MOUNT PLEASANT OPERATION

MOUNT PLEASANT OPTIMISATION PROJECT

EPBC APPROVAL 2020/8735

2025/2026 ANNUAL COMPLIANCE REPORT

Document ID:	MPO EPBC 2020/8735 Approval 2025/2026 Annual Compliance Report		
Company:	MACH Energy Australia Pty Ltd		
Effective Date:	21/11/2026	**Status:**	Final
Endorsed By:	Lisa Richards	**Revision Number:**	01

EPBC APPROVAL 2020/8735 - 2025/2026 ANNUAL COMPLIANCE REPORT	
Name of Operation/Project	Mount Pleasant Operation – Mount Pleasant Optimisation Project
Approval Holder	MACH Energy Australia Pty Ltd
ACN of Approval Holder	608 495 441
Name of Holder of Development Consent	MACH Energy Australia Pty Ltd
Approved Action	To realign the approved Northern Link Road, increase the open cut coal extraction up to 21 Mtpa within the approved Mount Pleasant Project (EPBC 2011/5795) development area, including accessing deeper coal reserves in the North Pit, continued use of the controlled release dam and associated infrastructure as described in the Continuation of Bengalla Mine, NSW, Water Management Plan, (EPBC Act referral 2012/6378), and to extend the life of the mine to 22 December 2048 [See EPBC Act referral 2020/8735].
Location of the Action	Muswellbrook Local Government Area, NSW
Dates for the Reporting Period	24 September 2025 and 23 September 2026
Date of Preparation	21 November 2026
Environmental Risks	No new environmental risks identified
Declaration of accuracy In making this declaration, I am aware that sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.	
Signature	
Name of person accepting responsibility for the report	Lisa Richards
Position of person accepting responsibility for the report	Environment & Community Manager
Organisation	MACH Energy Australia Pty Ltd, ACN 608 495 441
Date	21/11/2026

In accordance with Condition 31 of EPBC Approval 2020/8735:

> "*The approval holder must prepare a compliance report for each 12-month period following the date of this approval decision, or as otherwise agreed to in writing by the Minister.*"

The EPBC 2020/8735 approval decision (the Approval) was published on 24 September 2024. The following Annual Compliance Report addresses compliance with the conditions of EPBC Approval 2020/8735 between 24 September 2025 and 23 September 2026.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
Part A – Conditions specific to the Action			
1.	*The **approval holder** must not exceed the **clearing** limits specified below.* *a) 26.4 hectares of **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC** (as depicted in Annexure 2).* *b) 27.4 hectares of **Striped legless lizard (Delma impar/Delma vescolineata) habitat** (as depicted in Annexure 3).*	Compliant	Approximately 0.75 ha of "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC" was cleared as part of the Action between 24 September 2025 and 23 September 2026. The cumulative area of "White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC" cleared as part of the Action as of 23 September 2026 is approximately 25.52 ha. Approximately 0.75 ha of "Striped legless lizard (Delma impar/Delma vescolineata) habitat" was cleared as part of the Action between 24 September 2025 and 23 September 2026. The cumulative area of Striped legless lizard (Delma impar/Delma vescolineata) habitat" cleared as part of the Action as of 23 September 2026 is approximately 25.52 ha. Construction associated with the Action is now complete, and no further disturbance is expected to occur in future reporting periods.
2.	*The **approval holder** must not **clear** outside the **Mount Pleasant Optimisation Project Area** (as depicted in Annexure 1) as part of this Action.*	Compliant	Clearance as part of the Action has not occurred outside the Mount Pleasant Optimisation Project Area (refer Annexure 1, EPBC Approval).
3.	*Prior to commencement of **construction** of the Northern Link Road, or other timeframe agreed to by the **Minister**, the **approval holder** must **retire** 307 **Biodiversity credits** for Northern Link Road Option 1 or 229 **Biodiversity credits** for Northern Link Road Option 2 (or additional credits as agreed by the **NSW Planning Secretary**) for the listed **White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC**.*	Compliant	MACH Energy has proceeded with a refined alignment of the Northern Link Road Option 2. The retirement of additional credits for the Northern Link Road Option 2 (270 credits in total compared to 229 credits) was agreed with the NSW Planning Secretary on 18 March 2025 with the approval letter available here: link. MACH Energy retired 270 Biodiversity credits for the listed White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC on 2 May 2025. MACH Energy commenced construction of the Northern Link Road on, or soon after, 9 June 2025.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
4.	*Prior to 16 July 2026, or other timeframe agreed to by the **Minister**, the **approval holder** must **retire** 293 **Biodiversity credits** for Northern Link Road Option 1 or 225 **Biodiversity credits** for Northern Link Road Option 2 for either Delma impar or Delma vescolineata.*	Not Compliant	On 6 March 2026, MACH made a request to the NSW Planning Secretary to extend the timeframe to retire biodiversity credits for the for the *Delma vescolineata* in light of the ongoing legal processes related to the State development consent. MACH has requested an extension of the timeframe under Condition 4 of the EPBC Approval to require the retirement of credits for Delma vescolineata prior to 31 December July 2027, or otherwise by the date set by the NSW Planning Secretary, whichever is sooner. MACH is yet to receive a response from the NSW Planning Secretary regarding the request for a time extension, or whether it will accept a retirement of biodiversity credits while the NSW Land and Environment Court remitter process is afoot.
5.	*The **approval holder** must comply with conditions B63, B64 and B65 of Part B of the **State development consent** to prepare and implement the **Biodiversity Management Plan** and conditions B87, B88, B89, B90, B91 and B92 of Part B of the **State development consent** to prepare and implement a Rehabilitation Strategy and Rehabilitation Management Plan.*	Compliant	The Biodiversity Management Plan (BMP) was approved by the NSW Department of Planning, Housing & Infrastructure on 5 November 2024. The Rehabilitation Strategy was approved by the NSW Department of Planning, Housing & Infrastructure on 23 July 2025. The Rehabilitation Management Plan (RMP) was prepared in accordance with the provisions under the *Mining Act 1992*. All plans/strategies have been implemented.
Water Resources			
6.	*The **approval holder** must not extract more than 21 million tonnes of **run-of-mine coal** from the **Mount Pleasant Optimisation Project Area** as part of the Action in any calendar year and must cease extraction by 22 December 2048.*	Compliant	Approximately 12.78 Mt of run-of-mine coal was extracted from the Mount Pleasant Optimisation Project Area in calendar year 2025. Approximately 14.1 Mt of run-of-mine coal is forecast for extraction from the Mount Pleasant Optimisation Project Area in calendar year 2026.
7.	*The **approval holder** must ensure the Action has no **adverse effect** on the **function** of a **water resource**.*	Compliant	No adverse effects have been recorded during monitoring as per the Water Management Plan (WMP).

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
8.	*The **approval holder** must comply with conditions B39, B40, B41, B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52, B53, B54, B87-B92 of Part B of the **State development consent**.*	Non-Compliant	MACH Energy has complied with consent conditions, *B39- B51, B53-B54* for Water in the State Development Consent. B52 - On Thursday 5 February 2026 MACH Energy representatives became aware of a minor non-compliance with the conditions and/or commitments made in the WMP. This was reported to the Department on Monday 9 February in accordance with the requirements of this approval. MACH Energy has complied with consent conditions, *B87-B92* for Rehabilitation in the State Development Consent.
9.	*The **approval holder** must, within 5 **business days** of its approval by the **NSW Planning Secretary** (including any approval of a revised version), submit to the **department**:* *a) the **Water Management Plan*** *b) a table stating every **trigger level** and where it is specified in the **Water Management Plan** and* *c) if a revised version of the **Water Management Plan** is approved by the **NSW Planning Secretary**, a document specifying what changes have been made from the previous version (including by supplying a copy with these changes marked in track mode) and a description of any implications of the changes for **protected matters**.*	Compliant	EPBC 2020/8735 was issued on 24 September 2024. On 30 September 2024 (i.e. within five business days of EPBC 2020/8735 coming into effect), MACH Energy provided electronic correspondence notifying the DCCEEW of the approval of Version 2 of the Water Management Plan and provided a table stating every trigger level and where it was specified in the Water Management Plan. DCCEEW notified MACH Energy of receipt of this correspondence on 23 October 2024. Version 3 of the Water Management Plan was approved by the NSW Planning Secretary on 7 February 2025. On 12 February 2025 (i.e. within five business days of the approval), MACH Energy provided electronic correspondence notifying the DCCEEW of the Water Management Plan approval. DCCEEW notified MACH Energy of receipt of this correspondence on 13 February 2025. Version 4 of the Water Management Plan was submitted on 11 August 2025 and is currently awaiting approval, after which MACH Energy will provide electronic correspondence to the DCCEEW within five business days of the approval.
10.	*The **approval holder** must notify the **department** within 5 **business days** of submitting a request to have a revised version of the **Water Management Plan** approved by the **NSW Planning Secretary**.*	Not applicable	Not triggered. No revised versions of the Water Management Plan submitted in the reporting period.
11.	*If, at any time until the end date of this approval, the **approval holder** predicts or detects the reaching of a **trigger level**, the **approval holder** must notify the **department** of the predicted or actual reaching within 10 **business days** of predicting or detecting the reaching of the **trigger level**, and publish on the **website**, within 3 months of the detection or reaching, the notification and a description of any relevant corrective actions that have been undertaken to prevent the breach of a **performance measure**.*	Not applicable	Not triggered. No breaches of water resource trigger levels in the reporting period.
12.	*Upon receiving notification of a predicted or actual reaching of a **trigger level** under condition 11, the **Minister** may direct the **approval holder** to undertake specific corrective actions to minimise impacts to **water resources**. The **approval holder** must implement any specific corrective actions to minimise impacts to **water resources** as directed by the **Minister**.*	Not applicable	Not triggered. The Minister has not requested specific corrective actions to minimise impacts to water resources.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
13.	*If the **approval holder** predicts or detects a breach of a **performance measure**, the **approval holder** must notify the **department** of the predicted or actual breach within 5 **business days** of predicting or detecting the breach.*	Not applicable	Not triggered. In the event of a breach of a performance measure, MACH Energy will notify the department of the breach within 5 business days.
14.	*If the **approval holder** predicts or detects a reaching of a **performance measure** the **approval holder** must submit to the **department**, within 60 **business days** of predicting or detecting an exceedance of the **performance measure**, for the **Minister's** approval, an Impact Response Plan. The Impact Response Plan must:* *a) be prepared by a **suitably qualified expert**;* *b) describe all potential and actual impacts to **water resources** arising from the breach;* *c) describe and, where possible, include local scale numerical modelling of, all potential contributing activities;* *d) derive a scientifically robust rectification strategy based on multiple lines of evidence and field data to support the assessment of the **environmental value** of any affected **water resources** (including the groundwater-dependence of any potential **GDEs**)* *e) explain why any further investigations are or are not required to determine the cause of the reaching of the **performance measure** and to propose effective corrective actions;* *f) specify the mitigation and management measures that the **approval holder** has taken and/or proposes to take to address the reaching of the **performance measure**, including demonstrating the effectiveness of the mitigation and management measures using relevant data;* *g) specify the duration for which the Impact Response Plan must be implemented;* *h) provide justification for how the proposed mitigation and management measures will prevent or reverse the reaching of the **performance measure** and ensure compliance with condition 7; and* *i) include a **peer review** and details of how the **approval holder** has addressed any inadequacies raised in the **peer review**.*	Not applicable	Not triggered. No exceedance of performance measures has been recorded.
15.	*If the **approval holder** reaches a **performance measure**, the **approval holder** must, no later than 9 months after the date on which reaching of the **performance measure**, cease any element of mining as part of the Action that has contributed to reaching of the **performance measure** until or unless the Impact Response Plan in relation to reaching of the **performance measure** has been approved in writing by the **Minister**. The **approval holder** must commence implementing each approved Impact Response Plan within 5 **business days** of it being approved by the **Minister** and continue to implement it for the period specified in the approved Impact Response Plan.*	Not applicable	Not triggered.
16.	*The **approval holder** must publish each approved Impact Response Plan on the **website** within 5 **business days** of its approval. The **approval holder** must notify the **department** within 5 **business days** of an Impact Response Plan being published and keep the Impact Response Plan published on the **website** until the end date of this approval.*	Not applicable	Not triggered.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
17.	*If the **Minister** is not satisfied that the corrective actions or rectification measures specified in an Impact Response Plan will or are likely to achieve the outcome(s) required by condition 7, the **Minister** may direct the **approval holder** to undertake specific corrective action(s) to limit and/or prevent further impacts to **water resources**. The **approval holder** must implement any specific corrective actions to minimise impacts to **water resources** as directed by the **Minister**.*	Not applicable	Not triggered.
18.	*If the **Minister** directs the **approval holder** to undertake specific corrective action(s) under condition 17, the **approval holder** must, no later than 6 months after the date on which the **Minister** gave such a direction under condition 17, cease any element of mining as part of the Action that has contributed to reaching of the **performance measure** as part of the Action until or unless the **Minister** notifies the **approval holder** in writing that it may resume these elements of mining.*	Not applicable	Not triggered.
19.	*The **approval holder** must include in each **compliance report** a copy of all monitoring reports required by the Surface Water Management and Monitoring Plan (required under condition B52.(f)(iii) of the **State development consent**) and the Groundwater Management Plan (required under condition B52.(f)(iv) of the **State development consent**) included in the **Water Management Plan** to be provided to the NSW Government in the subject period of that **compliance report**.*	Compliant	MACH Energy prepares an annual review which includes a report of the surface water monitoring data and groundwater monitoring data required by the various monitoring plans. An extract of the surface water and groundwater monitoring data from the annual review is provided with this compliance report. MACH Energy has also included its monthly environmental monitoring reports and stream health monitoring reports for the period.
Part B – Administrative conditions			
Submission and publication of plans			
20.	*The **approval holder** must submit all **plans** required by these conditions electronically to the **department**.*	Compliant	The Water Management Plan was provided electronically to the Department as required by Condition 9. The requirement for an Impact Response Plan (IRP) is yet to be triggered.
21.	*Unless otherwise agreed to in writing by the **Minister**, the **approval holder** must publish each **plan** on the **website** within 15 **business days** of the date:* *a) of this approval, if the version of the **plan** to be implemented is specified in these conditions, or* *b) the **plan** is approved by the **Minister** in writing, if the **plan** requires the approval of the **Minister**, or* *c) the **plan** is submitted to the **department** in accordance with a requirement of these conditions, if the **plan** does not require the approval of the **Minister**, or* *d) the **plan** is approved by a state or territory government official as required under a state or territory government condition which must be complied with in accordance with these **EPBC Act** conditions.*	Compliant	The approved BMP, RMP, WMP and IRP are available on the MACH Energy website http://machenergyaustralia.com.au/ The Rehabilitation Strategy is available on the MACH Energy website http://machenergyaustralia.com.au/

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
22.	*The **approval holder** must keep all published **plans** required by these conditions on the **website** until the expiry date of this approval.*	Compliant	MACH Energy will have all published plans required by the approval conditions available on the website until 22 December 2058.
23.	*The **approval holder** is required to exclude or redact **sensitive ecological data** from **plans** published on the **website** or otherwise provided to a member of the public. If **sensitive ecological data** is excluded or redacted from a **plan**, the **approval holder** must notify the **department** in writing what exclusions and redactions have been made in the version published on the **website**.*	Not applicable	Not triggered. No sensitive ecological data is published in the plans.
Notification of date of commencement of the action			
24.	*The **approval holder** must notify the **department** electronically of the date of **commencement of the Action**, within 5 **business days** following **commencement of the Action**.*	Compliant	Not triggered in the reporting period.
25.	*If the **commencement of the action** does not occur within 5 years from the date of this approval, then the **approval holder** must not **commence the action** without the prior written agreement of the **Minister**.*	Compliant	Not triggered in the reporting period.
Compliance records			
26.	*The **approval holder** must maintain accurate and complete **compliance records**.*	Compliant	MACH Energy maintains comprehensive compliance records comprising all activities and outcomes associated with the Approval conditions. These records are available at the request of the Department.
27.	*If the **department** makes a request in writing, the **approval holder** must provide electronic copies of **compliance records** to the **department** within the timeframe specified in the request.* ***Note: Compliance records** may be subject to audit by the **department**, or by an independent auditor in accordance with section 458 of the **EPBC Act**, and/or be used to verify compliance with the conditions. Summaries of the results of an audit may be published on the **department's** website or through the general media.*	Not applicable	Not triggered. The Department has not made a request in writing for electronic copies of compliance records.
28.	*The **approval holder** must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under the conditions of this **approval are prepared in accordance with the** Guidelines for biological survey and mapped data, Commonwealth of Australia 2018, or as otherwise specified by the **Minister** in writing.*	Compliant	MACH Energy ensures that data required under the conditions of the approval follow the Guidelines for biological survey and mapped data, Commonwealth of Australia 2018.
29.	*The **approval holder** must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under the conditions of this approval are prepared in accordance with the Guide to providing maps and boundary data for EPBC Act projects, Commonwealth of Australia 2021, or as otherwise specified by the **Minister** in writing.*	Compliant	MACH Energy ensures that data required under the conditions of the approval follow the Guide to providing maps and boundary data for EPBC Act projects, Commonwealth of Australia 2021.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
30.	*The **approval holder** must submit all **monitoring data** (including **sensitive ecological data**), surveys, maps, other spatial and metadata and all species occurrence record data (sightings and evidence of presence) electronically to the **department** within 20 **business days** of the submission of a **compliance report**.*	Compliant	MACH Energy will electronically submit all data required under the conditions of the approval to the department within 20 business days after the submission of this Annual Compliance Report.
Annual compliance reporting			
31.	*The **approval holder** must prepare a **compliance report** for each 12-month period following the date of this approval decision, or as otherwise agreed to in writing by the **Minister**.*	Compliant	This report constitutes the annual compliance report, the previous report for the period 24 September 2024 to 23 September 2025 was completed and submitted to the department as required. This Annual Compliance Report covers the period of 24 September 2025 to 23 September 2026.
32.	*Each **compliance report** must be consistent with the Annual Compliance Report Guidelines, Commonwealth of Australia 2014.*	Compliant	The Annual Compliance Report (i.e. this document) follows the Annual Compliance Report Guidelines, Commonwealth of Australia 2014.
33.	*Each **compliance report** must include:* *a) Accurate and complete details of compliance and any non-compliance with the conditions and the **plans**, and any **incidents**.* *b) One or more **shapefile** showing all **clearing** of **protected matters**, and/or their habitat, undertaken within the 12-month period at the end of which that **compliance report** is prepared.* *c) A schedule of all **plans** in existence in relation to these conditions and accurate and complete details of how each **plan** is being implemented.*	Compliant	The Annual Compliance Report (i.e. this document) accurately represents the compliance status of each condition. The Annual Compliance Report is accompanied by a shapefile of the clearing of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland TEC and Striped Legless Lizard habitat. A register of relevant plans required under EPBC Approval 2020/8735 with submission dates, approval dates and condition numbers is included with the Annual Compliance Report.
34.	*The **approval holder** must:* *a) Publish each **compliance report** on the **website** within 60 **business days** following the end of the 12-month period for which that **compliance report** is required.* *b) Notify the **department** electronically, within 5 **business days** of the date of publication that a **compliance report** has been published on the **website**.* *c) Provide the weblink for the **compliance report** in the notification to the **department**.* *d) Keep all published **compliance reports** required by these conditions on the **website** until the expiry date of this approval.* *e) Exclude or redact **sensitive ecological data** from **compliance reports** published on the **website** or otherwise provided to a member of the public.* *f) If **sensitive ecological data** is excluded or redacted from the published version, submit the full **compliance report** to the **department within** 5 **business days** of its publication on the **website** and notify the **department** in writing what exclusions and redactions have been made in the version published on the **website**.* ***Note: Compliance reports** may be published on the **department's** website.*	Compliant	The Annual Compliance Report (i.e. this document) will be published on the MACH Energy website http://machenergyaustralia.com.au/ within 60 business days at the end of each 12-month period. The department will be notified within 5 business days after been published on the website. The Annual Compliance Report will remain on the website until the expiry date of this approval (22 December 2058). No sensitive ecological data is published in the plans.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
Reporting non-compliance			
35.	*The **approval holder** must notify the **department** electronically, within 2 **business days** of becoming aware of any **incident** and/or potential non-compliance and/or actual non-compliance with the conditions or commitments made in a **plan**.*	Compliant	On Monday 09 February 2026, the Department was notified of a potential non-compliance that MACH Energy representatives were made aware of on Thursday 5 February 2026 where sediment laden water was discharged from site. This complies with the 2-business day requirement.
36.	*The **approval holder** must specify in the notification:* *a) Any condition or commitment made in a **plan** which has been or may have been breached.* *b) A short description of the **incident** and/or potential non-compliance and/or actual non-compliance.* *c) The location (including co-ordinates), date and time of the **incident** and/or potential non-compliance and/or actual non-compliance.* ***Note**: If the exact information cannot be provided, the **approval holder** must provide the best information available.*	Compliant	On 09 February 2026, the Department was notified of a potential non-compliance under the WMP. The notification included all specifications required under Condition 36.
37.	*The **approval holder** must provide to the **department** in writing, within 12 **business days** of becoming aware of any **incident** and/or potential non-compliance and/or actual non-compliance, the details of that **incident** and/or potential non-compliance and/or actual non-compliance with the conditions or commitments made in a **plan**. The **approval holder** must specify:* *a) Any corrective action or investigation which the **approval holder** has already taken.* *b) The potential impacts of the **incident** and/or non-compliance.* *c) The method and timing of any corrective action that will be undertaken by the **approval holder**.*	Compliant	The Department was notified in writing on 23 February 2026 after MACH Energy representatives became aware of a potential non- compliance on 5 February 2026. The letter included all requirements under Condition 37.
Independent audit			
38.	*The **approval holder** must ensure that an **independent audit** of compliance with the conditions is conducted for every five-year period following the **commencement of the Action** until this approval expires, unless otherwise specified in writing by the **Minister**.*	Not applicable	Not triggered. It has not been five years since the commencement of the Action.

EPBC Approval 2020/8735 Conditions		Status	MACH Energy Comment
39.	*For each **independent audit**, the **approval holder** must:* *a) Provide the name and qualifications of the nominated **independent** auditor, the draft audit criteria, and proposed timeframe for submitting the **audit report** to the **department** prior to commencing the **independent audit**.* *b) Only commence the **independent audit** once the nominated **independent** auditor, audit criteria and timeframe for submitting the **audit report** have been approved in writing by the **department**.* *c) Submit the **audit report** to the **department** for approval within the timeframe specified and approved in writing by the **department**.* *d) Publish each **audit report** on the **website** within 15 **business days** of the date of the **department's** approval of the **audit report**.* *e) Keep every **audit report** published on the **website** until this approval expires.*	Not applicable	Not triggered. See above.
40.	*Each **audit report** must report for the five-year period preceding that **audit report**.*	Not applicable	Not triggered. See above.
41.	*Each **audit report** must be completed to the satisfaction of the **Minister** and be consistent with the Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines, Commonwealth of Australia 2019.*	Not applicable	Not triggered. See above.
Completion of the action			
42.	*The **approval holder** must comply with condition A5[1] in Schedule 2 of the **State development consent**.* *[1] Condition A5 in the **State development consent** states that mining operations may be carried out on the site, within the approved disturbance area, until 22 December 2048.*	Compliant	Mining operations are occurring and can continue to occur until 22 December 2048.
43.	*The **approval holder** must notify the **department** electronically 60 **business days** prior to the expiry date of this approval, that the approval is due to expire.*	Not applicable	Not triggered. It is more than 60 business days prior to the expiry date of the approval (22 December 2058).
44.	*Within 20 **business days** after the **completion of the Action**, and, in any event, before this approval expires, the **approval holder** must notify the **department** electronically of the date of **completion of the Action** and provide **completion data**. The **approval holder** must submit any spatial data that comprises **completion data** as a **shapefile**.*	Not applicable	Not triggered. The Action has not yet been completed.
Changes to State development consent			
45.	*The **approval holder** must notify the **department** in writing of any proposed change to the **State development consent** that may relate to **protected matters** within 5 **business days** of formally proposing a change or within 5 **business days** of submitting an application to propose a change.*	Not applicable	Not triggered. No changes to the State development consent have been proposed in the period.
46.	*The **approval holder** must notify the **department** in writing of any change to the **State development consent** conditions that may relate to **protected matters**, within 10 **business days** of a change to conditions being approved.*	Not applicable	Not triggered. No changes to the State development consent conditions have occurred in the period.

MOUNT PLEASANT OPERATION

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EPBC APPROVAL 2020/8735

2025/2026 ANNUAL COMPLIANCE REPORT

Attachment 1

Monitoring Data

Contents

1. MPO_Monthly_Environmental_Monitoring_Report_September_2025
2. MPO_Monthly_Environmental_Monitoring_Report_October_2025
3. MPO_Monthly_Environmental_Monitoring_Report_November_2025
4. MPO_Monthly_Environmental_Monitoring_Report_December_2025
5. MPO_Monthly_Environmental_Monitoring_Report_January_2026
6. MPO_Monthly_Environmental_Monitoring_Report_February_2026
7. MPO_Monthly_Environmental_Monitoring_Report_March_2026
8. MPO_Monthly_Environmental_Monitoring_Report_April_2026
9. MPO_Monthly_Environmental_Monitoring_Report_May_2026
10. MPO_Monthly_Environmental_Monitoring_Report_June_2026
11. MPO_Monthly_Environmental_Monitoring_Report_July_2026
12. MPO_Monthly_Environmental_Monitoring_Report_August_2026
13. MPO_Monthly_Environmental_Monitoring_Report_September_2026
14. MPO Stream Health Monitoring (Autumn 2025) - Final Report
15. MPO Stream Health Monitoring Report (Spring 2025) (Submitted Draft 2026.3003)
16. MPO Stream Health Monitoring Report (Autumn 2026) Draft 15 September 2026
17. Extract: Water Related sections of the MPO 2025 Annual Review Final

MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

September 2025

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1. Introduction

The Mount Pleasant Operation (MPO) is located within Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 September 2025
Reporting Period End Date	30 September 2025
Date All Data Received	14 October 2025

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in the following figures**:**

- **Figure 2-1** shows MPO attended noise monitoring locations and Noise Assessment Groups (NAGs).
- **Figure 2-2** shows the MPO Air Quality Monitoring network.
- **Figure 2-3** shows the MPO Blast Monitoring Locations.
- **Figure 2-4** shows the MPO Groundwater Monitoring network; and
- **Figure 2-5** shows the MPO Surface Water Monitoring network.

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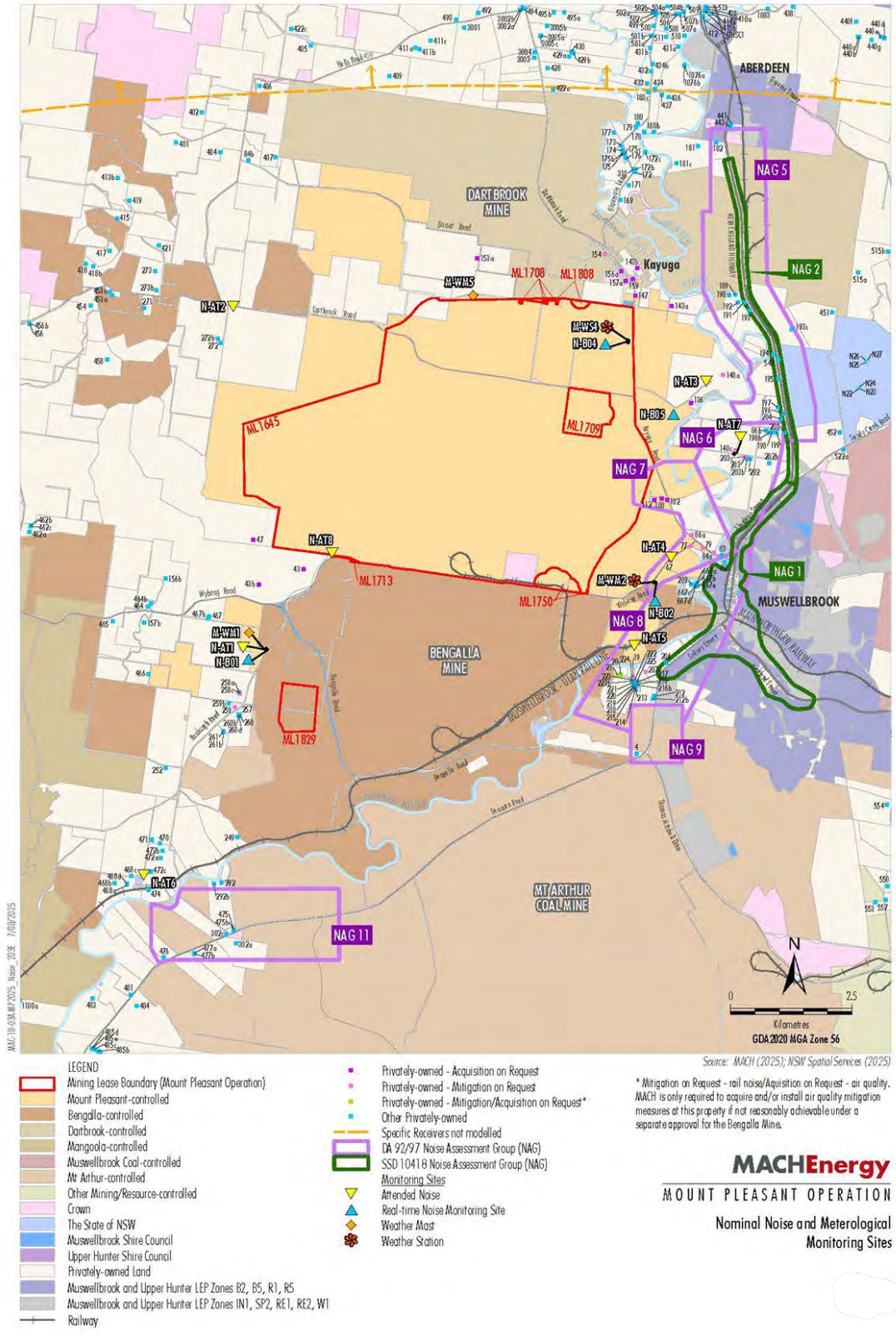

Figure 2-1 – MPO Attended Noise Monitoring Assessment Groups and Locations - Approved (SSD 10418) Water Management Plan

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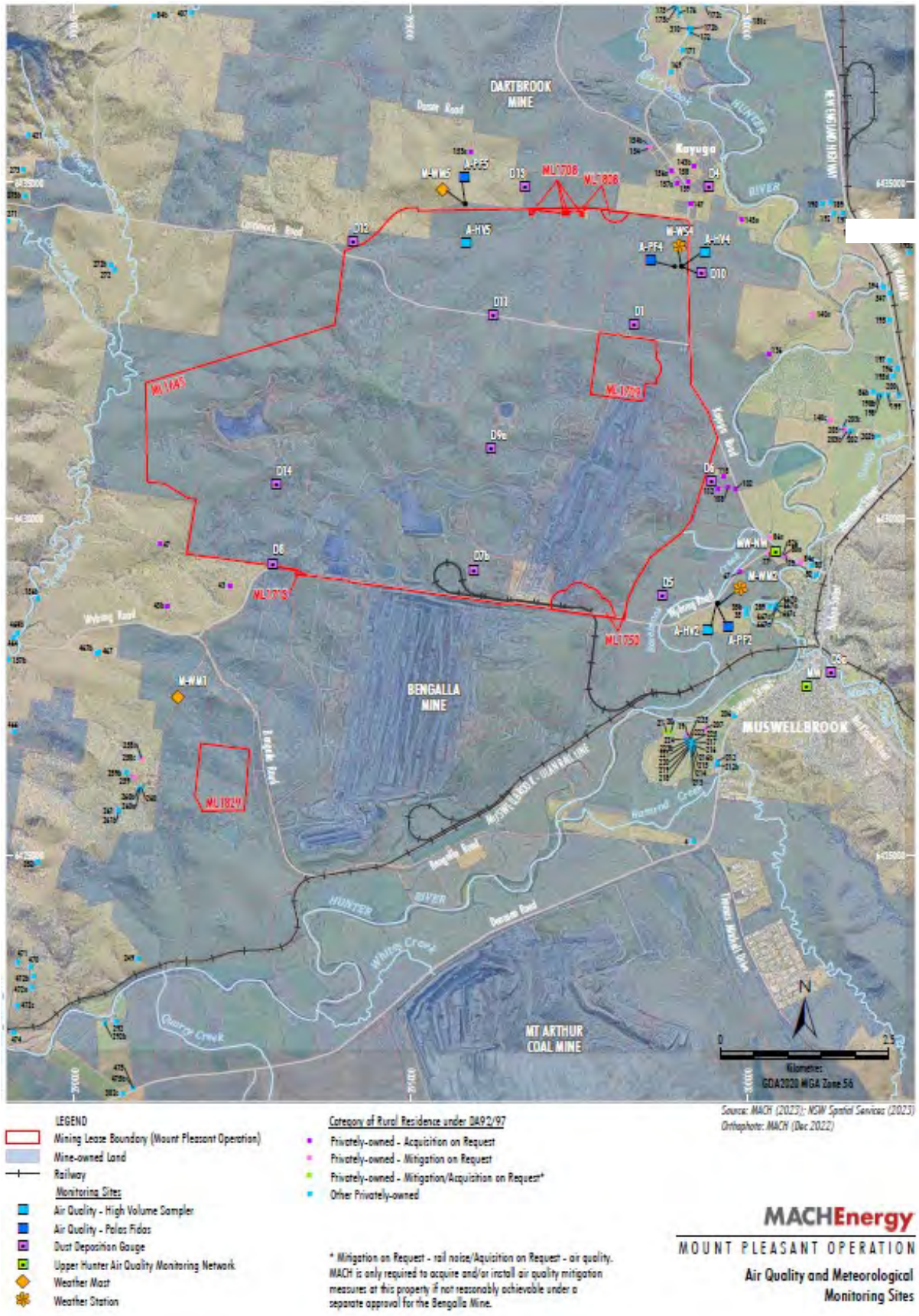

LEGEND

Mining Lease Boundary (Mount Pleasant Operation)

Mine-owned Land

Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 2-2 – MPO Air Quality and Meteorological Monitoring Network - Approved (SSD 10418) Water Management Plan

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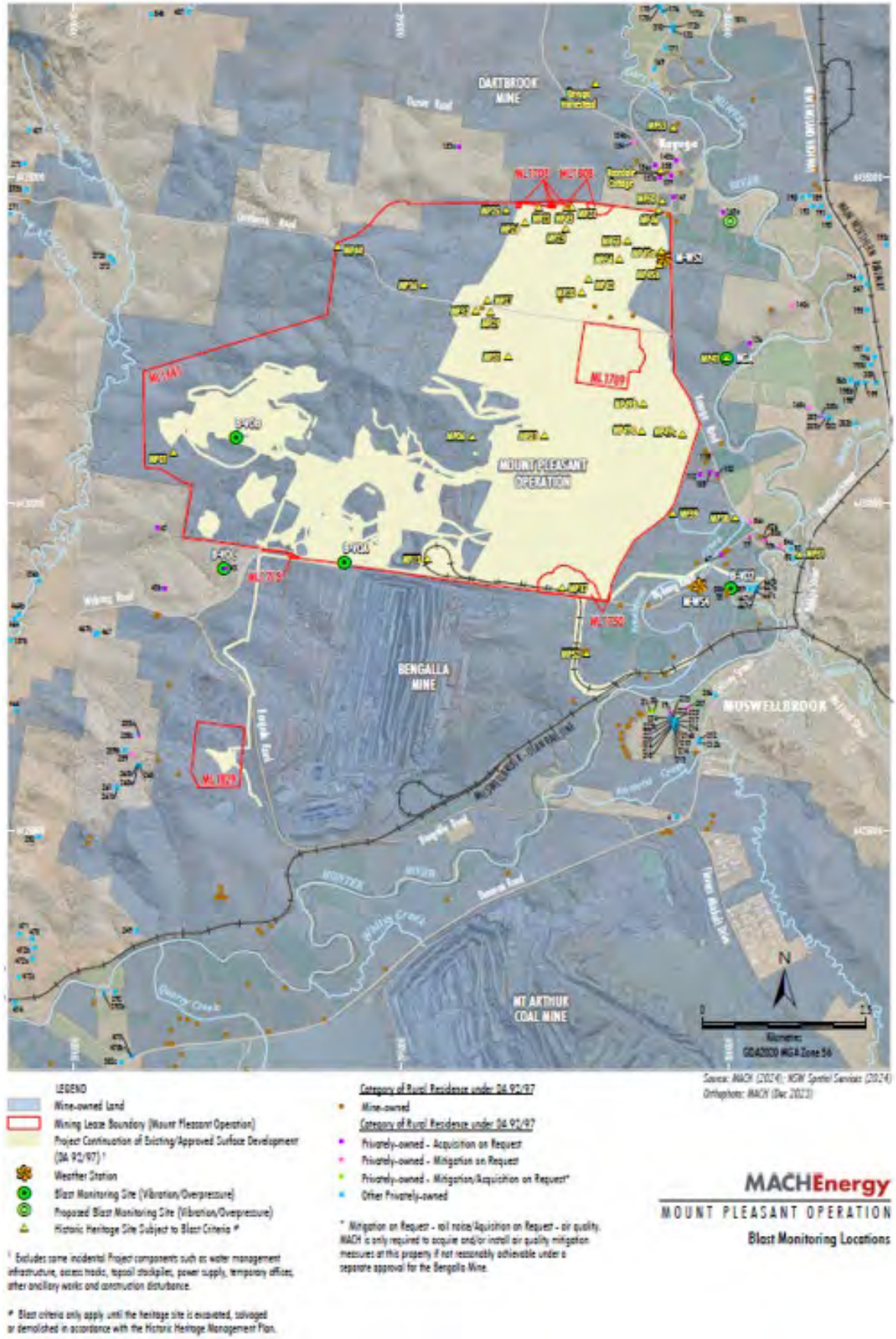

Figure 2-3 – MPO Blast Monitoring Locations

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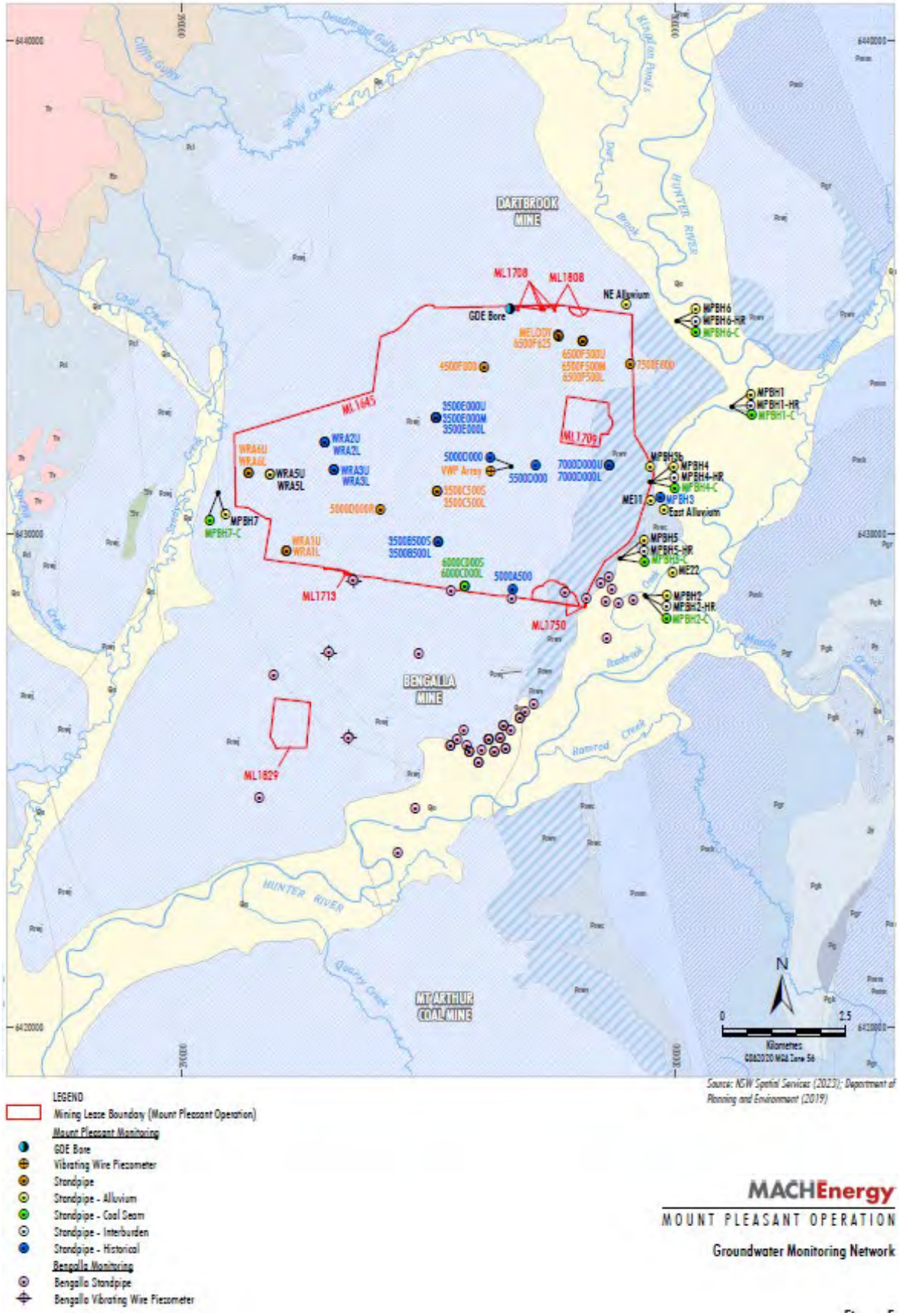

Figure 2-4 – MPO Groundwater Monitoring Network – Approved (SSD 10418) Water Management Plan

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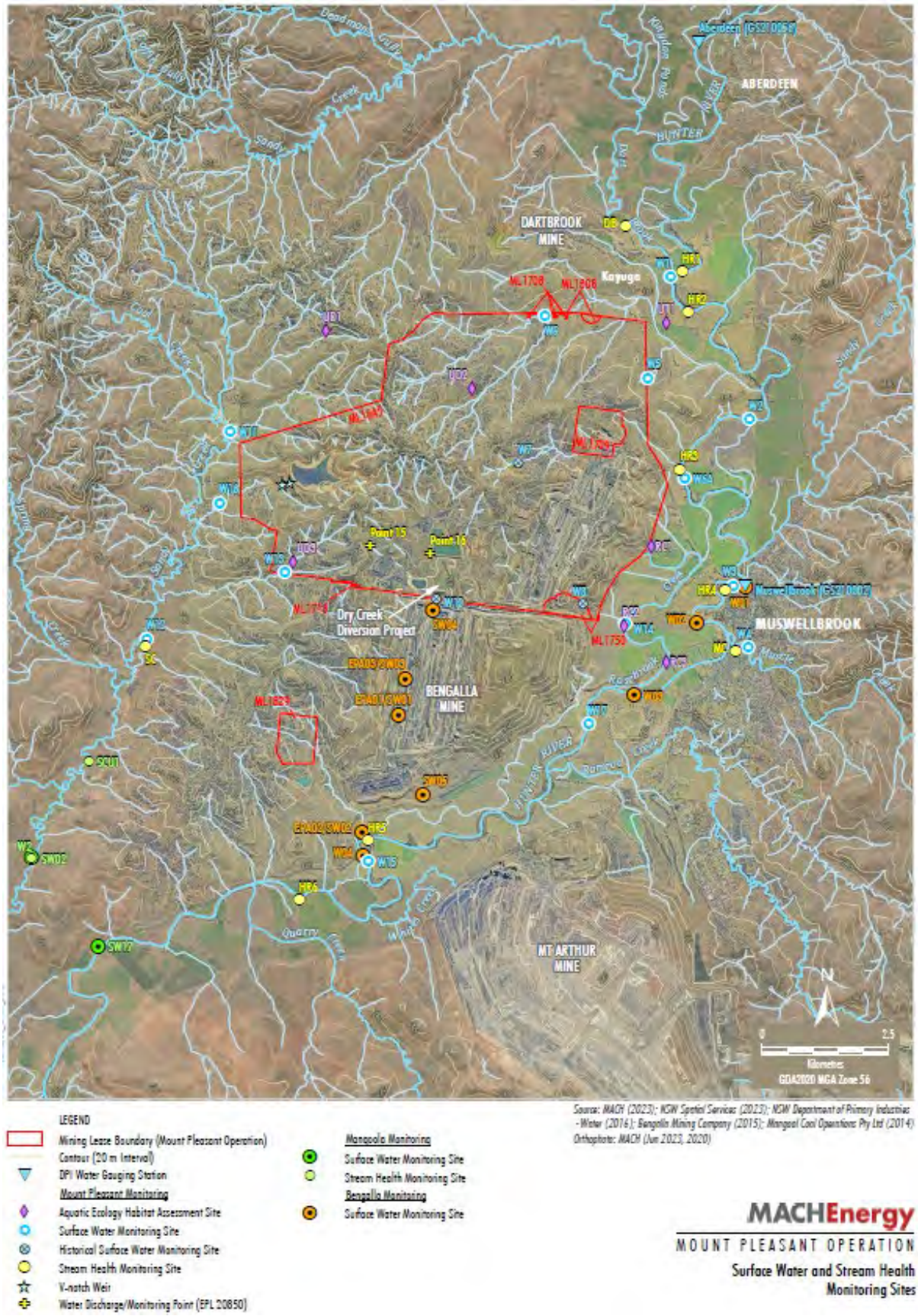

Figure 2-5 – MPO Surface Water Monitoring Network - Approved (SSD 10418) Water Management Plan

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10 µm and less than 2.5 µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout September 2025, there was 25.6mm and 20.8mm of rainfall recorded at M-WS2 and M-WS4, respectively.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – September 2025

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	1.0	3.6
D3	1.3	1.4
D4	0.7	1.1
D5a	3.5	2.1
D6	2.1	2.0
D7b	17.3**	**7.5**
D8	3.4	**5.0**
D9a	2.2	3.8
D10	0.9	1.2
D11	1.9	**4.2**
D12	0.5	1.4
D13	1.0	2.1
D14	8.3**	**4.3**
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

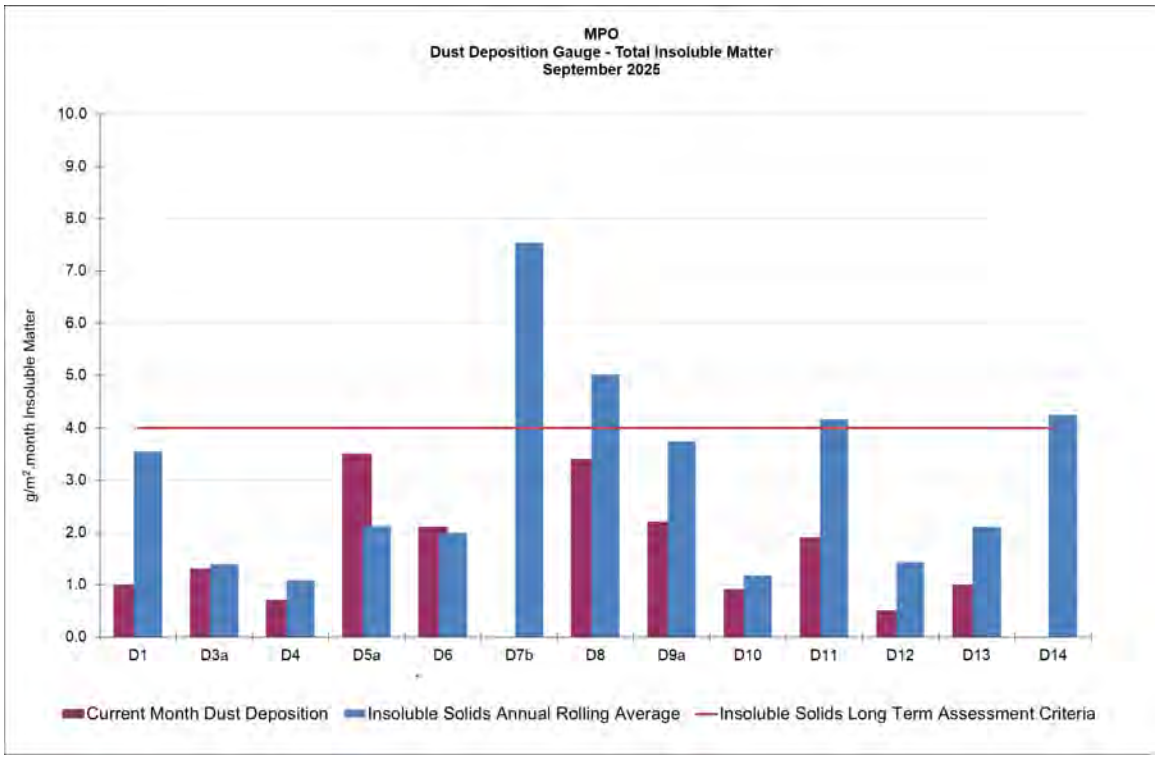

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval

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DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 5-2 Total Suspended Particulate Monitoring Data – September 2025

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
03/09/2025	-	48.7	14.1	15
09/09/2025		53.6	17.2	27.6
15/09/2025		51.5	19	23.4
21/09/2025	-	89.2	15.3	15.8
27/09/2025	-	128	33.9	45.4
*Monthly Mean	-	74.2	19.9	25.4
Annual Rolling Average	90	52	48	36

Notes:
**Results have been rounded to one decimal place for reporting purposes where applicable.*
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

6. Real Time Air Quality Monitoring

6.1 Methodology

Continuous particulate matter monitoring less than 10 µm (PM10) and particulate matter less than 2.5 µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages to the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

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Table 6-1: MPO Continuous Particulate PM_{10} Data – September 2025

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result			
01/09/2025	12.69	8.79	7.09	50
02/09/2025	16.80	13.66	13.59	50
03/09/2025	18.52	17.24	14.66	50
04/09/2025	18.39	11.45	8.70	50
05/09/2025	19.41	14.14	13.14	50
06/09/2025	16.35	14.78	17.80	50
07/09/2025	15.47	14.93	14.66	50
08/09/2025	17.78	14.85	10.72	50
09/09/2025	19.94	16.04	13.05	50
10/09/2025	13.14	12.07	9.82	50
11/09/2025	9.15	6.49	6.13	50
12/09/2025	7.69	5.69	5.39	50
13/09/2025	10.48	6.40	6.16	50
14/09/2025	11.36	7.53	7.10	50
15/09/2025	14.65	10.66	8.64	50
16/09/2025	16.79	15.01	11.98	50
17/09/2025	29.59	15.08	14.45	50
18/09/2025	21.95	13.91	11.60	50
19/09/2025	22.46	23.63	13.84	50
20/09/2025	18.56	12.40	8.56	50
21/09/2025	15.12	7.82	7.51	50
22/09/2025	17.67	8.40	7.55	50
23/09/2025	15.61	15.24	15.16	50
24/09/2025	16.28	15.62	12.17	50
25/09/2025	25.52	11.71	6.79	50
26/09/2025	27.53	21.14	9.54	50
27/09/2025	45.46	22.78	10.19	50
28/09/2025	40.96	30.43	15.24	50
29/09/2025	29.31	31.09	12.64	50
30/09/2025	27.34	34.64	11.41	50

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

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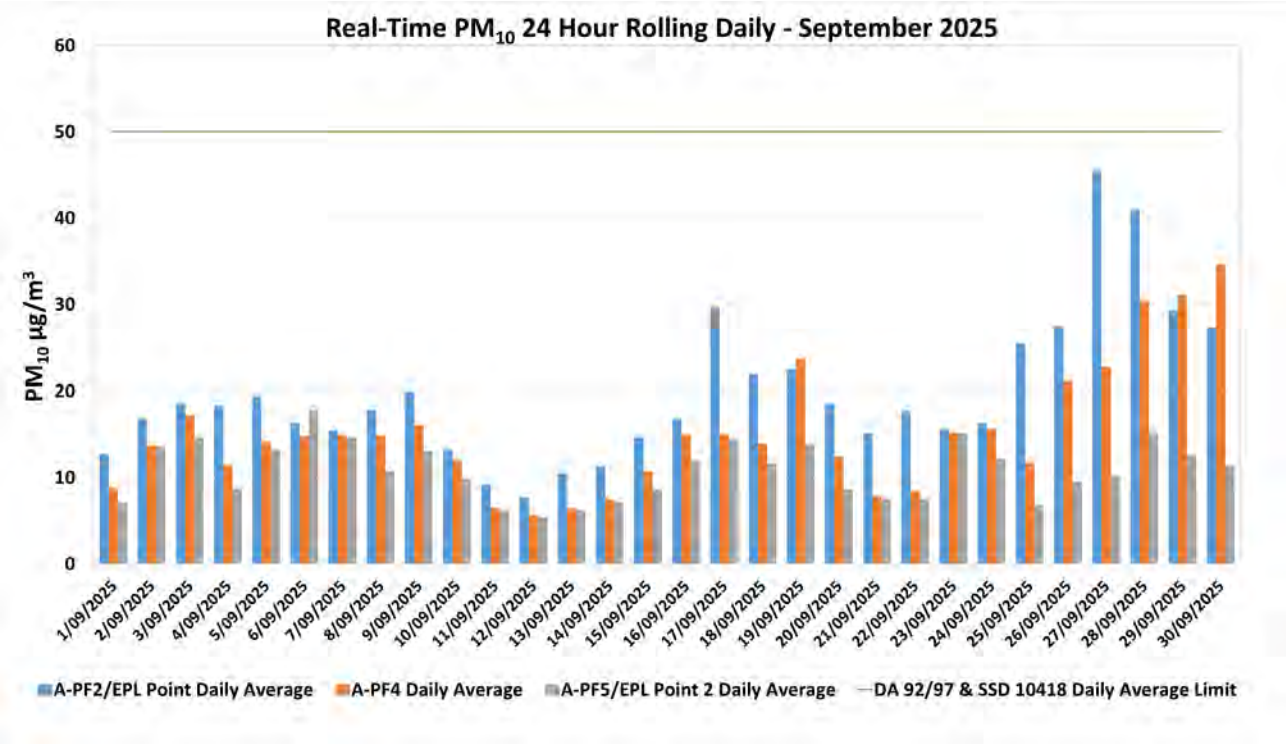

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for September 2025.

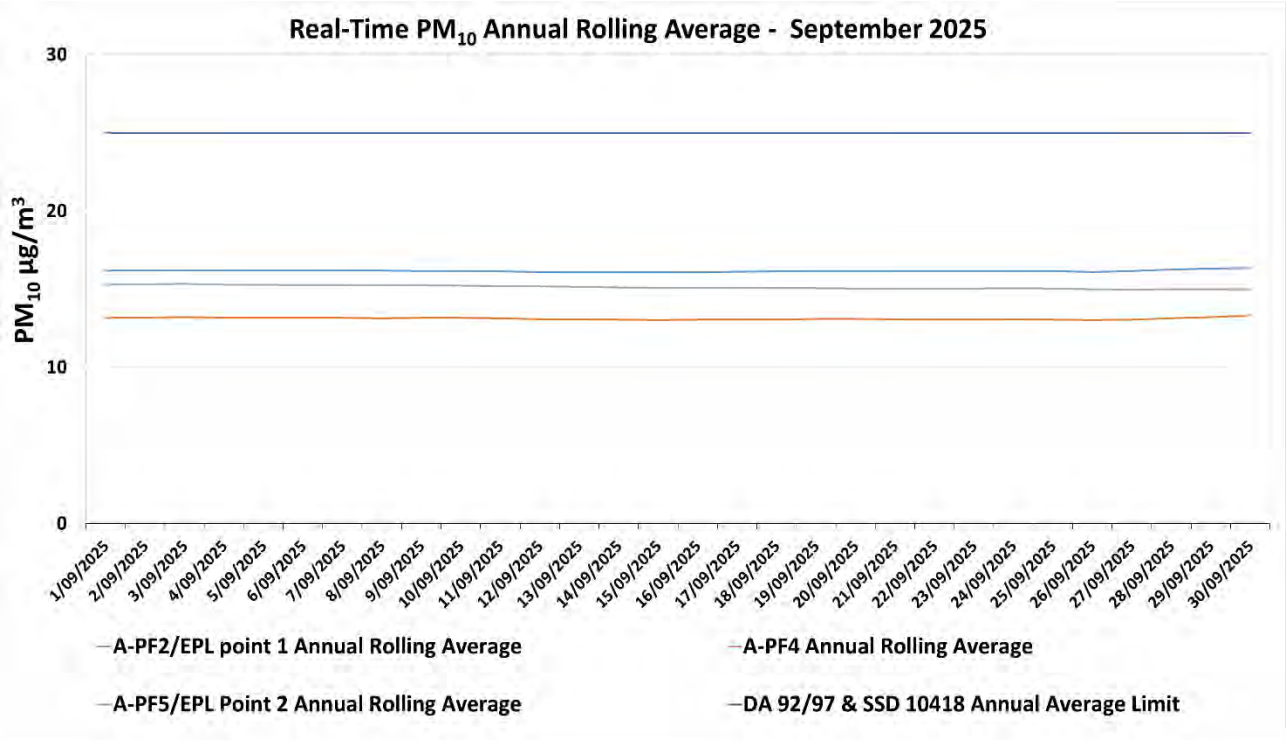

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for September 2025.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – September 2025

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result			
01/09/2025	4.33	3.83	3.23	25
02/09/2025	5.32	4.90	4.54	25
03/09/2025	5.95	5.89	4.82	25
04/09/2025	5.69	4.89	3.94	25
05/09/2025	6.20	5.52	4.71	25
06/09/2025	5.58	5.53	5.50	25
07/09/2025	5.62	5.78	5.14	25
08/09/2025	6.06	5.83	4.65	25
09/09/2025	6.17	5.94	5.23	25
10/09/2025	5.03	5.17	4.70	25
11/09/2025	3.30	3.00	2.91	25
12/09/2025	3.03	2.78	2.68	25
13/09/2025	3.66	3.01	2.84	25
14/09/2025	3.80	3.36	3.14	25
15/09/2025	5.22	4.76	4.26	25
16/09/2025	6.38	6.31	5.71	25
17/09/2025	7.49	6.20	5.78	25
18/09/2025	5.14	4.47	3.97	25
19/09/2025	5.36	5.51	3.37	25
20/09/2025	4.64	4.14	3.60	25
21/09/2025	4.01	3.36	3.30	25
22/09/2025	4.39	3.62	3.41	25
23/09/2025	3.85	3.95	3.77	25
24/09/2025	4.15	4.29	3.74	25
25/09/2025	5.94	4.88	3.86	25
26/09/2025	8.07	7.56	5.70	25
27/09/2025	9.81	7.79	6.03	25
28/09/2025	12.87	12.47	9.58	25
29/09/2025	10.66	11.07	7.32	25
30/09/2025	9.78	10.19	6.45	25

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

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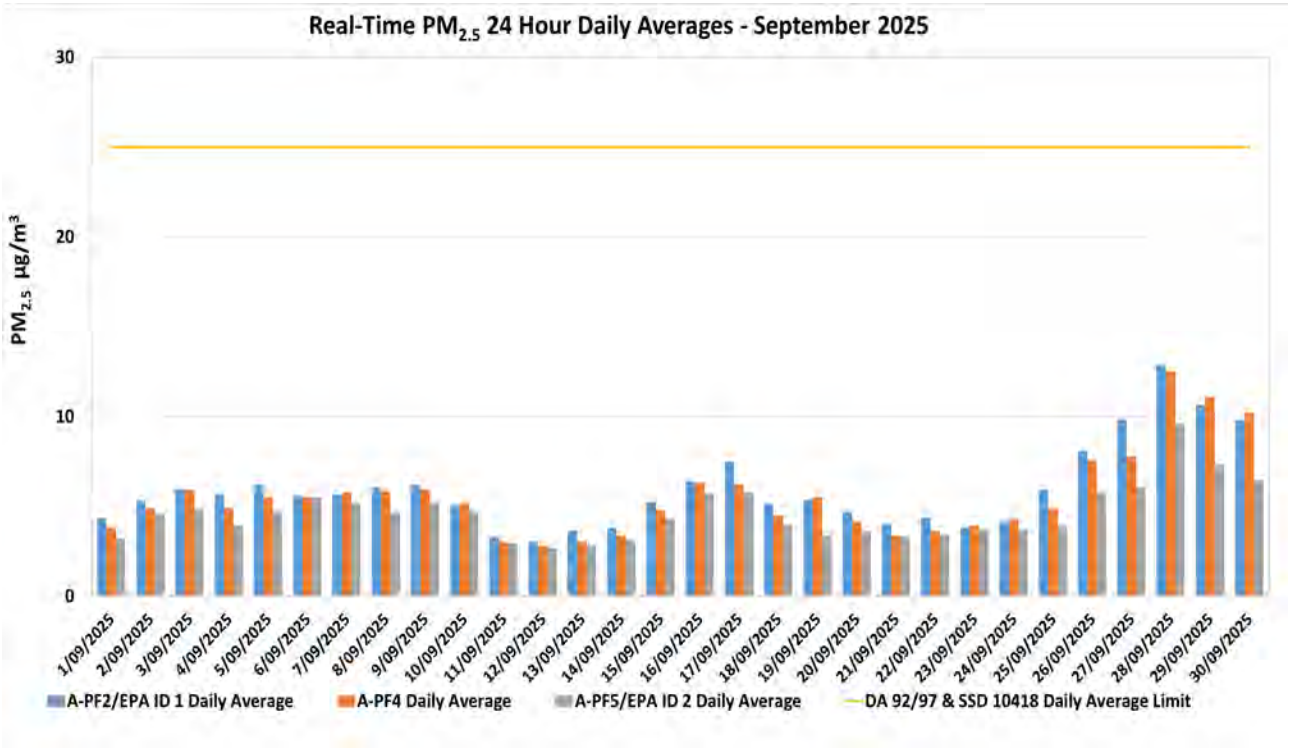

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for September 2025.

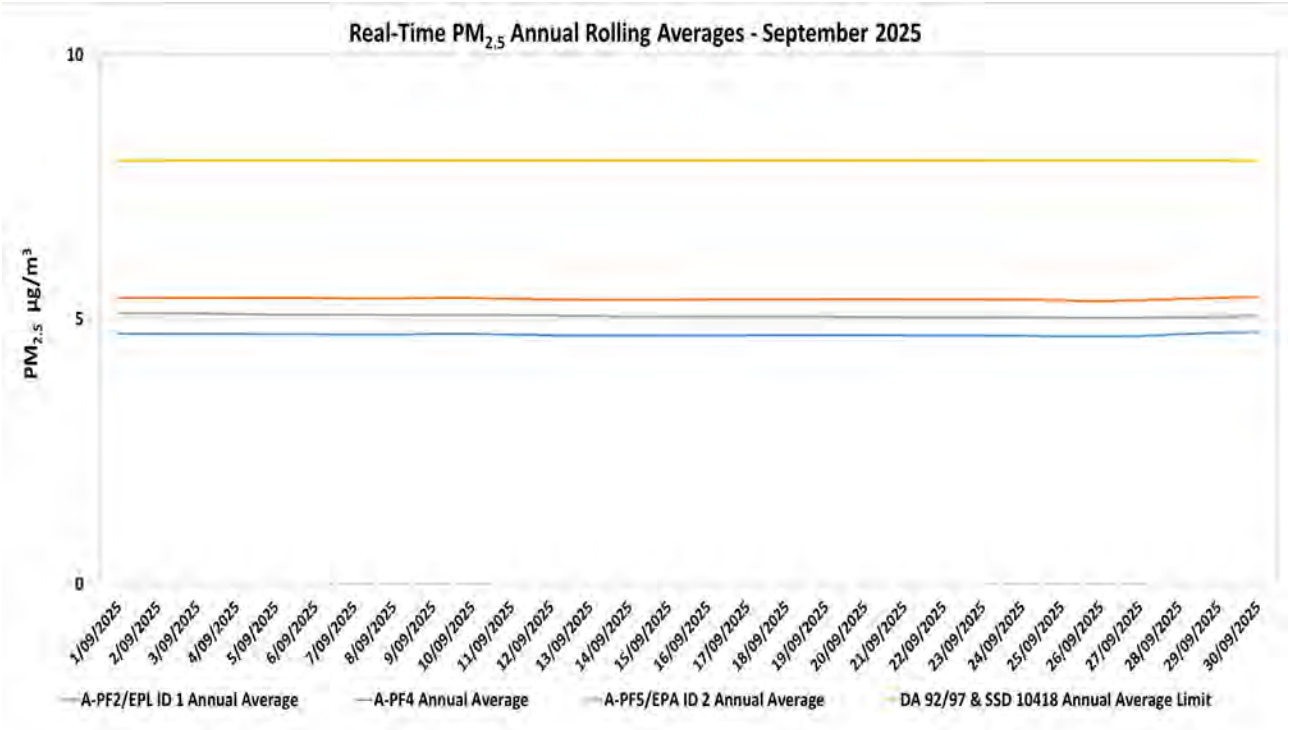

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for September 2025.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of times throughout the reporting period when adverse conditions occurred, when dust generating activities were ceased in accordance with EPL Condition O3.4 and when activities were resumed.

Table 7-1 Dust Shutdowns MPO- September 2025

Date	Time Dust Generating Activities were Ceased	Time Dust Generating Activities were Resumed	Shutdown Hours	24- hour rolling PM10 Average	Wind Direction
27/09/2025	15:20	17:20	2 hours	54.9 µg/m^3	329˚

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event. A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data.

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Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines.

In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1.**

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 30 September 2025

Station	pH	Electrical Conductivity (EC) (µs/cm)[1]	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
W1	8.0	**587**	325	11
W2	8.0	**607**	330	12
W3	8.0	597	319	17
W4	7.9	2120	1290	7
W5	*	*	*	*
W6A	8.0	**587**	329	15
W9	*	*	*	*
W11	**8.2**	3590	1920	<5
W12	8.1	4380	2410	<5
W13	*	*	*	*
W14	*	*	*	*
W15	7.9	**554**	310	19
W16	8.1	8550	5190	12
W17	8.0	573	316	21

*Note: Results in **bold** indicate exceedances of adopted assessment criteria.*
**Dry or insufficient water to sample.*
*** No access due to track conditions.*
**** Investigation Required*
[1] Results have been rounded in accordance with the In-house method Q4AN(EV)-332-WI2 (EC).

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 – $L_{A1,1min}$ Generated by MPO: Attended Night Monitoring – 3 and 4 September 2025

Location	Time	MPO Only $L_{A1,1min}$ dB[2,4]	Criterion dB	Wind Speed m/s Direction °	Criterion Applies[1]	Stability Class	Exceedance dB[3]
N-AT1	12:11am	IA	45	2.5 / 021	Yes	E	No
N-AT2	11:30pm	IA	45	3.1 / 294	Yes	E	NA
N-AT3	10:54pm	40[3] 42 adjusted	45	3.2 / 289	Yes	E	NA
N-AT4	11:20pm	38	45	1.7 / 043	Yes	D	No
N-AT5	11:41pm	34	45	1.8 / 038	Yes	D	No
N-AT6	1:04am	IA	45	2.2 / 020	Yes	D	No
N-AT7	10:43pm	41	45	3.2 / 294	Yes	E	NA
N-AT8	12:25am	37	NA[2]	2.1 / 030	NA[6]	D	NA[2]

Notes:

1. *As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.*
2. *Estimated or measured $L_{A1,1minute}$ attributed to MPO.*
3. *NA in exceedance column means meteorological conditions outside those specified in Condition L2.3 of EPL 20850 and thus criterion is not applicable.*
4. *IA = inaudible; and*
5. *Bold results indicate exceedance of criteria.*
6. *This is not a compliance monitoring location.*

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Table 10-2 – $L_{Aeq,15min}$ Generated by MPO: Attended Night Monitoring – 3 and 4 September 2025

Location	Time	MPO Only $L_{A1,1min}$ dB[2,4]	Criterion dB	Wind Speed m/s Direction °	Criterion Applies[1]	Stability Class	Exceedance dB[3]
N-AT1	12:11am	IA	37	2.5 / 021	Yes	E	No
N-AT2	11:30pm	IA	35	3.1 / 294	Yes	E	NA
N-AT3	10:54pm	36[3] 38 adjusted	40	3.2 / 289	Yes	E	NA
N-AT4	11:20pm	35	38	1.7 / 043	Yes	D	No
N-AT5	11:41pm	30	37	1.8 / 038	Yes	D	No
N-AT6	1:04am	IA	35	2.2 / 020	Yes	D	No
N-AT7	10:43pm	36	37	3.2 / 294	Yes	E	NA
N-AT8	12:25am	33	NA[2]	2.1 / 030	NA[6]	D	NA[2]

Notes:

1. *As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.*
2. *Estimated or measured $L_{Aeq,15minute}$ attributed to MPO.*
3. *IA = inaudible; and*
4. *Bold results indicate exceedance of criteria.*
5. *This is not a compliance monitoring location.*

Table 10-3 – $L_{Aeq,\ period}$ Cumulative Noise: Attended Night Monitoring – 3 and 4 September 2025

Location	Time	Measured Mining Only $L_{Aeq,\ period}$ dB[1,2,3]	Cumulative Noise Criterion LAeq dB	Exceedance dB
N-AT1	12:11am	IA	40	No
N-AT2	11:30pm	IA	40	NA
N-AT3	10:54pm	36[3] 38 adjusted	40	NA
N-AT4	11:20pm	35	40	No
N-AT5	11:41pm	38	40	No
N-AT6	1:04am	31	40	No
N-AT7	10:43pm	36	40	NA
N-AT8	12:25am	33	NA[2]	NA[2]

Notes:

1. *These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results; and*
2. *By definition, cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.*
3. *NA in exceedance column means criterion was not applicable due to atmospheric conditions.*
4. *This is not a compliance monitoring location.*

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11. Blast Monitoring

There were twelve (12) blast events (a total of 87 blasts YTD). Results are presented in **Table 11-1**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850.

Table 11-1 – MPO Blast Monitoring Results – September 2025

Day & Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
1/09/2025	15:34	1.060 mm/s	91.3 DBL	0.720 mm/s	101.8 DBL	Y
3/09/2025	12:33	1.970 mm/s	98.5 DBL	0.720 mm/s	102 DBL	Y
8/09/2025	15:08	0.590 mm/s	102 DBL	0.530 mm/s	106.6 DBL	Y
9/09/2025	15:23	0.750 mm/s	96.8 DBL	1.120 mm/s	108.9 DBL	Y
12/09/2025	15:12	1.520 mm/s	113.1 DBL	0.620 mm/s	115 DBL	Y
15/09/2025	15:05	0.050 mm/s	97.8 DBL	0.070 mm/s	107.2 DBL	Y
17/09/2025	10:51	1.020 mm/s	96.4 DBL	0.410 mm/s	101.6 DBL	Y
19/09/2025	16:06	0.490 mm/s	88.5 DBL	0.630 mm/s	99.4 DBL	Y
22/09/2025	9:10	0.050 mm/s	89.6 DBL	0.070 mm/s	91.9 DBL	Y
23/09/2025	13:13	0.150 mm/s	87.8 DBL	0.220 mm/s	92.8 DBL	Y
25/09/2025	13:50	0.310 mm/s	99.1 DBL	0.410 mm/s	96.9 DBL	Y
27/09/2025	15:16	0.230 mm/s	97.9 DBL	0.200 mm/s	104 DBL	Y

END OF REPORT

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Mount Pleasant Operation

Monthly Environmental Monitoring Report

October 2025

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1. Introduction

The Mount Pleasant Operation (MPO) is located within Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 October 2025
Reporting Period End Date	31 October 2025
Date All Data Received	17 October 2025

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).
All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10 µm and less than 2.5 µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout October 2025, there was 23mm and 21.9mm of rainfall recorded at M-WS2 and M-WS4, respectively.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA92/97 (which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

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4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – October 2025

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	1.9	3.6
D3	1.5	1.4
D4	1.5	1.1
D5a	2.8	2.3
D6	2.6	2.1
D7b***	16.4	**9.0**
D8	3.8	**5.1**
D9a	2.9	3.8
D10	4.5**	1.2
D11	2.4	**4.2**
D12	0.7	1.5
D13	1.5	2.1
D14	1.5	**4.2**
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*
**** Within the operational area. Not used to assess compliance or to represent residential receivers in the area.*

Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

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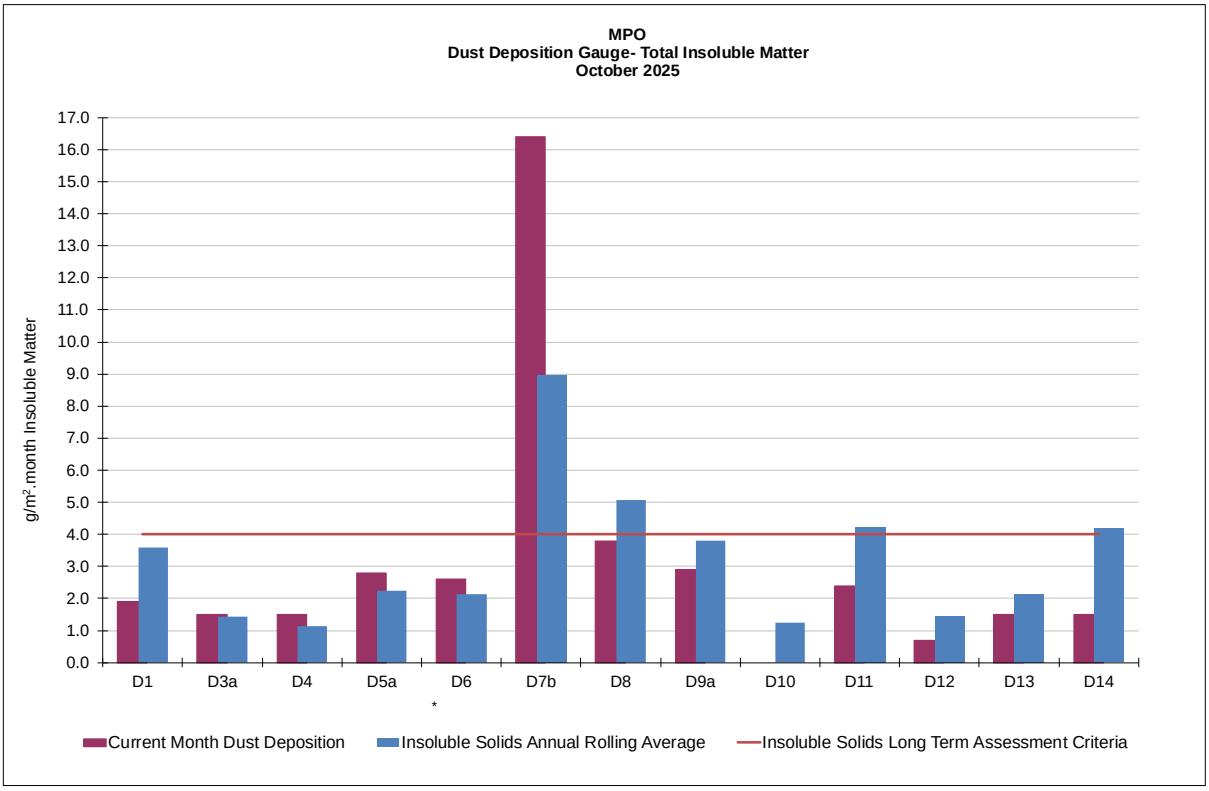

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 5-2 Total Suspended Particulate Monitoring Data – October 2025

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
03/10/2025	-	107	55.4	64.3
09/10/2025		93.6	45	71.5
15/10/2025		70.4	84.6	132
21/10/2025	-	101	99.8	167
27/10/2025	-	111	115	182
*Monthly Mean	-	96.6	80	123.4
Annual Rolling Average	90	55	50	43

Notes:
**Results have been rounded to one decimal place for reporting purposes where applicable.*
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

6. Real Time Air Quality Monitoring

6.1 Methodology

Continuous particulate matter monitoring less than 10 µm (PM10) and particulate matter less than 2.5 µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4 respectively. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

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6.3 Results

Real time PM10 and PM2.5 annual rolling averages to the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

Table 6-1: MPO Continuous Particulate PM_{10} Data –October 2025

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
01/10/2025	24.93	24.44	8.50	50
02/10/2025	30.57	14.58	5.20	50
03/10/2025	30.29	13.96	8.24	50
04/10/2025	23.26	14.63	12.45	50
05/10/2025	20.09	18.28	13.46	50
06/10/2025	26.64	19.52	8.95	50
07/10/2025	-	27.83	10.88	50
08/10/2025	40.44	28.42	7.61	50
09/10/2025	35.73	31.00	11.37	50
10/10/2025	25.48	19.09	10.39	50
11/10/2025	22.17	11.13	6.17	50
12/10/2025	24.10	10.09	6.46	50
13/10/2025	18.89	9.18	7.28	50
14/10/2025	18.60	14.84	12.75	50
15/10/2025	24.93	18.56	6.00	50
16/10/2025	24.43	39.42	7.76	50
17/10/2025	23.60	24.03	6.74	50
18/10/2025	-	18.01	8.92	50
19/10/2025	-	17.06	12.39	50
20/10/2025	-	23.24	8.22	50
21/10/2025	30.37	32.02	9.22	50
22/10/2025	36.18	42.38	11.11	50
23/10/2025	43.98	45.57	33.37	50
24/10/2025	32.60	39.52	40.20	50
25/10/2025	25.30	22.49	7.53	50
26/10/2025	28.75	24.47	6.60	50
27/10/2025	30.73	33.75	6.25	50
28/10/2025	18.40	22.60	7.90	50
29/10/2025	8.33	9.90	6.91	50
30/10/2025	12.72	13.20	8.57	50
31/10/2025	17.59	18.17	10.50	50

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled

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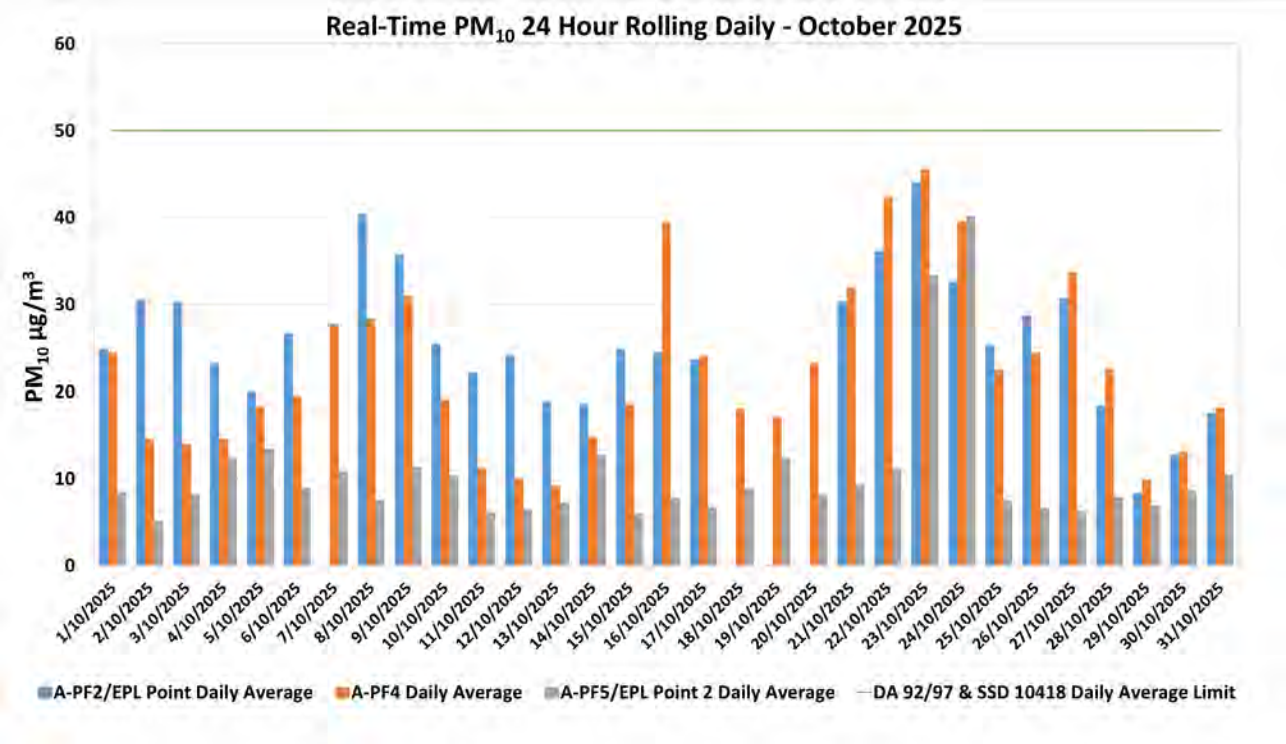

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for October 2025.

