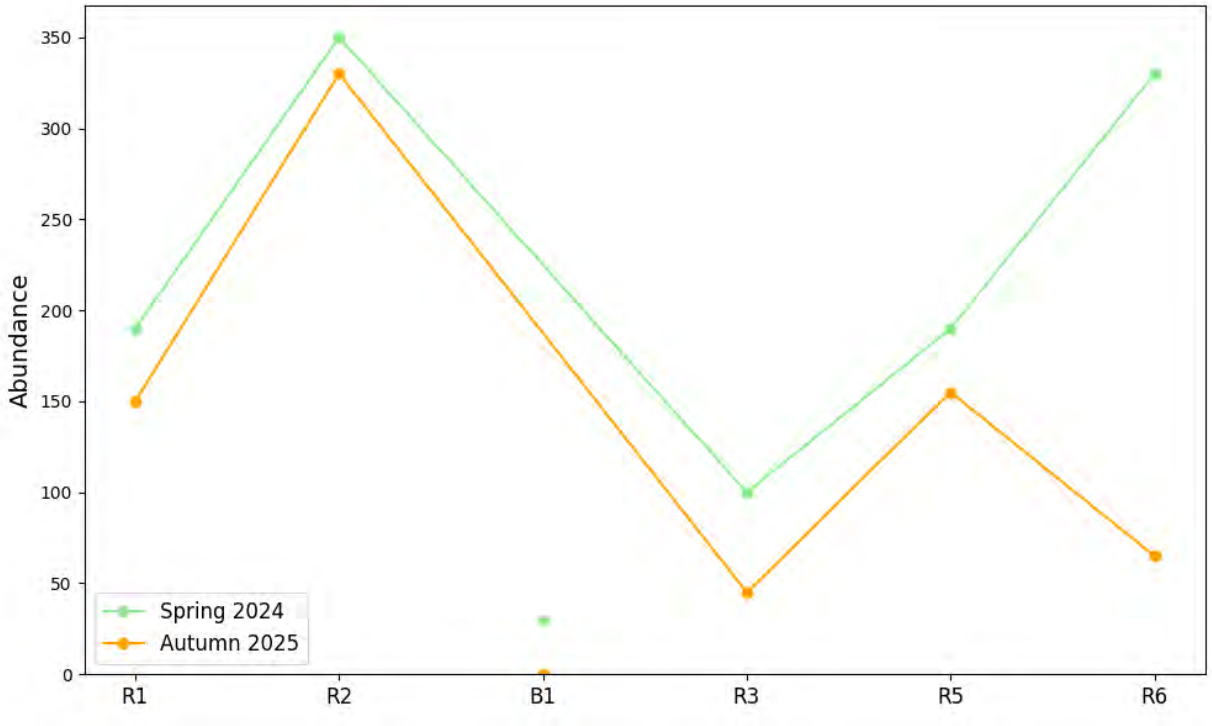


Figure 3.4: Total abundance (number of animals/m^2) of macroinvertebrates in the Ring River catchment in spring 2024 and autumn 2025.

3.2.2.2 Diversity

Total diversity was consistently low across the Ring River sites in spring 2024 ranging from nine taxa at R5 to 13 taxa at site R6 (Figure 3.5). Diversity was more variable in autumn 2025 and generally higher than the spring survey (Figure 3.5). Diversity was relatively high at site R2 and R5 (17 and 15 taxa respectively) but very low at R3 (5 taxa) and R6 (8 taxa) (Figure 3.5). Only four taxa were recorded at Bakers Creek (B1) in spring 2024 and none in autumn 2025.

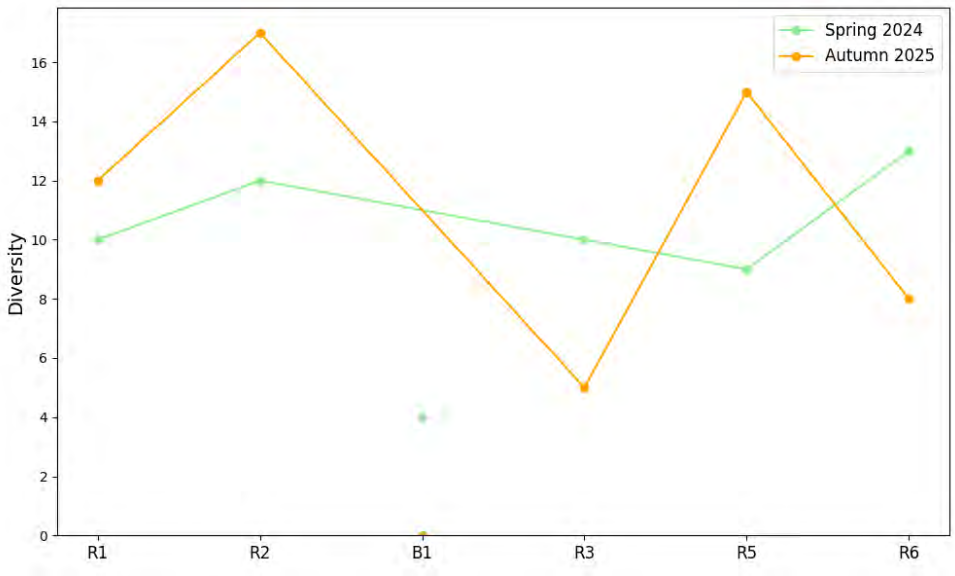


Figure 3.5: Number of families recorded from the Surber samples in the Ring River catchment in spring 2024 and autumn 2025.

3.2.2.3 Composition

A total of 25 taxa were recorded across the sites in spring 2024 and 29 taxa in autumn 2025.

Stoneflies in the family Notonemouridae and chironomids in the sub-family Orthocladiinae were by far the most abundant taxa recorded during the spring 2024 survey with these taxa recorded at all the Ring River sites except for R3 where Notonemouridae were not recorded. Eustheniidae stoneflies were also relatively abundant and recorded at all Ring River sites other than R3. The abundance and diversity of EPT taxa was highest at site R6 and R2 (Appendix A.1.1).

The distribution of taxa was more even for the autumn 2025 survey with caddis flies in the family Hydropsychidae, chironomids in the sub-family Chironominae and Orthocladiinae and three stonefly families (Notonemouridae, Eustheniidae and Gripopterygidae) the most abundant taxa across the sites Appendix A.1.1. The abundance and diversity of EPT taxa was substantially higher at sites R1 and R2 compared to the other Ring River sites (Appendix A.1.1).

Ten taxa recorded from the Surber data are rated as highly sensitive to poor water quality by the SIGNAL scoring system (Chessman 2003) and was mostly comprised of EPT fauna but included riffle beetles and fly larvae in the family Athericidae (Table 3.1). Unlike the 2023/24 reporting period (Entura 2024), there was no clear trend for a greater diversity or abundance of highly sensitive taxa at the two most upstream Ring River sites (R1 and R2) which are above the polluted Baker Creek inflow (Table 3.1; Figure 3.6 - Figure 3.7). Indeed the highest abundance and diversity of highly sensitive taxa was recorded at the most downstream site on the Ring River (R6) during spring 2024 (Figure 3.6 - Figure 3.7).

Table 3.1: Taxa recorded in the Ring River Surber samples rated as highly sensitive to poor water quality.

Order	Family/Sub-family	Common name	SIGNAL score	Sites present
Coleoptera	Elmidae	Riffle beetle	7	R6
Plecoptera	Austroperlidae	Stoneflies	10	R1, R2, R6
	Eustheniidae		10	R1, R2, R5, R6
	Gripopterygidae		8	R1, R2, R3, R5, R6
Ephemeroptera	Leptophlebiidae	Mayfly	8	R1, R2, R3
Trichoptera	Calocidae	Cased caddisflies	9	R6
	Philorheithridae		8	R2, R3
	Hydrobiosidae	Free living caddisflies	8	R2, R3, R5
	Philopotomidae		8	R2
Diptera	Athericidae	Fly larvae	8	R6

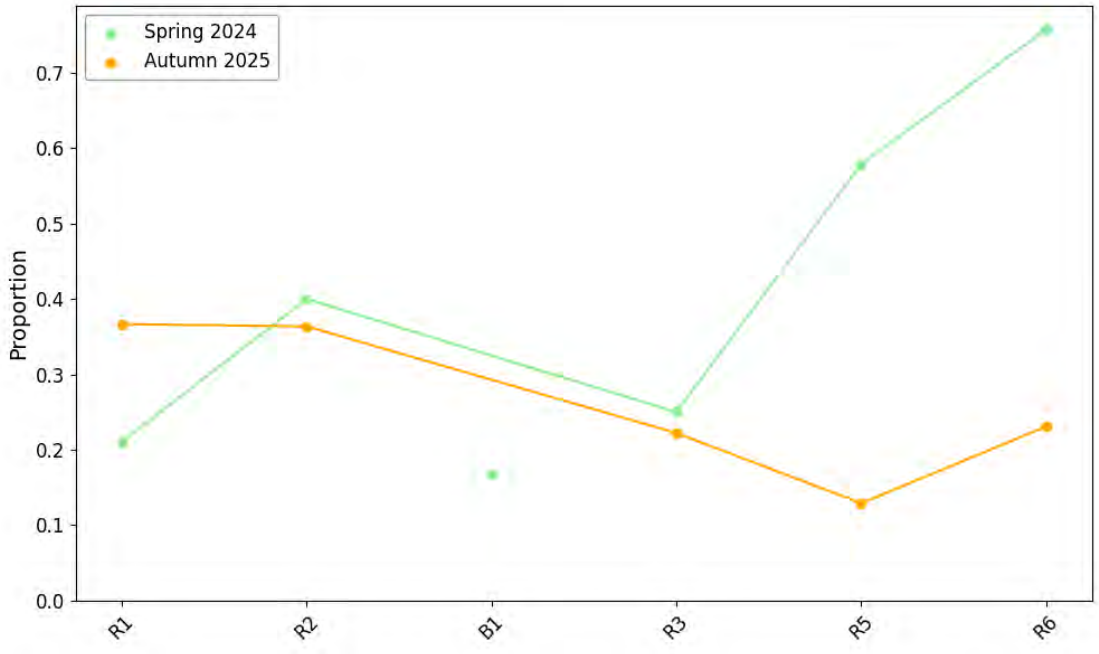


Figure 3.6: Proportion of total abundance for families rated as highly sensitive to poor water quality to total abundance in spring 2024 and autumn 2025.

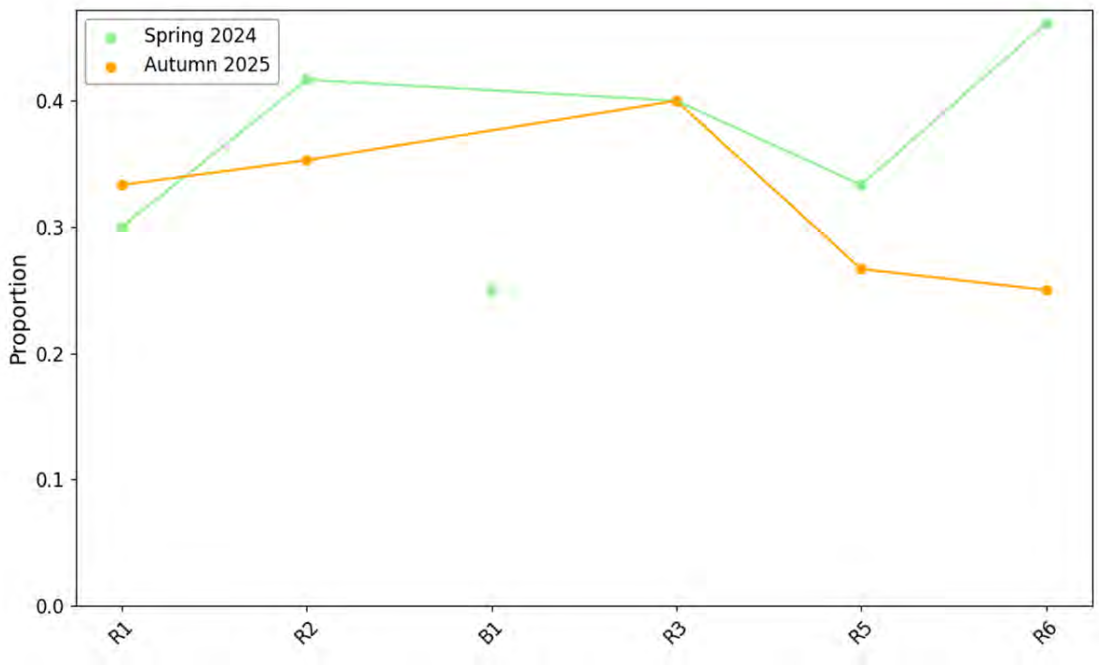


Figure 3.7: Proportion of the number of families rated as highly sensitive to poor water quality to total family number in spring 2024 and autumn 2025.

3.2.2.4 Ausrivas

The Ausrivas O/E scores and condition bands for the spring and autumn presence/absence models are provided in tables (Table 3.2 and Table 3.3) and graphically (Figure 3.8). Figure 3.9 and Figure 3.11 show all the data for the O/Epa O/E scores and condition bands since this model has been used in the biomonitoring program (2015 – 2024). The raw macroinvertebrate data is provided in Appendix A.

In spring 2024, the most upstream site on the Ring River (R1) had the highest O/E scores for the O/Epa model, assessed as significantly impaired (band B) in one replicate and reference condition (band A) in the other (Table 3.2; Figure 3.8). No other sites were assessed higher than band C.

River health declined at the next site downstream (R2) which was assessed as severely impaired (band C) for both replicates. Site R3, which is immediately downstream from the Baker Creek inflow was assessed as extremely impaired (band D) for both replicates (Table 3.2; Figure 3.8). Site R5 was also assessed as extremely impaired for both replicates while the most downstream site on the Ring River was assessed as band C for both replicates (Table 3.2). The Baker Creek and Dolcoath Creek were both assessed in the extremely impaired range (Table 3.2; (Figure 3.8). Overall, the spring results show a clear trend for very poor river health in the Ring River downstream from where Bakers Creek enters.

A similar longitudinal pattern occurred for the autumn 2024 survey, except the highest O/E scores occurred at site R2 instead of R1 (Table 3.3). Site R2 was assessed as significantly impaired (band B) for one replicate and severely impaired for the other replicate. Site R1 was assess as severely impaired for both replicates (Table 3.3). The remaining sites on the Ring River were all assessed in the extremely impaired range (band D) as was Bakers Creek (Table 3.3; (Figure 3.8). There was insufficient flow to sample Dolcoath Creek in autumn 2025

The mean O/Epa river health scores from spring 2024 and autumn 2025 were consistent with the results from previous years (Figure 3.9 - Figure 3.11) as summarised below:

- Site R1 has usually been in the significantly impaired range (band B), but occasionally has been assessed as severely impaired (band C) on four occasions since 2015 including in autumn 2025;
- Site R2 has been in the severely impaired range on all but three occasions including in autumn 2025 which just fell into band B. The O/E score in autumn 2024 was on the boundary between significantly impaired and reference condition and is by far the highest score at this site.
- Site R3 has almost exclusively been in the extremely impaired range (band D) which continued in spring 2024 and autumn 2025.
- Site R5 and R6 have mainly been in the extremely impaired range which continued in spring 2024 and autumn 2025.
- Baker Creek has only had scores in the extremely impaired band and Dolcoath Creek has mainly been in this band including in spring 2024 (could not be sampled in autumn 2025).

Table 3.2: AusRivAS O/Epa model O/E scores, condition bands, number of taxa and EPT proportion for the spring 2024 survey.

Site	Site	Sample number	Spring 2024 river health outputs		Number of taxa	EPT proportion
			O/E	Band		
Ring River	R1	1	0.62	B	10	0.90
		2	0.9	A	14	0.86
	R2	1	0.48	C	9	0.89
		2	0.55	C	10	0.90
	R3	1	0.14	D	2	1.00
		2	0.21	D	3	0.67
	R5	1	0.21	D	4	1.00
		2	0.14	D	3	1.00
	R6	1	0.29	C	5	1.00
		2	0.29	C	7	1.00
Baker Creek	B1	1	0.07	D	2	0.50
Dolcoath Creek	D1	1	0.2	D	4	0.75

Table 3.3: AusRivAS O/Epa model O/E scores, condition bands, number of taxa and EPT proportion for the autumn 2025 survey.

Site	Site	Sample number	Autumn 2024 river health outputs		Number of taxa	EPT proportion
			O/E	Band		
Ring River	R1	1	0.3	C	9	0.44
		2	0.49	C	9	0.44
	R2	1	0.54	C	10	0.70
		2	0.61	B	12	0.58
	R3	1	0.09	D	3	0.67
		2	0.17	D	4	0.50
	R5	1	0.26	D	4	0.75
		2	0.17	D	3	0.67
	R6	1	0.16	D	3	0.67
		2	0.23	D	4	0.50
Baker Creek	B1	1	0.08	D	2	0.00
Dolcoath Creek	D1	-	-	-	-	-

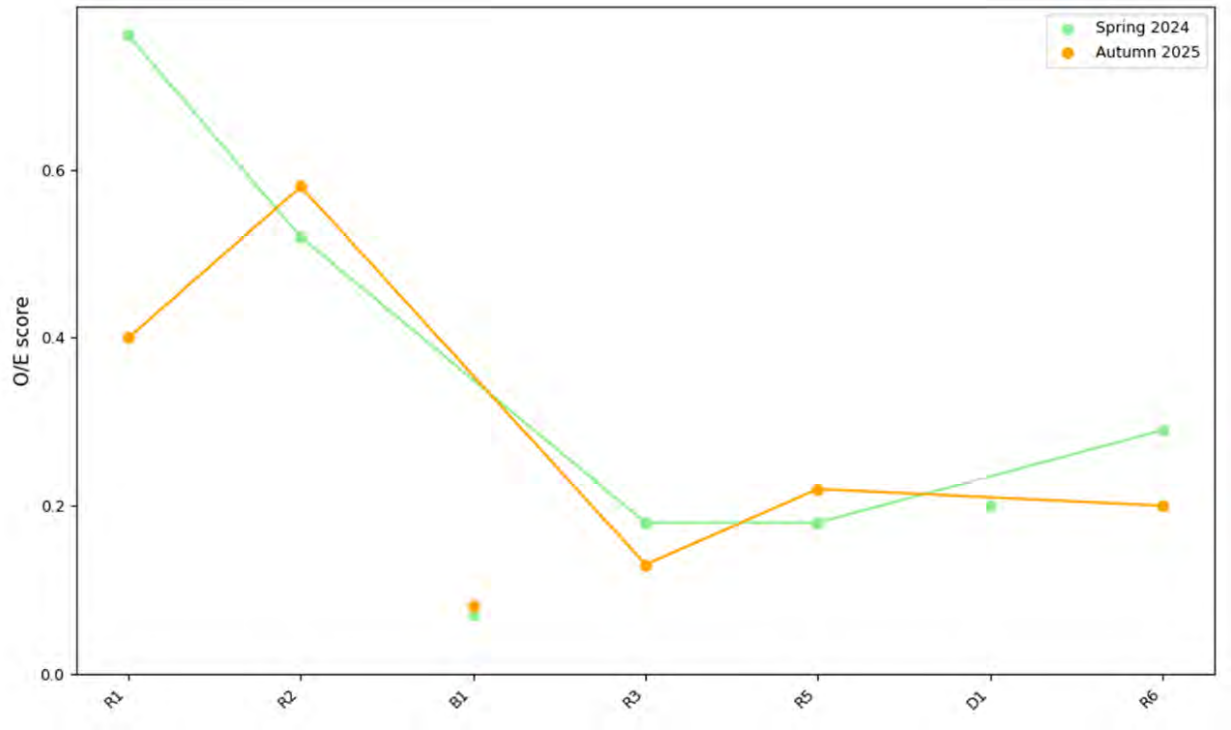


Figure 3.8: Mean AusRivAS O/Epa model O/E scores for the spring 2024 and autumn 2025 survey.

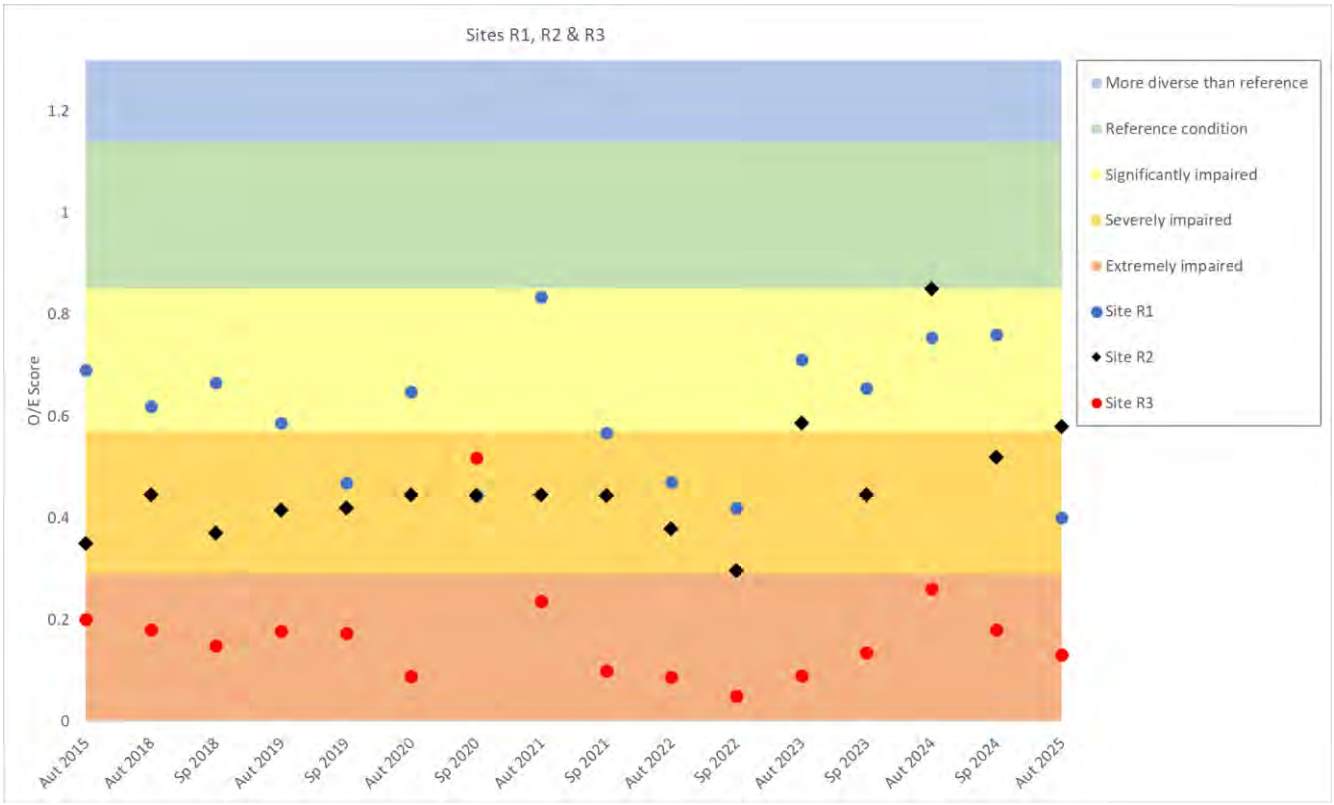


Figure 3.9: AusRivAS O/Epa model O/E scores and condition bands for Ring River sites R1, R2 and R3 from 2015 to 2025 (based on average score of two samples at each site).

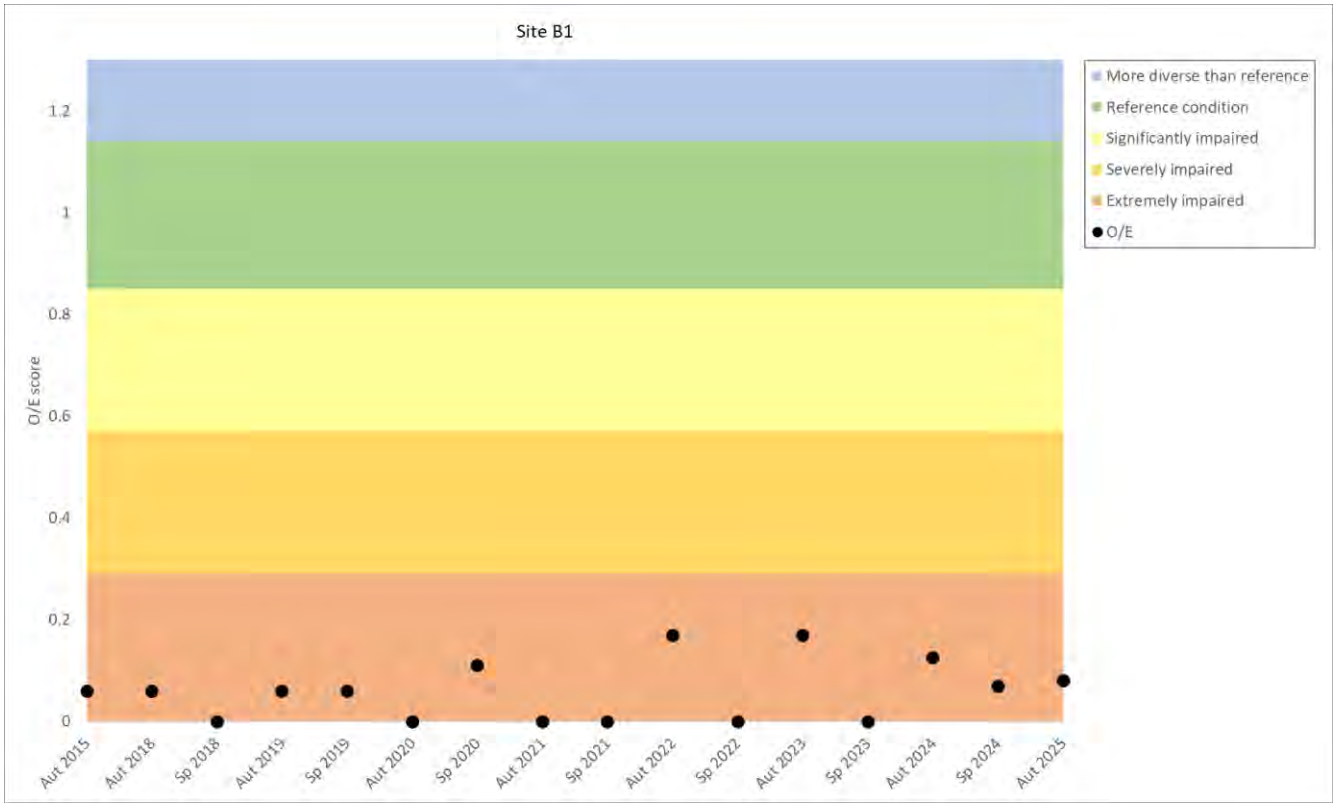


Figure 3.10: AusRivAS O/Epa model O/E scores and condition bands for Baker Creek (B1) from 2015 to 2025 (based on average score of two samples at each site).

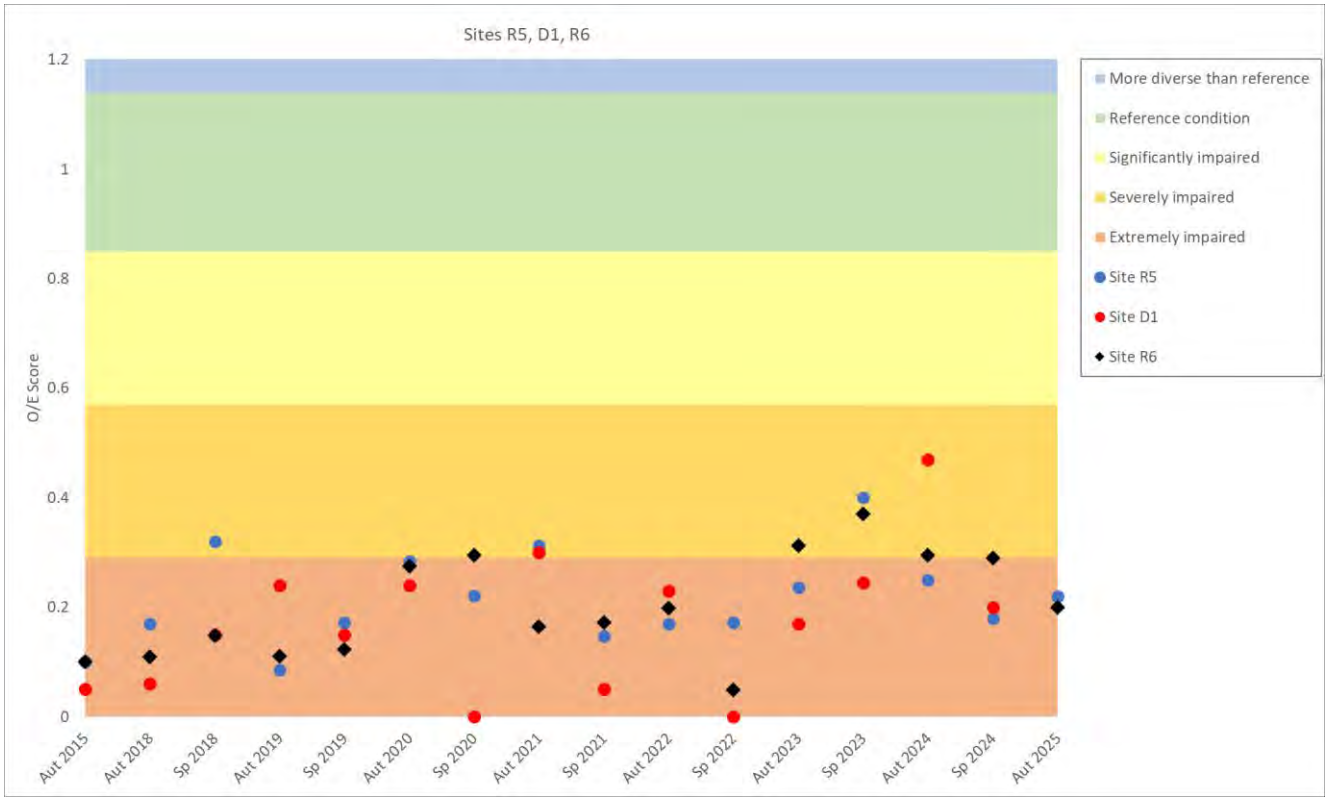


Figure 3.11 AusRivAS O/Epa model O/E scores and condition bands for Ring River sites R5 and R6 and for Dolcoath Creek (D1) from 2015 to 2025 (based on average score of two samples at each site).

3.2.2.5 TRCI macroinvertebrate condition score

The TRCI macroinvertebrate condition scores for spring 2024 and autumn 2025 are shown in Table 3.4 and Table 3.5. The raw data outputs and breakdown of the scoring system used to allocate a score for *Expectedness* (combination of the AusRivAS O/Epa O/E and SIGNAL scores), *Abundance* (total abundance from the Surber samples), and *Composition* (ratio of the proportion of EPT families to total families from the AusRivAS data) are provided in Appendix A.2.

The condition of all sites on the Ring River was rated as poor in both seasons (Table 3.4; Table 3.5). The poor rating is based on a combination of low O/E scores from the AusRivAS models (all sites were in the impaired bands) and low total abundance of macroinvertebrates from the Surber samples (all sites were well below the minimum threshold of 700 animals/m^2 which the TRCI assessment states for a site to be equivalent to reference condition).

The condition of Baker Creek was rated as poor in spring 2024 and very poor in autumn 2025. In spring 2024 this site had moderate *Expectedness* and *Composition* and low *Abundance* scores and in autumn 2025 was assessed as extra low for Composition (Table 3.4; Table 3.5).

Table 3.4: TRCI Macroinvertebrate scores for spring 2024

Site	Site code	Expectedness	Abundance	Composition	Condition
Ring River	R1	Moderate	Low	High	Poor
	R2	Moderate	Low	High	Poor
	R3	Moderate	Low	High	Poor
	R5	Moderate	Low	High	Poor
	R6	Moderate	Low	High	Poor
Baker Creek	B1	Moderate	Low	High	Poor

Table 3.5: TRCI Macroinvertebrate scores for Autumn 2025

Site	Site code	Expectedness	Abundance	Composition	Condition
Ring River	R1	Moderate	Low	High	Poor
	R2	Moderate	Low	High	Poor
	R3	Moderate	Low	High	Poor
	R5	Moderate	Low	High	Poor
	R6	Moderate	Low	High	Poor
Baker Creek	B1	Moderate	Low	Extra low	Very poor

3.3 Stitt River

3.3.1 Conductivity

Conductivity levels in the Stitt River ranged from 47 to 67 µS/cm in spring 2024 and 68 to 114 µS/cm in autumn 2025 (Figure 3.12).

There was a trend for increasing conductivity with distance downstream for both seasons but particularly from sites S3 to S6 in autumn 2025. Conductivity was generally lower at the Sterling River site compared to the Stitt River sites.

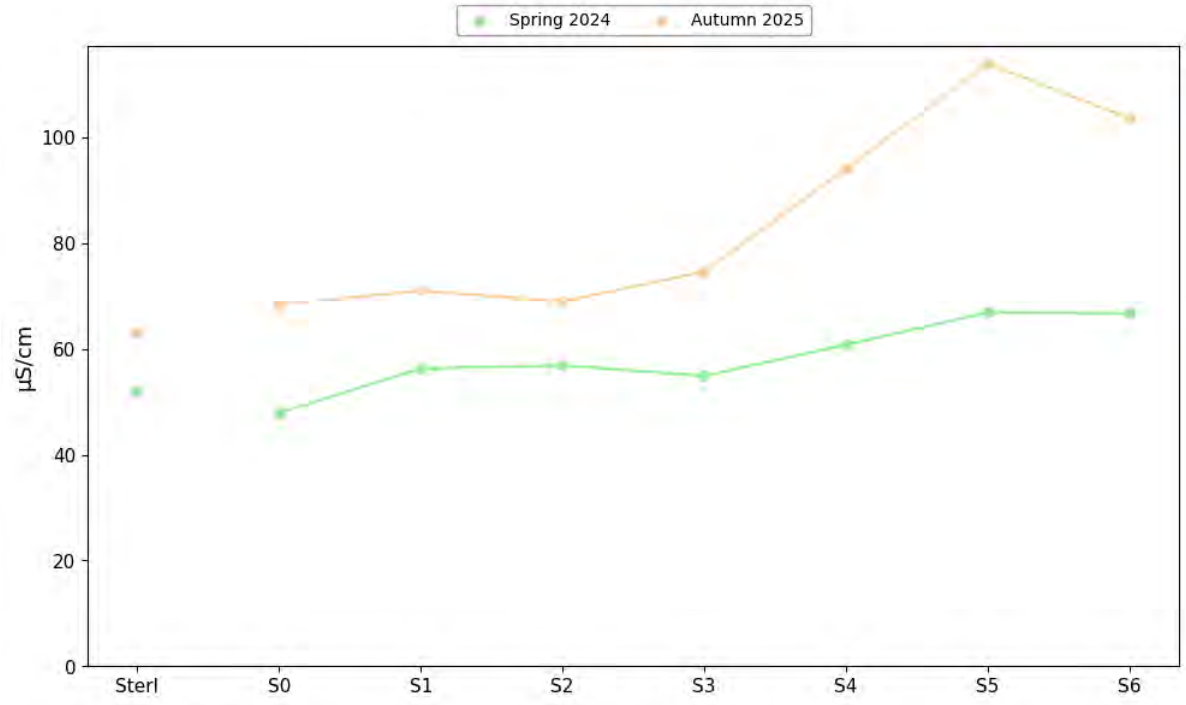


Figure 3.12: Conductivity (µS/cm) in spring 2024 and autumn 2025 at the Sterling River and Stitt River sampling sites.

3.3.2 Macroinvertebrates

3.3.2.1 Abundance – Surber data

The total abundance of macroinvertebrates was lower at all sites in spring 2024 compared to autumn 2025 (Figure 3.13).

For the spring 2024 survey, the total abundance at the reference sites varied between 290 at S0 and 770 animals/m^2 at S1. The total abundance at the sites downstream potential sources of MRCs (S3) ranged from 340 at S3 to 245 animals/m^2 at S6.

For the autumn 2025 survey, the total abundance at the reference sites varied between 735 at S0 and 1190 animals/m^2 at S1. The total abundance at the sites downstream potential sources of MRCs (S3 – S6) ranged from 290 animals/m^2 at S6 to 1285 animals/m^2 at S4 which was the highest abundance recorded at any site during the autumn survey.

The generally lower abundances in spring 2024 compared to autumn 2025 are likely related to prolonged periods of high flows preceding the spring 2024 survey (Section 3.1).

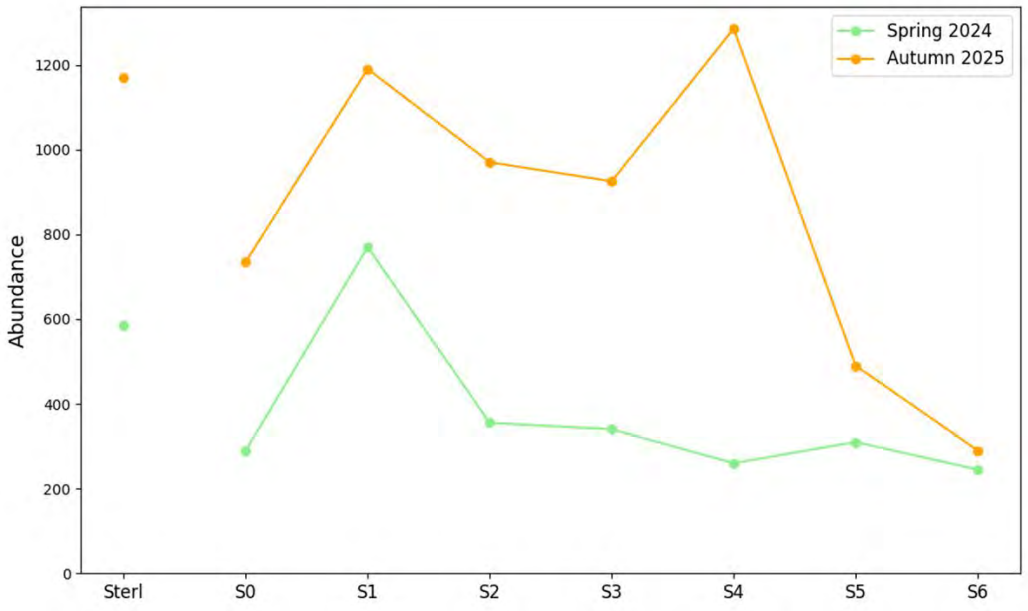


Figure 3.13: Total abundance (number of animals/m^2) of macroinvertebrates in the Sterling River and Stitt River sites in spring 2024 and autumn 2025.

3.3.2.2 Diversity

For most sites, the diversity of taxa between the spring 2024 and autumn 2025 survey was similar except for sites S3 and S4 where diversity was substantially higher during autumn (Figure 3.14). Overall, diversity tended to be higher at the reference sites (Sterl; S0 – S2) than the sites downstream potential sources of MRCs (S3 – S6), particularly for the spring 2024 survey.

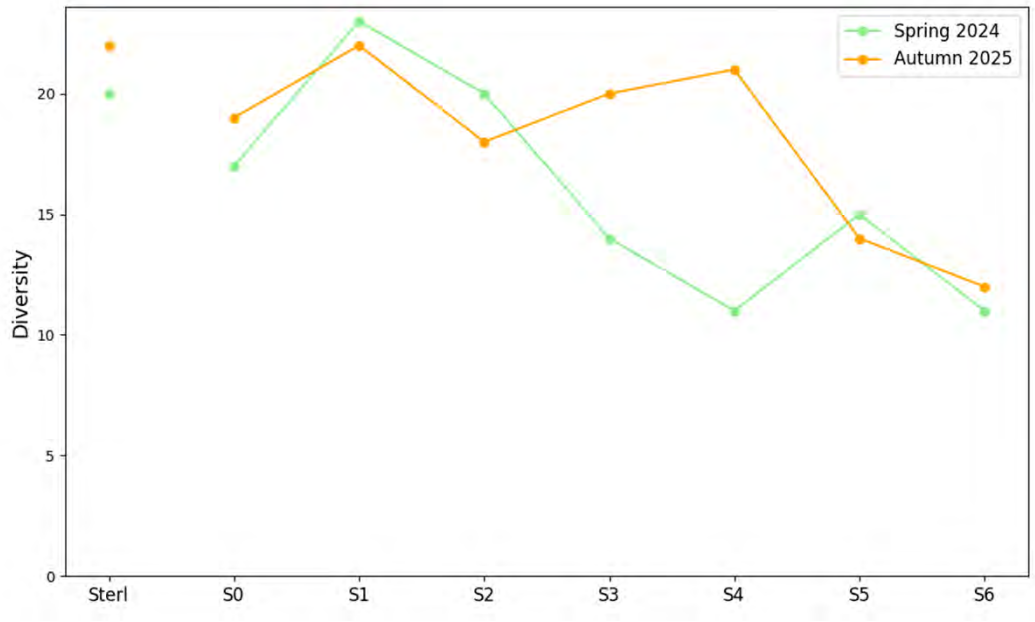


Figure 3.14: Number of families recorded from the Surber samples in the Sterling and Stitt River catchments in spring 2024 and autumn 2025.

3.3.2.3 Composition

A total of 33 taxa were recorded from the Surber samples in spring 2024 (Appendix B.1.1). In Spring 2024, the most common taxa across the sites were midge fly larvae in the sub-family Orthocladiinae; Leptophlebiidae mayflies and Gripopterygidae stoneflies. Leptophlebiidae mayflies and Gripopterygidae stoneflies are rated as highly sensitive to poor water quality based on the SIGNAL scoring system (discussed in more detail below) and were more abundant at the Stitt River sites S0 to S3 than S4 to S5. Beetles in the family Scirtidae and were also common at sites S3 to S6 but were absent or less common at the other sites.

In autumn 2025, 32 taxa were recorded from the Surber samples with the most common taxa midge fly larvae in the sub-family Chironominae and Orthocladiinae; Leptophlebiidae mayflies; and caddisflies in the family Hydropsychidae. As for the spring survey, Leptophlebiidae mayflies were far more abundant at the Sterling River and Stitt River sites S0 to S3 than at sites S4 to S6 and Scirtidae beetles were common at sites S3 to S6 but were absent or less common at the other sites.

Twelve taxa recorded from the Surber data in spring 2024/autumn 2025 are rated as highly sensitive to poor water quality by the SIGNAL scoring system (Chessman 2003) which mostly comprised of EPT fauna but included two dipteran families, elmid beetles and a dragonfly (Table 3.6). Four of these taxa were present at all sites (Elmidae; Gripopterygidae; Leptophlebiidae, Hydrobiosidae and Philorheithridae); however, of these five taxa, elmid beetles and Leptophlebiidae were more abundant at the Sterling River and the Stitt River site upstream of Site S4. Conoesucidae caddisflies were present at all sites other than S5 and S6 (Table 3.6).

In spring 2024, the proportional abundance of sensitive taxa was notably higher at the three Stitt River reference sites (S0 – S2) and Site S3 than Sites S4 – S6 (Figure 3.15). This pattern was repeated in the autumn 2025 survey but was not as strong (Figure 3.15). The proportional diversity of sensitive taxa also tended to be higher at the Stitt River reference sites than the sites downstream of potential sources of MRCs but this trend was less clear than for the proportional abundance. Also, site S6 had the highest proportional diversity of sensitive taxa of all sites during the spring 2024 survey (Figure 3.15).

Table 3.6: Taxa recorded in the Surber samples in spring 2024 and autumn 2025 rated as highly sensitive to poor water quality.

Order	Family/Sub-family	Common name	SIGNAL score	Sites present
Diptera	Athericidae	Water snipe fly	8	S1. S6
	Blephariceridae	Net-veined midges	10	S1, S2, S3
Coleoptera	Elmidae	Riffle beetle	7	All sites but far more abundant upstream of S4
Plecoptera	Eustheniidae	Stonefly	10	All sites except S5
	Gripopterygidae	Stonefly	8	All sites
Ephemeroptera	Leptophlebiidae	Mayfly	8	All sites but far more abundant upstream of S4
Trichoptera	Calocidae	Cased caddisflies	9	Sterl, S3
	Conoesucidae	Cased caddisflies	7	All sites except S5 and S6
	Philorheithridae	Cased caddisflies	8	All sites
	Philopotomidae	Free living caddisflies	8	Sterl, S1
	Hydrobiosidae	Free living caddisflies	8	All sites
Odonata	Telephlebiidae	Dragonfly	9	Sterl, S1

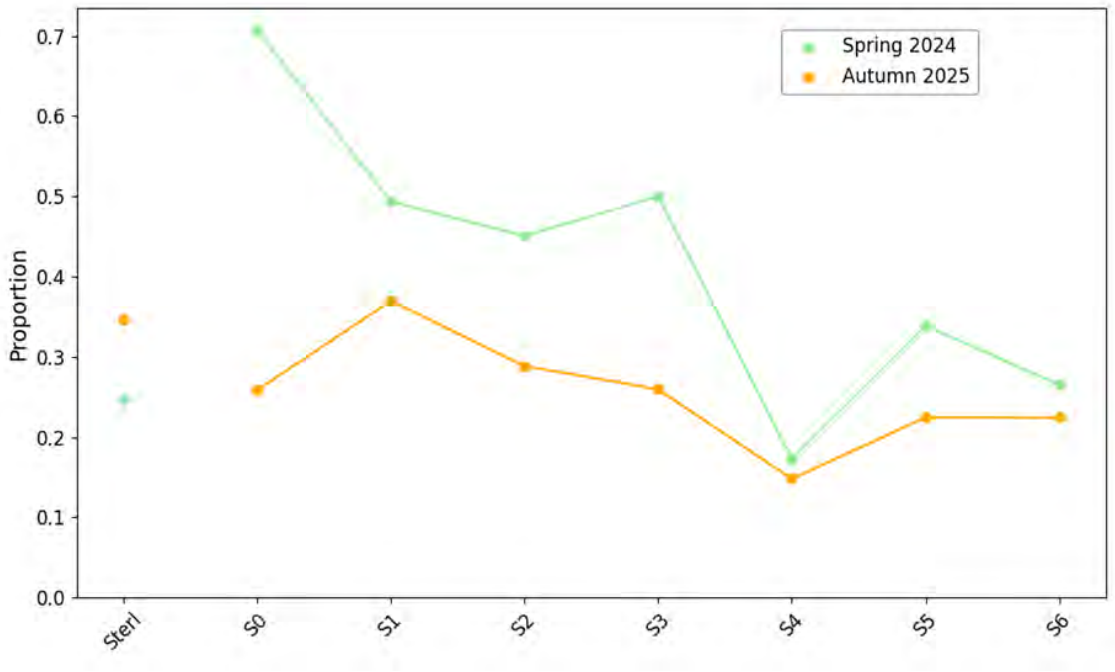


Figure 3.15: Proportion of total abundance for families rated as highly sensitive to poor water quality to total abundance in spring 2024 and autumn 2025.

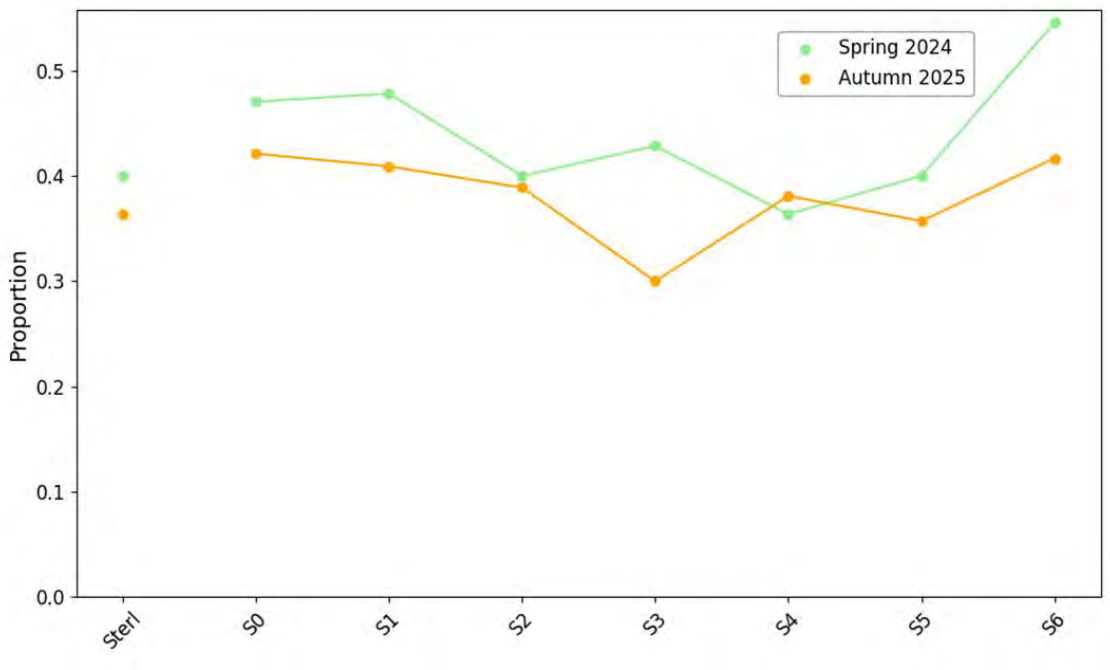


Figure 3.16: Proportion of the number of families rated as highly sensitive to poor water quality to total family number in spring 2024 and autumn 2025.

3.3.2.4 AusRivAS

The AusRivAS O/E scores and condition bands for the spring and autumn O/Epa models are provided in tables (Table 3.7 and Table 3.8) and graphically (Figure 3.17). Figure 3.18 to Figure 3.20 show all the O/E scores and condition bands since the O/Epa model has been used in the biomonitoring program (2015 – 2024). The raw macroinvertebrate data is provided in Appendix A.

In spring 2024, the two replicate AusRivAS samples from each site were rated as at least equivalent to reference condition (band A) except for two samples from the most downstream site on the Stitt River (S6) which were assessed as severely impaired (band C) (Table 3.7; Figure 3.17). The Observed/Expected (O/E) scores for the Sterling River reference site were at the very bottom of band A and lower than any of the Stitt River sites other than S6.

River health at the Stirling River site remained relatively low during autumn 2025. Of the two replicate samples, one was assigned to band B and the other to band A. The mean O/E score fell within the range indicative of significant ecological impairment (Table 3.8; Figure 3.17).

In autumn 2025, the three reference sites on the Stitt River were assessed as at least band A for each replicate, as were the first two Stitt River sites downstream MRCs (S3 and S4) (Table 3.8; Figure 3.17). However, both replicates at S5 were in band B and one of the two replicates at S6 was in band A and the other in band B (Table 3.8; Figure 3.17).

The patterns in mean O/Epa river health scores from 2015 to 2024 are summarised below and shown graphically in Figure 3.18 to Figure 3.20.

Reference sites

The Sterling River reference site has been in the reference condition range (band A) in 9 of 16 sampling occasions since 2015; the significantly impaired (band B) on 6 occasions; and in the severely impaired band (band C) on 2 occasions (Figure 3.18). The relatively high number of impaired ratings for an unregulated site which has no obvious catchment impacts is unusual.

The Stitt River site S0 has been in the reference condition, or more diverse than reference, on 14 of 18 occasions and in the significantly impaired band on 4 occasions (Figure 3.18). The Stitt River site S1 has been in the reference condition, or more diverse than reference, on 13 of 16 occasions and in the significantly impaired band on 3 occasions (Figure 3.19). The Stitt River site S2 has been in the reference condition, or more diverse than reference, on 8 of 16 occasions and in the significantly impaired band on 8 occasions (Figure 3.19).

Stitt River sites downstream from MRCs:

Site S3 and S4 have been in the reference condition, or more diverse than reference, on 7 of 16 occasions and in the significantly impaired band on 9 occasions. S3 and S4 have been in band A or better range for the last five sampling events which is by far the highest number of consecutive scores in the healthy range for these sites (Figure 3.19; Figure 3.20).

Site S5 has mainly been in the significantly impaired band, but recorded reference condition in 2015 and on four consecutive occasions from 2023 to 2024 before falling into band B during the last sampling occasion in autumn 2025 (Figure 3.20).

Site S6 has been in the significantly impaired band on all occasions other than in spring 2018 (extremely impaired) and in autumn 2024 when it was rated as equivalent to reference condition Figure 3.20). The mean O/E score at this site was only just outside band A in autumn 2025.

Table 3.7: AusRivAS O/Epa model O/E scores, condition bands, number of taxa and EPT proportion for the spring 2024 survey in Sterling and Stitt River catchments.

Site	Sample number	Spring 2024		Number of taxa	EPT proportion
		O/E	Band		
Sterling	1	0.86	A	18	0.44
	2	0.86	A	18	0.44
S0	1	1.03	A	17	0.47
	2	0.96	A	17	0.53
S1	1	1.15	X	18	0.44
	2	1.01	A	15	0.53
S2	1	1.03	A	17	0.47
	2	0.9	A	15	0.53
S3	1	1.03	A	19	0.42
	2	0.95	A	17	0.41
S4	1	1.01	A	20	0.40
	2	1.01	A	20	0.35
S5	1	0.93	A	17	0.41
	2	0.93	A	17	0.47
S6	1	0.47	C	10	0.50
	2	0.47	C	11	0.45

Table 3.8: AusRivAS O/Epa model O/E scores, condition bands, number of taxa and EPT proportion for the autumn 2025 survey in the Sterling and Stitt River catchments.

Site	Sample number	Autumn 2025		Number of taxa	Number of EPT families
		O/E	Band		
Sterling	1	0.89	A	16	0.44
	2	0.57	B	12	0.67
S0	1	0.96	A	17	0.59
	2	1.12	A	20	0.60
S1	1	1.32	X	19	0.42
	2	1.1	A	17	0.59
S2	1	1.1	A	16	0.56
	2	1.03	A	18	0.56
S3	1	1.06	A	19	0.53
	2	0.99	A	16	0.50
S4	1	1.16	X	17	0.53
	2	1.01	A	16	0.50
S5	1	0.8	B	12	0.50
	2	0.72	B	12	0.42
S6	1	0.73	B	13	0.38
	2	0.95	A	15	0.47

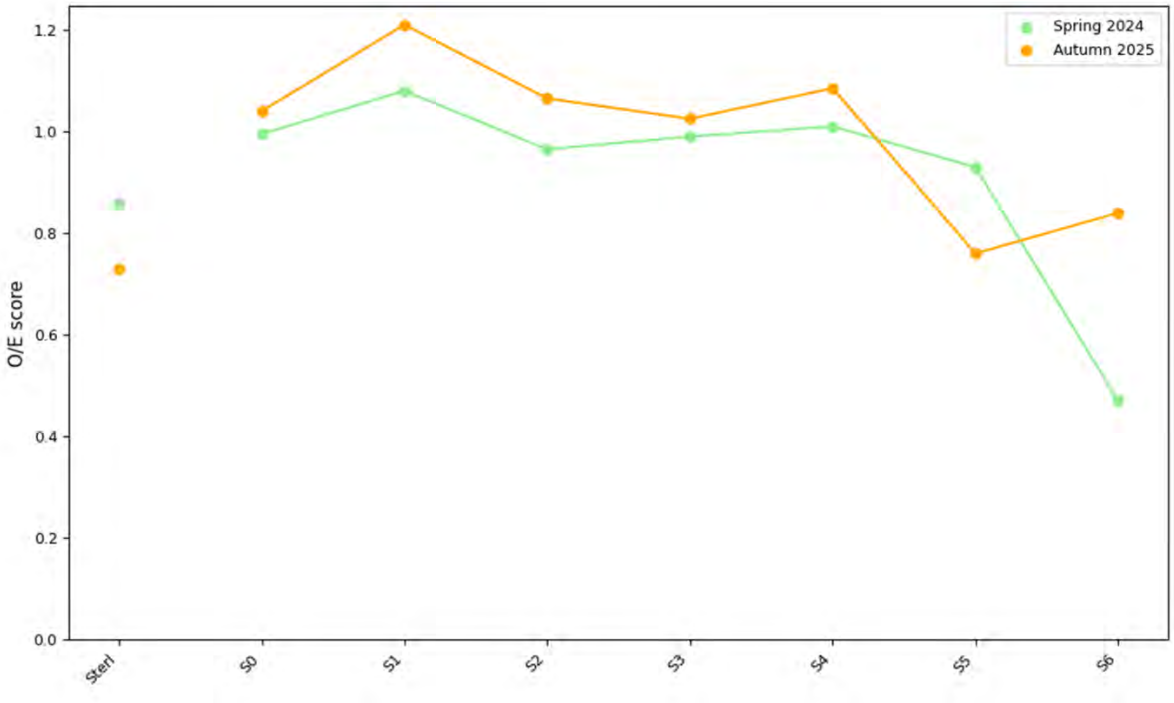


Figure 3.17 AusRivAS O/Epa model O/E scores for the spring 2024 and autumn 2025 survey in the Sterling and Stitt River catchments.

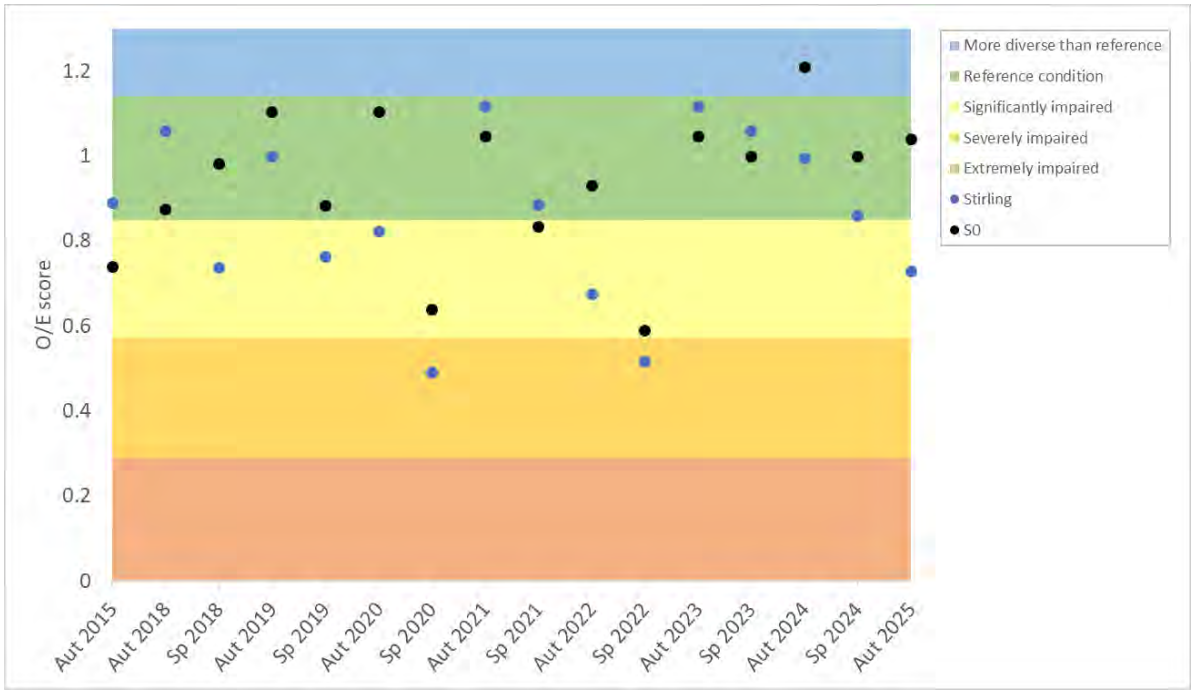


Figure 3.18: AusRivAS O/Epa model O/E scores and condition bands for the Sterling River and Stitt River site S0 from 2015 to 2025 (based on average score of two samples at each site).

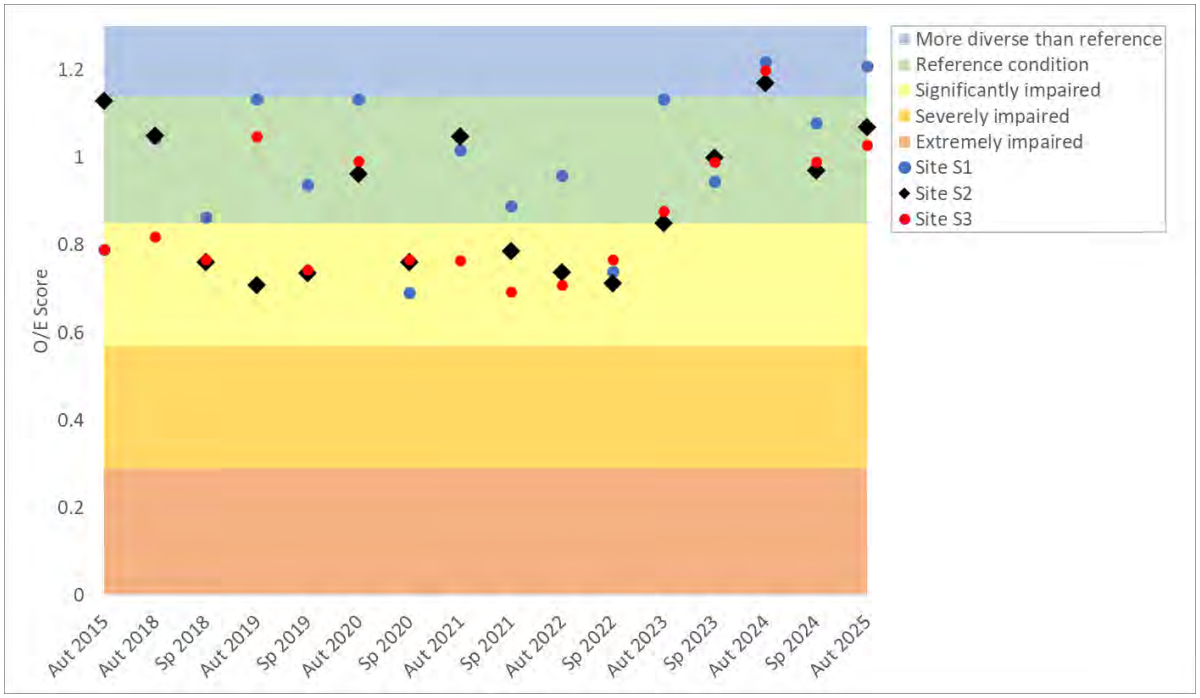


Figure 3.19: AusRivAS O/Epa model O/E scores and condition bands for the Stitt River sites S1, S2 and S3 from 2015 to 2025 (based on average score of two samples at each site).

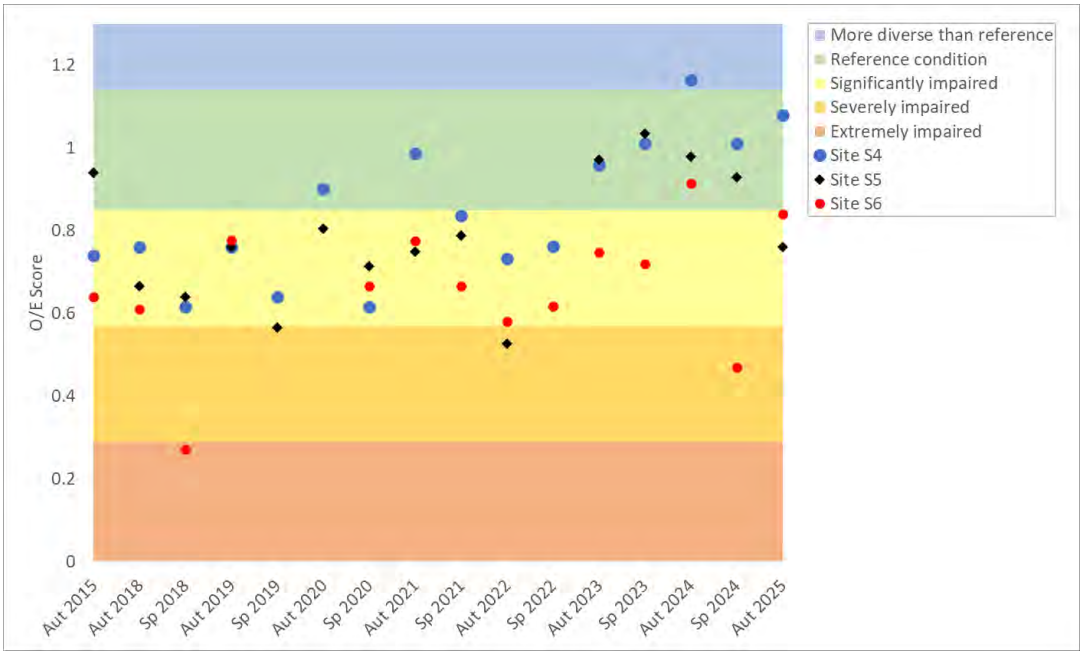


Figure 3.20: AusRivAS O/Epa model O/E scores and condition bands for the Stitt River sites S4, S5 and S6 from 2015 to 2025 (based on average score of two samples at each site).

3.3.2.5 TRCI

The TRCI macroinvertebrate condition scores for spring 2024 and autumn 2025 are shown in Table 3.9 and Table 3.10. The raw data outputs and breakdown of the scoring system used to allocate a score for *Expectedness* (combination of the Ausrivas O/Epa O/E and signal scores), *Abundance* (total abundance from the Surber samples), and *Composition* (ratio of the proportion of EPT families to total families from the AusRivAS data) are provided in Appendix B.2.

The TRCI condition scores for *Expectedness* was high for all sites in spring 2024, other than Stitt site S6, because the O/E scores and Signal O/E scores were in the high range (Table 3.9). Stitt site S6 was rated as moderate for *Expectedness* because the AusRivAS O/E score was in the impaired range. The *Composition* scores were high for all sites because EPT families formed at least 35% of the families present (Appendix B.2). The overall TRCI condition score was assessed as moderate at all sites other than S1 which was assessed as good and S6 which was assessed as poor. The sites assessed as in moderate condition were because the abundance score was below the 700 animals/m^2 threshold for a high (healthy) abundance score. Site S1 was assessed in good condition because the abundance score was above the 700 animals/m^2 threshold and site S6 was assessed as poor condition because it had a low AusRivAS and a low abundance score (Table 3.9).

In autumn 2025, sites S0 – S4 were assessed in good condition as they had maximum scores *Expectedness, Abundance* and *Composition* (Table 3.10). The Sterling River site was assessed in poor condition because of the impaired AusRivAS score. Sites S5 and S6 were assessed in poor condition because of the impaired AusRivAS score and low *Abundance* score (Table 3.10).

Prior to 2023/24, TRCI condition scores were only calculated on the autumn data and this is available for autumn 2018 to autumn 2025 (Table 3.11). The condition ratings have varied between and within sites over time; however, a moderate rating has been applied more often than either good or poor ratings at nearly all the sites (Table 3.11). In nearly every instance, a medium rating was caused by a low abundance score, rather than either a low expectedness or composition score. This may indicate that

abundances are naturally low in the Stitt River given that a low abundance rating has been common in the reference sites.

Table 3.9: TRCI Macroinvertebrate scores for spring 2024

Macroinvertebrate condition score					
Site	**Code**	**Expectedness**	**Abundance**	**Composition**	**Condition**
Sterling R.	Sterl	H	L	H	Moderate
Stitt R.	S0	H	L	H	Moderate
	S1	H	H	H	Good
	S2	H	L	H	Moderate
	S3	H	L	H	Moderate
	S4	H	L	H	Moderate
	S5	H	L	H	Moderate
	S6	M	L	H	Poor

Table 3.10: TRCI Macroinvertebrate scores for autumn 2025

Site	**Code**	**Expectedness**	**Abundance**	**Composition**	**Condition**
Sterling R.	Sterl	M	H	H	Poor
Stitt R.	S0	H	H	H	Good
	S1	H	H	H	Good
	S2	H	H	H	Good
	S3	H	H	H	Good
	S4	H	H	H	Good
	S5	M	L	H	Poor
	S6	M	L	H	Poor

Table 3.11: Available TRCI condition scores for autumn from 2018 to 2025 for the Sterling and Stitt rivers

Site	**Autumn 2018**	**Autumn 2019**	**Autumn 2020**	**Autumn 2021**	**Autumn 2022**	**Autumn 2023**	**Autumn 2024**	**Autumn 2025**
Sterling	Mod.	Good	Mod.	Mod.	Poor	Good	Mod.	Poor
S0	Mod.	Mod.	Mod.	Mod.	Poor	Mod.	Mod.	Good
S1	Good	Mod.	Good	Mod.	Mod.	Mod.	Mod.	Good
S2	Mod.	Mod.	Good	Mod.	Poor	Mod.	Mod.	Good
S3	Mod.	Good	Good	Poor	Poor	Mod.	Good	Good
S4	Mod.	Mod.	Mod.	Mod.	Poor	Mod.	Mod.	Good
S5	Poor	Mod.	Mod.	Poor	Poor	Mod.	Good	Poor
S6	Poor	Poor	-	Poor	Poor	Mod.	Mod.	Poor

3.3.3 Fish

As is typical for the Stitt River sites, introduced brown trout (*Salmo trutta*) were the only species recorded in spring 2024 and autumn 2025 (Table 3.12). A range of size classes of brown trout were recorded from juveniles to adult. In addition to brown trout, four spotted galaxias (*Galaxias truttaceus*) were recorded in the Sterling River site during the autumn 2024 survey. The conditions for electrofishing in spring 2024 were poor due to elevated river flows and sites S0, S1 and S6 could not be fished.

The following discussion and analysis exclude the data for site S6 as only a short reach can be fished and much of the available habitat is difficult to survey efficiently (i.e. areas of deep water and small cascades). Some analyses also excluded sites S0 and S4 for reasons outlined below.

From 2006 to 2022, the mean abundance of trout has generally been substantially lower at the sites downstream sources of MRCs compared to the reference sites (Figure 3.21). However, this was not the case for the previous monitoring period in spring 2023 and autumn 2024 (Entura 2024). In spring 2023, the mean number of trout caught per site was higher at sites downstream sources of MRCs compared to the reference sites which has not occurred since the monitoring program began (Entura 2024). In autumn 2024, the mean catch was similar between the reference sites and sites downstream MRCs (Entura 2024).

In spring 2024, the catches were low across all sites, but the mean number of trout was slightly higher at the sites downstream from MRCs compared to the reference sites (Figure 3.22). This pattern was reversed in autumn 2025 but was driven by the very high abundance (52) of trout at the Sterling River which is the highest catch recorded over the course of the monitoring program (Figure 3.22). Without including the catch from the Sterling River, the sites downstream from MRCs had a higher mean abundance of trout (14) in autumn 2025 compared to mean catch (7) at the reference sites on the Stitt River.

Figure 3.23 provides a visual representation of the mean catch per survey at the reference sites S1 and S2 and the absolute catch at S3 and S5 since the monitoring program began. These sites were chosen because fishing conditions are generally good (i.e. most areas of the channel can be accessed) and are comparable between the sites. Sites S0, S4 and S6 were excluded because they are all difficult to survey effectively due to steep gradients and or long sections of deep run/pool habitat which either cannot be surveyed effectively or cannot be accessed at all.

Catches at site S3 have been highly variable since the monitoring program began but have generally been lower than the catches at the reference sites from 2006 to autumn 2022 (Figure 3.23). From spring 2022 to autumn 2025 the catches at S3 have been higher than the catches at S1 and S2 on five of six occasions (Figure 3.23). Very few fish were caught at site S5 from 2006 to spring 2020. There has been a noticeable increase in fish at sites S3 and S5 from 2021 to 2025 and this site has recorded the highest number of fish among the Stitt River sites on four of six occasions since spring 2022 (Figure 3.23).