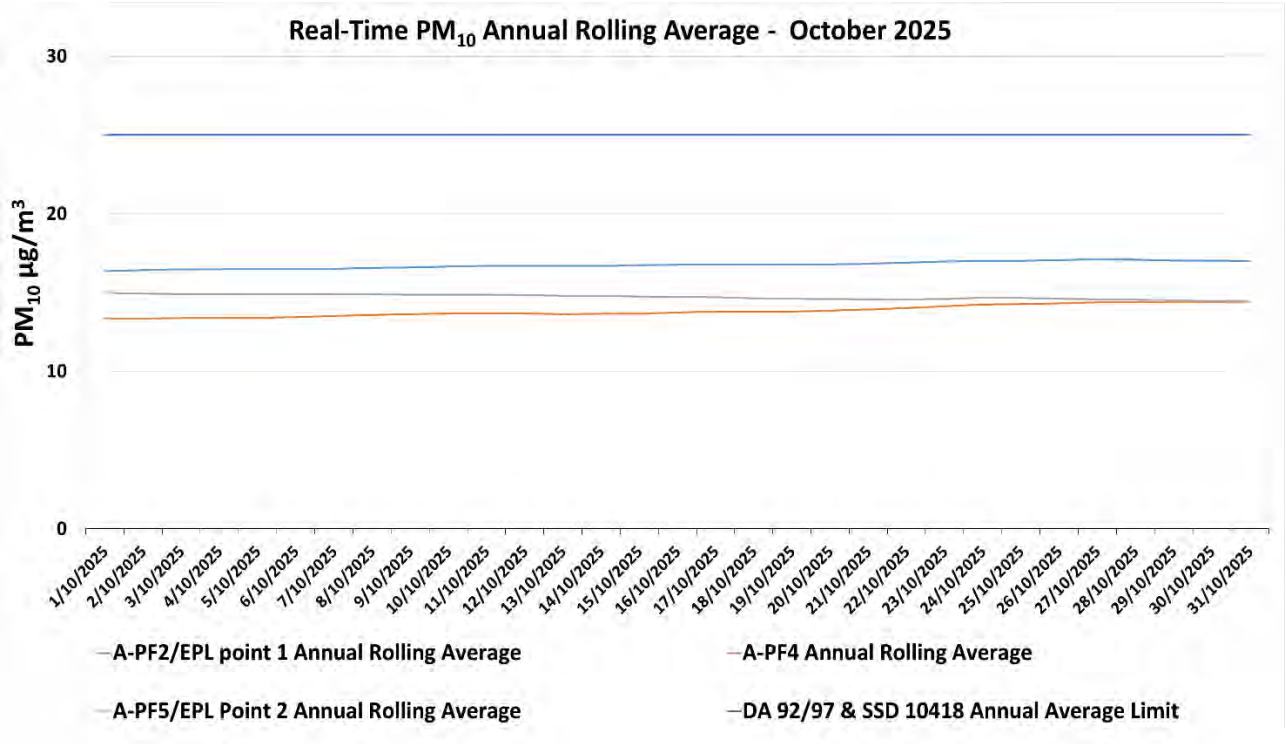

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for October 2025.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – October 2025

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2	A-PF2, A-PF4, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
01/10/2025	7.13	7.14	5.01	25
02/10/2025	5.20	3.94	2.75	25
03/10/2025	5.10	3.83	3.26	25
04/10/2025	4.82	4.05	3.68	25
05/10/2025	5.02	4.94	4.22	25
06/10/2025	7.63	7.36	5.41	25
07/10/2025	-	8.68	5.51	25
08/10/2025	7.90	7.36	4.34	25
09/10/2025	10.03	9.98	7.04	25
10/10/2025	8.52	8.07	6.50	25
11/10/2025	5.53	4.56	3.57	25
12/10/2025	4.77	3.51	2.94	25
13/10/2025	4.64	3.37	2.91	25
14/10/2025	5.12	4.86	4.36	25
15/10/2025	4.97	4.49	2.97	25
16/10/2025	5.78	7.17	3.91	25
17/10/2025	6.35	6.25	4.00	25
18/10/2025	-	7.10	5.11	25
19/10/2025	-	6.76	5.88	25
20/10/2025	-	6.71	4.33	25
21/10/2025	8.83	9.09	5.40	25
22/10/2025	10.12	11.06	5.90	25
23/10/2025	9.12	9.30	7.40	25
24/10/2025	7.41	8.26	7.58	25
25/10/2025	6.74	6.65	3.94	25
26/10/2025	7.31	6.90	3.80	25
27/10/2025	6.27	6.71	3.46	25
28/10/2025	4.71	5.20	3.52	25
29/10/2025	3.79	4.03	3.73	25
30/10/2025	5.56	5.85	4.98	25
31/10/2025	6.84	7.23	5.89	25

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

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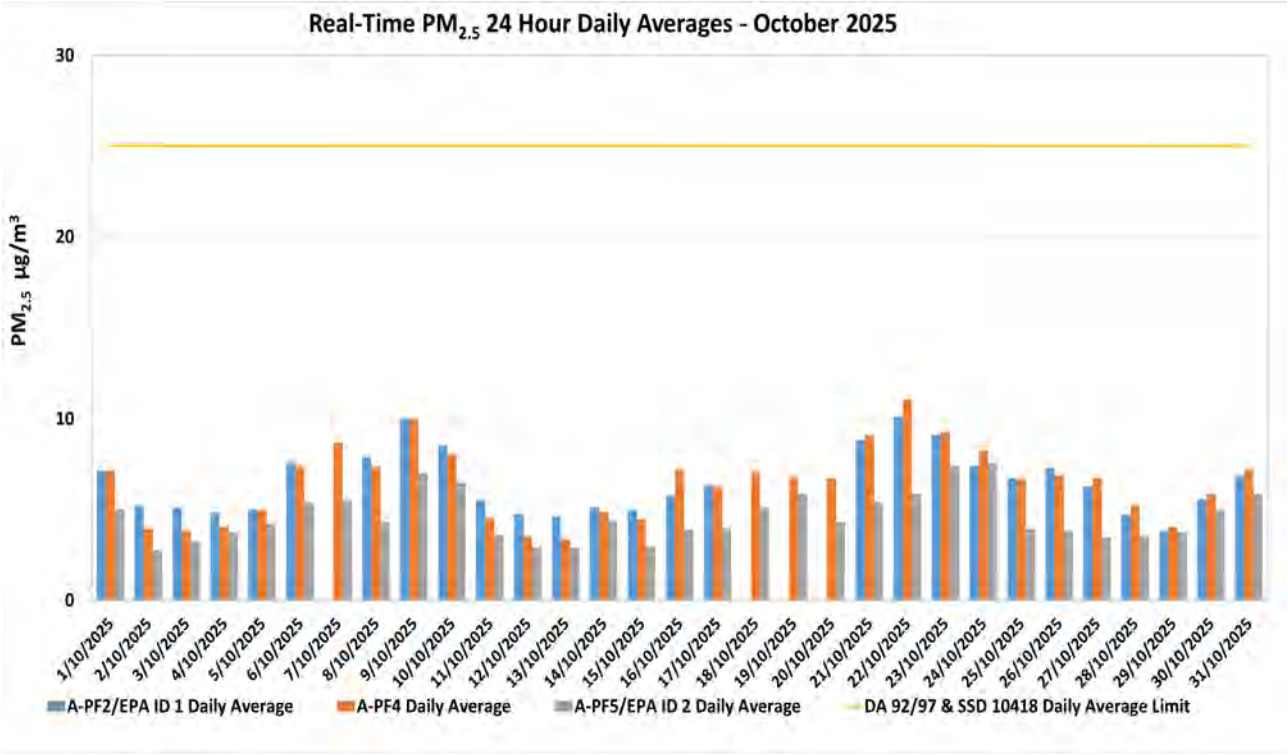

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for October 2025.

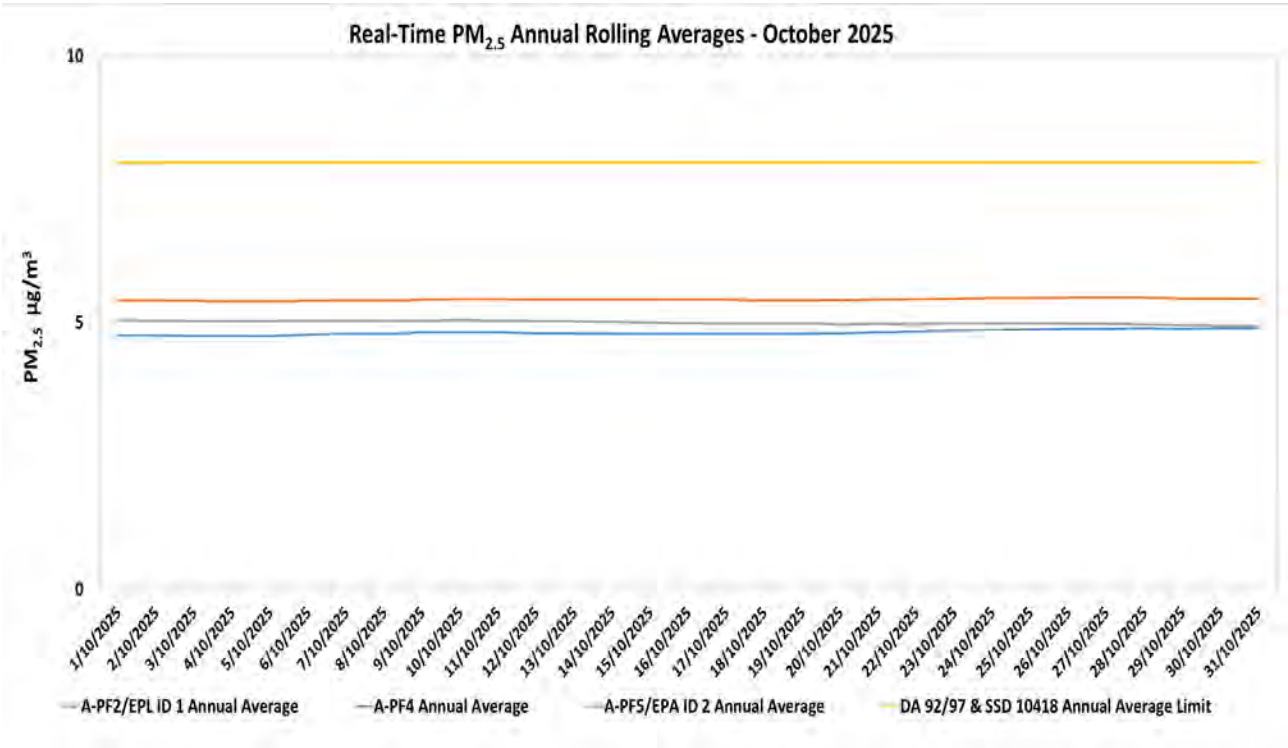

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for October 2025.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of days throughout the reporting period when adverse conditions were triggered leading to a shutdown event, in accordance with EPL Condition O3.4.

Table 7-1 Dust Shutdowns MPO- October 2025

Date	Muswellbrook NW 24- hour rolling PM10 Average (µg/m^3)	Wind Direction (˚)
2/10/2025	44.7	254
3/10/2025	45.6	295
8/10/2025	46.5	325
9/10/2025	54.2	330
9/10/2025	47.2	338
9/10/2025	50	268
22/10/2025	45.6	337
23/10/2025	63.4	271
24/10/2025	55.2	251

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event. A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

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8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines.

In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1.**

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 29 October 2025

Station	pH	Electrical Conductivity (EC) (µs/cm)[1]	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
W1	**8.4**	**700**	394	6
W2	**	**	**	**
W3	8.4	843	486	9
W4	**8.2**	2210	1410	**13**
W5	*	*	*	*
W6A	**8.5**	**783**	456	7
W9	*	*	*	*
W11	**	**	**	**
W12	**8.6**	4980	2800	<5
W13	9.0	5880	3390	12
W14	*	*	*	*
W15	**8.1**	**911**	546	14
W16	8.7	8440	5150	7
W17	**8.4**	**903**	524	23

*Note: Results in **bold** indicate exceedances of adopted assessment criteria of less than three consecutive events.*
**Dry or insufficient water to sample.*
*** No access due to track conditions.*
**** Investigation Required*
[1] Results have been rounded in accordance with the In-house method Q4AN(EV)-332-WI2 (EC).

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 – $L_{A1,1min}$ Generated by MPO: Attended Night Monitoring – 21 and 22 October 2025

Location	Time	MPO Only $L_{A1,1min}$ dB	Criterion dB	Wind Speed m/s Direction °	Criterion Applies	Stability Class	Exceedance dB
N-AT1	10:33pm	IA	45	1.8 / 150	Yes	E	No
N-AT2	10:04pm	IA	45	5.0 / 152	Yes	D	NA
N-AT3	11:08pm	IA	45	3.1 / 164	Yes	D	NA
N-AT4	11:55pm	IA	45	0.4 / 233	Yes	F	No
N-AT5	12:36am	36	45	0.4 / 168	Yes	F	No
N-AT6	11:55pm	IA	45	0.4 / 233	Yes	F	No
N-AT7	12:31am	IA	45	0.4 / 127	Yes	F	No
N-AT8	11:29pm	47	49	0.8 / 192	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-2 – $L_{Aeq,15min}$ Generated by MPO: Attended Night Monitoring – 21 and 22 October 2025

Location	Time	MPO Only $L_{A1,1min}$ dB	Criterion dB	Wind Speed m/s Direction °	Criterion Applies	Stability Class	Exceedance dB
N-AT1	10:33pm	IA	37	1.8 / 150	Yes	E	No
N-AT2	10:04pm	IA	35	5.0 / 152	Yes	D	NA
N-AT3	11:08pm	IA	40	3.1 / 164	Yes	D	NA
N-AT4	11:55pm	IA	38	0.4 / 233	Yes	F	No
N-AT5	12:36am	32	37	0.4 / 168	Yes	F	No
N-AT6	11:55pm	IA	35	0.4 / 233	Yes	F	No
N-AT7	12:31am	IA	37	0.4 / 127	Yes	F	No
N-AT8	11:29pm	41	43	0.8 / 192	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 – $L_{Aeq,\ period}$ Cumulative Noise: Attended Night Monitoring – 21 and 22 October 2025

Location	Time	Measured Mining Only $L_{Aeq,\ period}$ dB[1,2,3]	Cumulative Noise Criterion LAeq dB	Exceedance dB
N-AT1	10:33pm	IA	40	No
N-AT2	10:04pm	IA	40	NA
N-AT3	11:08pm	IA	40	NA
N-AT4	11:55pm	IA	40	No
N-AT5	12:36am	32	40	No
N-AT6	11:55pm	34	40	No
N-AT7	12:31am	IA	40	No
N-AT8	11:29pm	43	-	-

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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11. Blast Monitoring

There were nine (9) blast events (a total of 96 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – October 2025

Day & Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
1/10/25	15:10	1.05 mm/s	113 DBL	0.8 mm/s	103.6 DBL	Y
7/10/25	15:01	1.61 mm/s	103.1 DBL	0.69 mm/s	108.2 DBL	Y
8/10/25	14:47	0.27 mm/s	103.4 DBL	0.34 mm/s	103.8 DBL	Y
13/10/25	12:56	0.52 mm/s	108.7 DBL	0.58 mm/s	98.1 DBL	Y
15/10/25	13:19	0.43 mm/s	93.1 DBL	0.39 mm/s	95.4 DBL	Y
18/10/25	11:59	0.45 mm/s	95.5 DBL	0.37 mm/s	100.3 DBL	Y
20/10/25	14:05	0.33 mm/s	97.8 DBL	0.26 mm/s	106.1 DBL	Y
25/10/25	14:15	0.7 mm/s	91.4 DBL	0.73 mm/s	99.7 DBL	Y
27/10/25	16:45	0.57 mm/s	103.9 DBL	0.59 mm/s	108.1 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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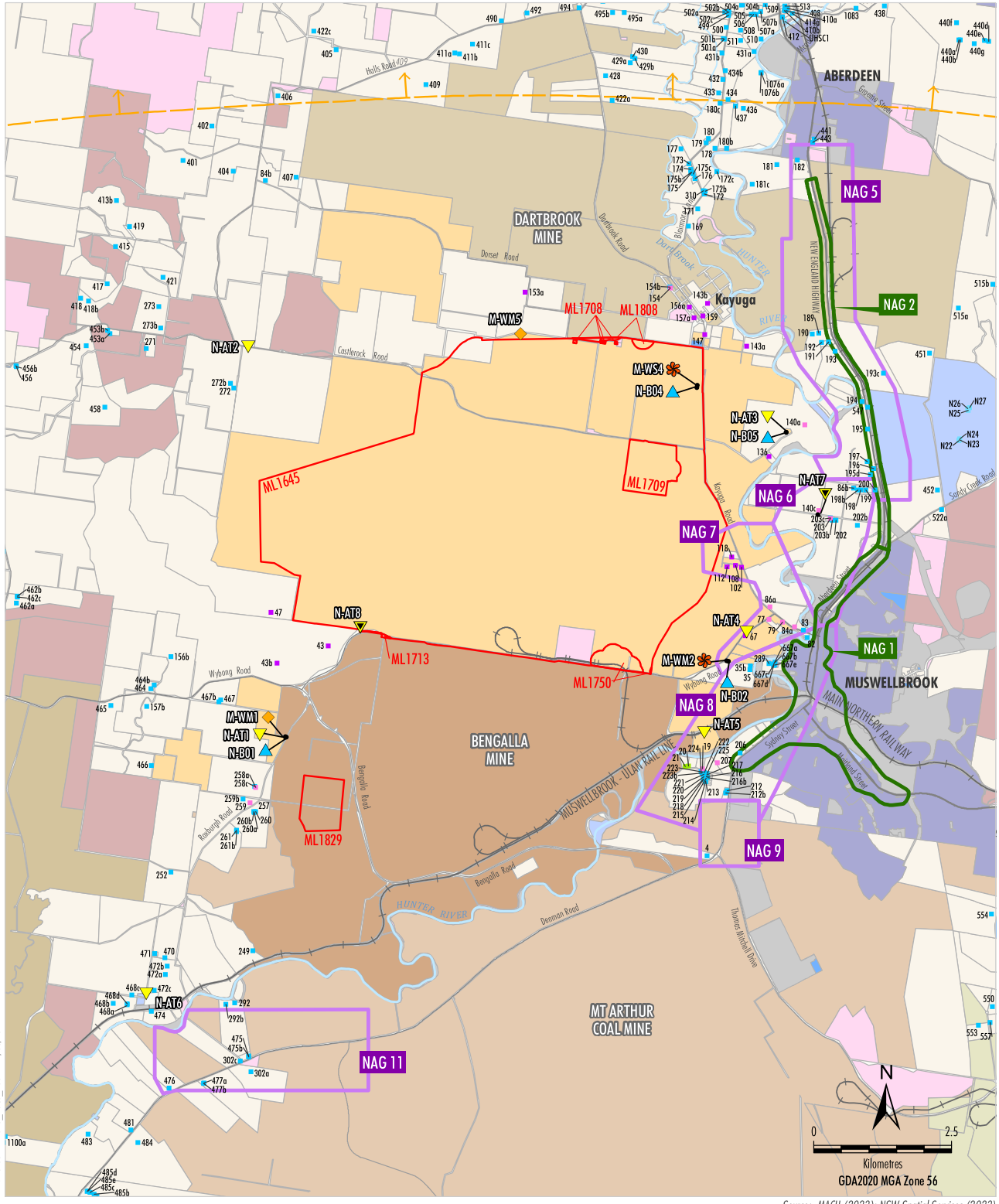


MAC-18-03A MP2023_Noise_203D 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

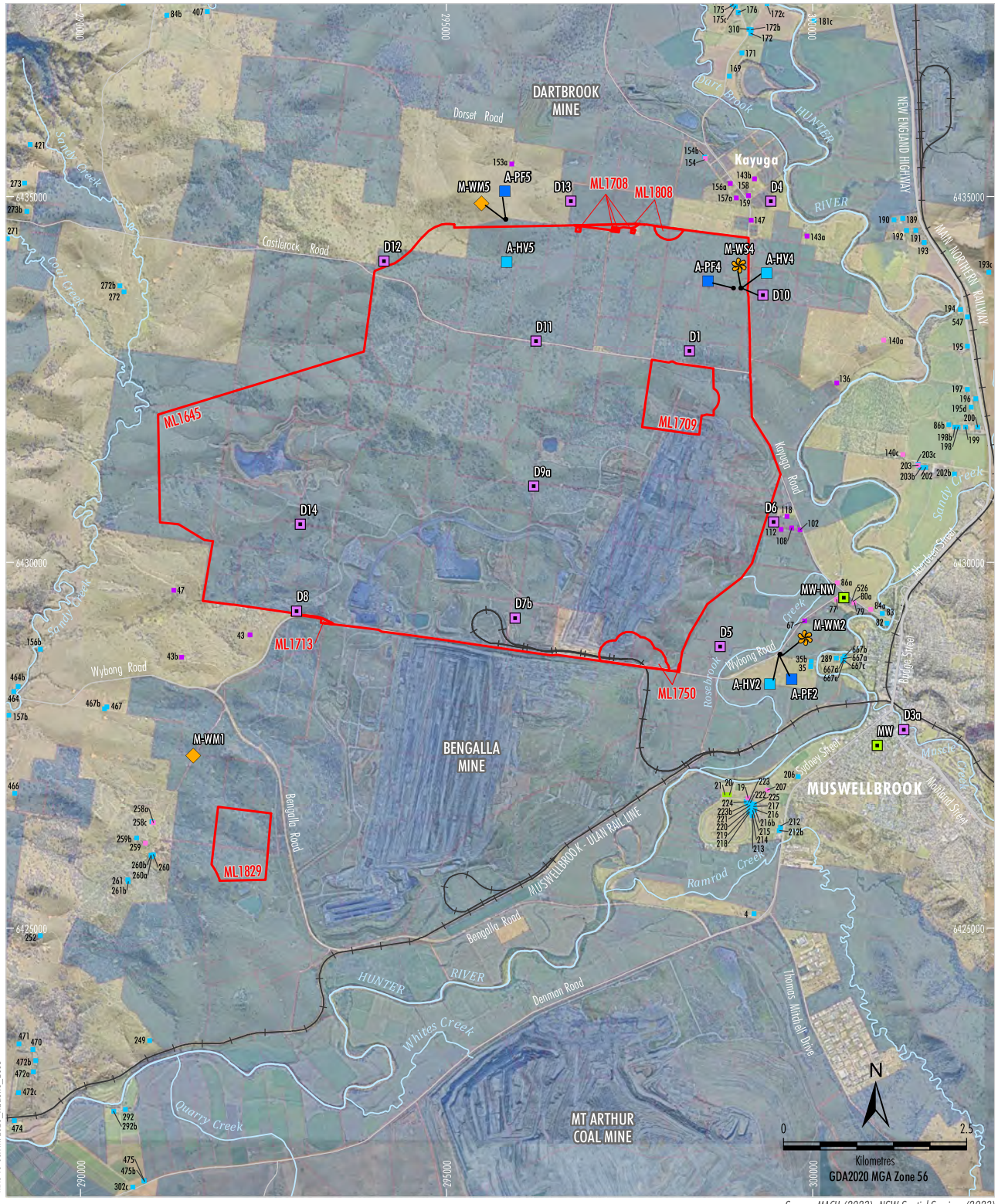
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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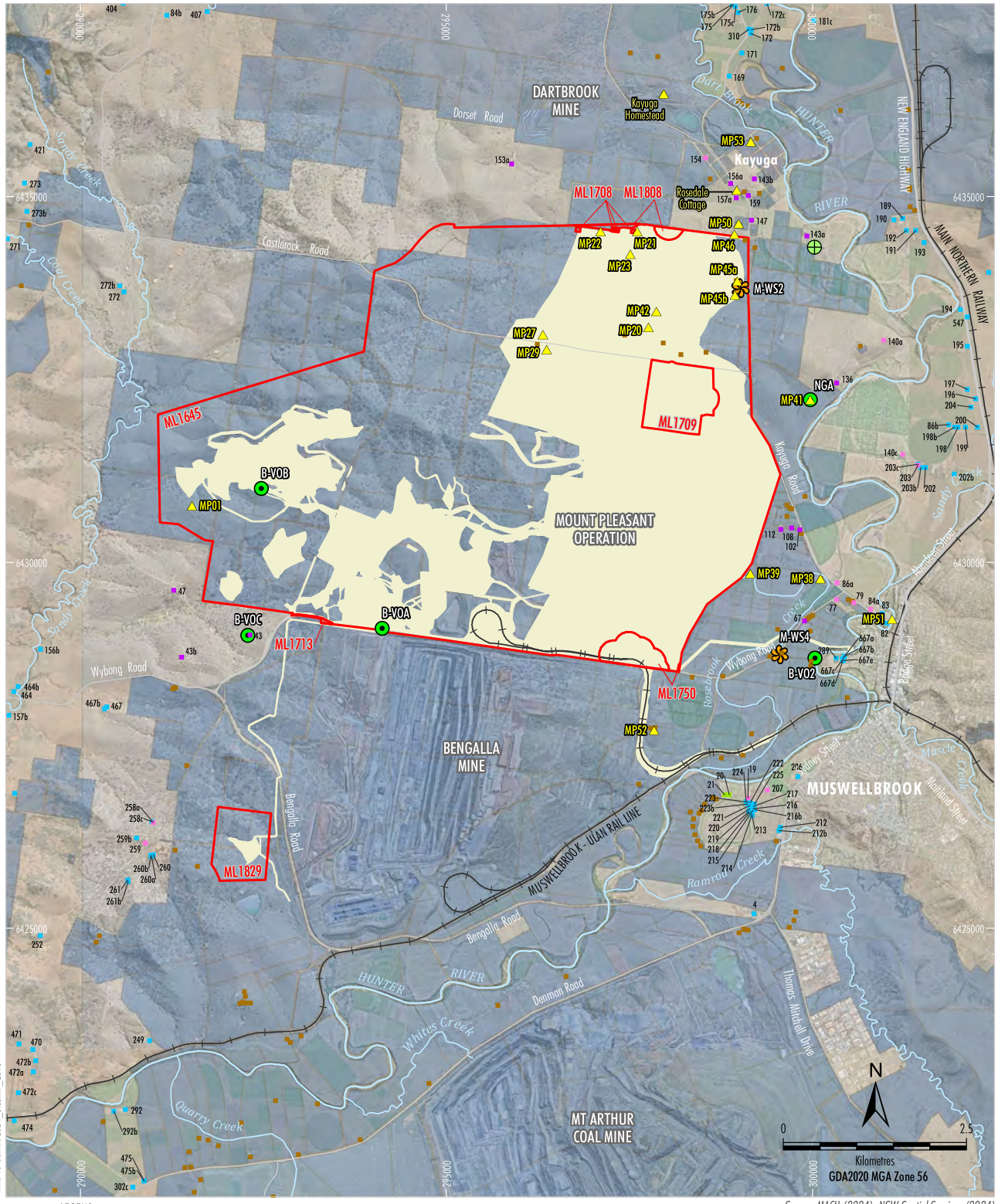
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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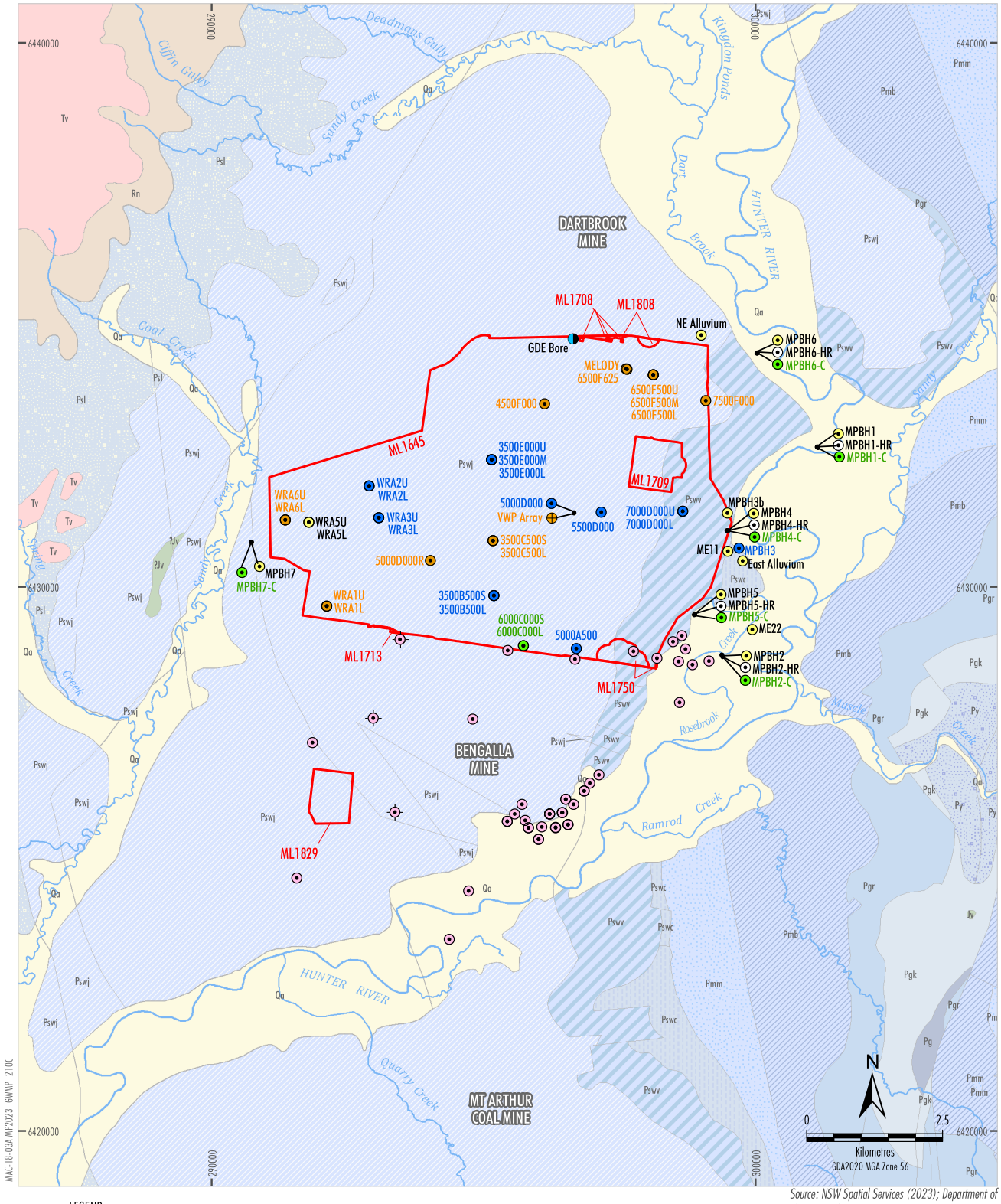
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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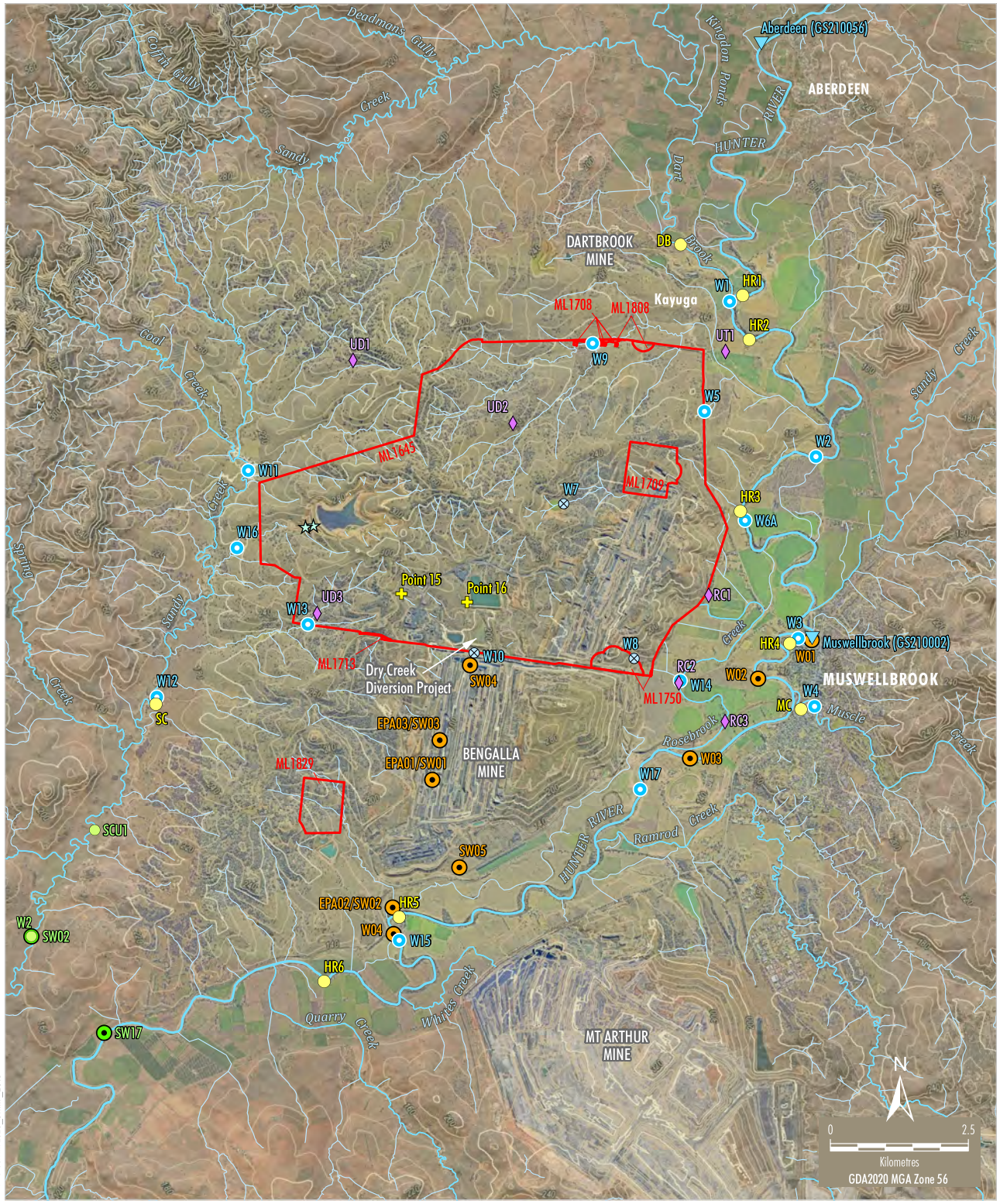
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

November 2025

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 November 2025
Reporting Period End Date	30 November 2025
Date All Data Received	22 December 2025

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 during the monitoring period. Throughout November 2025, there was 45mm recorded at M-WS2 noting there was some lost data over the 20 to 21 of November.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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robust monitoring practices. This transition from the previous development consent DA 92/97 (which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – November 2025

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	3.2	3.7
D3	2.3	1.5
D4	1.3	1.1
D5a	4.5	2.4
D6	3.9	2.2
D7b***	38	**12.9**
D8	5.7	**5.0**
D9a	2.3	3.6
D10	3.2	1.3
D11	3.5	**4.2**
D12	1.3	1.4
D13	2.5	2.2
D14	4.2	4.0
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*
**** Within the operational area. Not used to assess compliance or to represent residential receivers in the area.*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

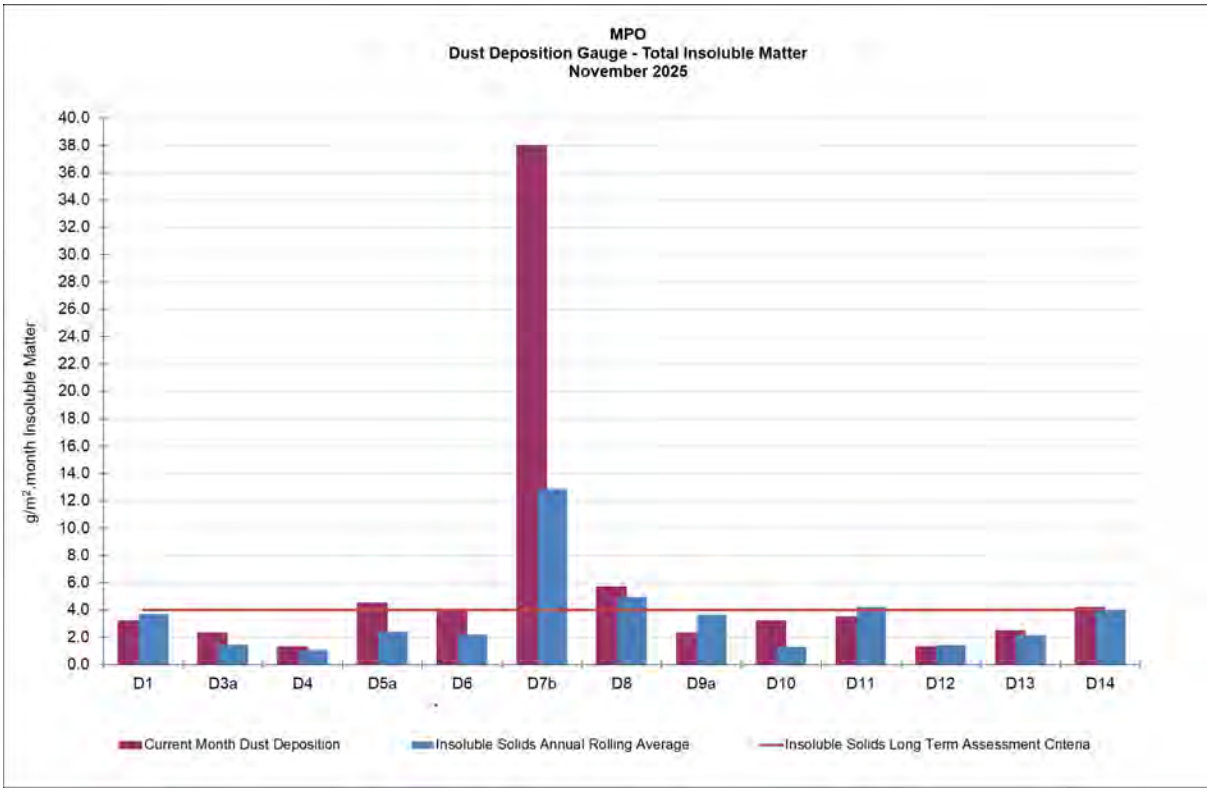

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

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TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – November 2025

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
02/11/2025	-	35.4	58.4	44.1
08/11/2025	-	139	52.2	68.7
14/11/2025	-	94.2	121	203
20/11/2025	-	68.6	59.3	67.3
26/11/2025	-	36.1	35.2	31.9
Monthly Mean	-	74.7	65.2	83
Annual Rolling Average	90	57	50	46

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages to the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

Table 6-1: MPO Continuous Particulate PM_{10} Data – November 2025

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
01/11/2025	14.59	14.05	8.56	50
02/11/2025	15.85	14.95	10.32	50
03/11/2025	22.24	19.80	13.19	50
04/11/2025	28.89	13.90	6.54	50
05/11/2025	22.36	8.91	4.15	50
06/11/2025	20.87	25.53	5.25	50
07/11/2025	23.25	38.14	8.78	50
08/11/2025	41.89	24.93	10.75	50
09/11/2025	33.33	17.00	8.42	50
10/11/2025	22.85	24.29	13.28	50

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Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
11/11/2025	27.92	32.76	6.54	50
12/11/2025	34.12	**58.96**	5.37	50
13/11/2025	30.15	**50.74**	8.17	50
14/11/2025	32.79	37.53	6.87	50
15/11/2025	31.53	40.69	11.12	50
16/11/2025	19.21	14.61	6.52	50
17/11/2025	42.80	11.36	4.37	50
18/11/2025	28.19	22.16	4.70	50
19/11/2025	21.32	28.03	4.83	50
20/11/2025	24.49	23.79	5.09	50
21/11/2025	-	20.44	7.45	50
22/11/2025	13.80	-	7.32	50
23/11/2025	17.34	-	9.04	50
24/11/2025	18.33	-	10.35	50
25/11/2025	18.84	21.23	7.62	50
26/11/2025	16.83	14.61	5.07	50
27/11/2025	23.04	17.70	6.36	50
28/11/2025	46.71	-	10.00	50
29/11/2025	33.32	16.00	5.60	50
30/11/2025	34.03	19.84	6.07	50

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
[1] Criteria of 50µg/m^3 does not apply to A-PF4 as it is not representative of a residence on privately owned land.

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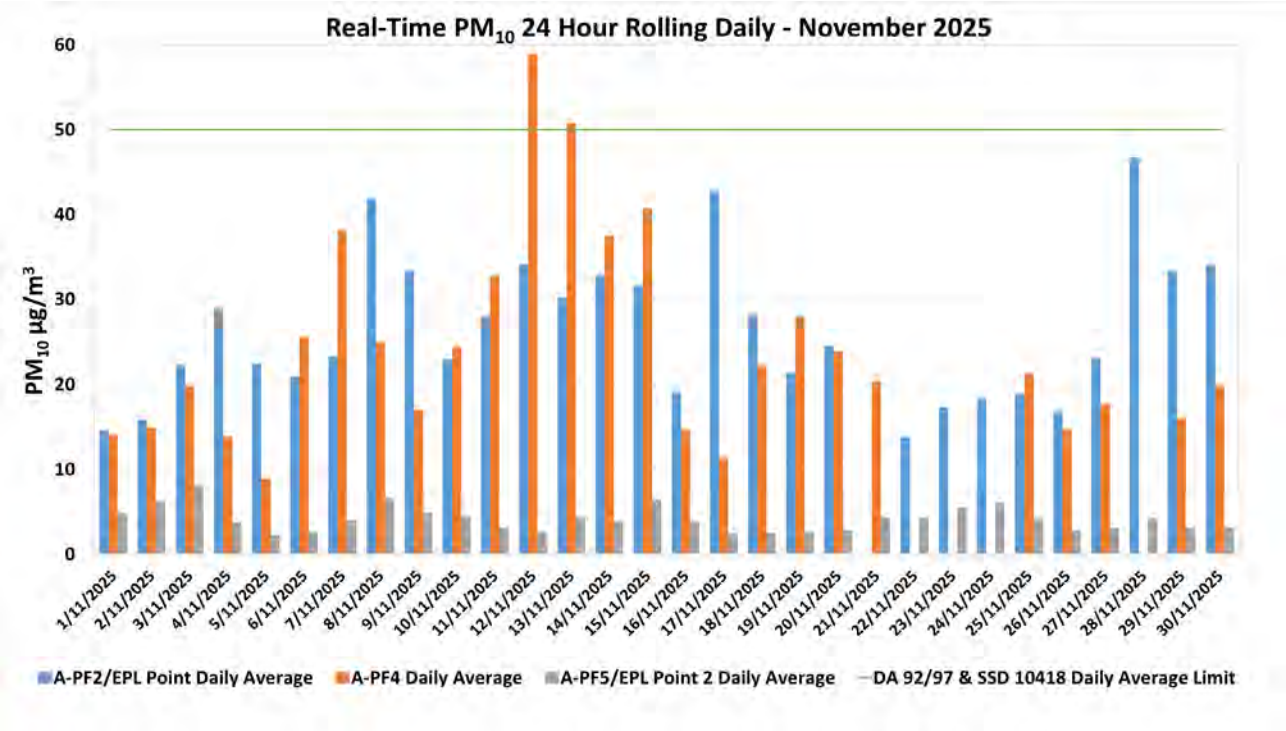

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for November 2025.

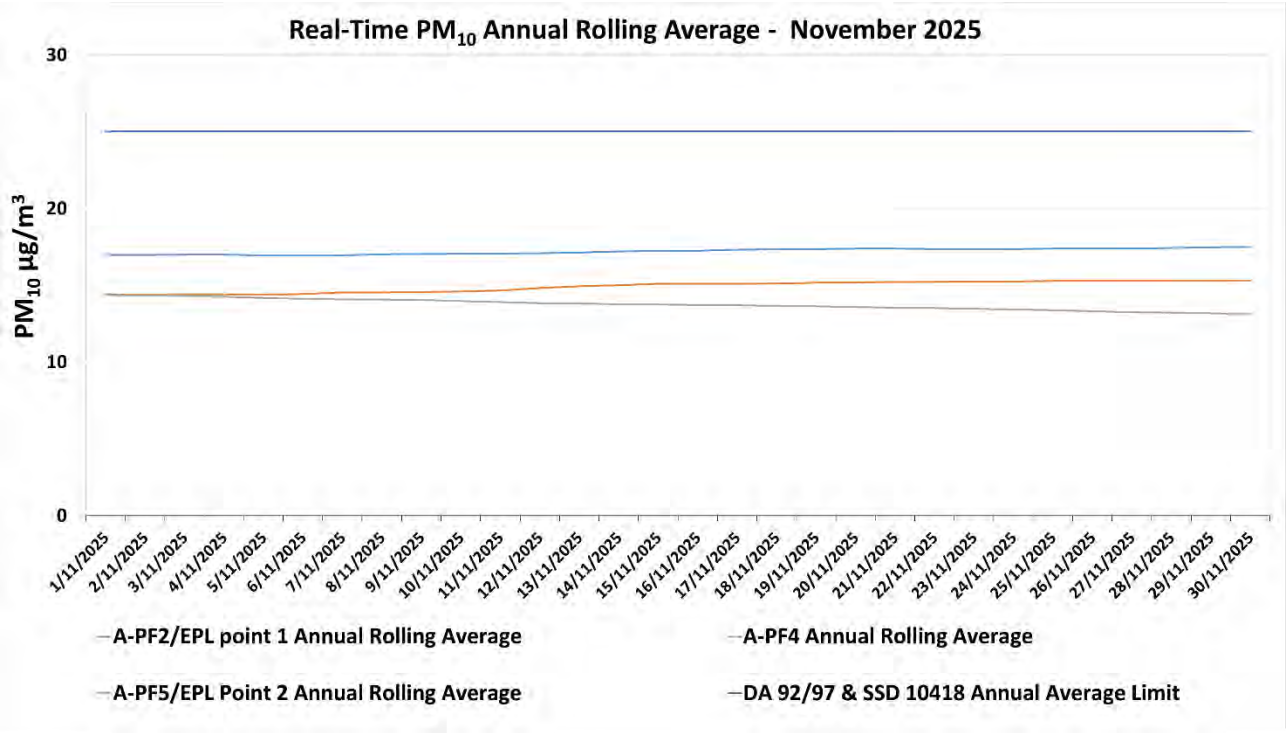

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for November 2025.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – November 2025

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result			
01/11/2025	5.64	5.74	4.83	25
02/11/2025	7.08	7.20	6.24	25
03/11/2025	9.53	9.79	8.11	25
04/11/2025	6.33	4.97	3.77	25
05/11/2025	4.49	2.99	2.27	25
06/11/2025	4.47	4.61	2.63	25
07/11/2025	5.44	6.49	3.92	25
08/11/2025	10.34	9.08	6.58	25
09/11/2025	8.12	6.71	4.91	25
10/11/2025	5.43	5.48	4.41	25
11/11/2025	6.17	6.14	3.12	25
12/11/2025	5.21	6.83	2.59	25
13/11/2025	7.16	8.47	4.42	25
14/11/2025	6.94	7.23	3.85	25
15/11/2025	10.86	11.87	6.47	25
16/11/2025	6.16	5.60	3.81	25
17/11/2025	6.07	3.41	2.39	25
18/11/2025	4.87	4.46	2.47	25
19/11/2025	4.44	4.87	2.60	25
20/11/2025	5.14	5.25	2.85	25
21/11/2025	-	6.99	4.37	25
22/11/2025	5.47	-	4.27	25
23/11/2025	7.46	-	5.46	25
24/11/2025	6.36	-	6.01	25
25/11/2025	5.43	5.69	4.17	25
26/11/2025	4.75	4.33	2.86	25
27/11/2025	5.56	5.10	3.11	25
28/11/2025	7.83	-	4.26	25
29/11/2025	6.41	4.57	3.11	25
30/11/2025	6.02	4.92	3.18	25

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
[1]Criteria of 25µg/m³ does not apply to A-PF 4 as it is not representative of a residence on privately owned land.

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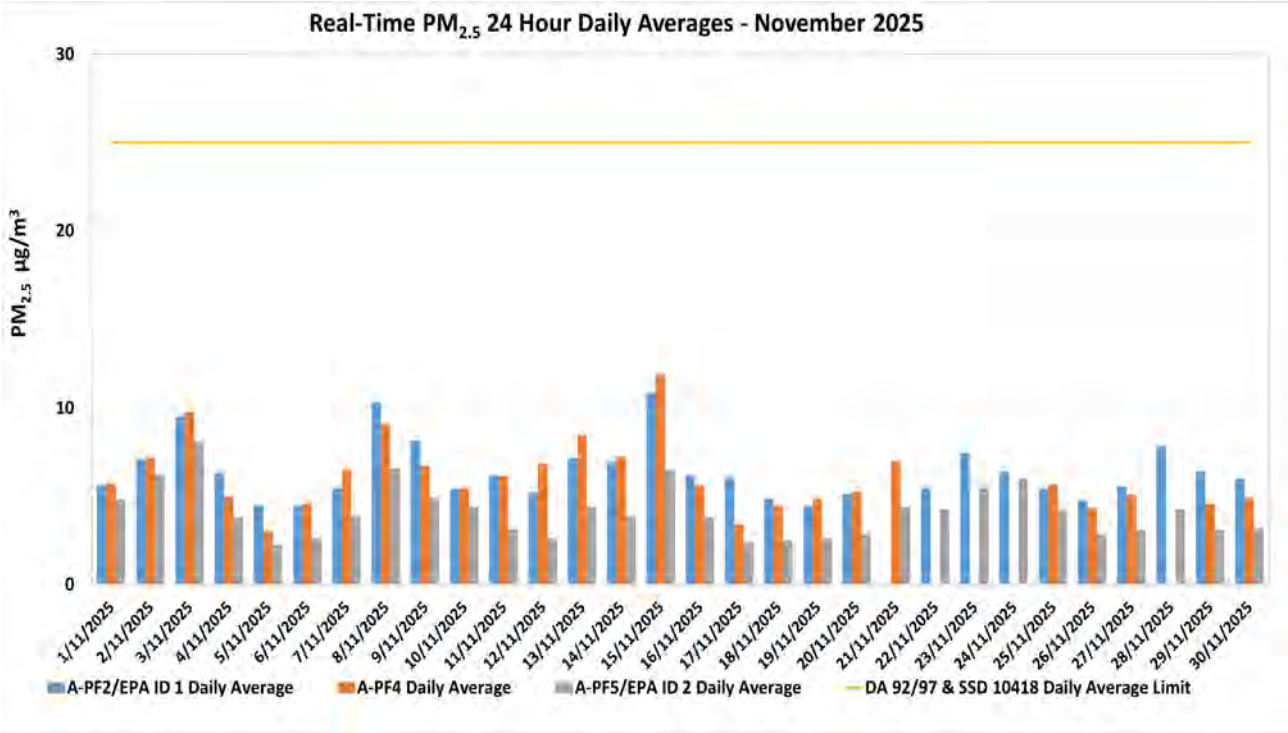

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for November 2025.

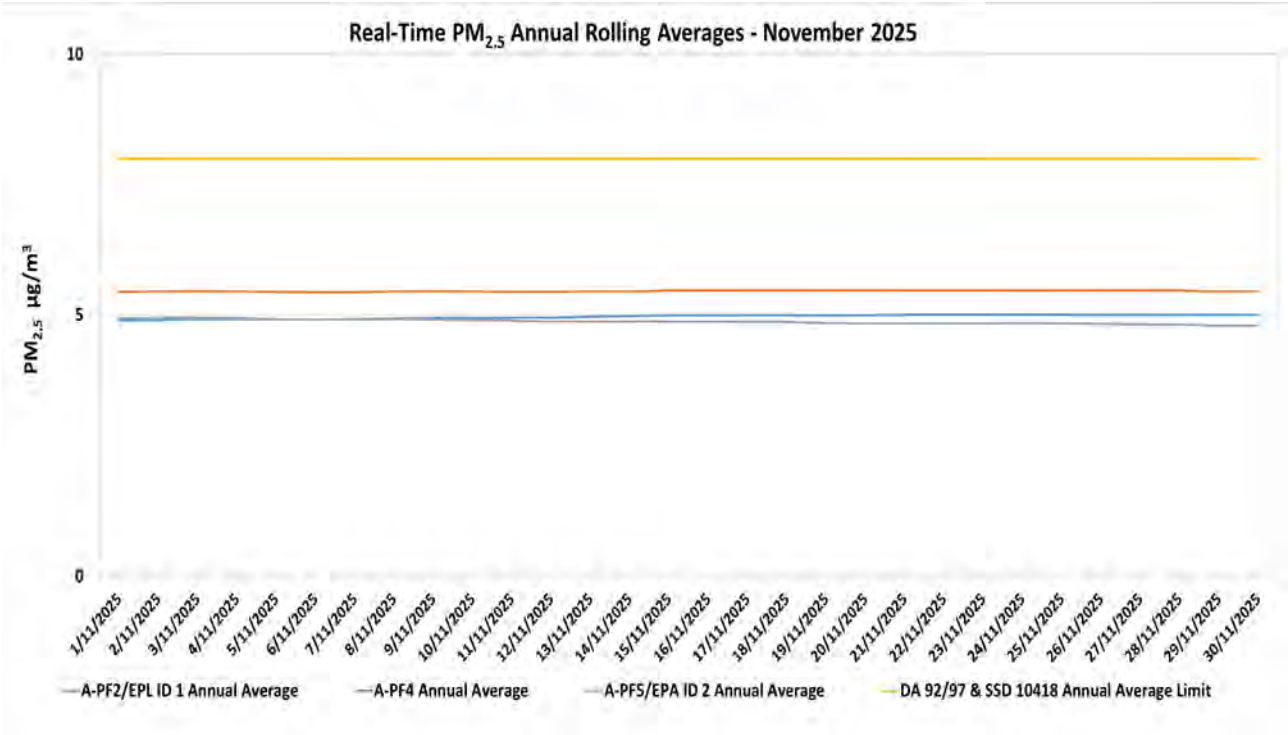

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for November 2025.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of days throughout the reporting period when adverse conditions were triggered leading to a shutdown event, in accordance with EPL Condition O3.4.

Table 7-1 Dust Shutdowns MPO- November 2025

Date	Muswellbrook NW 24- hour rolling PM10 Average (µg/m^3)	Wind Direction (˚)
17/11/2025	44.5	283
28/11/2025	50	307
28/11/2025	59.3	267

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event. A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or

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at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

This is the third consecutive sampling event where EC levels have been above trigger levels for W6A and W15. As W1 (Upstream Reference Site) has also been above the criteria for the same period, in accordance with the MPO Water Management Plan there is no trigger of the response protocol or further investigation required.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 26 November 2025

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	**8.3**	**690**	382	11
W2	**	**	**	**
W6A	8.2	**811**	460	15
W15	8.1	**965**	603	23
W17	8.0	**917**	554	16
Sandy Creek				
W11 (Upstream Reference Site)	**8.3**	**8080**	4770	**11**
W12	8.1	5200	2950	7
Muscle Creek				
W4 (Upstream Reference Site)	7.8	2250	1360	**14**
Unnamed Tributaries				
W3	7.9	872	509	**32**
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	8.5	9350	5620	14

*Note: Results in **bold** indicate exceedances of adopted assessment criteria of less than three consecutive events.*
**Dry or insufficient water to sample.*
*** No access due to track conditions.*

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

9.2 Assessment Criteria

An investigation is triggered if elevated measurements occur for three consecutive sampling events in accordance MPO Water Management Plan (MACH Energy, 2022).

An investigation was triggered (AGE, 2023) examining the cause of elevated EC values in the alluvial zone, specifically MPBH2. The data strongly suggests that the cause of the increase in EC is persistent above-average stage in the adjacent Hunter River, caused by above-average rainfall since 2020, which is causing a rise in groundwater levels in similar alluvial bores. Further Investigations have been undertaken during 2025, and in accordance with recommendations from Specialist Groundwater Consultants AGE, the *MPO Water Management Plan* (MACH Energy, 2025) has been revised to new recommended trigger levels for MPBH2. The revised MPO Water Management Plan was submitted to the Department of Planning Housing and Infrastructure in August 2025. Based on the previous assessment it is expected that EC levels of MPBH2 will continue to be above the older trigger level, this will not be reported each monitoring period as the investigation and recommendations have been completed as required.

9.3 Results

Water level results for the groundwater bores are presented in **Table 8-1**. The quarterly pH and EC results are presented in **Table 8-2** and **Table 8-3**, respectively.

Table 8-1 - MPO Quarterly Groundwater Water Level Results

Monitoring Location/ ID	Trigger	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	May 2025 Water Level (DTW)	Triggered (Yes/ No)
WRA1L	-	1.02	1.77	2.73	-
WRA1U	-	*	*	*	-
WRA3L-R	-	*	*	*	-
WRA3U-R	-	*	*	*	-
WRA5L-R	-	*	^	*	-
WRA5U-R	-	*	^	*	-
WRA6L	-	0.52	0.15	0.03	-
WRA6U	-	1.14	0.82	0.75	-
MPBH1	10.70	9.52	7.01	9.06	No
MPBH2	13.59	10.74	11.03	11.81	No
MPBH3b	13.04	10.89	10.56	11.68	No

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Monitoring Location/ ID	Trigger	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	May 2025 Water Level (DTW)	Triggered (Yes/ No)
MPBH4	-	11.21	11	11.70	-
MPBH5	-	*	*	*	-
MPBH1-C	-	9.383	6.863	^	-
MPBH1-HR	-	45.69	34.73	^	-
MPBH2-C	-	10.733	11.063	11.83	-
MPBH2-HR	-	14.246	28.916	11.87	-
MPBH4-C	-	9.923	9.503	10.41	-
MPBH4-HR	-	50.045	49.605	^	-
MPBH5-C	-	10.659	12.179	^	-
MPBH5-HR	-	10.3	11.11	^	-
MPBH6	-	8.601	8.391	8.85	-
MPBH6-C	-	9.998	9.738	10.18	-
MPBH6-HR	-	9.795	8.815	8.88	-
MPBH7	10.10	4.827	4.327	5.42	No
MPBH7-C	-	17.045	17.415	17.62	-
3500C500L	-	27.54	27.11	26.42	-
3500C500S	-	24.51	25.44	25.70	-
4500F000	-	22.10	22.09	^	-
5000D000-R	-	139.14	138.92	138.63	-
5500D000	-	139.60	134.92	134.32	-
6000C000L-R	-	*	*	*	-
6000C000U-R	-	*	*	*	-
6500F500L	-	50.73	52.16	52.10	-
6500F500M	-	51.21	52.61	52.77	-
6500F500U	-	28.03	26.56	31.74	-
6500F625	-	14.04	14.45	16.18	-
Melody	-	10.13	10	13.14	-
7500F000	-	36.18	36.51	36.55	-
GDE Bore Shallow	-	^	*	*	-

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Monitoring Location/ ID	Trigger	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	May 2025 Water Level (DTW)	Triggered (Yes/ No)
GDE Bore Deep	-	^	^	10.92	-
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment criterion for changes in standing water level from the previous measurement.
* Dry/insufficient water to sample.
^Unsafe access.
'-' indicates no trigger level

Table 8-2 - MPO Quarterly Groundwater pH Results

Monitoring Location/ ID	pH Trigger Range	November 2025 pH	August 2025 pH	May 2025 pH	Triggered (Yes/No)
WRA1L	6 - 8.5	7.2	7.4	7.1	No
WRA1U		*	*	*	No
WRA3L-R		7.4	7.5	7.5	No
WRA3U-R		*	*	*	No
WRA5L-R		7.2	^	7.4	No
WRA5U-R		7.5	^	7.5	No
WRA6L		7.0	7.5	7	No
WRA6U		6.8	6.8	6.9	No
MPBH1		7.1	7.3	6.9	No
MPBH2		6.8	6.7	6.8	No
MPBH3b		7.7	7.4	7.7	No
MPBH4		6.9	6.9	6.9	No
MPBH5		*	*	*	No
MPBH1-C	-	8.7	7.2	^	-
MPBH1-HR	-	7.7	7.6	^	-
MPBH2-C	-	7.9	8.1	7.4	-
MPBH2-HR	-	7.0	7.5	7.7	-
MPBH4-C	-	8.0	7.4	8	-
MPBH4-HR	-	7.4	7.4	^	-
MPBH5-C	-	11.0	11.1	^	-
MPBH5-HR	-	7.5	7.6	^	-
MPBH6	-	7.0	7	7	-
MPBH6-C	-	7.1	7.2	7.2	-
MPBH6-HR	-	7.1	7	7.4	-
MPBH7	-	7.0	7.3	7.1	-
MPBH7-C	-	7.0	7.1	7.1	-

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Monitoring Location/ ID	pH Trigger Range	November 2025 pH	August 2025 pH	May 2025 pH	Triggered (Yes/No)
3500C500L	6 - 8.5	7.4	7.5	7.5	No
3500C500S	-	7.2	7.3	7.3	-
4500F000	6 – 8.5	6.8	6.8	^	No
5000D000-R		7.4	7.5	7.5	No
5500D000		*	*	*	No
6000C000L-R		8.4	8.4	8.4	No
6000C000U-R		*	*	*	No
6500F500L		7.2	7.2	7.2	No
6500F500M		7.2	7.2	7.2	No
6500F500U		6.8	6.8	6.8	No
6500F625		7.0	7.0	7.0	No
Melody		7.1	6.8	6.8	No
7500F000		7.7	7.8	7.8	No
GDE Bore Shallow	-	^	*	*	-
GDE Bore Deep	-	^	6.8	6.8	-
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

*Results in **bold** indicate that the pH values recorded are outside the baseline range (20th – 80th percentile).*
** Dry/insufficient water to sample.*
^Unsafe access.
'-' indicates no trigger level

Table 8-3 - MPO Quarterly Groundwater EC Results

Monitoring Location/ ID	Maximum Beneficial Use Trigger	November 2025 EC	August 2025 EC	May 2025 EC	Triggered (Yes/No)
WRA1L	7800	2940	2990	3120	No
WRA1U	-	*	*	*	-
WRA3L-R	22000	8110	7810	7500	-
WRA3U-R	22000	*	*	*	-
WRA5L-R	7800	5290	^	5070	-
WRA5U-R	7800	6220	^	5980	-
WRA6L	7800	5580	5540	6670	No
WRA6U	22000	7770	7760	8430	No
MPBH1	800	658	576	604	No
MPBH2	930	**1038**	**1083**	**1222**	**Yes[1]**
MPBH3b	7800	4500	4480	5280	No

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Monitoring Location/ ID	Maximum Beneficial Use Trigger	November 2025 EC	August 2025 EC	May 2025 EC	Triggered (Yes/No)
MPBH4	7800	5510	5470	5290	No
MPBH5	-	*	*	*	-
MPBH1-C	-	1596	612	^	-
MPBH1-HR	-	1715	1626	^	-
MPBH2-C	-	1198	1223	1363	-
MPBH2-HR	-	1159	1424	1113	-
MPBH4-C	-	5570	4870	4820	-
MPBH4-HR	-	5570	5240	^	-
MPBH5-C	-	728	831	^	-
MPBH5-HR	-	827	1149	^	-
MPBH6	-	873	989	1274	-
MPBH6-C	-	2500	2650	3770	-
MPBH6-HR	-	1418	1543	6150	-
MPBH7	-	9940	6690	7630	-
MPBH7-C	-	10430	10290	10220	-
3500C500L	7800	3820	3830	3820	No
3500C500S	-	5710	5710	5610	-
4500F000	22000	7900	8620	*	No
5000D000-R	800	5210	5020	4500	Yes
5500D000	7800	*	*	*	No
6000C000L-R	7800	4790	4550	4760	No
6000C000U-R	7800	*	*	*	No
6500F500L	7800	2540	2470	2570	No
6500F500M	7800	2520	2770	2670	No
6500F500U	7800	6180	5300	5080	No
6500F625	7800	3040	987	4190	No
Melody	-	2340	914	6280	-
7500F000	7800	6330	6390	6290	No
GDE Bore Shallow	-	*	*	*	-
GDE Bore Deep	-	*	12920	12850	-
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment for EC values
** Dry/insufficient water to sample*
^Unsafe access
'-' indicates no trigger level
[1] See assessment criteria section for further information.

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10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{A1,1min}$ Generated by MPO: Attended Night Monitoring 19 and 20 Nov 2025

Location	Time	MPO Only LA1,1min dB	Criterion dB	Wind Speed m/s Direction °	Criterion Applies	Stability Class	Exceedance dB
N-AT1	1:36am	IA	45	0.9 / 118	Yes	E	No
N-AT2	10:54pm	IA	45	2.6 / 325	Yes	D	No
N-AT3	11:30pm	IA	45	2.4 / 311	Yes	D	No
N-AT4	11:58pm	35	45	1.1 / 146	Yes	E	No
N-AT5	12:19am	35	45	0.8 / 136	Yes	E	No
N-AT6	1:13am	IA	45	0.9 / 151	Yes	E	No
N-AT7	10:11pm	IA	45	2.4 / 316	Yes	E	No
N-AT8	12:45am	43[2] 45 adjusted	49[1]	0.7 / 118	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{Aeq,15min}$ Generated by MPO: Attended Night Monitoring 19 and 20 Nov 2025

Location	Time	MPO Only LA1,1min dB	Criterion dB	Wind Speed m/s Direction °	Criterion Applies	Stability Class	Exceedance dB
N-AT1	1:36am	IA	37[1]	0.9 / 118	Yes	E	No
N-AT2	10:54pm	IA	35	2.6 / 325	Yes	D	No
N-AT3	11:30pm	IA	40	2.4 / 311	Yes	D	No
N-AT4	11:58pm	31	38	1.1 / 146	Yes	E	No
N-AT5	12:19am	31	37[1]	0.8 / 136	Yes	E	No
N-AT6	1:13am	IA	35	0.9 / 151	Yes	E	No
N-AT7	10:11pm	IA	37	2.4 / 316	Yes	E	No
N-AT8	12:45am	39[2] 41 adjusted	43[1]	0.7 / 118	Yes	E	No

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Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 19 and 20 Nov 2025

Location	Time	Measured Mining Only LAeq, period dB1,2,3	Cumulative Noise Criterion LAeq dB	Exceedance dB
N-AT1	1:36am	30	40	No
N-AT2	10:54pm	IA	40	No
N-AT3	11:30pm	IA	40	No
N-AT4	11:58pm	31	40	No
N-AT5	12:19am	31	40	No
N-AT6	1:13am	23	40	No
N-AT7	10:11pm	IA	40	No
N-AT8	12:45am	39[3] 41 adjusted	NA[2]	NA[1]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA- inaudible; and **Bold** results indicate exceedance of criteria.*
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.
[3]- low-frequency adjusted.