Table 3.12: Brown trout caught in spring 2024 and autumn 2025 in the Sterling and Stitt rivers.

Type	Site	Spring 2024	Autumn 2025
Reference sites	Sterling R.	8	52
	Stitt R. S0	NA	NA
	Stitt R. S1	NA	4
	Stitt R. S2	6	10
Downstream tailings dam	Stitt R. S3	8	13
	Stitt R. S4	5	10
	Stitt R. S5	14	20
	Stitt R. S6	NA	NA

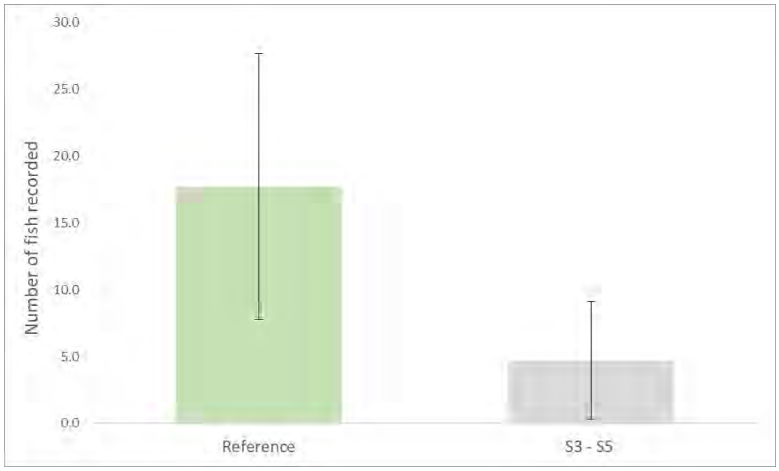


Figure 3.21: Mean number of brown trout caught at reference sites (Sterling, S0 – S2) and Stitt River sites downstream sources of MRCs (S3 – S5) from 2006 – 2022. Error bars show the standard deviation.

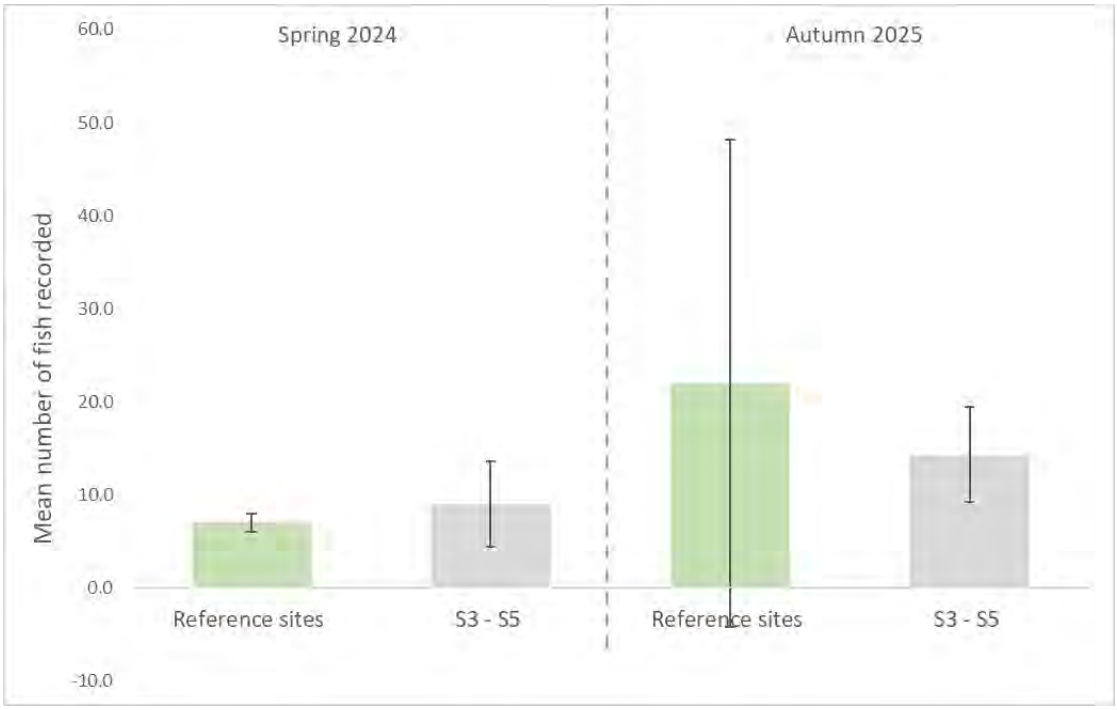


Figure 3.22: Mean number of brown trout caught at reference sites (Sterling and S2) and Stitt River sites downstream sources of MRCs (S3 – S5) in spring 2024 and autumn 2025. Error bars show the standard deviation.

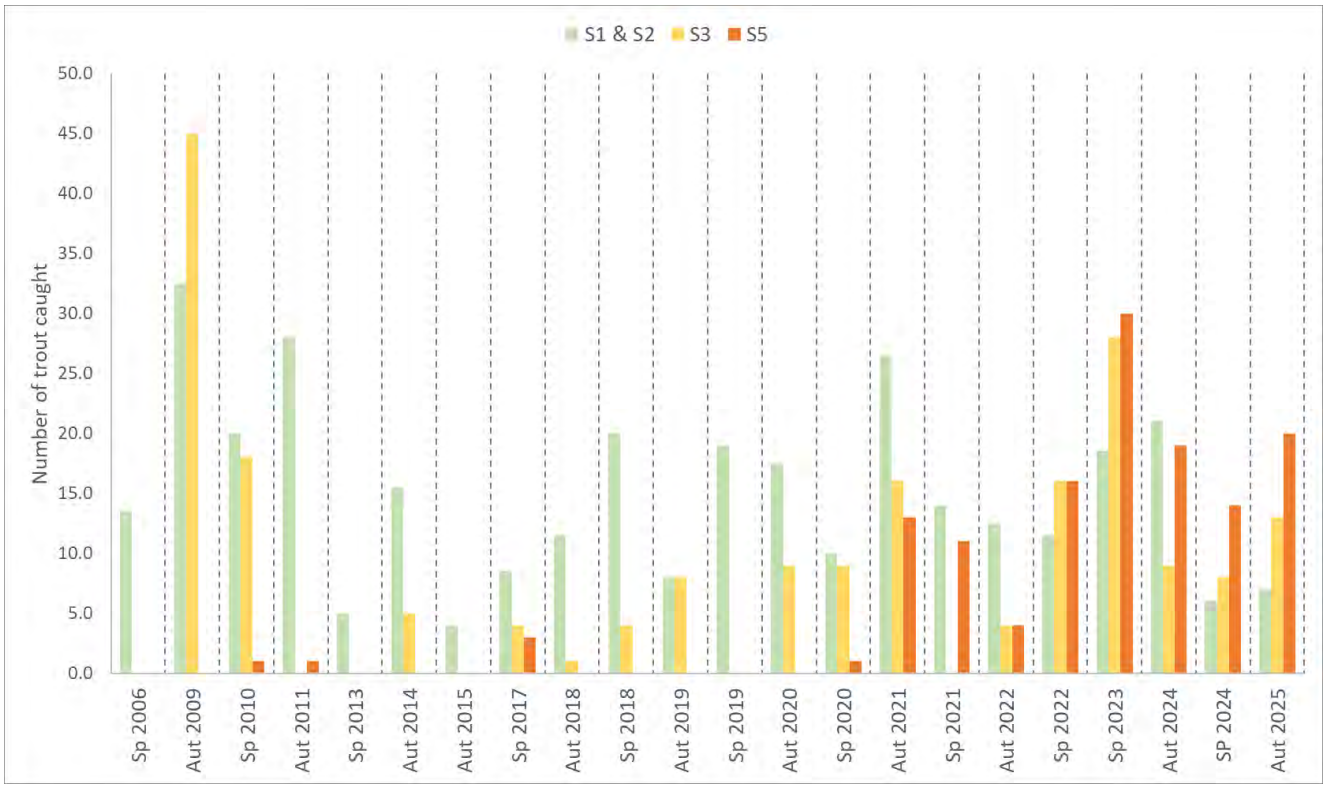


Figure 3.23: Abundance of trout recorded in the Stitt River reference sites (average of catches at S1 and S2) and sites downstream sources of MRCs (site S3 and S5) from 2006 to 2025.

4. Discussion

As noted in previous assessments, the Stitt River is in substantially better condition than the Ring River (FBM 2023). Sites in the Ring River catchment remain in an impaired condition; however, the macroinvertebrate and fish populations in the Stitt River downstream sources of MRCs have shown improvement since the monitoring program began in 2005, particularly from 2021 to autumn 2025.

4.1 Ring River

The legacy of pollution from the areas impacted by the Hercules Mine, particularly via Baker Creek, continues to impact the catchment. All the macroinvertebrate measures used (total abundance, diversity, composition, AusRivAS and the TRCI macroinvertebrate condition scores) indicate that the Ring River sites are in poor to extremely poor condition, particularly downstream of Baker Creek which is a major source of contaminants.

Although the sites are still impaired, some macroinvertebrate indicators suggest that the two Ring River sites upstream of the Baker Creek inflow are in better condition than those downstream. However, this upstream-downstream difference was less pronounced than during the spring 2023 and autumn 2024 monitoring period (Entura 2024). In spring 2024 and autumn 2025 the AusRivAS O/E scores providing the clearest evidence of the difference between the sites up and downstream from the Baker Creek inflow. Baker and Dolcoath creeks remain in a highly degraded condition.

4.2 Stitt River

4.2.1 Macroinvertebrates

Site S6 reported poor AusRivAS scores for both replicates in spring 2024 and for one replicate in autumn 2025. Despite this, the AusRivAS scores at S6 in autumn 2025 were the second highest reported at this site (the highest was in autumn 2024). Site S5 reported healthy AusRivAS scores in spring 2024 but poor scores in autumn 2025. Sites S3 and S4 reported AusRivAS scores in both seasons and have had five consecutive reference condition scores from autumn 2023 to autumn 2025. Prior to this, these sites have never had consecutive reference condition scores since the use of the O/Epa model began in 2015. Overall, the AusRivAS outputs suggest that the sites downstream sources of MRCs have improved, particularly over the last four years.

The TRCI condition scores are somewhat consistent with the AusRivAS outputs but the inclusion of total abundance in the TRCI metric significantly influences the condition ratings. Total abundances were substantially lower for the spring 2024 survey than the autumn 2025 survey at all sites except for S6 where abundances were similar between the seasons. The generally low abundances in spring 2024 were almost certainly related to the impacts of prolonged high flows in the months prior to the survey.

The total abundances in spring were below the 700 animals/m^2 that is rated as a good condition by the TRCI method at all sites other than S1. Lower abundances of macroinvertebrates following spate conditions is a natural process and is not indicative of poor condition. However, the TRCI rating system is heavily influenced by the abundance score. The low abundance scores in spring 2024 resulted in only a moderate health score for most of the sites, despite the healthy AusRivAS scores and healthy diversities of EPT taxa. Therefore, TRCI does not provide a useful condition score following spate conditions and further discussion of potential inconsistences with the TRCI method is provided below.

4.2.1.1 Potential links to MRCs

Low productivity/abundance can be caused by poor water quality and habitat quality associated with mining related impacts. Low total abundances of macroinvertebrates have previously been reported at the sites downstream from potential MRCs, particularly at site S5 and S6 which are the sites with the highest exposure to pollution sources from mining legacy around the town of Rosebery (Entura 2024).

Site S6 is likely the site most affected by MRCs from historic mining practices as it lies downstream of both Rosebery Creek and Primrose Creek—the two primary waterways draining the northern part of the town into the Stitt River (Koehnken 2024). Macroinvertebrate data from site S6 are consistent with greater influence from MRCs compared to sites S3 through S5, with generally lower total abundances, taxonomic diversity, and observed/expected (O/E) scores recorded in both the 2024/25 monitoring period and previous years.

Although Site S5 is located upstream of Rosebery Creek and Primrose Creek, it may still be influenced by inputs of contaminated water via seepage, stormwater runoff, or groundwater discharge from the town. Town drainage may also impact sites S4 and S3; however, these upstream sites, especially S3, are likely less exposed to town drainage.

Further analysis of historical water quality data could help identify potential point sources of MRCs. In addition, implementing spot water sampling for metal, conducted concurrently with the biomonitoring program and at the same site, may improve interpretation of macroinvertebrate data and strengthen attribution of any observed impacts.

The autumn 2025 survey was undertaken after a prolonged period of very low flows and sites S5 and S6 had substantially lower abundances than all sites and were the only sites to be below the 700 animals/m^2. These results are consistent with evidence of mining legacy impacts on the productivity of sites S5 and S6. By contrast, the abundance data at sites S3 and S4 were similar to those of the reference sites in both seasons which is consistent with the healthy AusRivAS scores at S3 and S4.

Some of the common taxa rated as highly sensitive to poor water quality by the SIGNAL method were absent or in low abundance at sites S4, S5 and S6. These included mayflies, elmid beetles and Conoesucidae caddisflies. The physical habitat conditions between the sites are quite similar and this cannot explain differences in the abundances of these taxa which suggest that their low abundance from sites S4 to S6 could be related to MRCs. These results are consistent with those reported for the 2023/24 period (Entura 2024).

4.2.1.2 Issues with the TRCI aquatic life index

Moderate TRCI condition ratings have been common at the monitoring sites since 2018, including at the reference sites on the Sterling and Stitt rivers. In nearly every instance, the moderate rating was because the abundance score was low, while expectedness and composition scores were in the high range. This may indicate that macroinvertebrate abundances are naturally low in these catchments.

It is questionable whether relatively small reductions in abundance below a threshold which does not consider regional differences in productivity are an appropriate measure of the health of macroinvertebrate communities in Tasmania. The metrics which use the presence or absence of taxa (AusRivAS), or presence of taxa expected under good habitat and water quality conditions (EPT diversity/abundance; SIGNAL scores) may be better indicators for MMG's biomonitoring program than the TRCI condition assessment.

Flaws in the TRCI's Aquatic Life Index are acknowledged by the Water Management Branch of NRE Tas and they do not use TRCI for their own river health programs, nor do they recommend that others use it (Scott Hardie, WMB, personal communication). The WMB trialled the Aquatic Life Index in the Ringarooma River catchment but concluded that the rule sets behind it would need to be refined before this could be considered a useful tool (DPIPWE 2014).

Despite these criticisms of the TRCI method, the abundance data from the Surber samples is useful because it allows a comparison of benthic productivity between the sites. Also, quantitative data from the Surber samples is superior to qualitative AusRivAS data for analysing the diversity and composition of macroinvertebrate communities.

4.2.2 Fish populations

Fish data is often difficult to interpret in biomonitoring assessments because fish communities are far harder to sample efficiently compared to macroinvertebrate communities. Also, the distribution of native fish in Tasmania is heavily influenced by the presence of introduced species and by hydro-power dams which at least limit but usually prevent the upstream migration of native species.

For fish monitoring in the MMG program, brown trout (*Salmo trutta*) are the only species which are likely to be an indicator of potential changes in habitat suitability/water quality. Occasional catches of native short-finned eels have occurred at some sites, but these are likely from stocking programs which distribute catches of eels into hydropower impoundments. Native climbing galaxias (*Galaxias brevipinnis*) and spotted galaxias (*Galaxias truttaceus*) have also occasionally been recorded at some sites, but their occurrence is too rare to be useful for biomonitoring.

Despite these limitations, the abundance of brown trout has increased at the sites downstream from sources of MRCs. The survey in spring 2023 was the first time that the mean abundance of trout exceeded those at the reference sites. The mean abundance between these site groups was nearly identical in autumn 2024 which suggest that the spring 2023 results were not an anomaly. Although the fish survey was reduced in spring 2024 due to flow conditions, the mean abundance of fish was still higher at the sites downstream MRCs in spring 2024 than at the reference sites and was only lower than the reference sites in autumn 2025 because of a very high abundance at the Sterling River reference site. In particular, the fish data shows a substantial increase in the abundance of trout at site S5 from the autumn in 2021 to 2025.

Overall, the fish monitoring supports the evidence from the macroinvertebrate data that river health is improving in the Stitt River downstream from sources of MRCs.

4.3 Recommendations

- Integration of biomonitoring results with detailed water quality data. MMG undertake regular water quality sampling in the catchments of the Stitt and Ring rivers. Analysis and discussion on the detection of "impact" and a comparison to current ANZECC/ARMCANZ guideline values may assist interpretation of the biomonitoring data.
- The collection of spot water samples analysed for metals at the biomonitoring sites at the same time as the biomonitoring program is conducted.
- Consideration to running the rank abundance (O/Erk) AusRivAS models in addition to the presence absence models would provide another line of evidence in the monitoring program.

- Further taxonomic identification to species for selected families may provide additional insights to differences between the sites and detection of impacts relating to MRCs. That is within invertebrate families, there may be differences in tolerances to water quality conditions. This information is masked by family level data.
- Multivariate statistics such as MDS plots could be used to interpret the similarity/dissimilarity of the communities. This was done in early assessments and may be informative, particularly as the macroinvertebrate communities downstream the 2/5 Dam have shown recent improvement.
- A trend analysis could be used to test the statistical significance of changes in macroinvertebrate indicators over time. This analysis is used by NRE Tas for detecting and reporting trends in river health at their long-term monitoring sites. In recent years, Entura have also been using the trend analysis for Hydro Tasmania's long term monitoring sites using the Time Trends Software (v 8.0, Jowett Consulting).
- Consider discontinuing calculation of the TRCI Aquatic Life Index for the reasons discussed above but continue with the Surber sampling as it provides valuable information on abundance data and is a provides a better of total diversity than the AusRivAS methods.
- Consideration to remove electrofishing from the program at sites S0 and S6. Fishing conditions at these sites are difficult and potentially unsafe, particularly under elevated flows, and the data is not directly comparable to the other sites.

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Appendices

A Ring River data

A.1 Macroinvertebrate data

A.1.1 Surber data: spring 2024

Class	Order	Family	R1	R2	R3	R5	R6	B1
Nematoda				1				
Annelida	Oligochaeta		5	1	2	2	1	
Arachnida	Acarina			1			1	
Crustacea	Amphipoda	Paramelitidae				1		
Insecta	Plecoptera	Eustheniidae	4	4		10	4	
		Austroperlidae					1	
		Gripopterygidae	1	2	1	4	3	1
		Notonemouridae	3	17		8	38	
	Ephemeroptera	Leptophlebiidae		4	2			
		Baetidae						1
		Pyralidae			1			
	Collembola					2	1	
	Diptera	subfam: Chironominae	1					
		subfam: Orthocladiinae	18	19	7	9	8	3
		Simuliidae	1	8	3		1	1
		Athericidae					3	
		Empididae		1				
		Sciomyzidae	1					
		Dip. Unid. Pup.	2		1	1	3	
	Trichoptera	Calocidae					1	
		Hydrobiosidae			1			
		Hydropsychidae			1		1	
		Philorheithridae		1	1			
		Trich. Unid. Pup.				1		
	Coleoptera	ScirtidaeL	2	11				
		COUNT	10	12	10	9	13	4
		Abundance	38	70	20	38	66	6
		Abundance per m^2	190	350	100	190	330	30

A.1.2 Surber data: autumn 2025

Class	Order	Family	R1	R2	R3	R5	R6	B1
	Gastropoda	Hydrobiidae	1		1			
		Physidae				1		
		Glacidorbidae		1				
Annelida	Oligochaeta		1	3	1	1	1	
Crustacea	Amphipoda	Paramelitidae				1		
Insecta	Plecoptera	Eustheniidae	4	6	1	1	2	
		Austroperlidae	1	1				
		Gripopterygidae	2	8		1		
		Notonemouridae	7	9		1	2	
	Ephemeroptera	Leptophlebiidae	4	3	1			
	Hemiptera	Corixidae		1				
	Collembola		1					
		subfam: Chironominae		4		12	4	
		subfam: Orthocladiinae	4	5		5	1	
		subfam: Tanypodinae					1	
		Simuliidae	1	2		2		
		Tipulidae				1		
		Athericidae					1	
		Ceratopogonidae				1		
		Empididae		1				
		Dip. Unid. Pup.					1	
		Ecnomidae		1				
		Hydrobiosidae		5		1		
		Hydropsychidae	3	13	5			
		Hydroptilidae				1		
		Leptoceridae				1		
		Philopotamidae		1				
	Coleoptera	ElmidaeA				1		
		ScirtidaeL	1	2				
		Count	12	17	5	15	8	0
		Abundance	30	66	9	31	13	0
		Abundance per m2	150	330	45	155	65	0

A.1.3 AusRivAS

Spring 2024

			R1a	R1b	R2a	R2b	R3a	R3b	R5a	R5b	R6a	R6b	B1	D1
Class	Order	Family												
Mollusca	Bivalvia	Sphaeriidae											1	
Annelida	Oligochaeta		1	2										
Crustacea	Amphipoda	Paramelitidae		1	1	2		1						2
Insecta	Plecoptera	Eustheniidae	25	16	2	6			1	3	4	2	1	
		Austroperlidae	2	1										
		Gripopterygidae	6	4	7	24	3	1	13	8		1		
		Notonemouridae	5	3	1	10			2	3	30	17		1
	Ephemeroptera	Leptophlebiidae		1		1								
		subfam: Chironominae		1				1						
		subfam: Orthocladiinae	4	2		6			1		1			
		subfam: Podonominae			1	2								
		subfam: Tanypodinae				1								
		Simuliidae			1									
		Tipulidae	1	1										2
		Athericidae										2		
		Dolichopodidae			1									
		Empididae										1		
	Trichoptera	Conoesucidae		1		1								
		Hydrobiosidae		1							2			
		Hydropsychidae		1										
		Leptoceridae	1											1
		Philorheithridae	1		1						1	2		
		ScirtidaeL	4	2	1	3	1					1		
		Taxa Number	**10**	**14**	**9**	**10**	**2**	**3**	**4**	**3**	**5**	**7**	**2**	**4**
		EPT number	9	12	8	9	2	2	4	3	5	7	1	3
		EPT proportion	0.90	0.86	0.89	0.90	1.00	0.67	1.00	1.00	1.00	1.00	0.50	0.75

Autumn 2025

Class	Order	Family	R1a	R1b	R2a	R2b	R3a	R3b	R5a	R5b	R6a	R6b	B1
Arachnida	Acarina	Acarina	1	2								1	
Insecta	Plecoptera	Eustheniidae	9	28	12	8			1	6	2	5	
		Austroperlidae	1										
		Gripopterygidae		3	4	5	2	5					
		Notonemouridae	16	13	12	23	1	10			1	1	
	Ephemeroptera	Leptophlebiidae			5	7							
		Baetidae											
	Diptera	Chironomidae	1	1	3	4	0	1					5
		Orthocladiinae	1		3	3		1					5
		Podonominae		1									
		Tanypodinae				1							
		Simuliidae				2							
		Tipulidae		2	2								
	Trichoptera	Calocidae	1										
		Conoesucidae			1								
		Hydrobiosidae			3	3							
		Hydropsychidae		1	1				4	4			
		Leptoceridae							1				
		Philopotamidae				1							
		Philorheithridae				1							
	Coleoptera	ElmidaeA	1						1	1	2	1	
		ScirtidaeL		1		6							
		DytiscidaeA	1										
		Number of taxa	9	9	10	12	3	4	4	3	3	4	2
		Number of EPT families	4	4	7	7	2	2	3	2	2	2	0
		EPT proportion	0.44	0.44	0.70	0.58	0.67	0.50	0.75	0.67	0.67	0.50	0.00

A.2 TRCI Expectedness, Abundance and Composition scores

A.2.1 Spring 2024

Raw scores for 0/Epa; Signal; EPT proportion; and Abundance					
Site	**Code**	**Mean O/Epa**	**Mean Signal O/E**	**Mean EPT proportion**	**Abundance (per m^2)**
Ring R.	R1	0.76	1.00	0.88	190
	R2	0.52	1.03	0.89	350
	R3	0.18	0.95	0.83	100
	R5	0.18	1.19	1.00	190
	R6	0.29	1.15	1.00	330
Bakers Ck.	B1	0.07	1.17	0.50	30
Dolcoath Ck.					

Scores and ratings for Expectedness					
Site	**Code**	**Expectedness**			
		O/Epa	**Signal O/E**	**Score**	**Rating**
Ring R.	R1	Moderate	High	65	M
	R2	Moderate	High	65	M
	R3	Low	High	30	M
	R5	Low	High	30	M
	R6	Low	High	30	M
Bakers Ck.	B1	Low	High	30	M
Dolcoath Ck.					

Scores and ratings Abundance and composition					
Site	**Code**	**Abundance**		**Composition**	
		Score	**Rating**	**Score**	**Rating**
Ring R.	R1	40	L	>0.35	H
	R2	40	L	>0.35	H
	R3	40	L	>0.35	H
	R5	40	L	>0.35	H
	R6	40	L	>0.35	H
Bakers Ck.	B1	10	L	>0.35	H

Macroinvertebrate condition score					
Site	**Code**	**Expectedness**	**Abundance**	**Compostion**	**Condition**
Ring R.	R1	M	L	H	Poor
	R2	M	L	H	Poor
	R3	M	L	H	Poor
	R5	M	L	H	Poor
	R6	M	L	H	Poor
Bakers Ck.	B1	M	L	H	Poor

A.2.2 Autumn 2025

Raw scores for 0/Epa; Signal; EPT proportion; and Abundance					
Site	**Code**	**Mean O/Epa**	**Mean Signal O/E**	**Mean EPT proportion**	**Abundance (per m^2)**
Ring R.	R1	0.40	1.14	0.44	150
	R2	0.58	1.09	0.64	330
	R3	0.13	1.04	0.58	45
	R5	0.22	1.19	0.71	155
	R6	0.20	1.20	0.58	65
Bakers Ck.	B1	0.08	0.65	0.00	0

Scores and ratings for Expectedness					
Site	**Code**	**Expectedness**			
		O/Epa	**Signal O/E**	**Score**	**Rating**
Ring R.	R1	L	H	30	M
	R2	M	H	65	M
	R3	L	H	30	M
	R5	L	H	30	M
	R6	L	H	30	M
Bakers Ck.	B1	L	H	30	M

Scores and ratings Abundance and composition					
Site	**Code**	**Abundance**		**Composition**	
		Score	**Rating**	**Score**	**Rating**
Ring R.	R1	40	L	>0.35	H
	R2	40	L	>0.35	H
	R3	10	L	>0.35	H
	R5	40	L	>0.35	H
	R6	10	L	>0.35	H
Bakers Ck.	B1	0	L	0	XL

Macroinvertebrate condition score					
Site	**Code**	**Expectedness**	**Abundance**	**Compostion**	**Condition**
Ring R.	R1	M	L	H	Poor
	R2	M	L	H	Poor
	R3	M	L	H	Poor
	R5	M	L	H	Poor
	R6	M	L	H	Poor
Bakers Ck.	B1	M	L	XL	Very poor

B Stitt River data

B.1 Macroinvertebrate data

B.1.1 Surbers: spring 2024

Class	Order	Family	Stirl	S0	S1	S2	S3	S4	S5	S6
		Glacidorbidae				1				
Annelida	Oligochaeta		5	1	4	4	3	8	6	11
Crustacea	Amphipoda	Paramelitidae	1	2	7	1			1	
		Eusiridae			1					
Insecta	Plecoptera	Eustheniidae	1	1	7	2		1		1
		Gripopterygidae		17	20	8	15	5	10	5
		Notonemouridae		1					1	1
	Ephemeroptera	Leptophlebiidae	13	16	27	8	14	2	2	2
		Baetidae	2	1		7	7	5	2	
	Odonata	Telephlebiidae	1		1					
	Collembola					1				
	Diptera	Chironomidae:								
		subfam: Chironominae	22		7	3		2	1	1
		subfam: Orthocladiinae	31	8	41	9	3	7	6	4
		subfam: Podonominae	1		2	2	1	5	2	
		subfam: Tanypodinae	1							
		Simuliidae			4	2	6			
		Tipulidae		1						
		Athericidae			1					1
		Blephariceridae				1	1			
		Dip. Unid. Pup.	14	1	3	3	4	3	1	5
	Trichoptera	Calocidae					1			
		Conoesucidae		2	2					
		Hydrobiosidae	2	1	5	3	1		2	3
		Hydropsychidae	4		5					
		Leptoceridae	1	1	2	5	2		5	
		Philopotamidae	4		1					
		Philorheithridae	1	1	5	1			5	
		Trich. Unid. Pup.			1					
	Coleoptera	ElmidaeA	2		2	5			1	
		ElmidaeL	5	2	5	4	2	1		
		ScirtidaeL	3	1		1	8	13	17	15
		PsepheniidaeL	3	1	1					
		COUNT	20	17	23	20	14	11	15	11
		Abundance	117	58	154	71	68	52	62	49
		Abundance per m2	585	290	770	355	340	260	310	245

B.1.2 Surbers: autumn 2025

Class	Order	Family	Stirl	S0	S1	S2	S3	S4	S5	S6
Platyhelminthes	Turbellaria							1		
	Gastropoda	Hydrobiidae							1	
Annelida	Oligochaeta		5	2	2	7	5	2	2	2
Arachnida	Acarina		2	1	1		1	1		
Crustacea	Amphipoda	Paramelitidae	3	1	4	16	4			
Insecta	Plecoptera	Eustheniidae		1	3	1	1	1		
		Gripopterygidae	7	1	7	1		8	5	
		Notonemouridae	1	2					3	
	Ephemeroptera	Leptophlebiidae	43	15	45	20	23	11	3	1
		Baetidae	2	4	7	5	4	1	1	
	Diptera	subfam: Chironominae	33	20	38	46	18	143	17	1
		subfam: Orthocladiinae	63	4	27	10	7	7	18	6
		subfam: Tanypodinae	2							
		Simuliidae	1		4	11	14	1	3	2
		Tipulidae					1			
		Athericidae								2
		Blephariceridae			1					
		Empididae				1	1	1		
		Dip. Unid. Pup.	6		2		10	5		
	Trichoptera	Calocidae	1							
		Conoesucidae	1	5	4	1	1	1		
		Helicopsychidae			2					
		Hydrobiosidae	6	2	6	11	5	4	10	6
		Hydropsychidae	8	50	42	13	4	22	4	2
		Hydroptilidae	5	8	1	4		3		
		Leptoceridae	13	12	16	22	12	7	8	8
		Philorheithridae	4	1	12	11	4	4	1	3
	Coleoptera	ElmidaeA			2			4		
		CarabidaeA					6			
		ElmidaeL	18	11	8	11	14	5		1
		ScirtidaeL	7	5	4	3	50	25	22	24
		PsepheniidaeL	3	2						
		Count	22	19	22	18	20	21	14	12
		Abundance	234	147	238	194	185	257	98	58
		Abundance per m2	1170	735	1190	970	925	1285	490	290

B.1.3 AusRivAS

Spring 2024

Class	Order	Family	Str_a	Str_b	S0_a	S0_b	S1_a	S1_b	S2_a	S2_b	S3_a	S3_b	S4_a	S4_b	S5_a	S5_b	S6_a	S6_b
Annelida	Oligochaeta		2	2	1		2		3	1	13	4	2	2	6	4		1
	Hirudinea																	
Arachnida	Acarina		2	6							1		1	1	1	1		
Crustacea	Amphipoda	Paramelitidae	4	8	5	4	6	4	12	7	2	3	1	3	1	1		
Insecta	Plecoptera	Eustheniidae	3	2	20	14	6	9	5	5	1		3	1	2			
		Austroperlidae		1	1					1								
		Gripopterygidae	3	6	8	30	11	10	2	14	6	3	10	3	15	14	4	18
		Notonemouridae	1												1			1
	Ephemeroptera	Leptophlebiidae	30	26	21	18	14	1	9	15	13	15	9	8	8	7	1	2
		Baetidae			5	7	11	17	3	2	7	5	4	3	6	9		
	Odonata	Telephlebiidae			1	1							1					
	Diptera	Chironomidae:	9	13	4	3	6	5	4	9	5	4	9	15	11	13	0	0
	Diptera	subfam: Chironominae	2	2			2	4	3	2	1			7	5	8		
		subfam: Orthocladiinae	5	6	2	1	3	1		4		1	4		1	1		
		subfam: Podonominae	2	5	2	2	1		1	3	4	3	5	8	5	4		
		Simuliidae			1		4	2	6		1		1	1				
		Tipulidae	2	3		1	2	1			2	1	1	2	1		1	
		Athericidae	1	1							1			1			2	13
		Blephariceridae											1	1				
		Ceratopogonidae										2	1					1
		Empididae							1									
		Muscidae					3							1				
	Trichoptera	Calocidae									1	1	2					
		Conoesucidae			1													
		Glossosomatidae				1												
		Helicophidae	1															
		Hydrobiosidae	9	4	11	7	21	18	24	11	16	21	12	8	18	20	2	7
		Hydropsychidae			1	1	5	1	2	1						1		
		Hydroptilidae	1															
		Leptoceridae	3	7		2	1	1	1	1		5	4	2	8	5	2	
		Philopotamidae		1							1					1		
		Philorheithridae		1		1	1	1	3		6	13	7	9		1	3	2
		Plectrotarsidae																
	Coleoptera	ElmidaeA			1	2	7	7	5	5	8	6	5	8	2	1		1
		ElmidaeL										1						
		ScirtidaeL	6		4	3			1		3	10		13	2	5	5	8
		PsepheniidaeL		5													1	
		Taxa number	**18**	**18**	**17**	**17**	**18**	**15**	**17**	**15**	**19**	**17**	**20**	**20**	**17**	**17**	**10**	**11**
		EPT number	**8**	**8**	**8**	**9**	**8**	**8**	**8**	**8**	**8**	**7**	**8**	**7**	**7**	**8**	**5**	**5**
		EPT proportion	**0.44**	**0.44**	**0.47**	**0.53**	**0.44**	**0.53**	**0.47**	**0.53**	**0.42**	**0.41**	**0.40**	**0.35**	**0.41**	**0.47**	**0.50**	**0.45**

Autumn 2025

Class	Order	Family	Str_a	Str_b	S0_a	S0_b	S1_a	S1_b	S2_a	S2_b	S3_a	S3_b	S4_a	S4_b	S5_a	S5_b	S6_a	S6_b
Annelida	Oligochaeta		3			1	4	2	1	1	1	6	2	3	1		5	3
Arachnida	Acarina		2	1	2	1	2		2	2		1	1	2	2	2	4	
Crustacea	Amphipoda	Paramelitidae	3		4	2	15	9	1	2	6	12	2			1		
Insecta	Plecoptera	Eustheniidae		2	16	10	5	9	5	4	4	3	1	2				
		Austroperlidae				2					1							
		Gripopterygidae	5	3	31	16	3	3		1	3	2	1	4	5	1	3	1
		Notonemouridae	2	5											2	2	5	4
	Ephemeroptera	Leptophlebiidae	28	40	17	6	10	12	18	12	16	17	5	6	4	8		2
		Baetidae			121	10	3	3	1	1	4							
	Odonata	Telephlebiidae			1		2			1								
	Hemiptera	Veliidae																
	Diptera	Chironomidae:																
		subfam: Chironominae	4		12	10	4	9	1	8	10	8	3	6	2	7	1	1
		subfam: Orthocladiinae	7		3		1	1			1	2	4		1	2	6	3
		subfam: Podonominae					1											
		subfam: Tanypodinae	3													1		
		Simuliidae			1	1	5	6		1	2		2	2	1		5	5
		Tipulidae				3	1		2		1	1		1				
		Athericidae	5	1							1						3	
		Blephariceridae																
		Ceratopogonidae																1
	Trichoptera	Calocidae							1				1					
		Conoesucidae			4	2	3	2	1	1			1	2				
		Helicophidae						1		12								
		Hydrobiosidae	8	4	19	22	17	25	22	2	15	20	10	7	16	18	16	8
		Hydropsychidae			1	2	1	3	2	1	1	2	2	2			1	1
		Hydroptilidae	4	15	2	1						1		1				
		Leptoceridae	4	1	7	2	23	12	8	12	18	10	3	9	18	14	5	16
		Philopotamidae	1	1	4	6				1	1	1						
		Philorheithridae				1		2	6		3		3		3			8
	Coleoptera	ElmidaeA	1		4	4	2	7	5	1	9	8	3	12		2		2
		ElmidaeL		3		1		1						1			1	1
		ScirtidaeL	7	4			1		1		9	2	14	17	14	27	10	13
		PsepheniidaeL								1								
		Number of taxa	16	12	17	20	19	17	16	18	19	16	17	16	12	12	13	15
		Number of EPT families	7	8	10	12	8	10	9	10	10	8	9	8	6	5	5	7
		EPT proportion	0.44	0.67	0.59	0.60	0.42	0.59	0.56	0.56	0.53	0.50	0.53	0.50	0.50	0.42	0.38	0.47

B.2 TRCI Expectedness, Abundance and Composition scores

B.2.1 Spring 2024

Raw scores for O/Epa; Signal; EPT proportion; and Abundance					
Site	**Code**	**Mean O/Epa**	**Mean Signal O/E**	**Mean EPT proportion**	**Abundance (per m^2)**
Stirling R.	Stirl.1	0.86	1.00	0.44	585
Stitt R.	S0	1.00	1.03	0.50	290
	S1	1.08	0.96	0.49	770
	S2	0.97	0.97	0.50	355
	S3	0.99	0.99	0.42	340
	S4	1.01	1.01	0.38	260
	S5	0.93	0.93	0.44	310
	S6	0.47	1.06	0.48	245

Scores and ratings for Expectedness					
Site	**Code**	**Expectedness**			
		O/Epa	**Signal O/E**	**Score**	**Rating**
Stirling R.	Stirl	H	H	100	H
Stitt R.	S0	H	H	100	H
	S1	H	H	100	H
	S2	H	H	100	H
	S3	H	H	100	H
	S4	H	H	100	H
	S5	H	H	100	H
	S6	L	H	30	M

Scores and ratings Abundance and composition					
Site	**Code**	**Abundance**		**Composition**	
		Score	**Rating**	**Score**	**Rating**
Stirling R.	Stirl.1	40	L	> 0.35	H
Stitt R.	S0	40	L	> 0.35	H
	S1	100	H	> 0.35	H
	S2	40	L	> 0.35	H
	S3	40	L	> 0.35	H
	S4	40	L	> 0.35	H
	S5	40	L	> 0.35	H
	S6	40	L	> 0.35	H

Macroinvertebrate condition score					
Site	**Code**	**Expectedness**	**Abundance**	**Composition**	**Condition**
Stirling R.	Stirl.1	H	L	H	Moderate
Stitt R.	S0	H	L	H	Moderate
	S1	H	H	H	Good
	S2	H	L	H	Moderate
	S3	H	L	H	Moderate
	S4	H	L	H	Moderate
	S5	H	L	H	Moderate
	S6	M	L	H	Poor

B.2.2 Autumn 2025

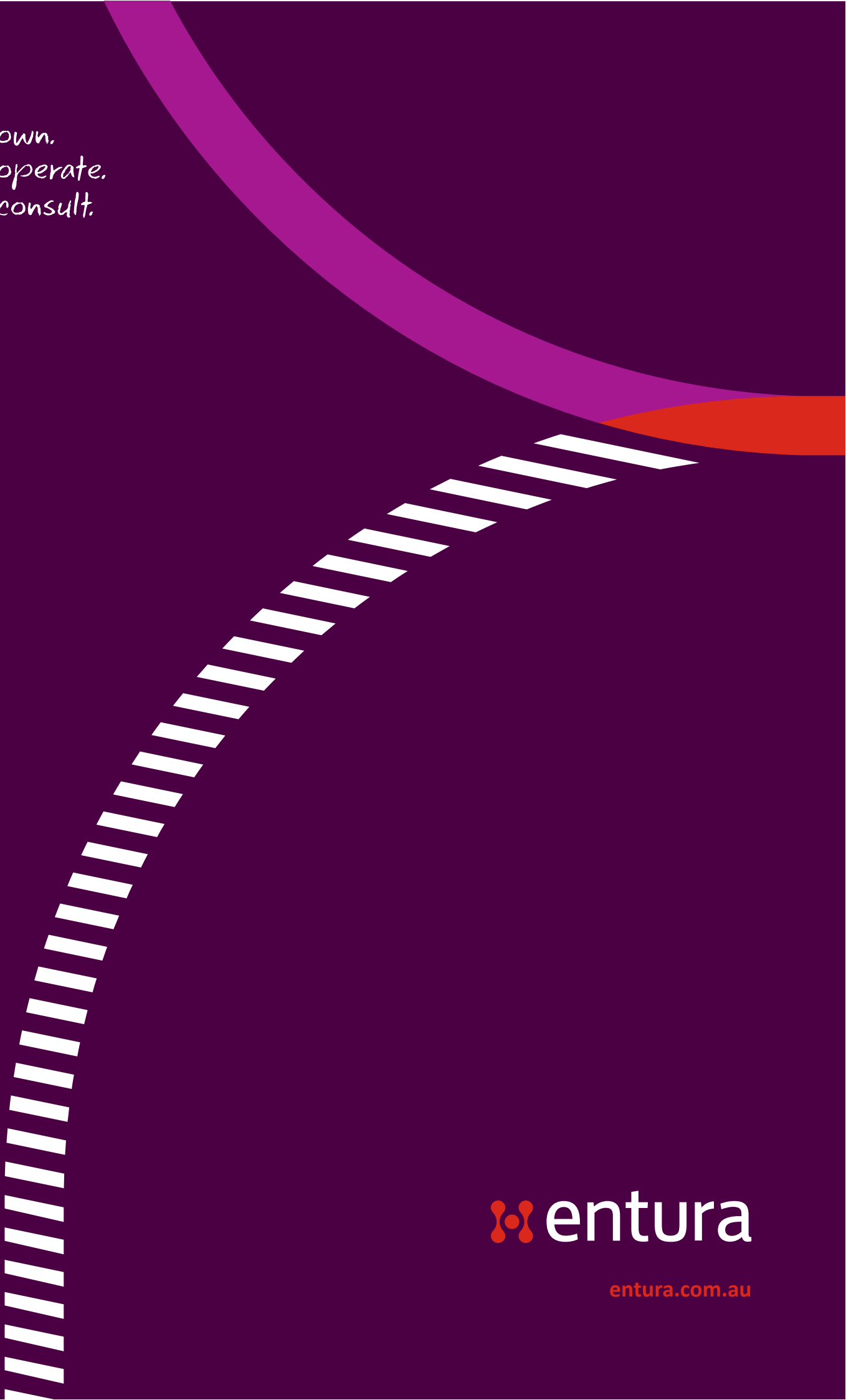
Raw scores for 0/Epa; Signal; EPT proportion; and Abundance					
Site	**Code**	**Mean O/Epa O/E**	**Mean Signal O/E**	**Mean EPT proportion**	**Abundance (per m^2)**
Stirling R.	Sterl.1	0.73	1.03	0.55	1170
Stitt R.	S0	1.04	1.01	0.59	735
	S1	1.21	0.98	0.50	1190
	S2	1.07	1.02	0.56	970
	S3	1.03	1.00	0.51	925
	S4	1.09	1.01	0.51	1285
	S5	0.76	0.94	0.46	490
	S6	0.84	0.93	0.43	290

Scores and ratings for Expectedness					
Site	**Code**	**Expectedness**			
		O/Epa	**Signal O/E**	**Score**	**Rating**
Stirling R.	Sterl	M	H	65	M
Stitt R.	S0	H	H	100	H
	S1	H	H	100	H
	S2	H	H	100	H
	S3	H	H	100	H
	S4	H	H	100	H
	S5	M	H	65	M
	S6	M	H	65	M

Scores and ratings Abundance and composition					
Site	**Code**	**Abundance**		**Composition**	
		Score	**Rating**	**Score**	**Rating**
Stirling R.	Sterl	100	H	> 0.35	H
Stitt R.	S0	100	H	> 0.35	H
	S1	100	H	> 0.35	H
	S2	100	H	> 0.35	H
	S3	100	H	> 0.35	H
	S4	100	H	> 0.35	H
	S5	40	L	> 0.35	H
	S6	40	L	> 0.35	H

Macroinvertebrate condition score					
Site	**Code**	**Expectedness**	**Abundance**	**Composition**	**Condition**
Stirling R.	Sterl	M	H	H	Poor
Stitt R.	S0	H	H	H	Good
	S1	H	H	H	Good
	S2	H	H	H	Good
	S3	H	H	H	Good
	S4	H	H	H	Good
	S5	M	L	H	Poor
	S6	M	L	H	Poor

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Appendix I Annual Air Quality Report – FY24/25 (EY, 2025)

Annual Air Quality Report - FY24/25

MMG Rosebery Mine

14 August 2025

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RELEASE NOTICE

Ernst & Young ("**EY**") was engaged on the instructions of MMG Rosebery Mine ("**Client**") to assess the air quality data in regards to their EPN and PCE conditions ("**Project**"), in accordance with the engagement agreement dated 20 June 2025 ("the **Engagement Agreement**").

The results of EY's work, including the assumptions and qualifications made in preparing the report, are set out in EY's report dated 14 August 2025 ("**Report**"). You should read the Report in its entirety including any disclaimers and attachments. A reference to the Report includes any part of the Report. No further work has been undertaken by EY since the date of the Report to update it.

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Ernst & Young's liability is limited by a scheme approved under Professional Standards Legislation.

Executive Summary

MMG Rosebery Mine has three permits issued under the *Environmental Management and Pollution Control Act 1994* with an obligation to report annually on aspects of its air quality monitoring programme. These permits Environment Protection Notice (EPN) 7153/3, Permit Conditions - Environmental (PCE) No. 9084 and PCE No. 11514 also contain a statutory requirement to develop and maintain a dust mitigation management plan. The air quality monitoring programme includes the use of high-volume air samplers (HVAS) with co-located DustTraks and dust deposition gauges (DDG). The EPN and PCE 9084 include compliance and trigger limits for ambient concentrations of particulate matter (TSP, PM_{10}) and metals concentrations (lead, cadmium, zinc), along with dust deposition rates. PCE 11514 includes additional metals concentrations (arsenic, copper, manganese) specifically for the Baillieu Street monitoring location. The dust deposition gauge and temporary real-time monitor at Baillieu Street were installed in March 2025, however installation of the HVAS has been delayed to August 2025.

The FY24/25 period had deviations from the EPN monitoring requirements as the PM_{10} HVAS unit at Giblin St was incorrectly configured to continuous sampling rather than 1 in 6 day sampling. All analysis was completed by a NATA accredited laboratory for the relevant Australian Standard: ALS Environment - NATA Accreditation No. 825.

A total of 12 HVAS samples were considered invalid during the FY24/25 monitoring period due to missed samples, malfunctioning units and failed calibrations. A total of 71 DDG samples were invalid due to high rainfall events, which are typical of the region, causing the DDGs to overflow with water.

HVAS and DDG compliance against the relevant EPN and PCE conditions are presented in Table 1 and Table 2, respectively. There were no reported exceedances of the compliance limits in FY24/25 indicating that the Rosebery Mine activities are a low environmental risk to air quality and that the current dust mitigation controls are appropriate.

Community complaints were received in FY24/25 monitoring period. All complaints were investigated and were not found to be due to Rosebery Mine related fugitive dust, which is evidenced by the HVAS and DDG monitoring results and wind conditions during the complaint, as no exceedances were recorded.

Considering the low environmental risk to air quality and the typical high amount of annual rainfall, a small and targeted monitoring network could provide more meaningful information regarding the mining operation's dust impact. Based on this assessment, it is recommended that the air quality monitoring network is consolidated.

In addition to the annual air quality report, the dust management performance was also assessed. The assessment concluded the Rosebery Mine should continue its current dust management and mitigation measures. It is also recommended that the proposed mitigation and inspection trigger levels are checked within three years (next due in 2027) to understand if they are sufficient to assist in the continued control of dust emissions from Rosebery Mine.

Table 1: HVAS Compliance against EPN 7153/3 Condition A2 and PCE 9084 Condition A4

Averaging period	Pollutant	AD3	AD2.1	Giblin Street	Alec Street	AD3	AD2.1	Giblin Street	Alec Street
		Trigger Level				Compliance Limit			
24 hour average	TSP	✓	✓	✓	✓	-	-	-	-
	PM_{10}	✓	✓	✓	✓	✓	✓	✓	✓
	Lead (as TSP)	✓	✓	✓	✓	-	-	-	-
	Cadmium (as PM_{10})	✓	✓	✓	✓	-	-	-	-
	Zinc (as PM_{10})	✓	✓	✓	✓	-	-	-	-
Annual average	TSP	-	-	-	-	✓	✓	✓	✓
90 day average	Lead (as TSP)	-	-	-	-	✓	✓	✓	✓

Notes:
Green ticks denote compliance with the respective trigger level or compliance limit
Grey crosses denote exceedances of the respective trigger level
Red crosses denote exceedances of the respective compliance limit
Dash denotes the trigger level or compliance limit is not applicable
Baillieu Street HVAS has not yet been installed

Table 2: DDG Compliance against EPN 7153/3 Condition A3, PCE 9084 Condition A5 and PCE 11514 Condition A6

Site	Monthly Deposited Dust above background	Monthly Total Deposited Dust	Annual Average Deposited Dust above background	Annual Average Total Deposited Dust
	Trigger Level		Compliance Level	
AD3	✓	✓	✓	✓
AD4	✓	✓	✓	✓
AD11	✓	✓	✓	✓
AD21	✓	✓	✓	✓
AD22	✓	✓	✓	✓
AD26 [1]	✓	✓	✓	✓
BG3	✓	✓	✓	✓

Notes:
Green ticks denote compliance with the respective trigger level or compliance limit
Grey crosses denote exceedances of the respective trigger level
Red crosses denote exceedances of the respective compliance limit
[1] AD26 DDG was installed in March 2025

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1. Introduction

MMG Rosebery Mine is an underground polymetallic base metal mine located in the township of Rosebery, Tasmania. MMG Rosebery Mine has an obligation under its Permits issued under the *Environmental Management and Pollution Control Act 1994* (Permit 1094 as varied by Environmental Protection Notice (EPN) 7153/3, Permit Conditions - Environmental (PCE) No. 9084, PCE No. 11514 & Rosebery Dust Mitigation Plan) to report annually on aspects of its dust deposition and ambient air quality monitoring programmes (EPN 7153/3 conditions A2, A3 and A5, G7 2.6, PCE 9084 conditions A4-5, G6 & M3 and PCE 11514 conditions A6-7 and 8). The conditions specified in PCE 11514 include additional metals concentrations which apply specifically to the Baillieu Street monitoring location. The dust deposition gauge (DDG), temporary real-time monitor and DustTrak at Baillieu Street were installed in March 2025, however installation of the high-volume air sampling (HVAS) has been delayed to August 2025 (EPA Tasmania, 2025).

Condition G7 of EPN 7153/3 requires that an analysis of air quality is performed annually. MMG Rosebery Mine engaged EY to complete the annual air quality analysis for 1 July 2024 to 30 June 2025 (FY24/25). This report provides a summary of the dust deposition and air quality monitoring data against the EPN and PCE conditions. In addition, an assessment of the Dust Mitigation Management Plan was performed to understand if the current plan is sufficient to minimise environmental risk.

Ernst & Young ("EY") was engaged to assess the MMG Rosebery Mine air quality data in regards to EPN 7153/3 regulatory requirements, in accordance with the engagement agreement dated 20 June 2025. This report provides that assessment and aims to understand the environmental risk to air quality resulting from the MMG Rosebery Mine activities based on the monitoring network data. Further, the report provides recommendations for additional/modification to the monitoring network or emissions mitigation measures aimed to better understand or reduce environmental risk.

1.1 EPN and PCE Requirements

MMG Rosebery Mine is required to comply with the conditions detailed in EPN 7153/3, PCE 9084 and PCE 11514. Table 3 and Table 5 present the compliance limits and trigger levels for the HVAS and DDGs respectively. Table 4 presents the compliance limits and trigger levels for the HVAS monitoring location at Baillieu Street.

As per paragraph 2 in section A3 of EPN 7153/3, monthly deposition measurements must be adjusted to account for the background deposition rate. For each sampling month, the background is defined as the minimum of the measured dust deposition rates. Table 6 outlines the sections of this report that address conditions of the EPN section A5-3 – Reporting of monitoring.

Table 3: EPN 7153/3 HVAS compliance limits and trigger levels

Pollutant	Compliance limit	Trigger levels
Total Suspended Particles (TSP)	0.090 mg/m^3 annual average	0.150 mg/m^3 24 hour average
Particulate Matter sub 10 micron (PM_{10})	0.150 mg/m^3 24 hour average	0.050 mg/m^3 24 hour average
Lead (as TSP)	0.0015 mg/m^3 90 day average	0.0087 mg/m^3 24 hour average
Cadmium (as PM_{10})	-	0.000003 mg/m^3 24 hour average[1]
Zinc (as PM_{10})	-	0.015 mg/m^3 24 hour average[1]

Note:
[1] 24 hour average was not specified within the EPN and PCE documents but was applied to be consistent with the other trigger level averaging periods

Table 4: PCE 11514 compliance limits and trigger levels – Baillieu Street

Pollutant	Compliance limit	Trigger levels
Total Suspended Particles (TSP)	0.090 mg/m^3 annual average	0.150 mg/m^3 24-hour average
Particulate Matter sub 10 micron (PM_{10})	0.150 mg/m^3 24-hour average	0.050 mg/m^3 24-hour average
Arsenic (as PM_{10})	0.000015 mg/m^3 annual average	0.00003 mg/m^3 24-hour average
Cadmium (as PM_{10})	0.00003 mg/m^3 24-hour average 0.000005 mg/m^3 annual average	0.000003 mg/m^3 24-hour average
Copper (as PM_{10})	0.001 mg/m3 24-hour average	0.001 mg/m^3 24-hour average
Lead (as TSP)	0.0015 mg/m^3 90-day average	0.0087 mg/m^3 24-hour average
Manganese (as PM_{10})	0.0003 mg/m^3 24-hour average	0.0003 mg/m^3 24-hour average
Zinc (as PM_{10})	0.05 mg/m^3 24-hour average 0.002 mg/m^3 annual average	0.015 mg/m^3 24-hour average

Note: The concentrations noted in this table apply to Baillieu Street monitoring location only

Table 5: EPN 7153/3 dust deposition gauge compliance limits and trigger levels

Pollutant	Compliance limit	Trigger levels
Deposited dust	2.0 g/m^2/month as an annual average increase above background at/or beyond the site boundary.	2.0 g/m^2/month as an increase above background at/or beyond the site boundary (monthly trigger level).
Deposited dust	4.0 g/m^2/month as an annual average at/or beyond the site boundary.	4.0 g/m^2/month as total deposition experiences at/or beyond the site boundary (monthly trigger level).

Note: The site boundary is defined as the MMG Rosebery Mine boundary.

Table 6: EPN 7153/3 condition A5-3, PCE 11514 condition A8-5 and relevant sections of this report

EPN 7153/3 condition A5-3 and PCE 11514 condition A8-5		Report section
3.1	Tabulated high volume air sampler, and dust and metals deposition results for the entire year, showing intermediate values as well as final monitoring results	Final monitoring results are provided in Section 3.1 and 3.2 with additional plots showing intermediate values are provided in Appendix A
3.2	Tabulated annual averages of the deposition increment above background, supported by deposition isopleths or graphs	Section 3.2 with additional plots provided in Appendix A
3.3	Monthly deposition isopleths or graphs of total dust and metal deposition and increment above 'background'	Section 3.2 with additional plots provided in Appendix A
3.4	Summaries of all exceedances occurring within the reporting year, describing the results of any investigations undertaken and the mitigation measures that were adopted in response	Section 3.1 and 3.2
3.5	Any supporting data analysis or description necessary to aid interpretation of the dataset	Additional plots showing intermediate values are provided in Appendix A

1.2 Monitoring Network Locations

As dictated within EPN 7153/3, PCE 9084 and PCE 11514, the coordinates and IDs for the air quality monitoring locations are presented in Table 7 and Figure 1. The monitoring network, required by EPN 7153/3, PCE 9084 and 11514, consists of five HVAS locations measuring both TSP and PM_{10} and twelve DDGs located across the township of Rosebery, including a background

sample location at the Rosebery golf course (BG3) and the new monitoring location at Baillieu Street (AD26) as detailed in PCE 11514. In addition to the HVAS and DDG locations, five real-time monitors are collocated with the HVAS monitors. DustTrak units are currently installed at all locations except the Baillieu Street location which utilises a Dust Master Pro. These units are used to provide real time alerts for the mitigation of dust from site as outlined in MMG Rosebery Mine's Dust Mitigation Management Plan (MMG, 2025a). As noted in Section 1.1, the Baillieu Street DDG was installed in March 2025 with a Dust Master Pro, however the HVAS installation has been delayed to August 2025. Due to this, HVAS results for this location have not been included in this report.

As the criteria presented in Table 5 are applicable to locations at or beyond the site boundary, the trigger levels do not apply to the DDGs AD1.1, AD2, AD5, AD23 and AD25 as they are located within the MMG Rosebery Mine site boundary. The deposition rates at locations outside of the site boundary are presented in graphical format in Appendix A.

Table 7: Monitoring locations

Monitoring site ID	Monitoring location description	Location (WGS 84 Zone 55S)	
		Easting (km)	Northing (km)
HVAS (EPN) and co-located DustTrak			
AD2.1	Former PMR Training Centre on Arthur Street (near the Core Shed)	378.63	5,374.00
AD3	15 Beech Street (near the Filter Plant)	377.70	5,374.49
Giblin Street	Giblin Street	378.61	5,373.18
Alec Street	Alec Street	378.97	5,373.40
Baillieu Street [1]	Baillieu Street	377.34	5,374.46
DDG (EPN within the mine boundary)			
AD1.1	Mine Office Building on Hospital Road	378.81	5,374.19
AD2.1	Former PMR Training Centre on Mill Road	378.66	5,373.91
AD5	Breaker Station/Crusher	378.65	5,374.24
AD23	Filter Plant Carpark	377.78	5,374.51
AD25	Passing Bay on Filter Plant Road	378.27	5,374.21
DDG (EPN at/or beyond the mine boundary)			
AD3	15 Beech Drive (near the HVAS)	377.70	5,374.49
AD4	Near Rosebery Station	378.61	5,373.18
AD11	Front yard of 1 Howard Street	377.93	5,374.29
AD21	Backyard in 9 Murchison St	379.06	5,373.89
AD22	Front yard of 21 Dalmeny St	379.27	5,373.63
AD26 [1]	Baillieu Street	377.34	5,374.52
BG3	Rosebery Golf Course	375.58	5,372.78

Note:
[1] The dust deposition gauge and temporary real-time monitor at Baillieu Street were installed in March 2025.

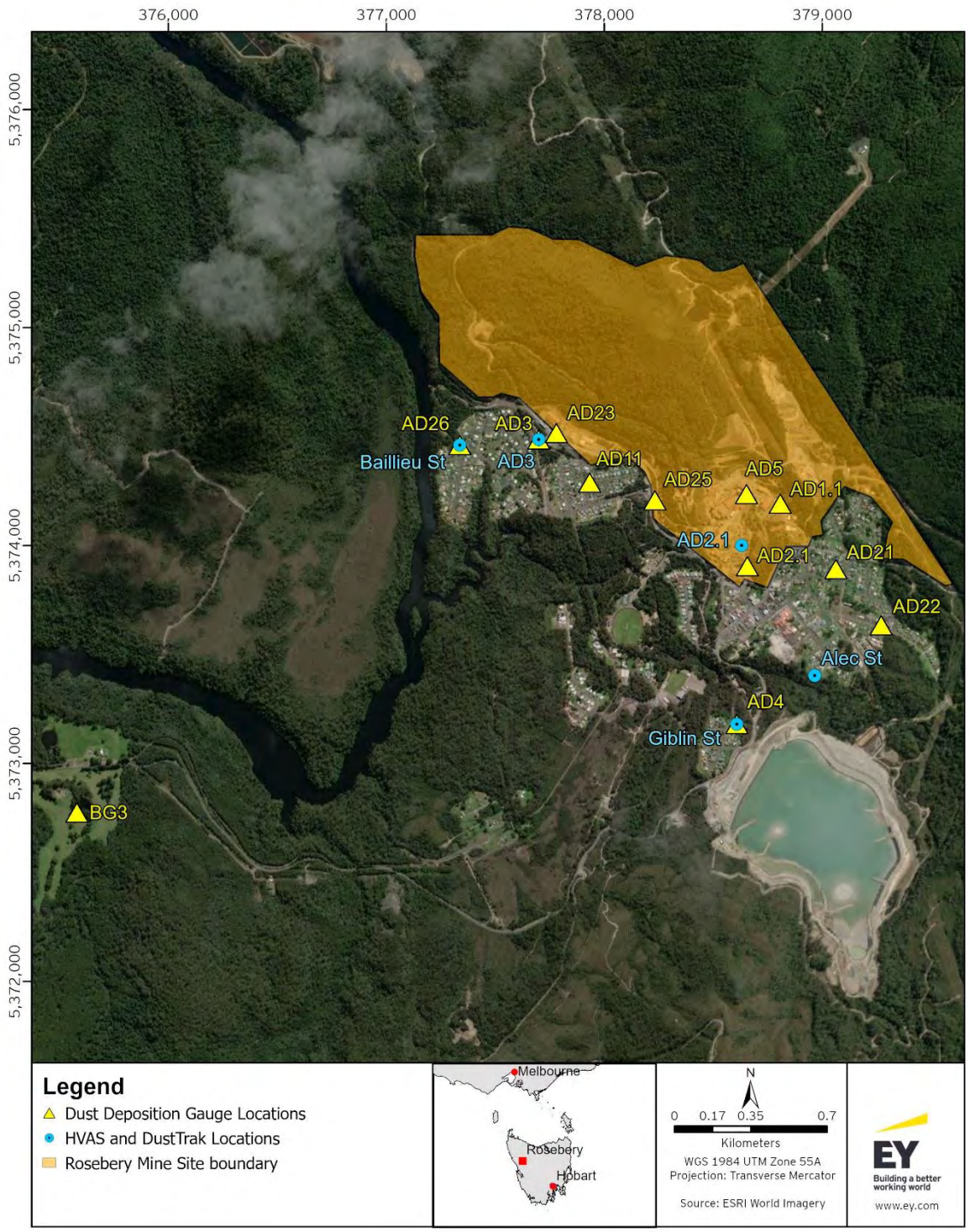


Figure 1: Air Quality Monitoring Locations

2. Sampling Procedures

2.1 High Volume Air Sampling

The HVAS monitors sample TSP and PM_{10} that is then analysed for compositions of lead (as TSP), cadmium (as PM_{10}) and zinc (as PM_{10}). Sampling of the 24-hour average concentrations ($\mu g/m^3$) occurs once every 6 days.

Twelve samples were considered invalid[1] during FY24/25 monitoring period as summarised in Table 8. All HVAS monitors were externally calibrated by a third-party contractor, Ecotech, on 19 November 2024 with periodic internal flow calibrations completed throughout the year. All monitors passed the post-calibration checks. The Giblin St TSP monitor failed the pre-calibration check for actual sample flow rate.

Table 8: HVAS FY24/25 - Invalid samples

Sample date	Location	Pollutant	Comment
02/09/2024	AD3 (Filter Plant)	PM_{10}	HVAS monitoring event was missed. The site electrician identified the unit had blown a fuse. The fuse was replaced and the unit tested and shown to be functional in preparation for the next sampling event.
26/09/2024 02/10/2024 08/10/2024 14/10/2024	AD3 (Filter Plant)	PM_{10}	Unit malfunctioned (incorrect run time and corrected volume displayed on unit).
20/10/2024 26/10/2024 01/11/2024 07/11/2024 13/11/2024 18/11/2024	Giblin St	TSP	On the 19 November 2024, Giblin St TSP unit failed calibration as the sample flow rate reading was outside the expected range. The prior calibration was conducted on the 17 October 2024 and the samples since this calibration are considered invalid.
07/12/2024	Giblin St	PM_{10}	After the unit was replaced on 5 December 2024, the unit was incorrectly configured to continuous sampling rather than 1 in 6 day sampling.

Sampling and analysis of TSP was performed using the EA143-MV method and referenced to Australian/New Zealand Standards AS/NZS 3580.9.3:2015: Determination of suspended particulate matter – Total suspended particulate matter (TSP) – High volume sampler gravimetric method (Australian/New Zealand Standard, 2015).

Sampling and analysis of PM_{10} was performed using Australian Standards AS 3580.9.6:2015: Determination of suspended particulate matter – PM_{10} high volume sampler with size-selective inlet – Gravimetric method, Monitoring Analysis (Australian/New Zealand Standard, 2015).

TSP, PM_{10} and metals analysis was performed by a NATA accredited laboratory (ALS Environmental – NATA Accreditation No. 825, Site No. 1656[2]). The HVAS samples were then digested in nitric acid and analysed for metals by inductively coupled plasma mass spectrometry (ICPMS).

The FY24/25 period had deviations from the EPN monitoring requirements whereby a HVAS unit was incorrectly configured to continuous sampling rather than 1 in 6 day sampling. The HVAS air monitoring complies with the applicable elements of EPN 7153/3 condition M1 as samples are analysed as per Australian Standard at a NATA accredited laboratory.

[1] AS 3580.19-2020 defines 'valid' as accurate, complete or meets specified criteria, therefore the term 'invalid' is defined as not meeting specified criteria, incomplete or is inaccurate.
[2] Accreditation viewed on nata.com.au on 8 August 2024.

2.2 Dust Deposition Gauges

Monthly dust deposition gauge bottles are sent to ALS Environmental for analysis (NATA Accreditation No. 825, Site No. 13778[2]). Total solids (mg), total insoluble matter (TIM, g/m^2/month), total soluble matter (g/m^2/month) and metals (arsenic, cadmium, copper, lead, manganese and zinc, µg/m^2/month) are analysed. NATA Accreditation is only available for gravimetric deposited matter (i.e. total soluble matter, TIM and total solids) and not for metals deposition analysis. Note that only TIM has trigger levels and compliance limits in EPN 7153/3 and PCE 11514.

A total of 71 samples were considered invalid due to high rainfall events flooding the DDGs as summarised in Table 9. Larger dust deposition sample bottles are proposed to minimise the overflow that is historically seen at MMG Rosebery Mine (MMG, 2025b; MMG, 2025c).

Table 9: DDG FY24/25 - Invalid samples

Sample month	Location	Comment
July 2024	AD2, AD22	High rainfall events flooded the gauges, resulting in no recorded data.
August 2024	All locations	
September 2024	All locations	
October 2024	AD1.1, AD2, AD3, AD4, AD11, AD21, AD22, AD23, AD25	
November 2024	AD3, AD4, AD11, AD23, AD25	
December 2024	All locations	
May 2025	AD1.1, AD2, AD4, AD5, AD11, AD21, AD22, AD23, AD25, AD26	
June 2025	All locations	

Note: The dust deposition gauge at Baillieu Street (AD26) was installed in March 2025.

Sampling for total soluble matter, TIM and total solids were conducted referencing Australian Standards AS/NZ 3580.10.1 2016: Methods for sampling and analysis of ambient Determination of particulate matter – Gravimetric method (Australian/New Zealand Standard, 2016).

There were no recorded deviations from the sampling procedures for the DDG sampling in FY24/25. The dust deposition monitoring complies with the applicable elements of EPN condition M1 and PCE 11514 condition M2 as samples are tested at a NATA accredited laboratory which is analysed as per Australian Standards.

2.3 DustTrak

DustTrak units are calibrated on an annual basis[3] with additional periodic checks completed by MMG staff. After the annual DustTrak unit calibrations, the units are sent to Environmental Protection Authority Tasmania (EPA Tasmania) for the wood fire smoke haze calibration factors programming. This factor is to reduce alarm notifications due to wood fire smoke haze from nearby residences.

DustTrak data is averaged on a 15- and 60-minute basis and are displayed within the Environmental Department office. The DustTrak data is not used for compliance purposes, but for real time dust event alerts and operational investigations.

[3] Calibrations completed in July 2024, September 2024, December 2024 and May 2025.

A DustTrak unit is yet to be installed at Baillieu Street. The site has a temporary Dust Master Pro installed in March 2025, with installation of a permanent HVAS unit delayed to August 2025 (EPA Tasmania, 2025).

2.4 Sampling Quality Assurance and Quality Control Procedures

MMG Rosebery Mine has a number of internal sampling quality assurance and quality control (QAQC) procedures to support the integrity of the air quality dataset collected during the reporting period. These include:

- Weekly verification quality checks of the DDG, HVAS and DustTrak data.
- Weekly analysis of the DDG, HVAS and DustTrak data to identify any inconsistent or incorrect results including any discrepancies between duplicate samples, if required re-sampling at the laboratory is requested.
- Monthly dust reports as per EPN 7153/3 A5-2 and PCE 11514 A8-2.
- Tests and checks of the DustTrak units are completed on a regular basis with comments recorded on any issues with the units.
- Site visit reports, most recently completed for all HVAS locations in November 2024.
- Implementation of site visit report recommendations including clearing of vegetation around the monitoring enclosures to comply with the Australian Standard AS/NZS 3580.1.1:2007: Methods for sampling and analysis of ambient air: Part 1.1: Guide to siting air monitoring equipment (Australian/New Zealand Standard, 2007).
- Maintenance of the HVAS and DustTrak units based on their operating manuals.
- Taking field and laboratory blanks at set frequency as referenced in the relevant Australian Standards.

The field blank results for HVAS (TSP, PM_{10}) show no unacceptable levels of discrepancy for the FY24/25 period, however, the field blank results for the DDG have indicated that dust contamination can occur during the sampling method. A response from ALS (MMG, 2025d) was received which noted that there is a possibility that the deposition bottles have previously been dosed with copper sulphate as a preservative instead of benzalkonium chloride. This could have been the possible cause of the metals contamination historically observed in the field blank samples. However, ALS stated that there is no way to confirm what preservative have been used historically. MMG has requested what corrective actions ALS are going to implement going forward.

In addition to the QAQC procedures listed above, the real time DustTrak concentrations and weather data are displayed within the Environmental Department office. Inspection and mitigation trigger alerts are automatically generated as per the Dust Mitigation Management Plan (MMG, 2025a) and are sent to relevant employees via email.

3. Air Quality Monitoring Results

3.1 High Volume Air Sampling

This section presents the results of the FY24/25 HVAS monitoring data and analysis. Table 10 summarises the HVAS data and compliance against the trigger level and compliance limits. Where analysis results were reported below the limit of reporting, half the limit of reporting was adopted for the analysis. The installation of the Baillieu Street HVAS has been delayed to August 2025.

The 24-hour average and 90-day average, provided in Table 10, represent the maximum averages for FY24/25.

In FY24/25, there were no exceedances reported of the trigger levels or compliance limits for all HVAS locations. Twelve sampling results were considered invalid due to failed sampling events, as shown in Table 8.

Typically, the HVAS monitoring data at AD2.1 (Core Shed) records higher concentrations compared to the other sites. This site is located within the site boundary and nearest to the larger emission sources at MMG Rosebery Mine. Lower concentrations are observed at the Giblin Street and Alec Street locations which is consistent with location of the monitors in relation to the mine site. These trends are also observed within the historical dataset. Annual HVAS trends show generally increased concentrations during summer months which are likely due to lower rainfall and increased temperatures. In FY21/22 and FY24/25, there have been no exceedances reported for the trigger levels or compliance limits.