11. Blast Monitoring

There were ten (10) blast events (a total of 106 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – November 2025

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
03/11/25	9:17	0.37 mm/s	103.1 DBL	0.44 mm/s	103.4 DBL	Y
04/11/25	9:06	0.24 mm/s	96.8 DBL	0.36 mm/s	105.8 DBL	Y
05/11/25	15:16	0.01 mm/s	98 DBL	0.03 mm/s	102.5 DBL	Y
06/11/25	11:01	0.31 mm/s	95.1 DBL	0.25 mm/s	94.1 DBL	Y
10/11/25	14:08	0.45 mm/s	97.4 DBL	0.73 mm/s	99 DBL	Y
17/11/25	09:15	0.71 mm/s	105.5 DBL	0.82 mm/s	103.2 DBL	Y
21/11/25	10:47	0.81 mm/s	101.4 DBL	0.25 mm/s	100 DBL	Y
21/11/25	14:35	0.28 mm/s	108.5 DBL	0.44 mm/s	108.7 DBL	Y
26/11/25	09:23	0.27 mm/s	92.7 DBL	0.45 mm/s	99.6 DBL	Y
28/11/25	09:25	0.21 mm/s	81.9 DBL	0.22 mm/s	91.4 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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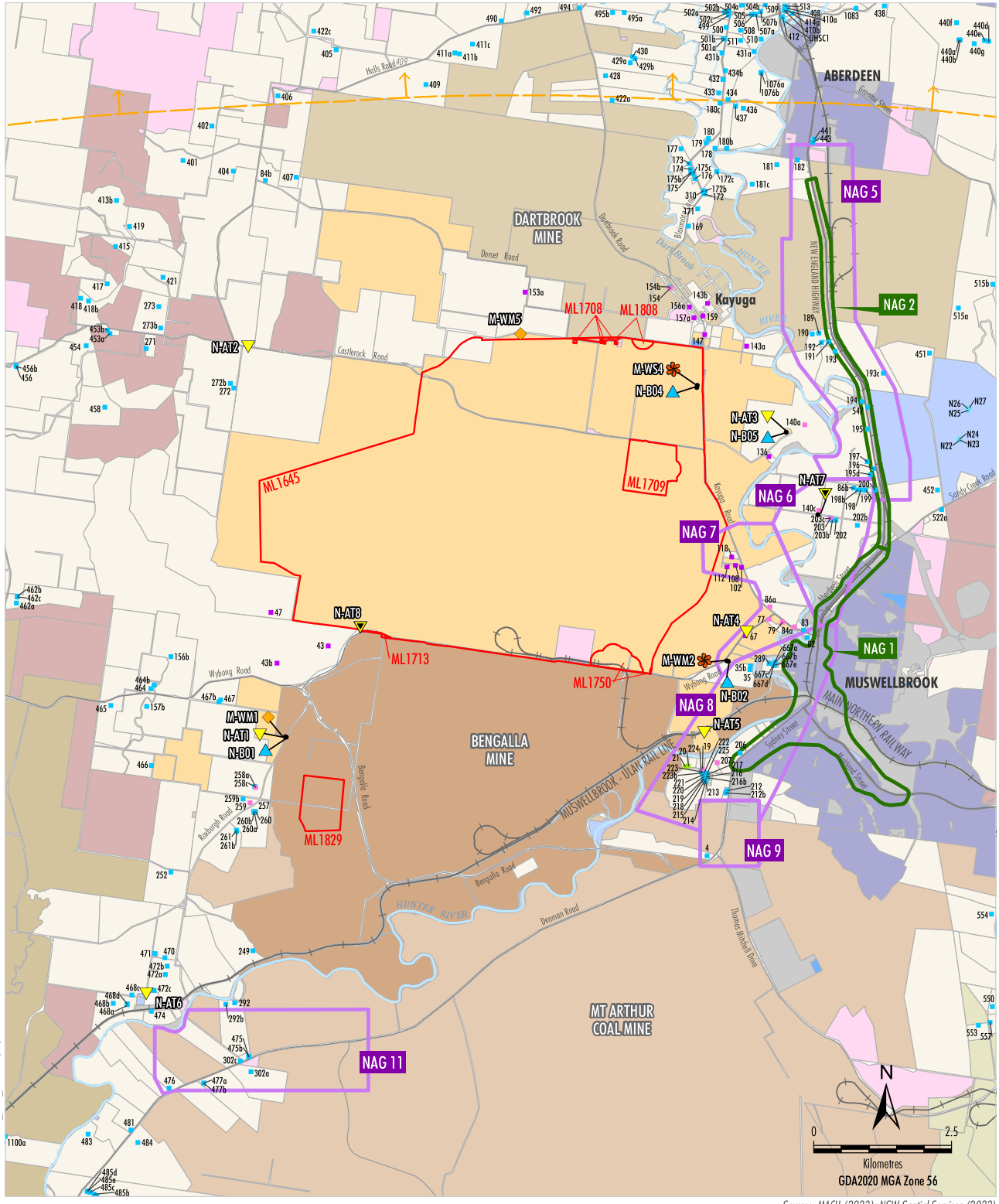


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

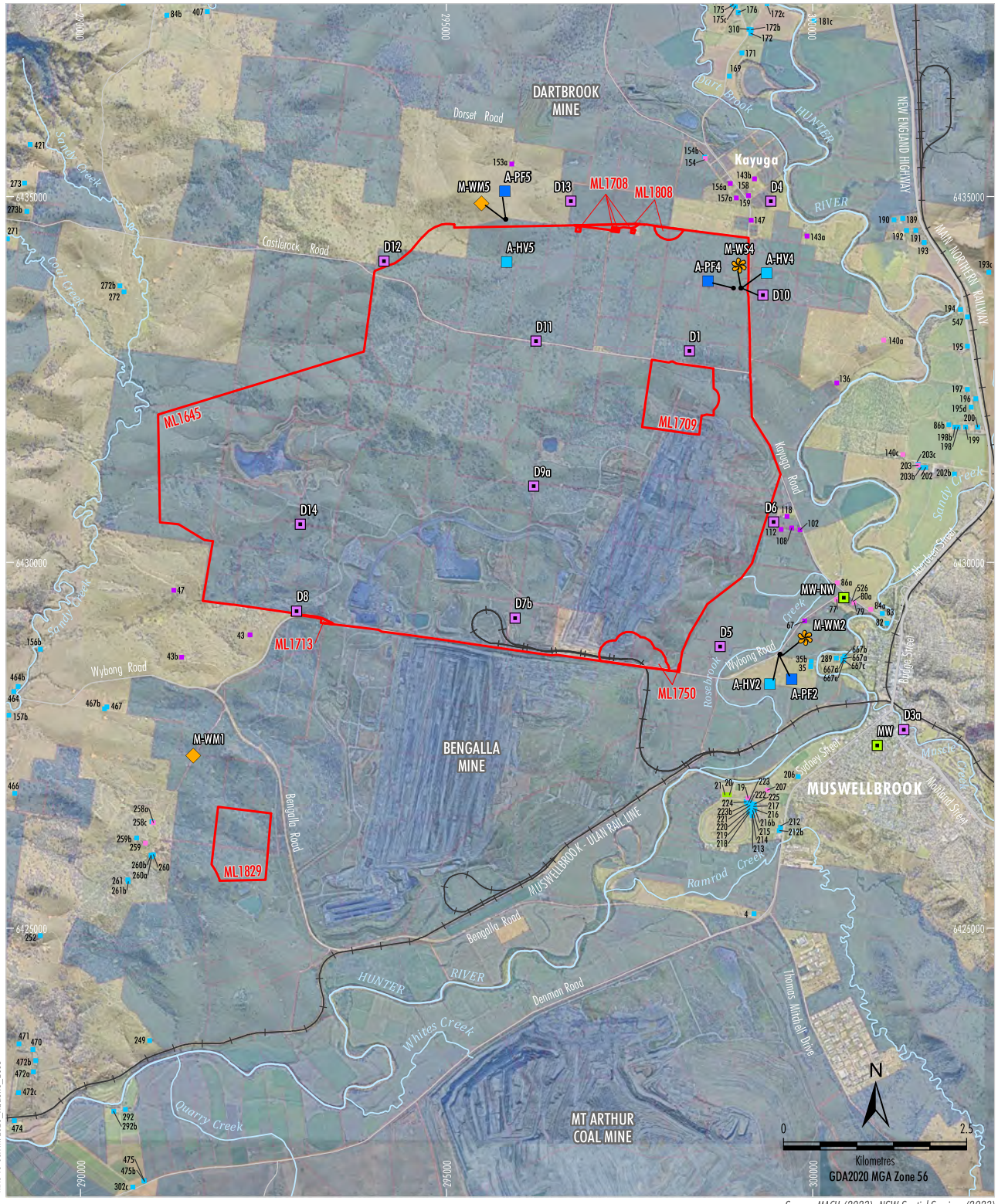
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

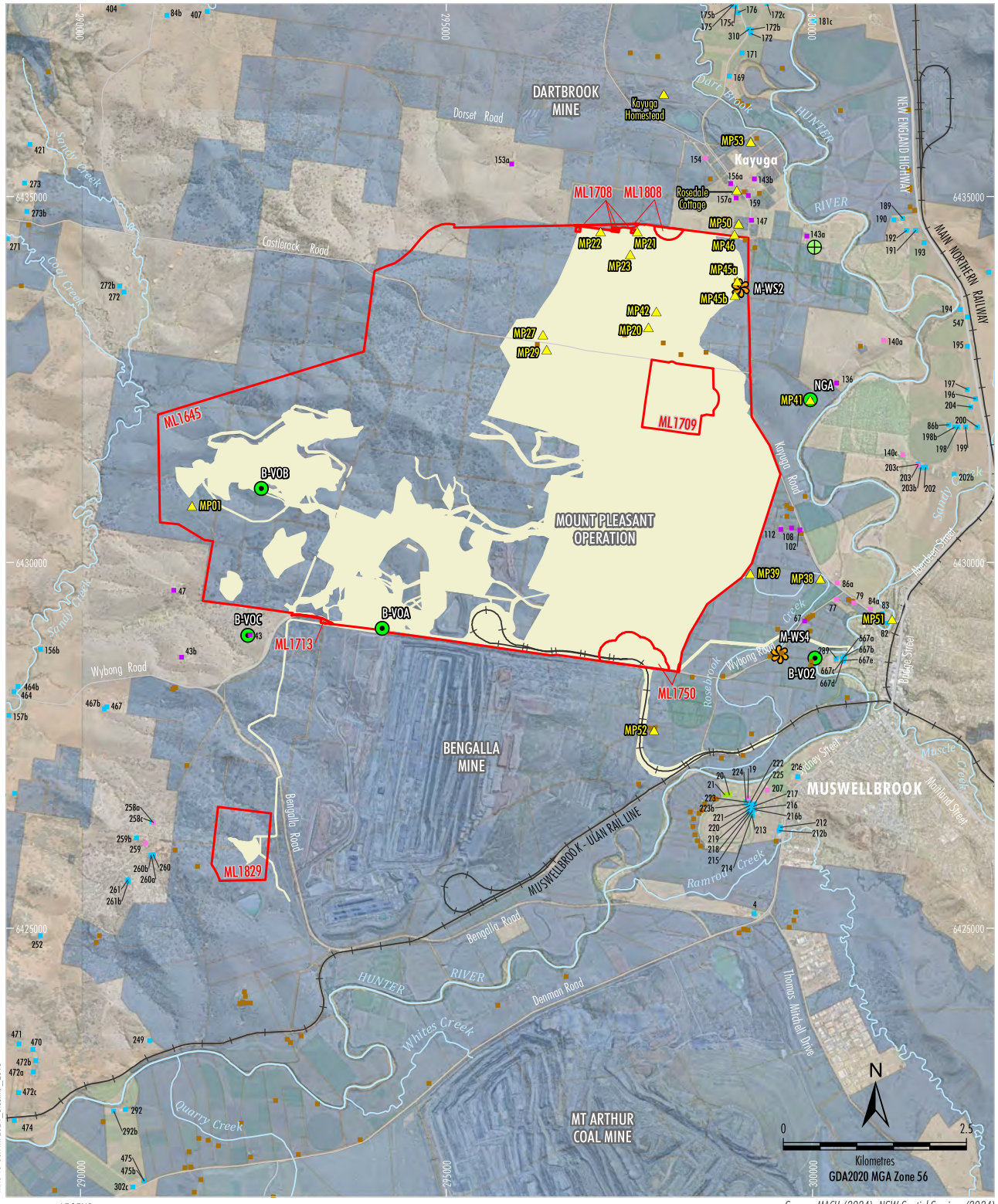
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

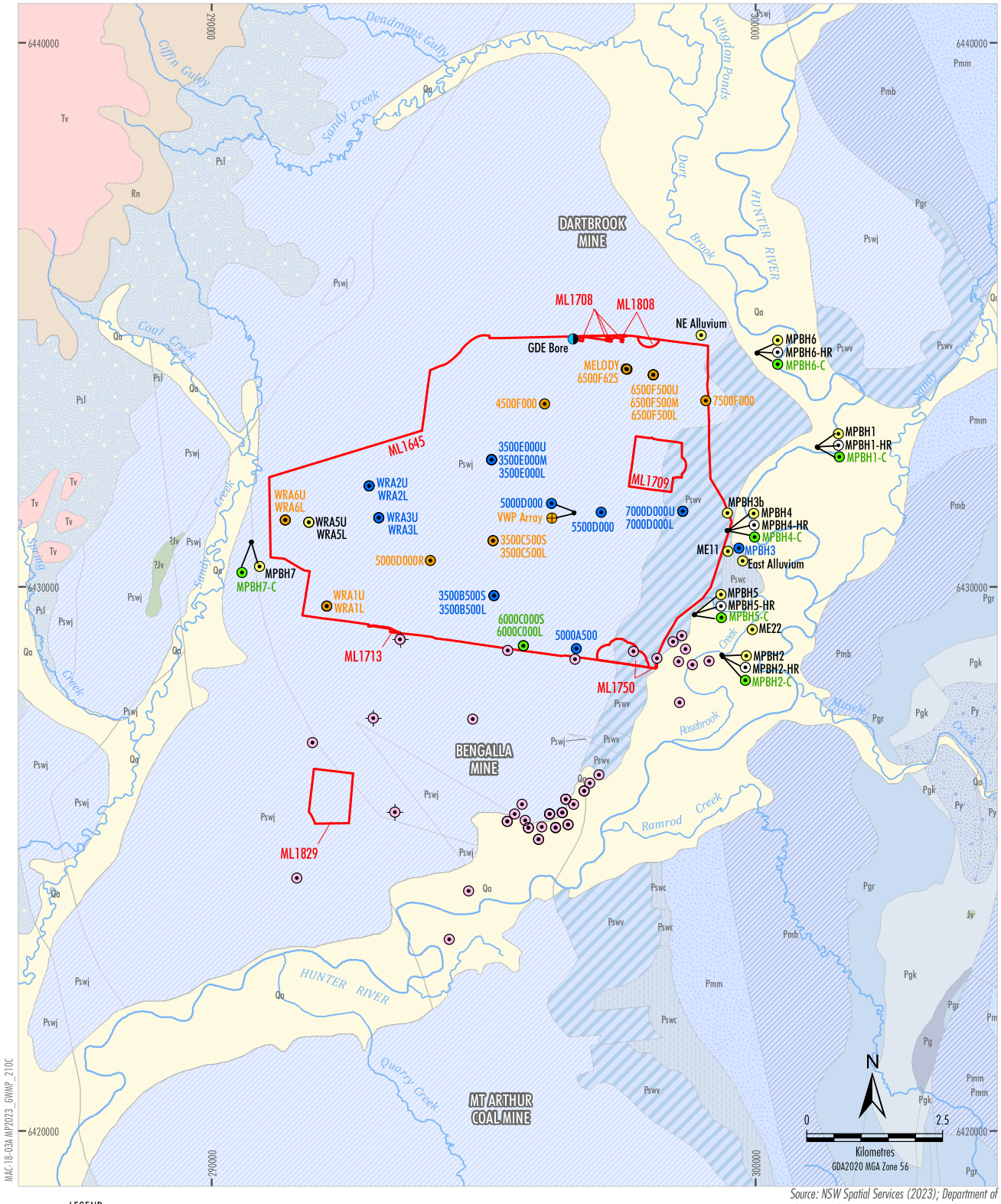
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

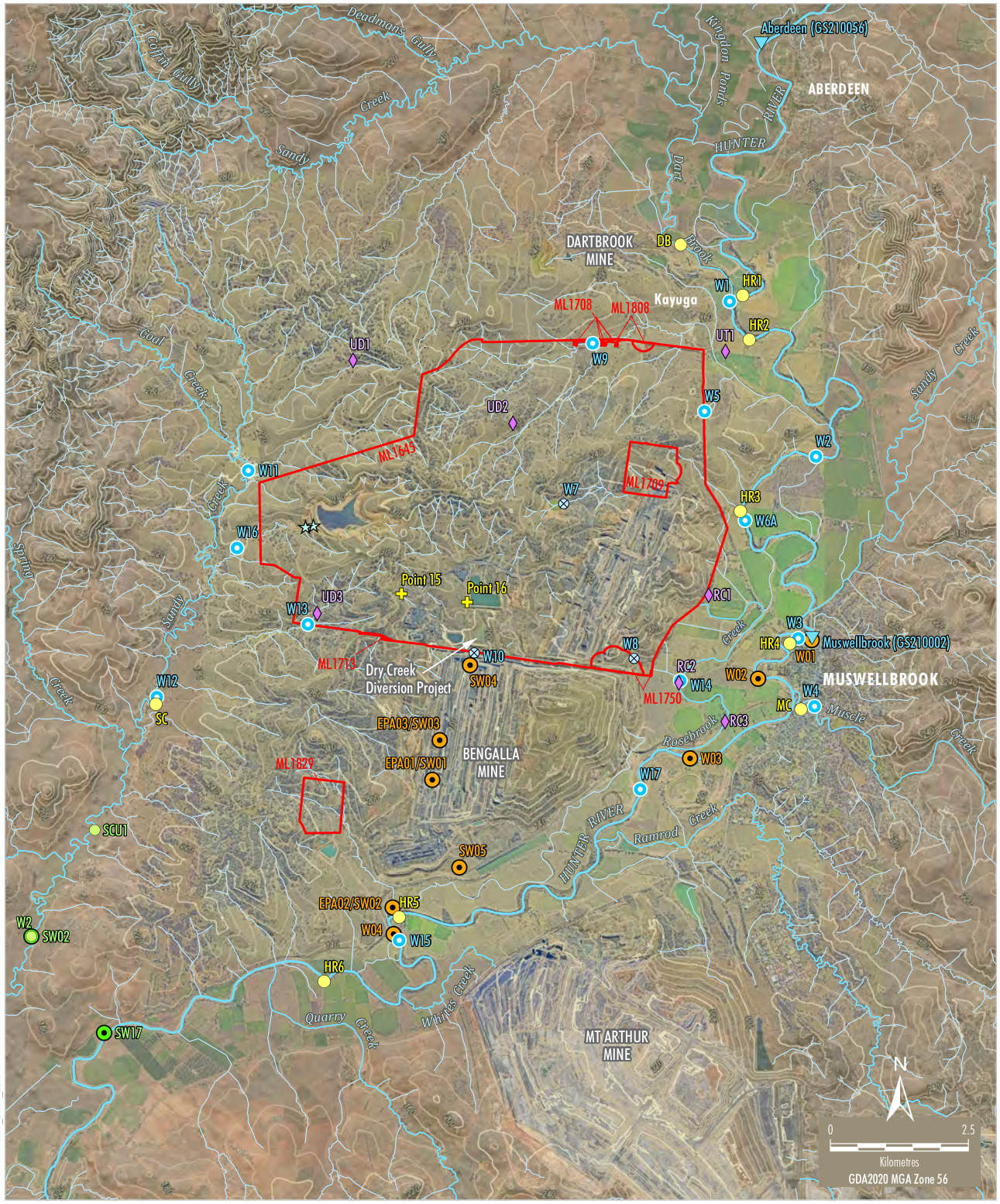
- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

MACHEnergy

MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

December 2025

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 December 2025
Reporting Period End Date	31 December 2025
Date All Data Received	13 January 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout December 2025, there was 21.8mm at M-WS2. M-WS4 had a blockage during the monitoring period, but this has now been rectified.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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robust monitoring practices. This transition from the previous development consent DA 92/97 (which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – December 2025

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	3.9	3.7
D3	2.2	1.5
D4	1.7	1.1
D5a	3.0	2.4
D6	3.8	2.2
D7b***	30.5	**15.8**
D8	16.1	**5.9**
D9a	3.1	3.7
D10	4.3	1.6
D11	1.5	4.0
D12	1.5	1.4
D13	1.9	2.1
D14	1.8	3.7
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*
**** Within the operational area. Not used to assess compliance or to represent residential receivers in the area.*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

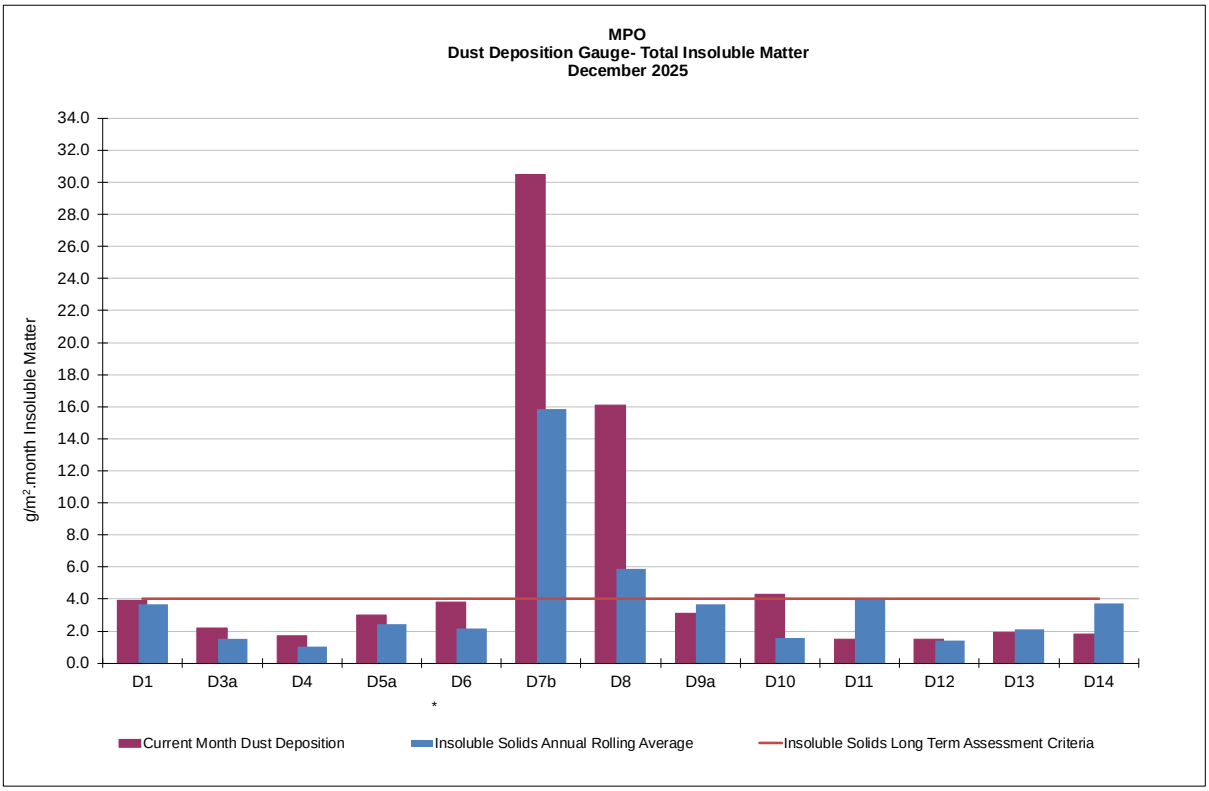

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

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TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – December 2025

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
02/12/2025	-	58.1	36.8	114
08/12/2025	-	98	161	256
14/12/2025	-	114	33.3	77.4
20/12/2025	-	66.1	76.1	64.1
26/12/2025	-	68.9	49.9	34.1
Monthly Mean	-	81	71.4	109.1
Annual Rolling Average	90	59	52	50

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages to the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

Table 6-1: MPO Continuous Particulate PM_{10} Data – December 2025

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
01/12/2025	32.81	-	7.76	50
02/12/2025	21.18	12.40	6.86	50
03/12/2025	17.41	21.85	6.85	50
04/12/2025	23.90	28.85	6.99	50
05/12/2025	23.68	19.79	12.95	50
06/12/2025	28.56	21.96	15.81	50
07/12/2025	35.05	22.53	16.64	50
08/12/2025	27.13	35.88	30.91	50
09/12/2025	41.31	58.92	44.78	50
10/12/2025	35.22	48.60	45.99	50

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Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
11/12/2025	25.43	36.59	35.95	50
12/12/2025	17.11	24.83	20.36	50
13/12/2025	15.27	16.23	15.12	50
14/12/2025	24.01	14.36	11.27	50
15/12/2025	36.11	27.68	30.07	50
16/12/2025	23.06	36.68	48.75	50
17/12/2025	18.77	34.45	37.98	50
18/12/2025	24.58	33.63	33.29	50
19/12/2025	30.91	23.07	17.07	50
20/12/2025	23.07	19.82	17.21	50
21/12/2025	30.26	30.38	28.57	50
22/12/2025	26.90	14.54	11.34	50
23/12/2025	18.36	15.99	14.31	50
24/12/2025	23.75	20.52	17.99	50
25/12/2025	21.41	20.45	15.79	50
26/12/2025	17.26	17.79	13.70	50
27/12/2025	13.31	10.92	13.78	50
28/12/2025	15.96	11.93	14.61	50
29/12/2025	17.77	14.44	17.89	50
30/12/2025	18.37	15.93	24.33	50
31/12/2025	25.97	21.67	27.57	50

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
[1] Criteria of 50µg/m^3 does not apply to A-PF4 as it is not representative of a residence on privately owned land.

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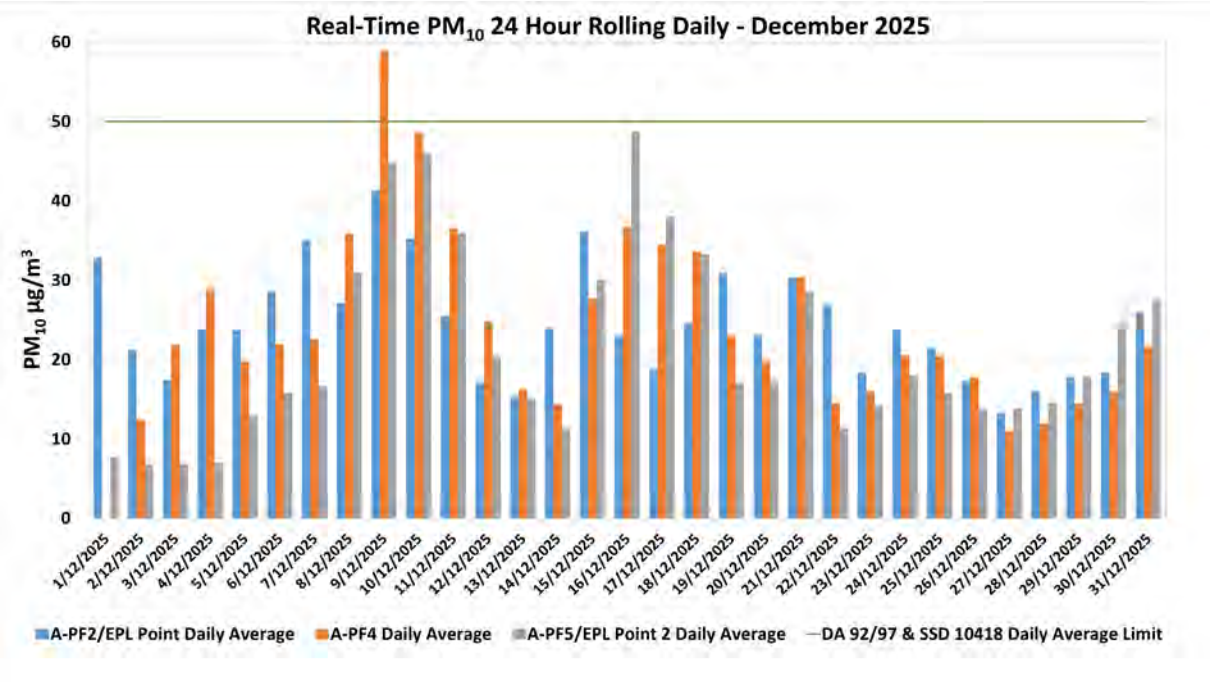

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for December 2025.

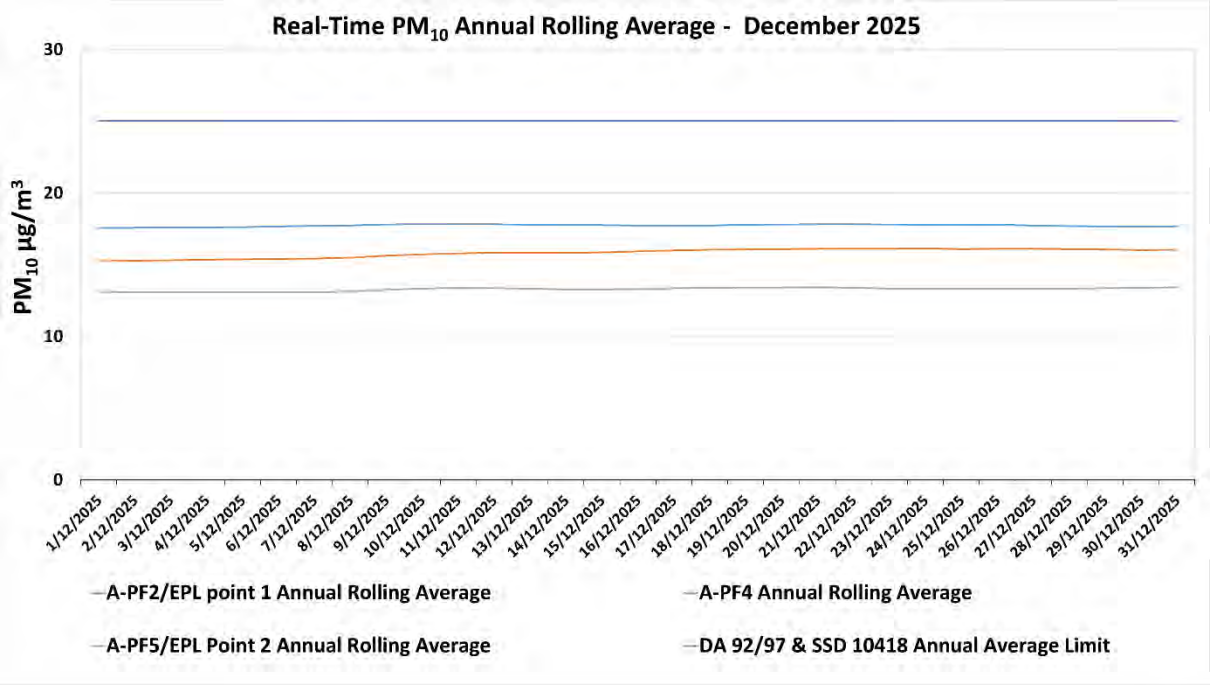

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for December 2025.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – December 2025

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result			
01/12/2025	6.92	-	3.58	25
02/12/2025	5.03	4.44	3.02	25
03/12/2025	4.60	5.13	3.35	25
04/12/2025	4.97	5.57	3.10	25
05/12/2025	5.39	5.09	4.23	25
06/12/2025	7.13	6.68	5.63	25
07/12/2025	9.10	7.70	6.36	25
08/12/2025	9.69	11.27	9.93	25
09/12/2025	16.31	17.35	14.83	25
10/12/2025	14.12	14.96	14.07	25
11/12/2025	10.97	12.37	12.01	25
12/12/2025	6.28	7.20	6.98	25
13/12/2025	4.79	5.01	5.19	25
14/12/2025	5.73	5.03	4.37	25
15/12/2025	8.61	8.29	7.89	25
16/12/2025	8.27	9.70	10.18	25
17/12/2025	6.02	7.33	7.77	25
18/12/2025	6.34	7.08	7.20	25
19/12/2025	6.75	6.23	5.24	25
20/12/2025	6.56	6.31	5.55	25
21/12/2025	8.25	8.47	7.72	25
22/12/2025	6.51	5.73	4.80	25
23/12/2025	5.34	5.32	4.84	25
24/12/2025	7.04	6.94	6.18	25
25/12/2025	7.12	7.29	6.29	25
26/12/2025	6.25	6.45	5.57	25
27/12/2025	4.52	4.36	4.57	25
28/12/2025	4.74	4.43	4.57	25
29/12/2025	5.12	4.97	5.26	25
30/12/2025	5.08	4.96	5.69	25
31/12/2025	7.60	7.39	7.51	25

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
[1]Criteria of 25µg/m³ does not apply to A-PF 4 as it is not representative of a residence on privately owned land.

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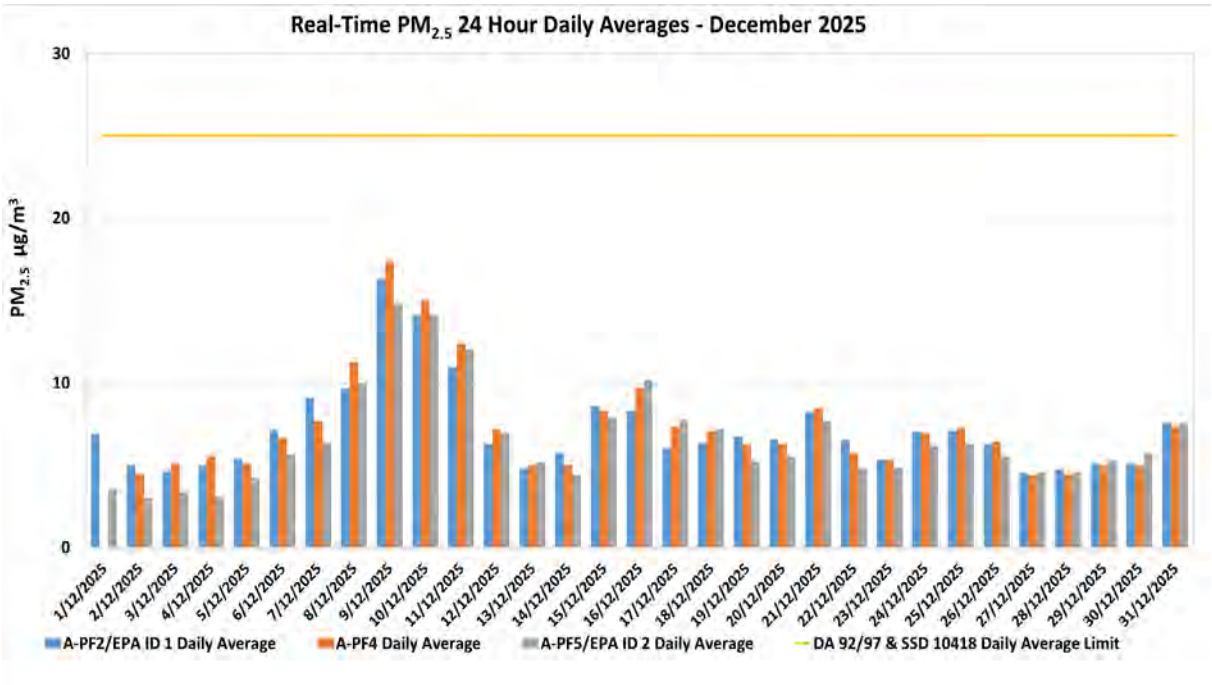

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for December 2025.

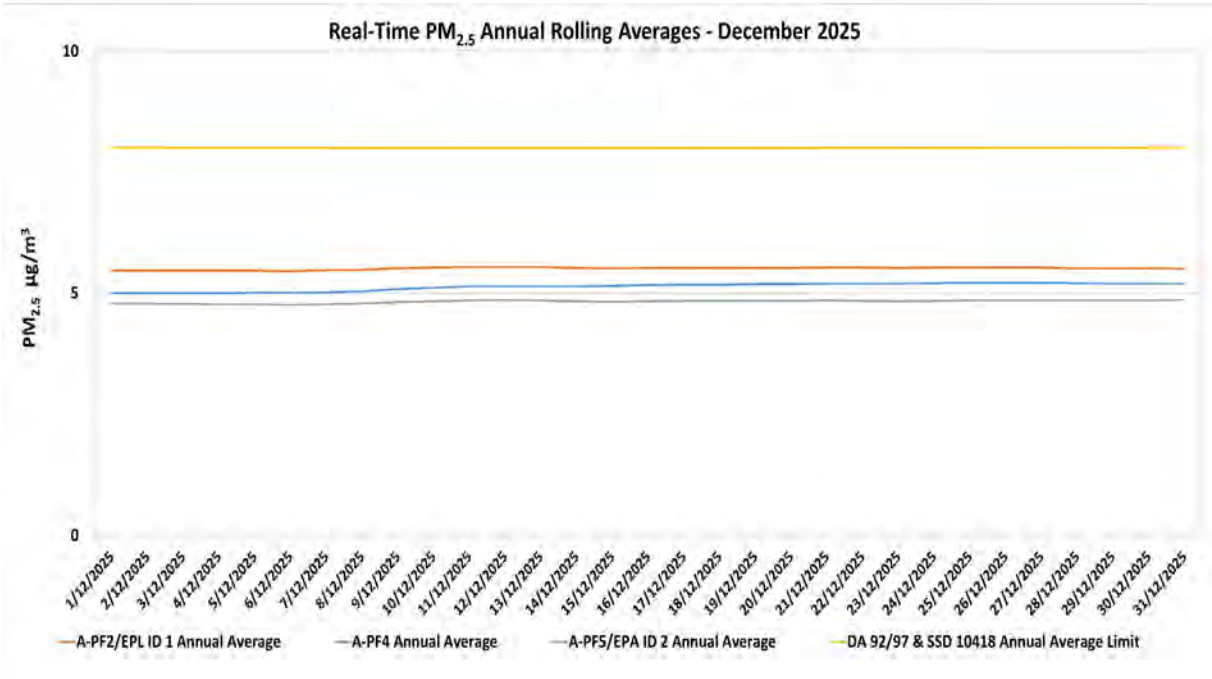

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for December 2025.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event. A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

This is the third consecutive sampling event where EC levels have been above trigger levels for W6A and W15. As W1 (Upstream Reference Site) has also been above the criteria for

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the same period, in accordance with the MPO Water Management Plan there is no trigger of the response protocol or further investigation required.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 30 December 2025

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.8	496	286	10
W2	7.7	**579**	316	12
W6A	7.9	**562**	320	11
W15	**8.3**	**706**	390	22
W17	**	**	**	**
Sandy Creek				
W11 (Upstream Reference Site)	8.0	4020	2230	9
W12	8.0	4730	2570	11
Muscle Creek				
W4 (Upstream Reference Site)	7.8	**2560**	1530	**14**
Unnamed Tributaries				
W3	7.9	620	344	19
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	*	*	*	*

*Note: Results in **bold** indicate exceedances of adopted assessment criteria of less than three consecutive events.*
**Dry or insufficient water to sample.*
*** No access due to track conditions.*

9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

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10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 4 and 5 Dec 2025

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:27am	IA	45	0.8 / 127	Yes	F	No
N-AT2	10:42pm	IA	45	2.6 / 317	Yes	D	No
N-AT3	11:18pm	IA	45	2.4 / 311	Yes	D	No
N-AT4	11:44pm	40	45	0.3 / 067	Yes	F	No
N-AT5	12:06am	38	45	0.5 / 041	Yes	F	No
N-AT6	1:02am	IA	45	0.7 / 198	Yes	F	No
N-AT7	10:00pm	IA	45	2.5 / 308	Yes	D	No
N-AT8	12:33am	45	49	0.7 / 148	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 4 and 5 Dec 2025

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:27am	IA	37	0.8 / 127	Yes	F	No
N-AT2	10:42pm	IA	35	2.6 / 317	Yes	D	No
N-AT3	11:18pm	IA	40	2.4 / 311	Yes	D	No
N-AT4	11:44pm	36	38	0.3 / 067	Yes	F	No
N-AT5	12:06am	35	37	0.5 / 041	Yes	F	No
N-AT6	1:02am	IA	35	0.7 / 198	Yes	F	No
N-AT7	10:00pm	IA	37	2.5 / 308	Yes	D	No
N-AT8	12:33am	39	43	0.7 / 148	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 4 and 5 Dec 2025

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:27am	IA	40	No
N-AT2	10:42pm	IA	40	No
N-AT3	11:18pm	IA	40	No
N-AT4	11:44pm	36	40	No
N-AT5	12:06am	35	40	No
N-AT6	1:02am	29	40	No
N-AT7	10:00pm	IA	40	No
N-AT8	12:33am	39	NA[2]	NA[1]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA- inaudible; and **Bold** results indicate exceedance of criteria.*
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

11. Blast Monitoring

There were ten (10) blast events (a total of 106 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – December 2025

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
02/12/25	12:19	1.28 mm/s	101.3 DBL	1.4 mm/s	103.9 DBL	Y
03/12/25	15:02	0.05 mm/s	99.6 DBL	0.07 mm/s	91.7 DBL	Y
08/12/25	16:26	0.610 mm/s	99.9 DBL	0.320 mm/s	101 DBL	Y
10/12/25	10:08	0.270 mm/s	97.9 DBL	0.290 mm/s	106.4 DBL	Y
12/12/25	13:58	0.580 mm/s	95.2 DBL	0.250 mm/s	98.2 DBL	Y
15/12/25	16:43	0.720 mm/s	99.1 DBL	0.850 mm/s	97.3 DBL	Y
20/12/25	16:16	0.630 mm/s	91.8 DBL	0.260 mm/s	97.3 DBL	Y
22/12/25	10:52	0.570 mm/s	89 DBL	0.650 mm/s	94.4 DBL	Y
23/12/25	13:36	0.590 mm/s	105.6 DBL	0.620 mm/s	110.6 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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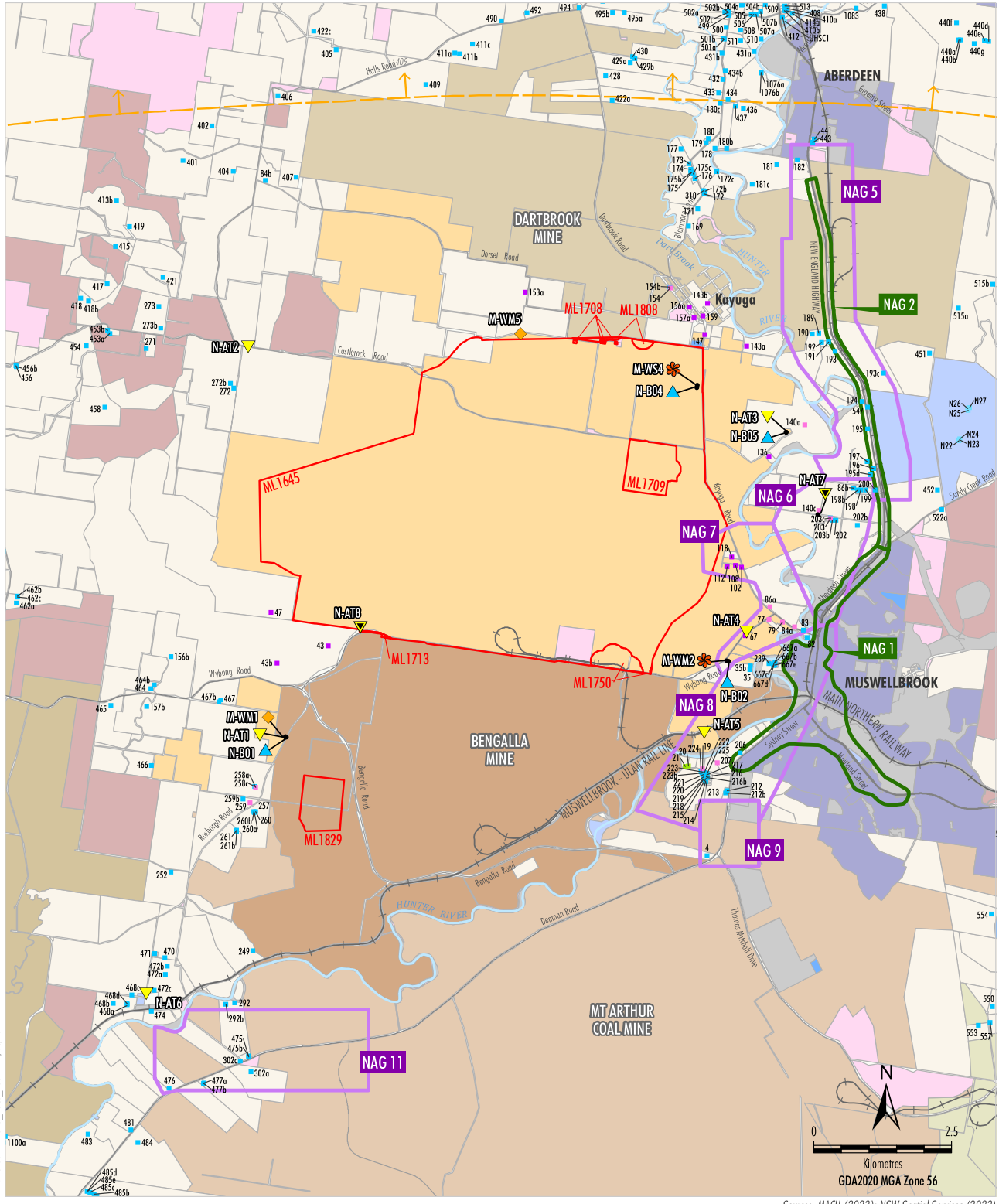


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

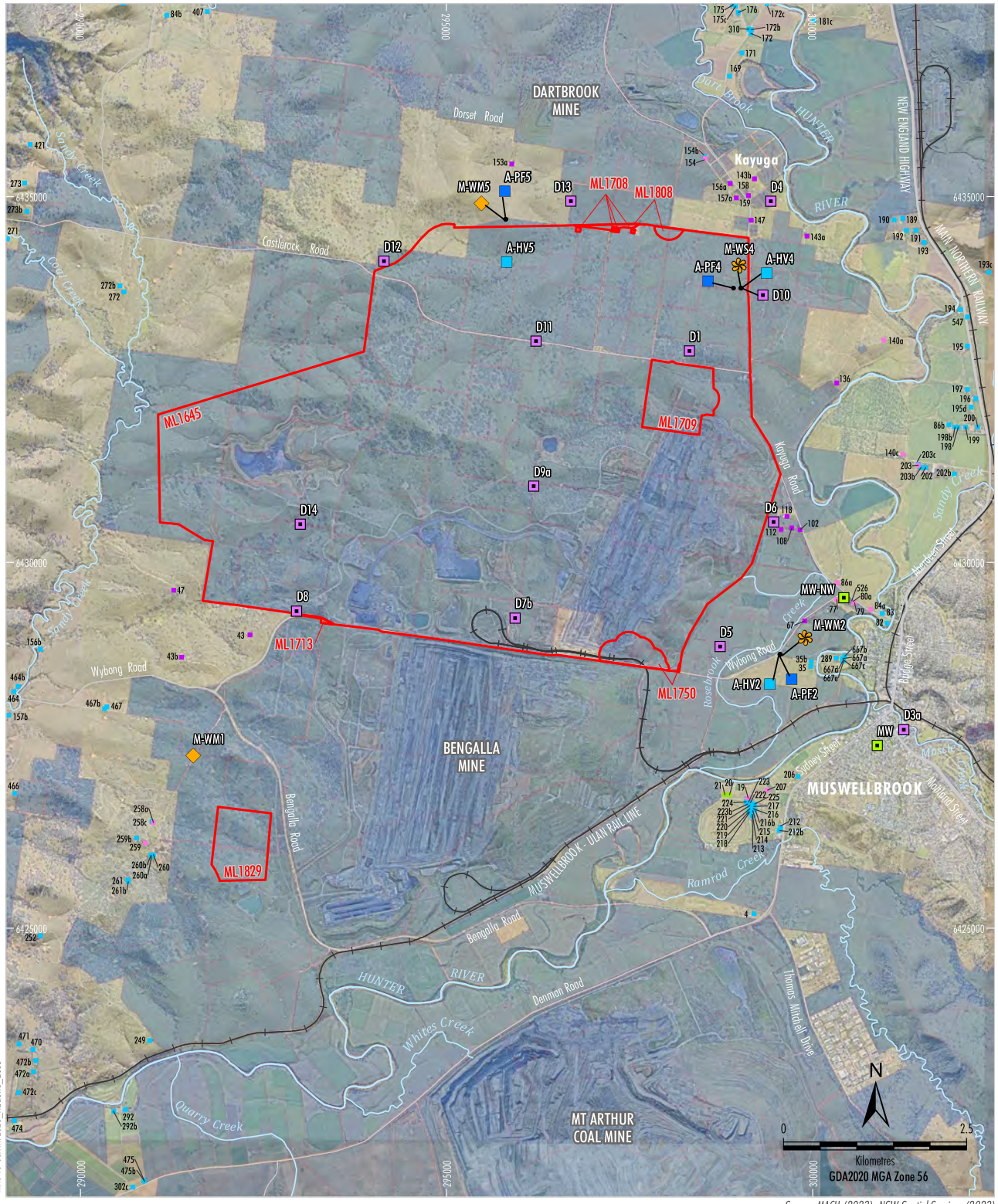
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

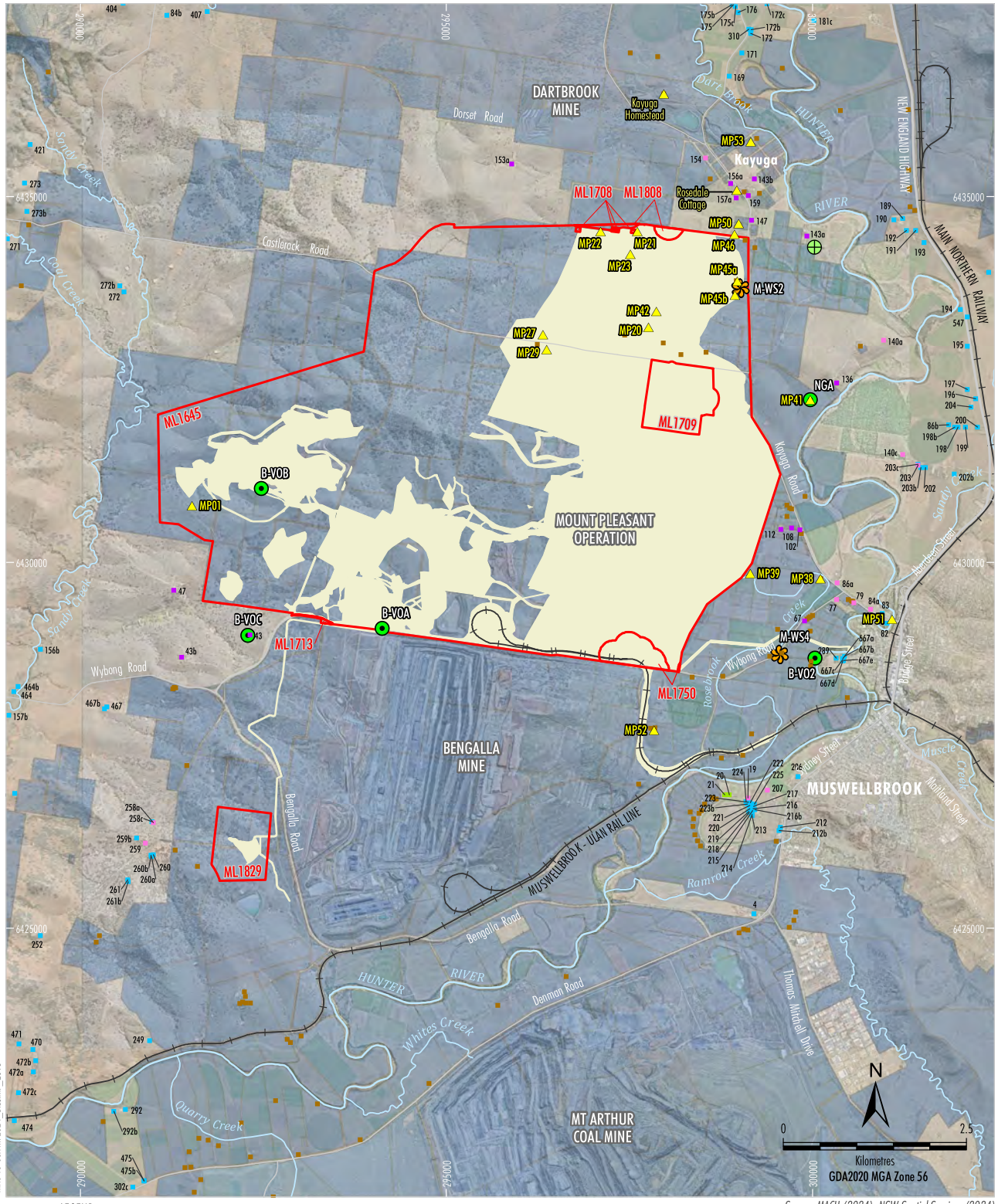
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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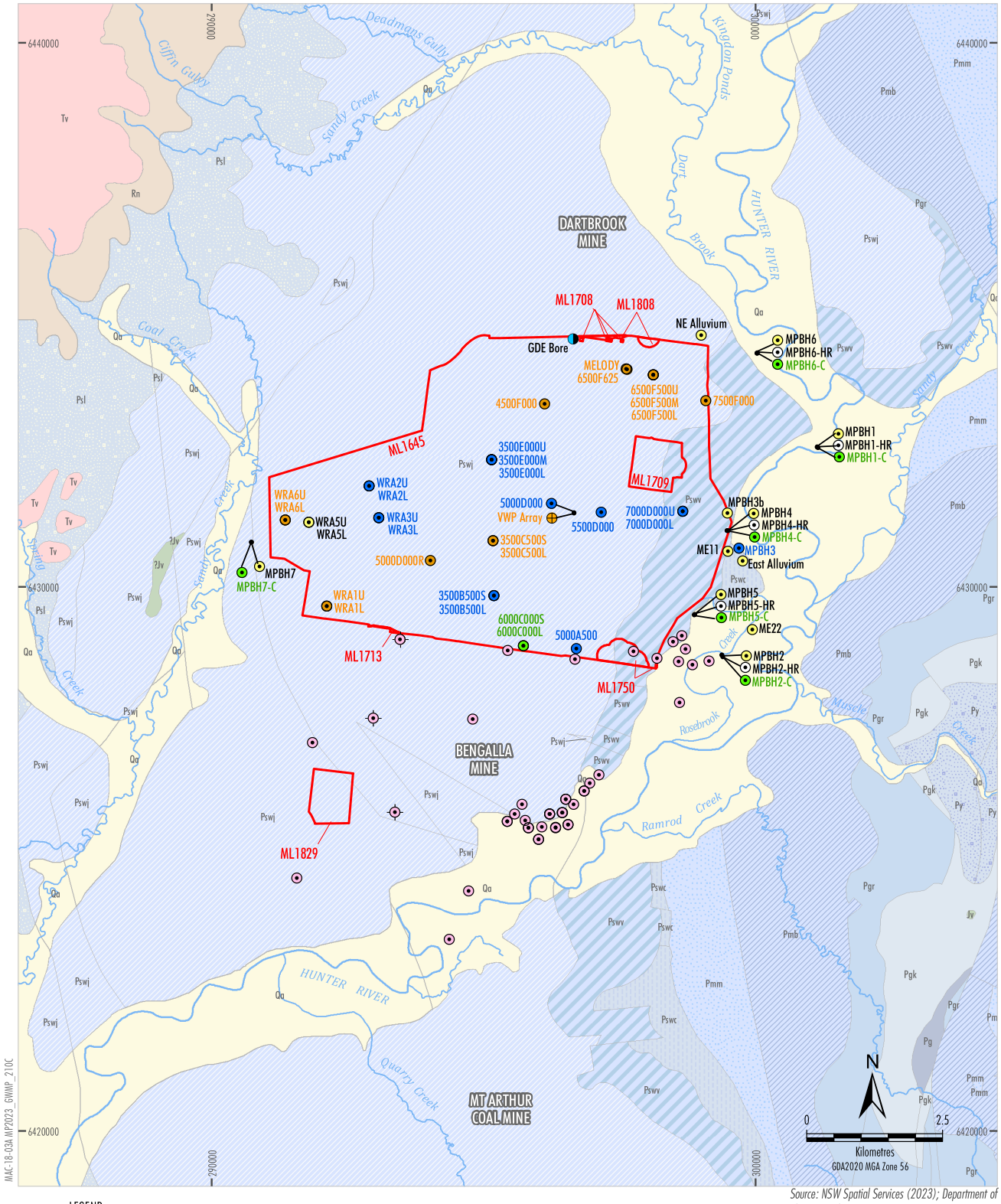
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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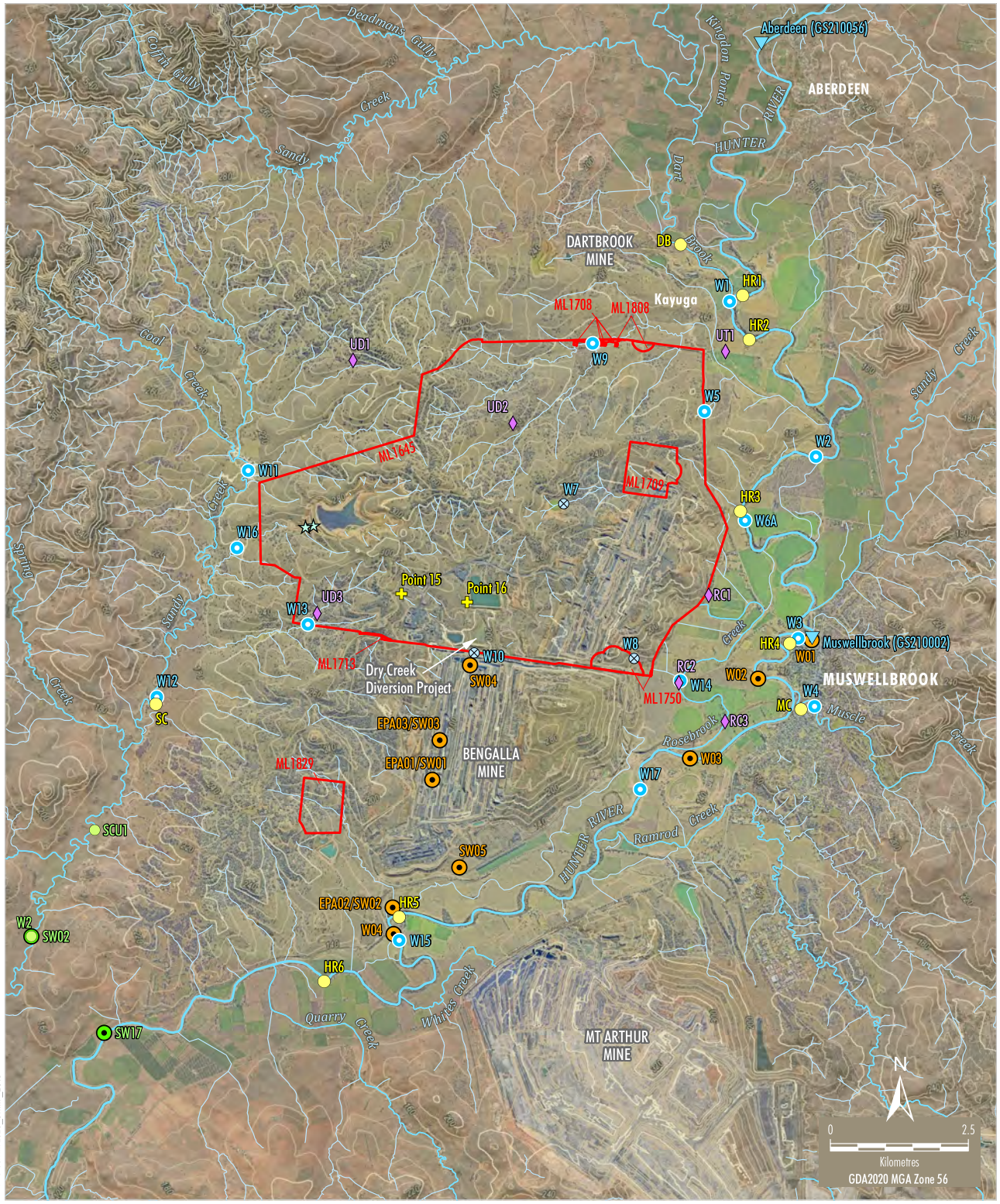
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

January 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 January 2026
Reporting Period End Date	31 January 2026
Date All Data Received	16 February 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout January 2026, there was 48.8mm at M-WS2 and 36.0mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – January 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	7.8	4.0
D3	1.5	1.4
D4	1.9	1.1
D5a	3.7**	2.5
D6	2.3	2.2
D7b***	70.9	**23.7**
D8	10.3	**6.3**
D9a	4.1	3.5
D10	3.7	1.8
D11	7.5	**4.3**
D12	2.6	1.4
D13	2.5	2.0
D14	12.2**	3.6
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*
**** Within the operational area. Not used to assess compliance or to represent residential receivers in the area.*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

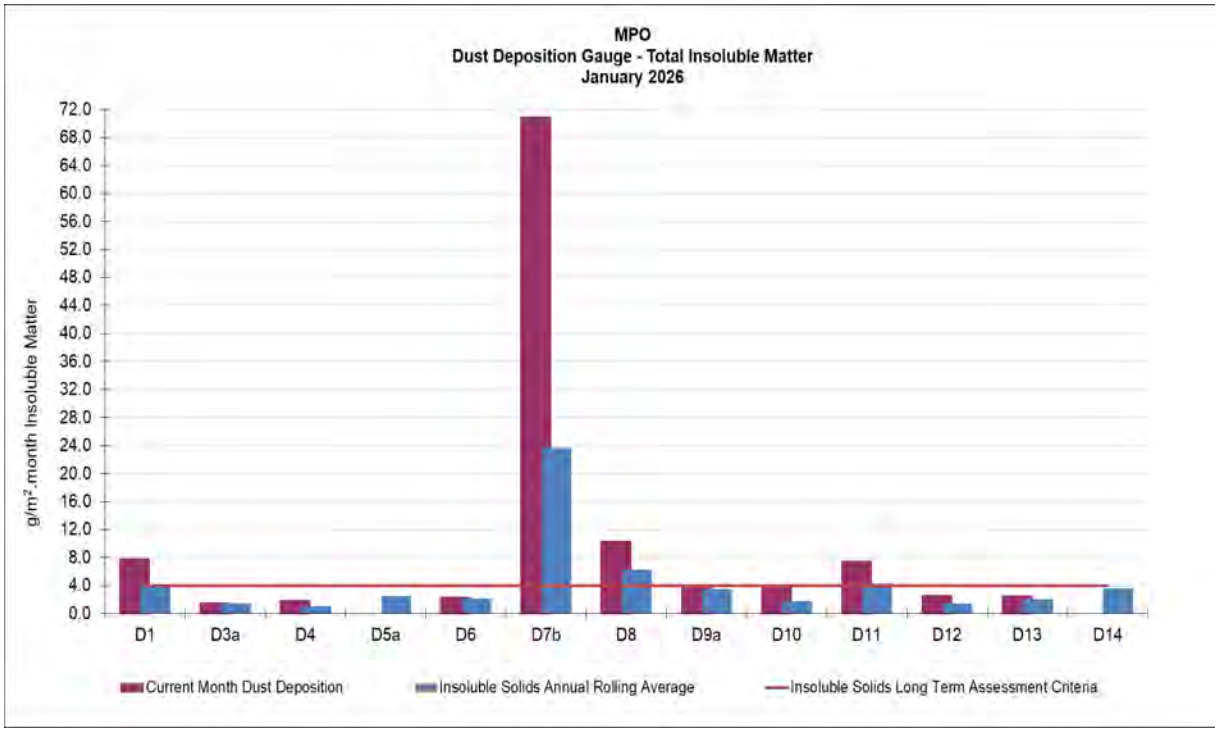

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.
TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval

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DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – January 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
01/01/2026	-	46.8	102	41.8
07/01/2026	-	43.1	121	55.2
13/01/2026	-	50.3	101	76.4
19/01/2026	-	25.7	92.1	29.2
25/01/2026	-	73.4	86.1	58.6
31/01/2026	-	139	154	229
Monthly Mean	-	63.1	109.4	81.7
Annual Rolling Average	90	60	56	52

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages to the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

Real Time Dust Levels are elevated on the 30/01/2026 and 31/01/2026 due to smoke haze in the region as a result of large bushfires in Oyster Cove and Nerong.

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Table 6-1: MPO Continuous Particulate PM_{10} Data – January 2026

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m³)
	24-hour Average Result			
01/01/2026	15.94	14.75	16.82	50
02/01/2026	13.25	11.33	15.24	50
03/01/2026	14.07	12.24	13.95	50
04/01/2026	17.33	10.11	8.34	50
05/01/2026	16.00	19.15	21.97	50
06/01/2026	20.00	19.90	28.29	50
07/01/2026	18.34	22.28	36.89	50
08/01/2026	22.63	24.61	33.96	50
09/01/2026	39.21	22.53	30.61	50
10/01/2026	-	13.23	9.53	50
11/01/2026	-	32.16	28.43	50
12/01/2026	12.97	12.40	28.22	50
13/01/2026	17.82	23.91	40.27	50
14/01/2026	16.72	17.05	46.13	50
15/01/2026	15.32	15.46	14.75	50
16/01/2026	16.05	16.66	18.08	50
17/01/2026	12.58	11.47	13.23	50
18/01/2026	8.39	8.00	9.07	50
19/01/2026	12.63	12.18	37.93	50
20/01/2026	14.27	13.83	41.19	50
21/01/2026	20.53	25.29	25.82	50
22/01/2026	32.44	34.76	41.23	50
23/01/2026	21.12	19.50	43.12	50
24/01/2026	21.99	18.73	17.46	50
25/01/2026	24.40	19.46	16.90	50
26/01/2026	29.48	25.83	34.70	50
27/01/2026	20.19	17.23	46.39	50
28/01/2026	32.84	30.81	44.33	50
29/01/2026	21.58	26.40	36.13	50
30/01/2026	39.23*	40.35*	**52.13***	50
31/01/2026	**57.07***	**90.69***	44.60*	50

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
[1] Criteria of 50µg/m³ does not apply to A-PF4 as it is not representative of a residence on privately owned land.
***** *Regional extraordinary event*

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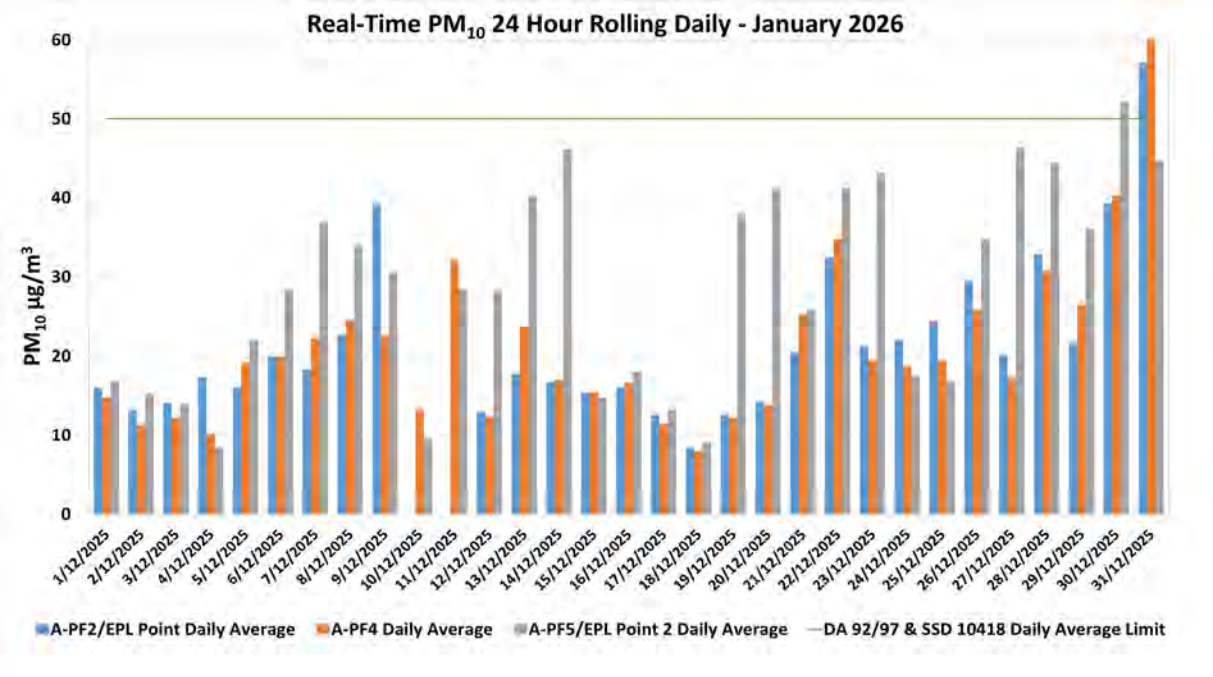

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for January 2026.

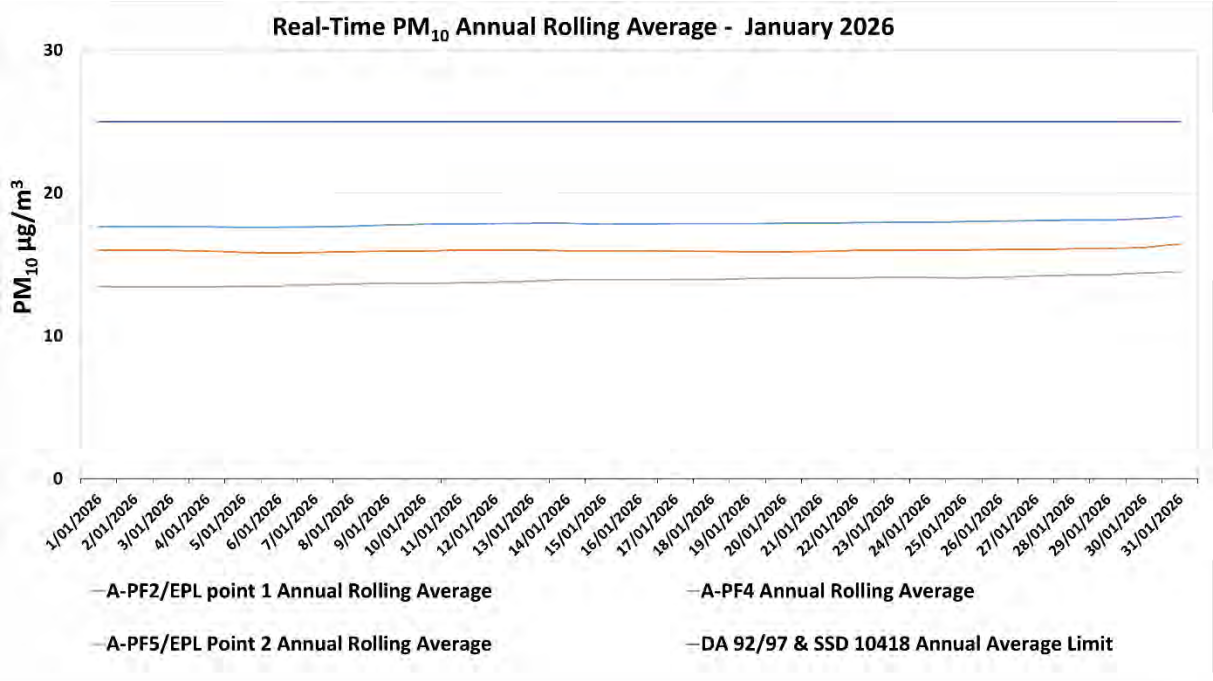

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for January 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – January 2026

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2	A-PF2, A-PF5 24 Hour Average Limit (µg/m^3)
	24-hour Average Result			
01/01/2026	6.12	6.29	5.92	25
02/01/2026	4.55	4.51	4.70	25
03/01/2026	4.13	4.05	4.04	25
04/01/2026	4.61	4.07	3.52	25
05/01/2026	5.69	6.33	6.46	25
06/01/2026	8.68	9.28	8.99	25
07/01/2026	6.52	7.23	7.89	25
08/01/2026	5.05	5.40	6.19	25
09/01/2026	6.47	5.17	5.45	25
10/01/2026	-	4.40	3.59	25
11/01/2026	-	12.03	10.30	25
12/01/2026	6.09	6.26	8.61	25
13/01/2026	7.11	7.79	9.81	25
14/01/2026	7.26	7.43	10.81	25
15/01/2026	7.37	7.20	7.33	25
16/01/2026	7.03	7.61	7.41	25
17/01/2026	4.65	4.74	4.71	25
18/01/2026	3.68	3.62	3.68	25
19/01/2026	4.75	4.88	7.61	25
20/01/2026	4.96	5.25	8.07	25
21/01/2026	5.89	6.51	6.21	25
22/01/2026	7.60	7.62	7.91	25
23/01/2026	6.39	6.48	8.77	25
24/01/2026	5.81	5.76	5.29	25
25/01/2026	6.18	5.90	5.31	25
26/01/2026	9.69	9.61	9.23	25
27/01/2026	6.10	5.92	9.15	25
28/01/2026	9.08	9.33	9.63	25
29/01/2026	8.08	9.11	8.76	25
30/01/2026	15.21*	15.94*	14.97*	25
31/01/2026	21.15*	**28.70***	15.90*	25

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
[1]Criteria of 25µg/m^3 does not apply to A-PF 4 as it is not representative of a residence on privately owned land.

***** *Regional extraordinary event*

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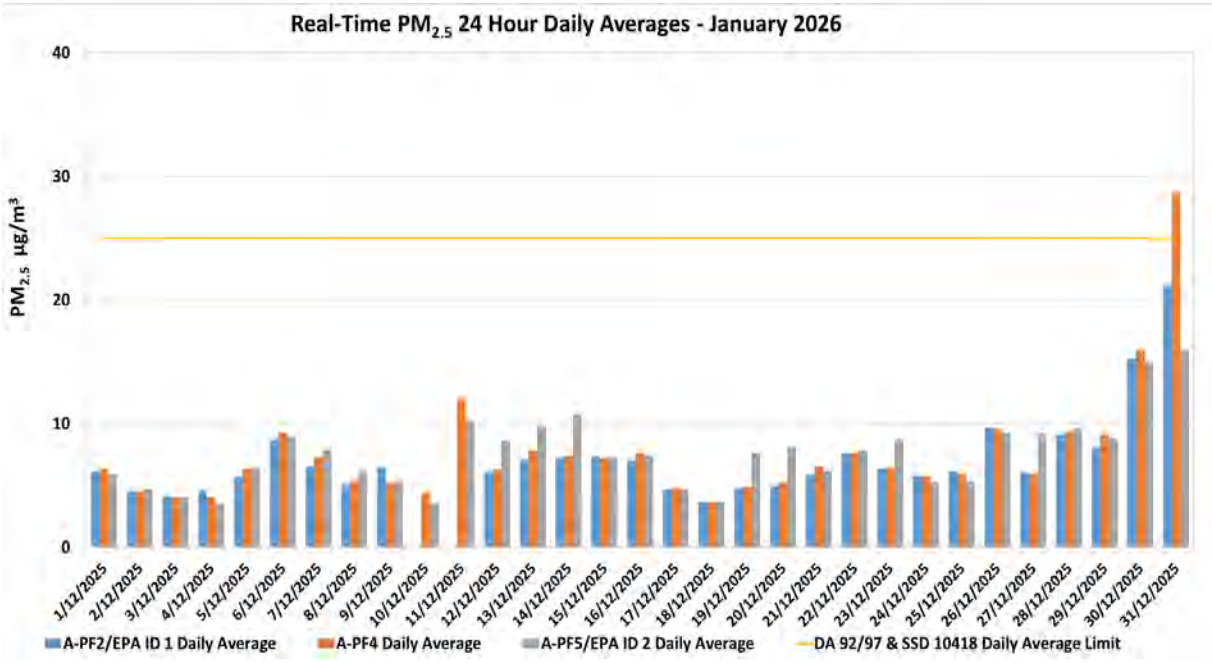

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for January 2026.