The intermediate results for the HVAS data are provided in Appendix A. Additional graphical results for the FY21/22 to FY24/25 HVAS data are also presented in Appendix A.

Table 10: HVAS monitoring results

Averaging period	Pollutant	Trigger level (mg/m^3)	Compliance limit (mg/m^3)	AD3 (mg/m^3)			AD2.1 (mg/m^3)			Giblin Street (mg/m^3)			Alec Street (mg/m^3)		
				Value	TL	CL	Value	TL	CL	Value	TL	CL	Value	TL	CL
24 hour average [a]	TSP	0.150	-	0.031	✓	-	0.067	✓	-	0.030	✓	-	0.027	✓	-
	PM_{10}	0.050	0.150	0.017	✓	✓	0.027	✓	✓	0.017	✓	✓	0.016	✓	✓
	Lead (as TSP)	0.0087	-	0.0011	✓	-	0.0008	✓	-	0.0001	✓	-	0.0001	✓	-
	Cadmium (as PM_{10})	0.000003	-	0.0000011	✓	-	0.0000010	✓	-	0.0000003	✓	-	0.0000003	✓	-
	Zinc (as PM_{10})	0.015	-	0.00044	✓	-	0.00042	✓	-	0.00008	✓	-	0.00009	✓	-
Annual average	TSP	-	0.090	0.014	-	✓	0.030	-	✓	0.012	-	✓	0.013	-	✓
90 day average [b]	Lead (as TSP)	-	0.0015	0.00062	-	✓	0.00040	-	✓	0.00003	-	✓	0.00003	-	✓
Number of valid data points (TSP) [c]				62			62			56			62		
Number of valid data points (PM_{10}) [c]				57			62			61			62		
Number of invalid data points (TSP) [c]				0			0			6			0		
Number of invalid data points (PM_{10}) [c]				5			0			1			0		

Notes:
[a] The 24 hour average represents the maximum average in FY24/25
[b] The 90 day average represents the maximum average in FY24/25
[c] No sampling results were considered invalid in FY24/25
Green ticks denote compliance with the respective trigger level or compliance limit
Grey crosses denote exceedances of the respective trigger level
Red crosses denote exceedances of the respective compliance limit
Dash ('-') denotes no trigger level or compliance limit in the EPN or PCE

3.2 Dust Deposition Gauges

This section presents the results of the FY24/25 DDG monitoring data and analysis.

Table 11 summarises the dust deposition rates of TIM against the trigger levels and compliance limits as presented in Table 5. The monthly deposited dust above background and the total monthly deposition including background contributions for DDG at or beyond the site boundary are presented in Figure 2 and Figure 3. All monthly DDG results for all locations are presented in Appendix A.

For each month, the background deposition rate was assumed to be the minimum TIM deposition rate across all locations. The monthly deposited dust above background for each location was calculated by subtracting the monthly background deposition rate from the deposition rate at each location.

It is important to note that a minimum of four months were considered invalid at each monitoring location due to high rainfall events flooding the gauges, as shown in Table 9. However, as the invalid data are due to large amounts of rainfall, the dust deposition during these periods would likely be low due to the high moisture of the dust generating materials. This means that the calculated annual averages are a conservative representation of the annual conditions as invalid data points are considered blanks in the calculations.

No exceedances of the compliance limits were reported for any deposition gauges at or beyond the site boundary for FY24/25. This is consistent with the long-term data trends observed since FY21/22.

No exceedances of the trigger level were reported for any deposition gauges at or beyond the site boundary for FY24/25.

In FY23/24, two exceedances of the trigger levels for monthly deposited dust above background levels were reported for AD21, in December 2023 and May 2024. The outcome of the investigations suggested that the exceedances were not due to operations at MMG Rosebery Mine. In FY22/23, two exceedances of the trigger levels were reported for both the monthly total deposited dust and deposited dust above background (AD11 and AD21). However, the outcome of the investigations suggested they were not due to operations at MMG Rosebery Mine. No exceedances of the trigger levels were recorded in FY21/22. No exceedances of the compliance limits were recorded in FY21/22 to FY23/24.

Since FY21/22, there have been a minimum of four months of invalid data annually due to the high rainfall events which is typically observed during winter months. Historically there is not an obvious trend in dust deposition results with location of the DDG, proximity to MMG Rosebery Mine or observed meteorology. Historical data is presented in Appendix A.

Table 11: DDG monitoring results at or beyond the boundary

Site	Number of valid samples	Monthly Deposited Dust above background (g/m²/month) [a, b]		Monthly Total Deposited Dust (g/m²/month) [b]		Annual Average Deposited Dust above background (g/m²/month) [a]		Annual Average Total Deposited Dust (g/m²/month)	
Trigger level		2.0		4.0		-		-	
Compliance limit		-		-		2.0		4.0	
AD3	6	0.6	✓	1.1	✓	0.2	✓	0.5	✓
AD4	5	0.7	✓	1.1	✓	0.3	✓	0.6	✓
AD11	5	1.1	✓	1.5	✓	0.4	✓	0.9	✓
AD21	6	0.5	✓	1.0	✓	0.2	✓	0.6	✓
AD22	5	0.7	✓	1.1	✓	0.4	✓	0.9	✓
AD26 [c]	2	0.2	✓	0.5	✓	0.1	✓	0.3	✓
BG3	8	0.5	✓	0.9	✓	0.1	✓	0.5	✓

Notes:
[a] The minimum monthly deposited dust value across all locations was adopted as the monthly background deposition rate
[b] The monthly deposited dust (above background and total) represent the maximum recorded values in FY24/25
[c] AD26 location was installed in March 2025
Green ticks denote compliance with the respective trigger level or compliance limit
Grey crosses denote exceedances of the respective trigger level
Red crosses denote exceedances of the respective compliance limit
Dash denotes the trigger level or compliance limit is not applicable

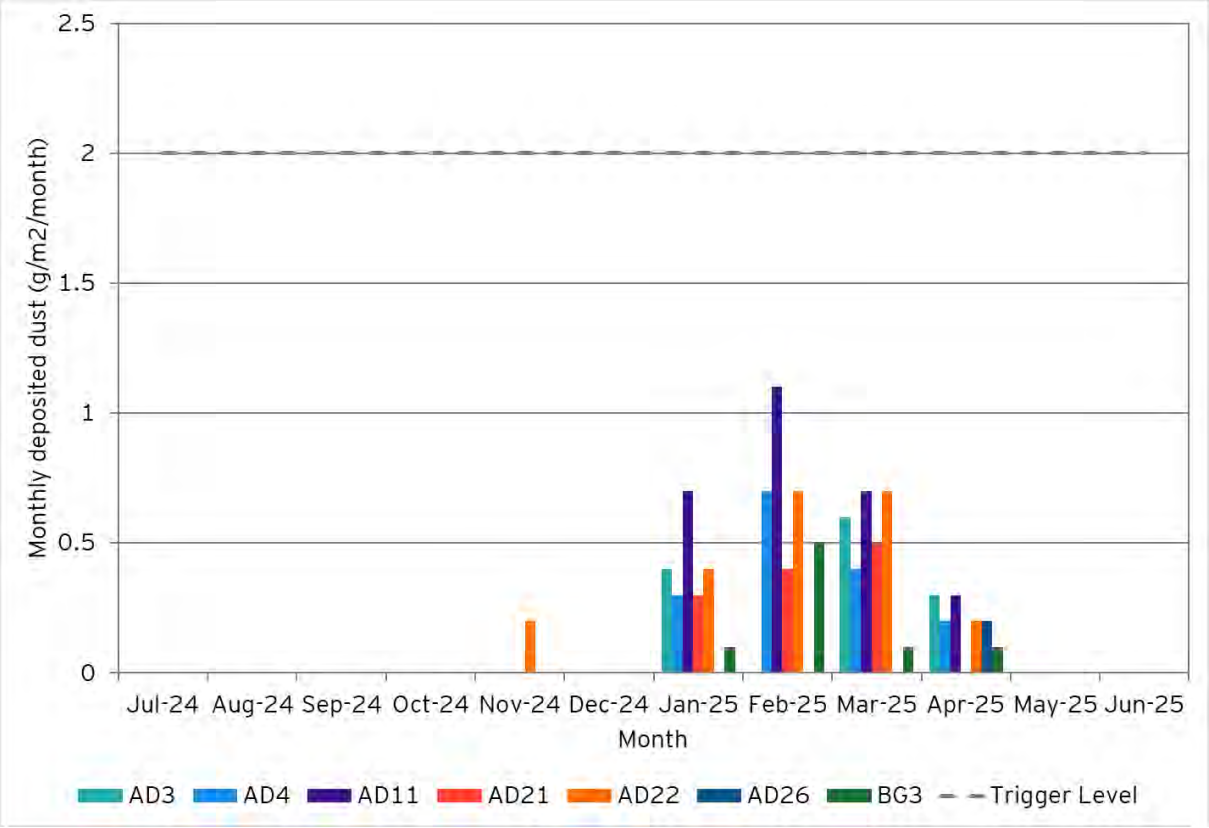


Figure 2: Monthly deposition above background for sites at or beyond the site boundary

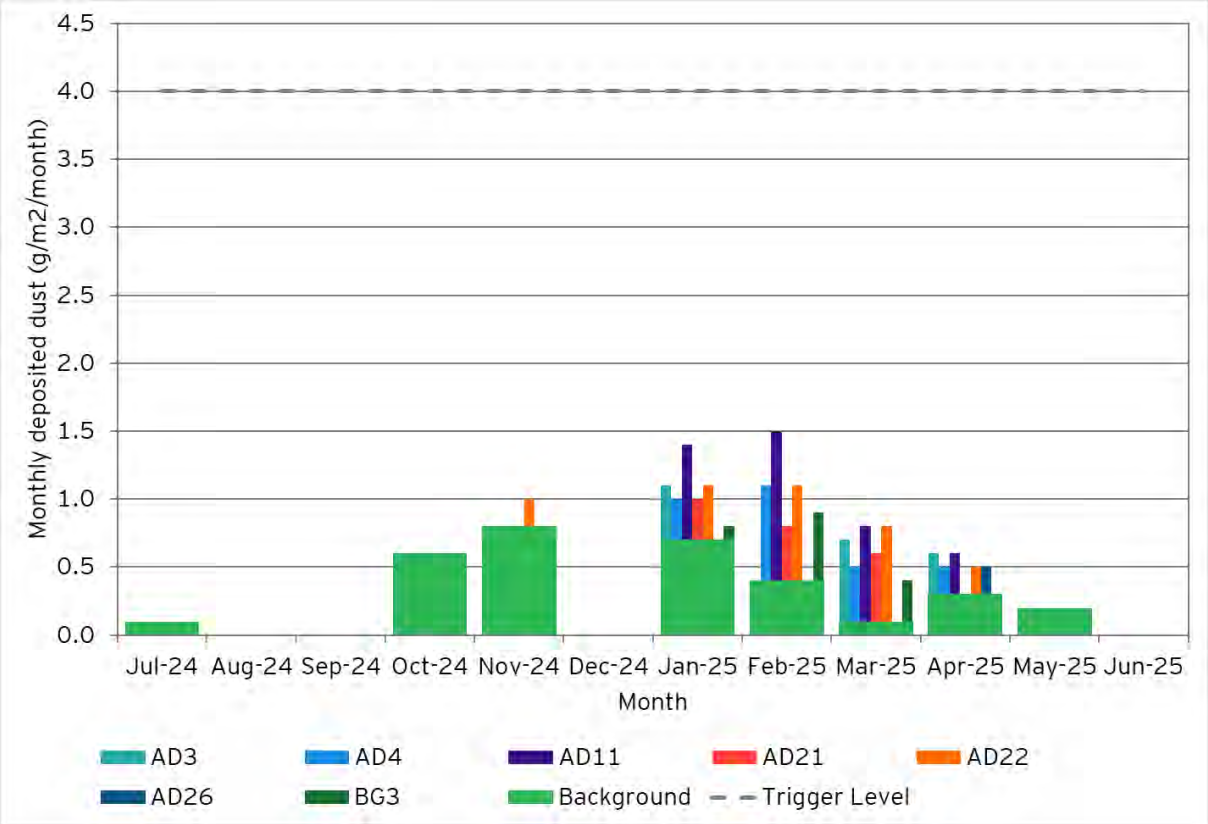


Figure 3: Total monthly deposition for sites at or beyond the site boundary

3.3 Summary

There were no exceedances of the trigger levels or compliance limits for all HVAS and DDG locations. As no exceedances of the compliance limits were reported, it is indicated that MMG Rosebery Mine is a low environmental risk to air quality and that the current dust mitigation controls are appropriate.

There have been previous recommendations that the air quality monitoring network could be consolidated in line with EPN 7153/3 condition A3-4 as the annual pattern has been established based on 13 years of data. The EPA have stated that they do not want MMG Rosebery Mine to reduce the number of deposition gauges (EPA Tasmania, 2025). However, considering the low environmental risk to air quality and the typical annual rainfall, a small targeted DDG network could provide more meaningful information regarding MMG Rosebery Mine's dust impact. As dust deposition rates are indicators of amenity issues, a consolidated network outside of the boundary of the MMG Rosebery Mine, along with a robust community complaints program, could provide better insight into the mines impacts.

4. Assessment of Dust Management Performance

MMG Rosebery Mine has a Dust Mitigation Management Plan (MMG, 2025a) that outlines the mitigation measures for reducing the environmental risk associated with the generation of dust due to the operations and activities at the mine. The Dust Mitigation Plan fulfils the requirements of section A6 of EPN 7153/3. The assessment of the Dust Mitigation Plan addresses the following:

- Sources of potential dust from the MMG Rosebery Mine.
- Details on the real-time monitoring network (four DustTrak's co-located with the HVAS monitors and site meteorological monitoring).
- The real-time inspection and mitigation level triggers, as presented in Table 12.
- General responses when real-time inspection or mitigation level triggers occur.
- Meteorological conditions that are considered conducive to dust events.

The inspection and mitigation levels are presented in Table 12.

Table 12: Real time dust trigger levels

Averaging period	Inspection Level (µg/m^3)	Mitigation level (µg/m^3)
15 minutes	300	500
60 minutes	200	350

Source: (MMG, 2025a)

4.1 Summary of Inspection and Mitigation Level Alerts

The number of alerts and alert days[4] of the inspection and mitigation levels, as described in Table 12, are summarised in Table 13. The 15-minute and 60-minute rolling averages reported by the telemetry network were used in the analysis, annual plots are provided in Appendix A. In late 2020, with the assistance of EPA Tasmania, site specific calibration factors were applied to the DustTraks to reduce the amount of dust alarms of inspection and mitigation levels due to wood fire smoke haze from nearby residences. It is recommended that the calibration factors are validated yearly, with the assistance of EPA Tasmania, to assess their appropriateness.

There were multiple changes to the DustTrak instrumentation throughout the FY24/25 period. On October 29, 2024, the Core Shed and Filter Plant DustTraks were upgraded from DustTrak II units to DRX models. In May 2025, both DRX units failed, with DustTrak IIs reinstalled for the remainder of the reporting period.

In FY24/25 there were exceedances of both the 15-minute and 60-minute mitigation levels for Filter Plant and Core Shed, and inspection level alerts for all DustTrak locations on 22 October 2024. Per the investigation conducted by MMG, the elevated concentrations were due to smoke from fuel reduction burns conducted by Parks and Wildlife Service in Zeehan on the 21 and 22 of October. Inspection level alerts were also recorded on the 14 February 2025. All four monitoring stations exceeded the 60-minute average, and all but Giblin Street exceeded the 15-minute average. These alerts were due to multiple active bushfires burning throughout the west coast of Tasmania. The 15-minute inspection level alert was also exceeded at Core Shed on 31 March 2025, due to bushfires within the region.

In FY23/24 there were no inspection or mitigation level alerts recorded for any of the DustTrak locations due to improved dust mitigation since FY22. In FY22/23, there were inspection and mitigation level alerts recorded for AD2.1 (Core Shed). These alerts were attributed to a smoke from the Rosebery bushfire and a nearby barbeque and were not related to MMG Rosebery Mine activities. In FY21/22, inspection and mitigation level alerts were recorded for AD3 (Filter Plant)

[4] An alert day is defined as a day where one or more alert of the mitigation or trigger level is raised.

and AD2.1 (Core Shed). These alerts were attributed to planned burns in locations near the mine and bushfires in Tullah located seven kilometres northeast from site.

Table 13: Number of alerts and alert days

	Averaging period	Monitoring site ID				
		AD3 (Filter Plant)	AD2.1 (Core Shed)	Giblin Street	Alec Street	AD26 (Baillieu St) [1]
Number of alerts						
Inspection level	15-minute	214	262	10	174	0
	60-minute	664	649	242	500	0
Mitigation level	15-minute	47	36	0	0	0
	60-minute	78	76	0	0	0
Number of alert days						
Inspection level	15-minute	2	3	1	2	0
	60-minute	2	2	2	2	0
Mitigation level	15-minute	1	1	0	0	0
	60-minute	1	1	0	0	0
Data capture[1]		93.33%	99.83%	99.65%	99.35%	27.89%

Note:
[1]. AD26 (Baillieu St) was installed in March 2025 and the data capture is based on a year of data
[2] Data capture excludes missing data points invalidated during the data analysis (except for Baillieu St which includes all data points). The invalidated data points are included in the real-time alerts.

4.2 Summary of Dust Management Performance

Analysis of the air quality monitoring network (HVAS and DDG monitoring data) shows that the performance of the dust management plan at the MMG Rosebery Mine is sufficient in mitigating fugitive dust. No DustTrak locations received alerts of the inspection or mitigation levels prescribed in the Dust Mitigation Management Plan due to MMG Rosebery Mine (MMG, 2025a). The alerts received were due to bushfires within the region.

Several community complaints were received in the FY24/25 monitoring period, per Table 14. All complaints were investigated by MMG and were not found to be due to MMG Rosebery Mine relation fugitive dust, evidenced by the HVAS monitoring and DDG results and wind conditions during the complaint, as no exceedances were recorded.

Table 14: Community complaints received during the reporting period

Category	Date Received	Details
Air	7/11/2024	A complaint was received via EPA Tasmania from a Rosebery resident regarding dust. MMG completed an investigation that found there were elevated north-westerly winds the day of the complaint, however, there was no evidence of fugitive dust leaving site (MMG, 2025e).
Air	11/01/2025	A complaint was received via EPA Tasmania from a Rosebery resident regarding dust. MMG completed an investigation that found there were elevated westerly winds the day of the complaints but no evidence of fugitive dust leaving site (MMG, 2025f).
Air	1/05/2025	A complaint was received via EPA Tasmania from a Rosebery resident regarding dust. MMG completed an investigation that found there were elevated south-southeasterly winds at the time of the grievance however, there was no evidence of a visible dust plume leaving site (MMG, 2025g).
Air & Noise	3-4/05/2025	Multiple complaints related to dust and noise were received by EPA Tasmania. An engagement action plan has been developed for MMG Rosebery to actively work with this nearby resident (MMG, 2025h).

4.3 Recommendations for Future Dust Management

Based on the assessment of the air quality monitoring network, it is recommended that the MMG Rosebery Mine continue its current management and mitigation measures. A review of the dust mitigation plan completed in 2024, stated that it is considered adequate for the management of dust emissions from operations at MMG Rosebery Mine (EY, 2024). It is recommended that the mitigation and inspection trigger levels are checked in three years (due in 2027) to understand if they are sufficient to assist in the continued control of dust from site.

5. References

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EY. (2024). *Dust Mitigation Plan Review - MMG Rosebery*. Ernst and Young.

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MMG. (2025c). *MMG Rosebery – Dust Deposition Network Upgrade - Further Information Request*. MMG.

MMG. (2025d). *per comms between Adam Pandelis and Browyn Sheen, Subject: RE: [EXTERNAL] - MMG Rosebery - metal contamination in DDG trip blanks*.

MMG. (2025e). *Dust Complaint (GR-04329) - Detailed report retrieved for borealis*. MMG Rosebery.

MMG. (2025f). *Dust observed in town coming from site 11/1/25 (GR-04428) - Detailed report retrieved for borealis*. MMG Rosebery.

MMG. (2025g). *MMG Rosebery - Dust Complaints*. MMG Rosebery.

MMG. (2025h). *Overview Complaints/Action Plan to EPA (GR-04510) - Detailed report retrieved for borealis*. MMG Rosebery.

Tasmania Government. (2022). *Environmental Management and Pollution Control Act 1994*. Tasmania Government.

Appendix A Additional Plots

Additional HVAS Data – FY24/25

The individual day 24-hour HVAS plots are presented in Figure 4 to Figure 8. The 90-day average lead (as TSP) is presented in Figure 9.

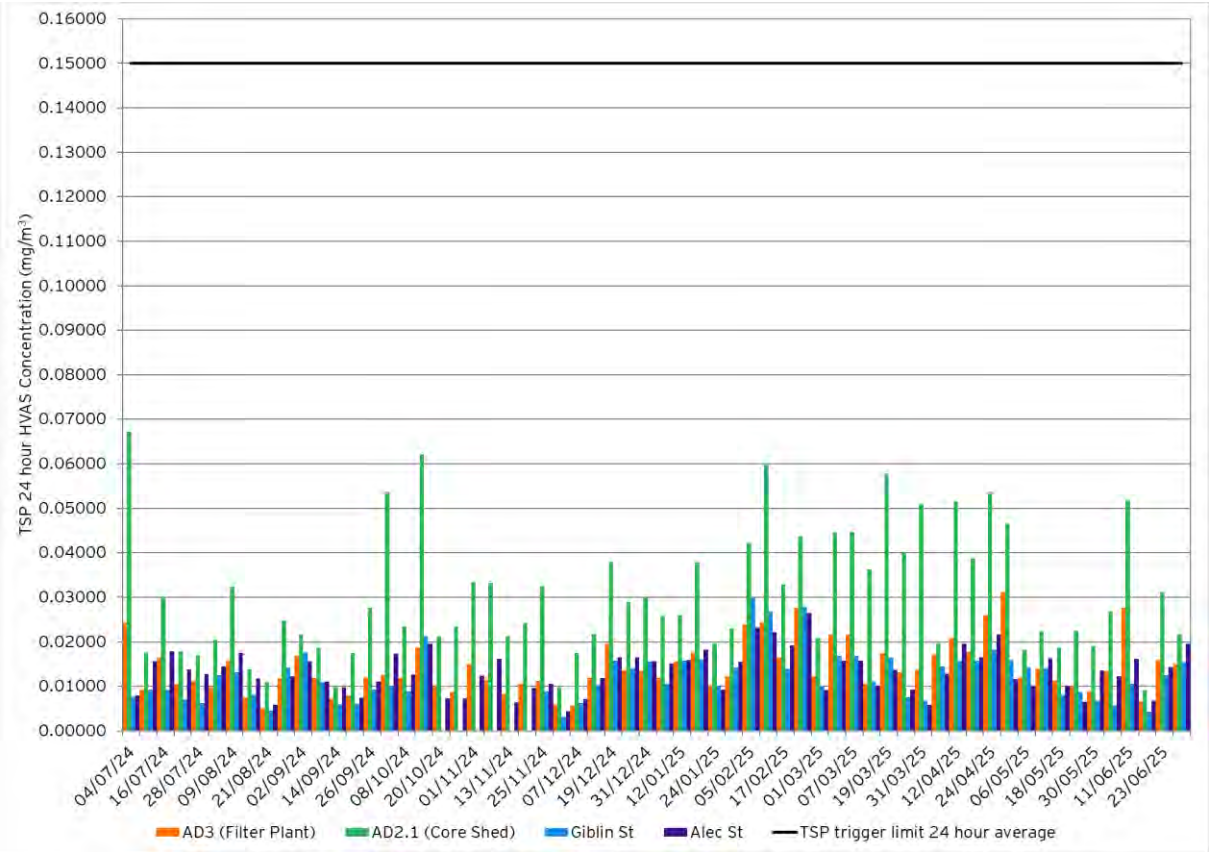


Figure 4: TSP HVAS 24-hour averages for FY24/25

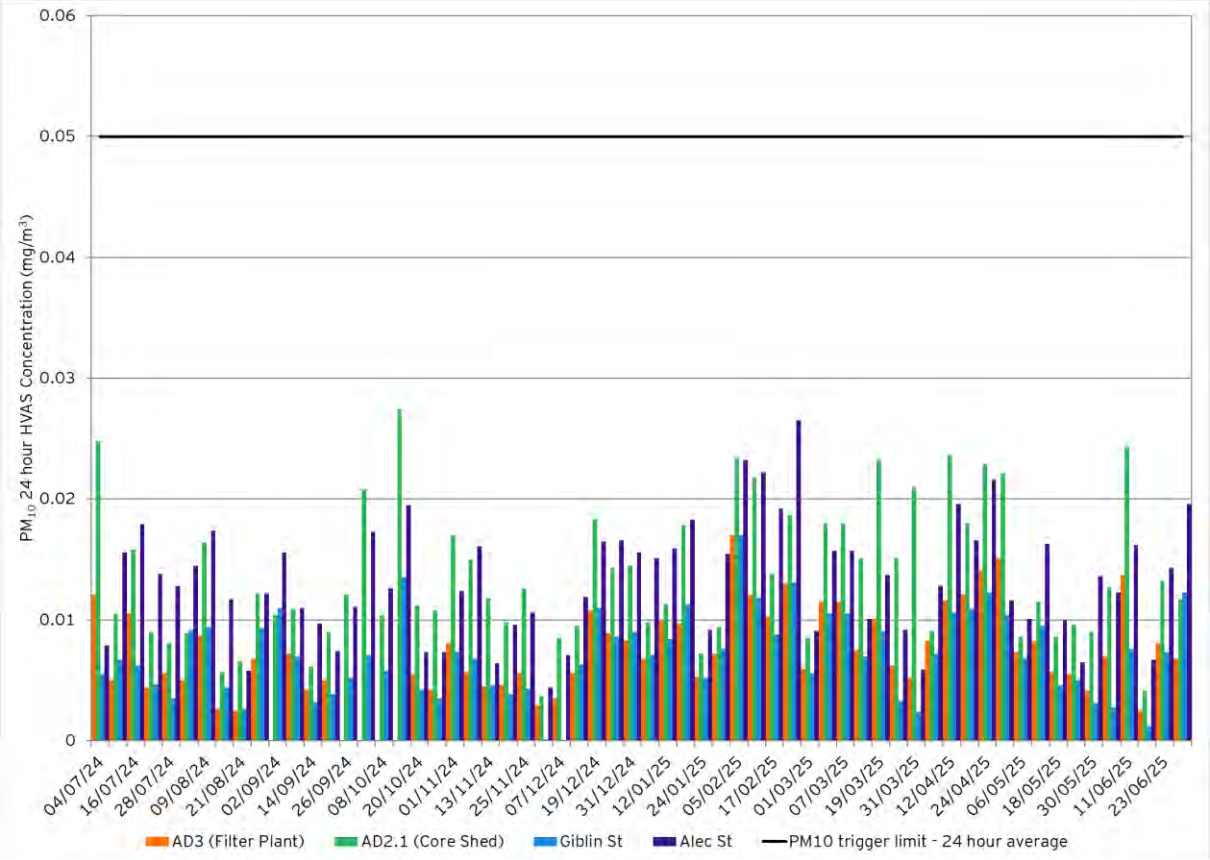


Figure 5: PM_{10} HVAS 24-hour averages for FY24/25

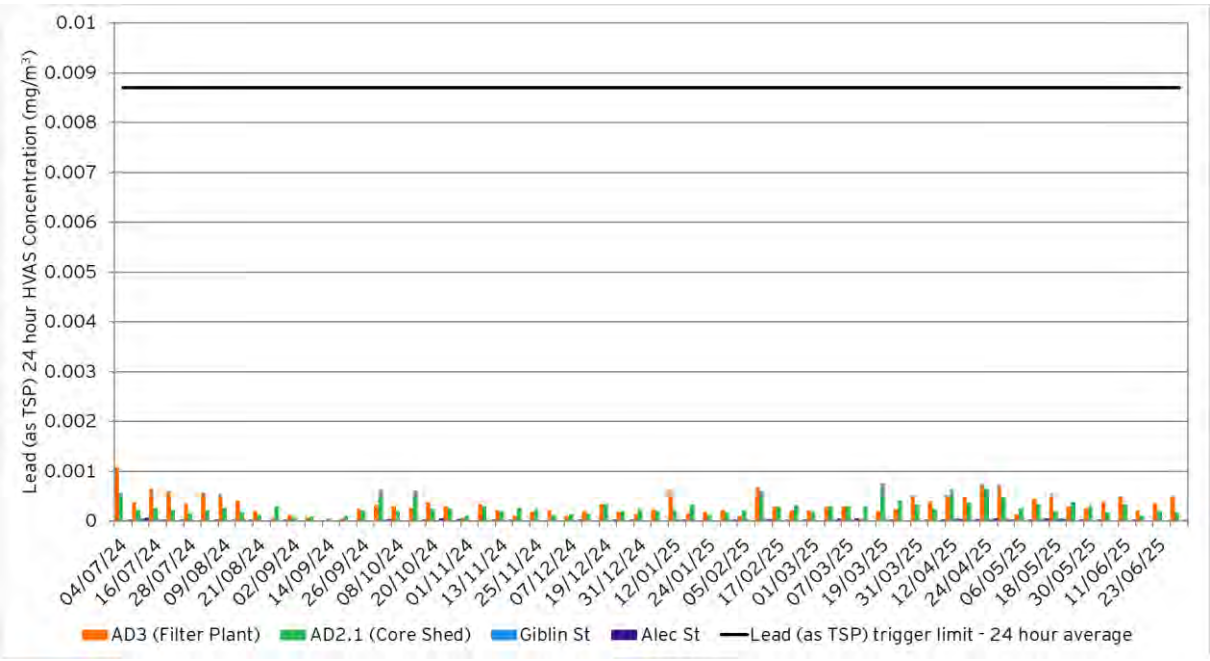


Figure 6: Lead (as TSP) 24-hour averages for FY24/25

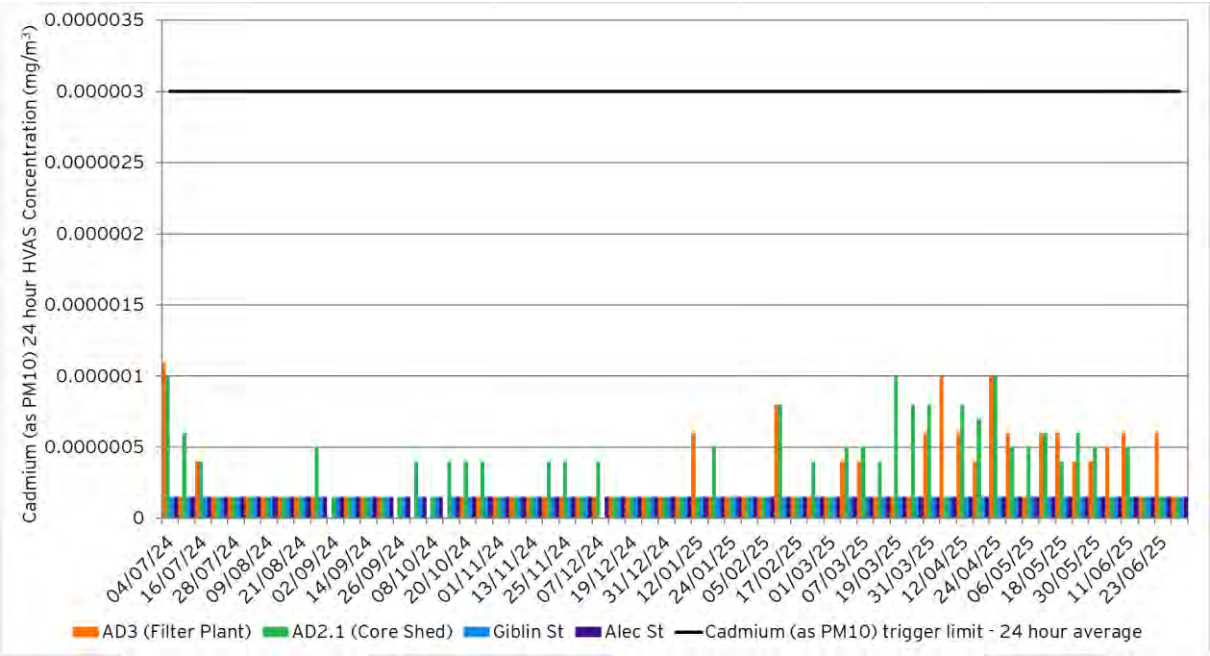


Figure 7: Cadmium (as PM_{10}) 24-hour averages for FY24/25

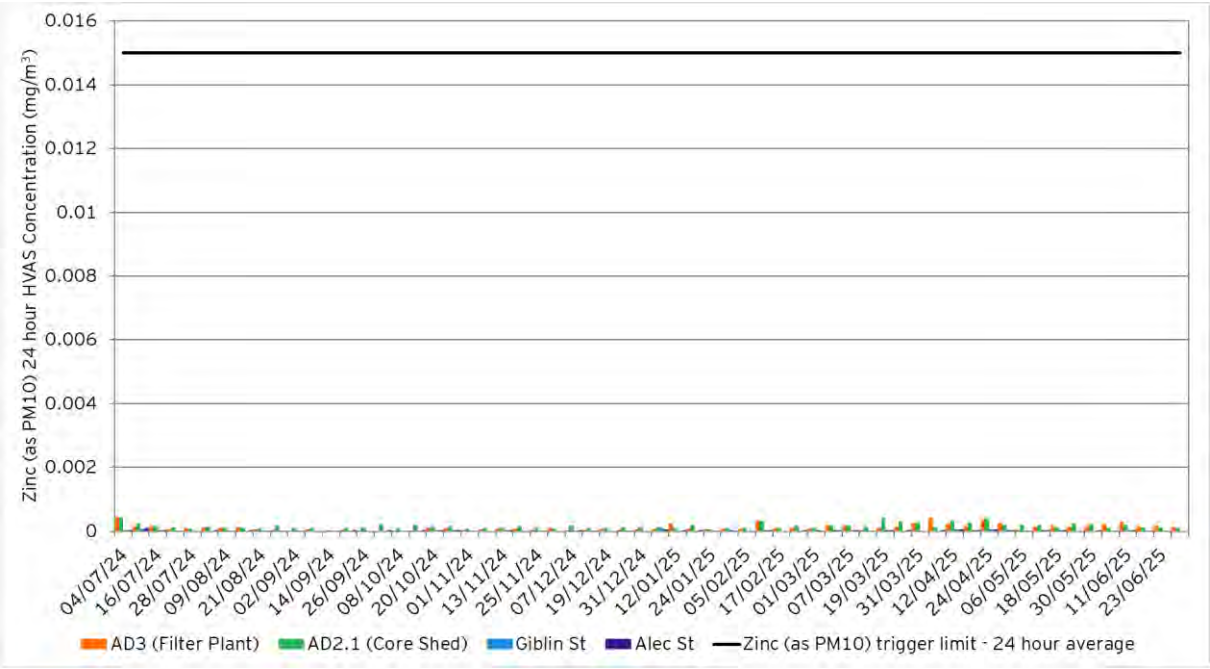


Figure 8: Zinc (as PM_{10}) 24-hour averages for FY24/25

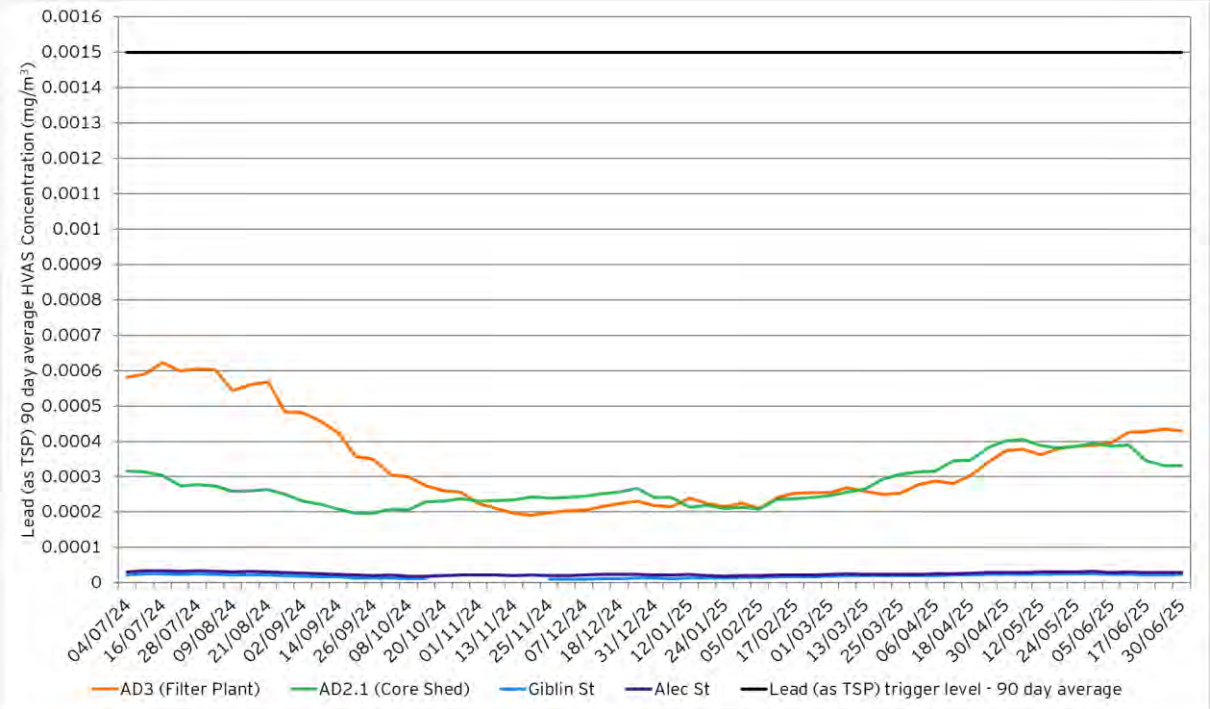


Figure 9: Lead (as TSP) HVAS 90-day average for FY24/25

Additional HVAS Data – FY21/22 to FY24/25

Provided in Figure 10 to Figure 14 is the FY21/22 to FY25 HVAS data.