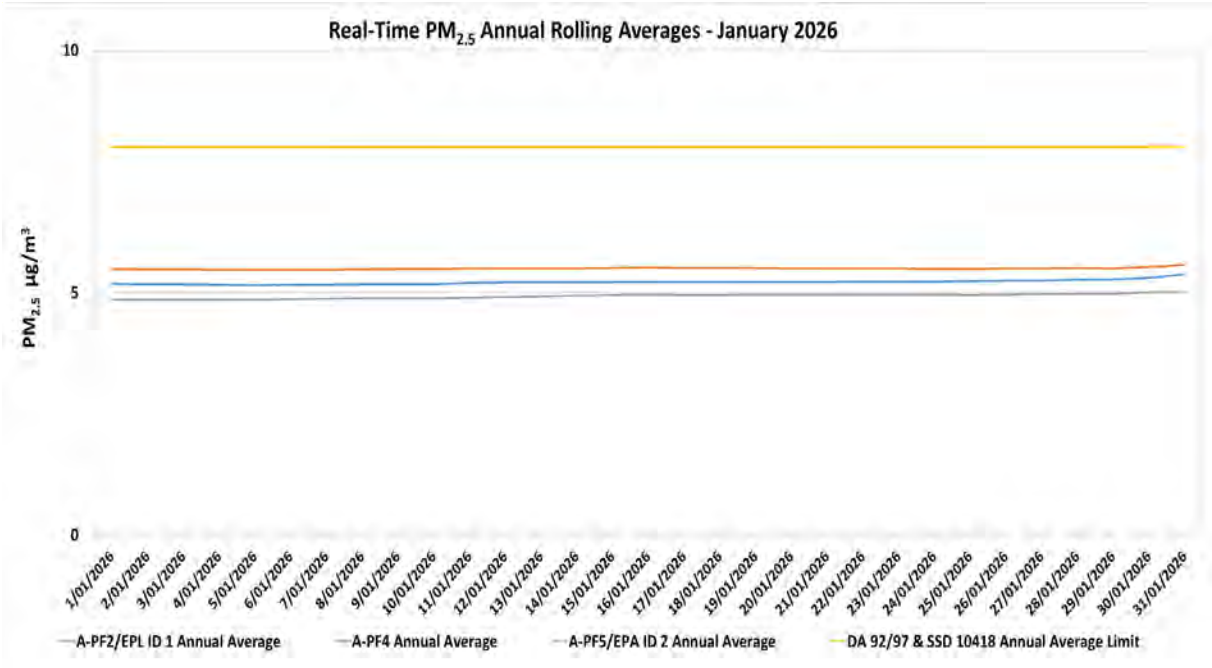

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for January 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

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Table 8-1 – MPO Monthly Surface Water Monitoring Results – 15 January 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	8.0	**529**	260	13
W2	8.0	**586**	271	10
W6A	8.1	**546**	283	15
W15	**8.1**	**650**	348	20
W17	**	**	**	**
Sandy Creek				
W11 (Upstream Reference Site)	**	**	**	**
W12	**8.3**	4350	2380	12
Muscle Creek				
W4 (Upstream Reference Site)	7.8	**2050**	1220	**21**
Unnamed Tributaries				
W3	7.9	586	288	18
W5	8.3	268	627	9910
W9	9.6	628	485	125
W13	8.1	3730	2090	94
W14	*	*	*	*
W16	8.5	3810	2110	20

*Note: Results in **bold** indicate exceedances of adopted assessment criteria of less than three consecutive events.*
**Dry or insufficient water to sample.*
*** No access due to track conditions.*

9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

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10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 21 and 22 Jan 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:42am	IA	45	0.6 / 227	Yes	E	No
N-AT2	10:55pm	IA	45	3.4 / 165	Yes	D	NA
N-AT3	11:33pm	IA	45	3.6 / 158	Yes	D	NA
N-AT4	12:02am	IA	45	1.3 / 200	Yes	F	No
N-AT5	12:24am	38	45	1.5 / 210	Yes	D	No
N-AT6	1:19am	IA	45	0.6 / 241	Yes	E	No
N-AT7	10:12pm	IA	45	4.2 / 161	Yes	E	NA
N-AT8	12:51am	39	49	1.7 / 211	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 21 and 22 Jan 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:42am	IA	37	0.6 / 227	Yes	E	No
N-AT2	10:55pm	IA	35	3.4 / 165	Yes	D	NA
N-AT3	11:33pm	IA	40	3.6 / 158	Yes	D	NA
N-AT4	12:02am	IA	38	1.3 / 200	Yes	F	No
N-AT5	12:24am	33	37	1.5 / 210	Yes	D	No
N-AT6	1:19am	IA	35	0.6 / 241	Yes	E	No
N-AT7	10:12pm	IA	37	4.2 / 161	Yes	E	NA
N-AT8	12:51am	32	43	1.7 / 211	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*

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NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 21 and 22 Jan 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:42am	33	40	No
N-AT2	10:55pm	IA	40	NA
N-AT3	11:33pm	IA	40	NA
N-AT4	12:02am	IA	40	No
N-AT5	12:24am	33	40	No
N-AT6	1:19am	32	40	No
N-AT7	10:12pm	IA	40	NA
N-AT8	12:51am	36	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA- inaudible; and **Bold** results indicate exceedance of criteria.*
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

11. Blast Monitoring

There were thirteen (13) blast events (a total of 13 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – January 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
02/01/26	15:24	0.34 mm/s	99.8 DBL	0.44 mm/s	102.3 DBL	Y
06/01/26	10:09	0.57 mm/s	99.7 DBL	0.25 mm/s	94.8 DBL	Y
08/01/26	15:01	0.19 mm/s	89.1 DBL	0.20 mm/s	93 DBL	Y
09/01/26	11:35	0.50 mm/s	94.9 DBL	0.51 mm/s	99.8 DBL	Y
12/01/26	10:16	0.41 mm/s	101 DBL	0.40 mm/s	107.9 DBL	Y
13/01/26	15:00	0.33 mm/s	99 DBL	0.22 mm/s	99.9 DBL	Y
14/01/26	16:59	0.19 mm/s	108.2 DBL	0.41 mm/s	118.9 DBL	Y
17/01/26	09:06	0.16 mm/s	90.7 DBL	0.22 mm/s	89.9 DBL	Y
20/01/26	11:03	0.20 mm/s	98.2 DBL	0.22 mm/s	104.6 DBL	Y
22/01/26	15:54	0.71 mm/s	104.2 DBL	0.33 mm/s	113.4 DBL	Y
24/01/26	15:11	0.13 mm/s	99.5 DBL	0.17 mm/s	96.3 DBL	Y
27/01/26	09:20	0.21 mm/s	102.6 DBL	0.14 mm/s	102.5 DBL	Y
30/01/26	13:08	0.17 mm/s	88.9 DBL	0.37 mm/s	93.7 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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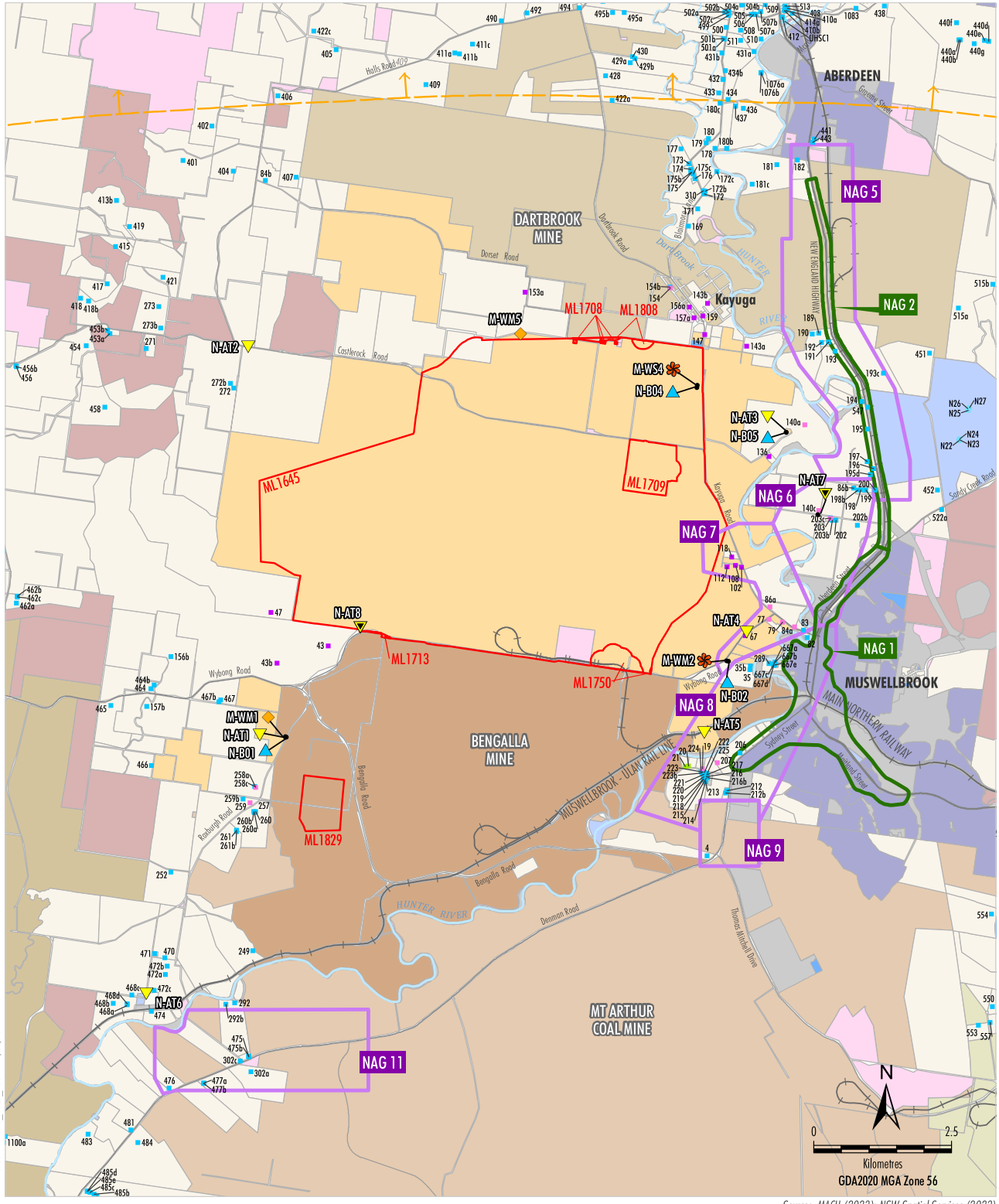


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

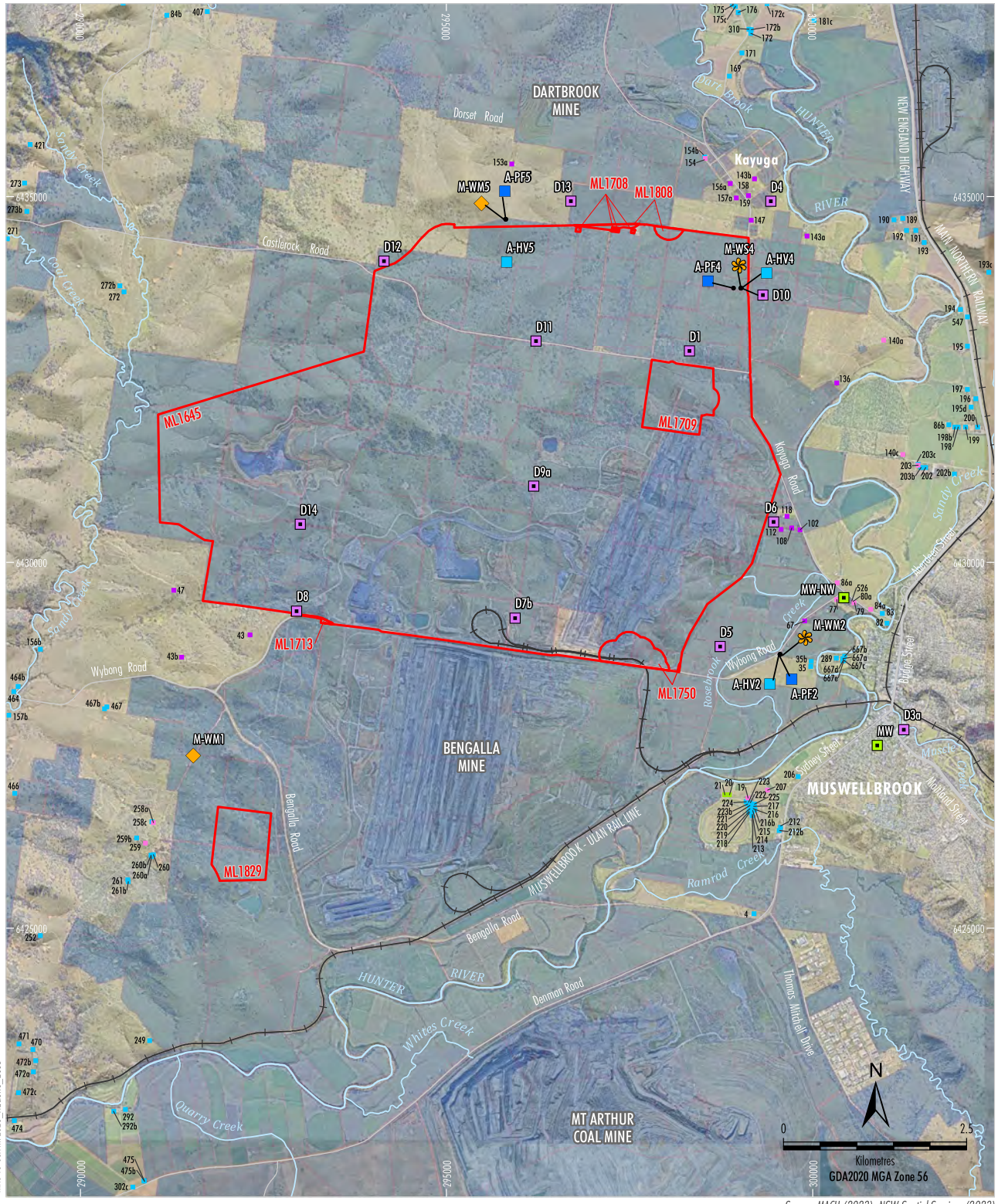
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

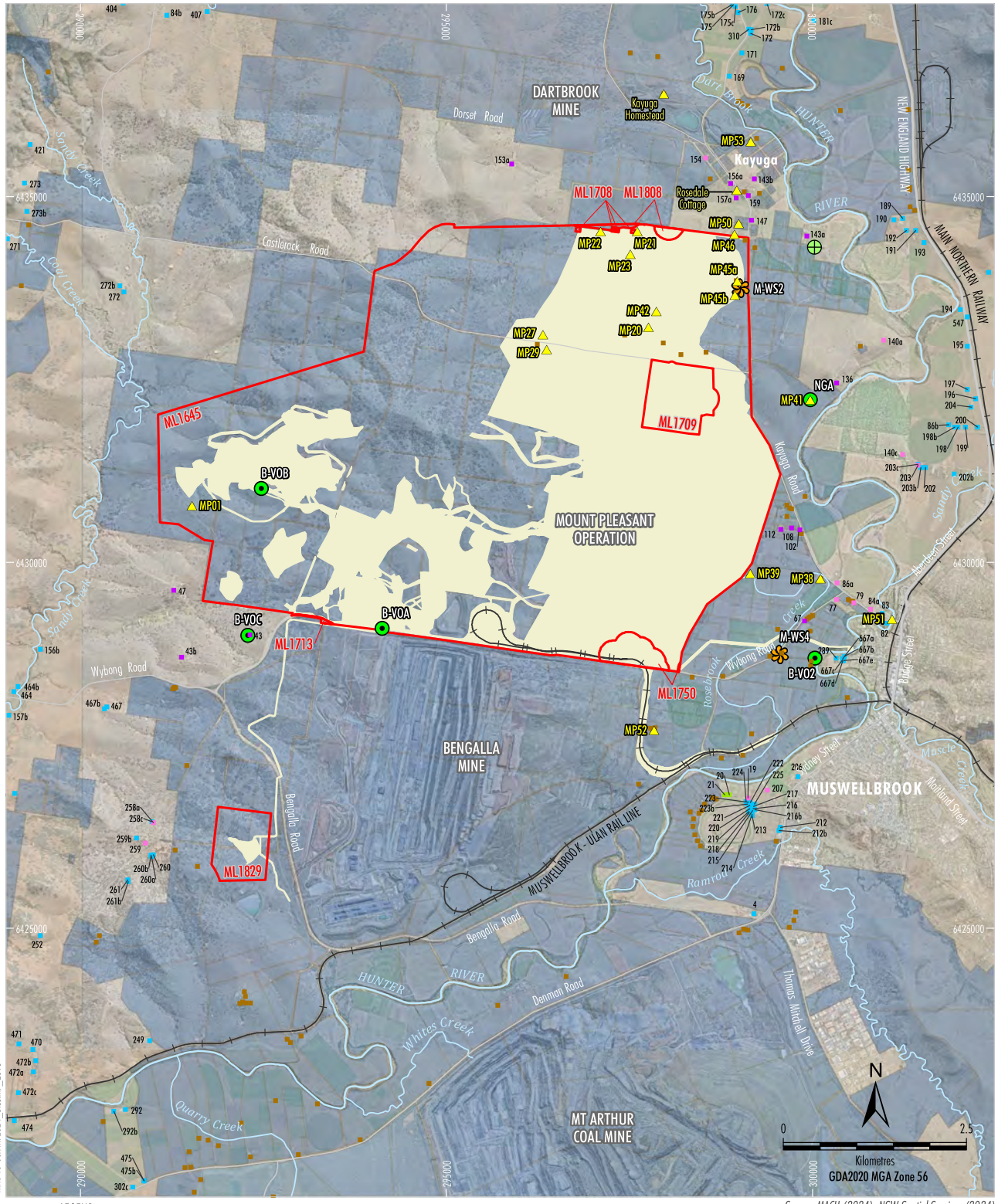
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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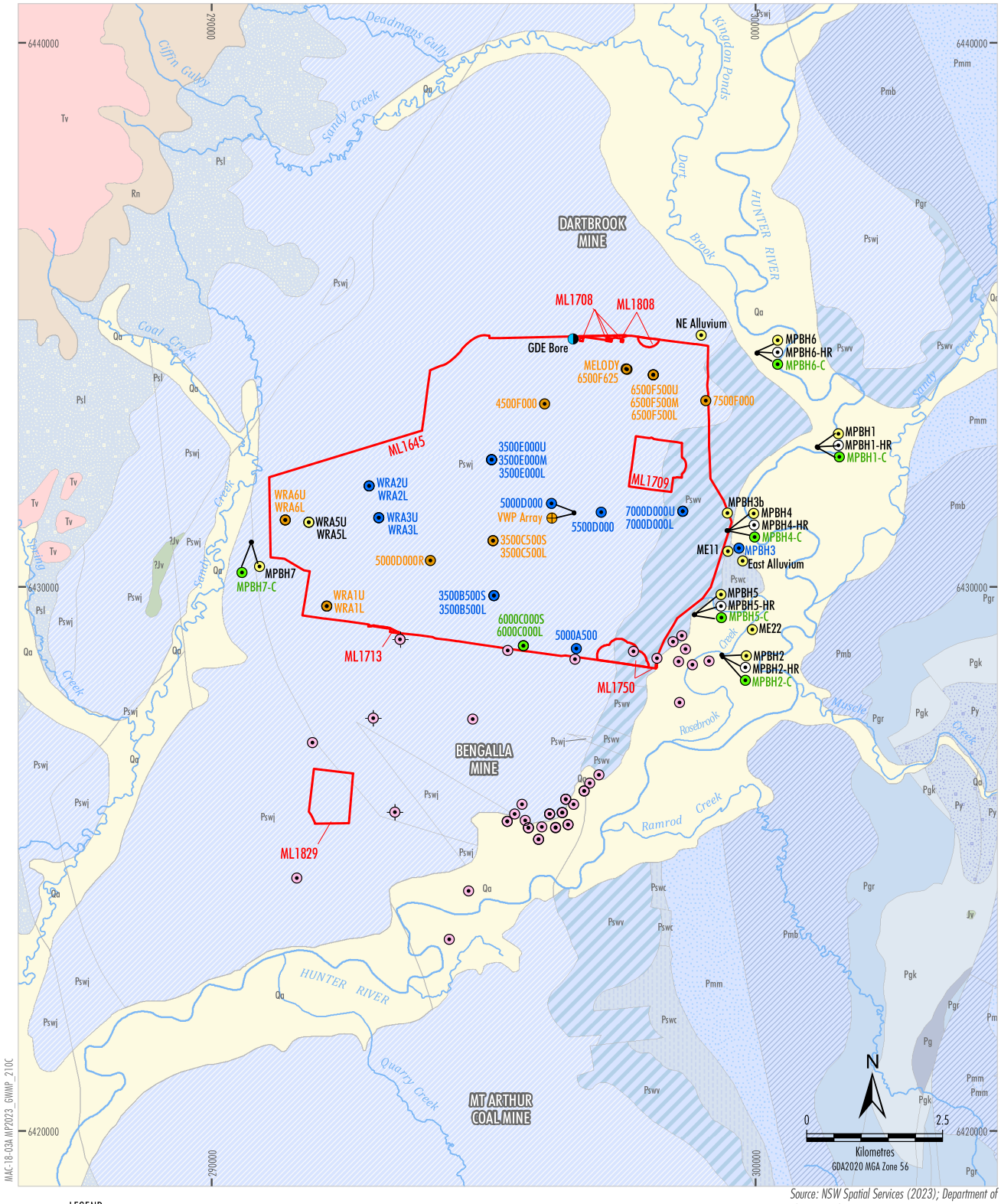
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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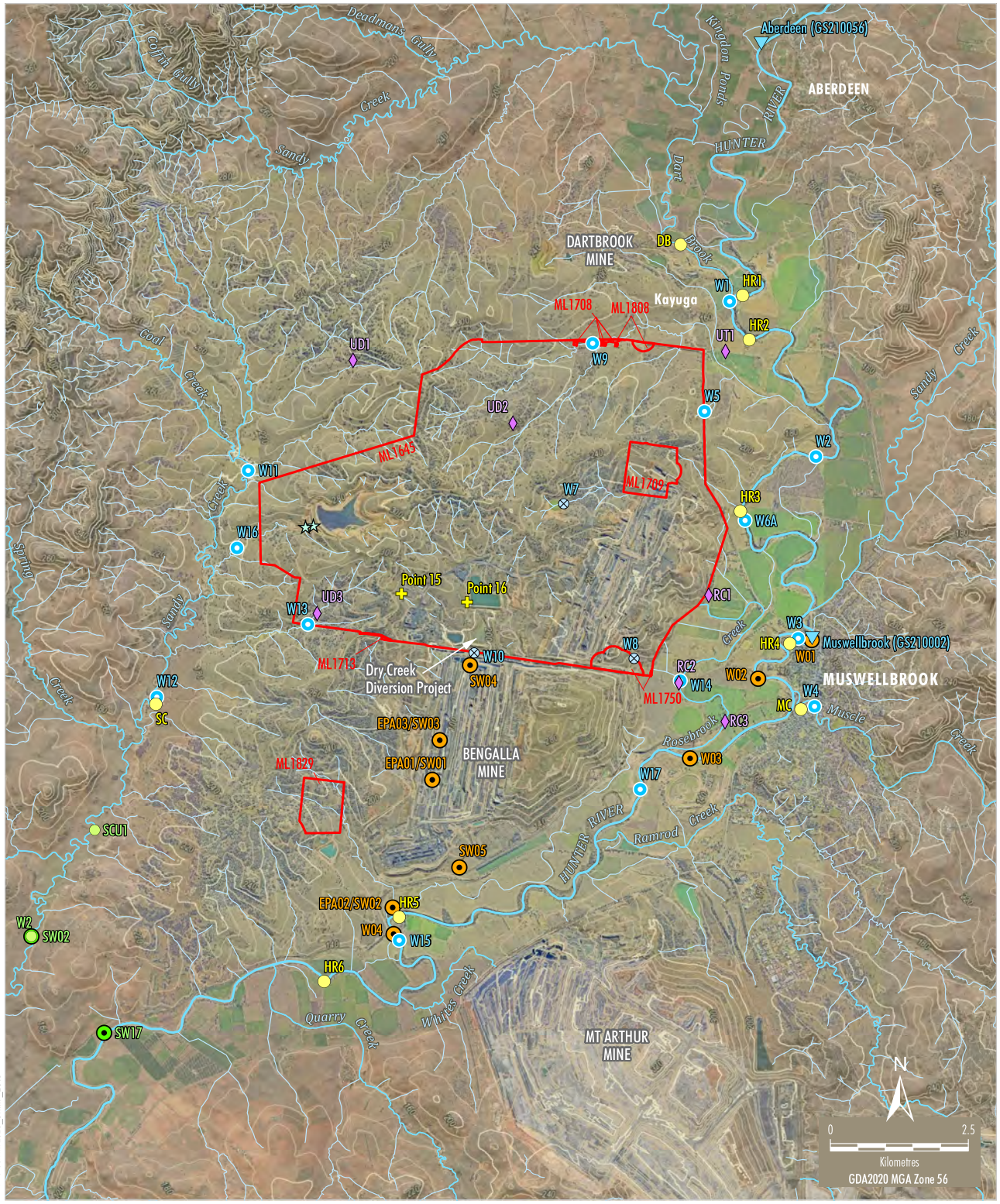
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

February 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 February 2026
Reporting Period End Date	28 February 2026
Date All Data Received	11 March 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout February 2026, there was 50.2mm at M-WS2 and 60.0mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b is located within close proximity to the northern boundary of a neighbouring mining operation and thus can be influenced by this site. D7b will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – February 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	9.0	**4.6**
D3	2.9	1.5
D4	3.6	1.3
D5a	3.1	2.6
D6	2.9	2.3
D7b***	42.8	**27.9**
D8	10.8	**6.6**
D9a	7.5	3.7
D10	3.1	2.0
D11	7.3	**4.6**
D12	2.1	1.4
D13	3.7	2.1
D14	7.1	3.7
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*
**** Within the operational area. Not used to assess compliance or to represent residential receivers in the area.*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

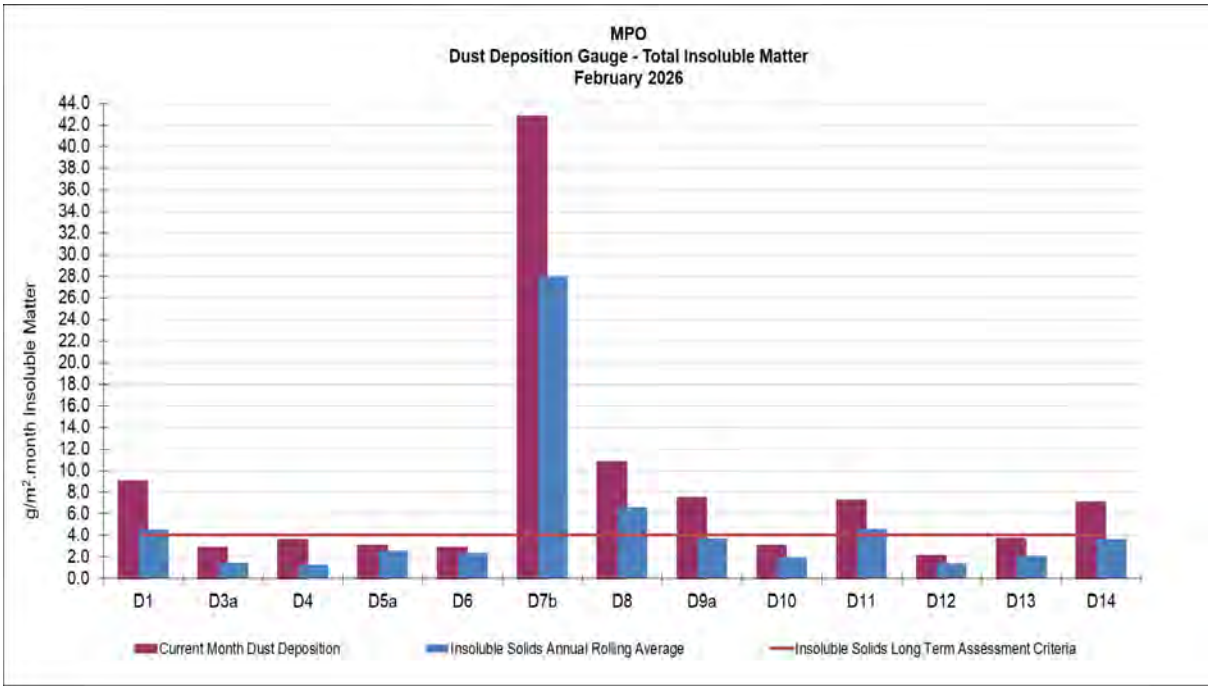

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – February 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
06/02/2026	-	100	185	140
12/02/2026	-	73.9	114	345
18/02/2026	-	88.4	63.6	99.7
24/02/2026	-	48.4	84.5	186
Monthly Average	-	77.7	111.8	192.7
Annual Rolling Average	90	61	59	57

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

Real Time Dust Levels are elevated on the 01/02/2026 due to smoke haze in the region as a result of large bushfires in Oyster Cove and Nerong and a localised windstorm event in the afternoon.

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Table 6-1: MPO Continuous Particulate PM_{10} Data Cumulative 24-hour Average February 2026

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/02/2026*	**61.84**	**53.35**	19.66
02/02/2026	12.57	12.18	23.36
03/02/2026	13.89	15.50	48.87
04/02/2026	23.78	26.97	31.88
05/02/2026	30.32	**50.99**	33.67
06/02/2026	29.29	39.67	**73.05**
07/02/2026	18.05	17.12	10.83
08/02/2026	22.02	28.92	25.14
09/02/2026	20.04	22.45	18.46
10/02/2026	19.78	21.90	44.09
11/02/2026	28.17	48.80	40.26
12/02/2026	22.53	41.68	43.39
13/02/2026	13.15	12.88	**65.58**
14/02/2026	12.59	-	16.13
15/02/2026	11.53	9.08	11.77
16/02/2026	11.00	**52.38**	**56.03**
17/02/2026	17.32	**60.10**	34.68
18/02/2026	23.79	24.98	11.50
19/02/2026	24.12	46.48	48.87
20/02/2026	14.71	29.36	43.14
21/02/2026	12.78	11.98	8.78
22/02/2026	18.98	21.06	18.21
23/02/2026	18.18	27.66	31.53
24/02/2026	17.69	38.95	**60.38**
25/02/2026	23.48	**52.37**	39.88
26/02/2026	13.55	25.36	46.23
27/02/2026	13.39	13.43	48.00
28/02/2026	11.89	12.19	22.72

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
[1] Criteria of 50µg/m^3 does not apply to A-PF4 as it is not representative of a residence on privately owned land.

***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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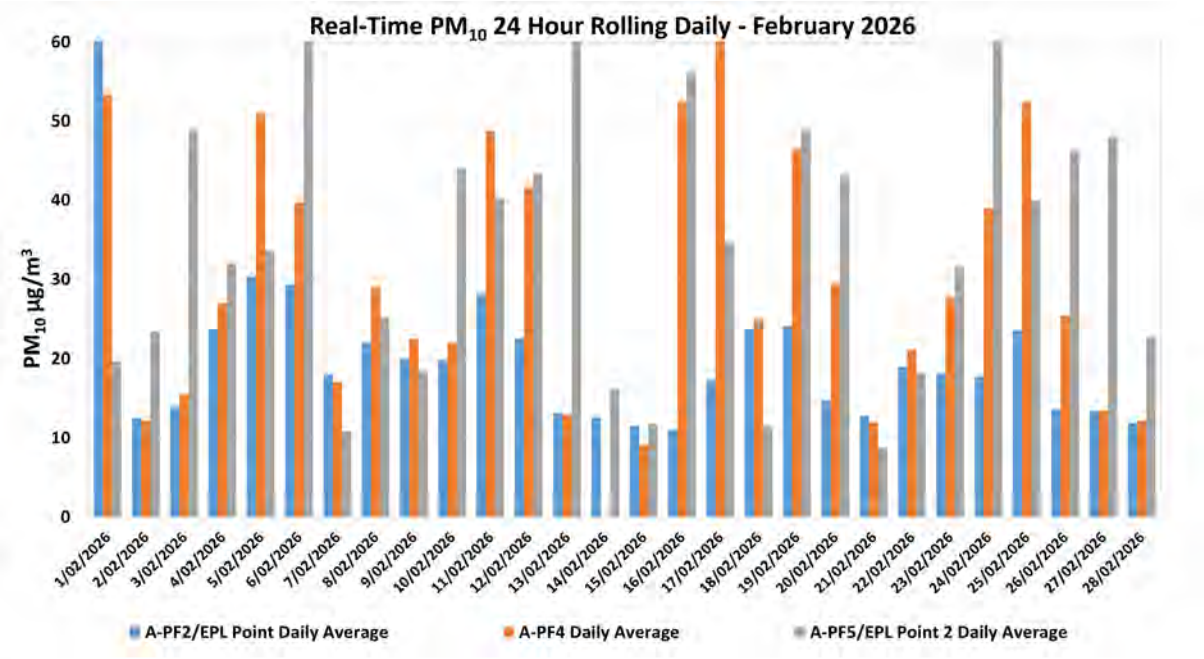

Figure 6-1: Real-time PM_{10} 24 Daily Average Results for February 2026.

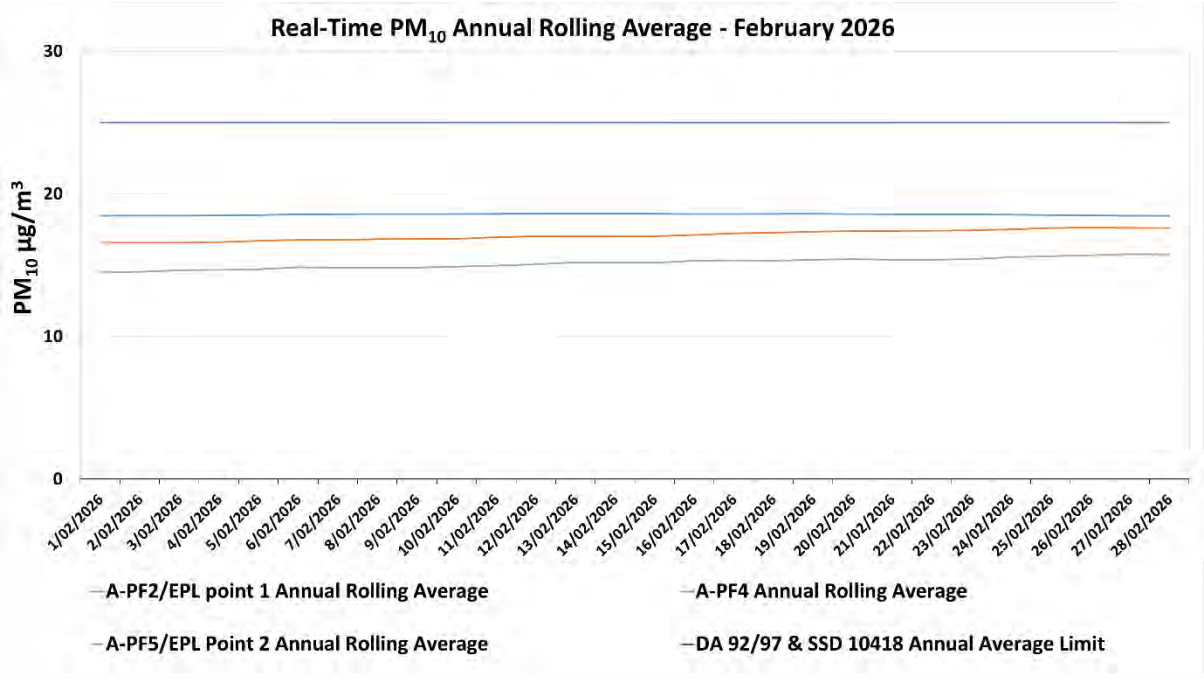

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for February 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – February 2026

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2
	24-hour Average Result		
01/02/2026*	**30.43**	23.04	8.91
02/02/2026	4.80	4.92	6.44
03/02/2026	4.99	5.34	9.40
04/02/2026	6.27	6.72	6.81
05/02/2026	7.03	9.79	6.81
06/02/2026	8.62	10.24	14.44
07/02/2026	5.84	5.80	4.66
08/02/2026	8.23	9.25	8.28
09/02/2026	7.61	8.36	6.96
10/02/2026	8.50	9.60	12.13
11/02/2026	10.81	17.08	11.10
12/02/2026	6.62	9.59	8.88
13/02/2026	4.75	4.93	12.23
14/02/2026	4.18	-	4.68
15/02/2026	3.80	3.49	3.84
16/02/2026	3.71	6.65	8.94
17/02/2026	4.31	7.73	6.47
18/02/2026	4.48	4.74	3.33
19/02/2026	8.45	10.94	10.55
20/02/2026	5.43	6.72	7.67
21/02/2026	4.37	4.58	3.61
22/02/2026	6.16	6.67	5.52
23/02/2026	5.30	6.18	6.06
24/02/2026	7.35	9.35	10.89
25/02/2026	5.94	8.42	7.71
26/02/2026	5.21	6.40	8.12
27/02/2026	4.77	4.98	7.82
28/02/2026	4.73	4.90	5.54

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
[1]Criteria of 25µg/m^3 does not apply to A-PF 4 as it is not representative of a residence on privately owned land.

***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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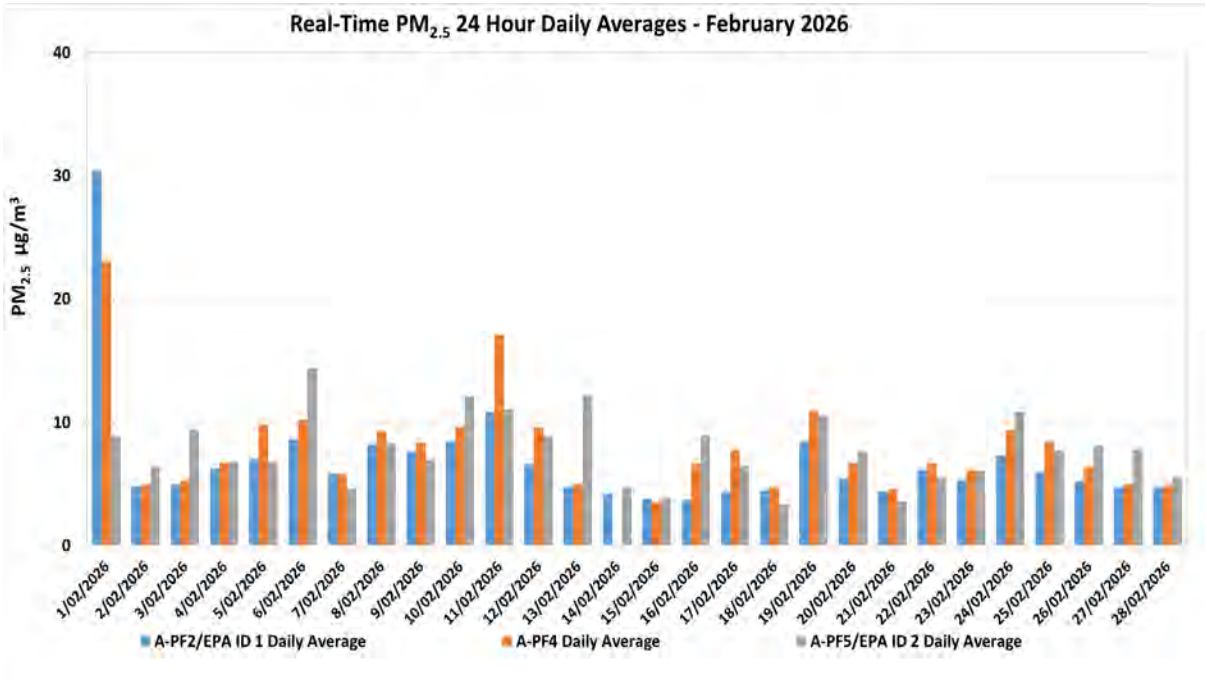

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for February 2026.

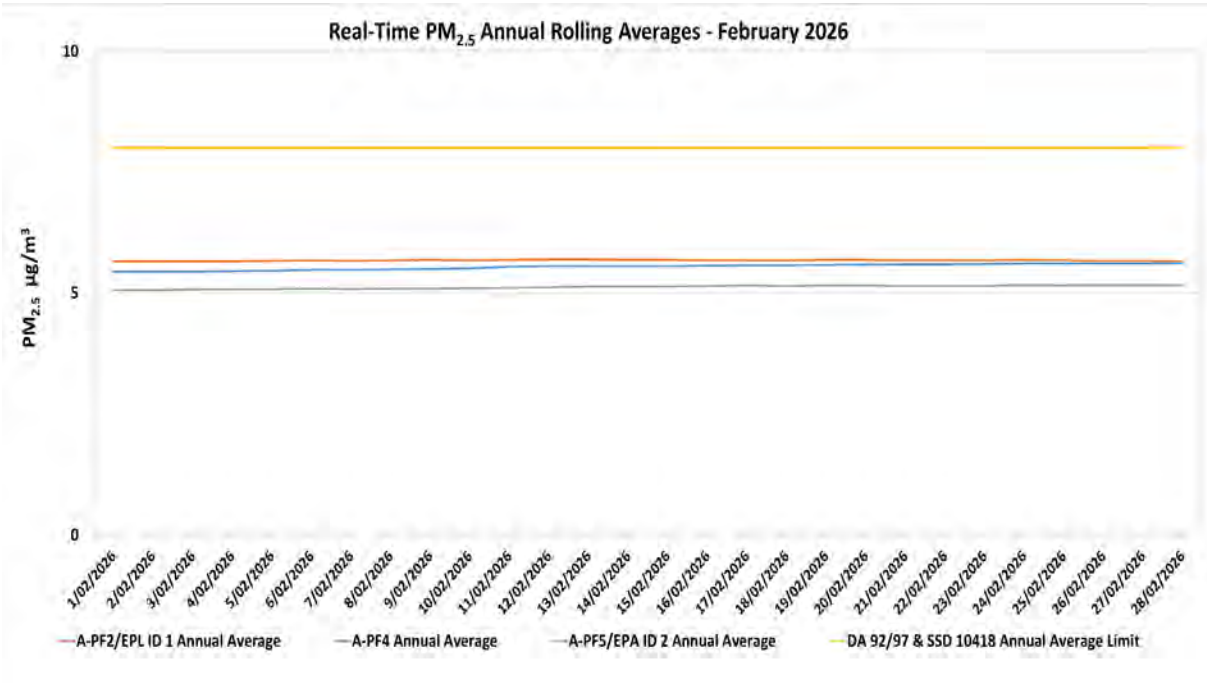

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for February 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of days throughout the reporting period when adverse conditions were triggered leading to a shutdown event, in accordance with EPL Condition O3.4.

Table 7-1 Dust Shutdowns MPO- February 2026

Date	Time Dust Generating Activities were Ceased	Time Dust Generating Activities were Resumed	Shutdown Hours	Muswellbrook NW 24- hour rolling PM10 Average (µg/m^3)	Wind Direction (°)
01/02/2026	4:35	5:35	1	72.3	296
01/02/2026	7:35	9:35	2	80.9	258
01/02/2026	14:40	15:40	1	73	307

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC

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(2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 02 February 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.9	449	238	12
W2	8.3	514	266	<5
W6A	8.0	**500**	271	13
W15	8.0	**613**	339	18
W17	8.1	641	334	<5
Sandy Creek				
W11 (Upstream Reference Site)	**8.2**	3580	1980	<5
W12	8.1	4970	2640	5
Muscle Creek				
W4 (Upstream Reference Site)	7.7	2130	1370	**17**
Unnamed Tributaries				
W3	8.0	535	289	9
W5	*	*	*	*
W9	^	^	^	^
W13	*	*	*	*
W14	*	*	*	*
W16	*	*	*	*

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access.

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

9.2 Assessment Criteria

An investigation is triggered if elevated measurements occur for three consecutive sampling events in accordance MPO Water Management Plan (MACH Energy, 2022).

An investigation was previously triggered (AGE, 2023) examining the cause of elevated EC values in the alluvial zone, specifically MPBH2. The data suggests that the cause of the increase in EC is persistent above-average stage in the adjacent Hunter River, caused by above-average rainfall since 2020, which is causing a rise in groundwater levels in similar alluvial bores. Further Investigations have been undertaken during 2025, and in accordance with recommendations from Specialist Groundwater Consultants AGE, the *MPO Water Management Plan* (MACH Energy, 2025) has been revised to new recommended trigger levels for MPBH2. The revised MPO Water Management Plan was submitted to the Department of Planning Housing and Infrastructure in August 2025. Based on the previous assessment it is expected that EC levels of MPBH2 will continue to be above the older trigger level. This will not be reported each monitoring period as the investigation and recommendations have been completed as required.

9.3 Results

Water level results for the groundwater bores are presented in **Table 8-1**. The quarterly pH and EC results are presented in **Table 8-2** and **Table 8-3**, respectively.

Table 8-1 - MPO Quarterly Groundwater Water Level Results

Monitoring Location/ ID	Trigger	February 2026 Water Level (DTW)	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	Triggered (Yes/ No)
WRA1L	-	2.73	1.02	1.77	-
WRA1U	-	*	*	*	-
WRA3L-R	-	*	*	*	-
WRA3U-R	-	*	*	*	-
WRA5L-R	-	*	*	^	-
WRA5U-R	-	*	*	^	-
WRA6L	-	0.67	0.52	0.15	-
WRA6U	-	0.99	1.14	0.82	-
MPBH1	10.70	9.56	9.52	7.01	No
MPBH2	13.59	10.99	10.74	11.03	No

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Monitoring Location/ ID	Trigger	February 2026 Water Level (DTW)	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	Triggered (Yes/ No)
MPBH3b	13.04	11.08	10.89	10.56	No
MPBH4	-	11.73	11.21	11	-
MPBH5	-	*	*	*	-
MPBH1-C	-	9.49	9.383	6.863	-
MPBH1-HR	-	42.29	45.69	34.73	-
MPBH2-C	-	10.98	10.733	11.063	-
MPBH2-HR	-	11.24	14.246	28.916	-
MPBH4-C	-	10.40	9.923	9.503	-
MPBH4-HR	-	49.93	50.045	49.605	-
MPBH5-C	-	10.45	10.659	12.179	-
MPBH5-HR	-	10.50	10.3	11.11	-
MPBH6	-	10.37	8.601	8.391	-
MPBH6-C	-	8.99	9.998	9.738	-
MPBH6-HR	-	10.06	9.795	8.815	-
MPBH7	10.10	5.37	4.827	4.327	No
MPBH7-C	-	17.79	17.045	17.415	-
3500C500L	-	27.64	27.54	27.11	-
3500C500S	-	24.99	24.51	25.44	-
4500F000	-	21.58	22.10	22.09	-
5000D000-R	-	139.38	139.14	138.92	-
5000D000	-	142.93	139.60	134.92	-
6000C000L-R	-	*	*	*	-
6000C000U-R	-	*	*	*	-
6500F500L	-	49.72	50.73	52.16	-
6500F500M	-	50.34	51.21	52.61	-
6500F500U	-	27.76	28.03	26.56	-
6500F625	-	15.14	14.04	14.45	-
Melody	-	12.31	10.13	10	-
7500F000	-	36.34	36.18	36.51	-
NE Alluvium	-	*	*	*	-

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Monitoring Location/ ID	Trigger	February 2026 Water Level (DTW)	November 2025 Water Level (DTW)	August 2025 Water Level (DTW)	Triggered (Yes/ No)
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment criterion for changes in standing water level from the previous measurement.
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
* Dry/insufficient water to sample.
^Unsafe access.
'-' indicates no trigger level

Table 8-2 - MPO Quarterly Groundwater pH Results

Monitoring Location/ ID	pH Trigger Range	February 2026 pH	November 2025 pH	August 2025 pH	Triggered (Yes/No)
WRA1L	6 - 8.5	7.0	7.2	7.4	No
WRA1U		*	*	*	No
WRA3L-R		7.5	7.4	7.5	No
WRA3U-R		*	*	*	No
WRA5L-R		7.1	7.2	^	No
WRA5U-R		7.5	7.5	^	No
WRA6L		6.9	7.0	7.5	No
WRA6U		6.8	6.8	6.8	No
MPBH1		6.8	7.1	7.3	No
MPBH2		6.9	6.8	6.7	No
MPBH3b		7.6	7.7	7.4	No
MPBH4		6.8	6.9	6.9	No
MPBH5		*	*	*	No
MPBH1-C	-	8.3	8.7	7.2	-
MPBH1-HR	-	7.6	7.7	7.6	-
MPBH2-C	-	10.3	7.9	8.1	-
MPBH2-HR	-	8.3	7.0	7.5	-
MPBH4-C	-	8.0	8.0	7.4	-
MPBH4-HR	-	7.2	7.4	7.4	-
MPBH5-C	-	10.6	11.0	11.1	-
MPBH5-HR	-	7.4	7.5	7.6	-
MPBH6	-	6.9	7.0	7	-
MPBH6-C	-	7.0	7.1	7.2	-
MPBH6-HR	-	7.1	7.1	7	-
MPBH7	-	6.9	7.0	7.3	-
MPBH7-C	-	7.0		7.0	-
3500C500L	6 - 8.5	7.5	7.4	7.5	No

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Monitoring Location/ ID	pH Trigger Range	February 2026 pH	November 2025 pH	August 2025 pH	Triggered (Yes/No)
3500C500S	-	7.3	7.2	7.3	-
4500F000	6 – 8.5	6.8	6.8	6.8	No
5000D000-R		7.5	7.4	7.5	No
6000C000L-R		8.4	8.4	8.4	No
6000C000U-R		7.5	*	*	No
6500F500L		7.2	7.2	7.2	No
6500F500M		7.1	7.2	7.2	No
6500F500U		6.8	6.8	6.8	No
6500F625		6.8	7.0	7.0	No
Melody		6.9	7.1	6.8	No
7500F000		7.7	7.7	7.8	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

*Results in **bold** indicate that the pH values recorded are outside the baseline range (20th – 80th percentile).*
** Dry/insufficient water to sample.*
^Unsafe access.
'-' indicates no trigger level

Table 8-3 - MPO Quarterly Groundwater EC Results

Monitoring Location/ ID	Maximum Beneficial Use Trigger	February 2026 EC	November 2025 EC	August 2025 EC	Triggered (Yes/No)
WRA1L	7800	2920	2940	2990	No
WRA1U	-	*	*	*	-
WRA3L-R	22000	8320	8110	7810	No
WRA3U-R	22000	*	*	*	No
WRA5L-R	7800	5290	5290	^	No
WRA5U-R	7800	5820	6220	^	No
WRA6L	7800	5560	5580	5540	No
WRA6U	22000	8230	7770	7760	No
MPBH1	800	707	658	576	No
MPBH2	930	**1086**	**1038**	**1083**	**Yes[1]**
MPBH3b	7800	4540	4500	4480	No
MPBH4	7800	5700	5510	5470	No
MPBH5	-	*	*	*	-
MPBH1-C	-	1301	1596	612	-
MPBH1-HR	-	1650	1715	1626	-
MPBH2-C	-	1549	1198	1223	-
MPBH2-HR	-	1788	1159	1424	-

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Monitoring Location/ ID	Maximum Beneficial Use Trigger	February 2026 EC	November 2025 EC	August 2025 EC	Triggered (Yes/No)
MPBH4-C	-	4980	5570	4870	-
MPBH4-HR	-	5720	5570	5240	-
MPBH5-C	-	647	728	831	-
MPBH5-HR	-	823	827	1149	-
MPBH6	-	1108	873	989	-
MPBH6-C	-	2450	2500	2650	-
MPBH6-HR	-	2750	1418	1543	-
MPBH7	-	11460	9940	6690	-
MPBH7-C	-	10780	10430	10290	-
3500C500L	7800	3900	3820	3830	No
3500C500S	-	5900	5710	5710	-
4500F000	22000	8510	7900	8620	No
5000D000-R	-	5460	5210	5020	No
6000C000L-R	7800	4900	4790	4550	No
6000C000U-R	7800	4400	*	*	No
6500F500L	7800	2540	2540	2470	No
6500F500M	7800	2520	2520	2770	No
6500F500U	7800	6000	6180	5300	No
6500F625	7800	3790	3040	987	No
Melody	-	3140	2340	914	-
7500F000	7800	6420	6330	6390	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment for EC values
** Dry/insufficient water to sample*
^ Unsafe access
'-' indicates no trigger level
[1] No further investigation required. See assessment criteria section for further information

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

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Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 11 and 12 Feb 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:37am	IA	45	2.3 / 025	Yes	D	No
N-AT2	10:51pm	IA	45	2.2 / 007	Yes	E	No
N-AT3	11:27pm	IA	45	2.6 / 016	Yes	D	No
N-AT4	11:55pm	27	45	2.6 / 026	Yes	D	No
N-AT5	12:18am	29	45	2.5 / 015	Yes	D	No
N-AT6	1:14am	IA	45	2.6 / 024	Yes	D	No
N-AT7	10:08pm	31	45	2.2 / 006	Yes	E	No
N-AT8	12:47am	43 45 adjusted	49	2.5 / 021	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion c

onditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 11 and 12 Feb 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:37am	IA	37	2.3 / 025	Yes	D	No
N-AT2	10:51pm	IA	35	2.2 / 007	Yes	E	No
N-AT3	11:27pm	IA	40	2.6 / 016	Yes	D	No
N-AT4	11:55pm	23	38	2.6 / 026	Yes	D	No
N-AT5	12:18am	26	37	2.5 / 015	Yes	D	No
N-AT6	1:14am	IA	35	2.6 / 024	Yes	D	No
N-AT7	10:08pm	27	37	2.2 / 006	Yes	E	No
N-AT8	12:47am	39 41 adjusted	43	2.5 / 021	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 11 and 12 Feb 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:37am	35	40	No
N-AT2	10:51pm	IA	40	No
N-AT3	11:27pm	IA	40	No
N-AT4	11:55pm	23	40	No
N-AT5	12:18am	26	40	No
N-AT6	1:14am	30	40	No
N-AT7	10:08pm	27	40	No
N-AT8	12:47am	44	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA- inaudible; and **Bold** results indicate exceedance of criteria.*
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

11. Blast Monitoring

There were nine (9) blast events (a total of 22 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – February 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
02/02/26	16:13	0.18 mm/s	111.7 DBL	0.21 mm/s	113.4 DBL	Y
06/02/26	15:19	0.17 mm/s	91.9 DBL	0.23 mm/s	95.8 DBL	Y
09/02/26	14:09	0.87 mm/s	97.2 DBL	0.47 mm/s	100.5 DBL	Y
11/02/26	15:32	0.26 mm/s	95.9 DBL	0.17 mm/s	97.8 DBL	Y
12/02/26	15:52	0.19 mm/s	95.9 DBL	0.14 mm/s	98 DBL	Y
19/02/26	11:24	0.65 mm/s	98.2 DBL	0.56 mm/s	101.4 DBL	Y
23/02/26	11:22	0.19 mm/s	95.9 DBL	0.14 mm/s	98 DBL	Y
24/02/26	12:58	0.45 mm/s	93.6 DBL	0.51 mm/s	97.9 DBL	Y
28/02/26	10:52	1.28 mm/s	104.8 DBL	0.53 mm/s	110.1 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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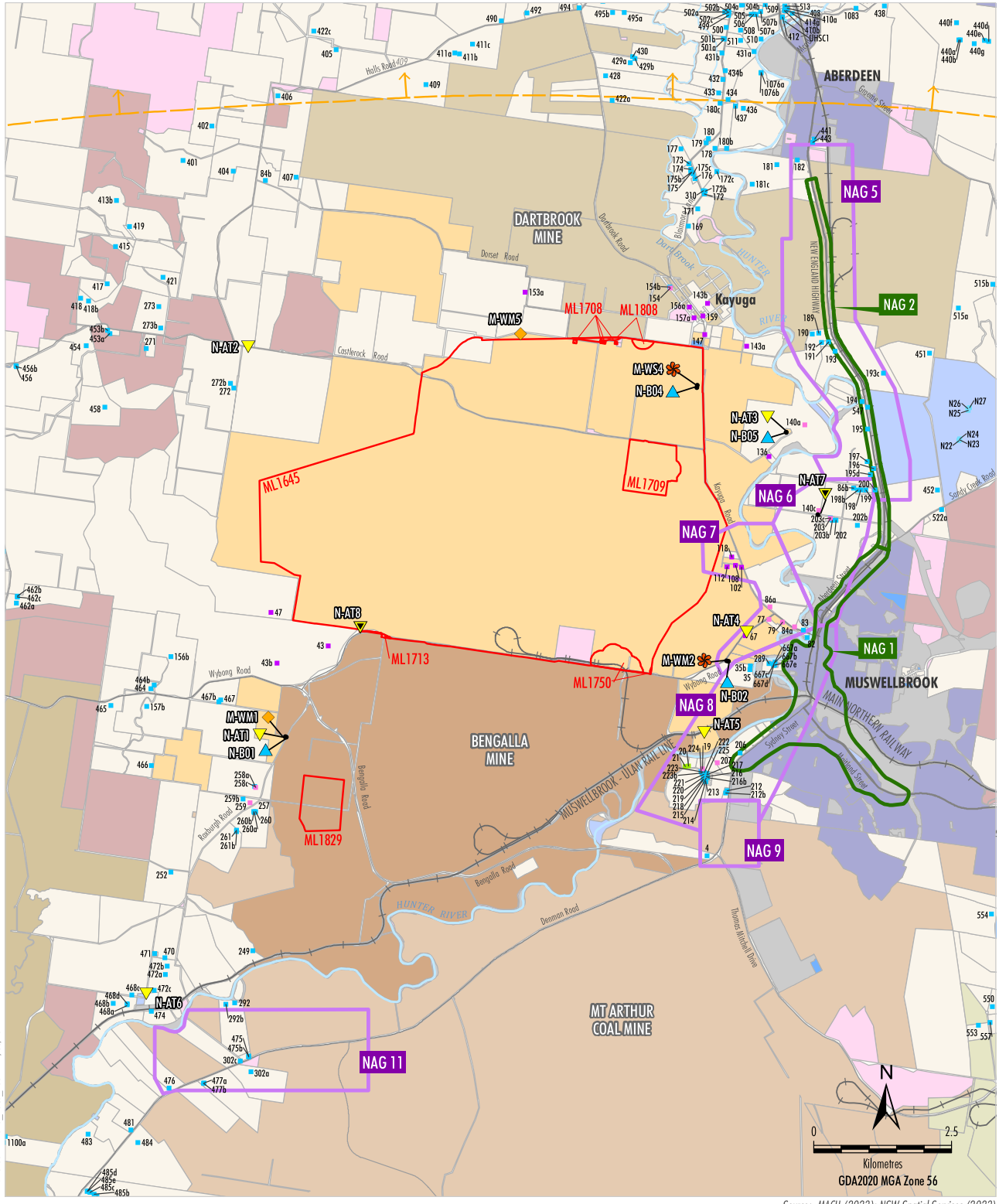


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

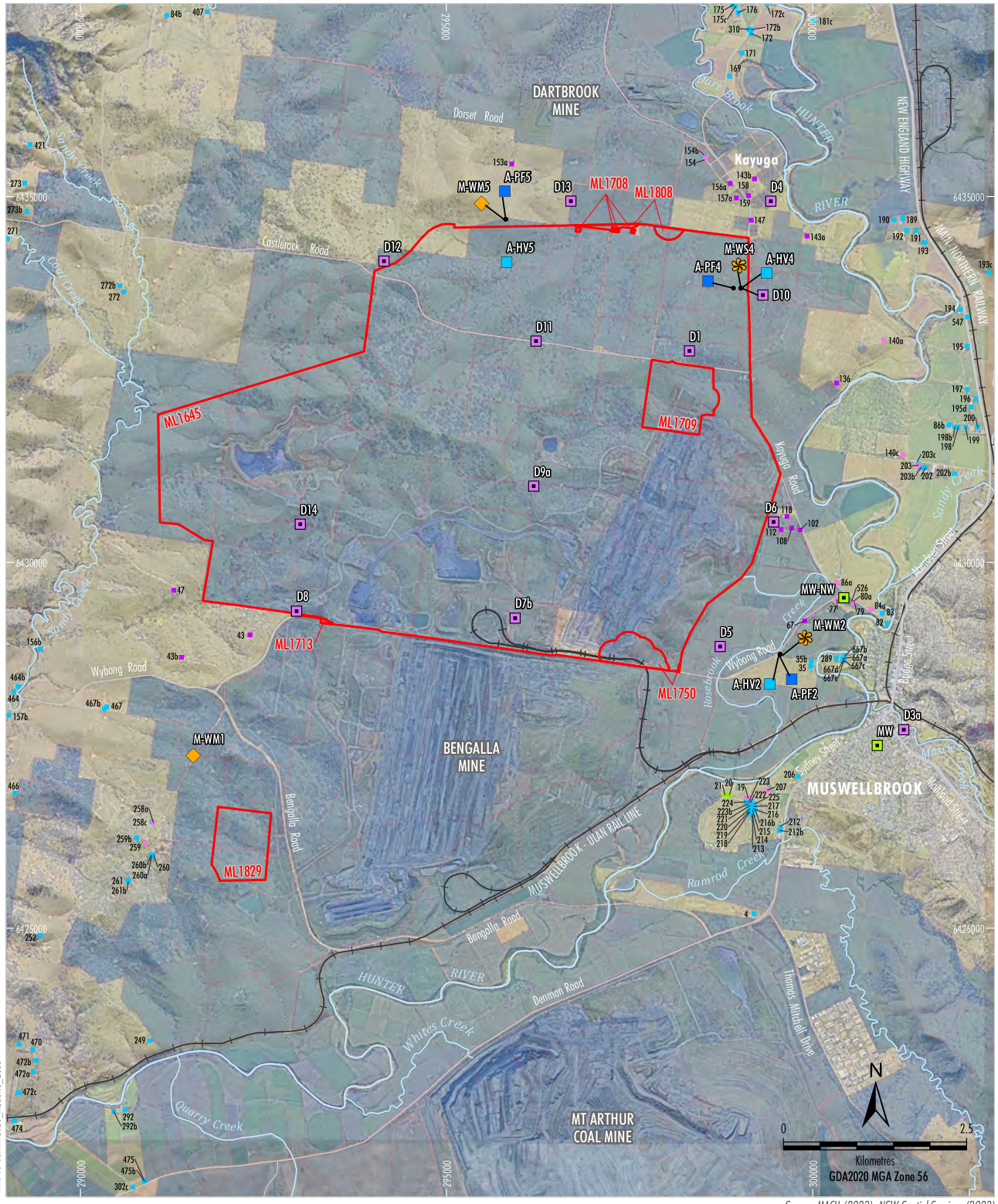
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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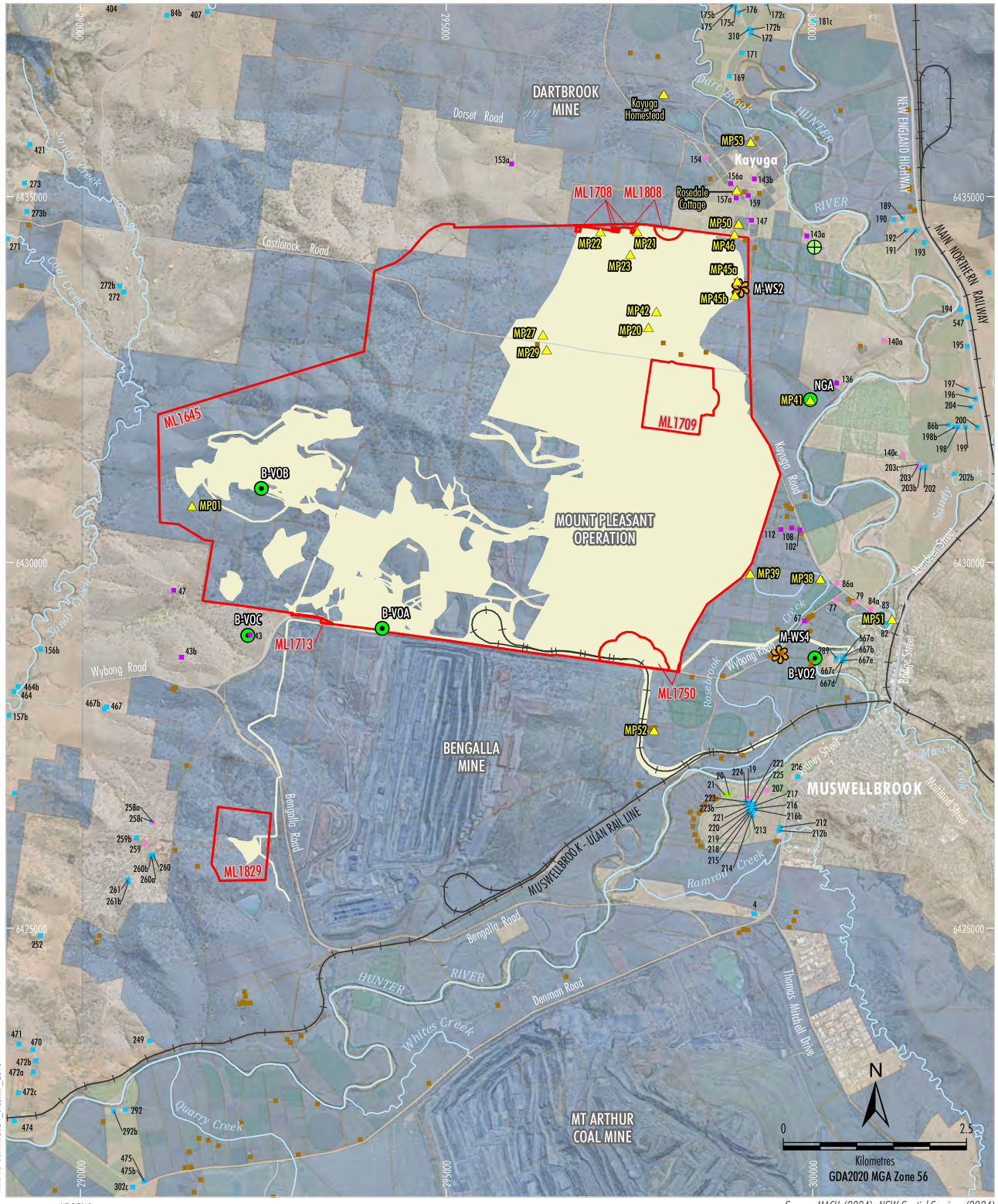
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

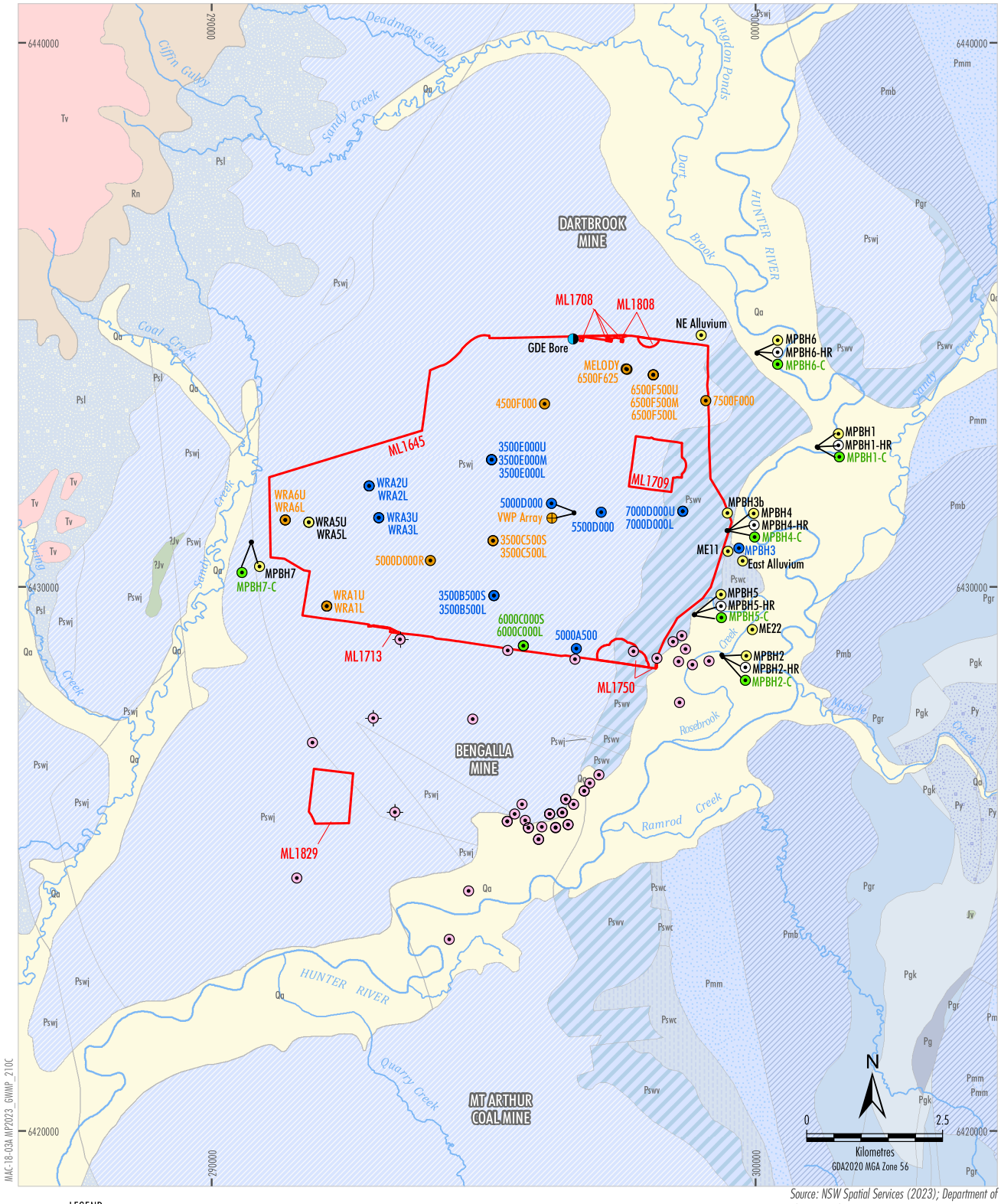
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

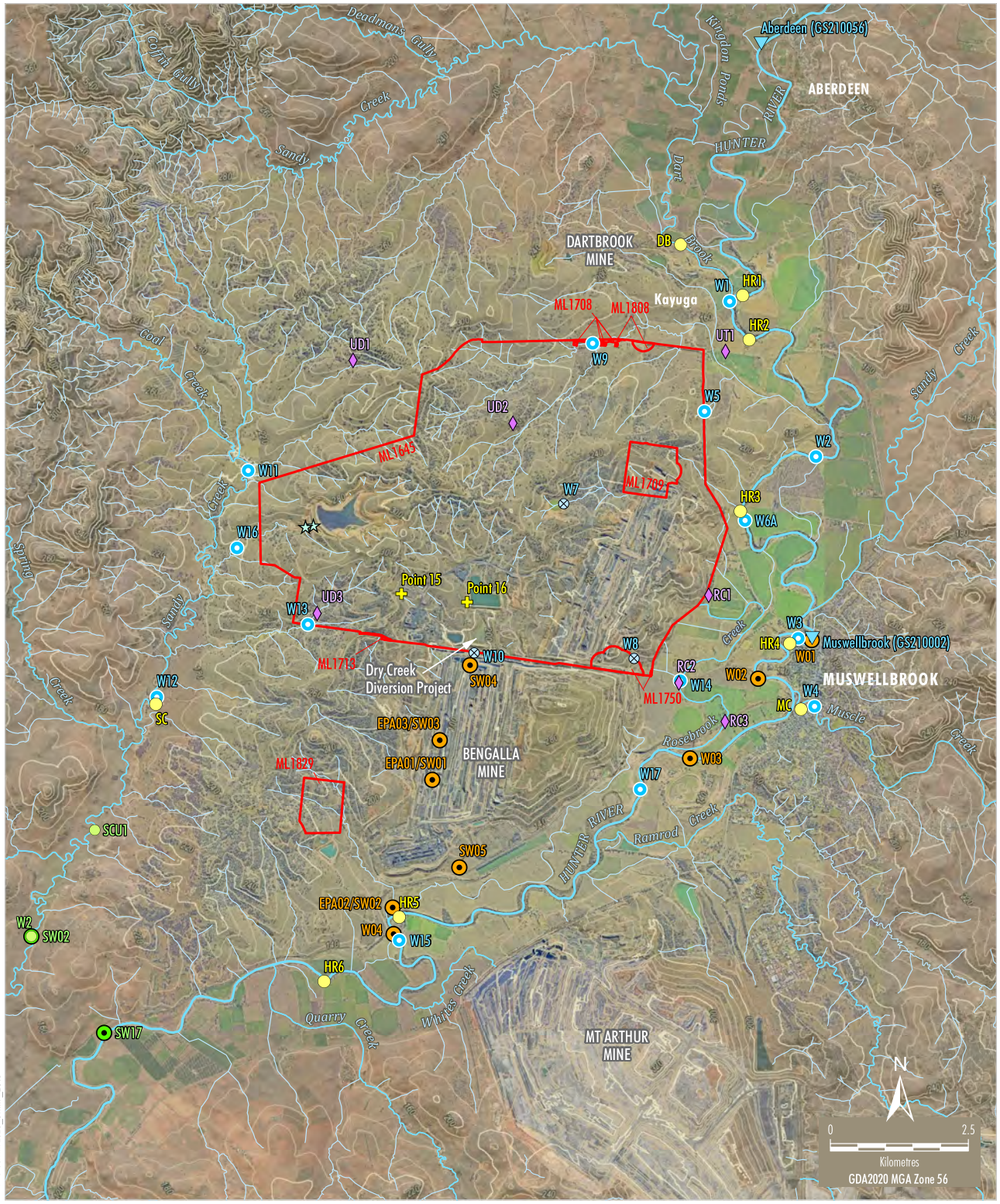
- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

MACHEnergy

MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

March 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 March 2026
Reporting Period End Date	31 March 2026
Date All Data Received	16 April 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout March 2026, there was 20.8mm at M-WS2 and 28.6mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued. Site D7b has now been mined through, therefore results from this monitor will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – March 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	7.6	**5.0**
D3	2.3	1.6
D4	1.2	1.3
D5a	2.3	2.7
D6	2.1	2.4
D8	11.7	**7.0**
D9a	5.5	3.6
D10	2.7	2.1
D11	5.1	**4.2**
D12	2.5	1.4
D13	3.9	2.2
D14	6.3	3.7
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

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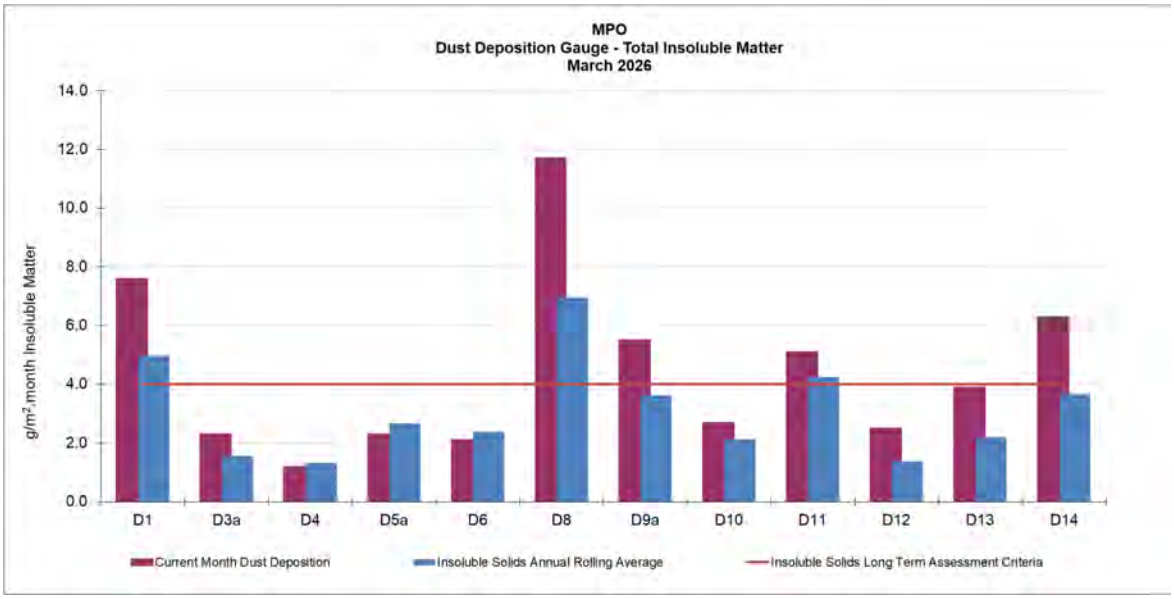

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.
TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2.

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Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – March 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
02/03/2026	-	79.5	161	222
08/03/2026	-	36.7	105	40
14/03/2026	-	58.5	109	64.9
20/03/2026	-	31.4	93.1	46.5
26/03/2026	-	46.8	31.7	27.9
Monthly Average	-	50.6	100	80.3
Annual Rolling Average	90	62	60	61

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average March 2026

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/03/2026	9.90	9.50	14.26
02/03/2026	19.85	41.73	49.24
03/03/2026	19.69	20.04	21.46
04/03/2026	18.10	20.99	15.66
05/03/2026	16.81	30.82	30.85
06/03/2026	24.66	35.01	34.81
07/03/2026	25.08	-	23.05
08/03/2026	9.81	-	14.03
09/03/2026	8.08	9.84	10.47
10/03/2026	11.48	16.36	17.79
11/03/2026	21.81	15.19	12.06
12/03/2026	34.55	94.91	28.11
13/03/2026	20.03	17.75	19.75
14/03/2026	16.49	16.35	19.69
15/03/2026	23.32	22.00	22.45
16/03/2026	23.38	25.62	20.55
17/03/2026	30.85	29.44	25.52
18/03/2026	17.39	26.41	22.02
19/03/2026	12.64	13.17	14.33
20/03/2026	13.52	14.67	16.61
21/03/2026	10.90	10.60	14.27
22/03/2026	12.69	11.26	16.61
23/03/2026	8.98	10.97	16.82
24/03/2026	12.70	15.87	19.26
25/03/2026	16.81	19.47	17.58
26/03/2026	13.62	11.97	8.64
27/03/2026	15.75	7.68	6.16
28/03/2026	14.03	11.80	16.11
29/03/2026	10.77	11.89	15.90
30/03/2026	14.55	18.21	21.77
31/03/2026	16.84	21.35	28.75

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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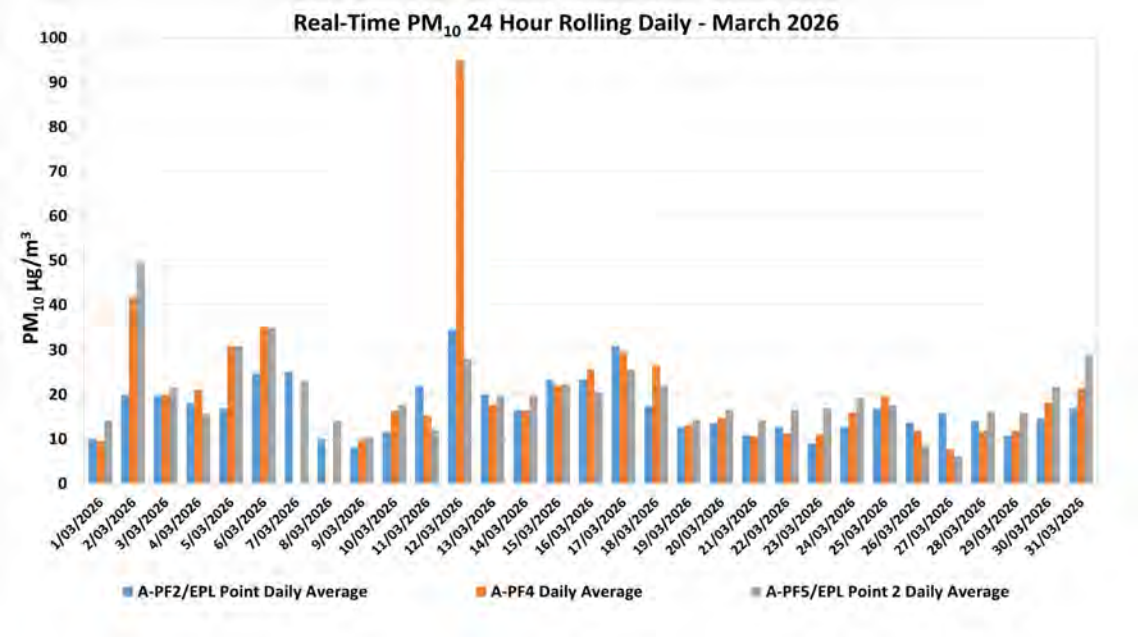

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for March 2026.

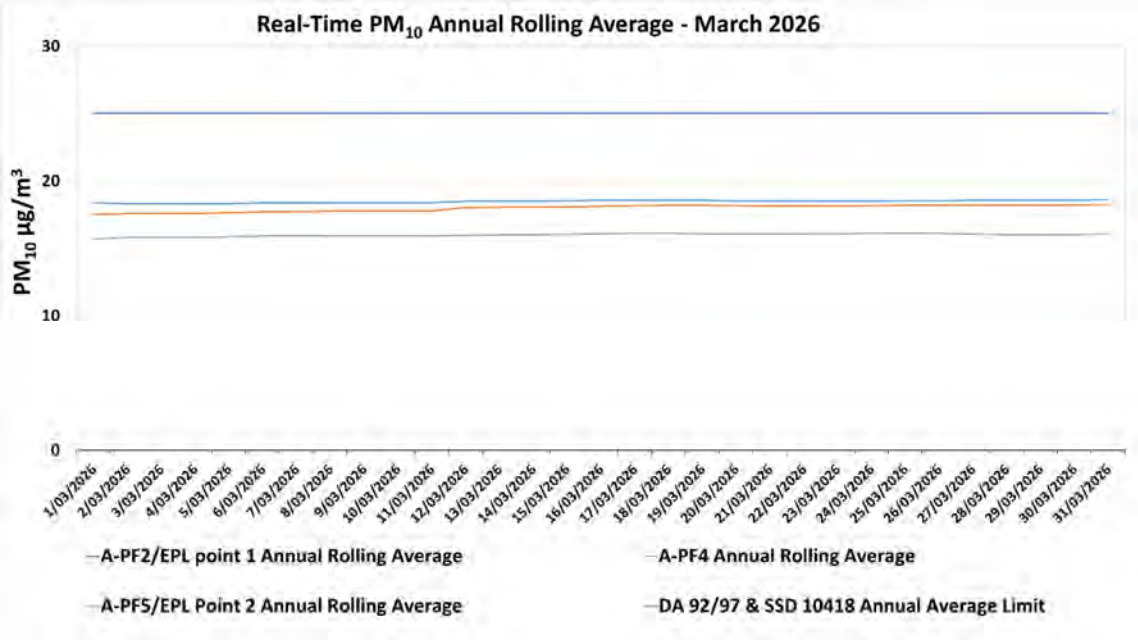

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for March 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – March 2026

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2
	24-hour Average Result		
01/03/2026	3.98	4.05	4.42
02/03/2026	4.73	6.41	7.47
03/03/2026	5.29	5.52	5.34
04/03/2026	5.24	5.63	4.79
05/03/2026	5.35	7.13	6.47
06/03/2026	7.09	9.25	7.56
07/03/2026	8.83	-	8.38
08/03/2026	3.86	-	4.34
09/03/2026	3.35	3.50	3.99
10/03/2026	4.20	4.72	5.11
11/03/2026	5.10	4.67	4.14
12/03/2026	6.77	12.68	6.31
13/03/2026	6.11	6.27	5.95
14/03/2026	4.97	5.13	5.44
15/03/2026	5.23	5.35	5.27
16/03/2026	4.95	5.42	4.62
17/03/2026	5.73	5.92	5.27
18/03/2026	6.04	7.01	6.49
19/03/2026	5.43	5.66	6.14
20/03/2026	5.94	6.78	6.65
21/03/2026	4.00	4.10	4.55
22/03/2026	3.88	3.92	4.76
23/03/2026	3.40	3.65	4.50
24/03/2026	4.37	4.80	5.89
25/03/2026	4.81	5.42	5.27
26/03/2026	4.06	3.98	3.38
27/03/2026	3.96	2.84	2.62
28/03/2026	3.91	3.68	4.06
29/03/2026	3.75	4.13	4.39
30/03/2026	4.45	4.93	5.54
31/03/2026	5.00	5.01	5.91

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

*****Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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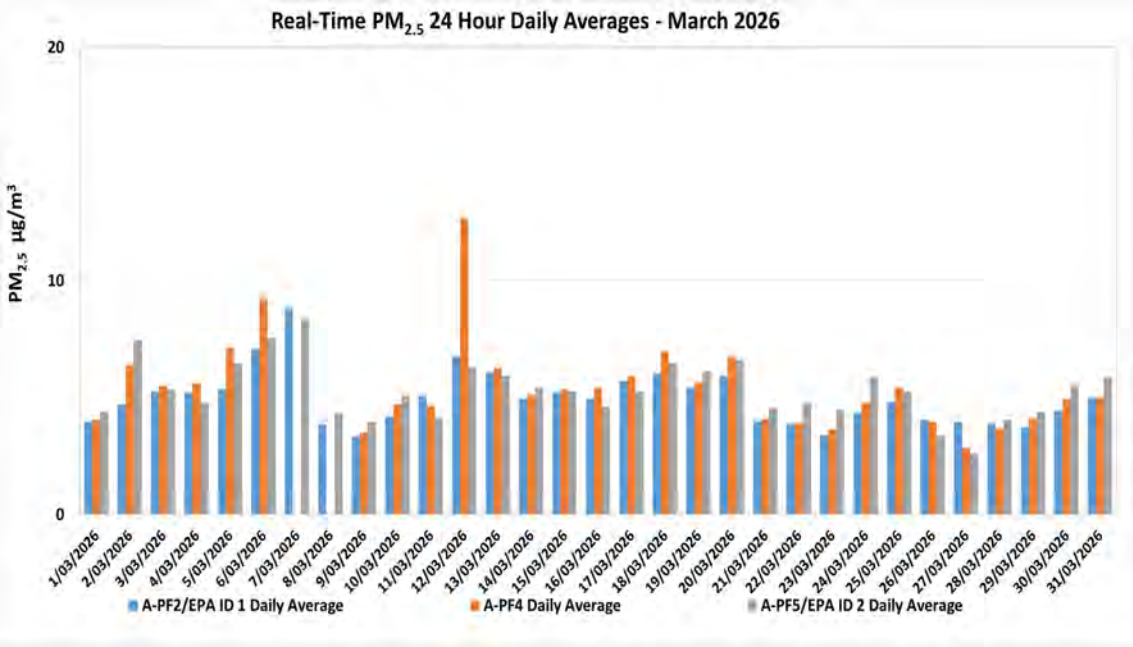

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for March 2026.