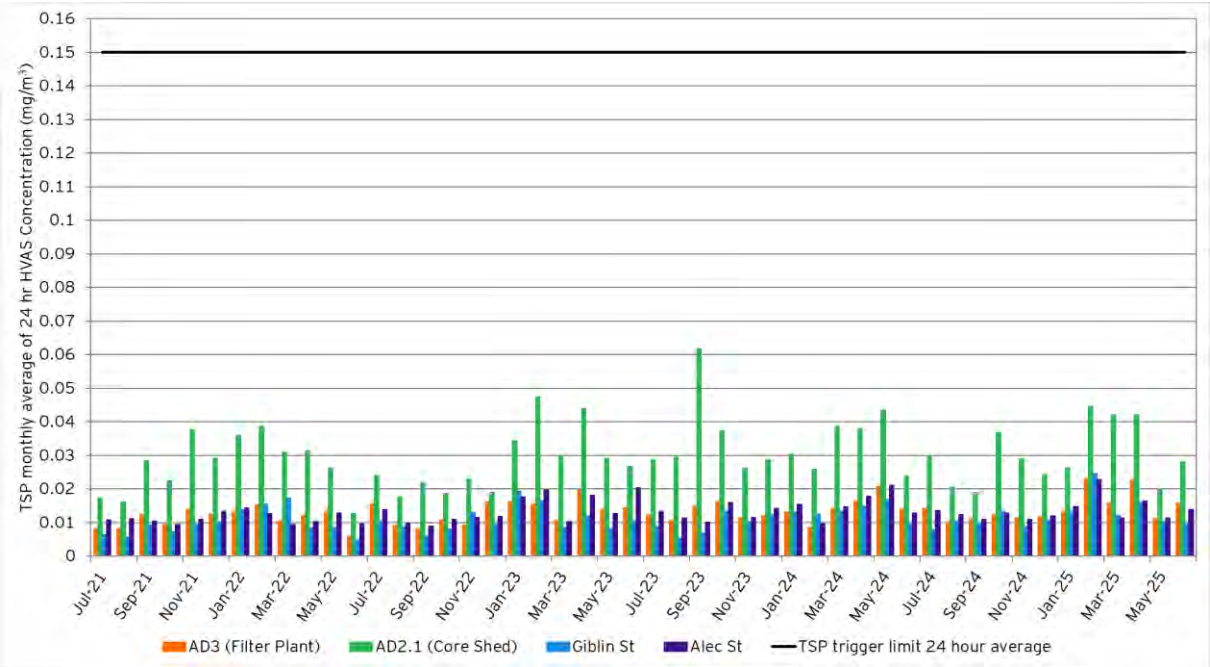


Figure 10: TSP HVAS monthly 24-hour averages – FY21/22 to FY24/25

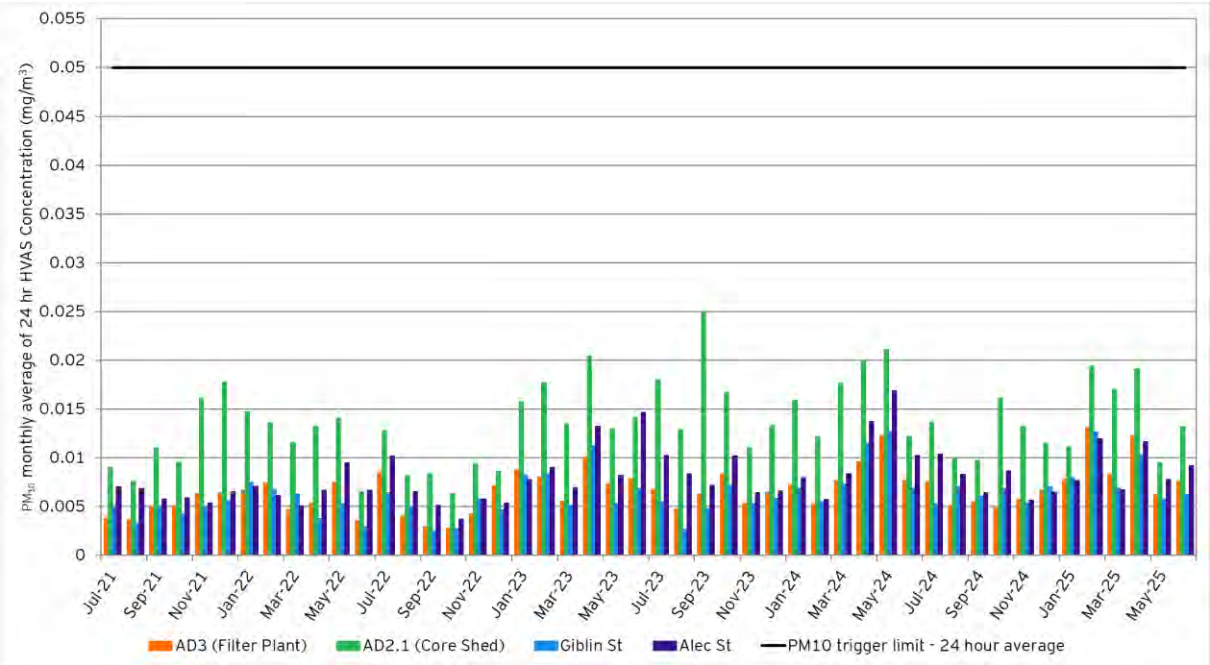


Figure 11: PM_{10} HVAS monthly 24-hour averages – FY21/22 to FY24/25

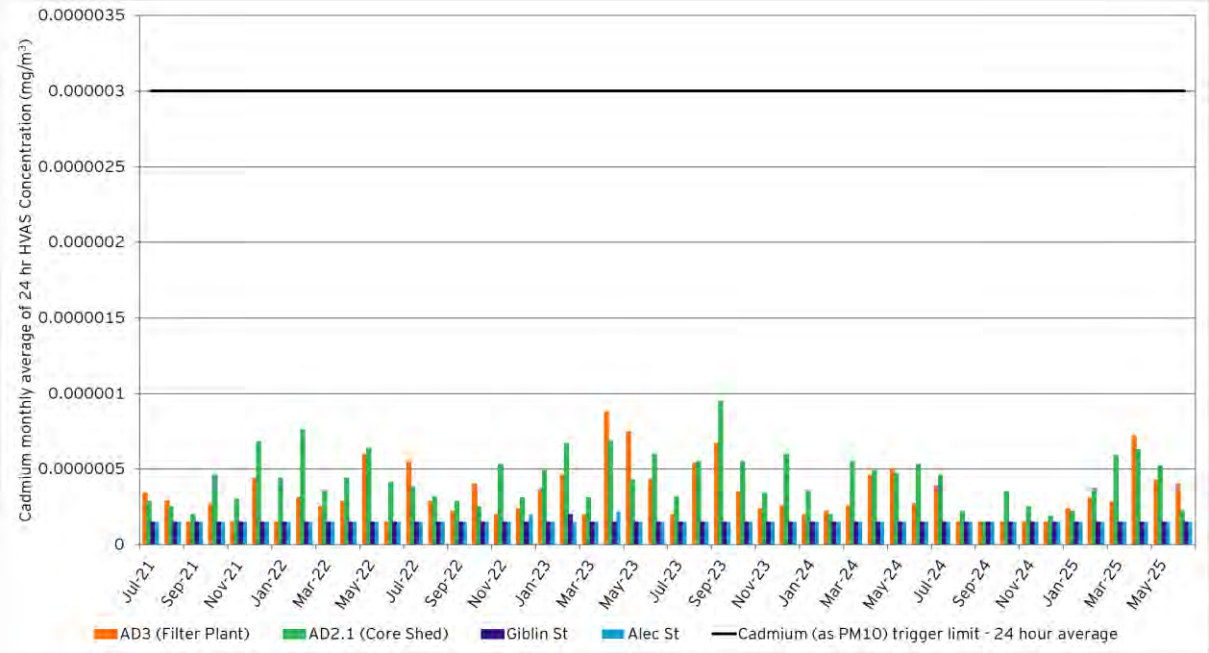


Figure 12: Cadmium (as PM_{10}) monthly 24-hr averages – FY21/22 to FY24/25

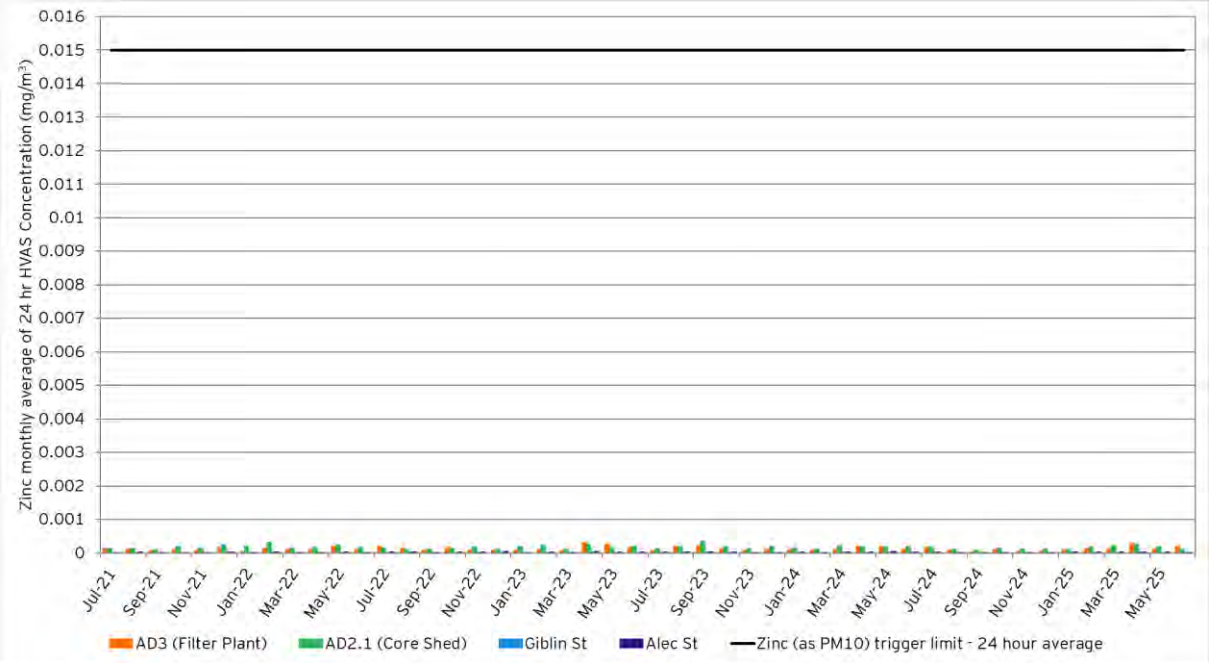


Figure 13: Zinc (as PM_{10}) monthly 24-hr averages – FY21/22 to FY24/25

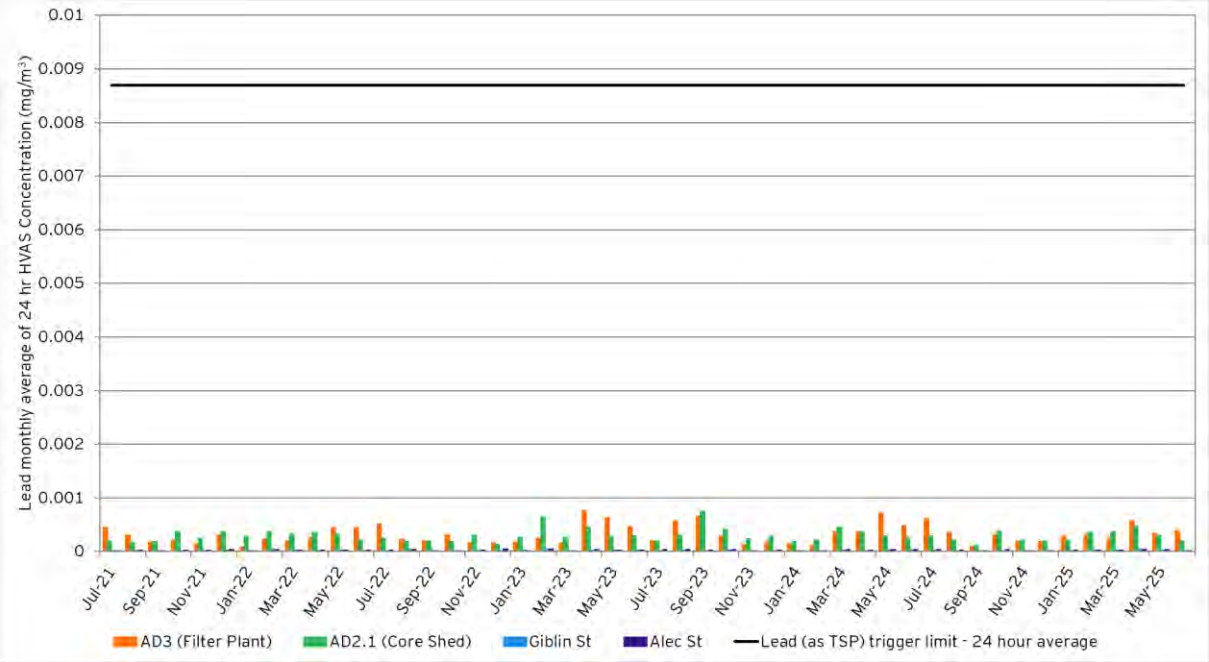


Figure 14: Lead (as TSP) monthly 24-hour averages – FY21/22 to FY24/25

Deposited dust data – FY24/25

The monthly dust deposition and monthly dust deposition above background for sites at or beyond the boundary are presented Figure 15 and Figure 16. The monthly dust deposition at all sites is presented in Figure 17.

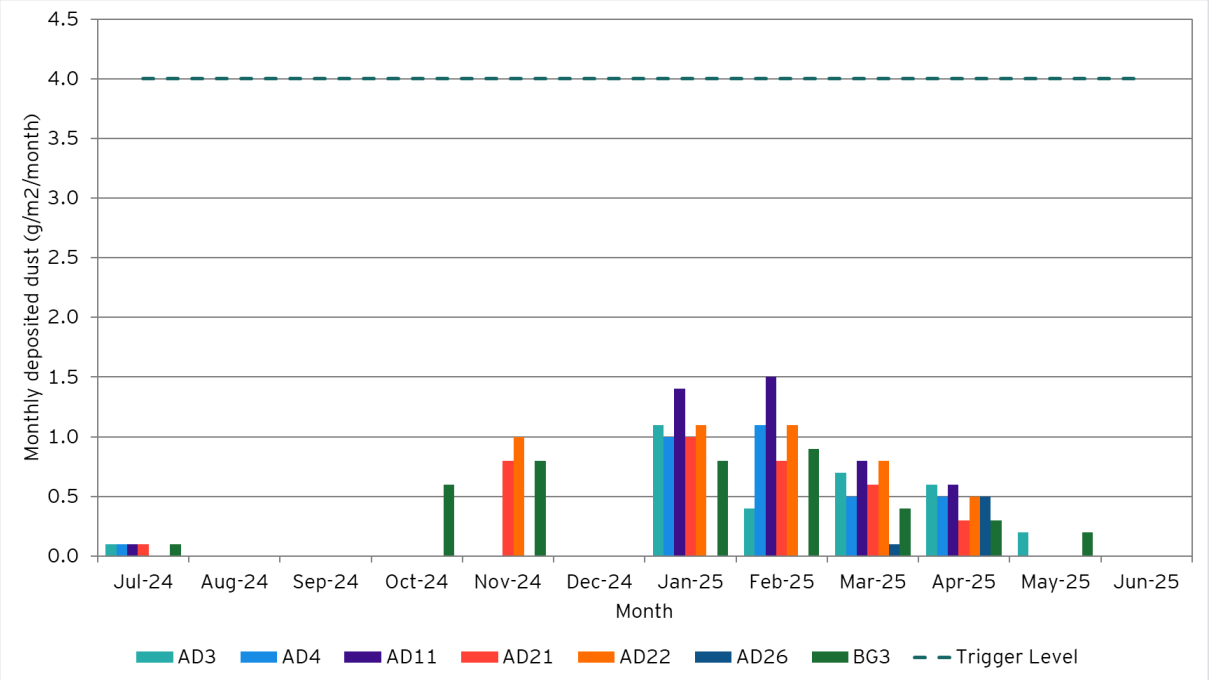


Figure 15: Monthly total dust deposition for sites at or beyond the site boundary

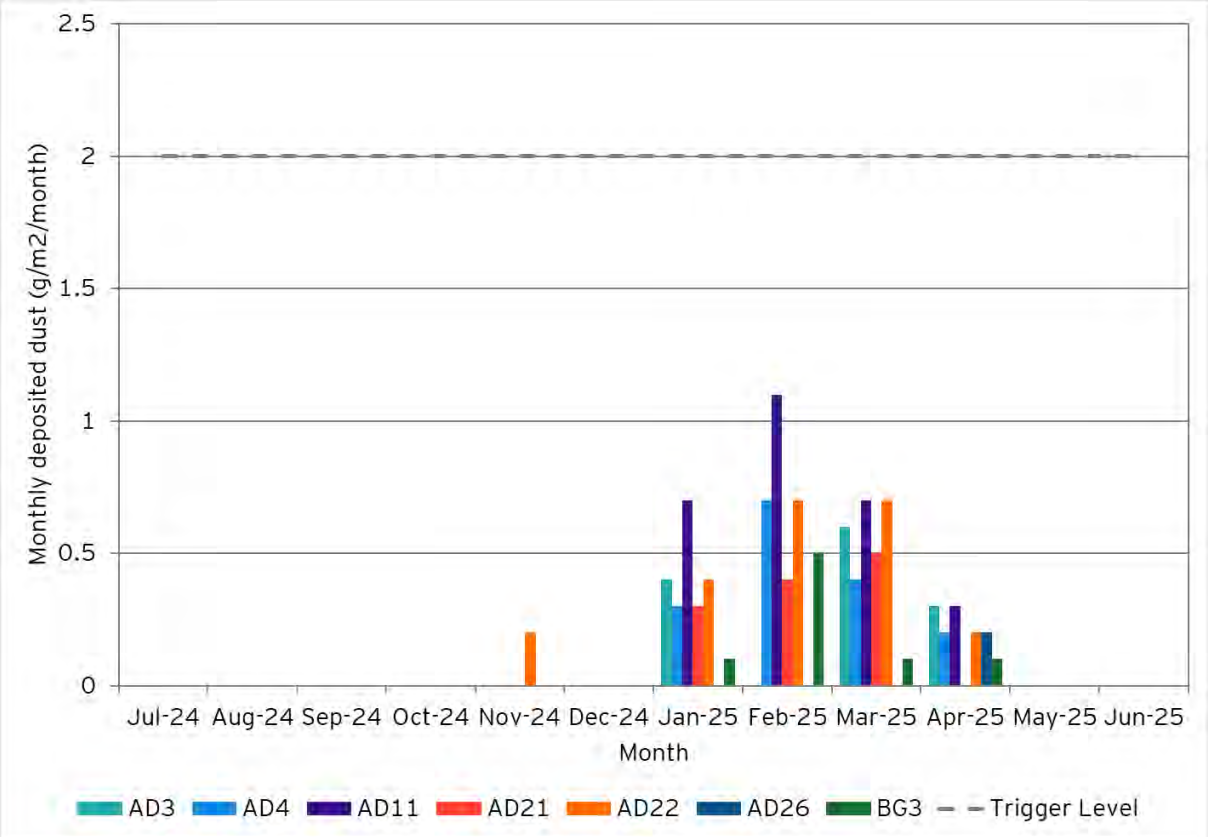


Figure 16: Monthly deposition above background for sites at or beyond the site boundary

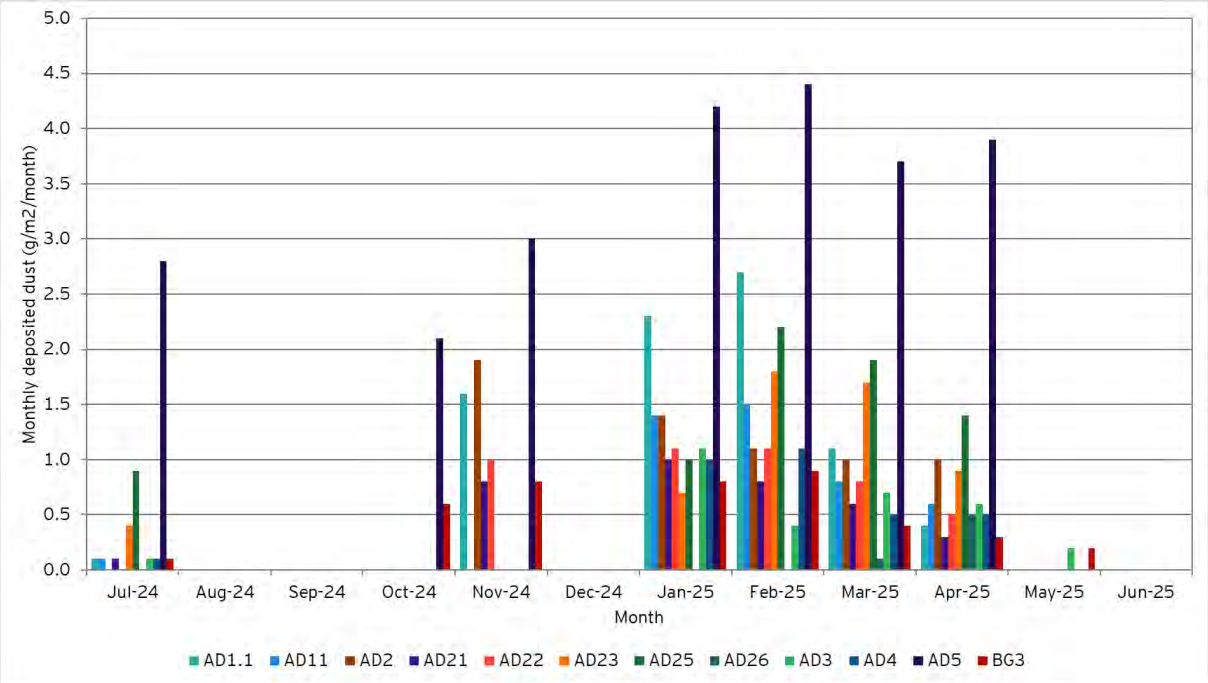


Figure 17: Monthly deposited dust (including background) at all sites

Deposited dust data – FY21/22 to FY24/25

Presented in Figure 18 is the monthly deposited dust above background for FY21/22 to FY24/25. Invalid results have not been included within this figure.

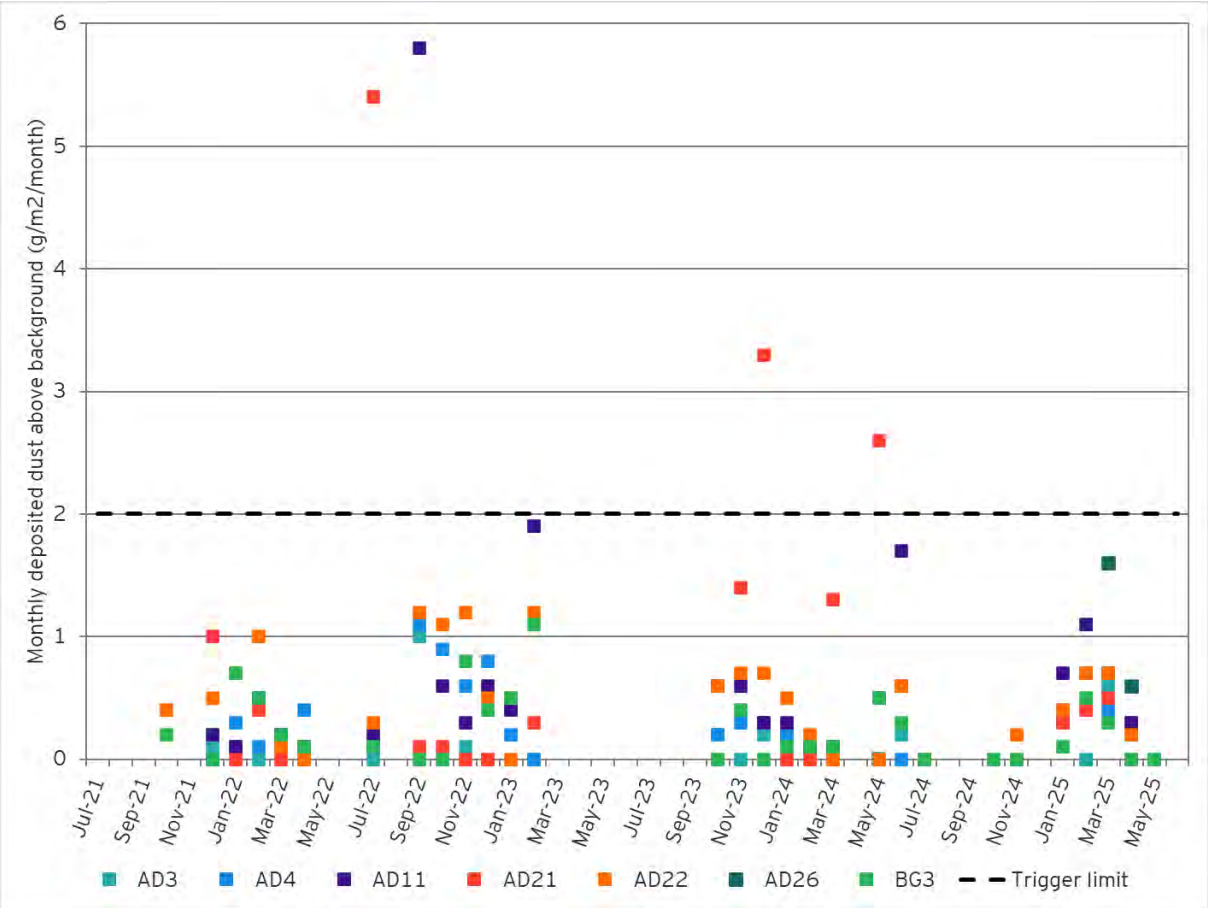


Figure 18: Monthly deposition dust above background – FY21/22 to FY24/25

DustTrak Data – FY24/25

The daily maximums of the15- and 60-minute PM_{10} concentrations as recorded by DustTrak are presented in Figure 19 and Figure 20.

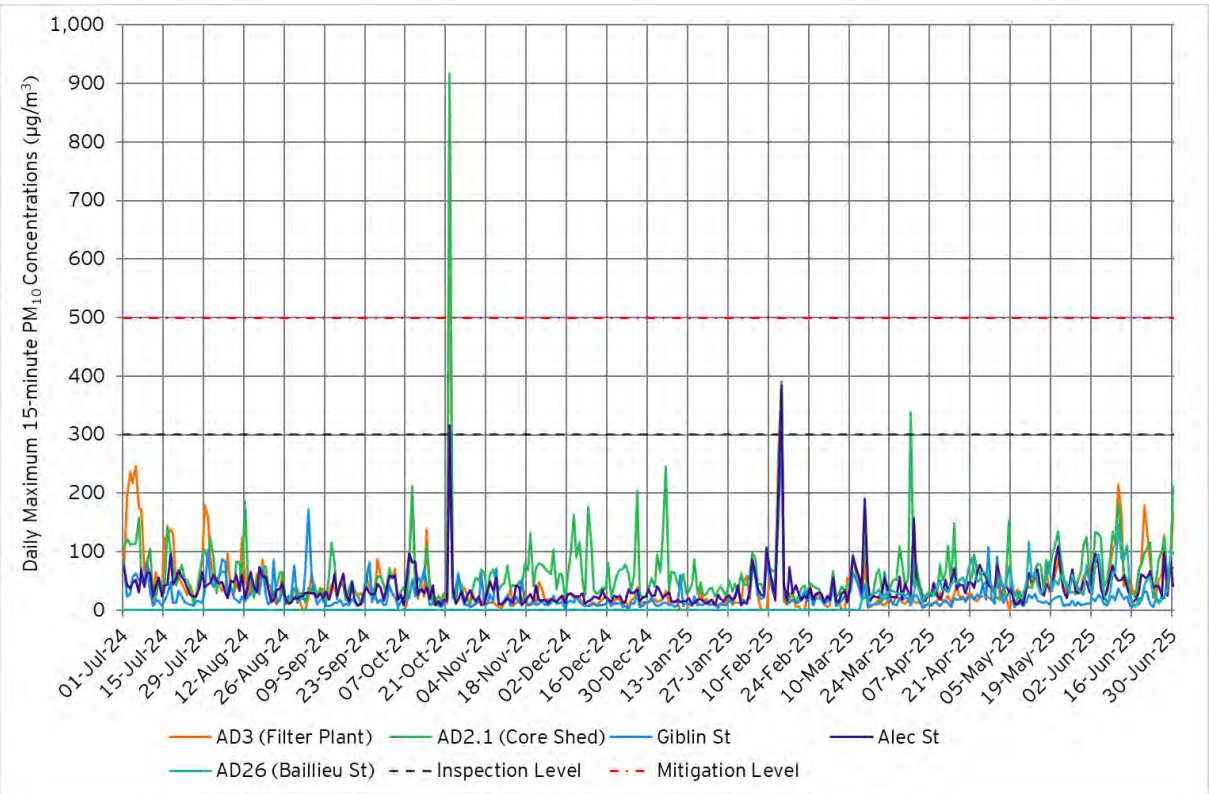


Figure 19: DustTrak – Daily maximum of 15-minute average PM_{10} concentrations

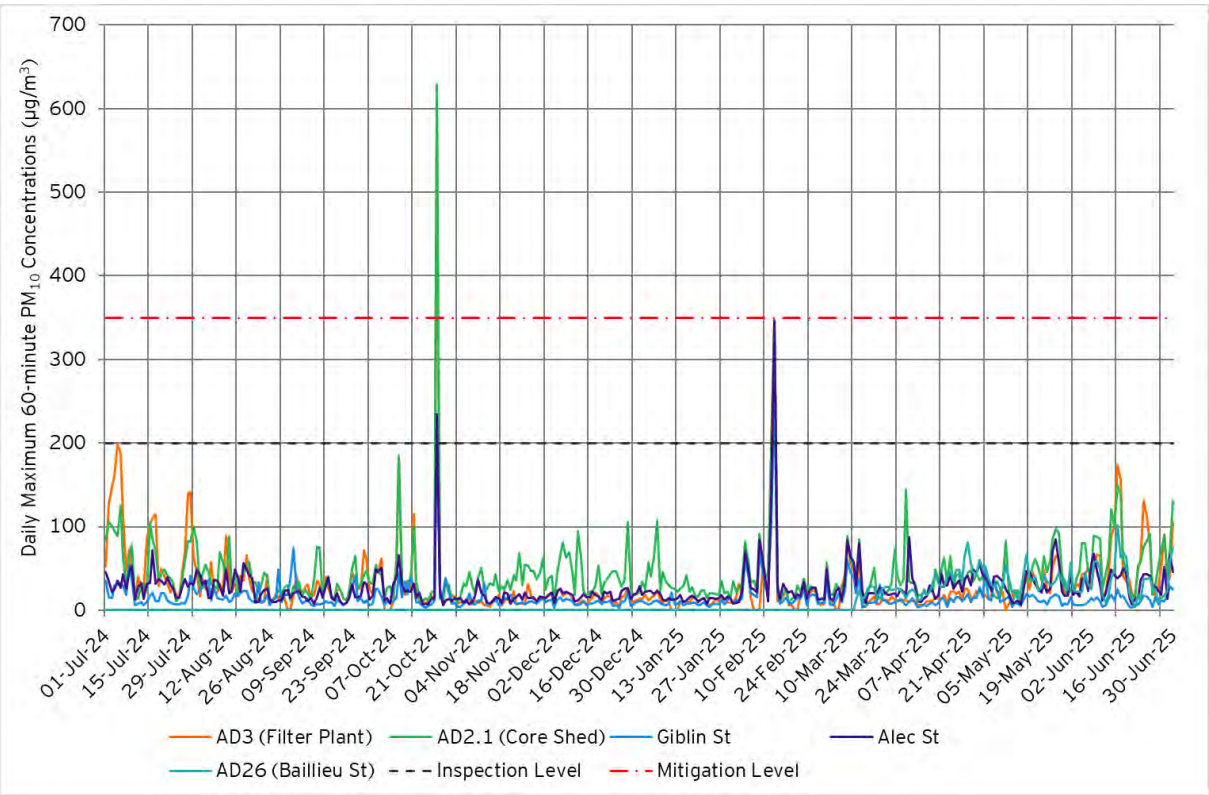


Figure 20: DustTrak – Daily maximum of 60-minute average PM_{10} concentrations

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Appendix J Rosebery Mine Environmental Noise, Ground Vibration and Air Blast Overpressure Annual Monitoring Data Review (Tarkarri, 2025)

MMG Limited

Rosebery mine Environmental noise, ground vibration and air blast overpressure annual monitoring data review 2024-2025



Report No. 7067_ACVIB_R

TARKARRI ENGINEERING PTY LTD
PO Box 506
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September 2025

Tarkarri Engineering

Air Quality • Acoustics • Environment • Vibration

DOCUMENT CONTROL

MMG LIMITED ROSEBERY MINE ENVIRONMENTAL NOISE, GROUND VIBRATION AND AIR BLAST OVERPRESSURE ANNUAL MONITORING DATA REVIEW 2024-2025

Report No.
7067_ACVIB_R
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Revision History

Revision No.	Date Issued	Reason/Comments
0	12/09/2025	Initial release

Distribution

Copy No._____	Revision No.	Location
1	0	Project/Client File
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Keywords

dBA – *Decibels A-weighted.*

A-weighting – *Weighting of the audible frequencies reflective of the response of the human ear to noise.*

$L_{Aeq,T}$ – *Equivalent continuous A-weighted sound pressure level over a given time (T).*

$L_{A90,T}$ – *A-weighted sound pressure level exceeded for 90 % of a given time period (T), typically known as the background.*

$L_{A10,T}$ – *A-weighted sound pressure level exceeded for 10 % of a given time period (T).*

GV – Ground vibration as peak particle velocity in mm/s

ABO – Air blast overpressure as dB Lin. Peak.