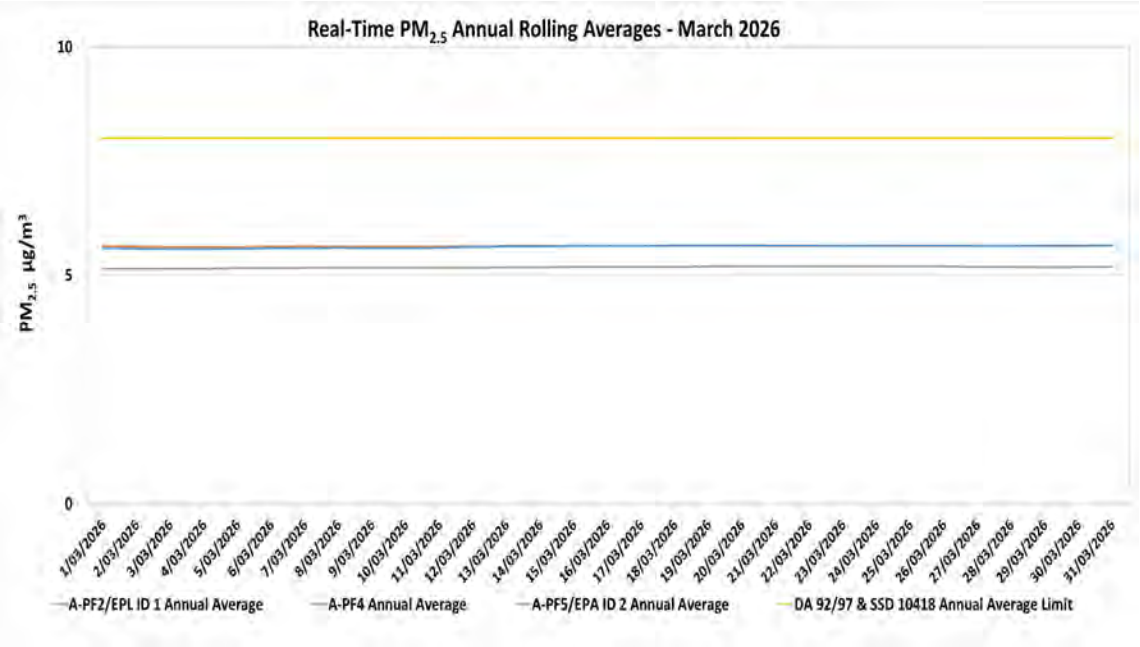

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for March 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

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Table 8-1 – MPO Monthly Surface Water Monitoring Results – 31 March 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.9	414	228	9
W2	7.8	426	239	11
W6A	8.0	428	240	12
W15	8.0	**493**	271	21
W17	7.9	493	260	19
Sandy Creek				
W11 (Upstream Reference Site)	**8.1**	3720	2110	<5
W12	8.0	4520	2490	7
Muscle Creek				
W4 (Upstream Reference Site)	7.7	**2640**	1680	**12**
Unnamed Tributaries				
W3	7.9	457	249	17
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	*	*	*	*

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access.

9. Noise Monitoring

9.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

9.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

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Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 30 and 31 March 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:36am	IA	45	0.5 / 130	Yes	F	No
N-AT2	10:54pm	26	45	2.9 / 166	Yes	D	No
N-AT3	11:30pm	33	45	3.3 / 162	Yes	D	NA
N-AT4	11:57pm	IA	45	1.2 / 211	Yes	D	No
N-AT5	12:20am	IA	45	1.2 / 204	Yes	D	No
N-AT6	1:13am	IA	45	0.6 / 271	Yes	F	No
N-AT7	10:13pm	IA	45	3.1 / 165	Yes	D	NA
N-AT8	12:46am	35	49	0.9 / 227	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 30 and 31 March 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:36am	IA	37	0.5 / 130	Yes	F	No
N-AT2	10:54pm	21	35	2.9 / 166	Yes	D	No
N-AT3	11:30pm	28	40	3.3 / 162	Yes	D	NA
N-AT4	11:57pm	IA	38	1.2 / 211	Yes	D	No
N-AT5	12:20am	IA	37	1.2 / 204	Yes	D	No
N-AT6	1:13am	IA	35	0.6 / 271	Yes	F	No
N-AT7	10:13pm	IA	37	3.1 / 165	Yes	D	NA
N-AT8	12:46am	31	43	0.9 / 227	Yes	D	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
*IA = inaudible; and **Bold** results indicate exceedance of criteria.*
NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 30 and 31 March 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:36am	40	40	No
N-AT2	10:54pm	21	40	No
N-AT3	11:30pm	28	40	NA[1]
N-AT4	11:57pm	IA	40	No
N-AT5	12:20am	IA	40	No
N-AT6	1:13am	29	40	No
N-AT7	10:13pm	IA	40	NA[1]
N-AT8	12:46am	40	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible, or if MPO is inaudible, the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
*IA- inaudible; and **Bold** results indicate exceedance of criteria.*
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

10. Blast Monitoring

There were ten (10) blast events (a total of 32 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – March 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
3/03/26	10:32	0.26 mm/s	101.8 DBL	0.19 mm/s	93.7 DBL	Y
4/03/26	15:02	1.19 mm/s	99.5 DBL	0.47 mm/s	100.2 DBL	Y
6/03/26	14:02	0.11 mm/s	96.5 DBL	0.27 mm/s	102.2 DBL	Y
9/03/26	9:14	0.4 mm/s	95.5 DBL	0.17 mm/s	100.4 DBL	Y
13/03/26	14:16	1.14 mm/s	107.2 DBL	0.53 mm/s	115.1 DBL	Y
16/03/26	10:10	0.49 mm/s	90.9 DBL	0.27 mm/s	94.1 DBL	Y
19/03/26	13:36	1.45 mm/s	92.9 DBL	0.67 mm/s	94.9 DBL	Y
20/03/26	13:08	0.64 mm/s	98.6 DBL	1.02 mm/s	94.5 DBL	Y
23/03/26	15:11	0.38 mm/s	90.4 DBL	0.71 mm/s	90.5 DBL	Y
25/03/26	13:58	0.11 mm/s	89 DBL	0.19 mm/s	95.2 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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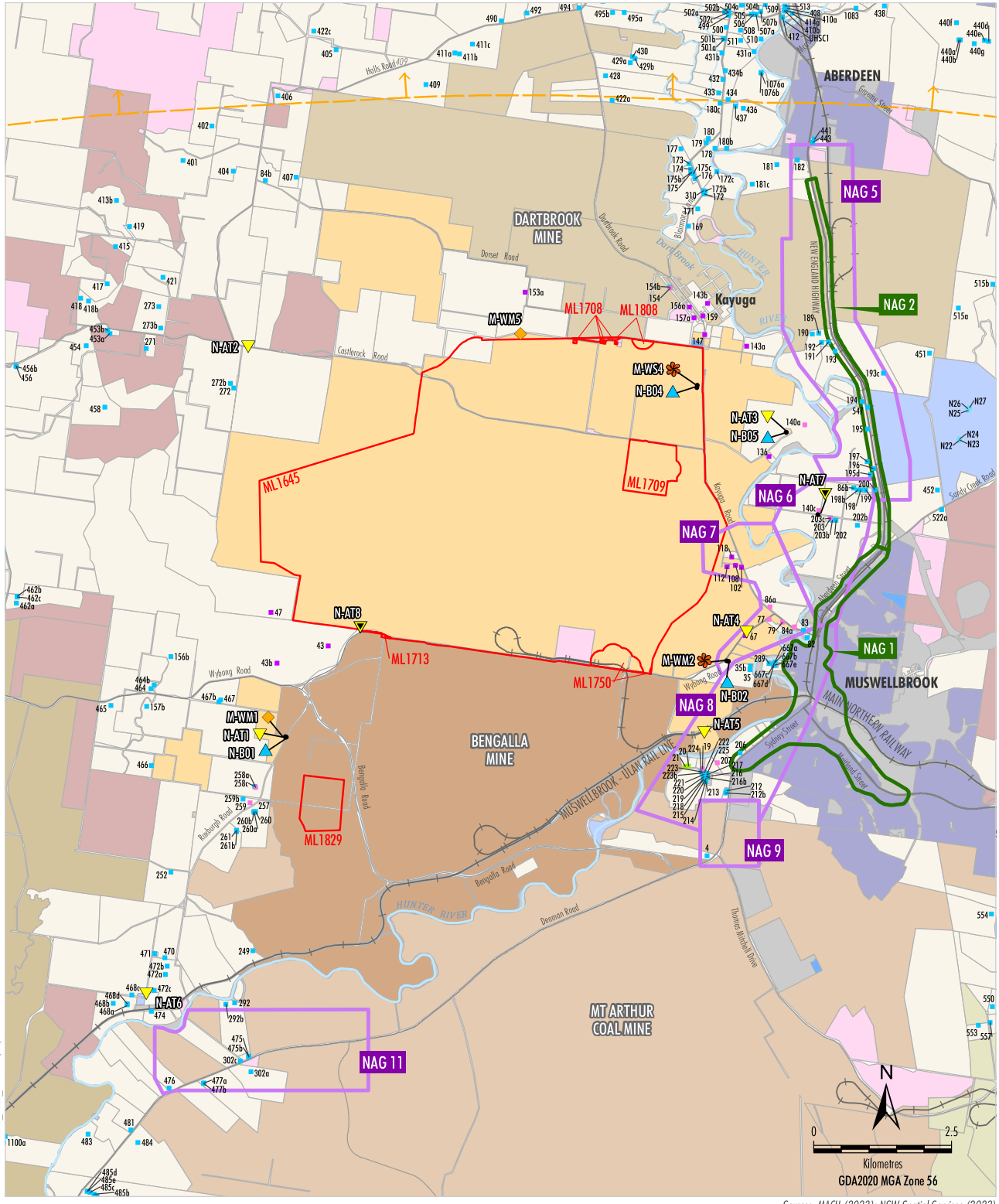


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

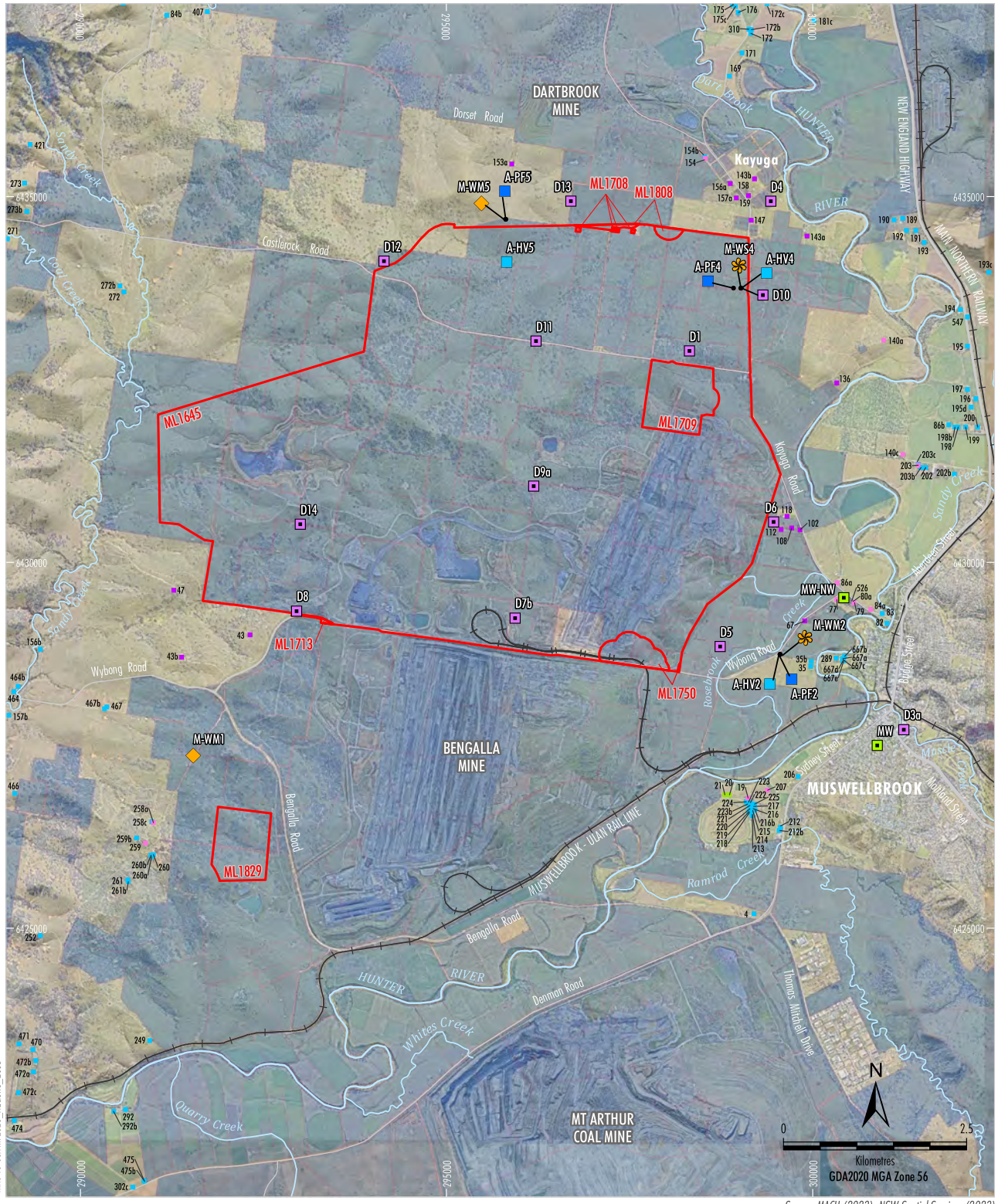
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

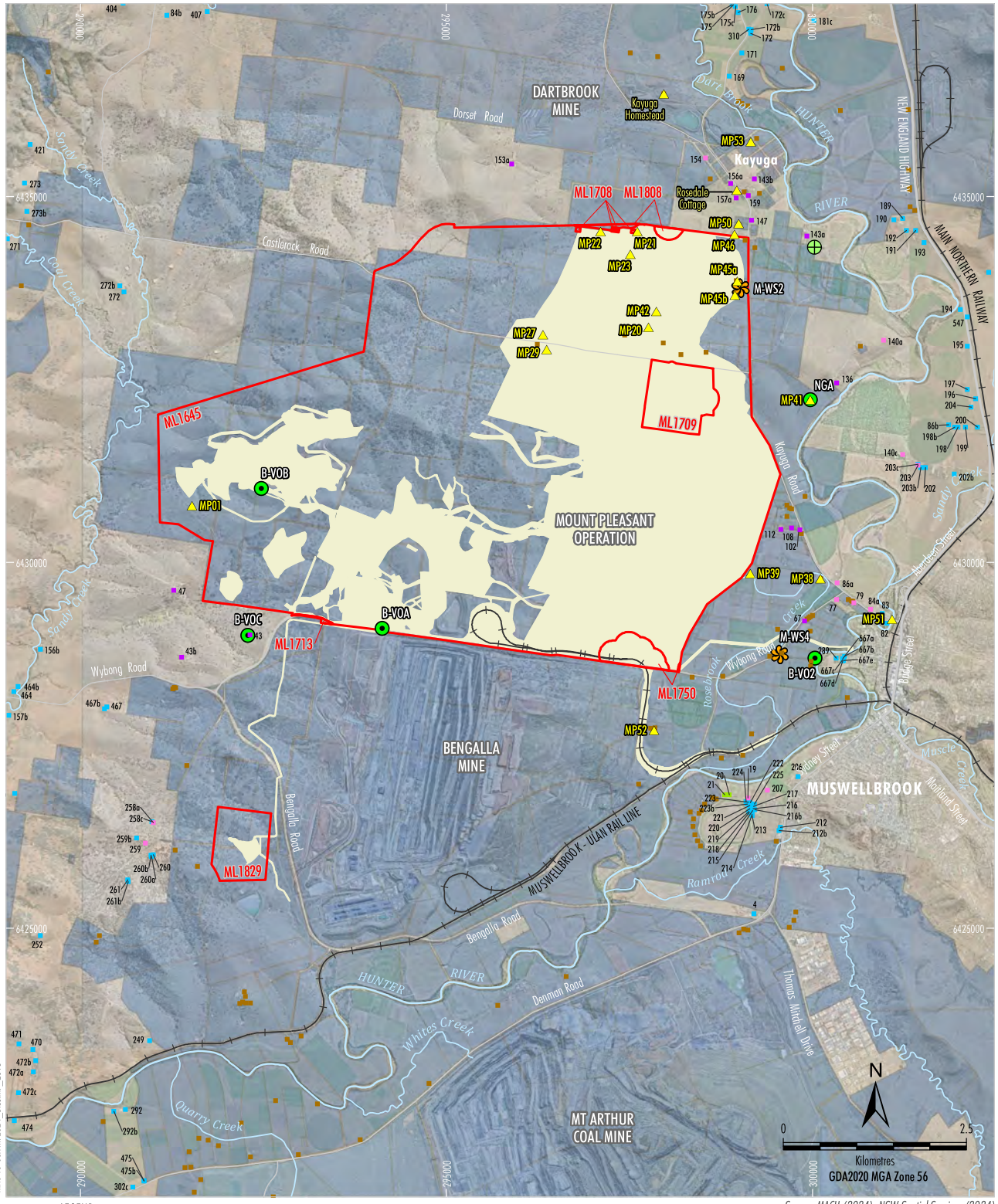
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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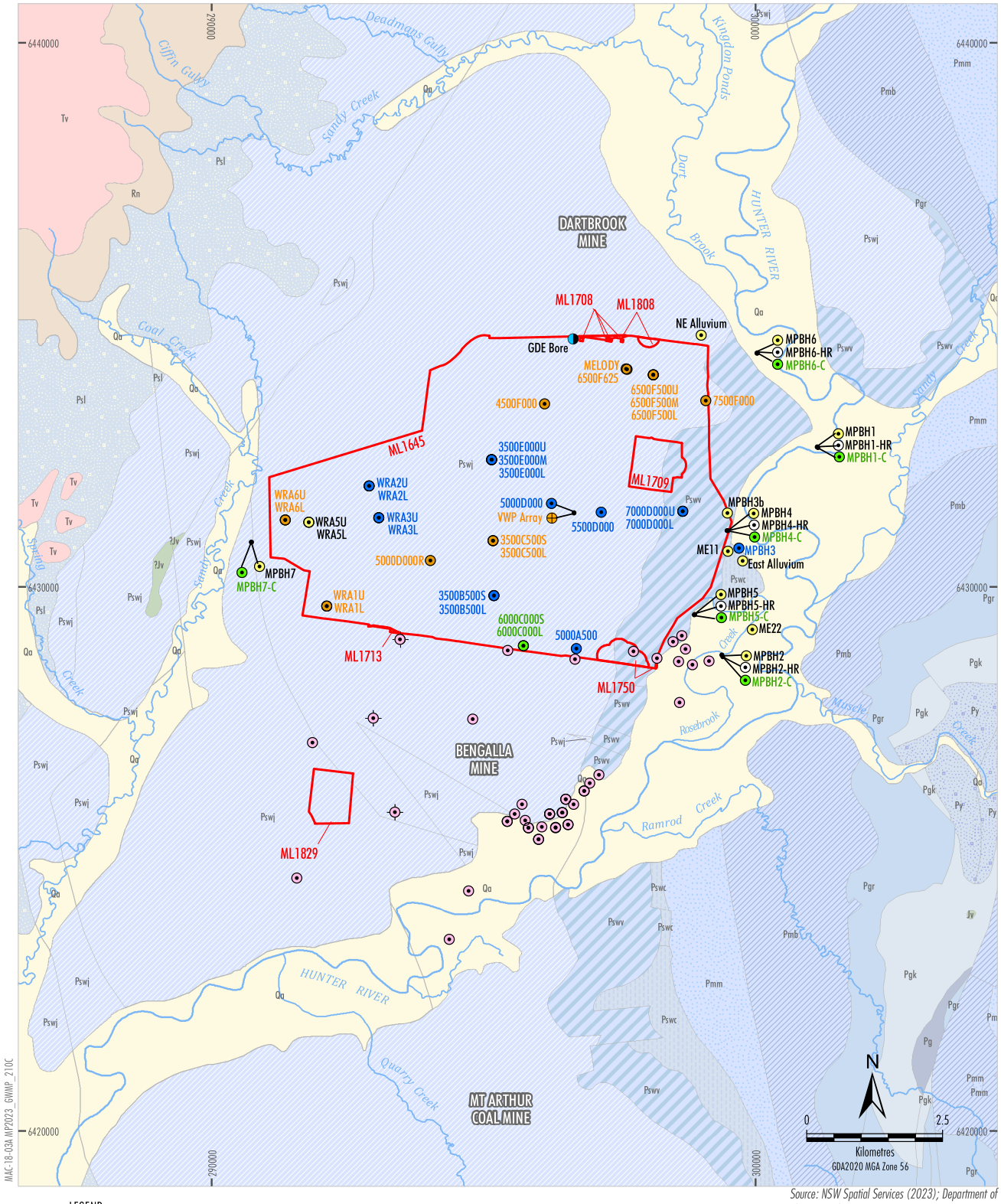
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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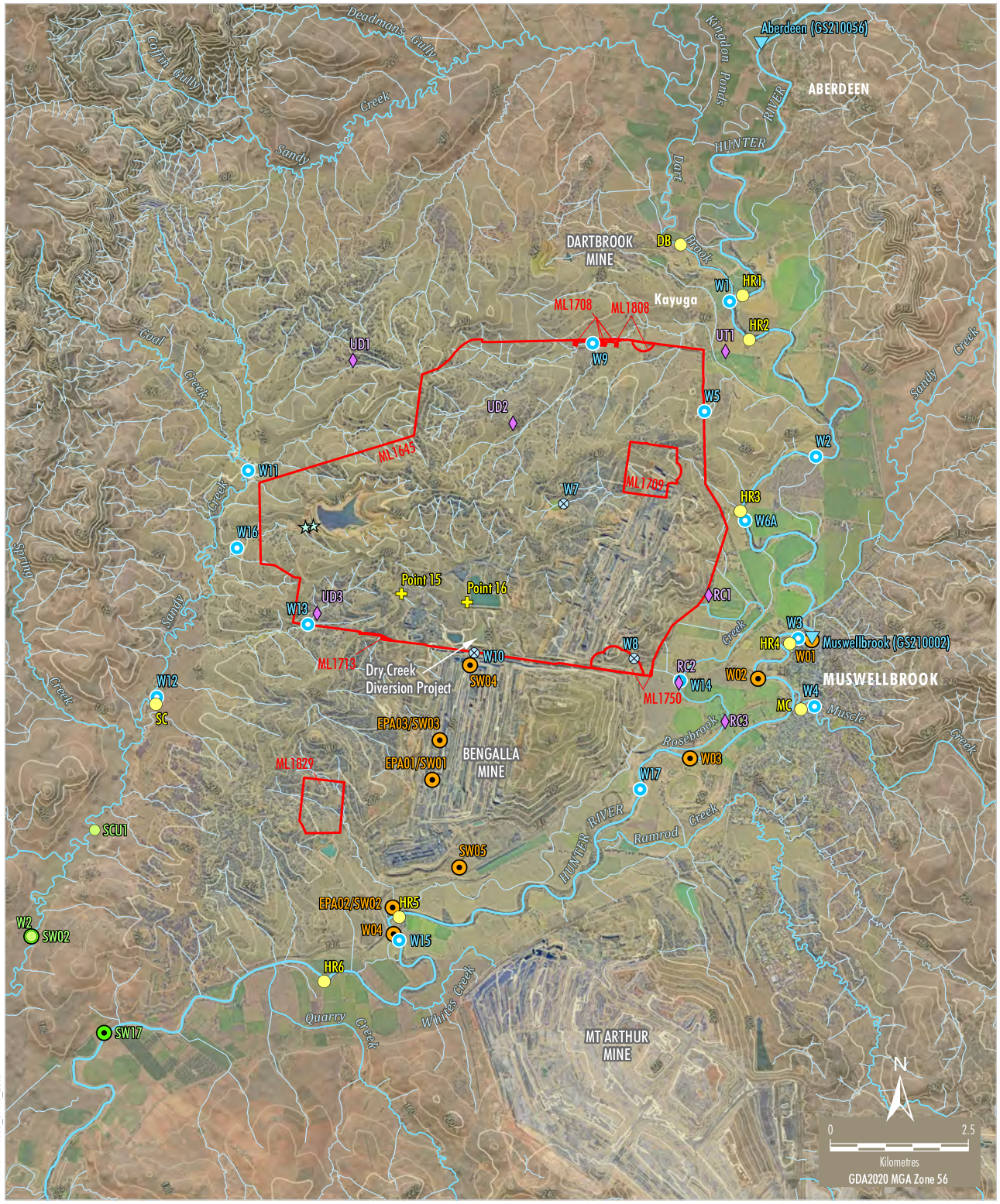
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

April 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 April 2026
Reporting Period End Date	30 April 2026
Date All Data Received	20 May 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout April 2026, there was 0.6mm at M-WS2 and 0mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 is located within close proximity to the North Opencut Pit and isn't considered representative of residential receivers. D1 will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

Site D7b has now been mined through, therefore results from this monitor will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – April 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	19.1	**6.0**
D3	2.7	1.7
D4	1.2	1.3
D5a	3.7	2.8
D6	4.2	2.6
D8	11.3	**7.5**
D9a	4.4	3.6
D10	2.5	2.2
D11	6.9	**4.3**
D12	1.8	1.4
D13	3.2	2.1
D14	5.1	3.8
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

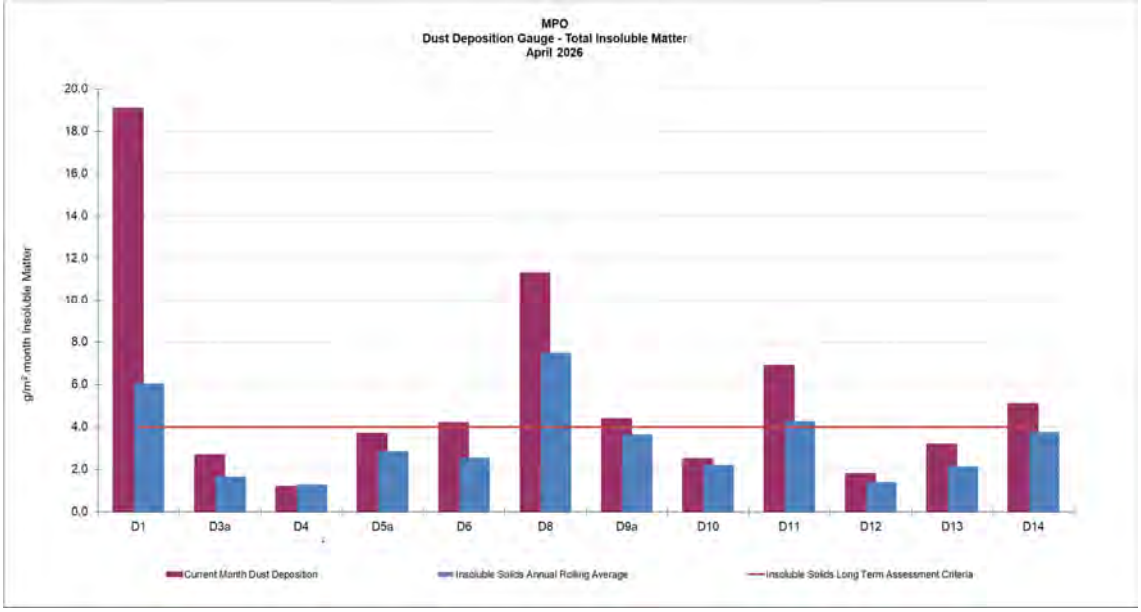

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – April 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
01/04/2026	-	56.8	107	85.4
07/04/2026	-	149	57.1	59.2
13/04/2026	-	115	59.4	92.6
19/04/2026	-	77.2	137	84.6
25/04/2026	-	28.8	87.6	36.7
Monthly Average	-	85.4	89.6	71.7
Annual Rolling Average	90	66	63	64

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average April 2026

Date	A-PF2/ EPA ID 1	A-PF4[1]	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/04/2026	20.70	17.62	26.39
02/04/2026	26.98	22.72	31.34
03/04/2026	22.44	21.36	26.31
04/04/2026	17.15	18.22	21.98
05/04/2026	11.47	11.64	17.56
06/04/2026	14.63	14.24	27.26
07/04/2026	19.70	22.28	20.85
08/04/2026	24.09	40.12	13.91
09/04/2026	32.47	36.80	23.10
10/04/2026	28.54	51.65	16.54
11/04/2026	21.74	40.83	13.66
12/04/2026	13.24	40.20	10.15
13/04/2026	16.86	26.01	10.76
14/04/2026	36.79	28.06	23.36
15/04/2026	48.09	33.73	47.29
16/04/2026	33.37	38.49	27.49
17/04/2026	22.36	42.92	14.55
18/04/2026	21.79	30.33	18.86
19/04/2026	22.03	21.97	25.43
20/04/2026	28.77	21.80	32.56
21/04/2026	35.62	22.72	38.03
22/04/2026	26.84	18.86	27.99
23/04/2026	39.11	18.89	30.59
24/04/2026	27.21	-	28.58
25/04/2026	14.86	-	16.19
26/04/2026	11.38	-	20.82
27/04/2026	15.25	-	21.92
28/04/2026	20.17	-	21.59
29/04/2026	29.58	-	23.57
30/04/2026	28.70	-	20.51

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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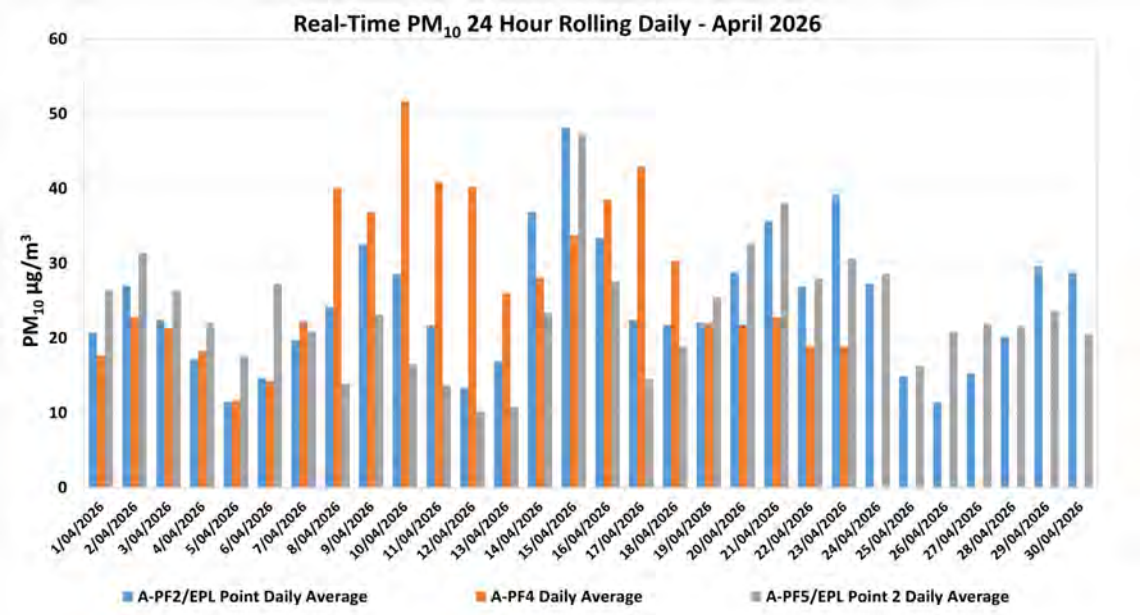

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for April 2026.

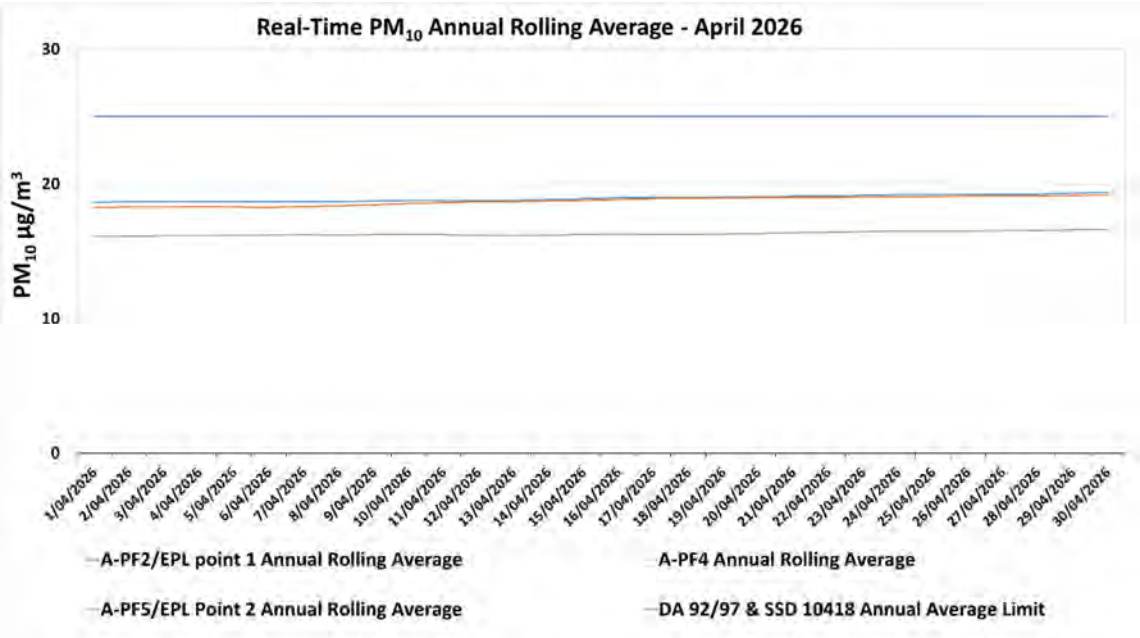

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for April 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – April 2026

Date	A-PF2/EPA ID 1	A-PF4[1]	A-PF5/EPA ID 2
	24-hour Average Result		
01/04/2026	5.36	5.67	6.02
02/04/2026	6.84	6.53	6.96
03/04/2026	6.82	6.47	6.61
04/04/2026	7.30	6.95	7.36
05/04/2026	5.05	4.75	5.80
06/04/2026	4.73	4.42	6.70
07/04/2026	5.09	4.98	5.12
08/04/2026	5.15	6.46	3.89
09/04/2026	6.35	6.64	5.18
10/04/2026	5.77	8.06	4.36
11/04/2026	5.31	7.15	4.17
12/04/2026	3.86	5.98	3.39
13/04/2026	4.44	5.54	3.67
14/04/2026	6.72	5.86	5.20
15/04/2026	8.71	7.16	8.37
16/04/2026	10.24	8.38	8.61
17/04/2026	5.36	7.06	4.43
18/04/2026	5.55	6.03	5.17
19/04/2026	6.04	5.87	6.09
20/04/2026	7.00	6.13	7.15
21/04/2026	6.82	5.57	7.04
22/04/2026	5.44	4.75	5.61
23/04/2026	6.69	4.85	6.04
24/04/2026	5.60	-	6.15
25/04/2026	4.82	-	4.80
26/04/2026	4.02	-	5.10
27/04/2026	4.42	-	5.03
28/04/2026	4.48	-	4.52
29/04/2026	5.05	-	4.84
30/04/2026	5.27	-	4.95

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)

***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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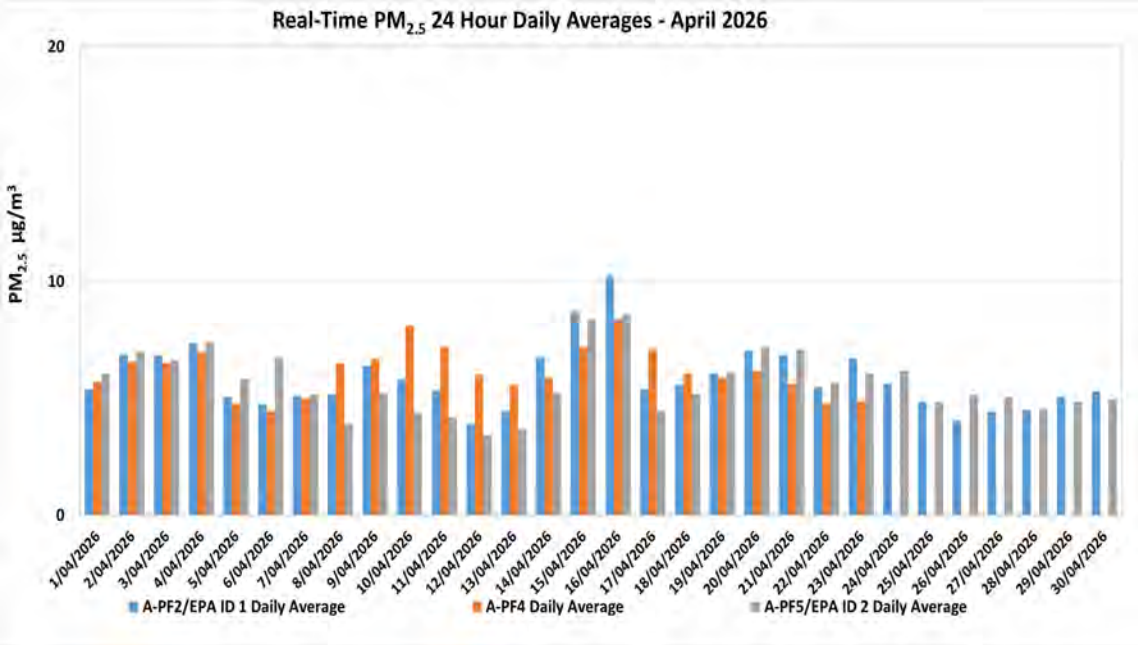

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for April 2026.

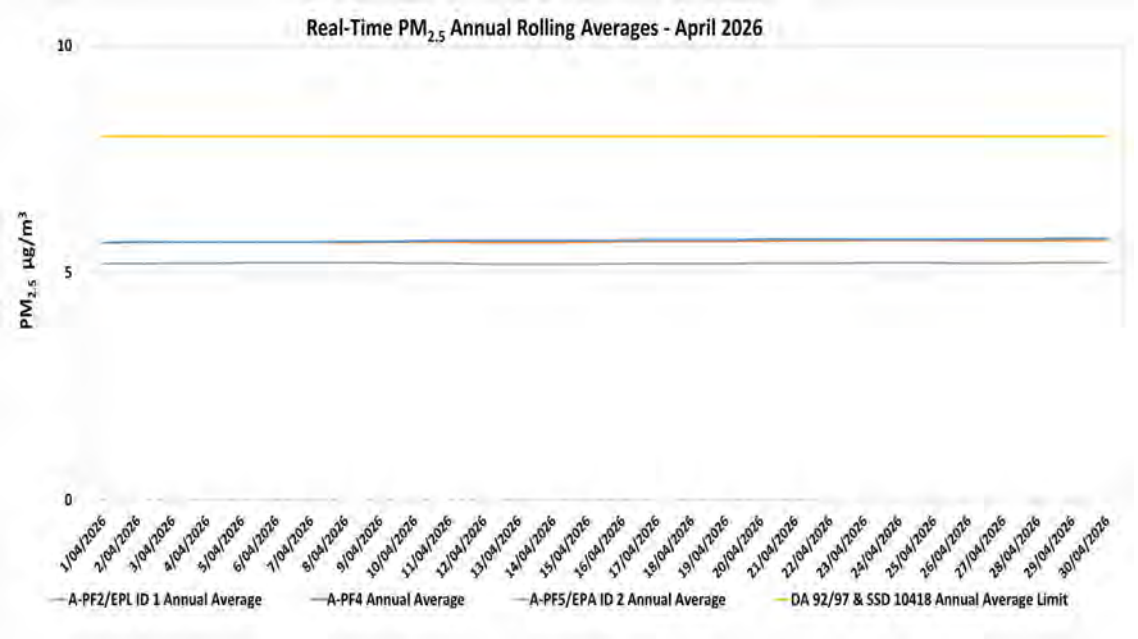

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for April 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of days throughout the reporting period when adverse conditions were triggered leading to a shutdown event, in accordance with EPL Condition O3.4.

Table 7-1 Dust Shutdowns MPO- April 2026

Date	Time Dust Generating Activities were Ceased	Time Dust Generating Activities were Resumed	Shutdown Hours	Muswellbrook NW 24- hour rolling PM10 Average (µg/m^3)	Wind Direction (°)
08/04/2026	14:40	15:40	1	44.6	280
11/04/2026	0:40	2:40	2	46	263
11/04/2026	7:40	11:40	4	50.9	304
12/04/2026	1:40	2:40	1	44.4	271
12/04/2026	17:40	19:40	2	44.1	279
18/04/2026	7:35	8:35	1	44.3	255

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8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

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8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 30 April 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	**8.5**	398	220	<5
W2	7.9	408	215	<5
W6A	8.2	409	224	<5
W15	8.0	442	252	13
W17	7.9	428	243	8
Sandy Creek				
W11 (Upstream Reference Site)	**8.2**	3810	2080	9
W12	8.1	4730	2570	8
Muscle Creek				
W4 (Upstream Reference Site)	7.7	**2990**	1860	10
Unnamed Tributaries				
W3	8.0	429	230	12
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	*	*	*	*

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access.

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9. Noise Monitoring

9.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

9.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 21 and 22 April 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:29am	IA	45	0.9 / 088	Yes	D	No
N-AT2	11:15pm	31	45	1.7 / 166	Yes	D	No
N-AT3	11:54pm	29	45	0.7 / 109	Yes	D	No
N-AT4	12:20am	IA	45	0.9 / 097	Yes	F	No
N-AT5	12:41am	IA	45	1.1 / 019	Yes	D	No
N-AT6	1:54am	IA	45	0.2 / 187	Yes	F	No
N-AT7	10:33pm	IA	45	1.9 / 158	Yes	E	No
N-AT8	1:08am	43	49	0.7 / 115	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 21 and 22 April 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:29am	IA	37	0.9 / 088	Yes	D	No
N-AT2	11:15pm	26	35	1.7 / 166	Yes	D	No
N-AT3	11:54pm	25	40	0.7 / 109	Yes	D	No
N-AT4	12:20am	IA	38	0.9 / 097	Yes	F	No
N-AT5	12:41am	IA	37	1.1 / 019	Yes	D	No
N-AT6	1:54am	IA	35	0.2 / 187	Yes	F	No
N-AT7	10:33pm	IA	37	1.9 / 158	Yes	E	No
N-AT8	1:08am	39	43	0.7 / 115	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 21 and 22 April 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:29am	43	40	Yes
N-AT2	11:15pm	26	40	No
N-AT3	11:54pm	25	40	No
N-AT4	12:20am	IA	40	No
N-AT5	12:41am	32	40	No
N-AT6	1:54am	29	40	No
N-AT7	10:33pm	IA	40	No
N-AT8	1:08am	49	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

The cumulative mining noise at N-AT8 was in exceedance of the cumulative criteria as per the Development Consent DA 92/97 at monitoring location N-AT1 during the April monitoring period. During this exceedance, the Mount Pleasant Operation mining noise contributions were inaudible.

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10. Blast Monitoring

There were eleven (11) blast events (a total of 43 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – April 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
02/04/26	10:45	0.61 mm/s	102.7 DBL	0.9 mm/s	103.4 DBL	Y
07/04/26	9:05	0.22 mm/s	89.8 DBL	0.24 mm/s	99 DBL	Y
10/04/26	11:45	0.08 mm/s	90.4 DBL	0.13 mm/s	93.8 DBL	Y
13/04/26	9:05	0.39 mm/s	97.7 DBL	0.35 mm/s	97.3 DBL	Y
15/04/26	15:06	1.01 mm/s	88.6 DBL	1.06 mm/s	97.4 DBL	Y
18/04/26	14:43	0.1 mm/s	93.3 DBL	0.14 mm/s	95.9 DBL	Y
20/04/26	9:07	0.44 mm/s	86 DBL	0.41 mm/s	94 DBL	Y
23/04/26	11:19	0.37 mm/s	92.5 DBL	0.75 mm/s	95.6 DBL	Y
24/04/26	9:08	0.56 mm/s	103.9 DBL	0.27 mm/s	95.5 DBL	Y
28/04/26	10:58	1.06 mm/s	93.7 DBL	0.28 mm/s	94.1 DBL	Y
30/04/26	12:02	0.72 mm/s	99.2 DBL	0.480 mm/s	103.2 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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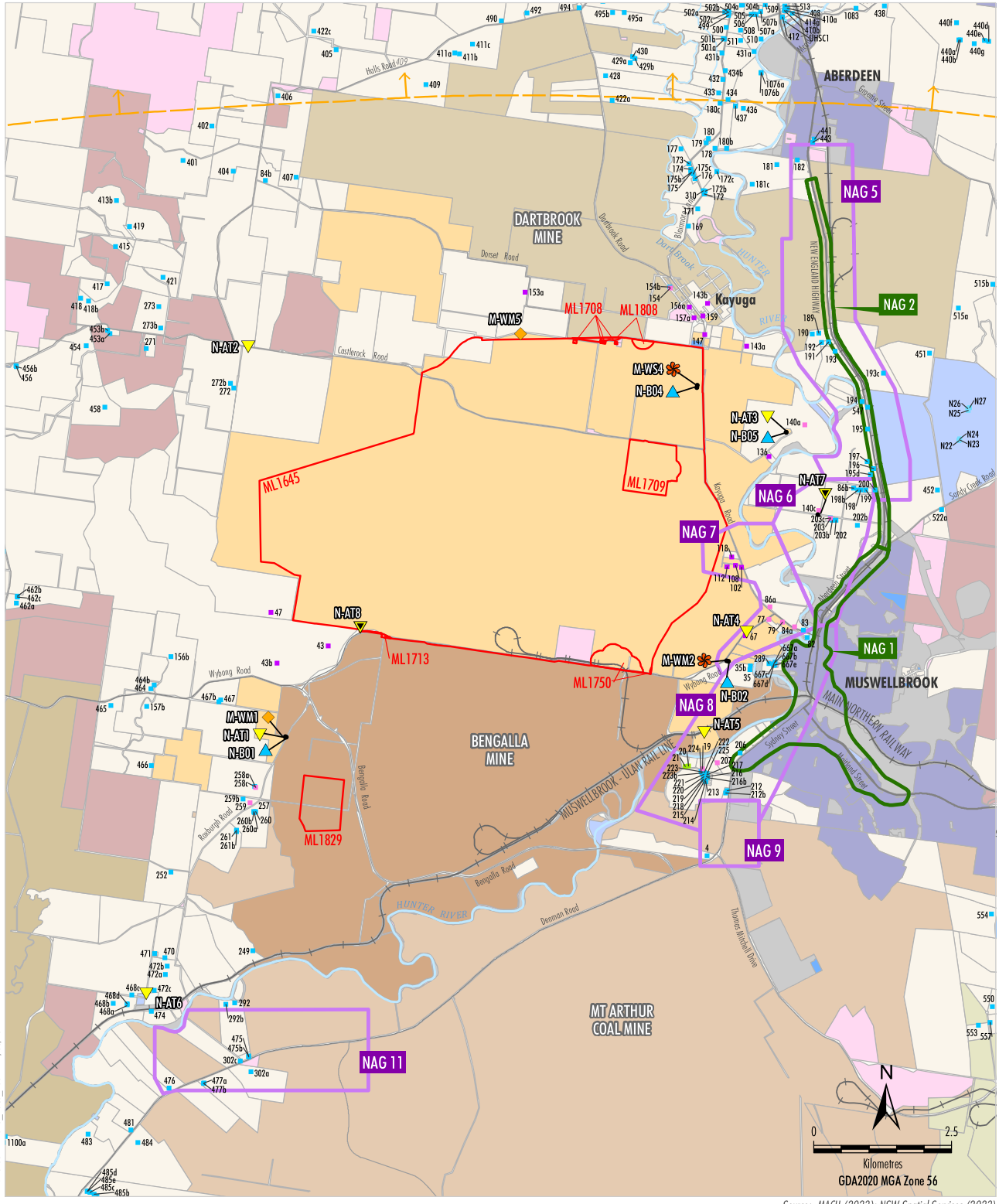


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

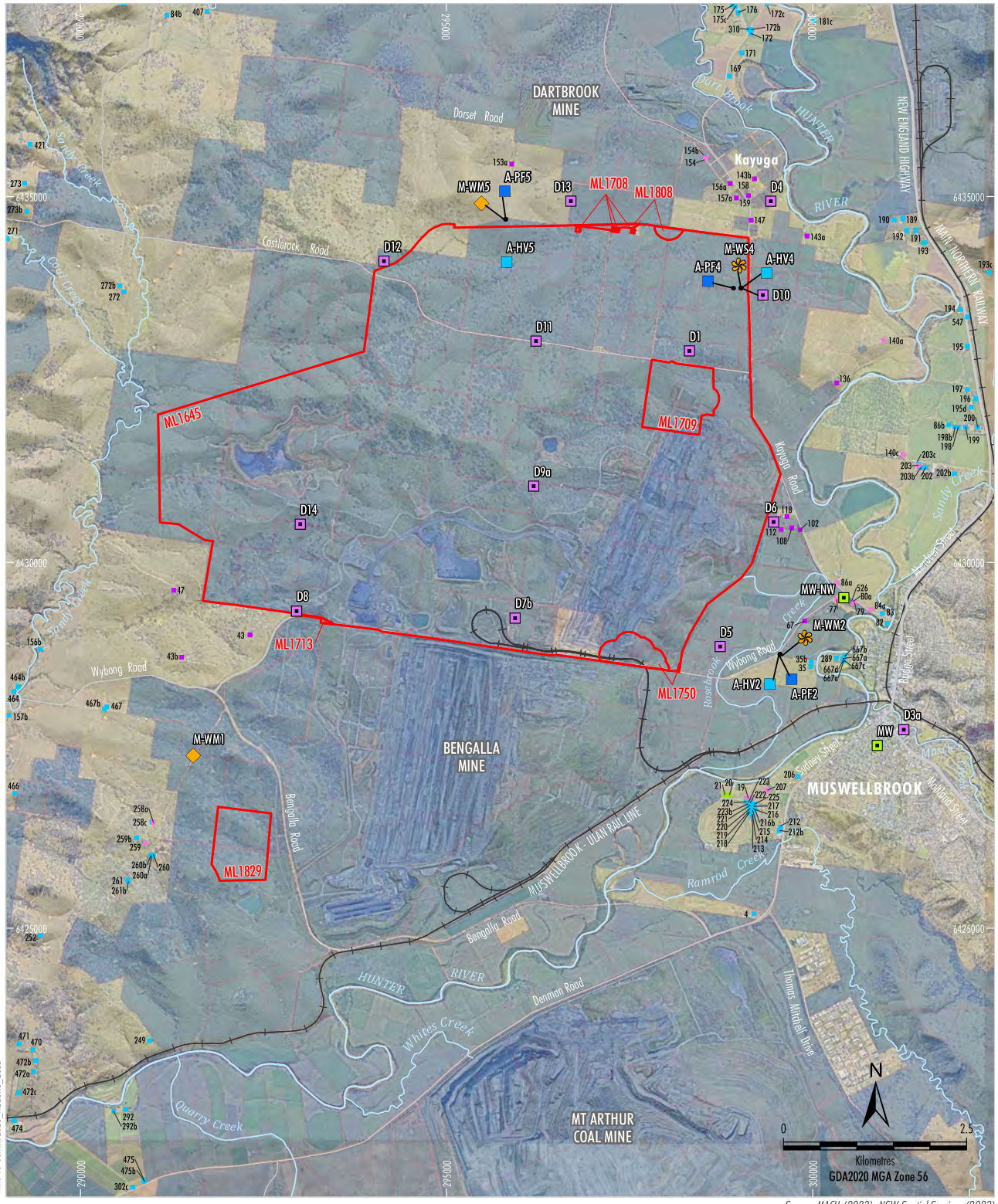
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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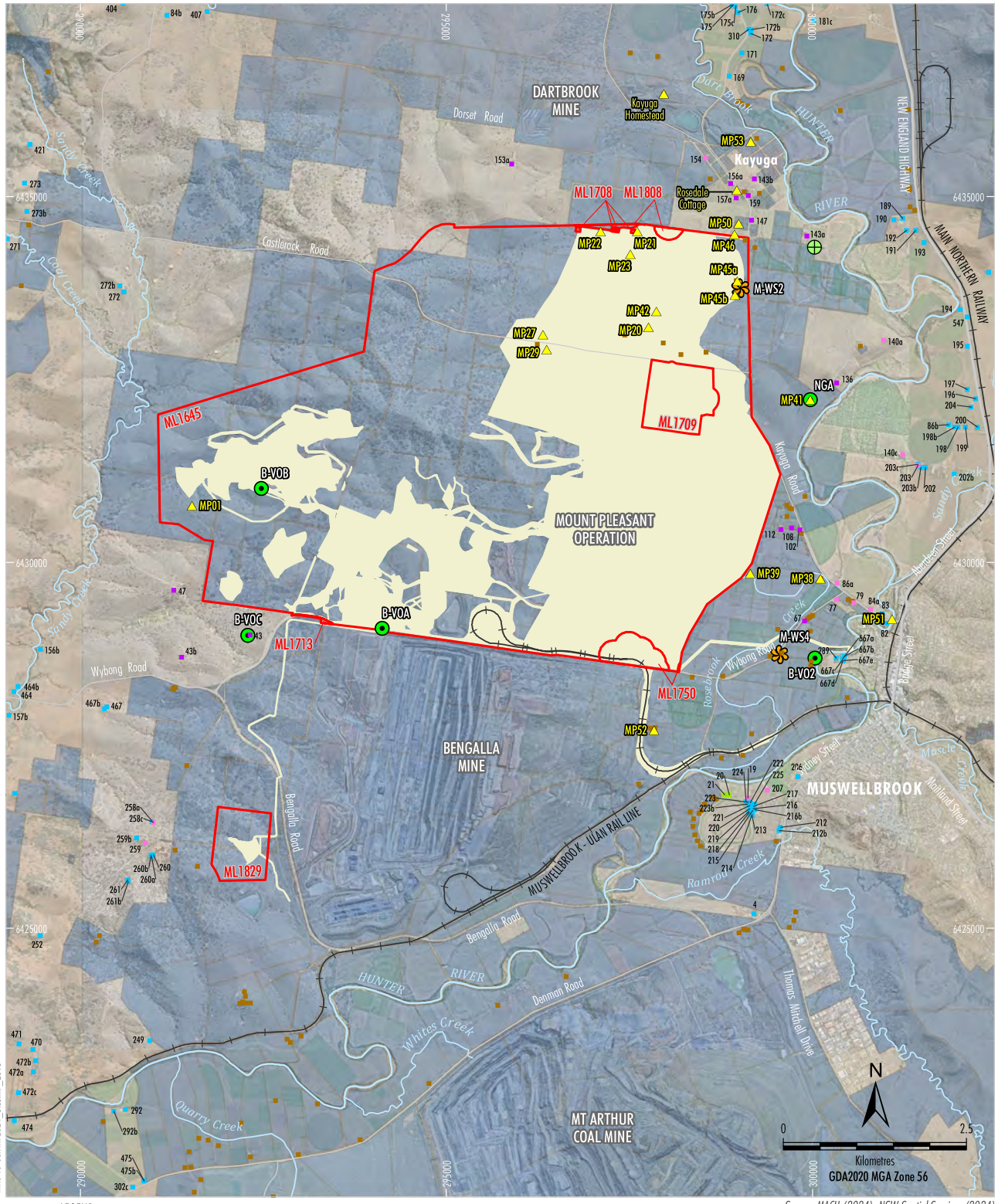
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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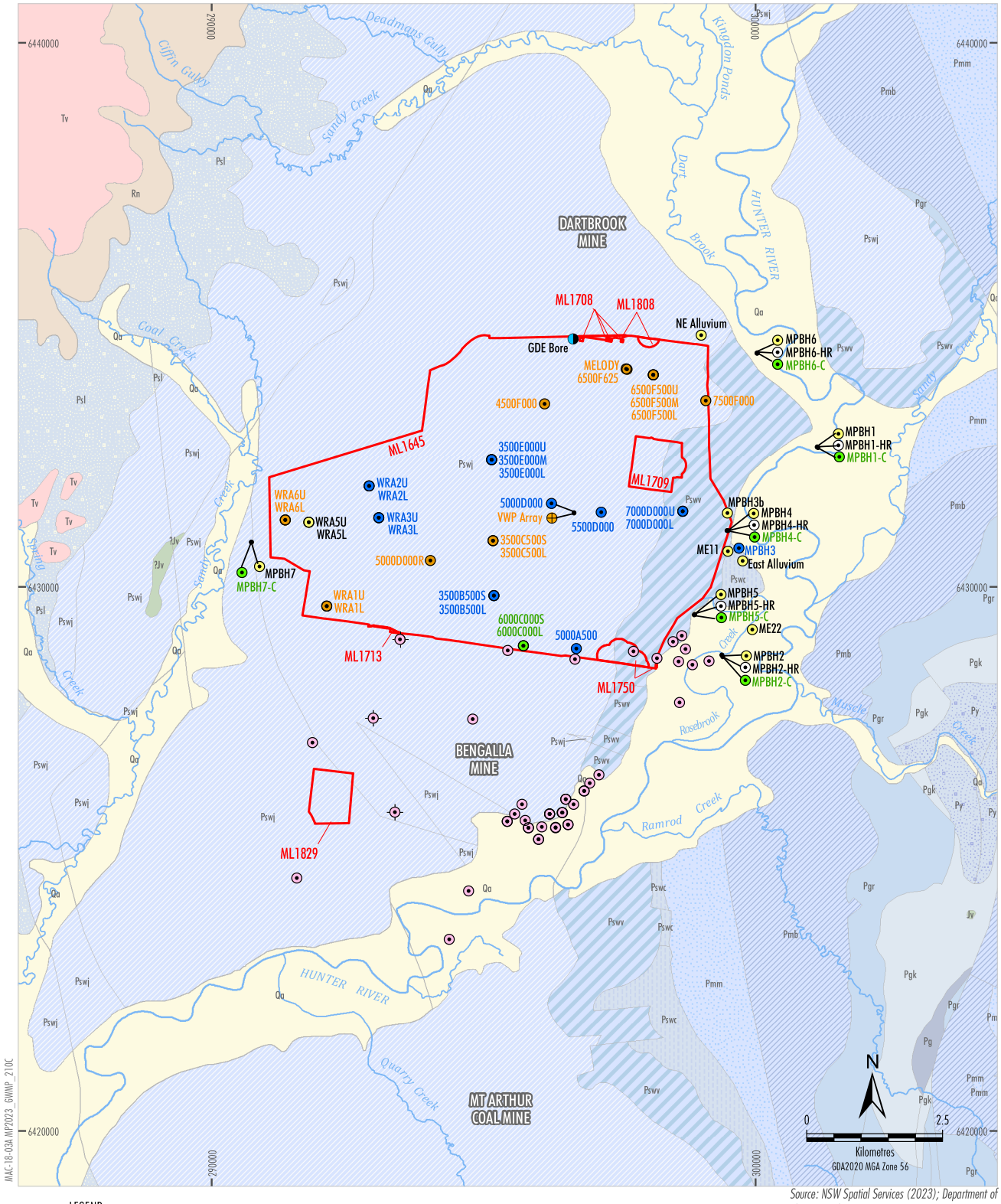
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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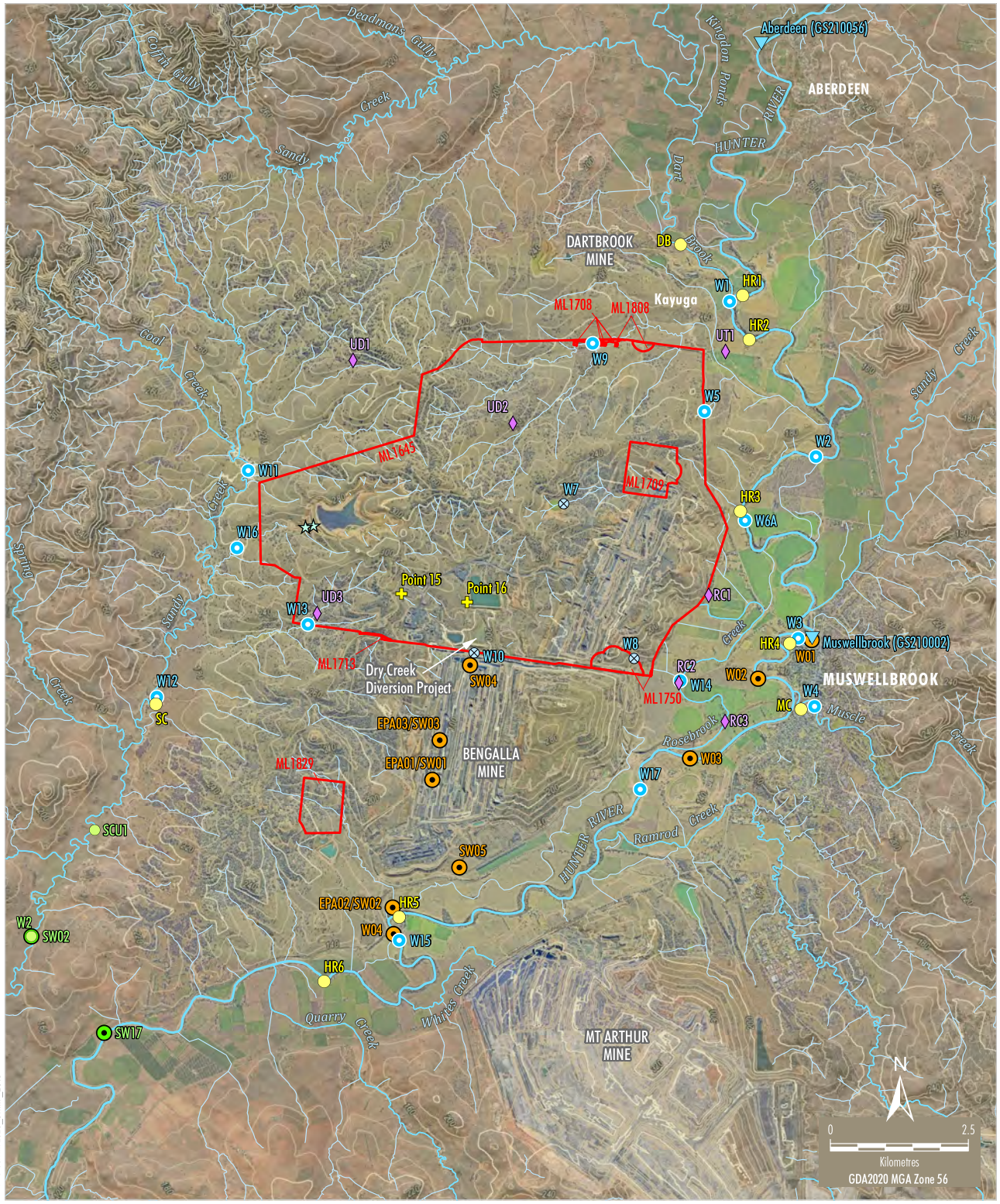
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

May 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 May 2026
Reporting Period End Date	31 May 2026
Date All Data Received	18 June 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout May 2026, there was 100.6mm at M-WS2 and 96.6mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 is located within close proximity to the North Opencut Pit and isn't considered representative of residential receivers. D1 will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

Site D7b has now been mined through, therefore results from this monitor will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – May 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	6.5	**6.2**
D3	1.7	1.7
D4	1.2	1.3
D5a	2.0	2.9
D6	3.1**	2.6
D8	16.9	**8.5**
D9a	5.4	3.7
D10	2.0	2.3
D11	6.8	**4.3**
D12	2.0	1.4
D13	3.4	2.2
D14	5.2	3.9
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

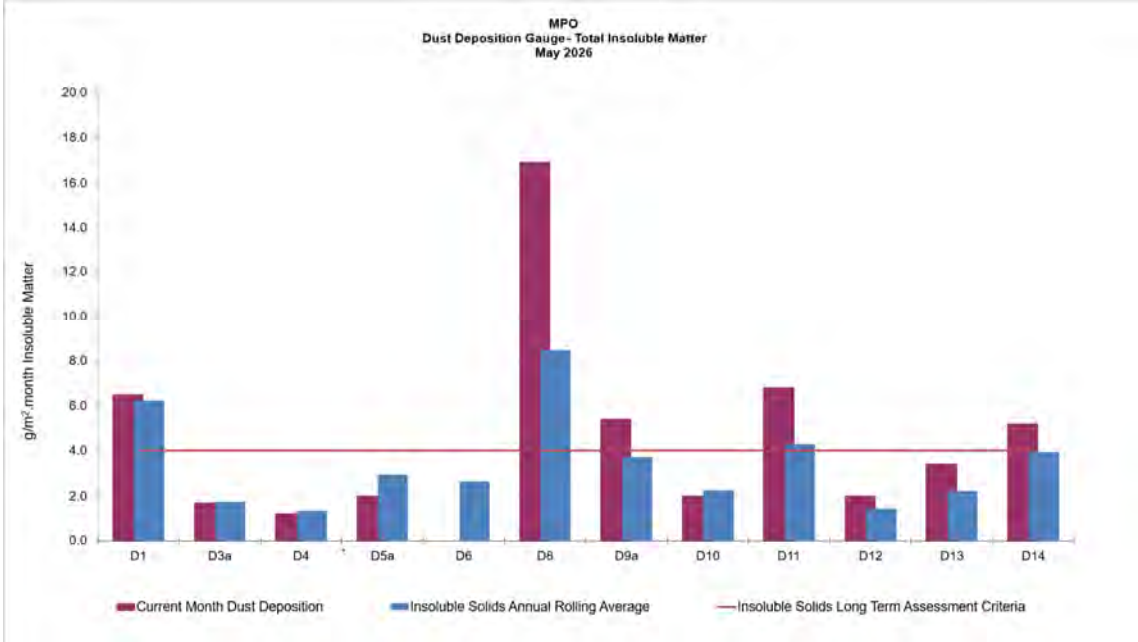

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – May 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
01/05/2026	-	43.4	108	122
07/05/2026	-	95.4	32.2	26.4
13/05/2026	-	13.9	41.5	27.7
19/05/2026	-	25.5	13.2	19.5
25/05/2026	-	28.4	58	29.3
31/05/2026	-	33.3	4.2	4.8
Monthly Average	-	40.0	42.9	38.3
Annual Rolling Average	90	66	62	65

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average May 2026

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/05/2026	-	18.18	23.07
02/05/2026	-	21.47	30.62
03/05/2026	-	28.88	31.16
04/05/2026	-	31.39	10.82
05/05/2026	-	10.92	6.49
06/05/2026	-	21.32	16.35
07/05/2026	32.34	9.43	7.31
08/05/2026	21.59	9.31	7.00
09/05/2026	18.01	14.03	23.59
10/05/2026	18.25	17.35	23.70
11/05/2026	13.96	19.58	17.47
12/05/2026	11.14	13.57	14.36
13/05/2026	8.24	8.50	10.52
14/05/2026	9.47	13.05	11.62
15/05/2026	9.78	11.68	13.58
16/05/2026	10.85	11.07	14.71
17/05/2026	14.91	16.61	19.98
18/05/2026	15.60	17.15	15.58
19/05/2026	8.16	7.90	5.64
20/05/2026	11.12	12.52	8.26
21/05/2026	12.51	13.33	15.28
22/05/2026	9.88	12.79	11.64
23/05/2026	10.90	10.52	12.30
24/05/2026	13.72	14.04	16.52
25/05/2026	12.08	11.82	16.70
26/05/2026	14.86	19.26	18.50
27/05/2026	12.25	16.63	13.86
28/05/2026	8.34	11.80	8.25
29/05/2026	8.21	10.79	5.52
30/05/2026	10.24	6.47	5.63
31/05/2026	10.86	6.16	5.24

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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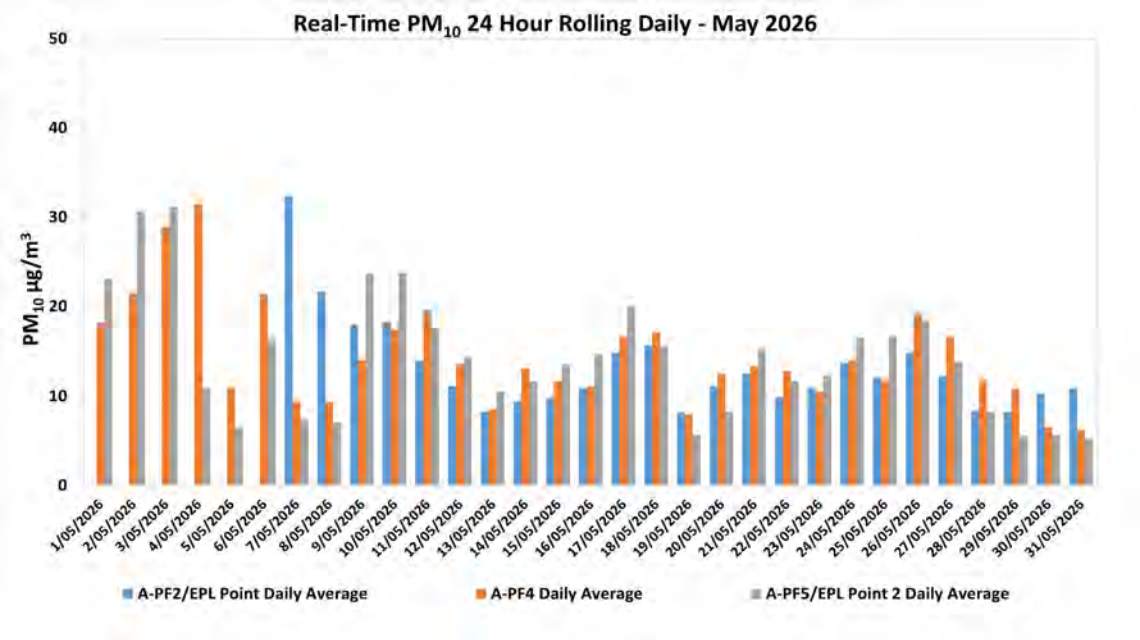

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for May 2026.

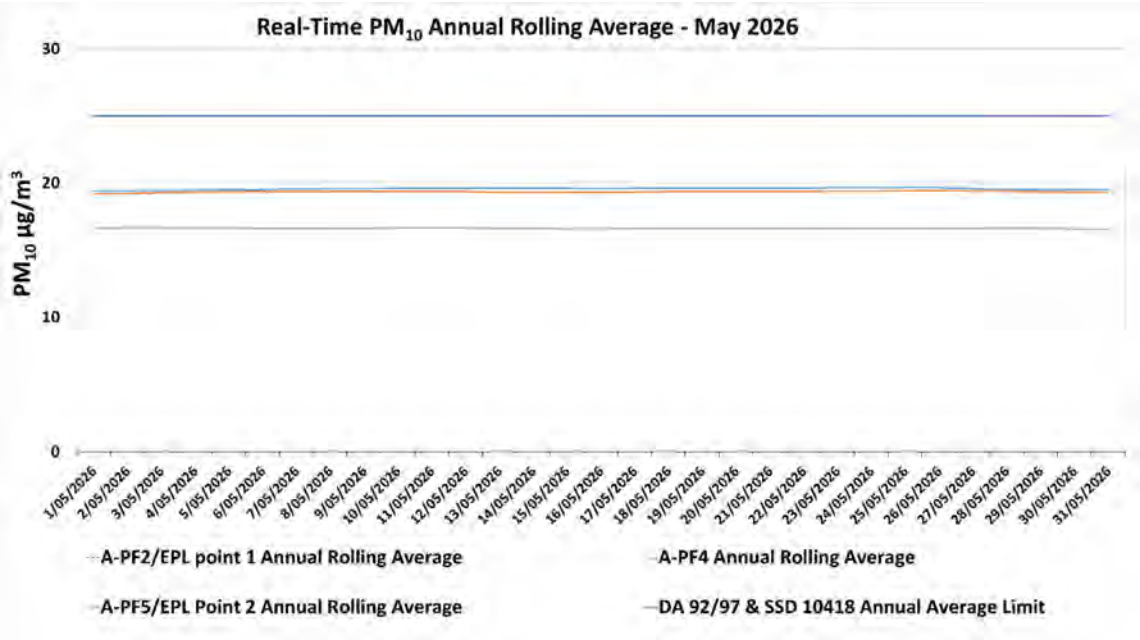

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for May 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – May 2026

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2
	24-hour Average Result		
01/05/2026	-	4.62	5.34
02/05/2026	-	5.72	6.68
03/05/2026	-	6.94	7.24
04/05/2026	-	6.36	3.76
05/05/2026	-	4.01	2.95
06/05/2026	-	4.81	4.32
07/05/2026	5.16	3.61	3.19
08/05/2026	4.46	3.32	2.95
09/05/2026	4.96	4.17	5.43
10/05/2026	8.15	7.09	8.55
11/05/2026	6.00	7.34	6.71
12/05/2026	4.52	5.07	5.45
13/05/2026	3.64	3.56	4.22
14/05/2026	4.37	4.55	4.94
15/05/2026	4.39	4.64	5.11
16/05/2026	4.78	4.84	5.51
17/05/2026	6.31	6.56	7.22
18/05/2026	6.56	7.03	6.78
19/05/2026	3.22	3.69	2.73
20/05/2026	4.59	4.36	3.49
21/05/2026	4.77	4.68	4.87
22/05/2026	3.91	4.77	4.22
23/05/2026	4.43	4.52	5.25
24/05/2026	6.04	6.29	7.02
25/05/2026	5.54	5.61	6.73
26/05/2026	5.90	7.03	7.17
27/05/2026	5.44	5.63	5.46
28/05/2026	3.62	4.77	3.97
29/05/2026	3.08	4.30	2.53
30/05/2026	3.67	3.18	2.87
31/05/2026	3.70	3.10	2.70

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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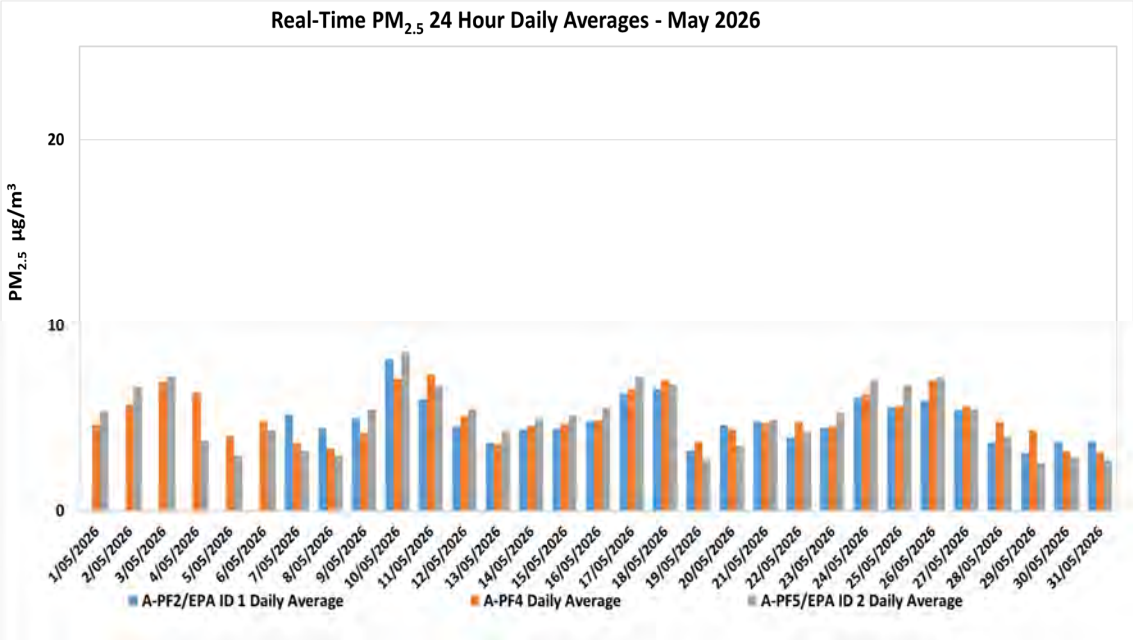

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for May 2026.