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References

[1] Environment Division, Department of Environment, Parks, Heritage and the Arts (July 2008) Noise Measurement Procedures Manual, 2nd Edition.

[2] 5944_ACVIB_R_MMG - Rosebery mine environmental noise, ground vibration and air blast overpressure annual monitoring data review 2023-2024.

[3] 5955_AC_R_MMG - Rosebery mine environmental noise survey 2024.

Executive Summary

Tarkarri Engineering was commissioned to conduct an annual review of noise, ground vibration and air blast overpressure data collected over the 2024-25 financial year at MMG's Rosebery mine.

Average $L_{Aeq,15min}$ levels recorded by five fixed noise monitoring stations were similar to the previous year, with exception to increases in evening levels noted at Mt Black.

Ground vibration and air blast overpressure levels recorded during blasting times at the mine were below the allowable limits. Some exceedances of the air blast limits were recorded, however, these were most likely due to adverse weather conditions.

The noise, ground vibration and air blast overpressure levels reviewed show that there remains no indication of performance changes in environmental noise emission levels or blasting generated by Rosebery mine.

1 Introduction

MMG Rosebery commissioned Tarkarri Engineering to undertake an annual review of continuous environmental noise monitoring, and ground vibration (GV) and air blast overpressure (ABO) monitoring of blasting activities at their Rosebery mine. The review is a requirement under MMG Rosebery's Environmental Protection Notice (EPN) 7153/3, condition G7.

The relevant sections of the EPN regarding the annual review and environmental noise, GV and ABO conditions are:

G7 Annual Monitoring Review and Management Report

1 Unless otherwise specified in writing by the Director, an Annual Monitoring Review and Management Report, covering a 12 month review period from 1 July of the preceding year to 30 June of the following year, must be submitted to the Director by 30 November 2011 and every subsequent year by September 30 thereafter. The Annual Monitoring Review and Management Report must be made publicly available by the person responsible for the activity.

2 The Annual Monitoring Review and Management Report must be compiled for the activity using the ISO 14001 Environmental Management System (EMS) Framework to demonstrate continual improvement and compliance with legal requirements (including this Notice) and must include, but not be limited to:

2.6 a review of the monitoring requirements contained within Attachment 2 of this Notice for the review period, including a detailed comparative review of monitoring locations, including discharge and ambient monitoring points that illustrate significant trends. Include a review of the accuracy of the sampling procedures, sampling schedule, sample locations and test methods applied;

Noise Control

N1 Continuous Noise Monitoring

1 Unless otherwise approved in writing by the Director:

1.1 noise emissions from the activity must be monitored applying the MMG Rosebery Mine continuous monitoring program at the locations specified in Table 13 of Attachment 2 and locations shown on Attachment 7, based on equivalent continuous (Leq) and L10 and L90 A-weighted sound pressure levels measured over a period of 15 minutes or an alternative time interval specified by the Director;

1.2 noise level measurements must be taken in the presence of ambient noise normally existent in the area;

1.3 measured noise levels are to be adjusted for tonality and impulsiveness in accordance with the *Tasmanian Noise Measurement Procedures Manual 2004*, or any future revision of this manual, issued by the Director;

1.4 all methods of measurement must be in accordance with the *Tasmanian Noise Measurement Procedures Manual 2004*;

1.5 noise from the activity must not cause an environmental nuisance, at any domestic residence or commercial activity in other ownership;

1.6 an indicator of whether environmental noise nuisance has occurred will be based on the record of any noise complaints received by MMG Rosebery Mine; and

1.7 If a noise complaint is received, the person responsible must:

1.7.1 address the complaint including the use of appropriate dispute resolution if required; or if necessary; and

1.7.2 implement noise abatement measures so that nuisance noise emissions from the activity do not result in ongoing environmental nuisance occurring

1.8 Results of the continuous noise monitoring program and noise related complaints must be reported in the Annual Monitoring Review and Management Report.

Blasting

B1 Blasting Control

Ground vibration due to blasting must not result in environmental nuisance occurring at any domestic residence or commercial activity in other occupation or ownership. Ground vibration management must be controlled by the combination of monitoring, at the location shown on Attachment 7 and for the parameters specified in Table 13 of Attachment 2.

B2 Blasting - noise and vibration limits

1 Blasting on The Land must be carried out in accordance with blasting best practice environmental management (BPEM) principles, and must be carried out such that, when measured at the curtilage of any residence (or other noise sensitive premises) in other occupation or ownership, airblast overpressure and ground vibration comply with the following:

- **1.1** for 95% of blasts, airblast overpressure must not exceed 115dB (Lin Peak);
- **1.2** airblast overpressure must not exceed 120dB (Lin Peak);
- **1.3** for 95% of blasts ground vibration must not exceed 5mm/sec peak particle velocity; and
- **1.4** ground vibration must not exceed 10mm/sec peak particle velocity.

2 All measurements of airblast overpressure and peak particle velocity must be carried out in accordance with the methods set down in *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*, Australian and New Zealand Environment Council, September 1990.

ATTACHMENT 2 (9 OF 9)

NOISE & VIBRATION MONITORING SCHEDULE

Table 13 Noise and vibration monitoring

Location	Description	Continuous Measurement
N1	Police house	Noise: LAeq, LA10, LA90
N2	Cohen Street	Noise: LAeq, LA10, LA90
N3	Clemons Street	Noise: LAeq, LA10, LA90
V1	Hospital	Peak Particle Vibration: mm/sec

This technical memo presents the results of the annual review for the period 1 July 2024 to 30 June 2025.

2 Site description

The MMG Rosebery mine is located on the lower south-west slope of Mount Black. The township of Rosebery borders the mine's above ground ore processing and train loading facilities to the south, south-west and west. Tailings storage facilities for the mine are located approx. 1.7 km north-west of the Rosebery township and to the south of the township on the southern side of the Murchison Hwy.

The mine produces zinc, lead, copper concentrates and gold dore bars via mechanised underground mining methods and employs crushing, grinding and flotation processes in their above ground processing facility.

Unattended monitoring of environmental noise is conducted at 5 locations across the township of Rosebery with GV and ABO monitored at a single location.

Table 2-1 presents spatial information for the environmental noise, GV and ABO monitoring locations. The table also provides location information on the weather stations for the mine that

were used to filter environmental noise data. Figure 2-1 and 2-2 provide aerial views showing the monitoring locations with residential zones shaded in yellow.

Table 2-1: Information on environmental noise, GV and ABO and weather monitoring locations.

Environment noise; GV and ABO; and weather monitoring location information		
Number	Location	Coordinates (MGA)
Environmental noise		
N1	Police House	378530, 5373726
N2	Cohen St	377812, 5374410
N3	Mt Black	379195, 5374213
N4	Murchison St	379063, 5374101
N5	Alec St	378988, 5373396
GV and ABO		
V1	Hospital	378827, 5374072
Weather stations		
W1	Bobadil	376839, 5376290
W2	Overflow Carpark	378748, 5374012
W3	2/5 Dam	378491, 5372628

EPN 7153/3 monitoring locations.

NB: Positions N4 and N5 are additional monitoring locations not specifically required under EPN 7153/3. They were implemented to monitor truck movements to and from the level 3 waste rock dump (WRD) (truck movements to and from this area seldomly occur as the WRD is no longer used) in the case of position N4 and the construction of the 2/5 Tailings Storage Facility (TSF) (as required under Permit Conditions Environmental no. 9084 (R1)), in the case of position N5.

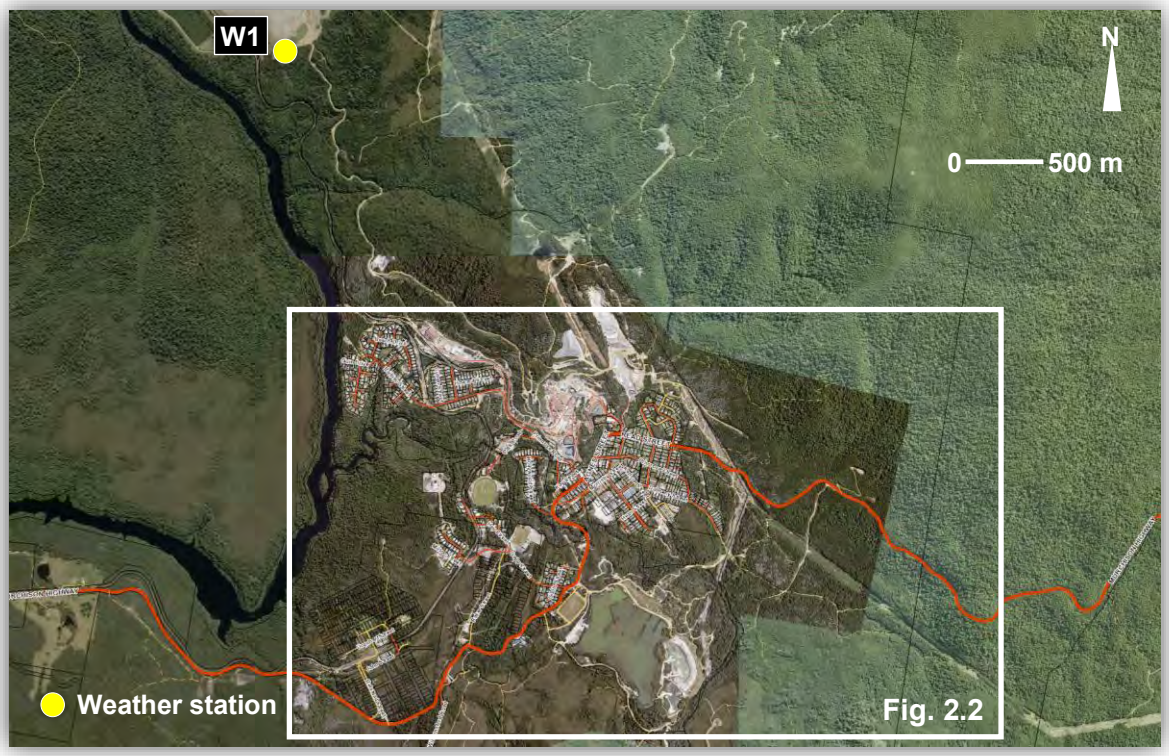


Figure 2-1: Aerial view of Rosebery and surrounds with the location of weather station 1 and the extent of Figure 2.2 marked.

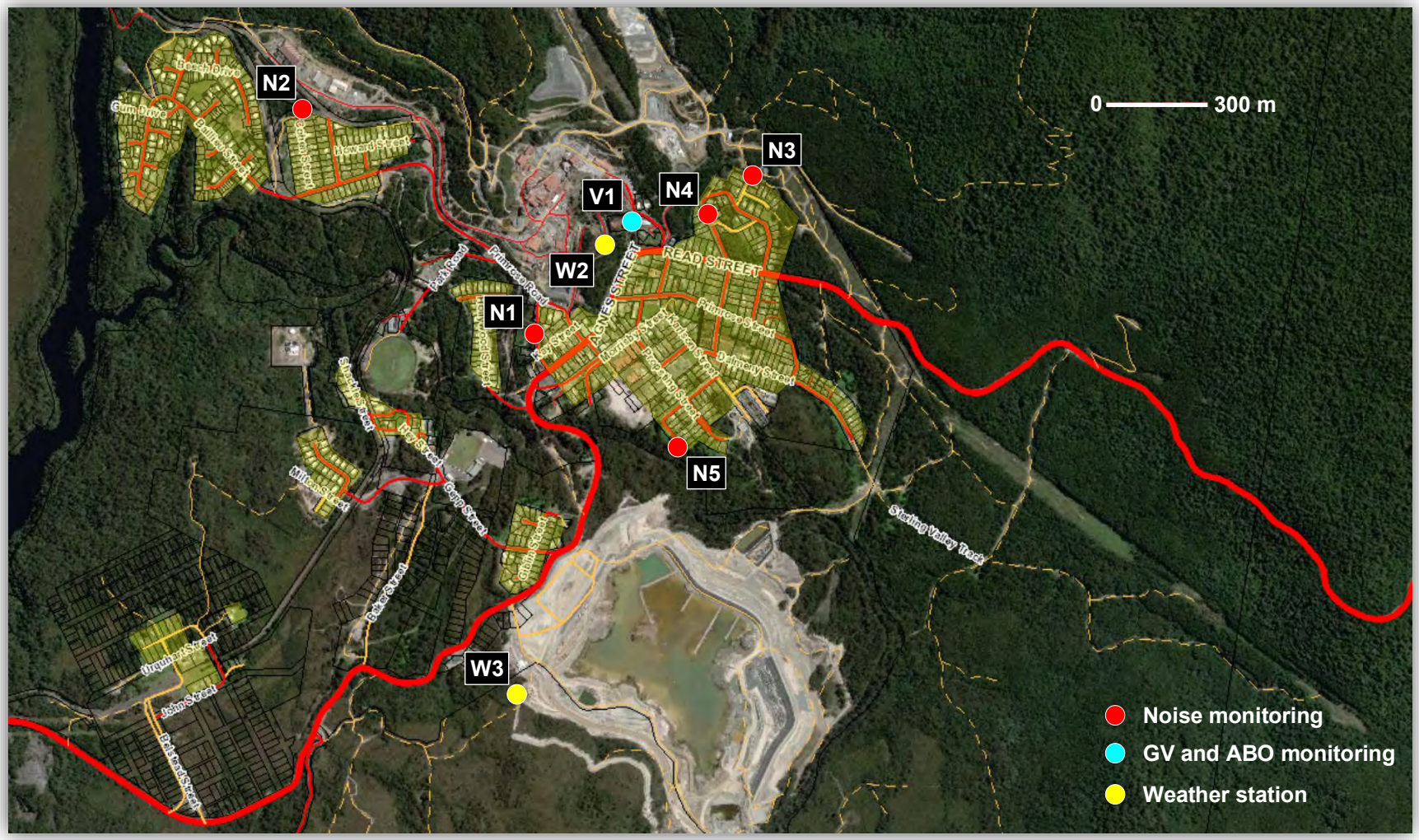


Figure 2-2: Aerial view of Rosebery with environmental noise; GV and ABO; and weather monitoring locations marked.

3 Environmental noise monitoring

Unattended continuous noise monitoring is conducted at 5 locations across the township of Rosebery as shown in Figure 2.2. Acoustic Research Laboratories Ngara Type 1 noise loggers are used to record fast response A-weighted sound pressure levels with 15-minute equivalent continuous (L_{eq}), min, max and 8 Ln-statistic levels (including L_{A90}, L_{A10}) extracted during post download data processing.

Field calibrations are completed approximately weekly, and factory calibration completed once every 2 years by a National Association of Testing Authorities (NATA) accredited laboratory. All monitored data presented here was from NATA laboratory calibrated loggers (calibration certificates, including field calibrators units, are provided in the appendix of this report).

The 5 environmental noise monitoring stations are in general accordance with requirements of section 4 and section 5.2 of the *Tasmanian Noise Measurement Procedures Manual, 2nd Edition* (July 2008)[1].

Available 15-minute interval data sets for each measurement location were filtered for erroneous data and poor weather conditions (i.e. winds speeds in excess of 5 m/s and precipitation), based on 10-minute weather data recorded at the three weather stations shown in Figures 2.1 and 2.2.

3.1 Data sets

Table 3-1 presents overall data availability as a percentage of the 35,040 possible 15-minute intervals available for analysis over the past monitoring year. Available data has subsequently been filtered against adverse weather conditions, measurement overload errors and measurement drift.

Table 3-1: Environmental noise monitoring data set summary.

Environmental noise monitoring data set summary				
Location	Recorded intervals		Intervals post filtering	
	count	%	count	%
Alec St	34,821	99.4	27,633	78.9
Cohen St	34,913	99.6	25,703	73.4
Mt Black	34,266	97.8	27,591	78.7
Murchison St	35,033	99.9	28,402	81.1
Police House	35,017	99.9	26,363	75.2

Data availability was greater than 97 %. After filtering out adverse weather conditions, meter overloads and data drift, approximately 78 – 81 % of possible intervals were available for analysis. An exception to this was, Cohen St with 73 % and Police house with 75.2%, due to prolonged periods of compromised data. These totals are similar to the 2023-24 report[2].

3.2 Summary Monitoring results

Table 3-2 provides annual arithmetically averaged L_{Aeq}, L_{A90} and L_{A10} 15-minute levels calculated from the filtered data sets for each measurement location. Levels for the day, evening and night periods are provided with each period defined as follows:

- Day: 0700 to 1800 hrs
- Evening: 1800 to 2200 hrs
- Night: 2200 to 0700 hrs.

Annual average levels from the 2023/2024 year[2] are also provided for comparative purposes.

Table 3-2: Environmental noise monitoring summary data.

Environmental noise monitoring summary data, average 15-minute Ln-statistics (dBA)										
Location	Period	2024/2025			2023/2024			Difference (dB)		
		L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}
Police House	Day	**52**	**47**	**53**	53	48	54	-1	-1	-1
	Evening	**52**	**47**	**53**	53	48	53	-1	-1	0
	Night	**49**	**47**	**50**	50	48	51	-1	-1	-1
Cohen St	Day	**52**	**49**	**53**	52	49	52	0	0	1
	Evening	**50**	**49**	**51**	50	49	51	0	0	0
	Night	**50**	**49**	**50**	49	48	50	1	1	0
Mt Black	Day	**43**	**37**	**44**	43	38	44	0	-1	0
	Evening	**42**	**37**	**43**	40	36	40	2	1	3
	Night	**38**	**36**	**39**	38	36	39	0	0	0
Murchison St	Day	**47**	**40**	**47**	47	41	47	0	-1	0
	Evening	**46**	**40**	**45**	45	41	45	1	-1	0
	Night	**41**	**39**	**42**	42	39	42	-1	0	0
Alec St	Day	**45**	**39**	**46**	46	40	47	-1	-1	-1
	Evening	**43**	**38**	**44**	43	39	44	0	-1	0
	Night	**40**	**37**	**41**	39	37	40	1	0	1

Average annual noise levels were generally within 1 dB of levels seen in the last reporting period[2]. The exception to this was Mt Black with evening noise level statistics increasing by 1-3 dB; however the evening noise levels were similar to those seen in the 2022-23 period[2].

The following subsections provide graphs of monthly average $L_{Aeq,15min}$ day, evening, and night levels (from filtered data) measured at each of the 5 monitoring locations.

3.2.1 Police House

Figure 3-1 presents monthly average 15-minute day, evening, and night L_{Aeq} levels at the Police House monitoring location.

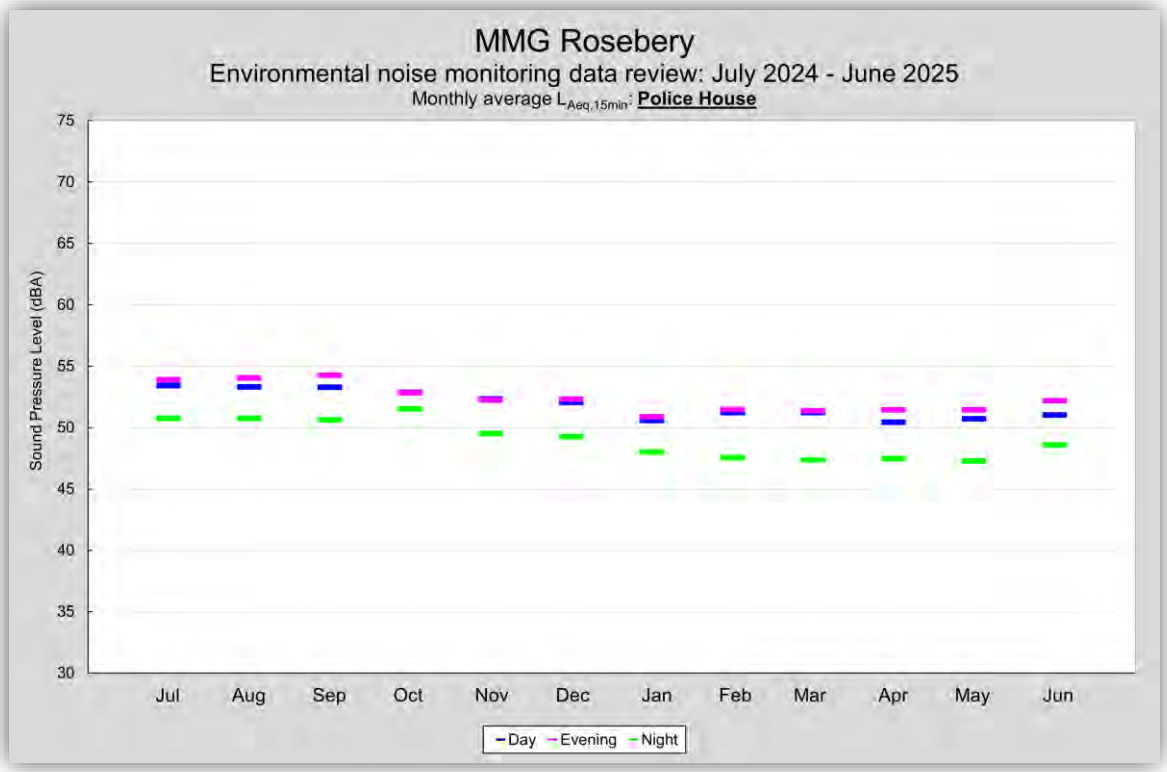


Figure 3-1: Monthly average $L_{Aeq,15min}$ levels for day, evening and night periods, **Police House** (N1).

Monthly average $L_{Aeq,15min}$ noise levels were relatively stable throughout the year. During most of the year, average levels were between 51 – 53 dBA during the day and 47 – 52 dBA at night suggesting a relatively stable noise environment. Evening noise levels were consistently higher than day, most likely due to local traffic in the evening.

3.2.2 Cohen St

Figure 3-2 presents monthly average 15-minute day, evening, and night L_{Aeq} levels at the Cohen St monitoring location.

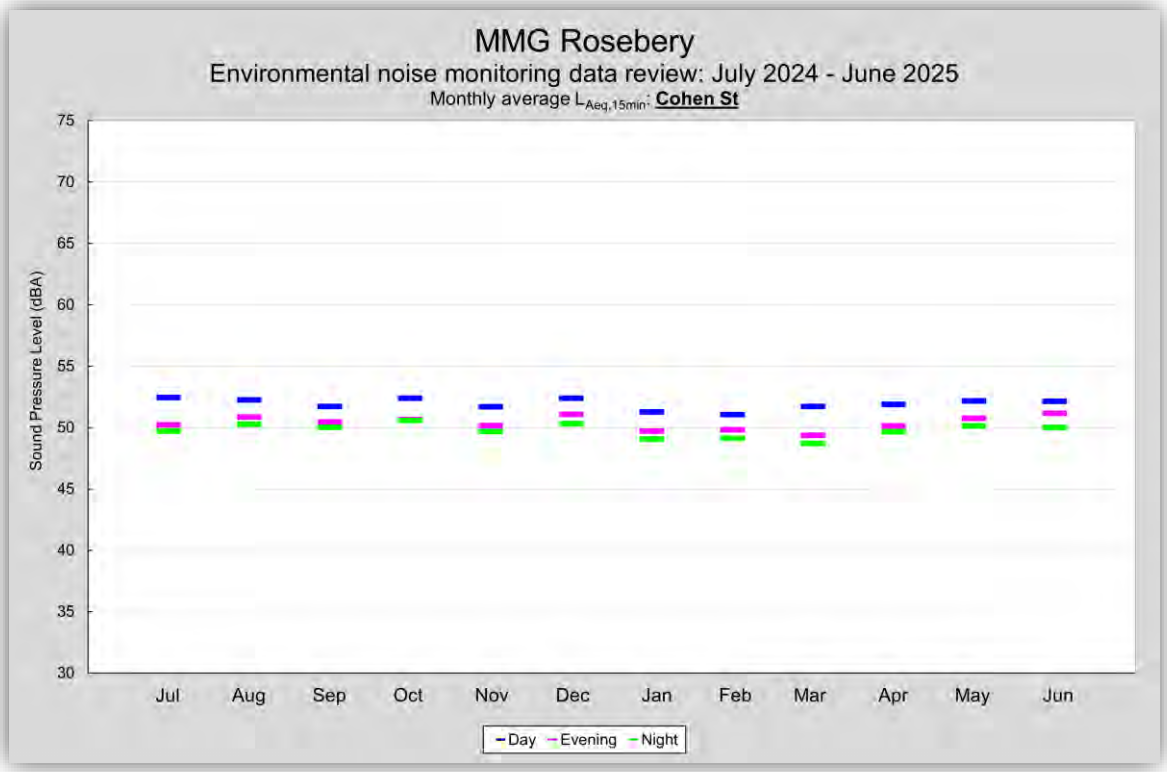


Figure 3-2: Monthly average $L_{Aeq,15min}$ levels for day, evening and night periods, **Cohen St** (N2).

Monthly average $L_{Aeq,15min}$ noise levels were consistent throughout the year, with average levels typically within 3 dBA across monthly and diurnal cycles. Measured levels were bounded between 53 dBA during the day and 49 dBA at night, suggesting a stable noise environment. The measurement position is within close proximity to MMGs filter plant, suggesting that fan and pumps associated with the plant controlled the environment.

This monitoring location is in close proximity to Position 4 in the 2024 environmental noise survey[3]. Sources noted from the MMG filter plant included pump noise, fan tones and LF tones.

3.2.3 Mt Black

Figure 3-3 presents monthly average 15-minute day, evening, and night L_{Aeq} levels at the Mt Black monitoring location.

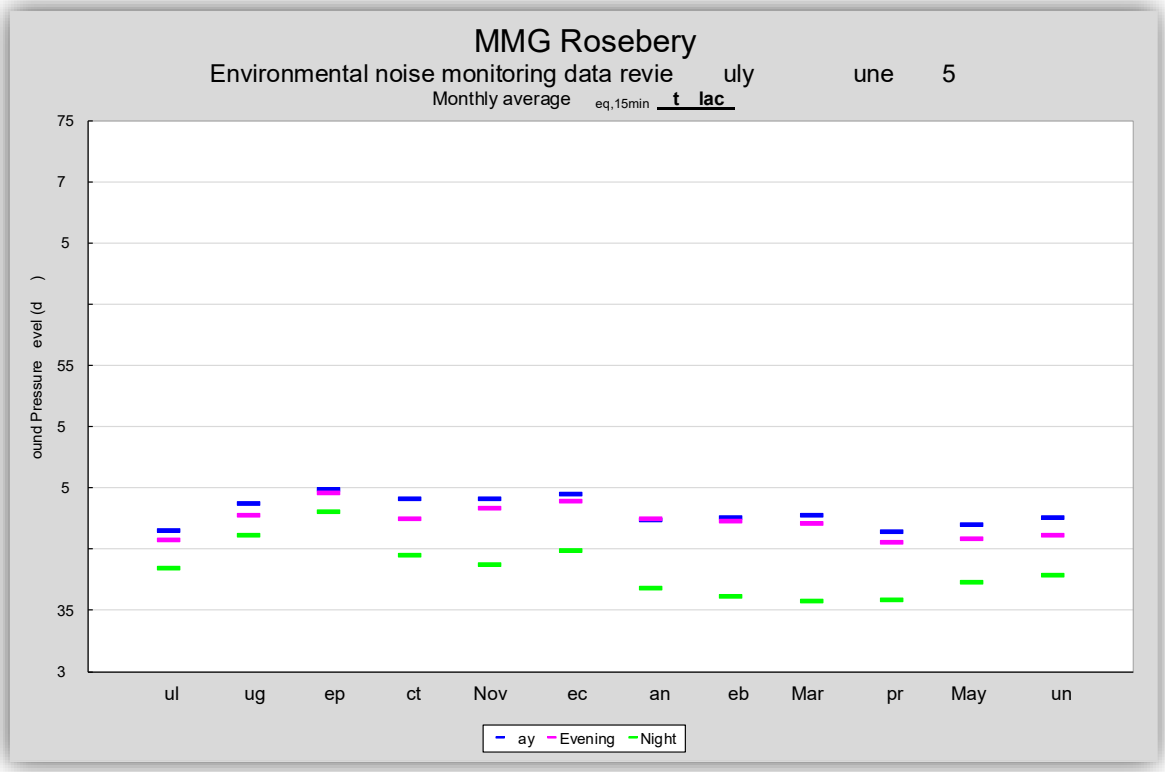


Figure 3-3: Monthly average $L_{Aeq,15min}$ levels for day, evening and night periods, **Mt Black** (N3).

Day and evening monthly L_{Aeq} levels were similar at this location throughout the year, with day being no more than 2 dBA above evening levels; while differing no more than 3 dBA throughout the year.

Day levels were similar to the 2023-24 review[2], while evening levels increased from 2-5 dB during the same recording periods. Rock breaking was present at 4 Level during evening periods; however, these increases can't solely be attributed to this as rockbreaking activity is not consistent with evening noise level increases. Sources external to the mine, such as rainfall on the nearby Taswater holding tanks, could be the cause of the evening increases. It is considered that increases during the evening period are the result of unknown sources, potentially external to the MMG facility.

The trend in night L_{Aeq} levels is almost identical that that of Mt Murchison (see section 3.2.4) and suggests that varying water flow in Rosebery Creek control night noise levels in the area.

3.2.4 Murchison St

Figure 3-4 presents monthly average 15-minute day, evening, and night L_{Aeq} levels at the Murchison St monitoring location.

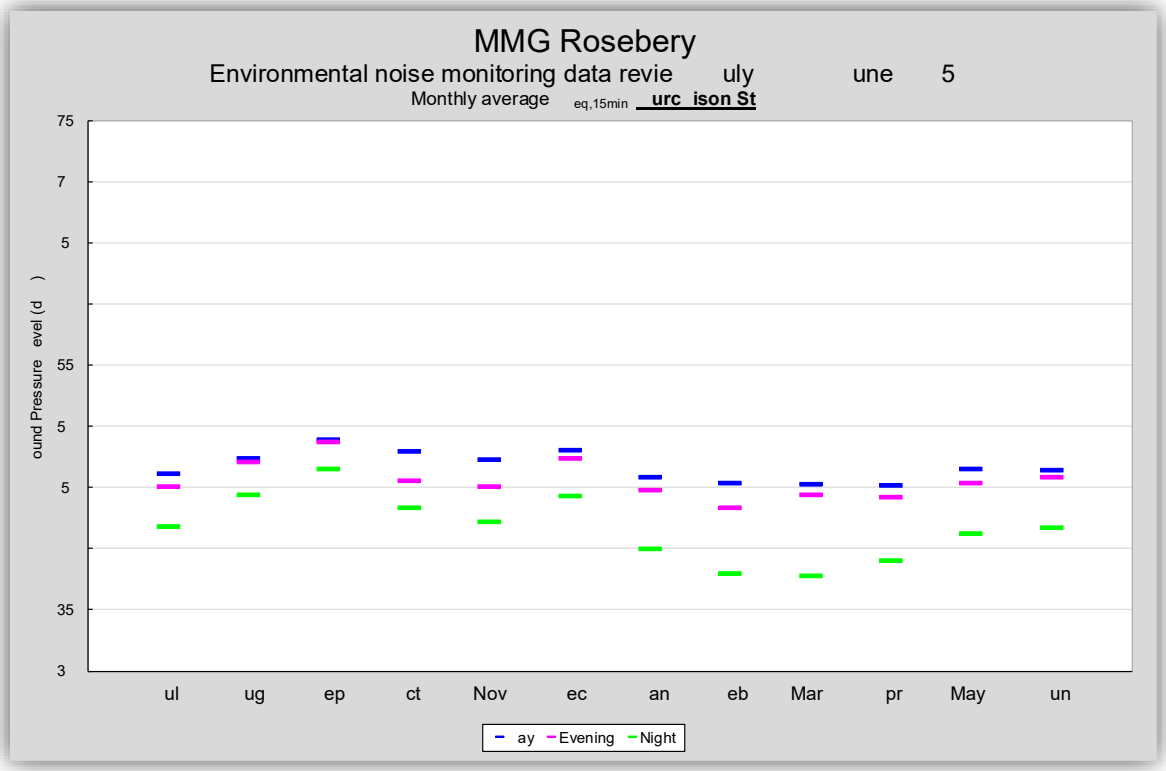


Figure 3-4: Monthly average $L_{Aeq,15min}$ levels for day, evening and night periods, **Murchison St** (N4).

Similar to previous years recording period[2]; the day, evening, and night levels were consistently 2 – 4 dB above Mt Black station averages (located 170 m NE from this station) throughout the year. Suggesting elevated levels could be a direct result of proximity to MMGs operations, as well as being closer to the Murchison Highway and water flow in Rosebery Creek.

3.2.5 Alec St

Figure 3-5 presents monthly average 15-minute day, evening, and night L_{Aeq} levels at the Alec St monitoring location.

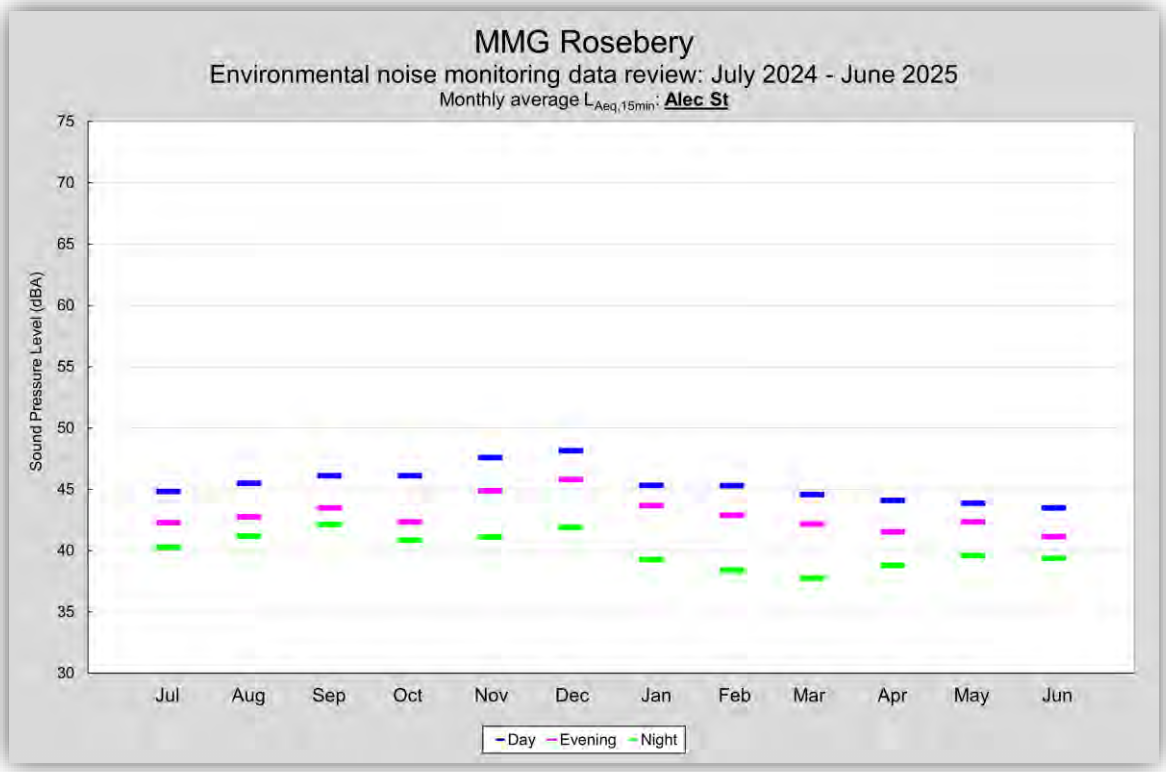


Figure 3-5: Monthly average $L_{Aeq,15min}$ levels for day, evening and night periods, **Alec St** (N5).

Average day L_{Aeq} levels were consistently 2 - 4 dBA above evening levels, with November and December seeing elevated noise stats compared to other months. Highway traffic and activity at the nearby 2/5 TSF may be a factor.

Water flow in the Stitt River may be a controlling factor for night noise levels, with changes consistent with those observed at the Mt Black and Murchison monitoring locations.

4 last onitoring

GV and ABO is monitored at a single location on the western side of the Rosebery Hospital. An Instantel Minimate Pro 4 monitor were used with an International Society of Explosives Engineers (ISEE) standard triaxial geophone and ISEE linear microphone.

15-minute peak particle velocity (mm/s) and peak linear sound pressure levels (dBL) have been recorded in the past. For this reporting period a 1-minute interval was utilised.

Blasting at the mine occurs during 2 time periods on a daily basis as follows:

- 0645 to 0700 hrs
- 1845 to 1900 hrs

Monitoring is undertaken in general accordance with the relevant guidelines including the *Australian and New Zealand Environment Council* (ANZECC) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (September 1990), *Australian Standard AS 2187.2-2006 Explosives storage and use. Use of explosives* and the Tasmanian *Quarry Code of Practice* (May 2017).

The measurement of GV and ABO is in general accordance with the provisions of the Appendix J sections J3.2 and 3.3 of *AS 2187.2-2006* with the exception of the location of the microphone which is close (approx. 5 – 10 cm) to the western wall of the Rosebery Hospital.

The Minimate Pro 4 unit is calibrated annually at a NATA accredited laboratory and all data presented here is from within the period of calibration.

4.1 Data set

Of the 1-minute data intervals in the monitoring year, 91.5% of data was available for analysis. Total available data reduced by 4% from the same measurement period for 2023-24[2].

The following summarises the significant period of missing data from the July 2024 - June 2025 period:

- 25/02/2025 – 26/03/2025

The above dates were missing data due to the Minimate and its Geophone being sent away for calibration. The relevant calibration certificates are found in the Appendix at the end of this report.

4.2 Ground vibration monitoring

Figure 4-1 presents 1-minute peak particle velocity levels measured at the Hospital monitoring location (the highest value of the three orthogonal measurement directions was selected for each interval). Figure 4-2 presents measured levels at scheduled blasting times only. Results are assessed against the following limits applicable under EPN 7153/3:

- 5 mm/s for 95 % of blasts
- 10 mm/s for 100 % of blasts

Both limits are marked on graphs for the complete data set (Figure 4-1) and during scheduled blasting times (Figure 4-2):

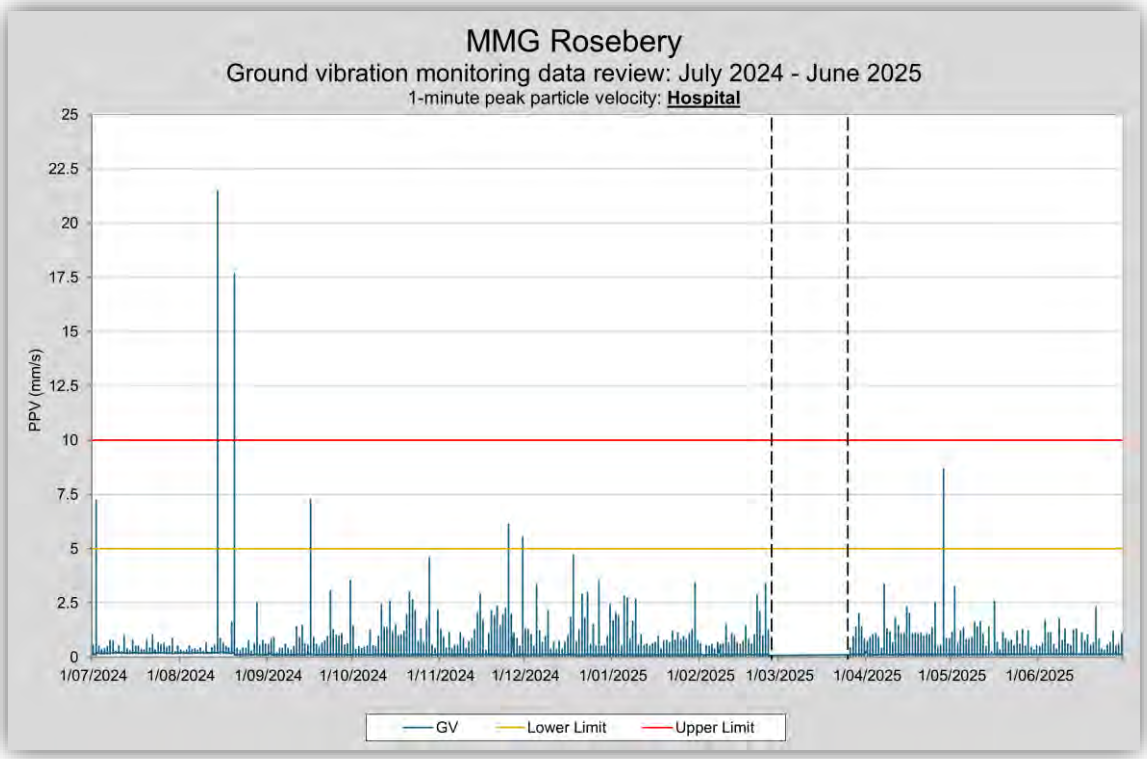


Figure 4-1: 1-minute peak particle velocity levels, **Hospital** (V1).

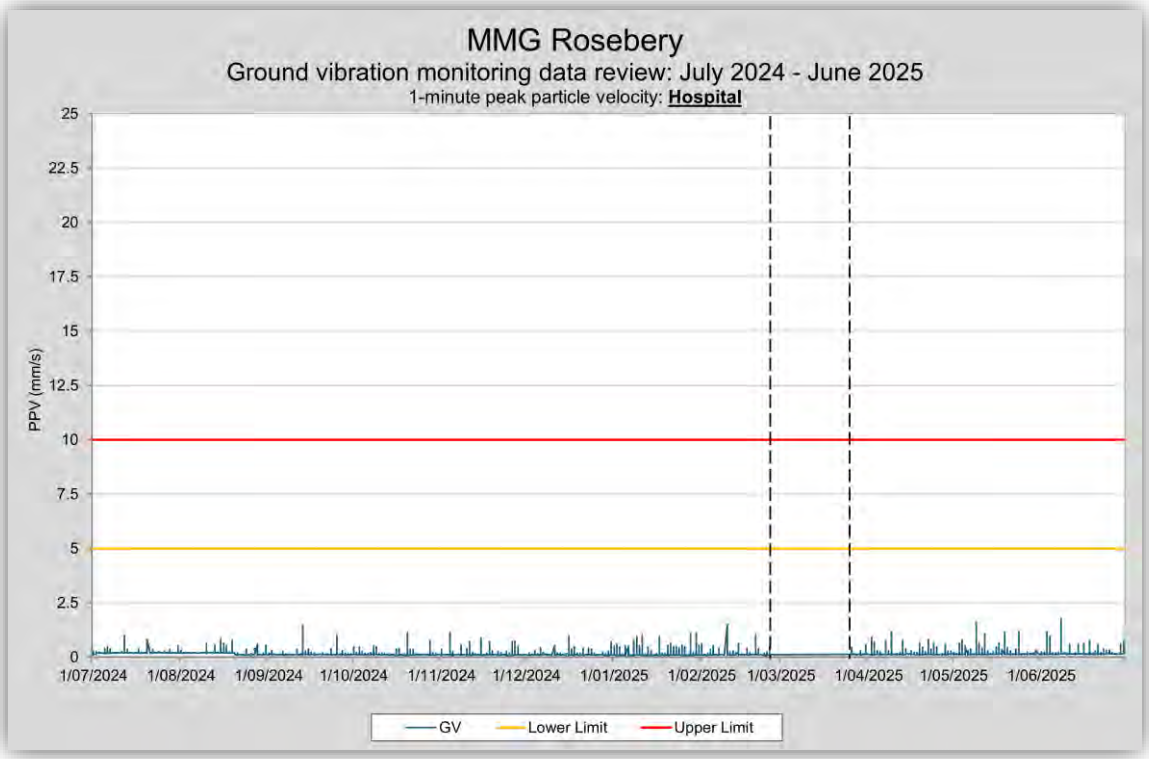


Figure 4-2: 1-minute peak particle velocity levels during scheduled blasting times, **Hospital** (V1).

From the above, Tarkarri Engineering notes no exceedance of the EPN limits occurred during scheduled blasting times. **The maximum recorded was 1.78mm/s on 08/06/2025 at 18:53**.

4.3 Air blast overpressure monitoring

Figure 4-3 presents 1-minute peak linear sound pressure levels measured at the Hospital monitoring location. Figure 4-4 presents measured levels at scheduled blasting times only. Results are assessed against the following limits applicable under EPN 7153/3:

- 115 dBL for 95 % of blasts
- 120 dBL for 100 % of blasts

Both limits are marked on graphs for the complete data set (Figure 4-4) and during scheduled blasting times (Figure 4-4)

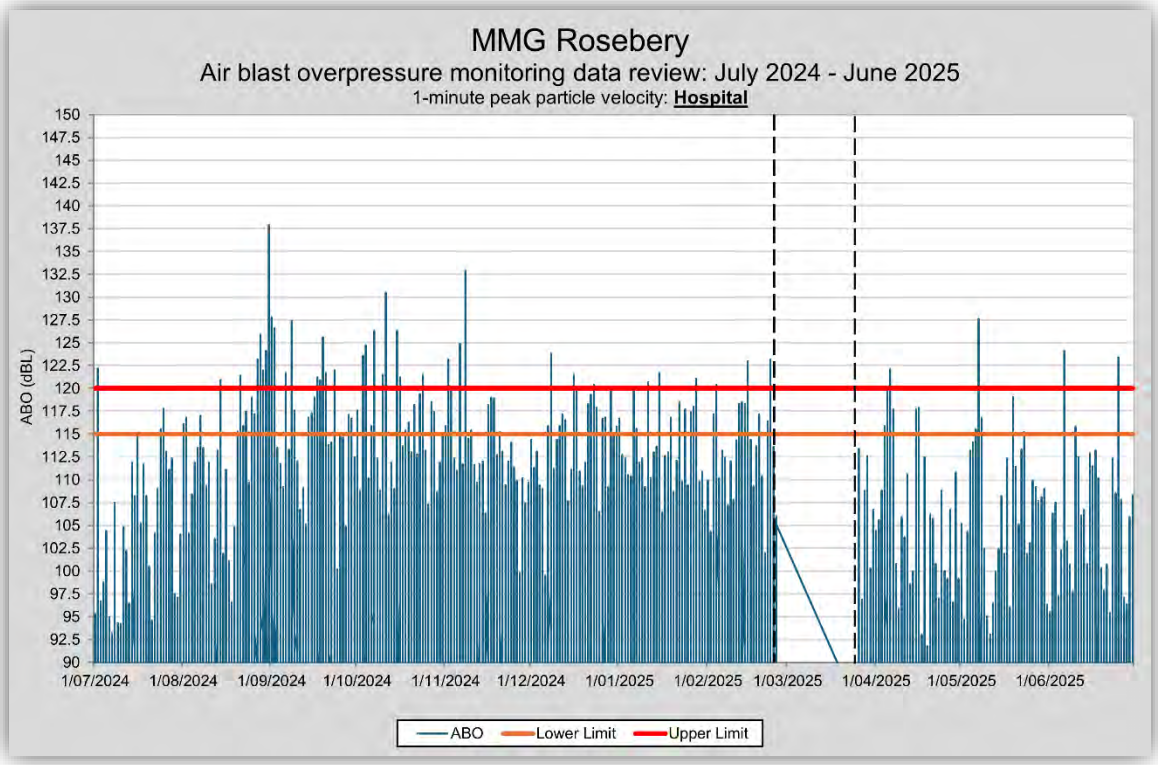


Figure 4-3: 1-minute peak linear sound pressure levels, **Hospital** (V1).

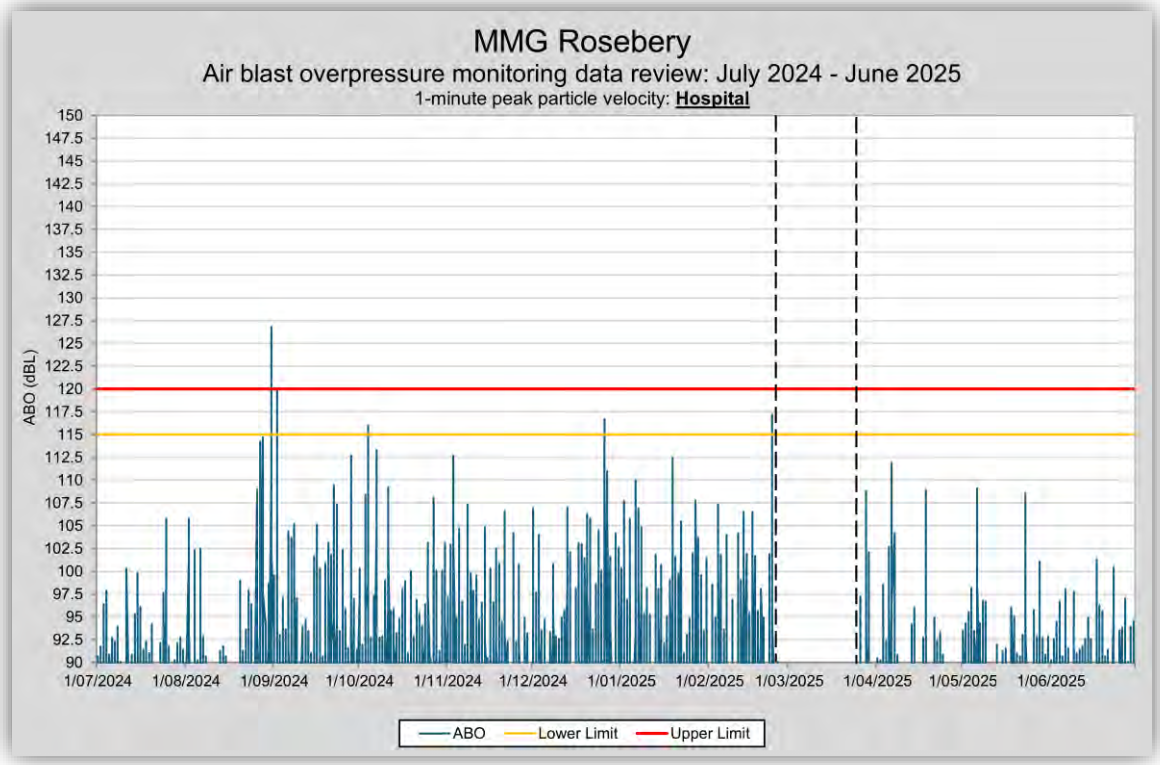


Figure 4-4: 1-minute peak linear sound pressure levels during scheduled blasting times, **Hospital** (V1).

The lower limit (115 dB) was exceeded on 11 separate occasions, or 1.5% of total blasts. This is deemed acceptable as it is well below the allowable 5% of total blasts for the monitoring period (it is also likely that these exceedances were not generated by blasting at the mine but rather generated by sources local to the monitor, with most coinciding with adverse weather conditions).

The upper limit (120 dB) was exceeded on the following 4 occasions:

- 31st August 2024 @ 18:45, 18:47, 18:48 and 18:49.
    - All 4 exceedances can be attributed to severe weather conditions. Weather data shows heavy rainfall and strong winds during these times.
    - Three lower limit exceedances were noted during this blasting period.
    - The following weather was noted at 18:45-19:00.
        - 5.8 mm of rainfall
        - Wind speeds in excess of 60 km/h

5 Community noise and vibration nuisance

MMG Rosebery received five complaints in relation to noise emanating from mining activity. All complaints were promptly investigated, and engagement with complainant's continued until all complaints were resolved. All community complaints and associated investigations are recorded and tracked ithin MMG's stakeholder management soft are, orealis.

Two complaints, involving the same event, in relation to vibration were also received.

Table 5-1: Community noise and vibration nuisance events.

Community noise and vibration nuisance events			
Date	Complaint	Investigation	Corrective Action
23/07/2024	Noise complaint from Rosebery resident. Clanging and banging at mine site, noted by resident on Read Street.	Excavator clearing material for new pad and rockbreaking activity suspected to be the issue. Acoustic noise barrier on 4 level open due to malfunction.	Resident informed excavator works to be complete soon. Electrical team to close noise wall ASAP and to inform team of any further issues when they arise.
24/02/2025	Concern over recording equipment.	Concern over recording device outside daughter's bedroom and wanted to know why this is needed.	Tenant advised that recording device is required for mine operations and is recording noise levels from MMG.
20/03/2025	Noise complaint from Rosebery resident. In particular, movement of heavy vehicles and reversing alarms through to 3:30am.	Acoustic wall gate at 4 level was open and not operational due to electrical fault. Noise attributed to routine stockpiling and batch plant operations at 3am for a duration of 30 – 45 mins.	Working with maintenance team to rectify issue and develop preventative maintenance strategy. Shut gate manually after deliveries.

07/04/2025	Vibration complaint. Two separate complaints in regards to the same event.	Tremors at the two separate residences were described.	Investigation found a seismic event occurred at the time of complaint. Mine and blasting operations were explained to residents satisfaction. No exceedances were recorded at the time of complaint.
28/04/2025	Noise complaint from Rosebery resident. Suggesting rock breaking is the source.	Mobile rock breaker operating at Pink Stockpile at time of complaint. Larger excavator than previously used.	Investigation underway to determine the effectiveness of a shroud on the rock breaker to reduce environmental nuisance to Rosebery residents.
30/04/2025	Noise complaint from Rosebery resident. Noise from site at 7:30 pm – 10:30 pm.	Likely related to breaking of overburden at 4 Level and loader operations on the grizzly plate.	Improvements being implemented/considered by MMG to reduce further impact.

6 Conclusions

Tarkarri Engineering has conducted a review of environmental noise, GV and ABO monitoring data recorded by MMG Rosebery between 1 July 2024 and 30 June 2025.

The environmental noise monitoring data typically showed annual averages for the L_{Aeq}, L_{A90} and L_{A10} 15-minute levels at monitoring positions N1, N2, N3, N4 and N5 similar to those measured in the previous year[2].

GV data showed that levels recorded during blasting times at the mine were below the EPN limits. Where ABO levels exceeded the lower EPN ABO limit this occurred less than the allowable 5 % of blast and exceedances of the upper limit were not associated with blasting (i.e. generated by adverse weather conditions).

7 Recommendations

7.1 Noise monitoring

Under the site EPN an environmental noise survey is required on a tri-annual basis and the survey methodology requirements under the EPN call for a 10-minute measurement interval (condition N3 3.3.). Tarkarri Engineering recommends that loggers at the 5 monitoring locations are changed to record 10-minute intervals rather than the current 15-minute intervals to bring survey and unobserved monitoring data in line, as suggested in 2023-24 annual review[2]. This change would also increase accuracy in relating the noise data with weather data. Approval for this change should be sought from irector of the EP as per condition N1 1.1 of the mine's EPN (see section 1 of this report for details).

Tarkarri Engineering notes that condition N1 1.3 states 'measured noise levels are to be adjusted for tonality and impulsiveness in accordance with the Tasmanian Noise Measurement Procedures Manual 2004, or future revisions of this manual, issued by the irector'. or tonality to be addressed as required an '… A-weighted … one-third octave spectrum must be measured'[1]. and for impulsiveness to be addressed as required measurements '…using a sound level meter set initially to fast and then impulse time response'[1] must be taken. The

current monitoring systems employed by MMG do not have the capability of measuring a 1/3-octave band spectrum or recording concurrent impulse time response noise levels.

NB: Tarkarri Engineering notes that without observation or directional noise measurement it would not be possible to determine the source of any tonal or impulsive noise emissions with any accuracy.

Lost data and inconsistencies in the data records was consistent with last monitoring year[2]. Contaminated data at Cohen St and Police House may have been due to calibration error, resulting in reduced data availability. Download and calibration procedures utilised by MMG for the noise monitoring stations should be reviewed regularly and potential retraining of personnel to minimise loss of data.

The following reminders are provided based on issues seen in previous years:

- eaving data on the meter until it has been properly transferred to MMG's data repository and reviewed.
- Care is taken in handling the microphones at each monitoring station as these are delicate and easily damaged during calibration.
- Ensuring that the field calibrator is activated prior to calibration being initiated and that care is taken during calibration.
- Check of connection points (i.e. cable connections to preamp and sound level meter unit) to ensure no water ingress, corrosion or other damage has occurred.

To investigate increases noted at Mt Black recording station, the following is recommended:

- Set NGARA unit to record noise files during the evening period. This will allow personnel to listen back to recordings; thus helping to determine the cause in increased noise levels.
- Assess evening data in the first quarter of the recording year to see if the trend of increased evening noise levels continues.
- If increased evening levels persist, conduct an environmental noise assessment focused around the Mt Black position, in particular during evening periods of normal MMG operations.

The implementation of these recommendations, in regards to Mt Black, will help to clarify the cause of evening increases, gathering a greater understanding of the noise environment external to the mine.

7.2 GV and ABO monitoring

As discussed in section 4 of this report, the current measurement location does not fully comply with the provisions of Appendix J sections J3.2 and J3.3 of *AS 2187.2-2006*. Tarkarri Engineering recommends that the monitoring equipment be relocated to a more suitable position. An investigation was conducted in Feb 2025 in regards to changing monitoring location to the 7 Level roof. This change has been requested by MMG and is awaiting EPA response. Changing data recording to 10 minutes, along with noise recording, would help to more accurately correlate with weather data. It is also recommended to record only during blasting times. To ensure no large blocks of missing data, it is recommended to install temporary equipment where any may be removed for calibration etc.

8 Appendix

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Sound Calibrator
IEC 60942:2017

Calibration Certificate

Calibration Number C24712

Client Details MMG
6 Hospital Road
Rosebury TAS, 7470

Equipment Tested/ Model Number : Pulsar Model 105
Instrument Serial Number : 63709

Atmospheric Conditions
Ambient Temperature : 23.5 °C
Relative Humidity : 43.5 %
Barometric Pressure : 101 kPa

Calibration Technician : Peter Elters
Calibration Date : 24 Sep 2024
Secondary Check: Cooper Sallway
Report Issue Date : 26 Sep 2024

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
	94	1000	94.34	1000.30
	94	1000	93.99	1000.40

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10 dB*	*Temperature*	*±0.1 °C*
Frequency	*±0.07 %*	*Relative Humidity*	*±1.9 %*
Distortion	*±0.20 %*	*Barometric Pressure*	*±0.11 kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate
Calibration Number C24781

Client Details	MMG - ROSEBERY MINE 6 Hospital Road Rosebery TAS 7470
Equipment Tested/ Model Number :	Ngara
Instrument Serial Number :	8780FE
Microphone Serial Number :	319691
Pre-amplifier Serial Number :	28099
Firmware Version :	V12.6

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.2 °C	**Ambient Temperature :**	23.5 °C
Relative Humidity :	52.9 %	**Relative Humidity :**	50.3 %
Barometric Pressure :	100.01 kPa	**Barometric Pressure :**	99.9 kPa

Calibration Technician :	Emanuel Eid	**Secondary Check:**	Cooper Sallway
Calibration Date :	23 Oct 2024	**Report Issue Date :**	23 Oct 2024

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

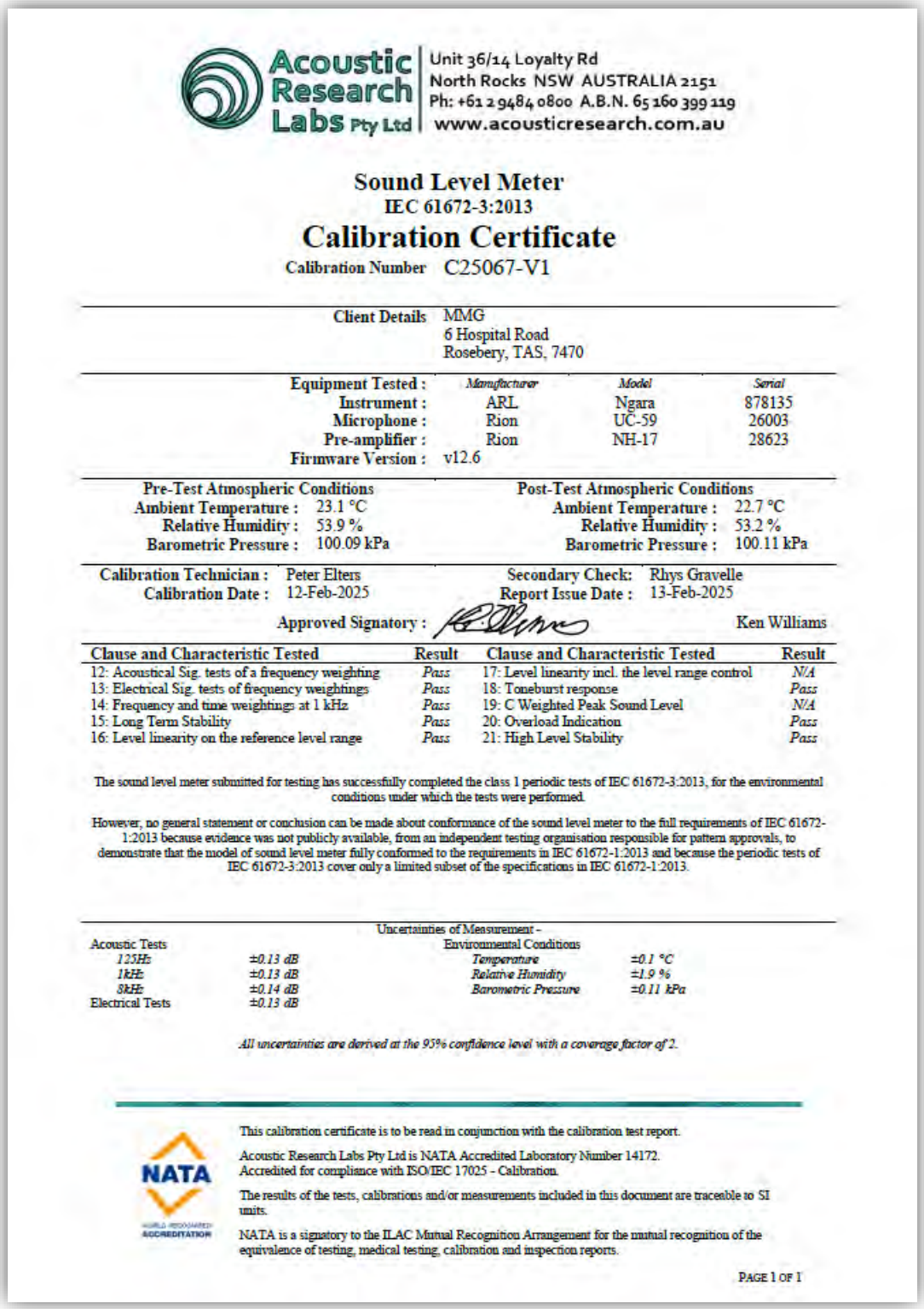
This calibration certificate is to be read in conjunction with the calibration test report.

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Sound Level Meter
IEC 61672-3:2013

Calibration Certificate

Calibration Number C25067-V1

Client Details MMG
6 Hospital Road
Rosebery, TAS, 7470

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	ARL	Ngara	878135
Microphone :	Rion	UC-59	26003
Pre-amplifier :	Rion	NH-17	28623
Firmware Version :	v12.6		

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	23.1 °C	Ambient Temperature :	22.7 °C
Relative Humidity :	53.9 %	Relative Humidity :	53.2 %
Barometric Pressure :	100.09 kPa	Barometric Pressure :	100.11 kPa

Calibration Technician : Peter Elters
Calibration Date : 12-Feb-2025
Secondary Check: Rhys Gravelle
Report Issue Date : 13-Feb-2025
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

NATA

This calibration certificate is to be read in conjunction with the calibration test report.

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Sound Calibrator
IEC 60942:2017

Calibration Certificate

Calibration Number C25065-V1

Client Details MMG
6 Hospital Road
Rosebery, TAS, 7470

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	Pulsar	Model 105	78234

Atmospheric Conditions

Ambient Temperature : 23.7 °C
Relative Humidity : 56.3 %
Barometric Pressure : 100.07 kPa

Calibration Technician : Jeff Yu
Calibration Date : 13-Feb-2025
Secondary Check: Rhys Gravelle
Report Issue Date : 13-Feb-2025

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
	94	1000	93.98	1000.30

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10 dB*	*Temperature*	*±0.1 °C*
Frequency	*±0.07 %*	*Relative Humidity*	*±1.9 %*
Distortion	*±0.20 %*	*Barometric Pressure*	*±0.11 kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C25151-V1

Client Details	MMG - Rosebery Mine 6 Hospital Road Rosebery TAS, 7470

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	ARL	Ngara	878139
Microphone :	Rion	UC-59	22403
Pre-amplifier :	Rion	NH-17	28142
Firmware Version :	v12.6		

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	22.8 °C	**Ambient Temperature :**	22 °C
Relative Humidity :	49.7 %	**Relative Humidity :**	50.6 %
Barometric Pressure :	100.98 kPa	**Barometric Pressure :**	100.99 kPa

Calibration Technician :	Peter Elters	**Secondary Check:**	Cooper Sallway
Calibration Date :	24-Mar-2025	**Report Issue Date :**	28-Mar-2025

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.10 dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

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Sound Level Meter
IEC 61672-3:2013
Calibration Certificate

Calibration Number C25221-V1

Client Details MMG - Rosebery Mine
6 Hospital Road
Rosebery TAS, 7470

Equipment Tested :	*Manufacturer*	*Model*	*Serial*
Instrument :	ARL	Ngara	8780FD
Microphone :	Rion	UC-59	19806
Pre-amplifier :	Rion	NH-17	28229
Firmware Version :	12.6		

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	22.2 °C	Ambient Temperature :	22 °C
Relative Humidity :	56.1 %	Relative Humidity :	56.2 %
Barometric Pressure :	101.27 kPa	Barometric Pressure :	101.27 kPa

Calibration Technician : Shaheen Boaz
Calibration Date : 14-Apr-2025
Secondary Check: Cooper Sallway
Report Issue Date : 15-Apr-2025
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*N/A*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2013 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.13 dB*	*Temperature*	*±0.1 °C*
1kHz	*±0.13 dB*	*Relative Humidity*	*±1.9 %*
8kHz	*±0.14 dB*	*Barometric Pressure*	*±0.11 kPa*
Electrical Tests	*±0.13 dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

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Sound Calibrator
IEC 60942:2017

Calibration Certificate

Calibration Number C25152-V1

Client Details MMG - Rosebery Mine
6 Hospital Road
Rosebery TAS, 7470

	Manufacturer	*Model*	*Serial*
Equipment Tested : Instrument :	Pulsar	Model 105	75585

Atmospheric Conditions
Ambient Temperature : 23.2 °C
Relative Humidity : 50.3 %
Barometric Pressure : 101.17 kPa

Calibration Technician : Peter Elters
Calibration Date : 28-Mar-2025
Secondary Check: Cooper Sallway
Report Issue Date : 28-Mar-2025

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
94	1000	94.05	1000.30

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.10 dB*	*Temperature*	*±0.1 °C*
Frequency	*±0.07 %*	*Relative Humidity*	*±1.9 %*
Distortion	*±0.20 %*	*Barometric Pressure*	*±0.11 kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

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CERTIFICATE OF CALIBRATION

CERTIFICATE NO: G53106

EQUIPMENT TESTED : Vibration Measuring System

Meter Model:	Minimate Pro4 720A2301	**Serial No:**	MP14225
Transducer Model:	Instantel 720A2004	**Serial No:**	SE14095

Owner: MMG Rosebery Mine
8 River Road
Wivenhoe, TAS 7320

Tests Performed: Measured Frequency response, Correct level display, Linearity display

Comments: Detailed overleaf.

CONDITION OF TEST:

Temperature	23 °C ±1° C	**Date of Receipt :**	05/03/2025
Relative Humidity	69 % ±5%	**Date of Calibration :**	13/03/2025
		Date of Issue :	13/03/2025

Acu-Vib Test Procedure: AVP15 (Ground vibration Monitor & Low Frequency Transducer)

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Julian Rickett

Accredited for compliance with ISO/IEC 17025 - Calibration

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This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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Accredited Laboratory
No. 9262
Acoustic and Vibration
Measurements

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AVCERT15 Rev.3.0 10/03/2025

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: M53107

EQUIPMENT TESTED : Blast Overpressure Microphone

Make & Model:	Instantel 720A1801	**Serial No:**	SL 13220
Owner:	MMG Rosebery Mine 8 River Road Wivenhoe, TAS 7320		
Tests Performed:	Low Frequency Microphone Response		
Comments:	Detailed Overleaf.		

CONDITION OF TEST:

Ambient Pressure	1010	hPa ±1 hPa	**Date of Receipt :**	05/03/2025
Temperature	23	°C ±1° C	**Date of Calibration :**	13/03/2025
Relative Humidity	69	% ±5%	**Date of Issue :**	13/03/2025

Acu-Vib Test Procedure: AVP18 (Low Frequency Microphone Calibration)

CHECKED BY: .....

AUTHORISED SIGNATURE: ..... Julian Rielt

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%

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Calibration Certificate

Description: Minimate Plus Base Unit

Part Number: 716A0403

Serial Number: BE14128

Calibration Date: 26 August 2024

Test Reference	Model	Serial No.
Fluke Multimeter	8808A	2315028,2308077
Instantel Zero/Gain Test Jig	718A1510-10	N/A

Saros certifies that the above product was calibrated by an authorised technician in accordance with manufacturer's specifications and to Australian Standards AS2187.2-2006. Calibration procedures were also conducted in accordance with AS/NZS ISO 9001:2015 quality standards.

Saros further certifies that equipment references used to complete this calibration are traceable to registered equipment standards used by the National Institute of Standards and Testing

The manufacturer recommends the product be calibrated on an annual basis by an authorised service and calibration facility.

Certified by:

Andrew Niven

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service@saros.com.au

ISO 9001:2015

Certificate No. AU1307

saros

Authorised Instantel Dealer and Calibration and Service Facility



Calibration Certificate

Description: Standard Triaxial Geophone (ISEE Version)

Part Number: 714A9701

Serial Number: BG13072

Calibration Date: 26 August 2024

Test Reference	Model	Serial No.
LDS Shaker	V450	99333/1
LDS Shaker	V555	429000/1
Labworks Power Amplifier	PA138	138-1835
Linear Power Amplifier with FPS	LPA1000	N/A
Crystal Instruments	Spider-81B	1322944,1310560
Signal Conditioner	482A21	02168,08878,10540 11664, 11736, 11572
ICP Accelerometer	333B30	40895, LW67182
ICP Accelerometer	333B40	64868, 58615
ICP Accelerometer	333B05	51111, 51110
Fluke Multimeter	8808A	2315028,2308077

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Calibration Certificate

Description: Linear Microphone 2-250 Hz

Part Number: 714A9801

Serial Number: BH10415

Calibration Date: 26 August 2024

Test Reference	Model	Serial No.
B&K High Pressure Mic Calibrator	4221	864030
B&K Microphone Unit	4193-L-004	2618263
B&K 1/2" Pressure Field Microphone	4193	2594081
B&K Microphone Pre Amplifier	2669L	2617689
B&K Nexus Conditioning Amplifier	2690-OS1	2627419
Fluke Multimeter	8808A	2315028,2308077
Crystal Instruments	Spider-81B	1310560
B&K 75VA Power Amplifier	2718	N/A

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