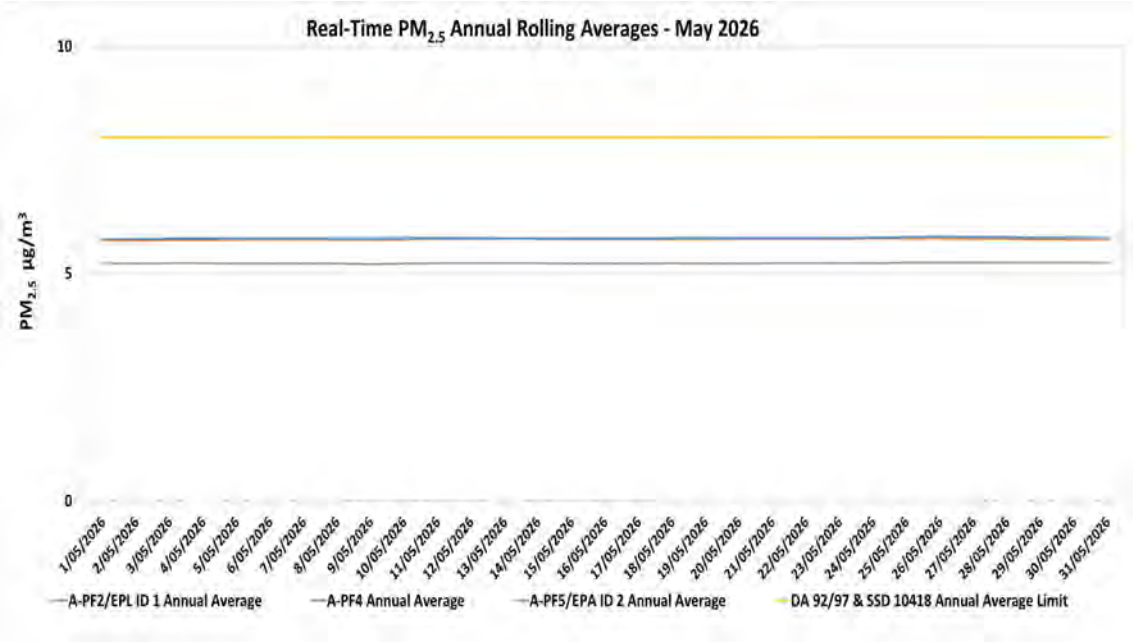

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for May 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

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8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1** and **Table 8-2**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 19 May 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.7	380	232	<5
W2	^	^	^	^
W6A	7.8	376	202	<5
W15	8.0	438	239	15
W17	7.2	468	251	10
Sandy Creek				
W11 (Upstream Reference Site)	^	^	^	^
W12	**8.3**	4820	2860	9
Muscle Creek				
W4 (Upstream Reference Site)	7.7	1918	1360	**23**
Unnamed Tributaries				
W3	8.0	391	234	12
W5	6.9	315	1630	2280
W9	^	^	^	*
W13	*	*	*	*
W14	*	*	*	*
W16	8.1	2820	1570	22

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access

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Table 8-2 – MPO Monthly Surface Water Monitoring Results – 29 May 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.5	412	235	7
W2	^	^	^	^
W6A	8.0	421	296	<5
W15	7.6	**498**	319	8
W17	8.0	512	307	8
Sandy Creek				
W11 (Upstream Reference Site)	**^**	^	^	^
W12	**8.4**	4390	2360	6
Muscle Creek				
W4 (Upstream Reference Site)	7.7	1648	1020	**12**
Unnamed Tributaries				
W3	8.0	480	280	<5
W5	7.7	381	520	136
W9	^	^	^	^
W13	7.9	2570	1320	231
W14	*	*	*	*
W16	^	^	^	^

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access.

9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

9.2 Assessment Criteria

An investigation is triggered if elevated measurements occur for three consecutive sampling events in accordance MPO Water Management Plan (MACH Energy, 2022).

An investigation was previously triggered (AGE, 2023) examining the cause of elevated EC values in the alluvial zone, specifically MPBH2. The data suggests that the cause of the increase in EC is persistent above-average stage in the adjacent Hunter River, caused by above-average rainfall since 2020, which is causing a rise in groundwater levels in similar

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alluvial bores. Further Investigations have been undertaken during 2025, and in accordance with recommendations from Specialist Groundwater Consultants AGE, the *MPO Water Management Plan* (MACH Energy, 2025) has been revised to new recommended trigger levels for MPBH2. The revised MPO Water Management Plan was submitted to the Department of Planning Housing and Infrastructure in August 2025. Based on the previous assessment it is expected that EC levels of MPBH2 will continue to be above the older trigger level. This will not be reported each monitoring period as the investigation and recommendations have been completed as required.

9.3 Results

Water level results for the groundwater bores are presented in **Table 8-1**. The quarterly pH and EC results are presented in **Table 8-2** and **Table 8-3**, respectively.

Table 8-1 - MPO Quarterly Groundwater Water Level Results

Monitoring Location/ ID	Trigger	May 2026 Water Level (DTW)	February 2026 Water Level (DTW)	November 2025 Water Level (DTW)	Triggered (Yes/ No)
WRA1L	-	3.72	2.73	1.02	-
WRA1U	-	*	*	*	-
WRA3L-R	-	*	*	*	-
WRA3U-R	-	*	*	*	-
WRA5L-R	-	*	*	*	-
WRA5U-R	-	*	*	*	-
WRA6L	-	0.4	0.67	0.52	-
WRA6U	-	0.67	0.99	1.14	-
MPBH1	10.70	9.41	9.56	9.52	No
MPBH2	13.59	11.18	10.99	10.74	No
MPBH3b	13.04	11.66	11.08	10.89	No
MPBH4	-	11.97	11.73	11.21	-
MPBH5	-	*	*	*	-
MPBH1-C	-	9.323	9.49	9.383	-
MPBH1-HR	-	33.44	42.29	45.69	-
MPBH2-C	-	11.173	10.98	10.733	-
MPBH2-HR	-	11.226	11.24	14.246	-
MPBH4-C	-	10.683	10.40	9.923	-
MPBH4-HR	-	49.795	49.93	50.045	-
MPBH5-C	-	10.609	10.45	10.659	-
MPBH5-HR	-	10.81	10.50	10.3	-

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Monitoring Location/ ID	Trigger	May 2026 Water Level (DTW)	February 2026 Water Level (DTW)	November 2025 Water Level (DTW)	Triggered (Yes/ No)
MPBH6	-	10.091	10.37	8.601	-
MPBH6-C	-	10.548	8.99	9.998	-
MPBH6-HR	-	9.995	10.06	9.795	-
MPBH7	10.10	5.587	5.37	4.827	No
MPBH7-C	-	17.915	17.79	17.045	-
3500C500L	-	28.03	27.64	27.54	-
3500C500S	-	25.41	24.99	24.51	-
4500F000	-	21.88	21.58	22.10	-
5000D000-R	-	140.11	139.38	139.14	-
5000D000	-	147.7	142.93	139.60	-
6000C000L-R	-	*	*	*	-
6000C000U-R	-	*	*	*	-
6500F500L	-	51.33	49.72	50.73	-
6500F500M	-	51.93	50.34	51.21	-
6500F500U	-	28.04	27.76	28.03	-
6500F625	-	15.55	15.14	14.04	-
Melody	-	12.96	12.31	10.13	-
7500F000	-	^	36.34	36.18	-
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment criterion for changes in standing water level from the previous measurement.
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
* Dry/insufficient water to sample.
^Unsafe access.
'-' indicates no trigger level

Table 8-2 - MPO Quarterly Groundwater pH Results

Monitoring Location/ ID	pH Trigger Range	May 2026 pH	February 2026 pH	November 2025 pH	Triggered (Yes/No)
WRA1L		7.1	7.0	7.2	No
WRA1U		*	*	*	No
WRA3L-R		7.8	7.5	7.4	No
WRA3U-R		*	*	*	No
WRA5L-R		7.2	7.1	7.2	No

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Monitoring Location/ ID	pH Trigger Range	May 2026 pH	February 2026 pH	November 2025 pH	Triggered (Yes/No)
WRA5U-R	6 - 8.5	7.7	7.5	7.5	No
WRA6L		7.0	6.9	7.0	No
WRA6U		6.9	6.8	6.8	No
MPBH1		7.0	6.8	7.1	No
MPBH2		7.0	6.9	6.8	No
MPBH3b		7.8	7.6	7.7	No
MPBH4		7.0	6.8	6.9	No
MPBH5		*	*	*	No
MPBH1-C	-	7.5	8.3	8.7	-
MPBH1-HR	-	7.6	7.6	7.7	-
MPBH2-C	-	8.4	10.3	7.9	-
MPBH2-HR	-	8.1	8.3	7.0	-
MPBH4-C	-	8.1	8.0	8.0	-
MPBH4-HR	-	7.4	7.2	7.4	-
MPBH5-C	-	10.3	10.6	11.0	-
MPBH5-HR	-	7.3	7.4	7.5	-
MPBH6	-	6.8	6.9	7.0	-
MPBH6-C	-	7.5	7.0	7.1	-
MPBH6-HR	-	7.3	7.1	7.1	-
MPBH7	-	7.0	6.9	7.0	-
MPBH7-C	-	7.1	7.0		-
3500C500L	6 - 8.5	7.5	7.5	7.4	No
3500C500S	-	7.2	7.3	7.2	-
4500F000	6 – 8.5	6.7	6.8	6.8	No
5000D000-R		7.5	7.5	7.4	No
6000C000L-R		8.3	8.4	8.4	No
6000C000U-R		7.4	7.5	*	No
6500F500L		7.2	7.2	7.2	No
6500F500M		7.3	7.1	7.2	No
6500F500U		6.8	6.8	6.8	No
6500F625		7.0	6.8	7.0	No
Melody		7.0	6.9	7.1	No
7500F000		^	7.7	7.7	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

*Results in **bold** indicate that the pH values recorded are outside the baseline range (20th – 80th percentile).*
** Dry/insufficient water to sample.*
^Unsafe access.
'-' indicates no trigger level

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Table 8-3 - MPO Quarterly Groundwater EC Results

Monitoring Location/ ID	Maximum Beneficial Use Trigger	May 2026 EC	February 2026 EC	November 2025 EC	Triggered (Yes/No)
WRA1L	7800	3100	2920	2940	No
WRA1U	-	*	*	*	-
WRA3L-R	22000	7810	8320	8110	No
WRA3U-R	22000	*	*	*	No
WRA5L-R	7800	5330	5290	5290	No
WRA5U-R	7800	5870	5820	6220	No
WRA6L	7800	6730	5560	5580	No
WRA6U	22000	8240	8230	7770	No
MPBH1	800	594	707	658	No
MPBH2	930	**1000**	**1086**	**1038**	**Yes**[1]
MPBH3b	7800	4530	4540	4500	No
MPBH4	7800	5430	5700	5510	No
MPBH5	-	*	*	*	-
MPBH1-C	-	643	1301	1596	-
MPBH1-HR	-	1754	1650	1715	-
MPBH2-C	-	1484	1549	1198	-
MPBH2-HR	-	1731	1788	1159	-
MPBH4-C	-	4950	4980	5570	-
MPBH4-HR	-	5050	5720	5570	-
MPBH5-C	-	641	647	728	-
MPBH5-HR	-	865	823	827	-
MPBH6	-	1093	1108	873	-
MPBH6-C	-	4860	2450	2500	-
MPBH6-HR	-	5880	2750	1418	-
MPBH7	-	10100	11460	9940	-
MPBH7-C	-	11210	10780	10430	-
3500C500L	7800	3830	3900	3820	No
3500C500S	-	5480	5900	5710	-
4500F000	22000	9260	8510	7900	No
5000D000-R	-	5290	5460	5210	No
6000C000L-R	7800	4780	4900	4790	No
6000C000U-R	7800	4430	4400	*	No
6500F500L	7800	2550	2540	2540	No
6500F500M	7800	2620	2520	2520	No
6500F500U	7800	6140	6000	6180	No
6500F625	7800	3790	3790	3040	No

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Monitoring Location/ ID	Maximum Beneficial Use Trigger	May 2026 EC	February 2026 EC	November 2025 EC	Triggered (Yes/No)
Melody	-	4850	3140	2340	-
7500F000	7800	^	6420	6330	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment for EC values
** Dry/insufficient water to sample*
^ Unsafe access
'-' indicates no trigger level
[1] No further investigation required. See assessment criteria section for further information

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 25 and 26 May 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:26am	IA	45	1.1 / 209	Yes	F	No
N-AT2	10:41pm	30	45	3.2 / 160	Yes	E	NA
N-AT3	11:20pm	IA	45	2.5 / 162	Yes	E	No
N-AT4	11:47pm	IA	45	1.0 / 183	Yes	D	No
N-AT5	12:08am	IA	45	0.9 / 215	Yes	D	No
N-AT6	1:02am	IA	45	1.5 / 186	Yes	D	No
N-AT7	10:00pm	IA	45	2.3 / 172	Yes	D	No
N-AT8	12:35am	43	49	0.7 / 222	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 25 and 26 May 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:26am	IA	37	1.1 / 209	Yes	F	No
N-AT2	10:41pm	25	35	3.2 / 160	Yes	E	NA
N-AT3	11:20pm	IA	40	2.5 / 162	Yes	E	No
N-AT4	11:47pm	IA	38	1.0 / 183	Yes	D	No
N-AT5	12:08am	IA	37	0.9 / 215	Yes	D	No
N-AT6	1:02am	IA	35	1.5 / 186	Yes	D	No
N-AT7	10:00pm	IA	37	2.3 / 172	Yes	D	No
N-AT8	12:35am	38	43	0.7 / 222	Yes	F	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 25 and 26 May 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:26am	36	40	No
N-AT2	10:41pm	25	40	NA
N-AT3	11:20pm	IA	40	No
N-AT4	11:47pm	IA	40	No
N-AT5	12:08am	IA	40	No
N-AT6	1:02am	27	40	No
N-AT7	10:00pm	IA	40	No
N-AT8	12:35am	40	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

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11. Blast Monitoring

There were ten (10) blast events (a total of 53 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – May 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
01/05/2026	10:38	0.37 mm/s	103 DBL	0.50 mm/s	97.7 DBL	Y
02/05/2026	10:03	0.54 mm/s	90.2 DBL	0.19 mm/s	94 DBL	Y
07/05/2026	11:48	0.85 mm/s	107.6 DBL	0.61 mm/s	109.4 DBL	Y
11/05/2026	15:24	0.25 mm/s	96.8 DBL	0.57 mm/s	93.3 DBL	Y
13/05/2026	14:48	0.10 mm/s	97.5 DBL	0.13 mm/s	97.7 DBL	Y
14/05/2026	14:00	0.28 mm/s	102.6 DBL	0.49 mm/s	110.4 DBL	Y
18/05/2026	10:18	1.01 mm/s	111.1 DBL	0.82 mm/s	103 DBL	Y
21/05/2026	11:00	0.19 mm/s	89.4 DBL	0.23 mm/s	95.1 DBL	Y
27/05/2026	10:07	0.48 mm/s	91.6 DBL	0.51 mm/s	96.8 DBL	Y
28/05/2026	11:18	0.05 mm/s	99.3 DBL	0.08 mm/s	94.6 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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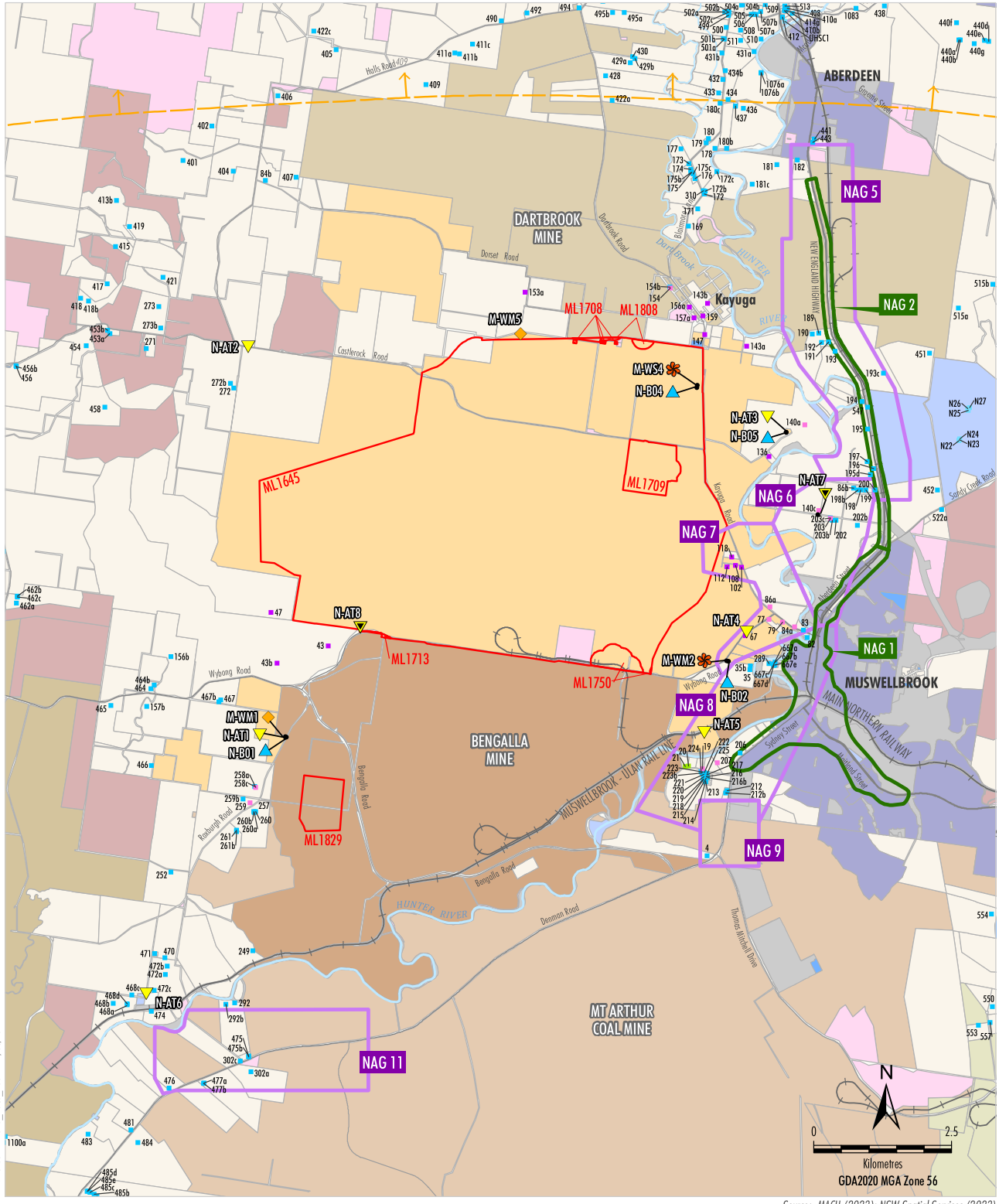


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

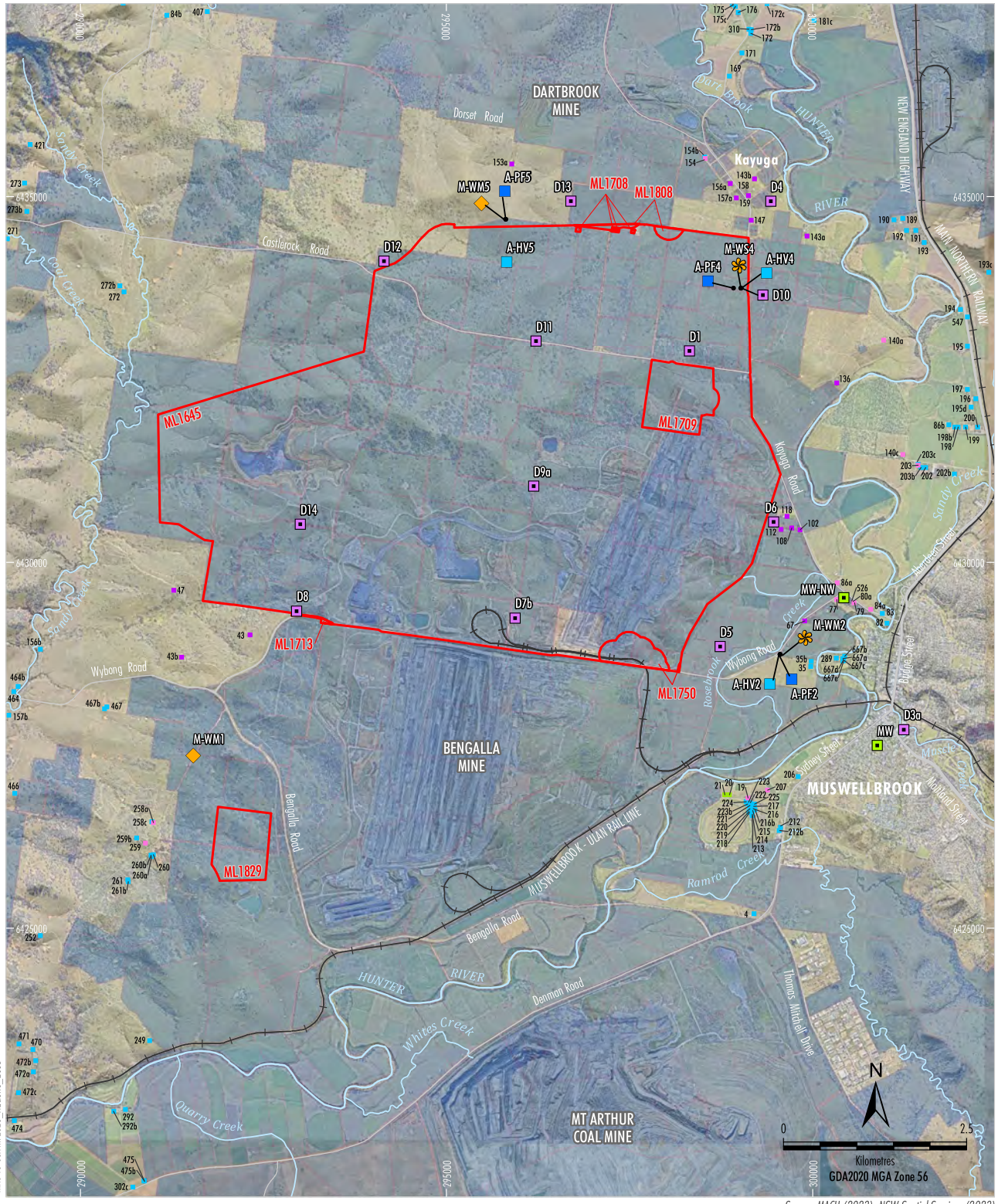
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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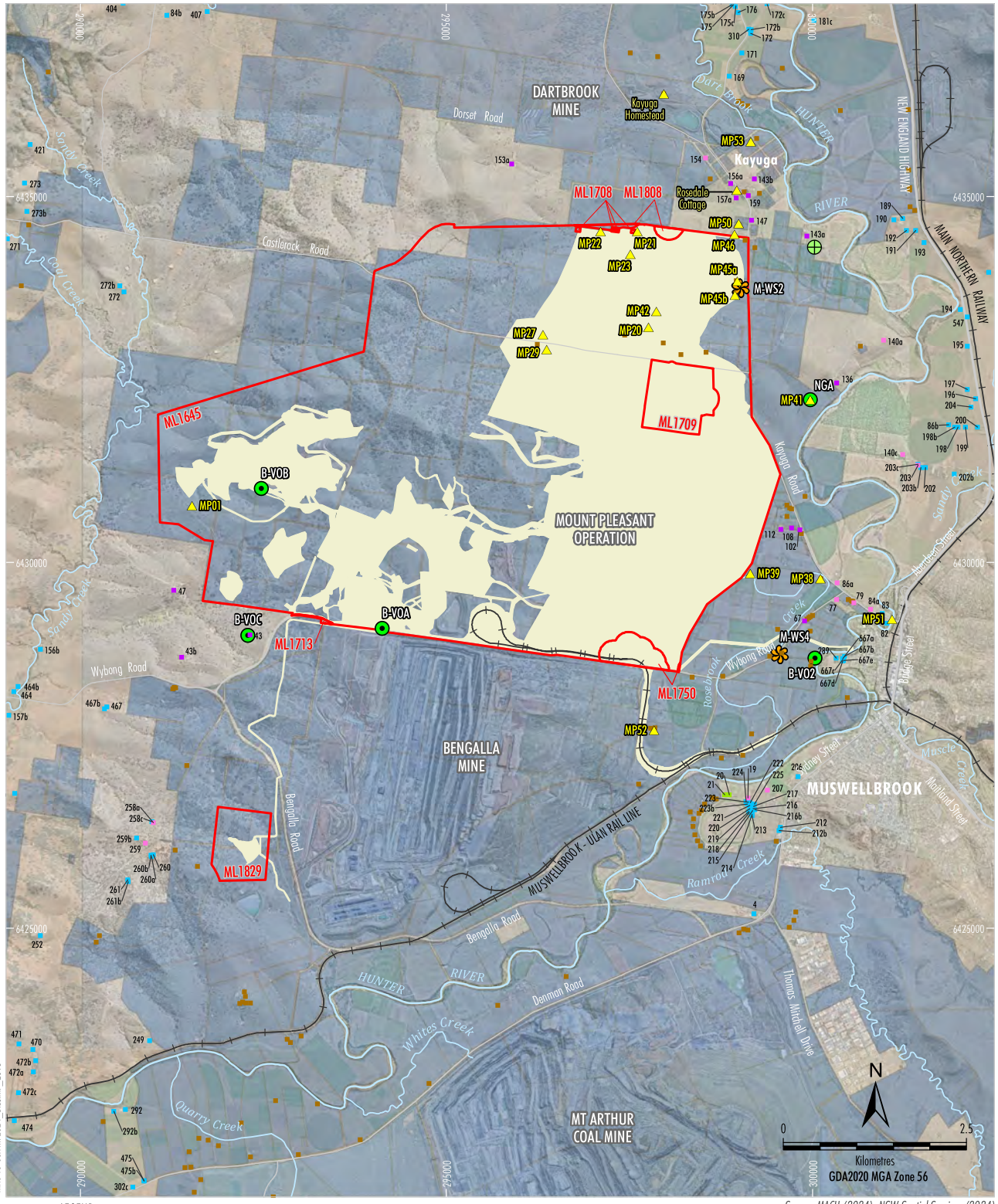
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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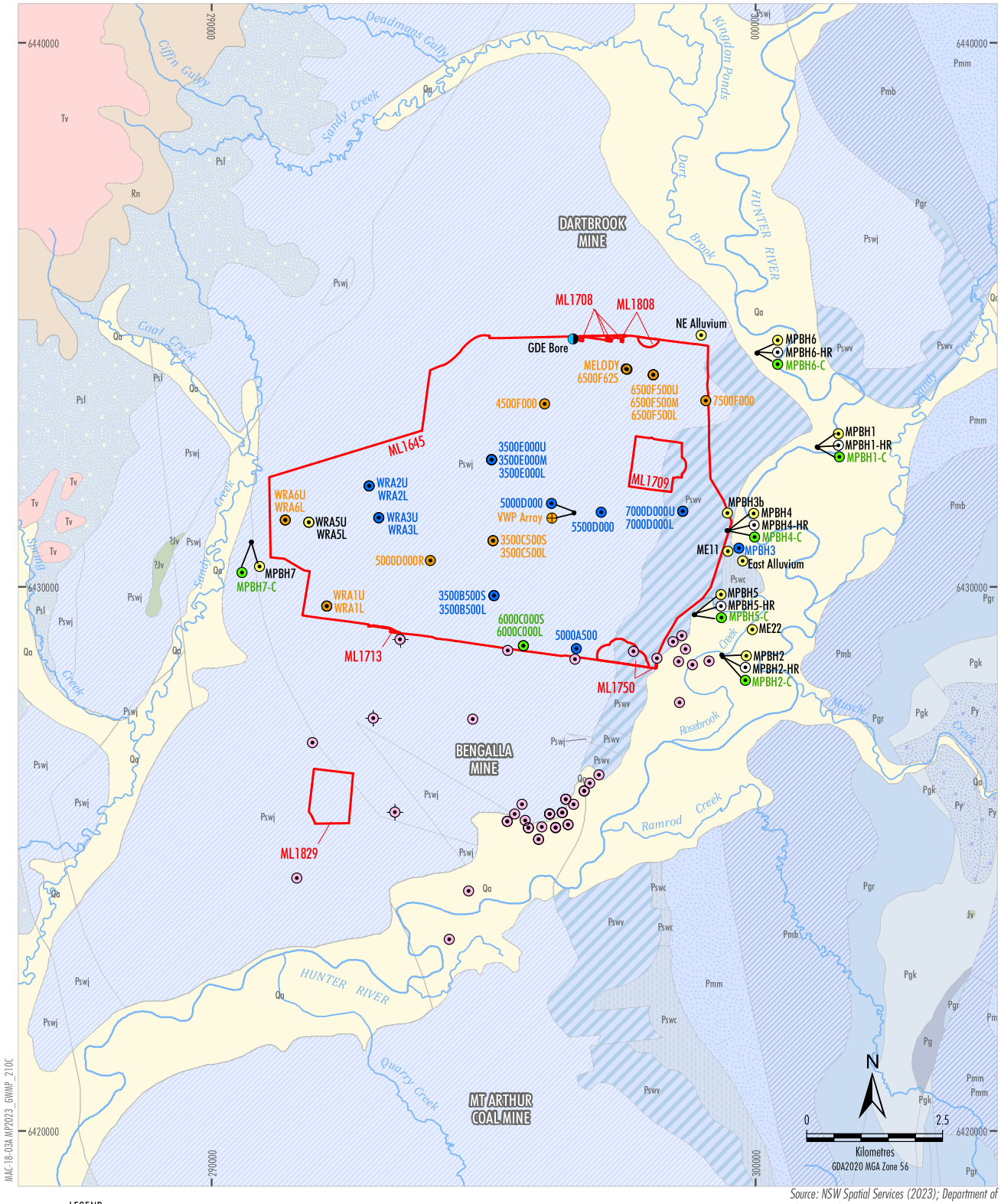
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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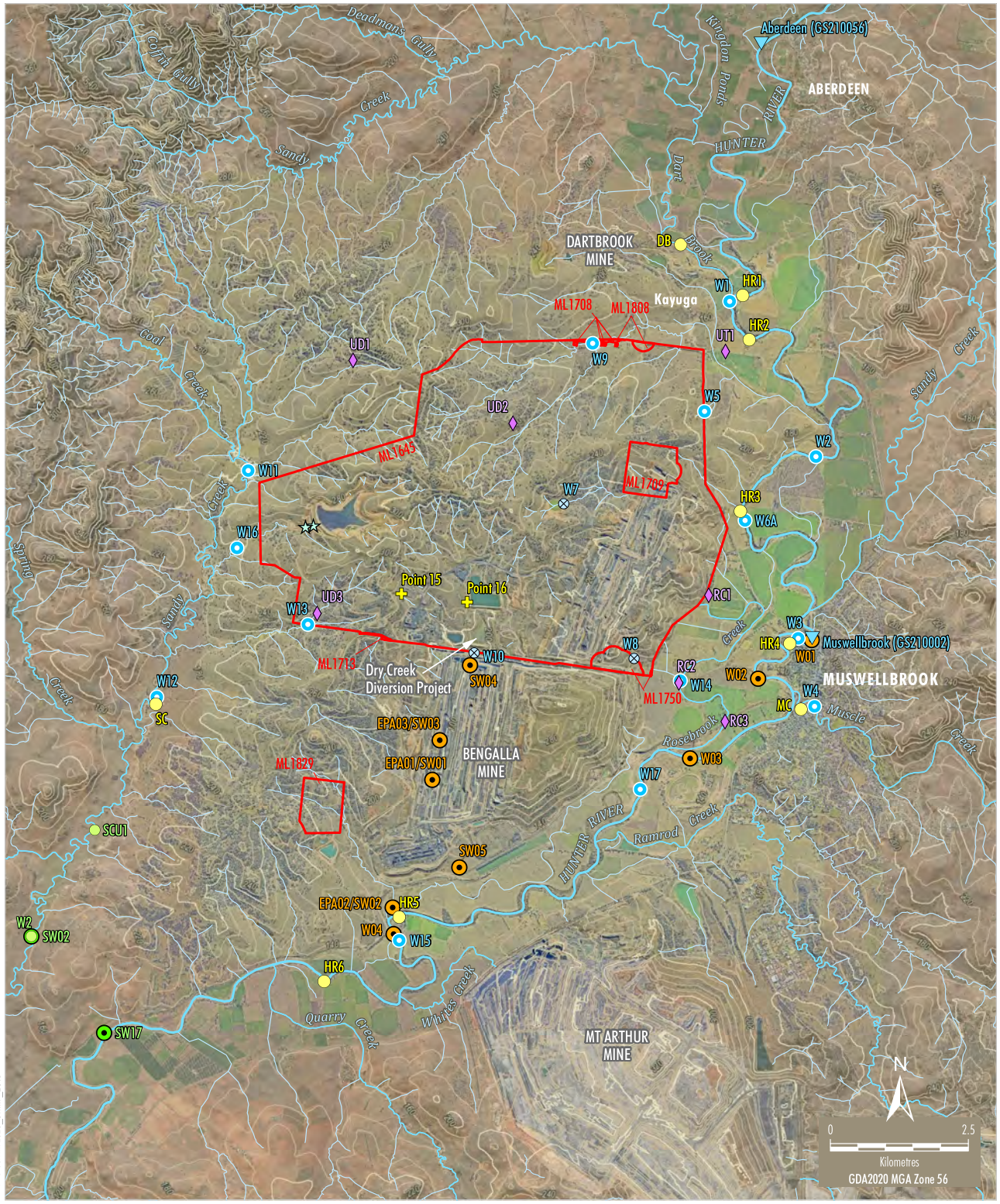
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

June 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 June 2026
Reporting Period End Date	30 June 2026
Date All Data Received	15 July 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout June 2026, there was 16.6mm at M-WS2 and 13.0mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 is located within close proximity to the North Opencut Pit and isn't considered representative of residential receivers. D1 will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

Site D7b has now been mined through, therefore results from this monitor will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – June 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	6.2	**6.5**
D3	1.4	1.8
D4	0.6	1.4
D5a	2.2	2.9
D6	3.4**	2.7
D8	4.3	**8.6**
D9a	4.3	3.9
D10	1.2	2.3
D11	2.9	**4.3**
D12	1.2	1.5
D13	1.3	2.3
D14	1.9	3.9
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

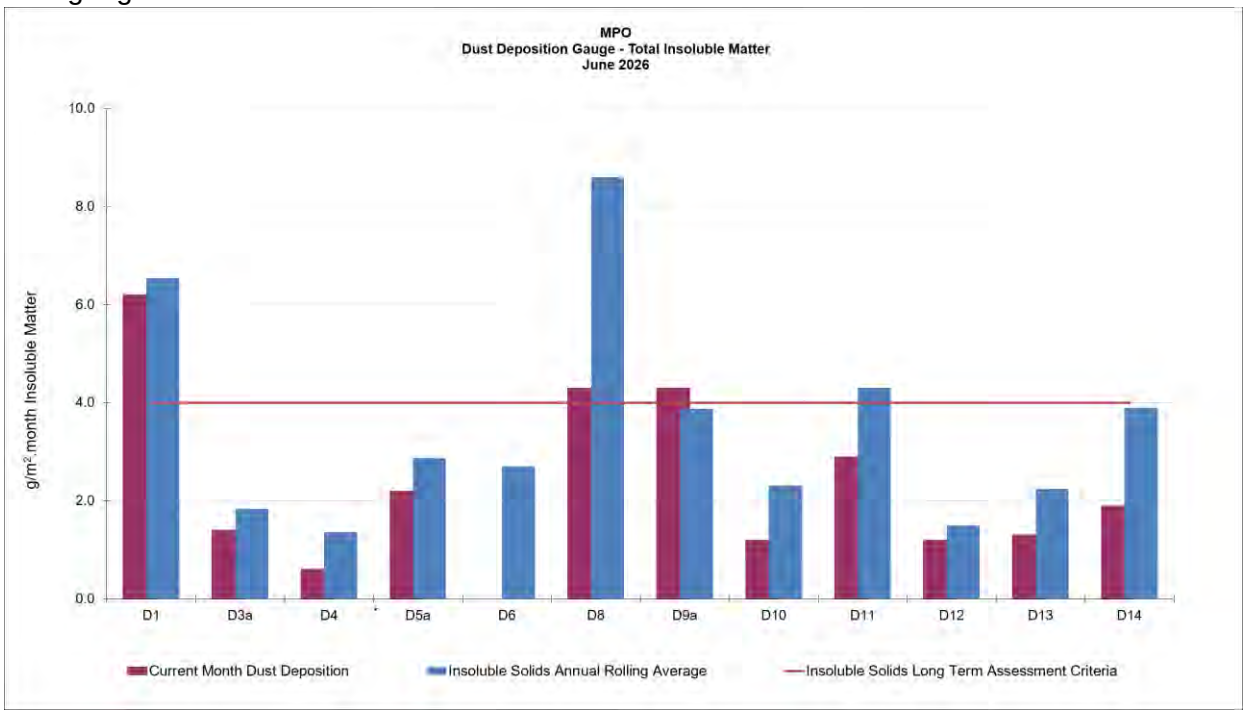

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4 and HVAS A-PF5. The NLR project works are expected to continue until June 2026 and then cease to impact on HVAS A-PF5. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – June 2026

Run Date	Assessment Criterion	TSP µg/m^3		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
06/06/2026	-	38.4	15.9	13.2
12/06/2026	-	22.7	53.1	22.6
18/06/2026	-	30.1	14.1	27.1
24/06/2026	-	38.9	63.0	128.0
30/06/2026	-	39.7	33.1	45.0
Monthly Average	-	34.0	35.8	47.2
Annual Rolling Average	90	65	64	67

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Link Road (NLR) and Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF5 and A-PF4. The NLR project works are expected to continue until June 2026 and then cease to impact on A-PF5. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average June 2026

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/06/2026	13.96	8.06	6.70
02/06/2026	15.96	8.11	6.61
03/06/2026	16.51	9.25	7.52
04/06/2026	8.43	6.58	5.42
05/06/2026	12.51	5.34	4.54
06/06/2026	8.44	7.62	5.98
07/06/2026	13.99	13.19	17.25
08/06/2026	12.19	13.59	14.57
09/06/2026	11.99	17.10	22.28
10/06/2026	15.21	14.17	12.44
11/06/2026	11.98	10.40	9.52
12/06/2026	13.65	13.64	18.50
13/06/2026	15.84	12.44	9.81
14/06/2026	14.83	12.00	9.98
15/06/2026	10.84	11.59	12.63
16/06/2026	14.71	23.13	18.57
17/06/2026	12.64	19.00	18.30
18/06/2026	10.57	10.44	7.83
19/06/2026	13.32	7.61	6.16
20/06/2026	10.75	5.38	4.73
21/06/2026	12.17	6.89	5.46
22/06/2026	10.19	11.69	6.10
23/06/2026	15.13	33.01	19.60
24/06/2026	12.52	38.90	17.85
25/06/2026	12.21	12.63	16.59
26/06/2026	8.97	9.83	16.34
27/06/2026	11.51	11.56	19.54
28/06/2026	11.53	11.46	17.25
29/06/2026	13.23	12.82	17.86
30/06/2026	16.10	17.79	9.56

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled

***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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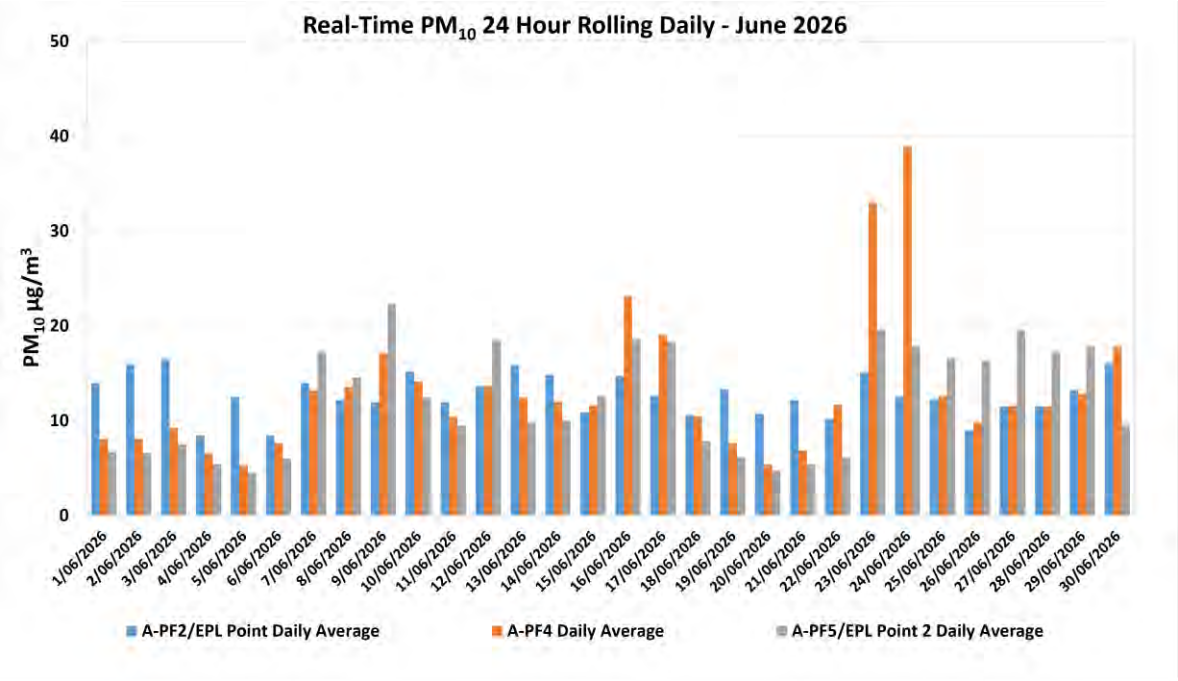

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for June 2026.

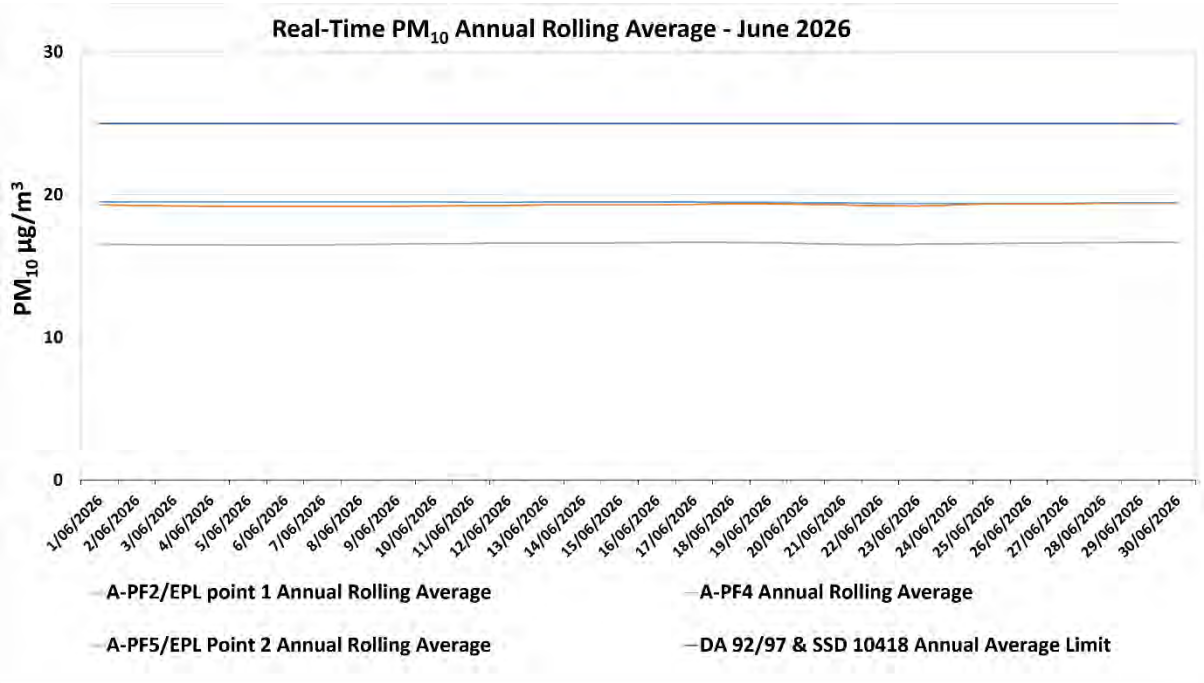

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for June 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – June 2026

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2
	24-hour Average Result		
01/06/2026	4.11	3.45	3.16
02/06/2026	4.15	3.26	2.95
03/06/2026	3.82	3.07	2.87
04/06/2026	3.02	2.75	2.60
05/06/2026	3.44	2.46	2.31
06/06/2026	3.79	3.58	2.95
07/06/2026	5.48	5.23	4.82
08/06/2026	5.82	6.01	5.57
09/06/2026	5.64	6.60	7.38
10/06/2026	5.13	5.01	5.27
11/06/2026	5.60	4.67	4.28
12/06/2026	6.01	6.06	7.09
13/06/2026	7.23	6.98	5.63
14/06/2026	5.16	4.07	3.42
15/06/2026	4.20	4.25	4.70
16/06/2026	5.93	6.80	5.69
17/06/2026	4.84	5.39	4.80
18/06/2026	4.23	4.05	3.38
19/06/2026	3.83	3.04	2.81
20/06/2026	3.20	2.55	2.37
21/06/2026	4.40	3.45	2.85
22/06/2026	4.15	4.23	3.14
23/06/2026	5.10	5.83	4.48
24/06/2026	4.75	6.35	4.57
25/06/2026	5.19	5.03	5.35
26/06/2026	4.13	4.47	5.62
27/06/2026	5.64	5.21	6.54
28/06/2026	5.01	5.26	5.87
29/06/2026	5.99	6.06	6.32
30/06/2026	6.01	5.71	5.03

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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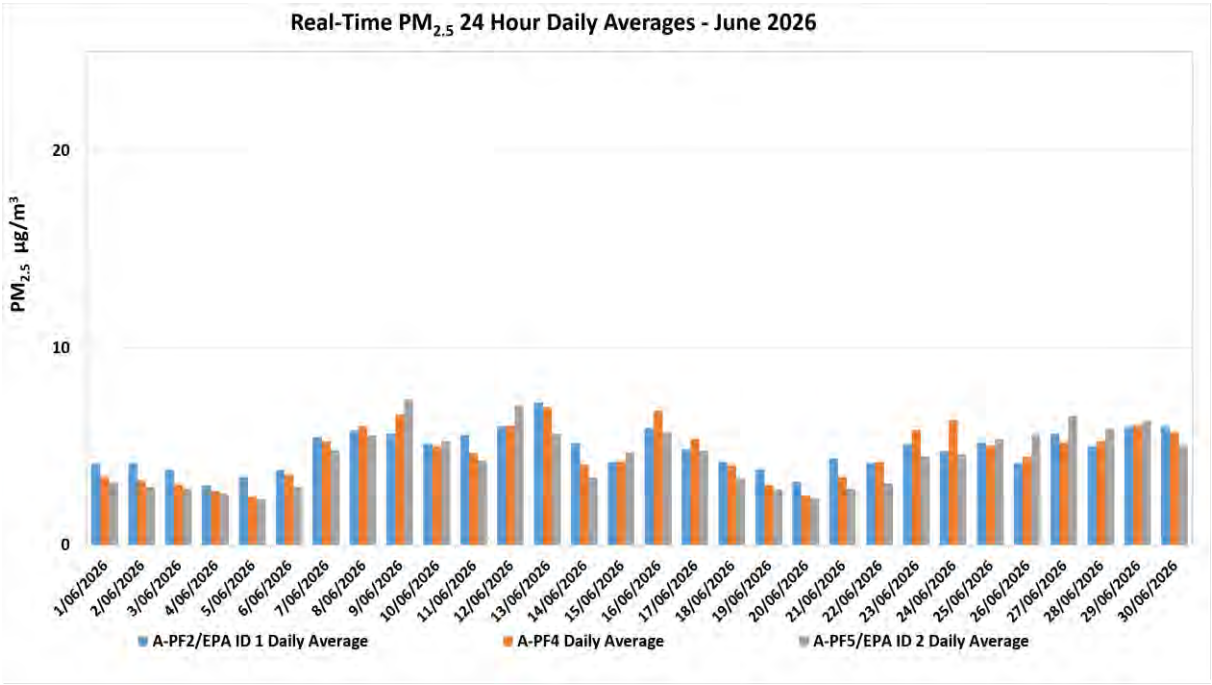

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for June 2026.

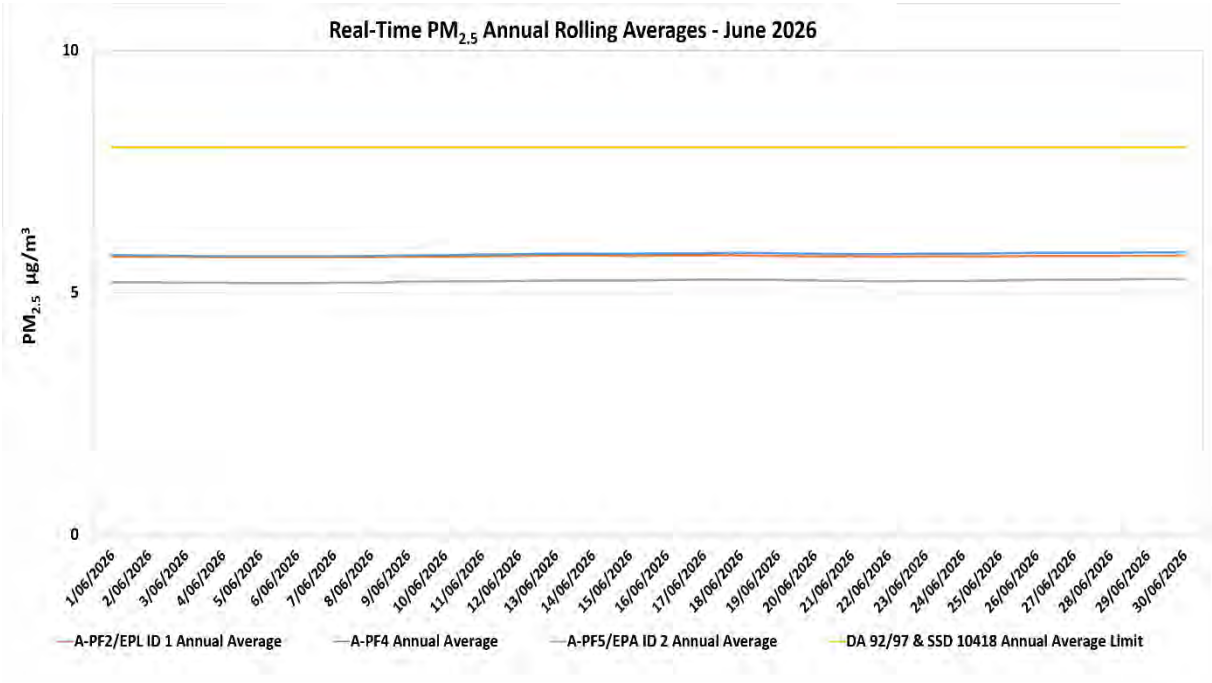

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for June 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

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8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 30 June 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	8.2	**847**	485	<5
W2	8.0	876	473	<5
W6A	8.1	836	497	5
W15	7.8	989	582	9
W17	7.7	971	566	<5
Sandy Creek				
W11 (Upstream Reference Site)	**8.3**	4520	2400	<5
W12	7.9	5340	3270	<5
Muscle Creek				
W4 (Upstream Reference Site)	7.7	2430	1770	**13**
Unnamed Tributaries				
W3	7.9	887	542	6
W5	*	*	*	*
W9	^	^	^	^
W13	*	*	*	*
W14	*	*	*	*
W16	8.5	9330	5490	21

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 15 and 16 June 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:42am	IA	45	1.0 / 041	Yes	E	No
N-AT2	11:30pm	25	45	0.8 / 147	Yes	F	No
N-AT3	12:08am	IA	45	0.5 / 070	Yes	E	No
N-AT4	12:35am	IA	45	1.2 / 205	Yes	F	No
N-AT5	12:56am	26	45	0.5 / 135	Yes	F	No
N-AT6	2:06am	IA	45	1.1 / 024	Yes	D	No
N-AT7	10:47pm	IA	45	2.3 / 158	Yes	E	No
N-AT8	1:22am	43	49	1.1 / 054	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 15 and 16 June 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:42am	IA	37	1.0 / 041	Yes	E	No
N-AT2	11:30pm	22	35	0.8 / 147	Yes	F	No
N-AT3	12:08am	IA	40	0.5 / 070	Yes	E	No
N-AT4	12:35am	IA	38	1.2 / 205	Yes	F	No
N-AT5	12:56am	23	37	0.5 / 135	Yes	F	No
N-AT6	2:06am	IA	35	1.1 / 024	Yes	D	No
N-AT7	10:47pm	IA	37	2.3 / 158	Yes	E	No
N-AT8	1:22am	35	43	1.1 / 054	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 $L_{Aeq,\ period}$ Cumulative Noise: Attended Night Monitoring 15 and 16 June 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:42am	40	40	No
N-AT2	11:30pm	22	40	No
N-AT3	12:08am	IA	40	No
N-AT4	12:35am	IA	40	No
N-AT5	12:56am	23	40	No
N-AT6	2:06am	28	40	No
N-AT7	10:47pm	IA	40	No
N-AT8	1:22am	46	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

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11. Blast Monitoring

There were ten (10) blast events (a total of 63 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – June 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
4/06/2026	12:22	0.82 mm/s	106 DBL	0.37 mm/s	109.2 DBL	Y
6/06/2026	15:10	0.09 mm/s	87.4 DBL	0.16 mm/s	93 DBL	Y
9/06/2026	13:38	1.19 mm/s	97.7 DBL	0.56 mm/s	98.9 DBL	Y
10/06/2026	12:03	0.19 mm/s	88 DBL	0.53 mm/s	98 DBL	Y
15/06/2026	10:23	1.26 mm/s	94.2 DBL	0.89 mm/s	95 DBL	Y
19/06/2026	9:27	1.73 mm/s	95.3 DBL	1.18 mm/s	108.7 DBL	Y
22/06/2026	10:18	0.25 mm/s	88.6 DBL	0.18 mm/s	98 DBL	Y
24/06/2026	10:13	0.61 mm/s	102.4 DBL	0.48 mm/s	106.4 DBL	Y
25/06/2026	14:08	0.36 mm/s	93.8 DBL	0.46 mm/s	96.1 DBL	Y
27/06/2026	14:01	0.34 mm/s	92.2 DBL	0.54 mm/s	93.4 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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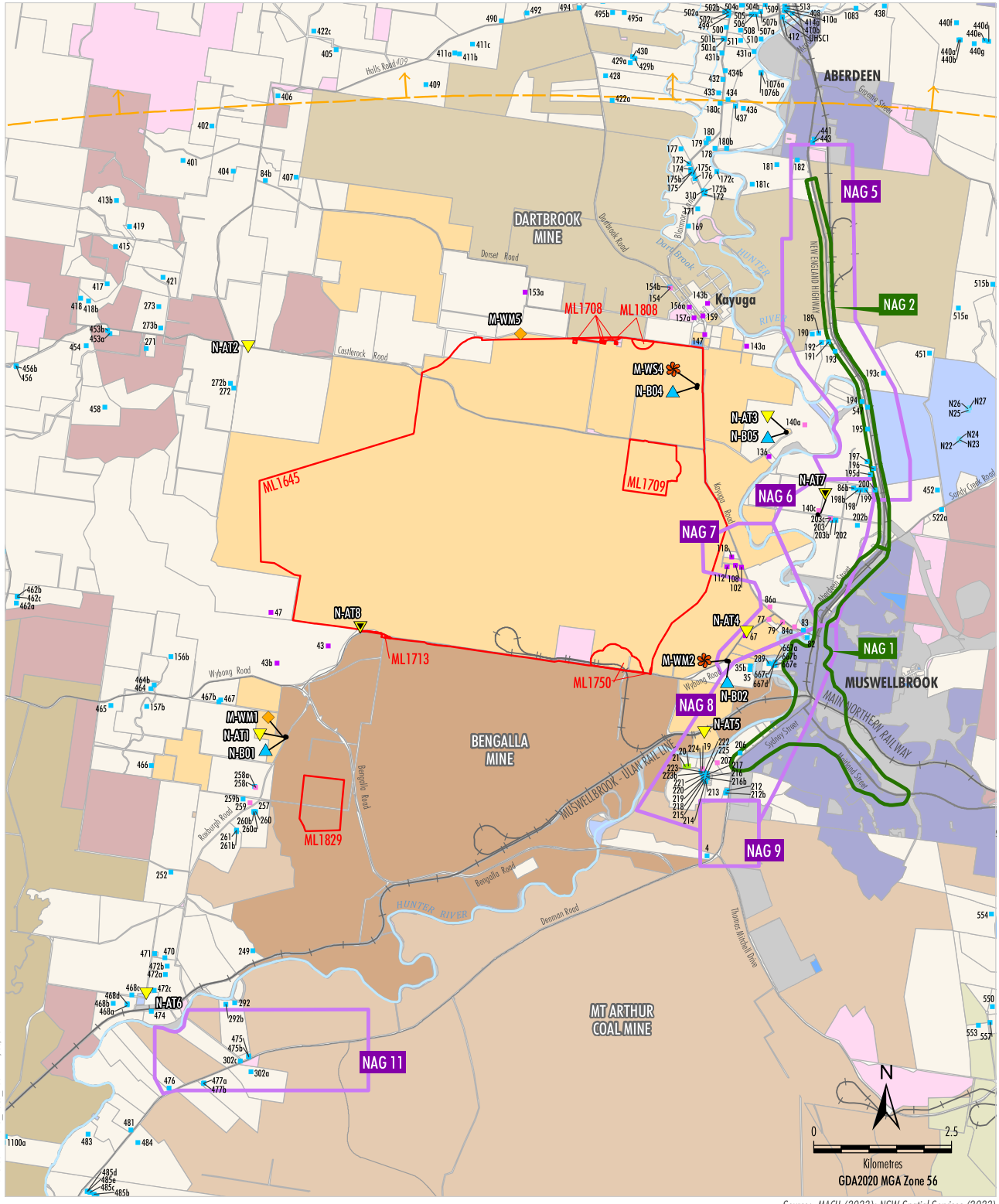

MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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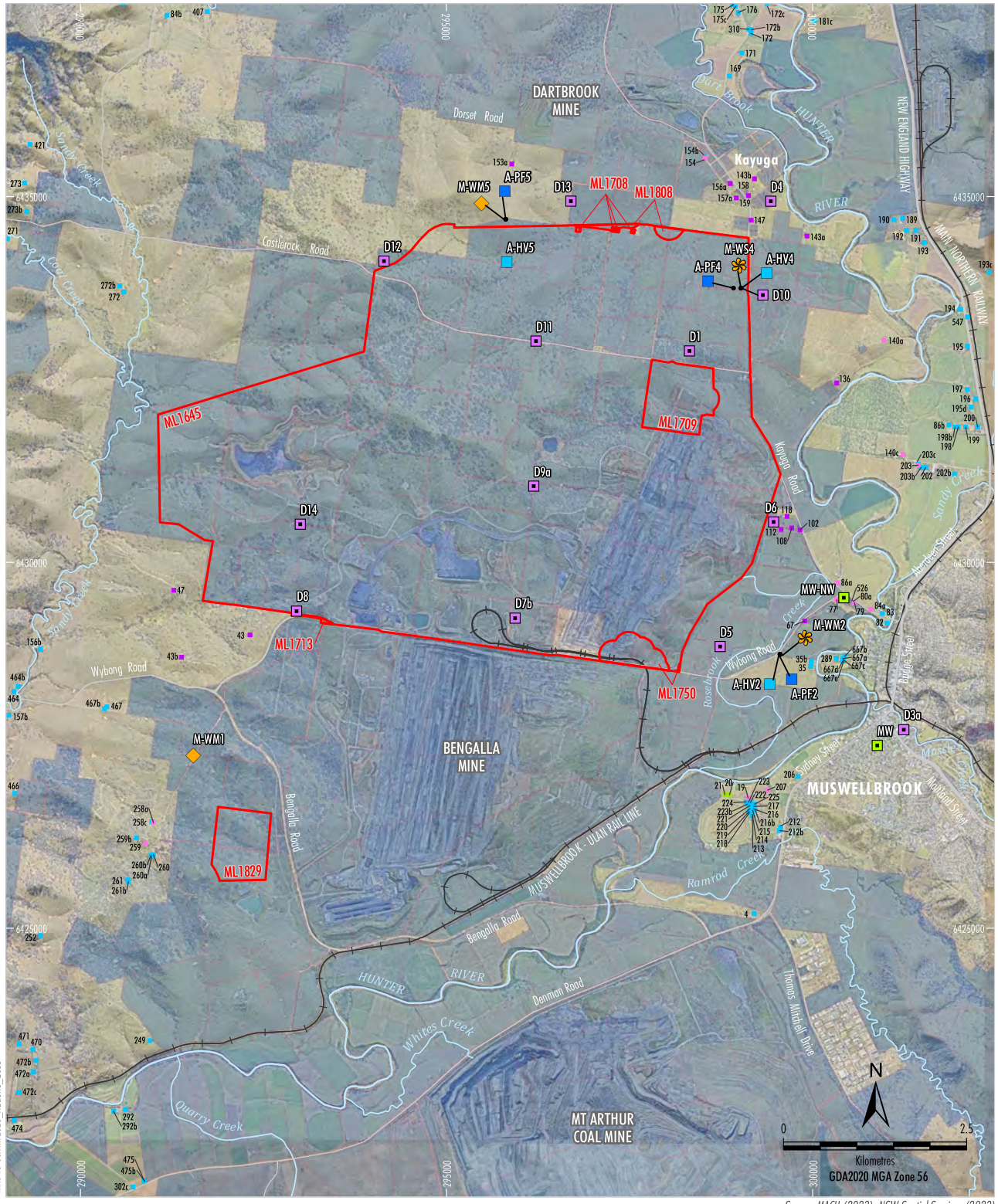
MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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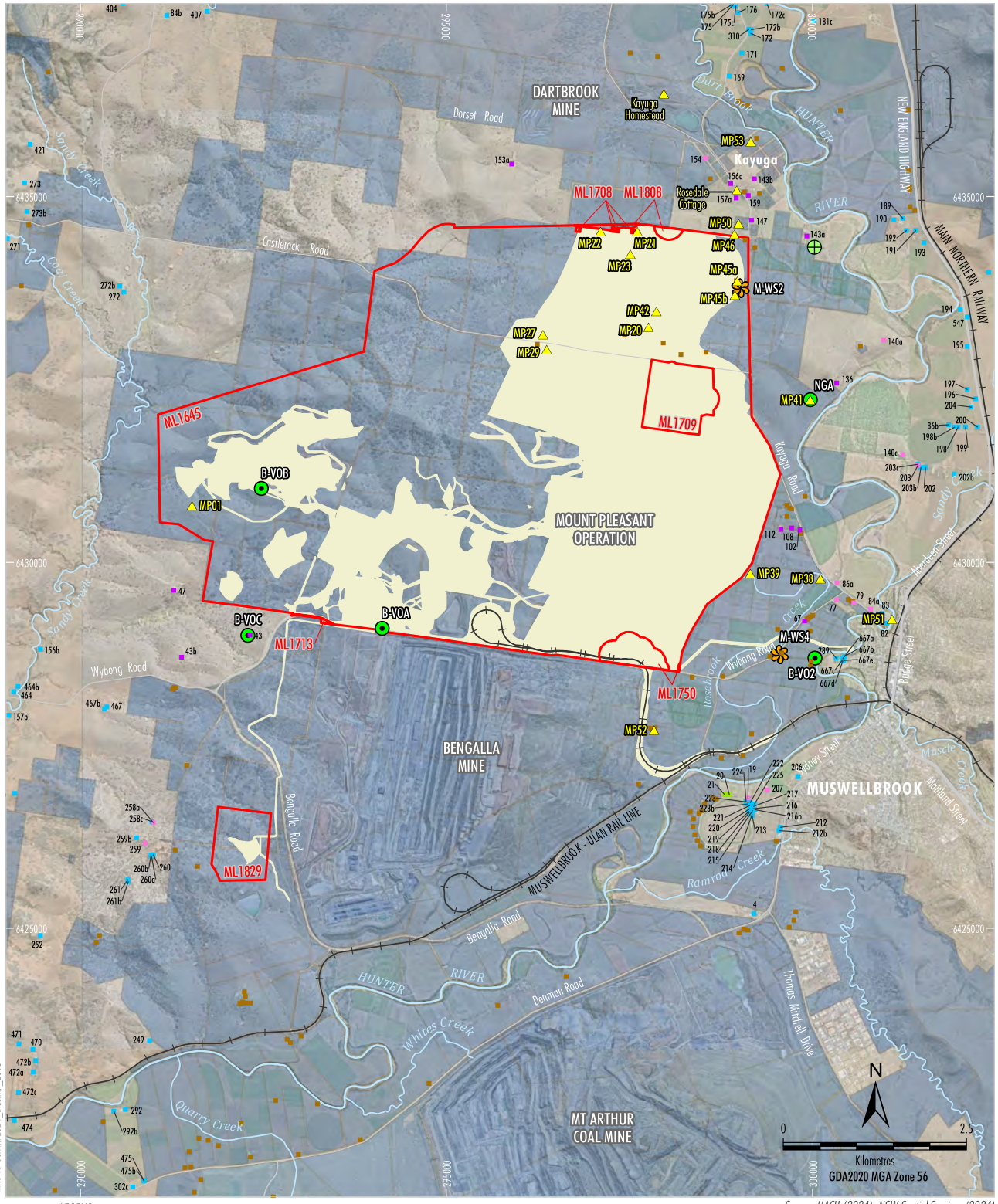
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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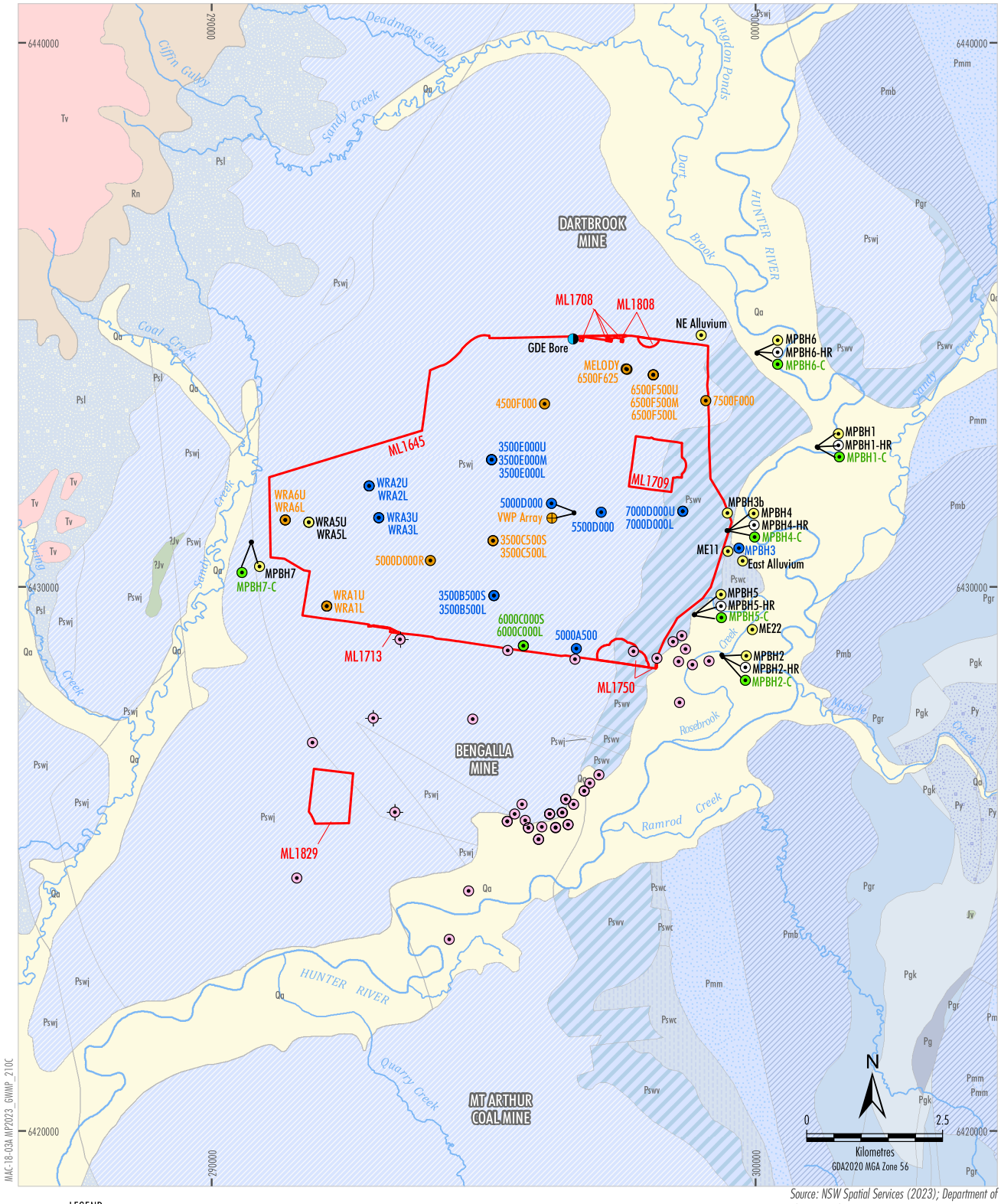
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

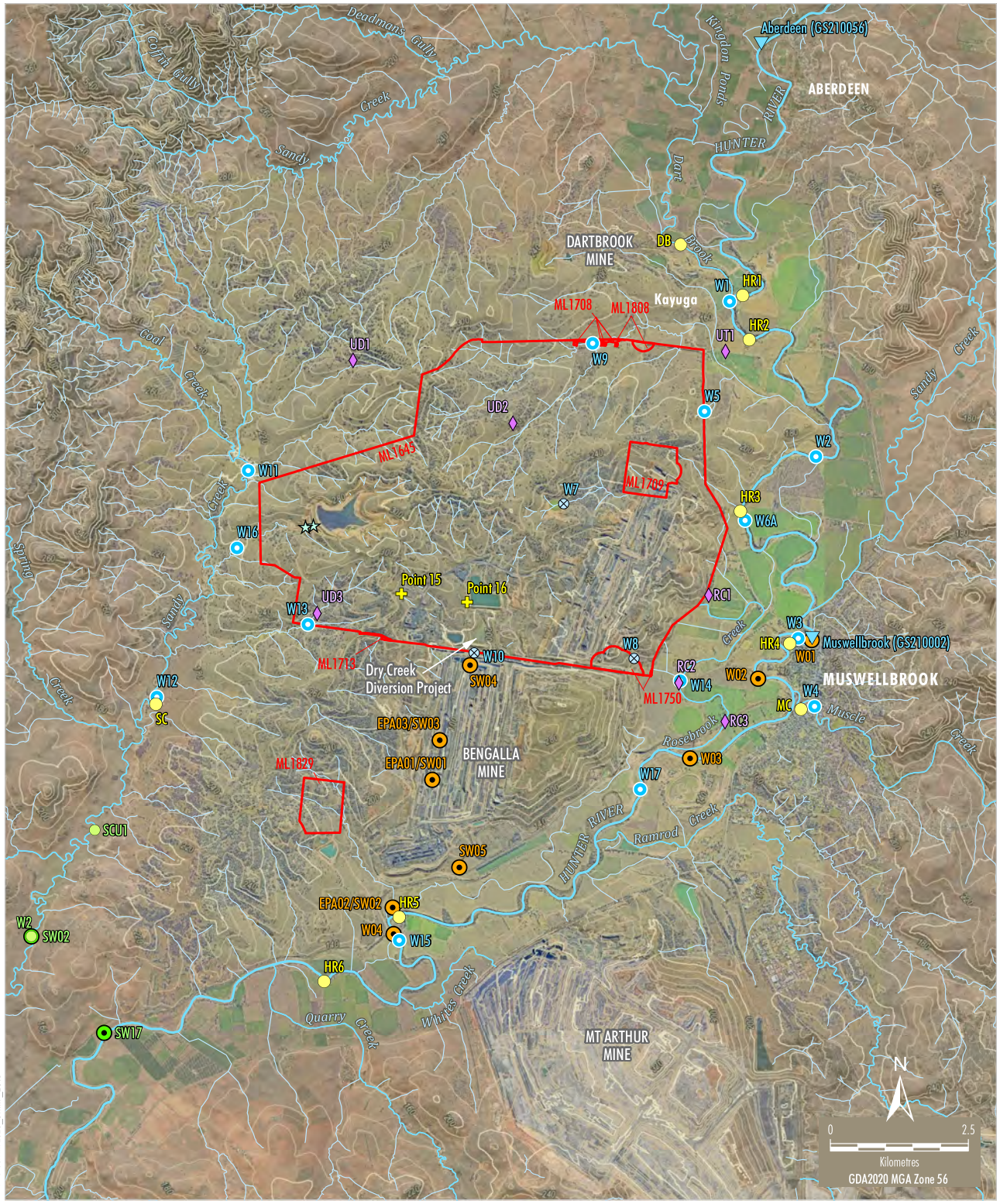
- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

MACHEnergy

MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

MACHEnergy

Mount Pleasant Operation

Monthly Environmental Monitoring Report

July 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 July 2026
Reporting Period End Date	31 July 2026
Date All Data Received	15 August 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout July 2026, there was 12.2mm at M-WS2 and 10.6mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 is located within close proximity to the North Opencut Pit and isn't considered representative of residential receivers. D1 will continue to be monitored, however will not be used to assess compliance or to represent residential receivers in the area.

Site D7b has now been mined through, therefore results from this monitor will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – July 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D1	5.4	**6.8**
D3	1.6	1.9
D4	0.4	1.3
D5a	2.5	2.9
D6	2.7	2.8
D8	7.3	**8.8**
D9a	4.7	**4.1**
D10	1.3	2.3
D11	0.7	**4.2**
D12	7.0	2.0
D13	2.0	2.3
D14	3.1	3.9
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

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Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

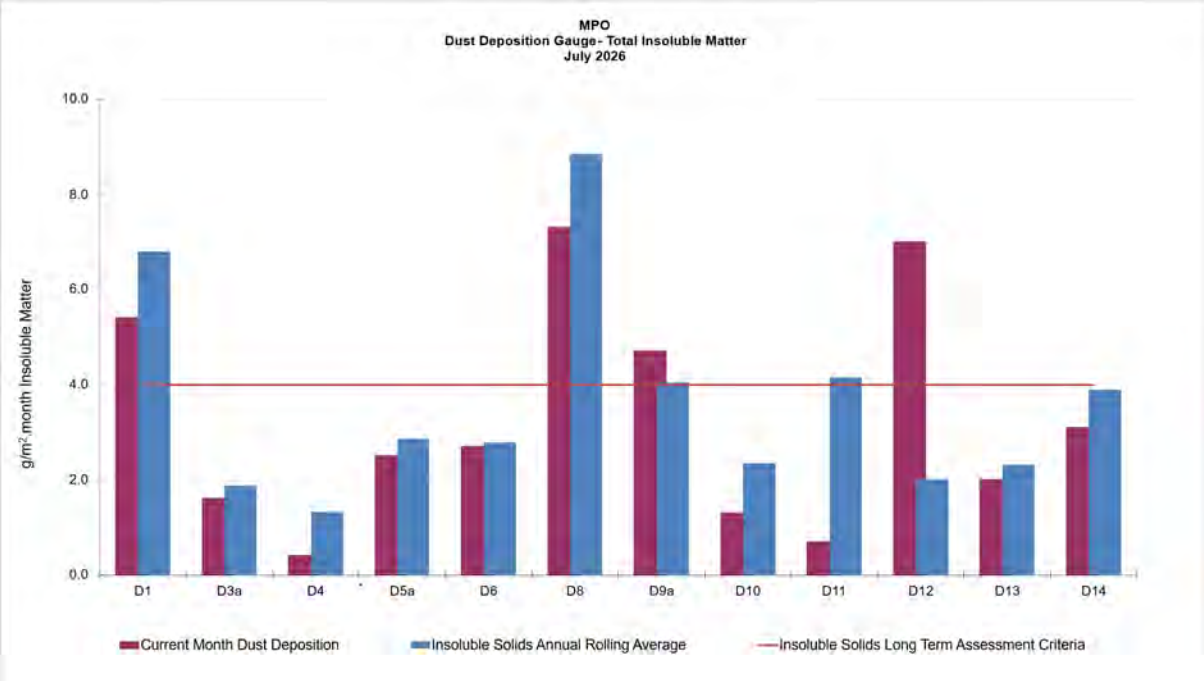

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – July 2026

Run Date	Assessment Criterion	TSP µg/m³		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
06/07/2026	-	54.3	60.8	39.6
12/07/2026	-	38.5	15.5	18.7
18/07/2026	-	28.3	58.9	31.8
24/07/2026	-	65.6	8.6	17.9
30/07/2026	-	57.0	75.5	37.8
Monthly Average	-	48.7	43.9	29.2
Annual Rolling Average	90	63	65	67

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF4. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average July 2026

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/07/2026	12.21	25.30	9.38
02/07/2026	18.77	6.76	5.88
03/07/2026	30.45	7.48	5.90
04/07/2026	10.20	7.43	6.04
05/07/2026	10.37	8.21	9.53
06/07/2026	11.60	11.08	12.54
07/07/2026	12.22	12.95	18.59
08/07/2026	11.90	27.98	22.95
09/07/2026	9.20	11.13	13.94
10/07/2026	10.41	11.69	15.00
11/07/2026	12.18	9.35	8.69
12/07/2026	11.52	7.46	6.50
13/07/2026	13.27	8.94	6.93
14/07/2026	14.22	8.68	6.55
15/07/2026	13.38	18.14	17.45
16/07/2026	12.62	17.54	19.24
17/07/2026	10.27	10.92	14.73
18/07/2026	9.35	10.79	14.07
19/07/2026	10.32	11.16	17.61
20/07/2026	11.06	12.74	18.42
21/07/2026	15.85	26.32	23.33
22/07/2026	17.33	9.67	7.89
23/07/2026	21.16	8.96	6.87
24/07/2026	13.06	9.19	6.54
25/07/2026	11.77	8.43	6.99
26/07/2026	14.39	11.65	14.71
27/07/2026	14.46	15.62	22.01
28/07/2026	23.62	11.80	8.23
29/07/2026	28.91	10.82	7.86
30/07/2026	14.91	14.38	18.10
31/07/2026	14.62	13.81	15.51

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
**Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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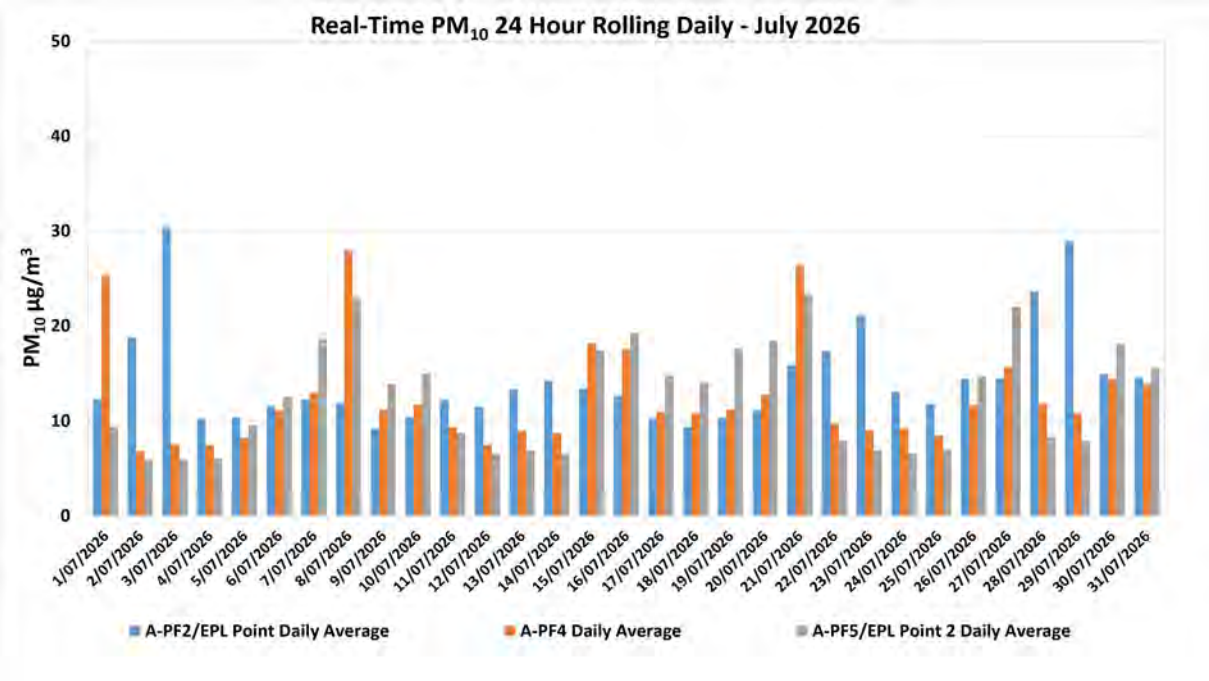

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for July 2026.

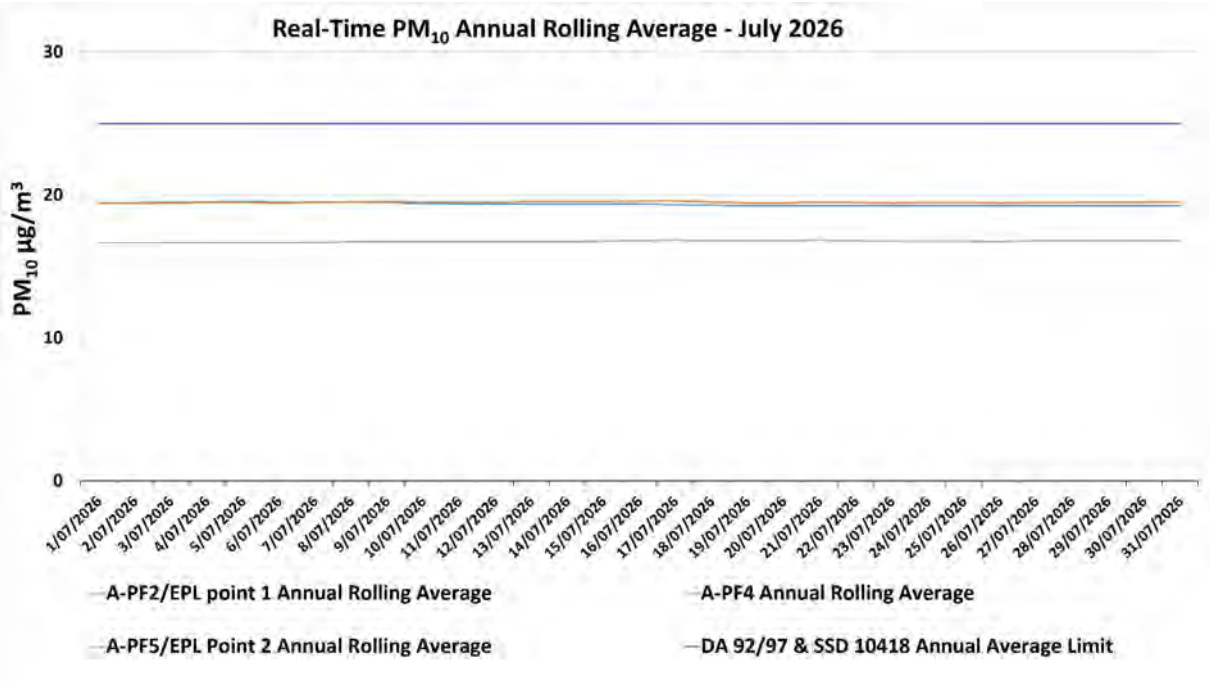

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for July 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – July 2026

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2
	24-hour Average Result		
01/07/2026	4.64	5.59	3.61
02/07/2026	3.96	2.94	2.78
03/07/2026	5.02	2.99	2.76
04/07/2026	3.73	3.52	2.96
05/07/2026	4.04	3.73	3.68
06/07/2026	4.10	4.11	4.38
07/07/2026	4.44	4.59	4.91
08/07/2026	4.47	5.52	6.13
09/07/2026	4.16	4.44	4.98
10/07/2026	5.20	5.71	5.77
11/07/2026	5.44	4.91	4.45
12/07/2026	4.18	3.52	3.13
13/07/2026	4.39	4.05	3.31
14/07/2026	4.52	3.78	3.11
15/07/2026	4.28	5.01	4.66
16/07/2026	5.26	6.41	6.95
17/07/2026	4.50	4.82	5.49
18/07/2026	4.09	4.40	4.88
19/07/2026	4.01	4.06	4.89
20/07/2026	4.16	4.56	4.69
21/07/2026	5.69	6.31	5.64
22/07/2026	4.53	4.07	3.47
23/07/2026	4.81	3.69	3.10
24/07/2026	3.71	3.41	2.83
25/07/2026	3.96	3.76	3.29
26/07/2026	4.39	4.16	4.08
27/07/2026	5.33	5.42	5.64
28/07/2026	5.80	4.73	3.53
29/07/2026	5.68	4.15	3.19
30/07/2026	4.54	4.69	4.78
31/07/2026	5.49	5.06	4.88

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
**Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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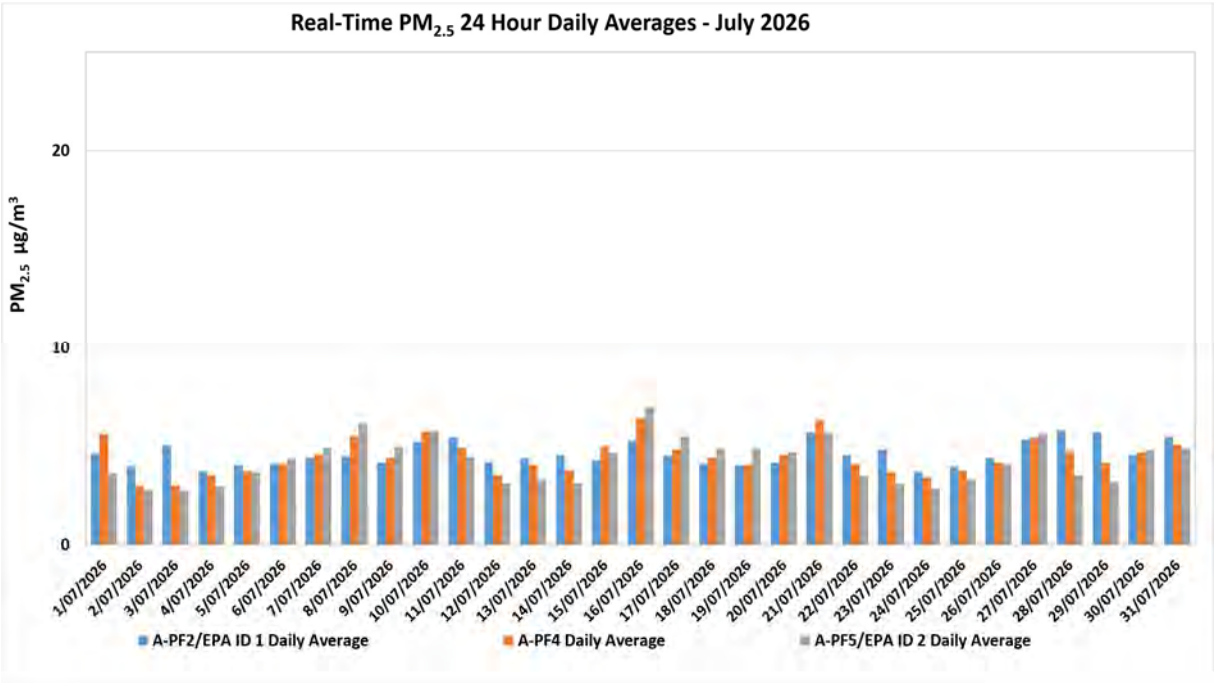

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for July 2026.

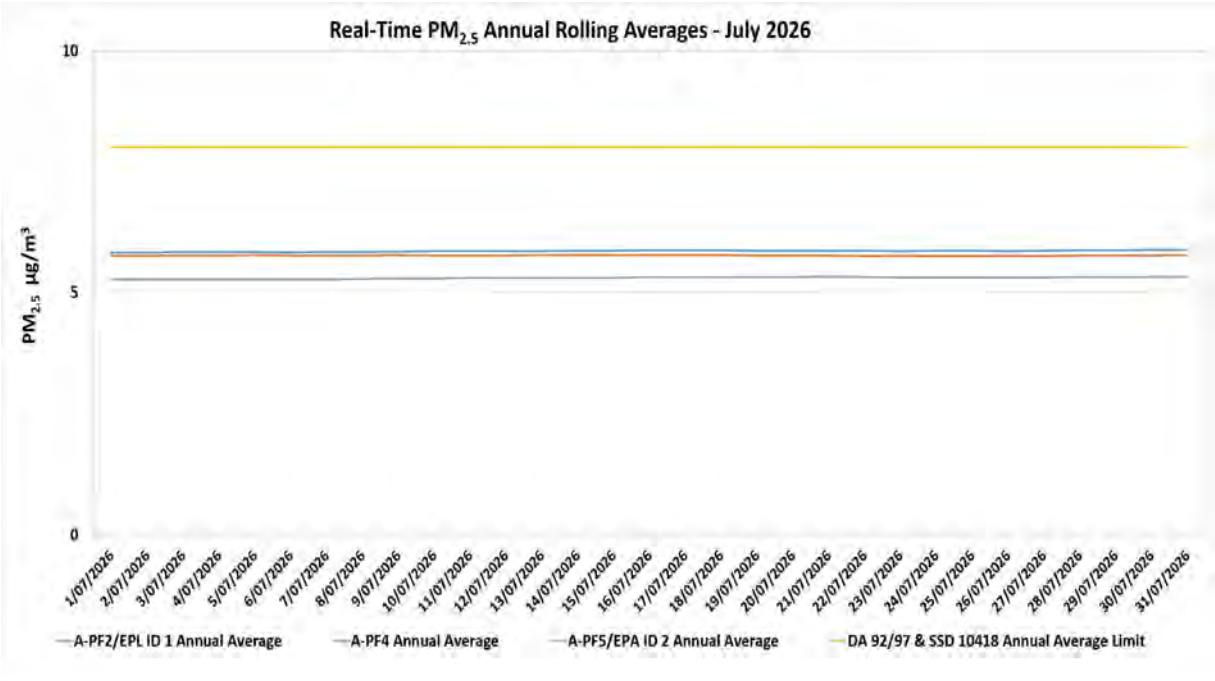

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for July 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 $\mu g/m^3$.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

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8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – 28 July 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.9	**688**	363	7
W2	8.0	703	382	<5
W6A	8.3	704	385	<5
W15	**8.3**	830	438	8
W17	7.8	797	440	6
Sandy Creek				
W11 (Upstream Reference Site)	**8.2**	4510	2390	**27**
W12	8.1	5580	3130	<5
Muscle Creek				
W4 (Upstream Reference Site)	7.8	**3040**	1860	9
Unnamed Tributaries				
W3	8.1	773	420	<5
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	8.7	9400	5380	18

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 21 and 22 July 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:32am	IA	45	0.8 / 020	Yes	E	No
N-AT2	10:50pm	26	45	1.5 / 294	Yes	F	No
N-AT3	11:25pm	38	45	1.9 / 336	Yes	E	No
N-AT4	11:52pm	35	45	1.5 / 050	Yes	D	No
N-AT5	12:14am	36	45	0.4 / 217	Yes	F	No
N-AT6	1:08am	IA	45	1.0 / 042	Yes	E	No
N-AT7	10:09pm	IA	45	2.8 / 289	Yes	F	NA
N-AT8	12:40am	46	49	0.9 / 350	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 21 and 22 July 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:32am	IA	37	0.8 / 020	Yes	E	No
N-AT2	10:50pm	23	35	1.5 / 294	Yes	F	No
N-AT3	11:25pm	29	40	1.9 / 336	Yes	E	No
N-AT4	11:52pm	27	38	1.5 / 050	Yes	D	No
N-AT5	12:14am	32	37	0.4 / 217	Yes	F	No
N-AT6	1:08am	IA	35	1.0 / 042	Yes	E	No
N-AT7	10:09pm	IA	37	2.8 / 289	Yes	F	NA
N-AT8	12:40am	37	43	0.9 / 350	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-3 $L_{Aeq,\ period}$ Cumulative Noise: Attended Night Monitoring 21 and 22 July 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:32am	39	40	No
N-AT2	10:50pm	26	40	No
N-AT3	11:25pm	29	40	No
N-AT4	11:52pm	33	40	No
N-AT5	12:14am	32	40	No
N-AT6	1:08am	31	40	No
N-AT7	10:09pm	IA	40	NA
N-AT8	12:40am	39	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

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11. Blast Monitoring

There were eight (8) blast events (a total of 71 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – July 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
1/07/2026	15:38	0.3 mm/s	98.6 DBL	0.2 mm/s	97.6 DBL	Y
10/07/2026	12:34	0.21 mm/s	92.8 DBL	0.45 mm/s	93.4 DBL	Y
15/07/2026	11:03	0.67 mm/s	95.8 DBL	0.56 mm/s	95.8 DBL	Y
17/07/2026	14:58	0.06 mm/s	110.6 DBL	0.06 mm/s	90.2 DBL	Y
23/07/2026	14:18	1.41 mm/s	103 DBL	0.71 mm/s	101.3 DBL	Y
25/07/2026	15:06	0.08 mm/s	92.1 DBL	0.11 mm/s	93.3 DBL	Y
29/07/2026	14:56	0.28 mm/s	107.8 DBL	0.2 mm/s	118 DBL	Y
30/07/2026	12:10	0.8 mm/s	92 DBL	0.47 mm/s	94.8 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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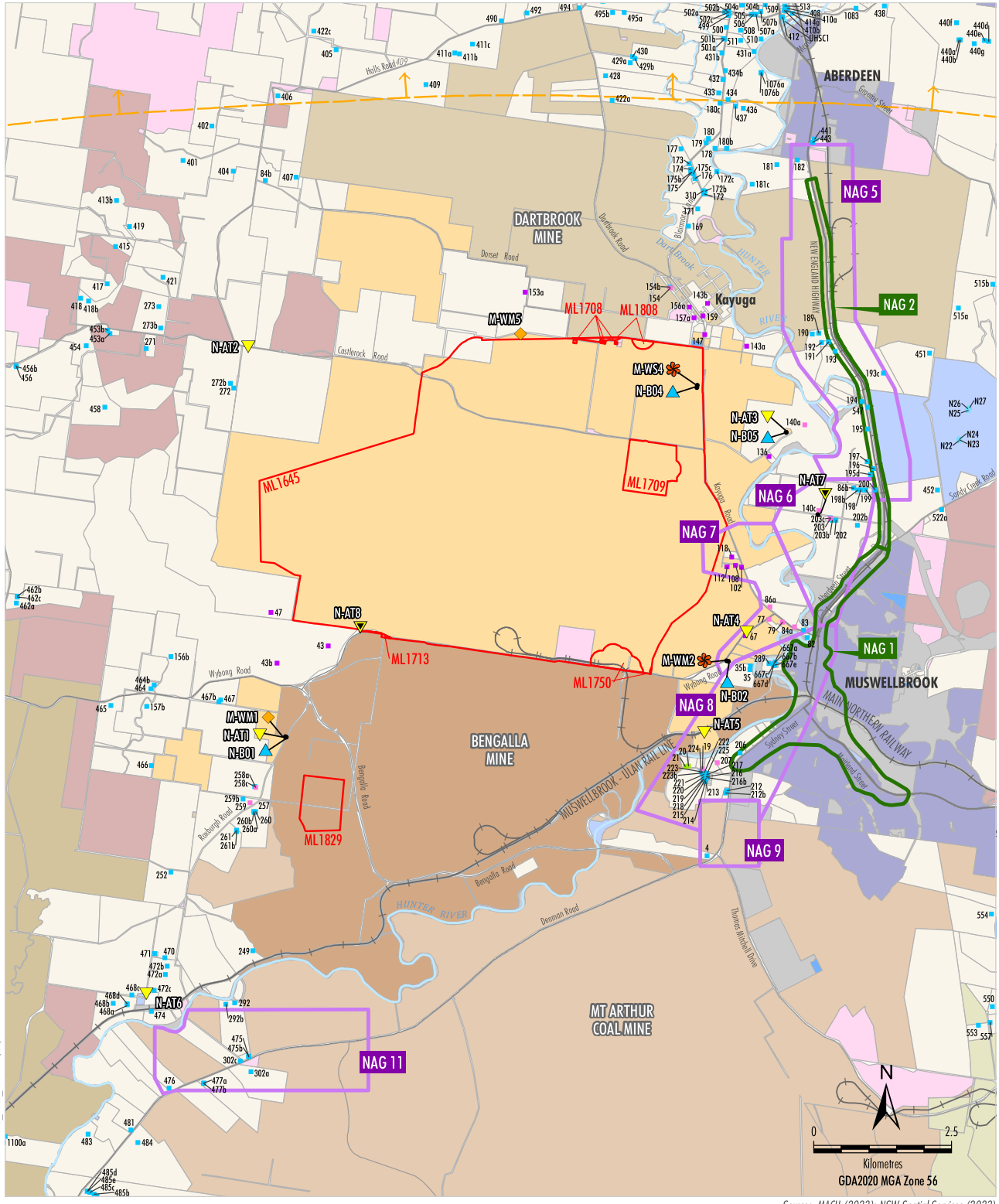


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

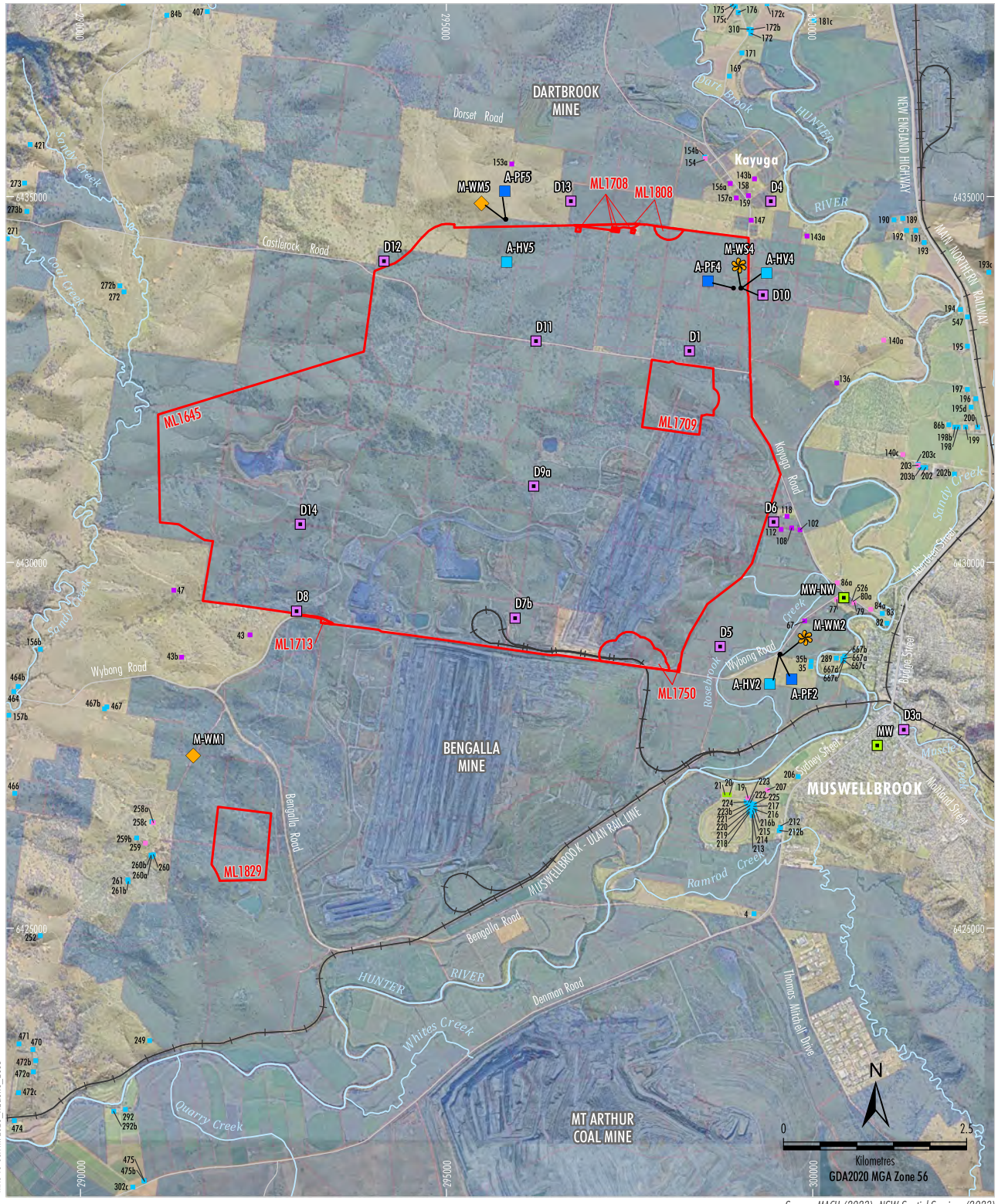
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

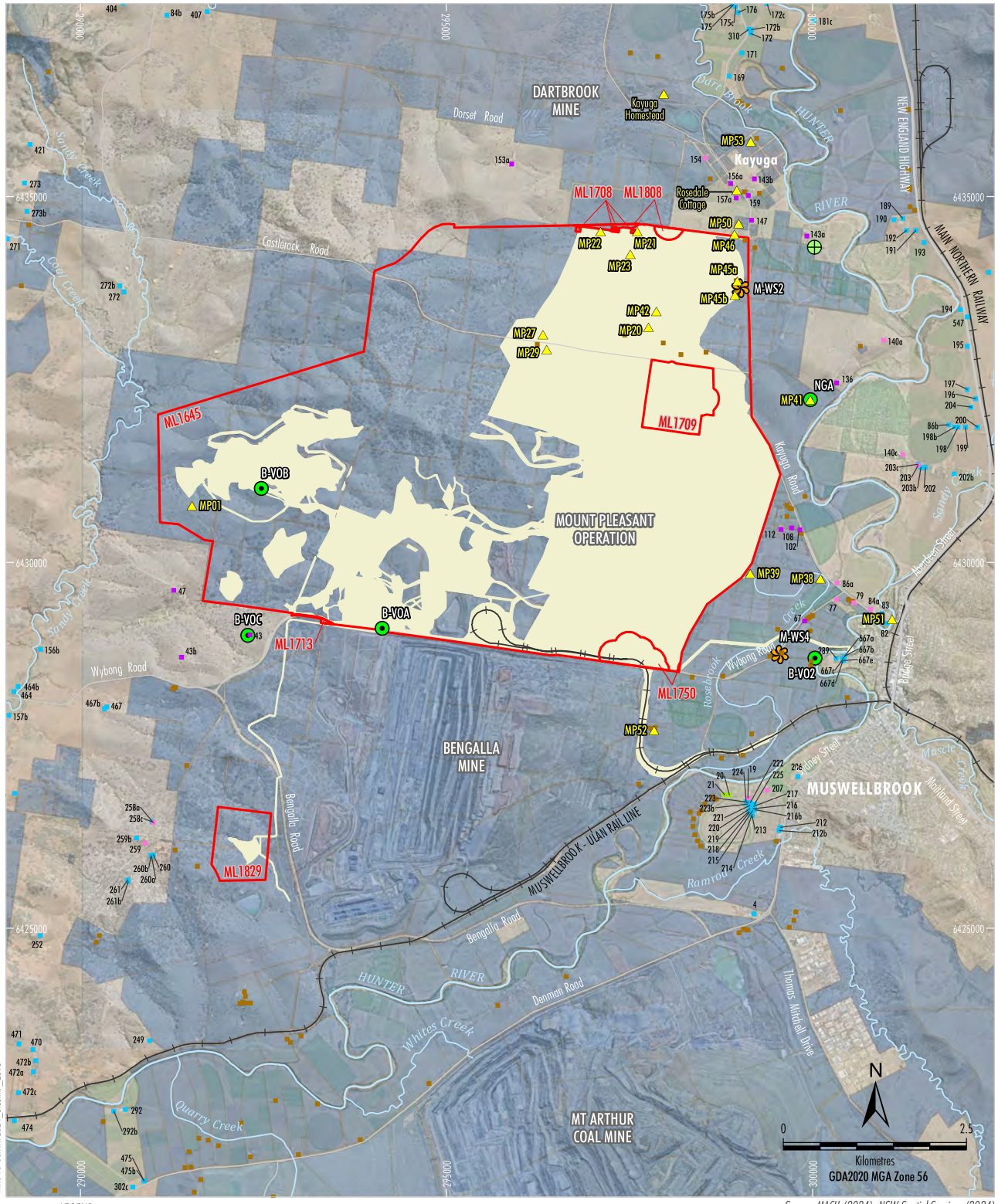
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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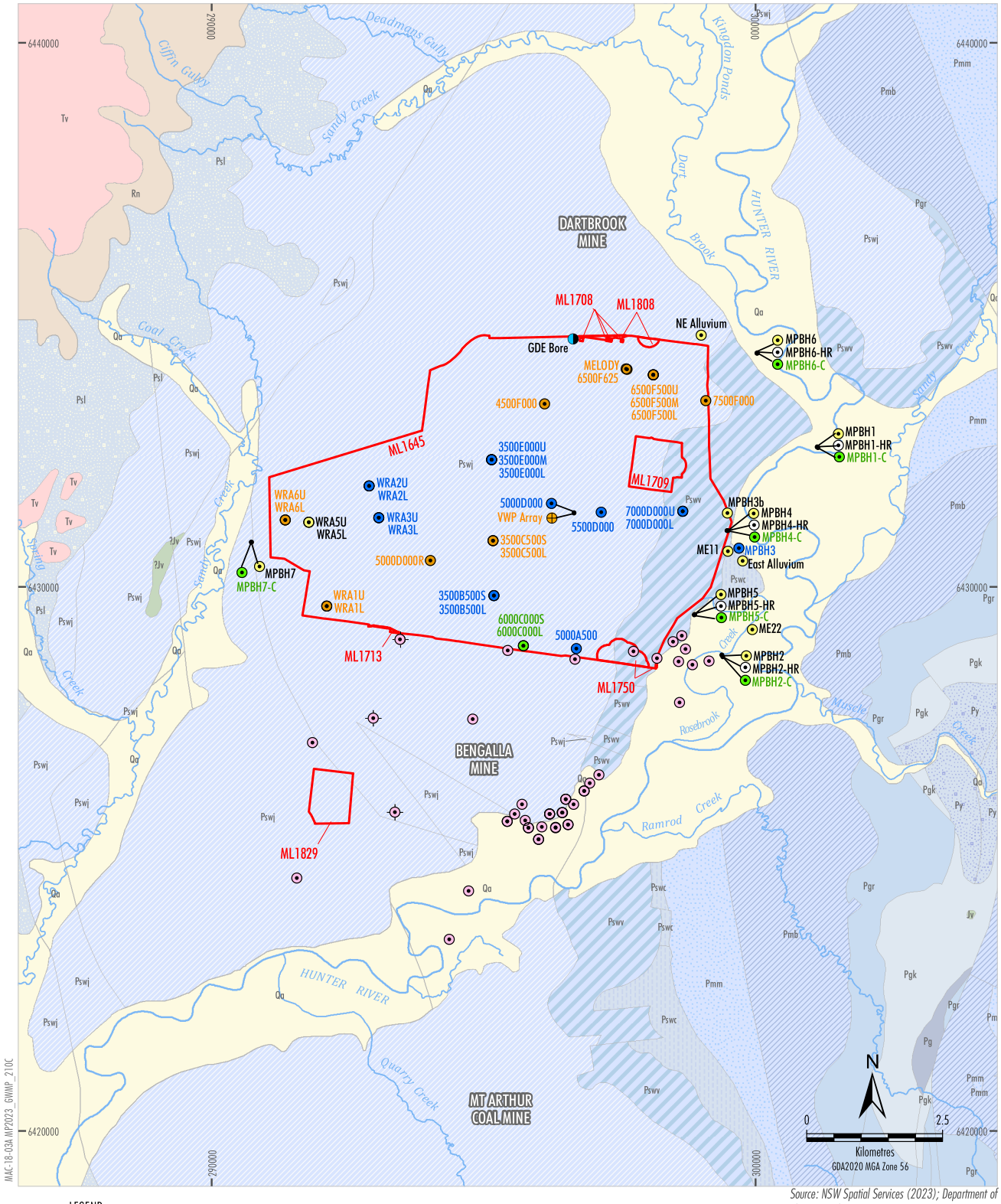
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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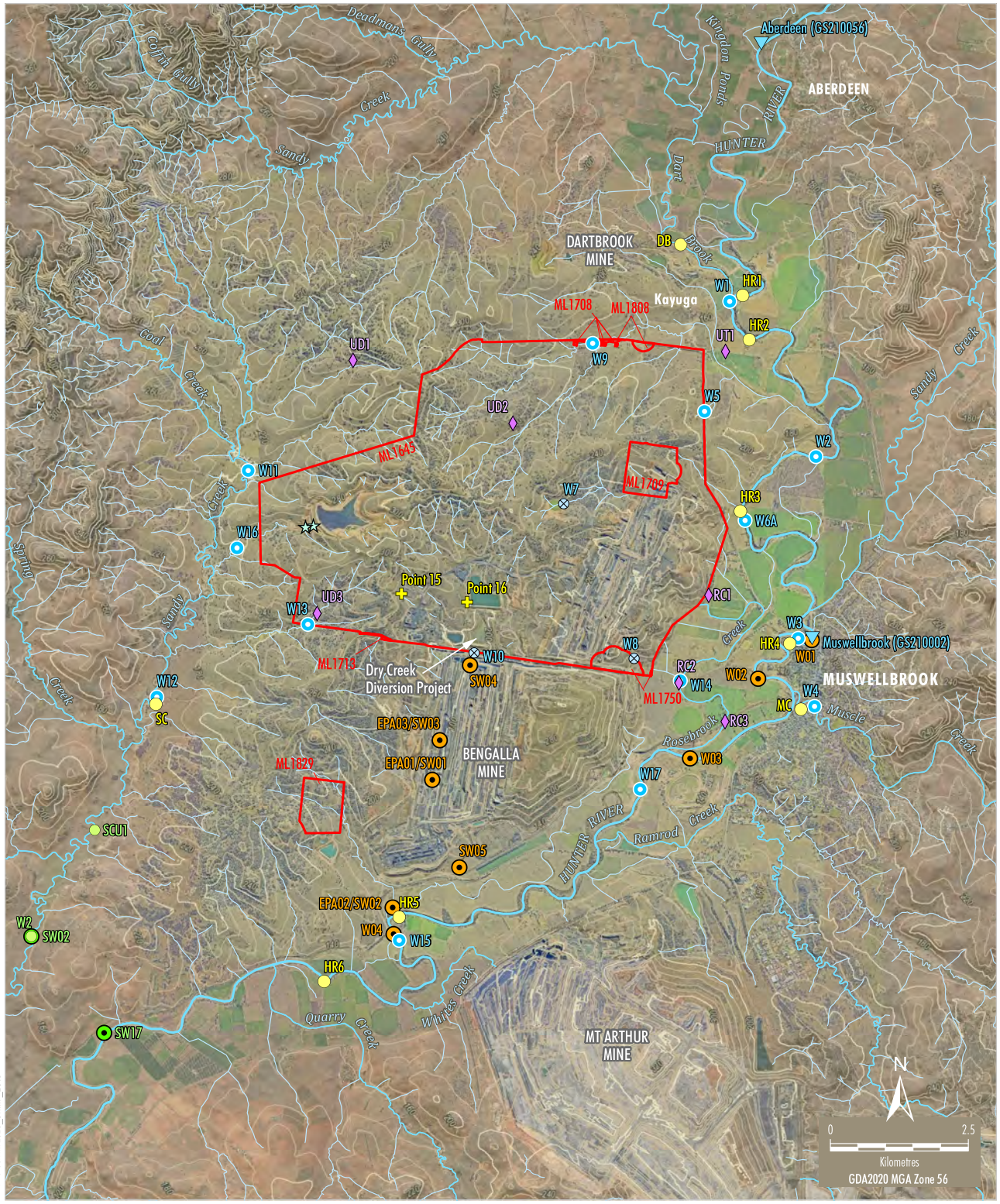
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

August 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 August 2026
Reporting Period End Date	31 August 2026
Date All Data Received	18 September 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout August 2026, there was 27.6mm at M-WS2 and 30.6mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 and D7b has now been mined through, therefore results from these sites will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – August 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D3	2.1	2.0
D4	0.8	1.3
D5a	3.9	3.0
D6	3.6	3.0
D8	9.8	**9.3**
D9a	3.4	**4.2**
D10	1.1	2.4
D11	5.5	**4.3**
D12	1.6	2.1
D13	2.1	2.4
D14	3.7	**4.0**
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

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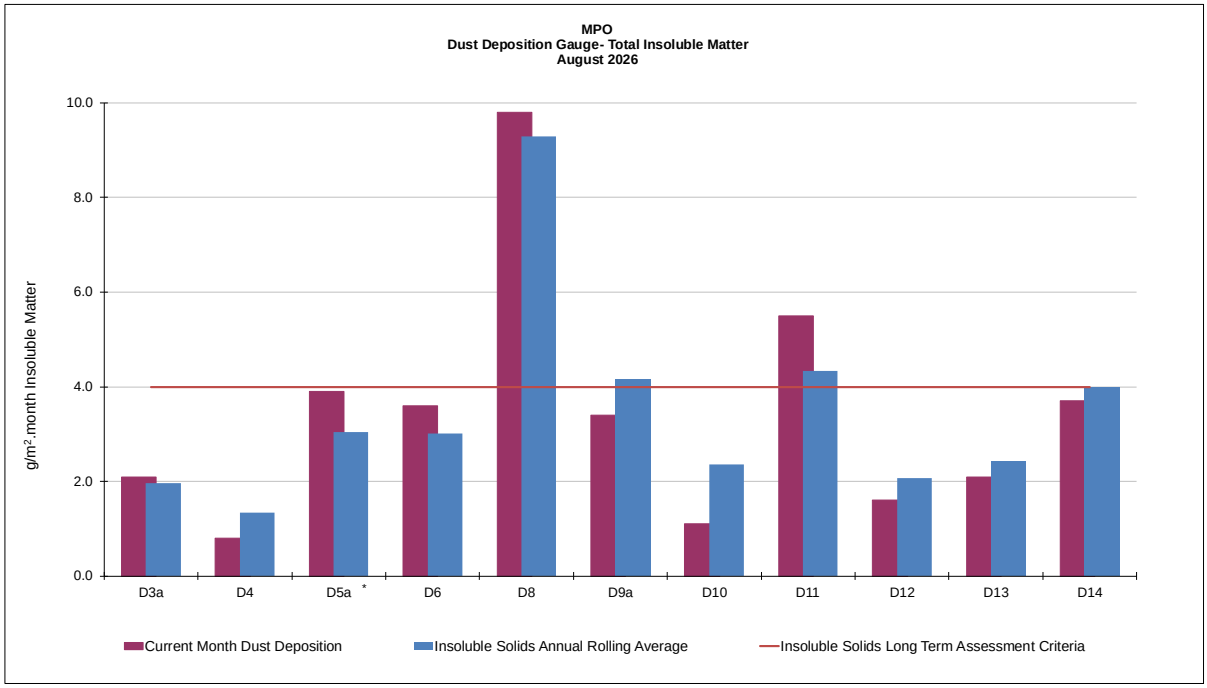

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – August 2026

Run Date	Assessment Criterion	TSP µg/m³		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
05/08/2026	-	59.2	9.4	20.7
11/08/2026	-	37.2	4.4	8.2
17/08/2026	-	22.3	68.3	51.4
23/08/2026	-	29.0	65.7	19.6
29/08/2026	-	36.0	65.0	50.2
Monthly Average	-	36.7	42.6	30.0
Annual Rolling Average	90	63	67	68

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF4. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average August 2026

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/08/2026	14.83	15.49	25.85
02/08/2026	21.84	23.48	16.54
03/08/2026	21.50	13.95	8.97
04/08/2026	23.36	12.25	6.93
05/08/2026	14.38	9.86	6.68
06/08/2026	26.09	12.16	6.92
07/08/2026	15.55	10.17	7.71
08/08/2026	-	16.41	14.69
09/08/2026	-	-	14.18
10/08/2026	17.89	7.98	8.27
11/08/2026	7.76	7.14	5.45
12/08/2026	7.40	6.85	5.22
13/08/2026	5.93	6.60	5.24
14/08/2026	4.33	26.46	25.92
15/08/2026	3.76	16.08	22.22
16/08/2026	3.75	13.79	18.47
17/08/2026	3.94	12.23	12.67
18/08/2026	3.97	12.39	12.79
19/08/2026	3.94	15.98	14.90
20/08/2026	14.64	12.77	7.28
21/08/2026	17.94	11.02	8.51
22/08/2026	18.96	6.96	5.65
23/08/2026	10.57	10.78	15.89
24/08/2026	17.69	12.46	11.51
25/08/2026	14.79	17.47	6.51
26/08/2026	8.68	7.89	8.80
27/08/2026	16.69	19.84	23.13
28/08/2026	15.97	14.22	13.46
29/08/2026	15.02	17.61	21.55
30/08/2026	20.85	15.13	14.69
31/08/2026	15.54	27.61	19.42

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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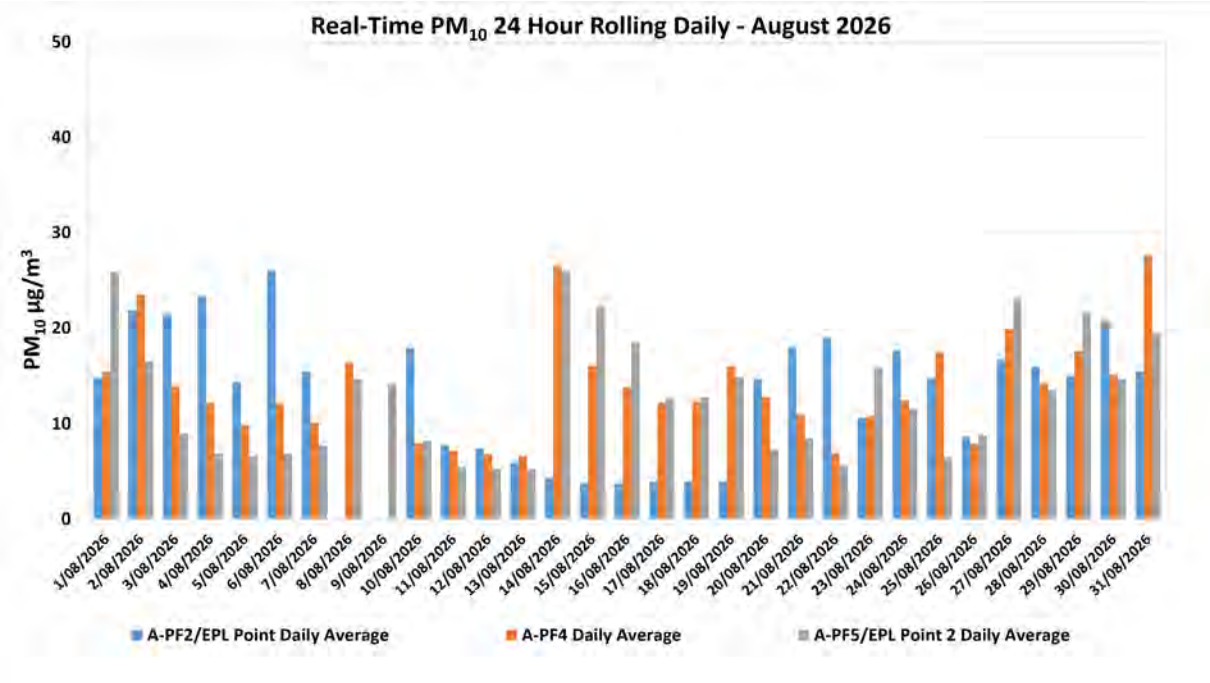

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for August 2026.

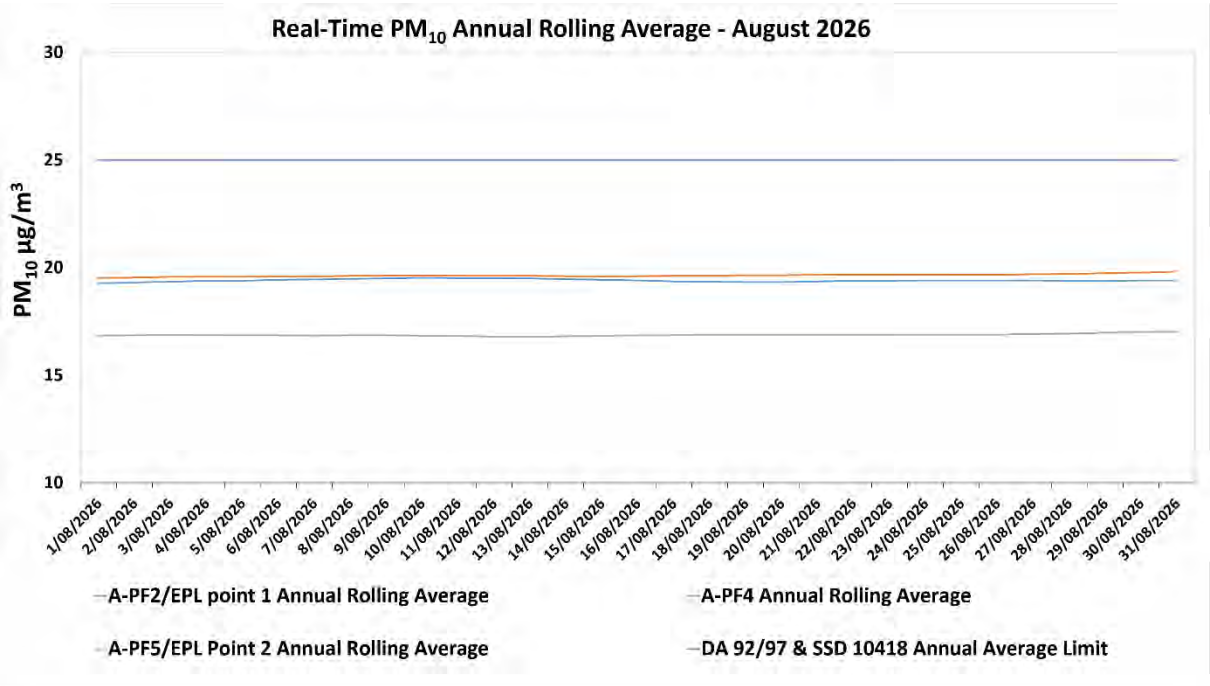

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for August 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data – August 2026

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2
	24-hour Average Result		
01/08/2026	5.39	5.64	7.02
02/08/2026	7.65	7.61	5.89
03/08/2026	7.05	5.38	4.05
04/08/2026	5.09	4.17	3.06
05/08/2026	3.96	3.44	2.83
06/08/2026	4.95	4.00	3.07
07/08/2026	4.73	4.20	3.32
08/08/2026	-	5.75	4.73
09/08/2026	-	-	5.29
10/08/2026	3.60	2.74	3.44
11/08/2026	2.78	2.99	2.67
12/08/2026	2.65	3.08	2.63
13/08/2026	2.42	2.88	2.61
14/08/2026	2.17	5.78	6.09
15/08/2026	2.06	6.15	7.28
16/08/2026	2.06	5.62	6.26
17/08/2026	2.11	4.81	5.15
18/08/2026	2.13	4.05	4.40
19/08/2026	2.10	5.45	5.30
20/08/2026	3.74	4.16	3.14
21/08/2026	5.19	4.47	3.68
22/08/2026	4.80	3.28	2.81
23/08/2026	4.35	4.71	4.97
24/08/2026	6.04	4.99	4.83
25/08/2026	5.02	5.10	3.23
26/08/2026	4.00	3.88	3.99
27/08/2026	6.64	7.50	8.26
28/08/2026	7.51	7.04	6.15
29/08/2026	6.23	6.92	7.31
30/08/2026	7.59	6.64	5.53
31/08/2026	6.82	7.97	7.05

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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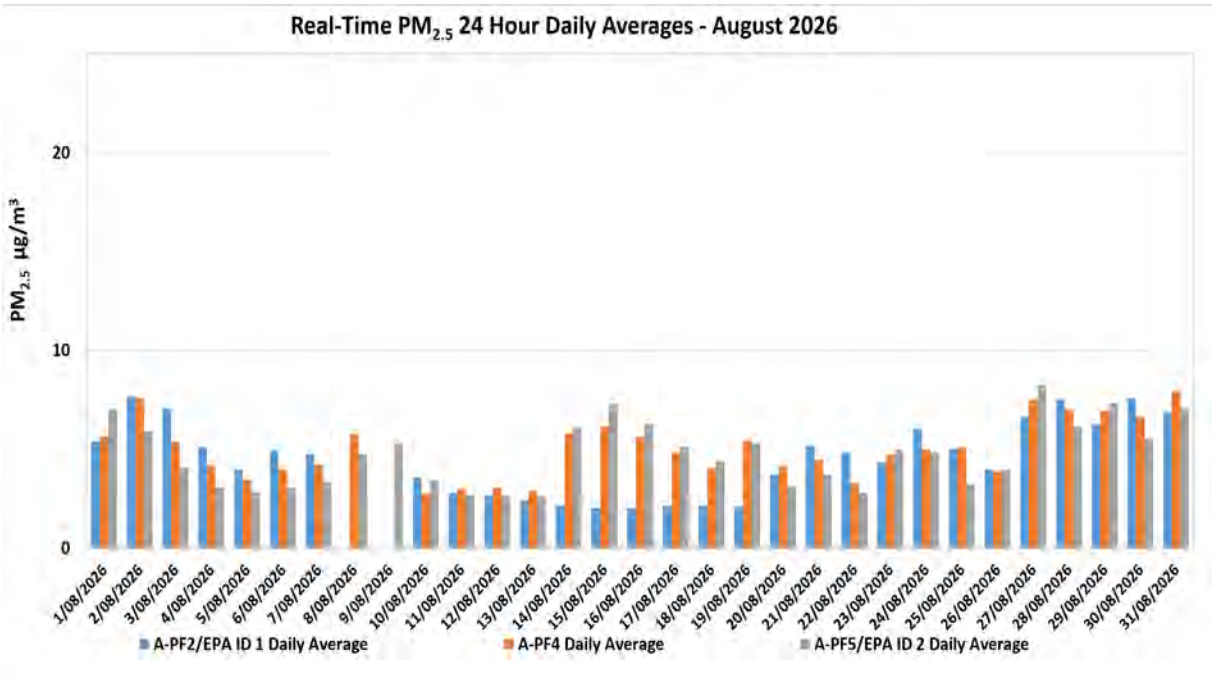

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for August 2026.

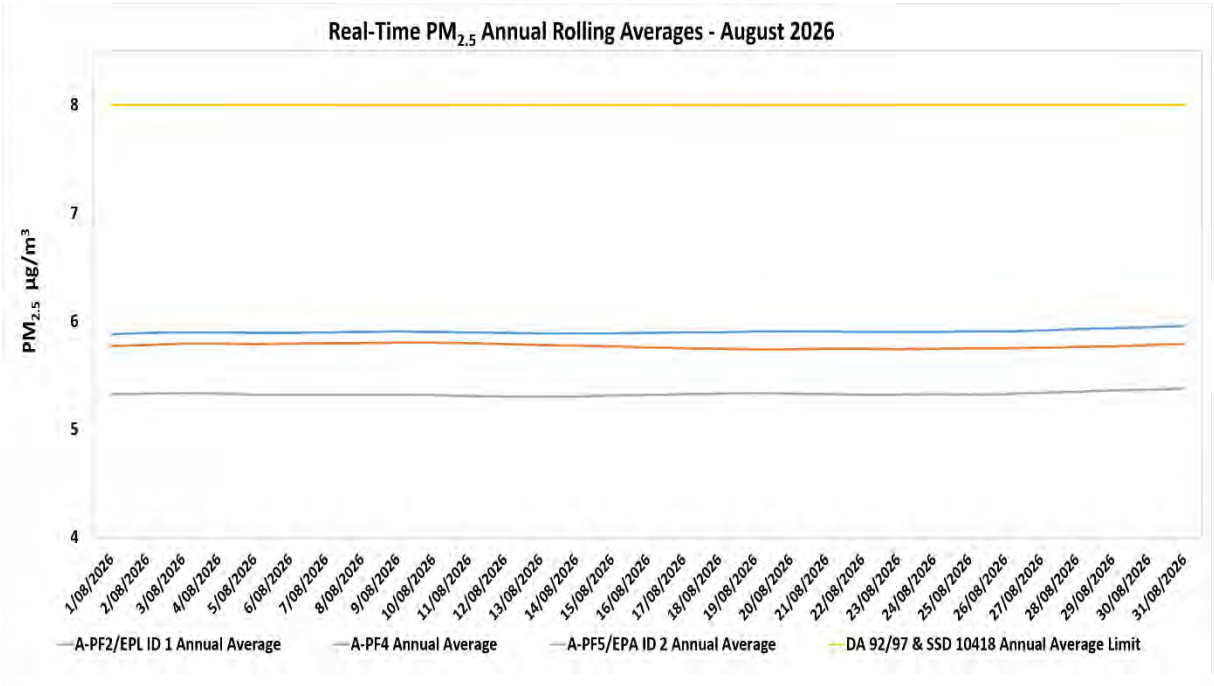

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for August 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction is continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

There were no dust shutdowns during the monitoring period.

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8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

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8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – August 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	7.9	**745**	420	11
W2	^	^	^	^
W6A	8.0	746	415	13
W15	8.0	654	378	14
W17	7.6	1078	646	10
Sandy Creek				
W11 (Upstream Reference Site)	^	^	^	^
W12	8.1	5450	3040	5
Muscle Creek				
W4 (Upstream Reference Site)	7.7	**2490**	1620	**19**
Unnamed Tributaries				
W3	8.0	807	444	7
W5	*	*	*	*
W9	7.6	720	486	72
W13	8.1	3430	1920	97
W14	*	*	*	*
W16	^	^	^	^

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access

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9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

9.2 Assessment Criteria

An investigation is triggered if elevated measurements occur for three consecutive sampling events in accordance MPO Water Management Plan (MACH Energy, 2022).

An investigation was previously triggered (AGE, 2023) examining the cause of elevated EC values in the alluvial zone, specifically MPBH2. The data suggests that the cause of the increase in EC is persistent above-average stage in the adjacent Hunter River, caused by above-average rainfall since 2020, which is causing a rise in groundwater levels in similar alluvial bores. Further Investigations have been undertaken during 2025, and in accordance with recommendations from Specialist Groundwater Consultants AGE, the *MPO Water Management Plan* (MACH Energy, 2025) has been revised to new recommended trigger levels for MPBH2. The revised MPO Water Management Plan was submitted to the Department of Planning Housing and Infrastructure in August 2025. Based on the previous assessment it is expected that EC levels of MPBH2 will continue to be above the older trigger level. This will not be reported each monitoring period as the investigation and recommendations have been completed as required.

9.3 Results

Water level results for the groundwater bores are presented in **Table 8-1**. The quarterly pH and EC results are presented in **Table 8-2** and **Table 8-3**, respectively.

Table 8-1 - MPO Quarterly Groundwater Water Level Results

Monitoring Location/ ID	Trigger	August 2026 Water Level (DTW)	May 2026 Water Level (DTW)	February 2026 Water Level (DTW)	Triggered (Yes/ No)
WRA1L	-	3.96	3.72	2.73	-
WRA1U	-	*	*	*	-
WRA3L-R	-	*	*	*	-
WRA3U-R	-	*	*	*	-
WRA5L-R	-	*	*	*	-
WRA5U-R	-	*	*	*	-
WRA6L	-	0.43	0.4	0.67	-
WRA6U	-	1.06	0.67	0.99	-
MPBH1	10.70	9.71	9.41	9.56	No
MPBH2	13.59	11.37	11.18	10.99	No
MPBH3b	13.04	11.7	11.66	11.08	No
MPBH4	-	12.06	11.97	11.73	-

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Monitoring Location/ ID	Trigger	August 2026 Water Level (DTW)	May 2026 Water Level (DTW)	February 2026 Water Level (DTW)	Triggered (Yes/ No)
MPBH5	-	*	*	*	-
MPBH1-C	-	9.613	9.323	9.49	-
MPBH1-HR	-	39.91	33.44	42.29	-
MPBH2-C	-	11.373	11.173	10.98	-
MPBH2-HR	-	30.226	11.226	11.24	-
MPBH4-C	-	10.723	10.683	10.40	-
MPBH4-HR	-	50.255	49.795	49.93	-
MPBH5-C	-	10.819	10.609	10.45	-
MPBH5-HR	-	10.99	10.81	10.50	-
MPBH6	-	9.251	10.091	10.37	-
MPBH6-C	-	10.298	10.548	8.99	-
MPBH6-HR	-	9.845	9.995	10.06	-
MPBH7	10.10	3.757	5.587	5.37	No
MPBH7-C	-	18.095	17.915	17.79	-
3500C500L	-	28.95	28.03	27.64	-
3500C500S	-	25.67	25.41	24.99	-
4500F000	-	21.88	21.88	21.58	-
5000D000-R	-	140.23	140.11	139.38	-
5000D000	-	149.5	147.7	142.93	-
6000C000L-R	-	*	*	*	-
6000C000U-R	-	*	*	*	-
6500F500L	-	51.93	51.33	49.72	-
6500F500M	-	52.53	51.93	50.34	-
6500F500U	-	28.36	28.04	27.76	-
6500F625	-	15.72	15.55	15.14	-
Melody	-	13.05	12.96	12.31	-
7500F000	-	^	^	36.34	-
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment criterion for changes in standing water level from the previous measurement.
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
* Dry/insufficient water to sample.

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^Unsafe access.
'-' indicates no trigger level

Table 8-2 - MPO Quarterly Groundwater pH Results

Monitoring Location/ ID	pH Trigger Range	August 2026 pH	May 2026 pH	February 2026 pH	Triggered (Yes/No)
WRA1L	6 - 8.5	7.2	7.1	7.0	No
WRA1U		*	*	*	No
WRA3L-R		7.6	7.8	7.5	No
WRA3U-R		*	*	*	No
WRA5L-R		7.1	7.2	7.1	No
WRA5U-R		7.6	7.7	7.5	No
WRA6L		7.1	7.0	6.9	No
WRA6U		6.9	6.9	6.8	No
MPBH1		6.8	7.0	6.8	No
MPBH2		6.9	7.0	6.9	No
MPBH3b		7.8	7.8	7.6	No
MPBH4		6.9	7.0	6.8	No
MPBH5		*	*	*	No
MPBH1-C	-	7.5	7.5	8.3	-
MPBH1-HR	-	7.6	7.6	7.6	-
MPBH2-C	-	8.9	8.4	10.3	-
MPBH2-HR	-	8.1	8.1	8.3	-
MPBH4-C	-	8.0	8.1	8.0	-
MPBH4-HR	-	7.4	7.4	7.2	-
MPBH5-C	-	10.2	10.3	10.6	-
MPBH5-HR	-	7.5	7.3	7.4	-
MPBH6	-	7.0	6.8	6.9	-
MPBH6-C	-	7.0	7.5	7.0	-
MPBH6-HR	-	7.0	7.3	7.1	-
MPBH7	-	7.0	7.0	6.9	-
MPBH7-C	-	7.1	7.1	7.0	-
3500C500L	6 - 8.5	7.3	7.5	7.5	No
3500C500S	-	7.1	7.2	7.3	-
4500F000	6 – 8.5	6.7	6.7	6.8	No

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Monitoring Location/ ID	pH Trigger Range	August 2026 pH	May 2026 pH	February 2026 pH	Triggered (Yes/No)
5000D000-R		7.4	7.5	7.5	No
6000C000L-R		8.4	8.3	8.4	No
6000C000U-R		7.5	7.4	7.5	No
6500F500L		7.2	7.2	7.2	No
6500F500M		7.2	7.3	7.1	No
6500F500U		6.8	6.8	6.8	No
6500F625		7.0	7.0	6.8	No
Melody		6.9	7.0	6.9	No
7500F000		^	^	7.7	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

*Results in **bold** indicate that the pH values recorded are outside the baseline range (20th – 80th percentile).*
** Dry/insufficient water to sample.*
^Unsafe access.
'-' indicates no trigger level

Table 8-3 - MPO Quarterly Groundwater EC Results

Monitoring Location/ ID	Maximum Beneficial Use Trigger	August 2026 EC	May 2026 EC	February 2026 EC	Triggered (Yes/No)
WRA1L	7800	3090	3100	2920	No
WRA1U	-	*	*	*	-
WRA3L-R	22000	7780	7810	8320	No
WRA3U-R	22000	*	*	*	No
WRA5L-R	7800	5200	5330	5290	No
WRA5U-R	7800	5686	5870	5820	No
WRA6L	7800	5570	6730	5560	No
WRA6U	22000	7530	8240	8230	No
MPBH1	800	614	594	707	No
MPBH2	930	**1042**	**1000**	**1086**	**Yes[1]**
MPBH3b	7800	4450	4530	4540	No
MPBH4	7800	5390	5430	5700	No
MPBH5	-	*	*	*	-
MPBH1-C	-	642	643	1301	-
MPBH1-HR	-	1684	1754	1650	-
MPBH2-C	-	1333	1484	1549	-
MPBH2-HR	-	1705	1731	1788	-
MPBH4-C	-	4840	4950	4980	-
MPBH4-HR	-	5260	5050	5720	-
MPBH5-C	-	635	641	647	-

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Monitoring Location/ ID	Maximum Beneficial Use Trigger	August 2026 EC	May 2026 EC	February 2026 EC	Triggered (Yes/No)
MPBH5-HR	-	794	865	823	-
MPBH6	-	995	1093	1108	-
MPBH6-C	-	1315	4860	2450	-
MPBH6-HR	-	2600	5880	2750	-
MPBH7	-	10240	10100	11460	-
MPBH7-C	-	10450	11210	10780	-
3500C500L	7800	3700	3830	3900	No
3500C500S	-	5340	5480	5900	-
4500F000	22000	8460	9260	8510	No
5000D000-R	-	5340	5290	5460	No
6000C000L-R	7800	4630	4780	4900	No
6000C000U-R	7800	4430	4430	4400	No
6500F500L	7800	2590	2550	2540	No
6500F500M	7800	2600	2620	2520	No
6500F500U	7800	5430	6140	6000	No
6500F625	7800	3630	3790	3790	No
Melody	-	4800	4850	3140	-
7500F000	7800	^	^	6420	No
NE Alluvium	-	*	*	*	-
East Alluvium	-	*	*	*	-

Results in **bold** indicate that the bore has exceeded the adopted assessment for EC values
** Dry/insufficient water to sample*
^ Unsafe access
'-' indicates no trigger level
[1] No further investigation required. See assessment criteria section for further information

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10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 4 and 5 August 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:40am	IA	45	2.0 / 047	Yes	E	No
N-AT2	11:08pm	IA	45	2.2 / 312	Yes	E	No
N-AT3	11:46pm	43	45	2.3 / 308	Yes	E	No
N-AT4	12:31am	33	45	1.6 / 064	Yes	E	No
N-AT5	12:52am	34	45	1.8 / 058	Yes	E	No
N-AT6	2:05am	IA	45	2.3 / 048	Yes	E	No
N-AT7	10:08pm	37	45	4.4 / 259	Yes	E	NA
N-AT8	1:19am	37	49	2.0 / 052	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 4 and 5 August 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:40am	IA	37	2.0 / 047	Yes	E	No
N-AT2	11:08pm	IA	35	2.2 / 312	Yes	E	No
N-AT3	11:46pm	33	40	2.3 / 308	Yes	E	No
N-AT4	12:31am	28	38	1.6 / 064	Yes	E	No
N-AT5	12:52am	31	37	1.8 / 058	Yes	E	No
N-AT6	2:05am	IA	35	2.3 / 048	Yes	E	No
N-AT7	10:08pm	32	37	4.4 / 259	Yes	E	NA
N-AT8	1:19am	29	43	2.0 / 052	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 4 and 5 August 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:40am	IA	40	No
N-AT2	11:08pm	IA	40	No
N-AT3	11:46pm	33	40	No
N-AT4	12:31am	32	40	No
N-AT5	12:52am	34	40	No
N-AT6	2:05am	24	40	No
N-AT7	10:08pm	32	40	NA
N-AT8	1:19am	33	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

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11. Blast Monitoring

There were twelve (12) blast events (a total of 83 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

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Table 11-3 – MPO Blast Monitoring Results – August 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
1/08/2026	13:59	1.44 mm/s	102.5 DBL	0.21 mm/s	95.6 DBL	Y
3/08/26	14:02	0.15 mm/s	96.3 DBL	0.45 mm/s	100.4 DBL	Y
8/08/26	15:10	0.88 mm/s	98.8 DBL	0.43 mm/s	102.1 DBL	Y
12/08/26	9:26	0.5 mm/s	104.1 DBL	0.57 mm/s	101.8 DBL	Y
13/08/26	10:18	0.23 mm/s	103.3 DBL	0.14 mm/s	97 DBL	Y
15/08/26	11:01	0.99 mm/s	97.3 DBL	0.54 mm/s	92.6 DBL	Y
17/08/26	14:29	0.37 mm/s	94.5 DBL	0.51 mm/s	109.4 DBL	Y
18/08/26	12:56	0.23 mm/s	98 DBL	0.22 mm/s	103.7 DBL	Y
21/08/26	10:58	0.21 mm/s	97.5 DBL	0.52 mm/s	103.1 DBL	Y
24/08/26	14:09	0.09 mm/s	90.2 DBL	0.14 mm/s	97.4 DBL	Y
25/08/26	10:04	0.52 mm/s	98.2 DBL	0.3 mm/s	103.8 DBL	Y
28/08/26	11:22	0.04 mm/s	91.2 DBL	0.09 mm/s	100.5 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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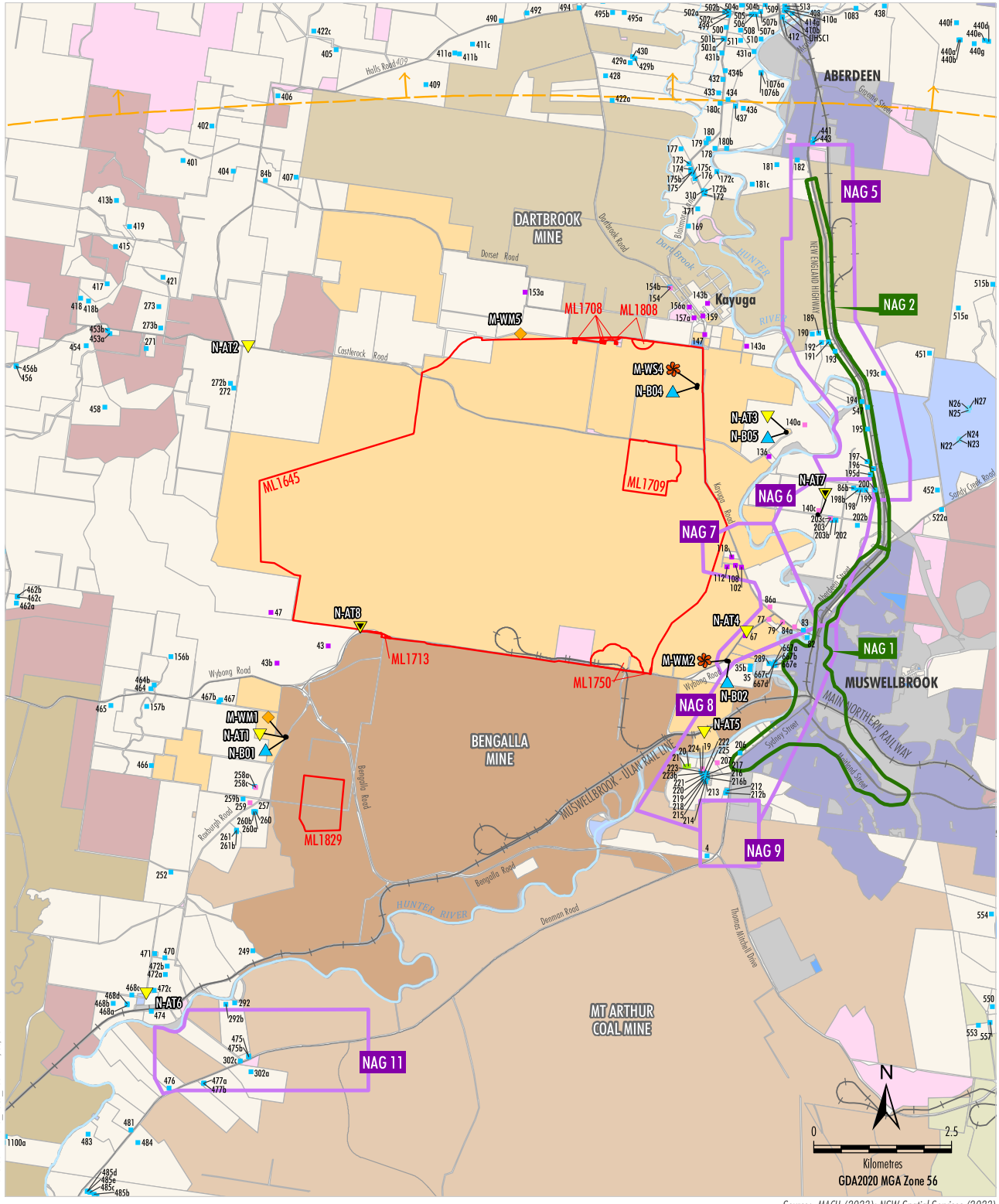


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

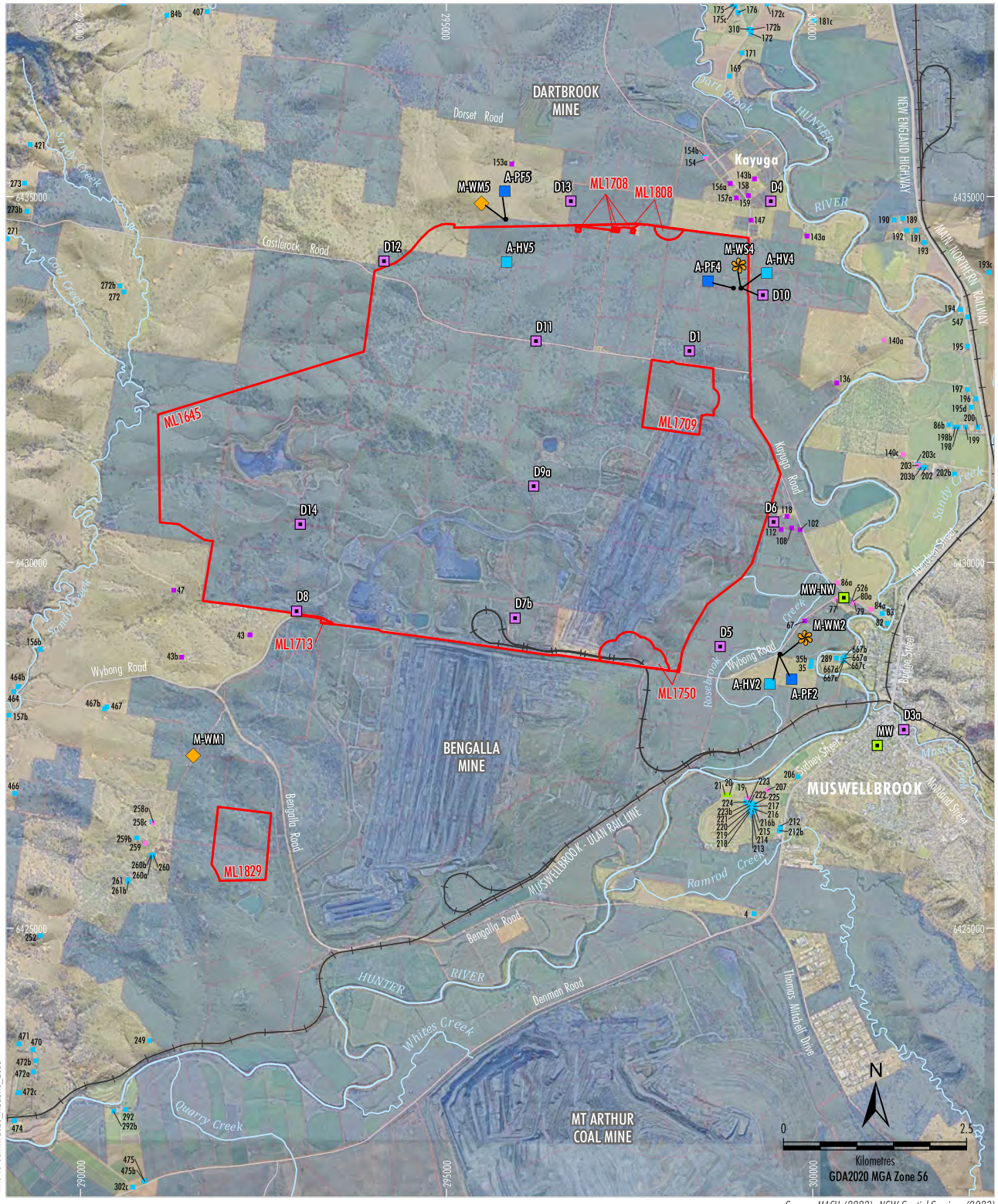
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

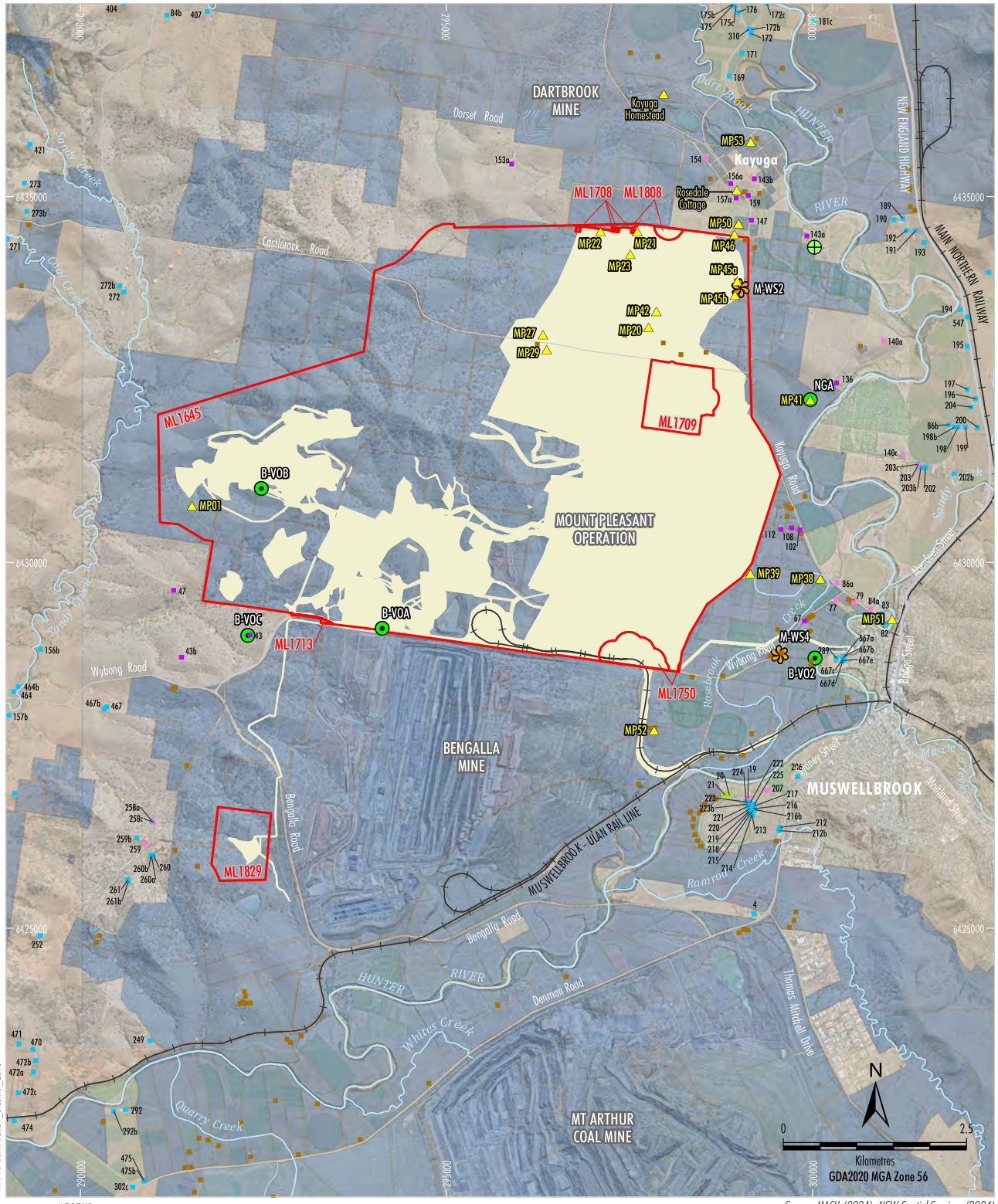
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

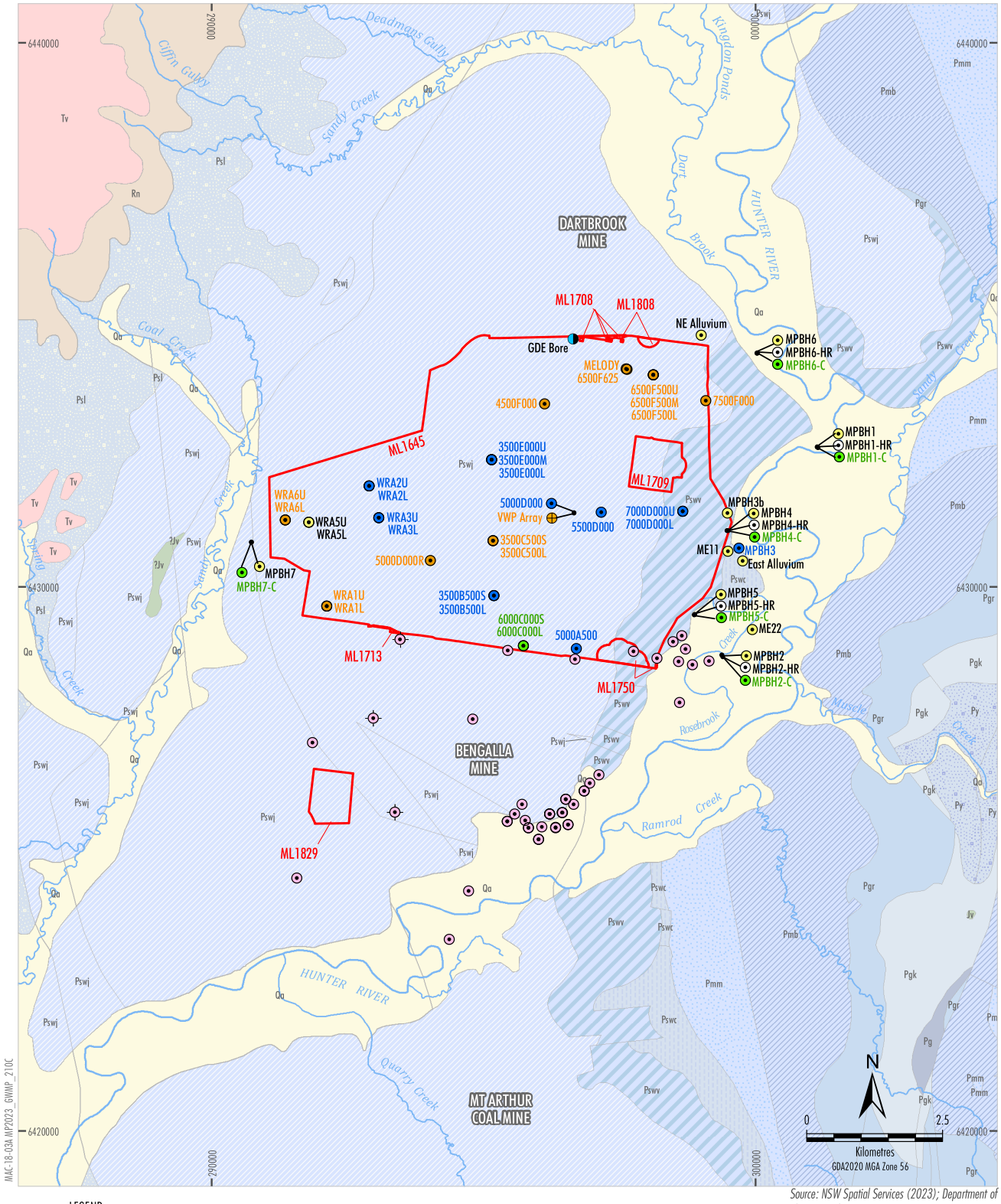
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

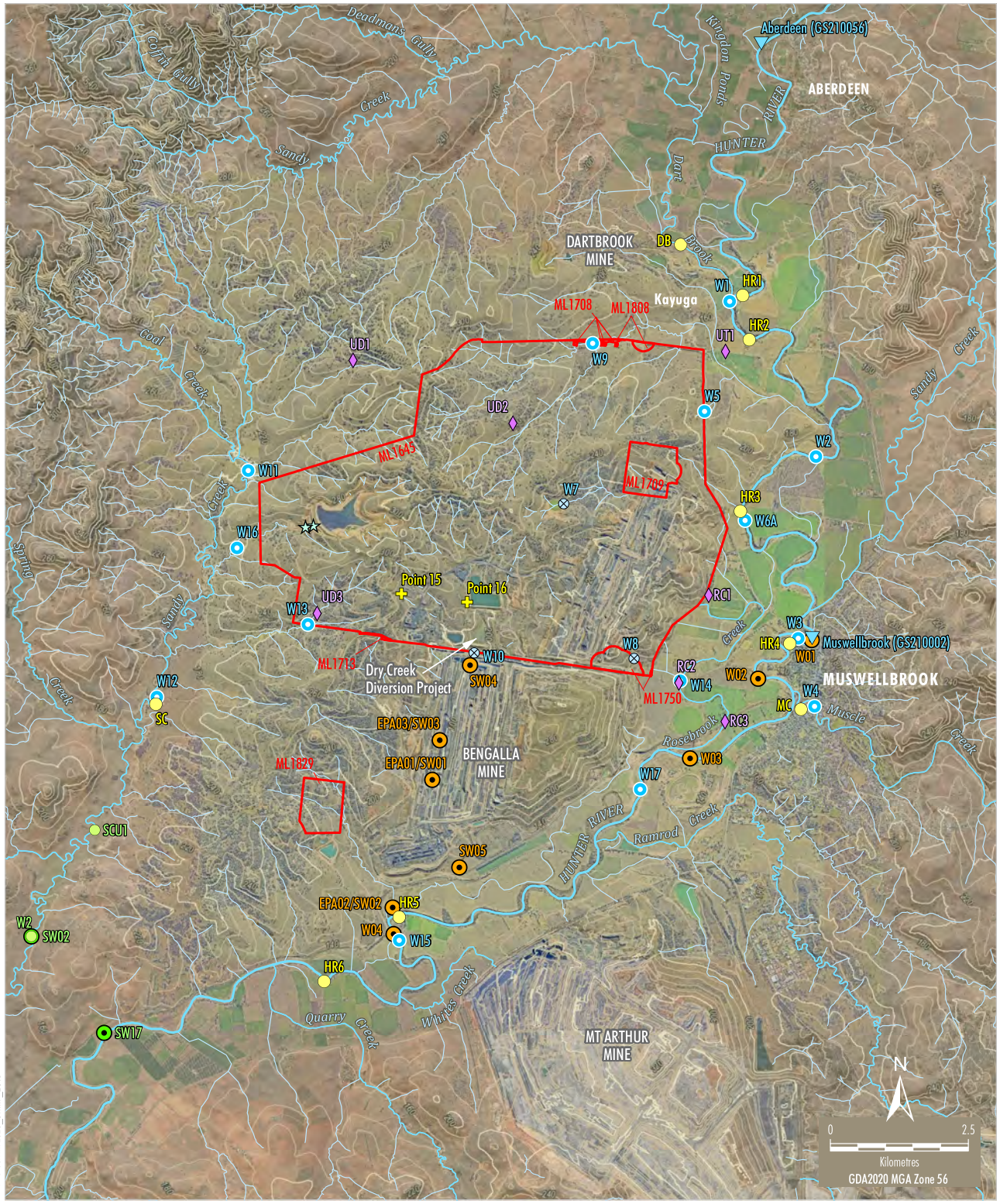
- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

MACHEnergy

MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

MACHEnergy

MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

Mount Pleasant Operation

Monthly Environmental Monitoring Report

September 2026

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1. Introduction

The Mount Pleasant Operation (MPO) is located within the Upper Hunter Valley of New South Wales, approximately three kilometres (km) north-west of Muswellbrook and approximately 50 km north-west of Singleton. The villages of Aberdeen and Kayuga are located 12 km north-northeast and 3 km north of the operations, respectively.

The purpose of this report is to provide a monthly update of monitoring data in accordance with the requirements of NSW Environmental Protection Licence (EPL) 20850, Section 66(6) of the *Protection of the Environment Operations Act 1997* (*POEO Act*), the MPO Development Approval (DA 92/97) and the MPO Development Consent (SSD 10418).

Table 1-1 – Mount Pleasant Operation

Name of Operation	Mount Pleasant Operation
Name of Licensee	MACH Energy Australia Pty Ltd
Environmental Protection Licence	20850
Project Approval	DA 92/97 and SSD 10418
Reporting Period Start Date	1 September 2026
Reporting Period End Date	30 September 2026
Date All Data Received	14 October 2026

Links to three key regulatory documents are provided here:

- Mount Pleasant Operation Development Application Approval DA 92/97; and
- Mount Pleasant Operation Development Consent SSD 10418.
- Mount Pleasant Operation EPL 20850

2. Monitoring Requirements

The MPO EPL 20850 specifically requires the monitoring of:

- 2 x Continuous particulate monitors
- Noise monitoring.
- Blast monitoring; and
- Meteorological monitoring.

Monitoring of sites not required by the EPL are conducted in accordance with the respective Management Plans as required by Project Approval (DA 92/97) and Development Consent (SSD 10418).

All monitoring is undertaken by suitably qualified and experienced person(s). The MPO Environmental Monitoring Network is shown in Appendix A.

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3. Meteorological Monitoring

Weather data is measured continuously[1] at the Kayuga Road (M-WS4) and the Wybong Road (M-WS2) meteorological stations. In addition to air quality parameters (particulate matter less than 10µm and less than 2.5µm (PM_{10} and $PM_{2.5}$)), the weather stations measure wind speed and direction, temperature (at 2 metres (m) and 10m), temperature inversion (using the sigma theta method), solar radiation, relative humidity, rainfall, and atmospheric pressure.

Meteorological data was captured at M-WS2 and M-WS4 during the monitoring period. Throughout September 2026, there was 2.4mm at M-WS2 and 0.4mm at M-WS4.

4. Dust Depositional Monitoring

4.1 Methodology

The dust deposition monitoring network comprises of thirteen (13) dust deposition gauges (DDG) that are collected on a monthly basis. Details of the monitoring locations are shown in Figure 2-2.

4.2 Assessment Criteria

Dust Deposition were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024). Dust deposition was monitored according to the OEH's Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC 2007), which references Australian Standard (AS)/New Zealand Standard (NZS) 3580.10.1:2016 Methods for Sampling and Analysis of Ambient Air: Determination of particulate matter – Deposited matter – Gravimetric Method.

DDG samples can be contaminated by a variety of means, notably by the presence of insects and bird droppings. Results for contaminated gauges were not included in the calculation of the annual averages as this would result in skewed or misleading results for the purpose of dust deposition assessment. The Australian Standard does not provide criteria for the determination of contamination of a DDG. AECOM determines a gauge sample to be contaminated only after reference to field observation sheets, historical monitoring location data, laboratory notes and results, prevailing atmospheric conditions, and feedback from field technicians. For example, a gauge sample with a statistically abnormally high insoluble solids result, a low ash residue result (indicating an elevated level of organic matter) and field notation that bird droppings or insects were present is likely to be considered contaminated.

While the new SSD 10418 doesn't explicitly mention dust deposition gauges, there's a notable shift in regulations towards embracing high volume air sampler results and continuous air quality monitoring programs, with a specific focus on total particulate matter, PM10, and PM2.5. These modern monitoring techniques offer a more comprehensive approach to environmental surveillance, furnishing real-time data and insights into air quality conditions. By harnessing these advanced methods, MPO can ensure the implementation of robust monitoring practices. This transition from the previous development consent DA 92/97

[1] The EPA's Ambient air monitoring guidance note (Guidance Note) states that after allowing sufficient down time for routine maintenance and calibrations a continuous monitoring system should be able to achieve at least a 95% availability.

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(which is yet to be surrendered) to SSD 10418 signifies a proactive measure towards upholding environmental compliance. Therefore, Dust Depositional Monitoring will continue to be included in monthly reporting as per DA92/97 up until surrender where it will be discontinued.

Site D1 and D7b has now been mined through, therefore results from these sites will no longer continue.

4.3 Results

Dust Deposition Data was conducted by AECOM during the monitoring period. Sample analysis was performed by ALS, a National Accreditation and Testing Authority (NATA) accredited laboratory.

Results are summarised in **Table 4-1**. Annual rolling averages have been provided as an indication of performance in the 12 months leading up to the current monitoring period as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

Table 4-1: Dust Depositional Results – September 2026

Location	Monthly Insoluble Solids (g/m^2.month)	Insoluble Solids Annual Rolling Average (g/m^2.month)
D3	1.4	2.0
D4	0.1	1.3
D5a	1.9	2.9
D6	1.6	3.0
D8	3.7	**9.3**
D9a	3.6	**4.3**
D10	0.6	2.3
D11	2.9	**4.4**
D12	1.5	2.2
D13	1.6	2.5
D14	3.8	**4.0**
Criterion	-	**4.0**

Notes:
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
** Insufficient monthly results to calculate annual average*
*** Contaminated results*

Figure 4-1 compares the monthly insoluble solids results to the annual averages for each dust gauge and the assessment criterion.

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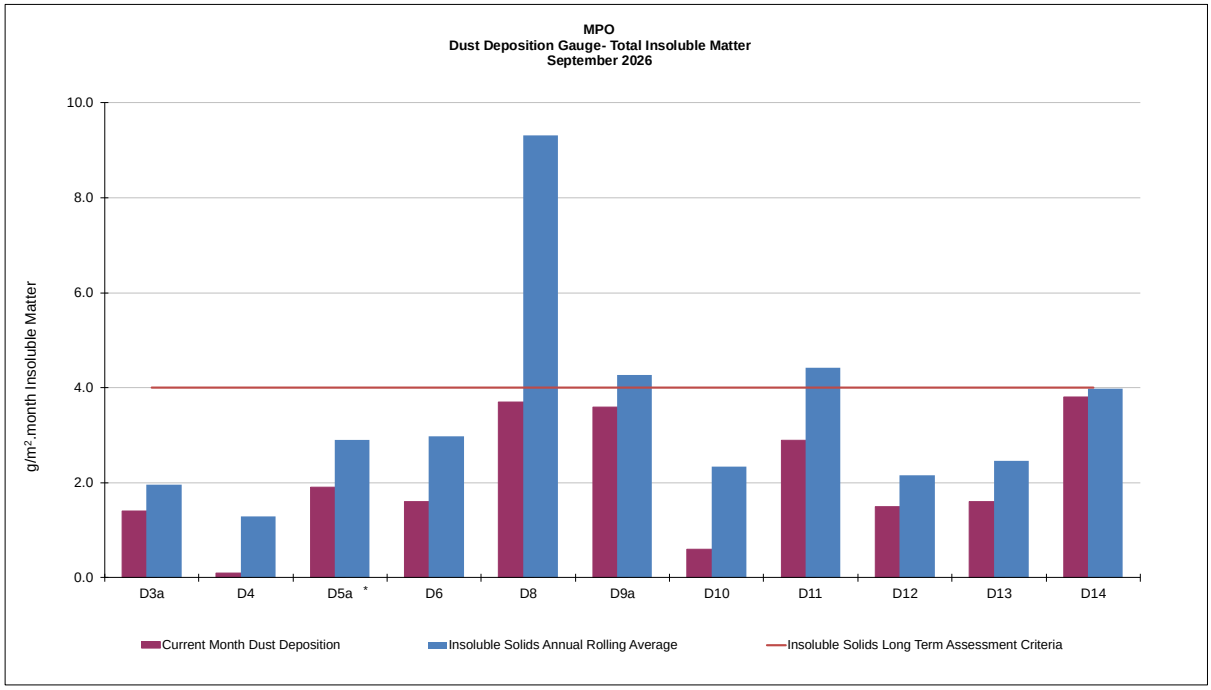

Figure 4-1: MPO Dust Deposition Monthly Results and Annual Rolling Average

5. Total Suspended Particulates

5.1 Methodology

Three Total Suspended Particulate Matter (TSP) High-Volume Air Samplers (HVAS) are run for 24 hours every six days. The locations are displayed in **Table 5-1** below.

Table 5-1 Total Suspended Particulate Monitoring Sites

ID	Description
A-PF2	Reilly's
M-WS4	Kayuga Road Met Station
A-PF5	Athlone

5.2 Assessment Criteria

Total Suspended Particulates were assessed as per the MPO Air Quality and Greenhouse Gas Management Plan (MACH Energy, 2024) in accordance with AM-15 of Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DECC, 2007), referencing AS/NZS 3580.9.3:2015 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – Total suspended particulate matter (TSP) - High volume sampler gravimetric method, for the monitoring of TSP.

TSP is assessed against the guidelines defined in the EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016), Project Approval DA 92/97 and Development Consent SSD 10418. The DA 92/97 and SSD 10418 both specify an annual average project contribution plus background criterion of 90µg/m3.

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5.3 Results

Sample collection was undertaken by AECOM with sample analysis performed by ALS, a NATA accredited laboratory. TSP results for the monitoring period are provided in Table 5-2. Twelve-month rolling averages to the current month are provided as an indication of performance as per Schedule 3, Condition 20 of DA 92/97 and Schedule 2, Condition B28 of SSD 10418.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near HVAS M-WS4. The NSWI works will have a permanent impact to HVAS M-WS4. A revised Air Quality and Greenhouse Gas Management Plan was submitted to the Department of Planning, Infrastructure and Housing in May 2025 to relocate A-PF4 to a more suitable location. DPHI have not completed their review of the management plan. When the Management Plan is approved, the monitoring station will be relocated. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

Table 5-2 Total Suspended Particulate Monitoring Data – September 2026

Run Date	Assessment Criterion	TSP µg/m³		
		HVAS A-PF2	HVAS A-PF5	HVAS M-WS4
04/09/2026	-	98.0	18.0	25.3
10/09/2026	-	56.6	154.0	67.0
16/09/2026	-	74.1	108.0	94.6
22/09/2026	-	59.9	109.0	52.5
28/09/2026	-	29.0	121.0	57.5
Monthly Average	-	63.5	102.0	59.4
Annual Rolling Average	90	62	74	71

Notes:
Results have been rounded to one decimal place for reporting purposes where applicable.
*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*

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6. Real Time Air Quality Monitoring

6.1 Methodology

Monitoring of continuous particulate matter less than 10µm (PM10) and particulate matter less than 2.5µm (PM2.5) was conducted continuously at three locations (one utilised for management only) at MPO during the monitoring period.

6.2 Assessment Criteria

The EPA identification numbers 1 and 2 refer to monitors installed on Wybong Road (A-PF2) and Dorset Road (A-PF5), respectively. In addition, a third monitor (A-PF4) is installed on Kayuga Road with data used for management purposes only. Project Approval Schedule 3, Condition 20 of DA 92/97 and Development Consent Schedule 2, Condition B28 of SSD 10418 specify a limit for:

- An incremental impact PM10 of 50 µg/m3 and PM2.5 of 25 µg/m3 in a 24-hour daily average i.e. incremental increase in concentrations due only to the development.
- The total annual average PM10 of 25 µg/m3 and PM2.5 of 8 µg/m3. i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources, excluding extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

The Northern Surface Water Infrastructure (NSWI) construction works are currently being undertaken near A-PF4. The NSWI works will have a permanent impact to A-PF4. The station will continue to be impacted until it is able to be relocated. Results are no longer considered indicative of impacts to residential receivers from the operations.

6.3 Results

Real time PM10 and PM2.5 annual rolling averages for the current month have been provided in **Figures 6.2 and 6.4**, respectively. **Figure 6.1 and Table 6.1** below show the real-time PM_{10} 24 hour daily average results at MPO air quality monitoring sites during the monitoring period. Real time $PM_{2.5}$ 24-hour average results during the reporting period are presented in **Figure 6.3** and **Table 6.2.**

There were no cumulative PM10 results greater then 50 µg/m3 and PM2.5 greater than 25 µg/m3 in a 24-hour daily average at A-PF2 and A-PF5. Criteria for A-PF4 does not apply as it is not representative of a residence on privately owned land. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

The total annual average cumulative level for PM10 and PM2.5 have not exceeded their respective levels of 25 µg/m3 and 8 µg/m3. As such, an assessment of the incremental contribution from Mount Pleasant Operation is not triggered.

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Table 6-1: MPO Continuous Particulate PM_{10} Data
Cumulative 24-hour Average September 2026

Date	A-PF2/ EPA ID 1	A-PF4	A-PF5/ EPA ID 2
	24-hour Cumulative Average		
01/09/2026	22.10	16.54	11.81
02/09/2026	25.09	14.67	10.05
03/09/2026	25.63	12.94	9.15
04/09/2026	24.47	10.03	7.39
05/09/2026	23.35	12.43	8.97
06/09/2026	15.29	9.30	20.10
07/09/2026	20.15	13.38	21.37
08/09/2026	18.26	22.97	22.47
09/09/2026	20.25	15.57	19.77
10/09/2026	21.31	20.56	26.20
11/09/2026	18.26	20.63	25.84
12/09/2026	18.60	19.04	32.66
13/09/2026	22.45	21.76	22.96
14/09/2026	18.19	14.96	10.55
15/09/2026	36.42	15.33	13.34
16/09/2026	19.70	23.83	19.76
17/09/2026	24.31	35.82	43.78
18/09/2026	23.41	12.02	9.40
19/09/2026	20.62	11.03	8.78
20/09/2026	30.96	10.25	8.50
21/09/2026	37.69	16.47	18.17
22/09/2026	11.63	11.90	14.87
23/09/2026	29.75	26.76	34.83
24/09/2026	30.26	33.04	32.09
25/09/2026	41.63	34.63	21.73
26/09/2026	29.40	19.69	17.59
27/09/2026	14.65	14.04	19.18
28/09/2026	8.81	12.97	16.62
29/09/2026	13.75	23.18	25.36
30/09/2026	27.04	21.74	14.65

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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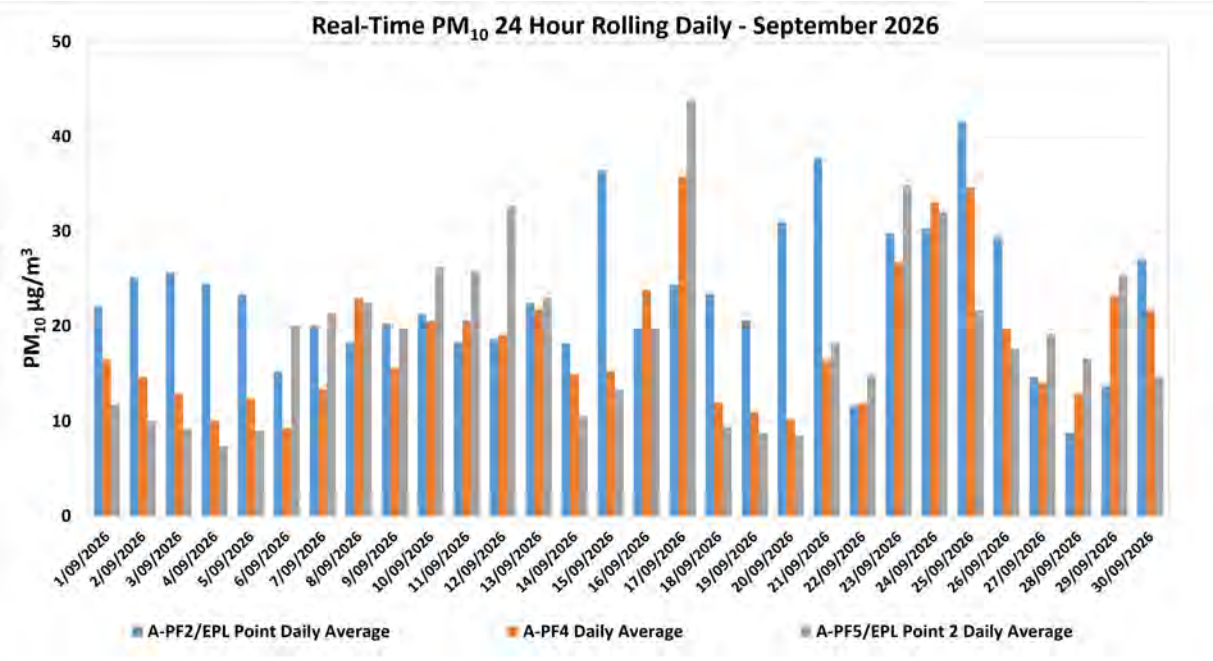

Figure 6-1: Real-time PM_{10} 24- hourly Daily Average Results for September 2026.

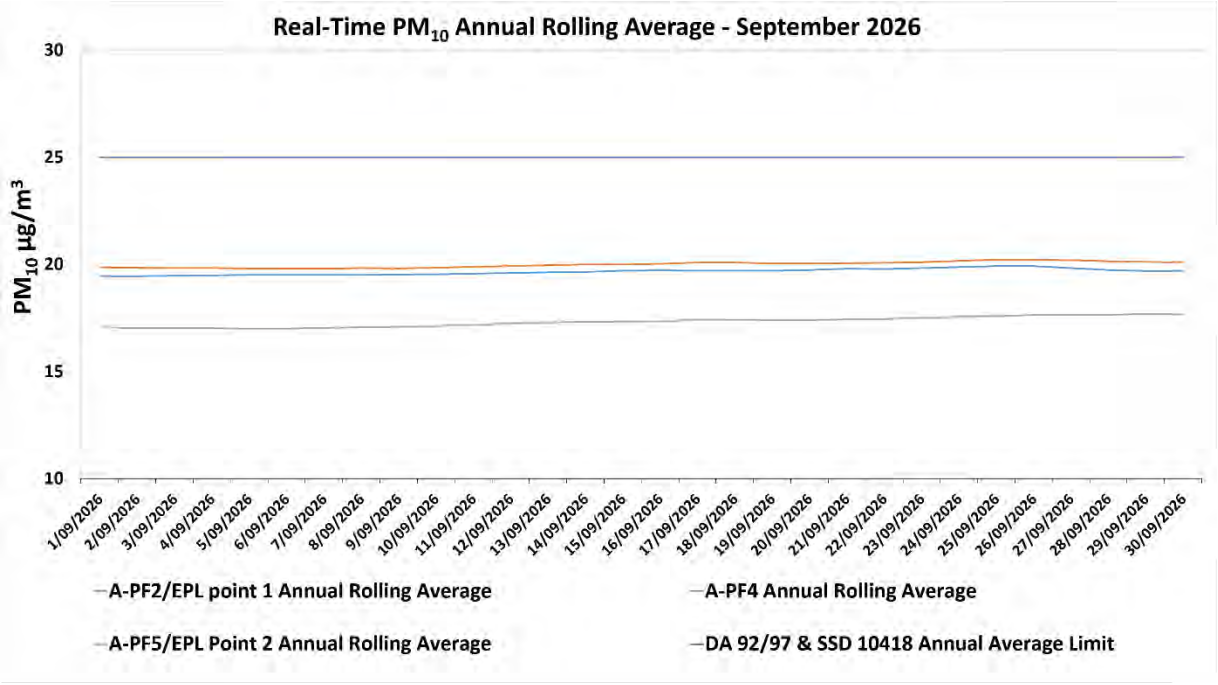

Figure 6-2: Real-time PM_{10} Annual Rolling Average Results for September 2026.

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Table 6-2: MPO Palas Fidas $PM_{2.5}$ Data
Cumulative 24-hour Average September 2026

Date	A-PF2/EPA ID 1	A-PF4	A-PF5/EPA ID 2
	24-hour Average Result		
01/09/2026	7.54	7.42	6.03
02/09/2026	6.09	5.02	4.24
03/09/2026	5.45	4.29	3.67
04/09/2026	5.45	4.03	3.38
05/09/2026	5.11	4.11	3.50
06/09/2026	4.08	3.46	4.53
07/09/2026	4.80	4.28	5.10
08/09/2026	5.42	6.09	6.65
09/09/2026	6.07	5.95	6.05
10/09/2026	5.82	5.89	7.08
11/09/2026	6.22	6.84	8.25
12/09/2026	6.48	6.90	9.54
13/09/2026	5.83	7.00	7.23
14/09/2026	5.29	5.08	4.38
15/09/2026	6.99	5.51	4.99
16/09/2026	4.93	5.52	5.40
17/09/2026	5.62	6.86	7.86
18/09/2026	5.70	4.51	4.04
19/09/2026	4.31	3.59	3.13
20/09/2026	5.35	3.39	3.07
21/09/2026	7.61	5.73	5.62
22/09/2026	4.76	4.97	5.50
23/09/2026	9.33	9.48	10.29
24/09/2026	10.63	11.54	11.74
25/09/2026	9.15	9.23	7.66
26/09/2026	7.34	7.08	6.19
27/09/2026	5.11	5.37	6.10
28/09/2026	3.42	3.71	4.89
29/09/2026	3.72	4.48	6.23
30/09/2026	5.35	5.28	3.94

*Results in **bold** indicate an elevated measurement of adopted assessment criteria.*
Results with "- "indicate dates where data was affected by maintenance or servicing (scheduled and unscheduled)
***Extraordinary event (e.g. bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary).*

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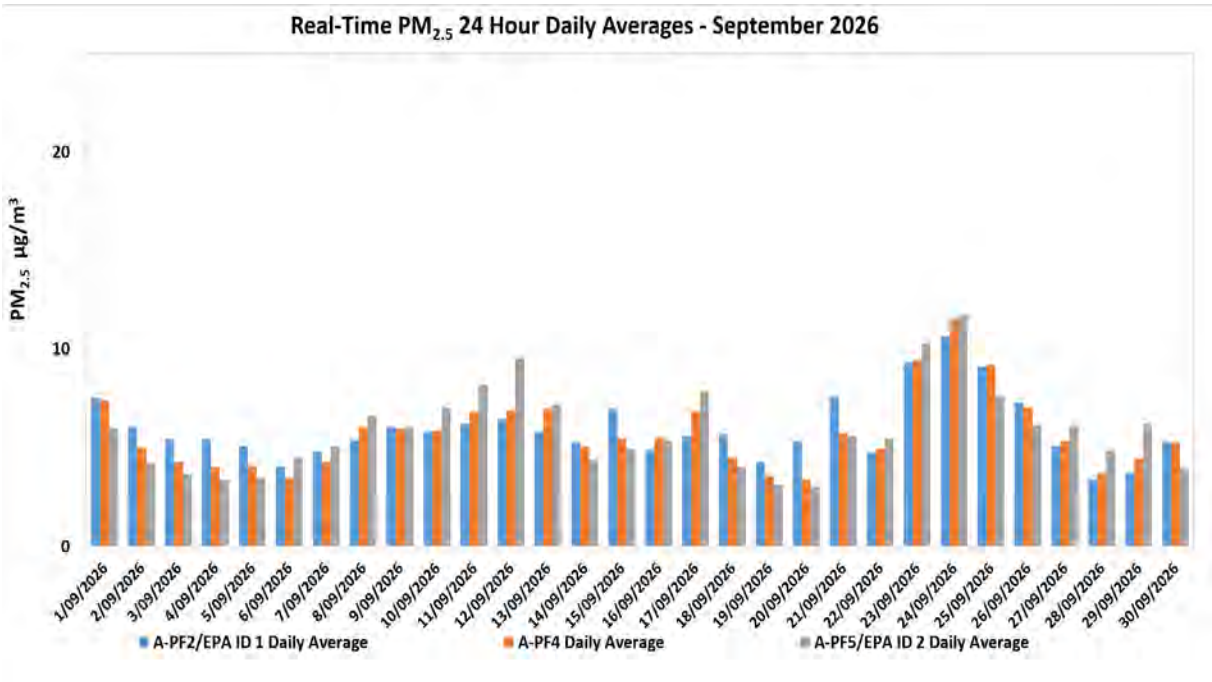

Figure 6-3: Real-time $PM_{2.5}$ 24 hour Daily Average Results for September 2026.

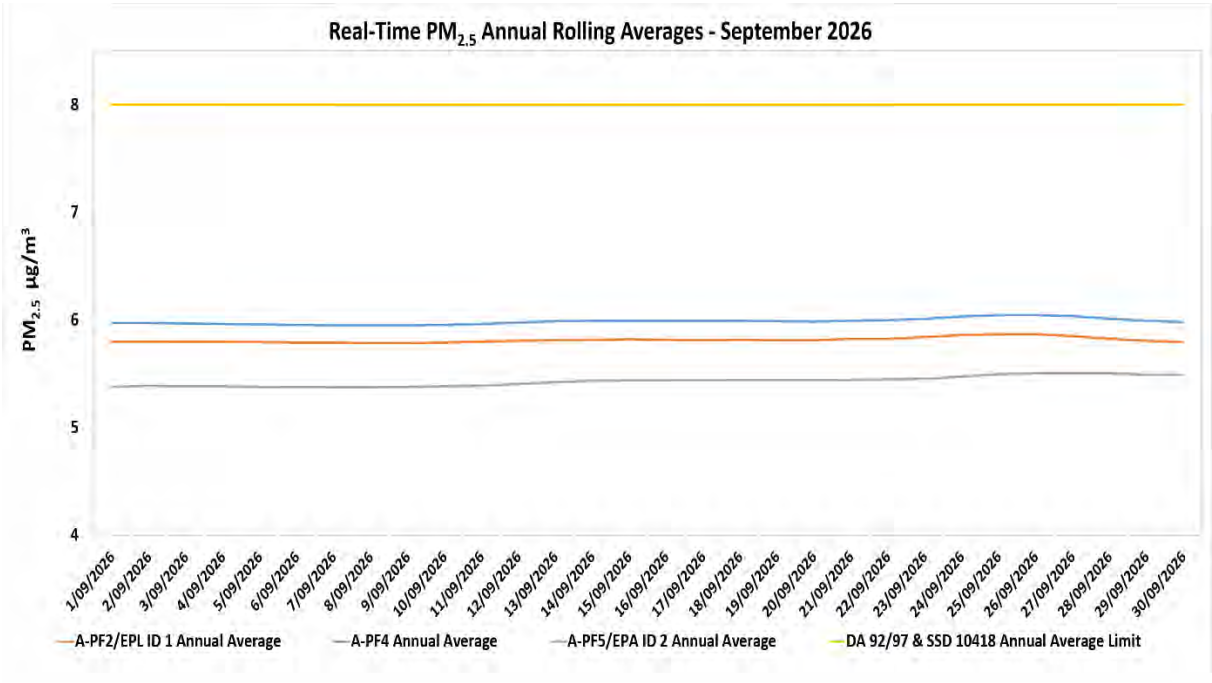

Figure 6-4: Real-time $PM_{2.5}$ Annual Rolling Average Results for September 2026.

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7. Dust Shutdowns

7.1 Methodology

PM_{10} dust levels and wind direction are continually monitored at the Muswellbrook NW Upper Hunter Air Quality Monitoring Network Station to assess any exceedances over a 24-hour period.

7.2 Assessment Criteria

Adverse conditions that lead to the shutdown of dust generating activities at Mount Pleasant are assessed as per EPL 20850 requirement O3. Adverse conditions are defined as the occurrence of both adverse wind conditions and adverse PM_{10} conditions measured at the Muswellbrook NW Air Quality Monitoring Station.

- Adverse wind conditions are the result of a one-hour average wind direction between 250 degrees and 340 degrees.
- Adverse PM_{10} conditions are the occurrence of the rolling 24- hour average PM_{10} concentration exceeding 44 µg/m^3.

When adverse conditions have passed and a minimum of one hour of no dust generating activities have been undertaken, activities may resume.

7.3 Results

Table 7.1. presents a log of days throughout the reporting period when adverse conditions were triggered leading to a shutdown event, in accordance with EPL Condition O3.4.

Table 7-1 Dust Shutdowns MPO- September 2026

Date	Time Dust Generating Activities were Ceased	Time Dust Generating Activities were Resumed	Shutdown Hours	Muswellbrook NW 24- hour rolling PM10 Average (µg/m^3)	Wind Direction (°)
15/09/2026	19:40	20:40	1	44.6	262
21/09/2026	13:40	16:40	3	44	286

8. Surface Water Monitoring

8.1 Methodology

Surface water quality is monitored at fourteen (14) sites on a monthly basis, with additional monitoring conducted if triggered by a rain event (>20mm in a 24- hour period). A more comprehensive suite of analysis is performed at these sites on a quarterly basis.

8.2 Assessment Criteria

Surface waters were assessed as per the *MPO Water Management Plan* (MACH Energy, 2025) in accordance with site specific trigger values that have been developed using the ANZECC (2000) guidelines for sites that contain a minimum of two years of monthly data. Sites with insufficient data are assessed on default trigger values adopted from ANZECC (2000) guidelines. In accordance with the MPO Water Management Plan (WMP) Table 26 (MACH Energy, 2024) if a water quality indicator at a potential impact monitoring location or at a downstream receiving water monitoring location is above (or outside the range) of the

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site-specific trigger value for three consecutive sampling events, and the same has not occurred at the relevant upstream reference site(s) an investigation is required.

8.3 Results

Surface water monitoring was conducted by AECOM during the monitoring period. Laboratory analysis was performed by ALS NATA accredited laboratory. Monthly monitoring results for pH, EC, TSS and Total Dissolved Solids (TDS) are presented in **Table 8-1**.

Table 8-1 – MPO Monthly Surface Water Monitoring Results – September 2026

Station	pH	Electrical Conductivity (EC) (µs/cm)	Total Dissolved Solids (TDS) (mg/L)	Total Suspended Solids (TSS) (mg/L)
Hunter River				
W1 (Upstream Reference Site)	8.0	470	259	9
W2	7.9	479	272	10
W6A	8.0	478	265	14
W15	**8.2**	**590**	336	**24**
W17	8.0	550	306	20
Sandy Creek				
W11 (Upstream Reference Site)	8.1	4660	2700	20
W12	8.1	5160	2920	13
Muscle Creek				
W4 (Upstream Reference Site)	7.7	2690	1730	10
Unnamed Tributaries				
W3	8.0	525	289	18
W5	*	*	*	*
W9	*	*	*	*
W13	*	*	*	*
W14	*	*	*	*
W16	*	*	*	*

*Note: Results in **bold** indicate exceedances of adopted assessment criteria for less than three consecutive events.*
*Results in **bold** and red indicate exceedances of adopted assessment criteria for more than three consecutive events.*
**Dry or insufficient water to sample.*
^Unsafe access

9. Groundwater Monitoring

9.1 Methodology

Groundwater monitoring is conducted on a quarterly basis, in February, May, August and November.

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10. Noise Monitoring

10.1 Methodology

Attended noise monitoring was undertaken during the monitoring period at eight (8) monitoring locations as per the *MPO Noise Management Plan* (MACH Energy, 2024) in accordance with DA 92/97, SSD 10418 and EPL 20850.

10.2 Results

The results for nighttime attended noise monitoring against noise criteria is shown in **Table 10-1**; **Table 10-2;** and **Table 10-3.**

Table 10-1 $L_{1,1min}$ Generated by MPO: Attended Night Monitoring 14 and 15 September 2026

Location	Time	MPO Only dB(A), L_1 (1min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:53am	IA	45	0.5 / 053	Yes	F	No
N-AT2	10:56pm	IA	45	3.2 / 317	Yes	D	NA
N-AT3	11:29pm	29	45	3.7 / 328	Yes	D	NA
N-AT4	12:13am	35	45	1.8 / 073	Yes	E	No
N-AT5	12:34am	39	45	0.7 / 112	Yes	F	No
N-AT6	1:29am	IA	45	0.9 / 148	Yes	D	No
N-AT7	10:16pm	25	45	3.4 / 320	Yes	E	NA
N-AT8	1:02am	48	49	0.8 / 082	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

Table 10-2 $L_{eq,15min}$ Generated by MPO: Attended Night Monitoring 14 and 15 September 2026

Location	Time	MPO Only dB(A), Leq (15min)	Criterion dB(A)	Wind Speed (m/s) Direction (°)	Criterion Applies	Stability Class	Exceedance
N-AT1	1:53am	IA	37	0.5 / 053	Yes	F	No
N-AT2	10:56pm	IA	35	3.2 / 317	Yes	D	NA
N-AT3	11:29pm	26	40	3.7 / 328	Yes	D	NA
N-AT4	12:13am	29	38	1.8 / 073	Yes	E	No
N-AT5	12:34am	34	37	0.7 / 112	Yes	F	No
N-AT6	1:29am	IA	35	0.9 / 148	Yes	D	No
N-AT7	10:16pm	20	37	3.4 / 320	Yes	E	NA
N-AT8	1:02am	39	43	0.8 / 082	Yes	E	No

Notes: As per Condition L2.3 of EPL 20850, noise emission limits do not apply during wind speeds greater than 3m/s at 10m above ground level, or stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level, or stability category G temperature inversion conditions.
IA = inaudible. NA in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.

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Table 10-3 $L_{Aeq, period}$ Cumulative Noise: Attended Night Monitoring 14 and 15 September 2026

Location	Time	Measured Mining Only dB(A), LAeq	Criterion dB(A)	Exceedance
N-AT1	1:53am	36	40	No
N-AT2	10:56pm	IA	40	NA
N-AT3	11:29pm	26	40	NA
N-AT4	12:13am	29	40	No
N-AT5	12:34am	34	40	No
N-AT6	1:29am	32	40	No
N-AT7	10:16pm	20	40	NA
N-AT8	1:02am	41	NA[2]	NA[2]

Notes: These are the results for MPO and all other mining sources. 15-minute measurements have been assumed to apply across the entire night period as a conservative measure and to represent "worst case" results.
Cumulative noise refers to two or more noise sources. If only one other source of mining is audible the measured cumulative noise defined here is 'Nil'.
N-AT8 is under acquisition rights and has no cumulative dB criteria.
IA- inaudible.
NA[1]- in the exceedance column means atmospheric conditions outside those specified in the EPL, therefore criterion was not applicable.
NA[2]- This is not a compliance monitoring location under DA92/97, and cumulative noise criteria are only applicable under DA92/97.

11. Blast Monitoring

There were twelve (12) blast events (a total of 95 blasts YTD). Results are presented in **Table 11-3**. All blast results during this monitoring period were below the criteria stated in Schedule 3, Condition 10 of DA 92/97, Schedule 2; Condition B12 of SSD 10418; and L5 of EPL 20850 as shown in **Table 11-1** and **Table 11-2**.

Table 11-1 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Historic heritage sites[1]	-	10	0%
All public infrastructure	-	50	0%

Source: Development Consent DA 92/97
dB = decibels, mm/s = millimetres per second.
[1] The blasting criteria in relation to historic heritage sites applies to each historic heritage site until such a time as the relevant management requirements for the sites have been fulfilled. Refer to Section 7.4.2 for further detail.

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Table 11-2 Development Consent DA 92/97 Blasting Criteria

Location	Airblast Overpressure (dB[Lin Peak])	Ground Vibration (mm/s [Peak Particle Velocity])	Allowable Exceedance
Residence on privately owned land[a]	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months
Mine-owned residences	-	10	
Historic heritage sites[b]	-	10	0%
Other public infrastructure	-	50 (or a limit determined by the structural design methodology in AS 2187.2 - 2006, or its latest version)	0%

Source: Development Consent SSD 10418
[a]The locations referred to in Table 2 are shown in Appendix 3 of Development Consent SSD 10418.
[b]These limits do not apply to historic heritage sites located within the approved disturbance area. Refer to Section 7.4.2 for further detail

Table 11-3 – MPO Blast Monitoring Results – September 2026

Date Fired	Time Fired	BVOC Vibration (mm/s)	BVOC Overpressure (dBL)	BVO2 Vibration (mm/s)	BVO2 Overpressure (dBL)	Blast Fume Compliant
1/09/2026	11:05	0.26 mm/s	99.6 DBL	0.34 mm/s	103.1 DBL	Y
4/09/2026	11:34	0.2 mm/s	93.8 DBL	0.33 mm/s	98.1 DBL	Y
7/09/2026	12:04	1.14 mm/s	96.1 DBL	0.54 mm/s	96.2 DBL	Y
8/09/2026	11:06	0.34 mm/s	99.5 DBL	0.19 mm/s	99.8 DBL	Y
11/09/2026	11:08	0.33 mm/s	94.2 DBL	0.54 mm/s	96.7 DBL	Y
14/09/2026	11:23	0.92 mm/s	87.5 DBL	0.4 mm/s	100.7 DBL	Y
17/09/2026	11:16	0.2 mm/s	95 DBL	0.28 mm/s	95.9 DBL	Y
18/09/2026	12:55	0.33 mm/s	94 DBL	0.38 mm/s	102.7 DBL	Y
22/09/2026	9:07	0.2 mm/s	104.2 DBL	0.44 mm/s	101.9 DBL	Y
24/09/2026	15:17	0.28 mm/s	93.3 DBL	0.62 mm/s	93.3 DBL	Y
25/09/2026	11:27	0.03 mm/s	92.6 DBL	0.04 mm/s	92 DBL	Y
28/09/2026	9:53	0.06 mm/s	107.2 DBL	0.08 mm/s	100.6 DBL	Y

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APPENDIX A

MPO Environmental Monitoring Network.

Figure numbers referred to in respective management plans.

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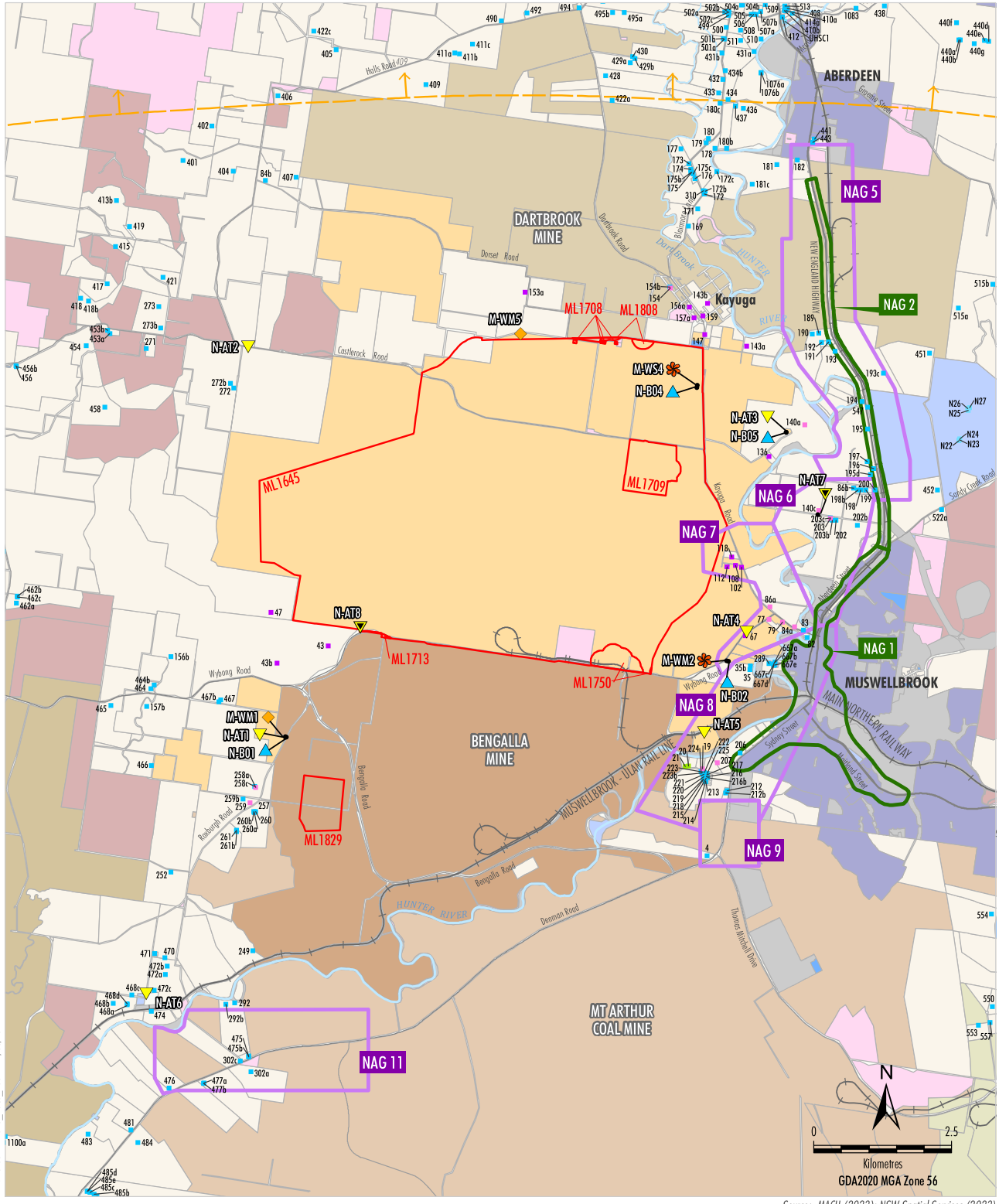


MAC-18-03A MP2023_Noise_2030 12/03/2024

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mount Pleasant-controlled
- Bengalla-controlled
- Dartbrook-controlled
- Mangoola-controlled
- Muswellbrook Coal-controlled
- Mt Arthur-controlled
- Other Mining/Resource-controlled
- Crown
- The State of NSW
- Muswellbrook Shire Council
- Upper Hunter Shire Council
- Privately-owned Land
- Muswellbrook and Upper Hunter LEP Zones B2, B5, R1, R5
- Muswellbrook and Upper Hunter LEP Zones IN1, SP2, RE1, RE2, W1
- Railway

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned
- Specific Receivers not modelled
- DA 92/97 Noise Assessment Group (NAG)
- SSD 10418 Noise Assessment Group (NAG)

Monitoring Sites

- Attended Noise
- Proposed Attended Noise [1]
- Real-time Noise Monitoring Site
- Weather Mast
- Weather Station

[1] Proposed Site to be Implemented

Source: MACH (2023); NSW Spatial Services (2023)

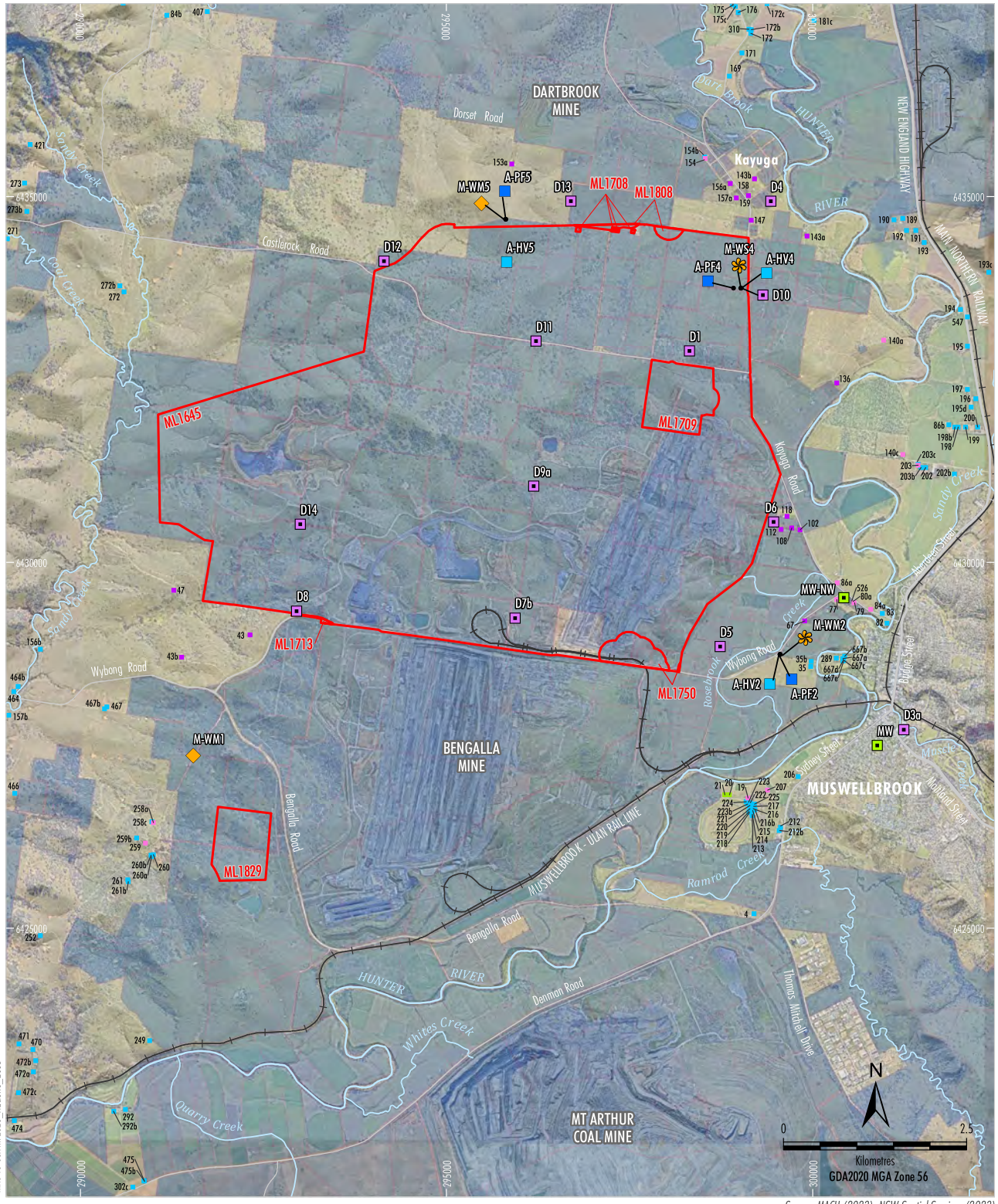
* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

MACHEnergy

MOUNT PLEASANT OPERATION

Nominal Noise and Meterological Monitoring Sites

Figure 8



MAC-18-03A MP2023_A0&GHG_203B

Source: MACH (2023); NSW Spatial Services (2023)
Orthophoto: MACH (Dec 2022)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Mine-owned Land
- Railway

Monitoring Sites

- Air Quality - High Volume Sampler
- Air Quality - Palas Fidas
- Dust Deposition Gauge
- Upper Hunter Air Quality Monitoring Network
- Weather Mast
- Weather Station

Category of Rural Residence under DA92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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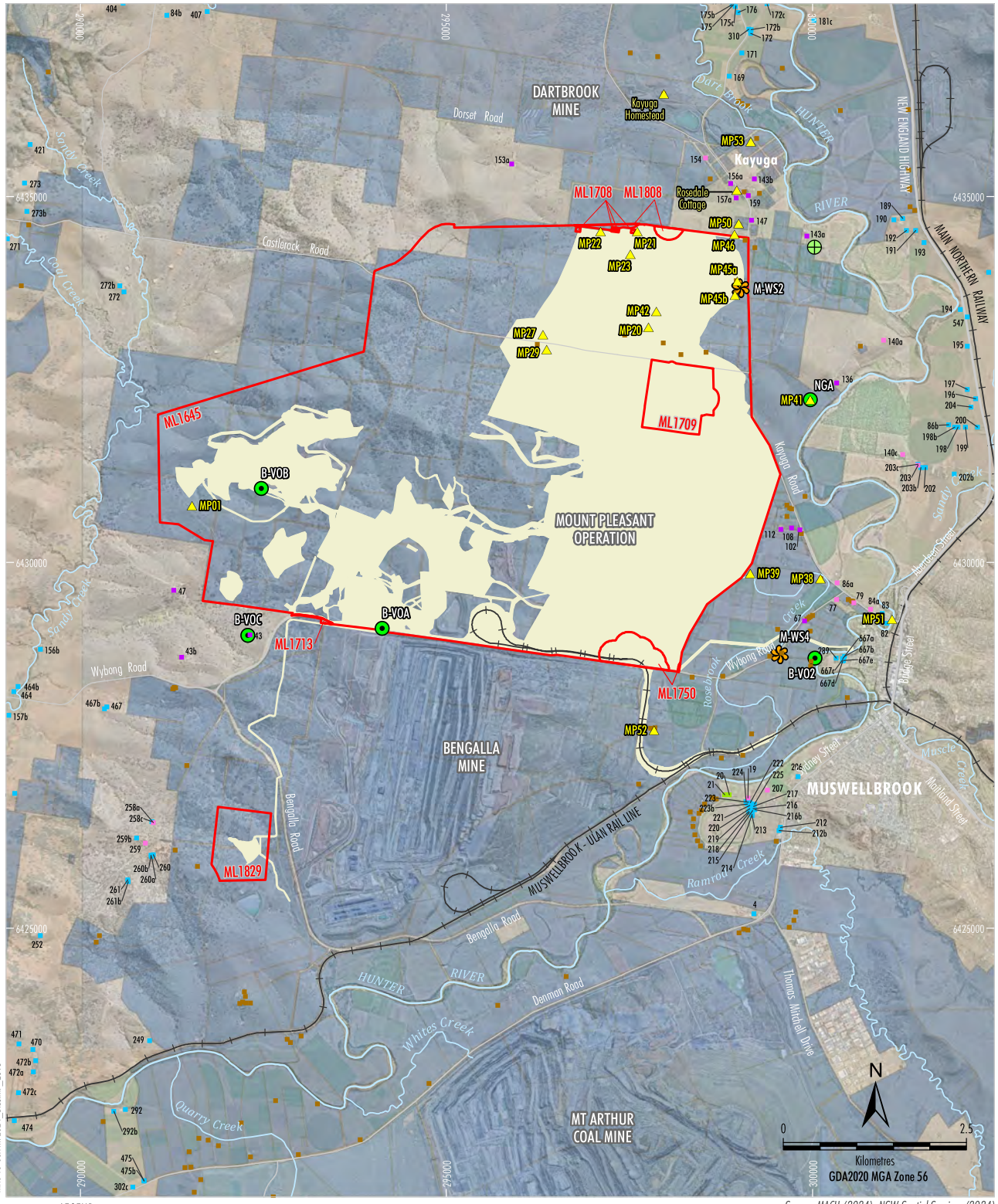
MOUNT PLEASANT OPERATION

Air Quality and Meteorological Monitoring Sites

Figure 3



Source: MACH (2024); NSW Spatial Services (2024)
Orthophoto: MACH (Dec 2023)

LEGEND

- Mine-owned Land
- Mining Lease Boundary (Mount Pleasant Operation)
- Project Continuation of Existing/Approved Surface Development (DA 927/97)[1]
- Weather Station
- Blast Monitoring Site (Vibration/Overpressure)
- Proposed Blast Monitoring Site (Vibration/Overpressure)
- Relevant Historic Heritage Sites # ^

Category of Rural Residence under DA 92/97

- Mine-owned

Category of Rural Residence under DA 92/97

- Privately-owned - Acquisition on Request
- Privately-owned - Mitigation on Request
- Privately-owned - Mitigation/Acquisition on Request*
- Other Privately-owned

[1] Excludes some incidental Project components such as water management infrastructure, access tracks, topsoil stockpiles, power supply, temporary offices, other ancillary works and construction disturbance.

Blast criteria only apply until the heritage site is excavated, salvaged or demolished in accordance with the Historic Heritage Management Plan.

^ Blast criteria do not apply to historic heritage sites located within the approved disturbance area.

* Mitigation on Request - rail noise/Aquisition on Request - air quality. MACH is only required to acquire and/or install air quality mitigation measures at this property if not reasonably achievable under a separate approval for the Bengalla Mine.

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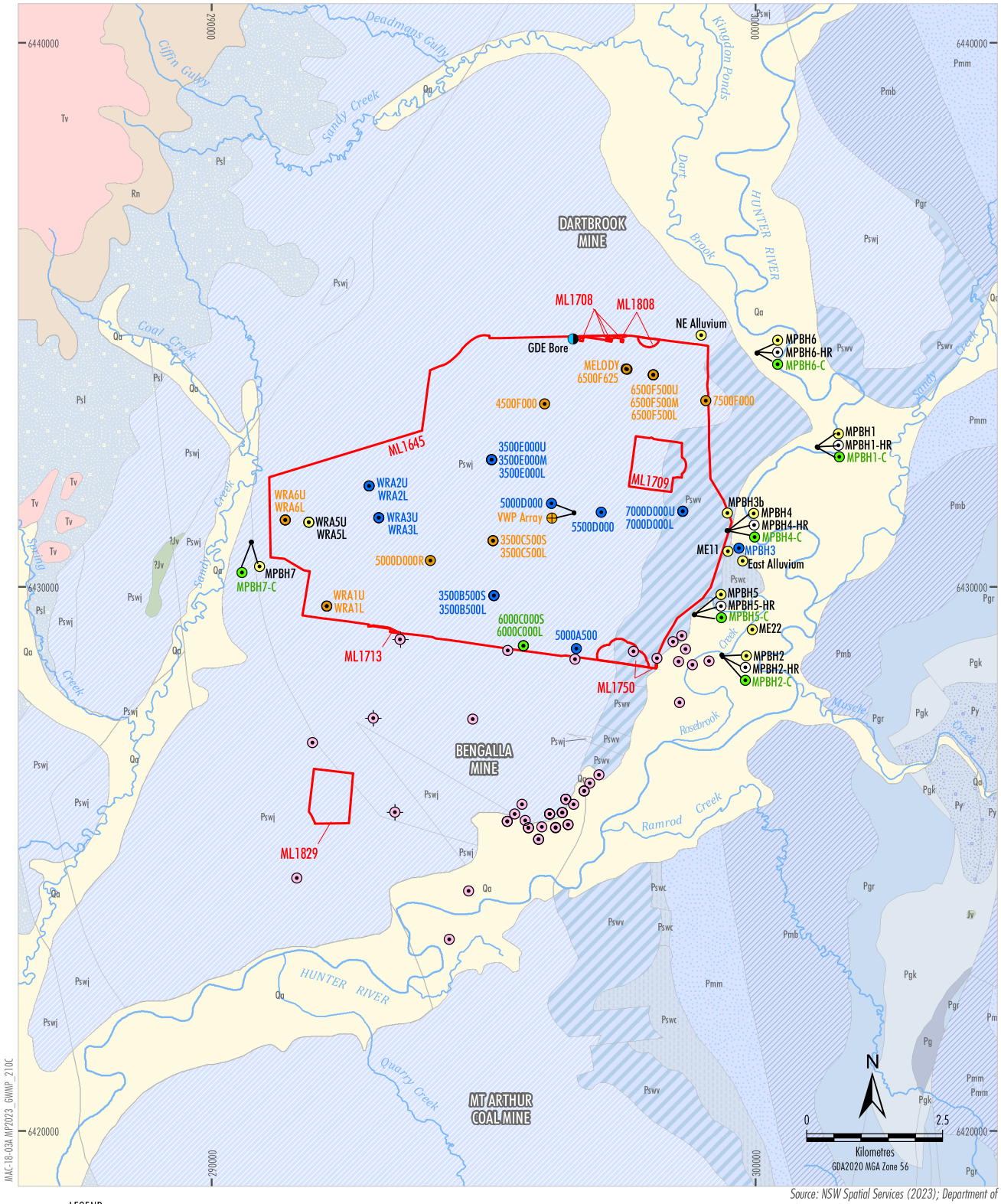
MOUNT PLEASANT OPERATION

Blast Monitoring Locations

Figure 3



MAC-18-03A MP2023_GWMP_210C

Source: NSW Spatial Services (2023); Department of Planning and Environment (2019)

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Coal Seam
- Standpipe - Interburden
- Standpipe - Historical

Bengalla Monitoring

- Bengalla Standpipe
- Bengalla Vibrating Wire Piezometer

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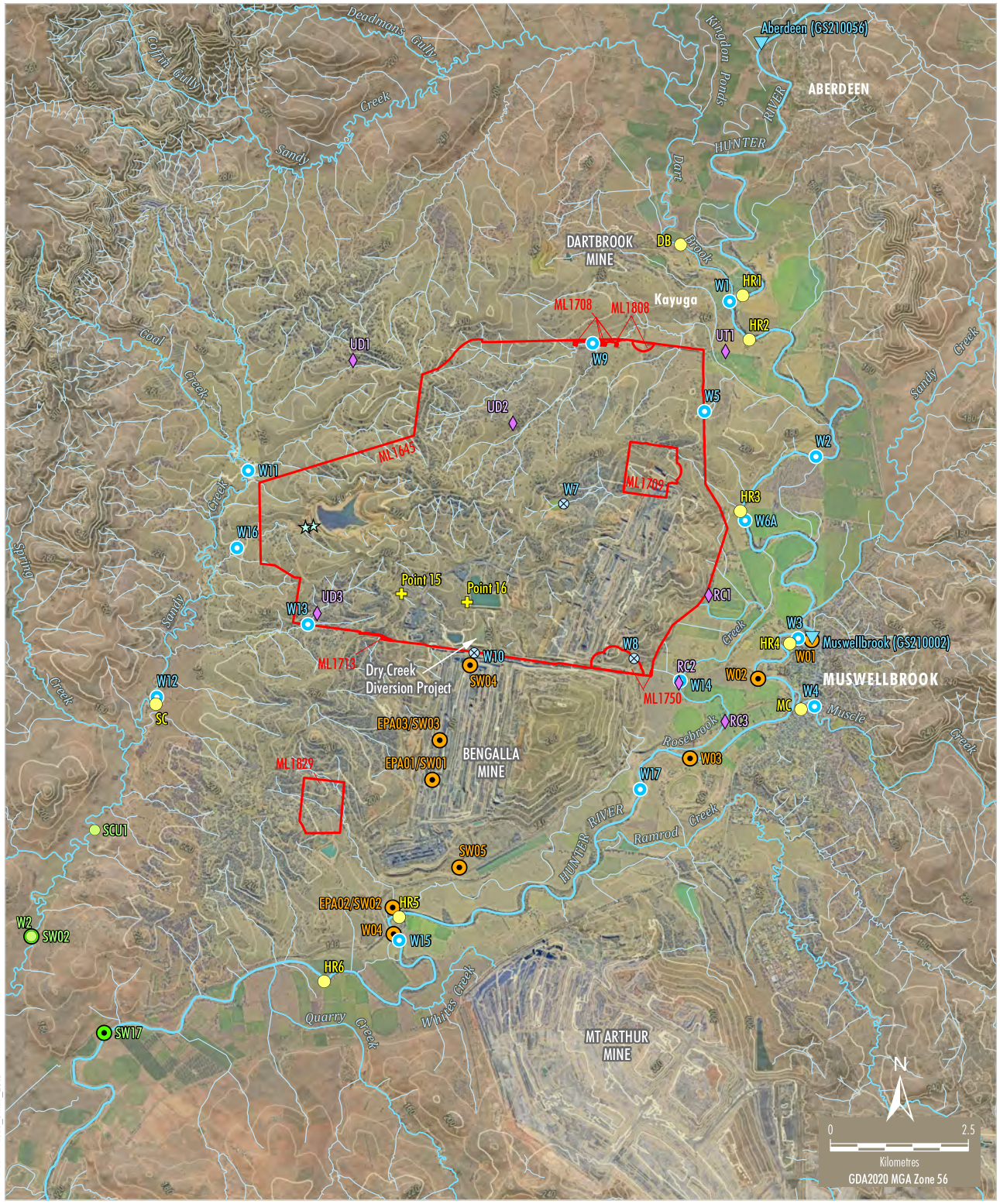
MOUNT PLEASANT OPERATION

Groundwater Monitoring Network

Figure 5



MAC-18-03A MP2023_SWMP_2010

LEGEND

- Mining Lease Boundary (Mount Pleasant Operation)
- Contour (20 m Interval)
- DPI Water Gauging Station

Mount Pleasant Monitoring

- Aquatic Ecology Habitat Assessment Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Stream Health Monitoring Site
- V-notch Weir
- Water Discharge/Monitoring Point (EPL 20850)

Mangoola Monitoring

- Surface Water Monitoring Site
- Stream Health Monitoring Site

Bengalla Monitoring

- Surface Water Monitoring Site

Source: MACH (2023); NSW Spatial Services (2023); NSW Department of Primary Industries - Water (2016); Bengalla Mining Company (2015); Mangool Coal Operations Pty Ltd (2014)
Orthophoto: MACH (Jun 2023, 2020)

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MOUNT PLEASANT OPERATION

Surface Water and Stream Health Monitoring Sites

Figure 4

MOUNT PLEASANT OPERATION

STREAM HEALTH & STYGOFAUNA MONITORING

Autumn 2025 SURVEY



Prepared for
AECOM Australia on behalf of MACH Energy Australia

17 November 2025

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Cover photo	Bats observed in trees growing in riparian habitat adjacent to the Muscle Creek survey site (13/05/2025).

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Disclaimer

This report has been prepared by BIO-ANALYSIS Pty Ltd (BA) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with AECOM Pty Ltd on behalf of MACH Energy Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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EXECUTIVE SUMMARY

Introduction

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton. The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively.

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs and in accordance with Development Consent DA 92/97, consent SSD10418 (activated in February 2024) and Environmental Protection Licence (EPL) 20850. Any discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 51 discharge credits.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Monitoring Plan (SWMP). MACH Energy are required to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries.

The spring 2017 survey forms the basis for the ongoing monitoring to assess stream health in accordance with the Surface Water Management Plan (SWMP) (MACH Energy, 2019), to determine any change in selected aquatic indicators throughout the life of the MPO and ascertain whether these changes can be attributed to the MPO. The stream health monitoring programme focusses on three main indicators:

- Aquatic habitat, including riparian habitat, aquatic macrophytes and fish habitat;
- Aquatic macroinvertebrates sampled using the Australian River Assessment System (AUSRIVAS) protocol;
- Fish sampled using backpack electrofishing and fyke nets.

Limited *in situ* water quality sampling is also done to assist in interpreting trends in the above indicators. Stream health monitoring is required to be done in spring and autumn each year.

The results of the current survey (autumn 2025) are compared with those obtained in each of spring and autumn since the spring 2017 survey.

An additional requirement this year was to monitor alluvial bores in the vicinity of the Hunter River, to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores were sampled in May 2026.

Results

Six species of fish (including two introduced species), freshwater shrimp and freshwater prawns were collected in autumn 2025. Long-finned eels (ranging between approximately 70-120 cm in length) were collected at two of the six Hunter River sites sampled (HR5&6), Muscle Creek and Dartbrook. Carp continues to be abundant at Site HR5 within the Hunter River and within the lower reaches of Dartbrook.

Altogether, ten species of fish have been caught/observed by the stream health monitoring programme since spring 2017, including Australian bass, Long-finned eels, Freshwater catfish, Australian smelt, Sea mullet, native gudgeons, Common carp and Mosquito fish. Overall, the species composition of assemblages has been comparable throughout the survey period. No threatened species of fish listed under the NSW *Fisheries Management Act, 1994* (FM Act) or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed.

Four likely stygofauna from two families (i.e., Neonipharidae and Isotomidae) were identified from two (MP-BH1 and MP-BH2) of seven bores sampled in May 2025. These taxa are known from previous surveys of stygofauna within the Hunter River alluvium.

Macroinvertebrate assemblages have consistently (i.e. before and during mining activities at the MPO) been dominated by pollution tolerant taxa. Some pollution sensitive taxa have also commonly been collected, including caddis fly and mayfly families, upstream and downstream of the MPO area, including at the time of the autumn 2025 survey.

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, one site (Site HR3) has consistently scored below its indicator criteria (Band A - equivalent to AUSRIVAS reference condition) while the other (Site HR4: Band B - significantly impaired) has scored lower on thirteen out of the sixteen sampling occasions. Similar deviations from historical AUSRIVAS band levels have been recorded at sites sampled at Dart Brook and Muscle Creek, which are not exposed to mining activities at the MPO.

Importantly for this stream health study, none of the statistical tests used to formally examine trends in the condition of aquatic macroinvertebrate fauna (assemblage structure, diversity, OE50 and SIGNAL2 scores) have indicated a change that could be attributed to a MPO related impact.

Therefore, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site.

Conclusions and Recommendations

As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made since 2019. There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

Examination of results from the autumn 2025 survey found no measurable changes in the indicator variables examined in relation to the findings of the baseline survey that could be indicative of an impact associated with the MPO.

It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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1.0 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively (Figure 1).

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs. MPO is operated in accordance with Development Consent DA 92/97, as subsequently modified[1], consent SSD10418 (activated in February 2024) and Environmental Protection Licence 20850 Currently MPO is approved to produce up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 2026. MACH Energy commenced mining operations in January 2018.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Management Plan (SWMP) (MACH Energy, 2019), to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries (Figure 2).

An additional requirement this year was to monitor alluvial bores in the vicinity of the Hunter River to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores were sampled in May 2025.

This Report provides the results of investigations undertaken in autumn (12-14 May) 2025 in accordance with requirements outlined in the SWMP and the Water Management Plan (SSD10418). The objectives of this survey were to:

[1] To date, four applications to modify the Minister's consent for the MPO have been submitted. A copy of the consolidated Development Consent DA 92/97 incorporating Mods 1, 2, 3, and 4 is provided as Attachment 1 in (REF).

- Undertake the 2025 autumn survey within the Study Area as required by the SWMP and the Water Management Plan (SSD10418)
- Determine the presence of any stygofauna taxa in selected bores;
- Determine whether any changes in stream health have occurred since the 2017 spring survey and whether changes, if any, are due to potential mining-related impacts at the MPO,
- Provide MPO with recommendations on further surveys or response mechanisms, as required, by the SWMP if stream health within the Study Area has deteriorated.



Figure 1. Project Area

2.0 METHODS

2.1 Study Area

MPO is located within the Muswellbrook Local Government Area (LGA). The locality of Kayuga is immediately to the north of MPO and the township of Aberdeen is located further northeast, on the eastern side of the Hunter River. Muswellbrook township is located approximately 4 km south-east of the MPO (Figure 1).

The township of Denman is located approximately 18 km to the southwest near the confluence of the Hunter and Goulburn Rivers (Figure 1).

The drainage network in the vicinity of the MPO is generally characterised by steep gullies which drain from the surrounding hills into the flat alluvial plains adjacent to the Hunter River. The Hunter River flows in a southerly direction approximately 1 km to the east of the MPO's mining lease boundaries and is the largest drainage feature within the catchment.

A number of ephemeral drainage lines traverse the MPO area and drain into the Hunter River. The eastern portion of the MPO area drains via Rosebrook Creek (Figure 1), as well as other ephemeral, unnamed drainages. Areas in the south and west of the MPO boundary drain to an ephemeral drainage line (commonly referred to as Dry Creek) and Sandy Creek, respectively, both of which flow into the Hunter River (Figure 1). No permanently flowing waterways are present within MPO's ML boundaries.

Surrounding land uses include agriculture (grazing, dairy, vineyards, horse and cattle studs, turf, flower and market gardens) and coal mining (ERM Mitchell McCotter, 1997). The Bengalla Coal Mine immediately adjoins the southern boundary of MPO. The Mount Arthur Coal Mine is located approximately 5 km to the south. The Mangoola Coal Mine is located approximately 8 km to the west. The Dartbrook Coal Mine immediately adjoins to the north (Figure 1). As such, the catchment area in the region of MPO has been historically cleared and altered.

The regional climate for the Muswellbrook areas is warm temperate with an average annual rainfall of approximately 600 mm (BOM, 2020).

2.2 Previous Investigations

Stream Health Monitoring

The initial stream health monitoring was implemented in November 2017. The results of the first survey are described in the "Stream Health Monitoring Spring 2017 Survey" report (BIO-ANALYSIS, 2018). Since the Spring 2017 Survey, surveys have been done in autumn (May) and spring (November) 2018, autumn (May) 2019 and spring (October) 2019, autumn (May) 2020 and spring (November) 2020, autumn (May) 2021, spring (October) 2021, autumn (May) 2022, spring (September) 2022, autumn (May) 2023, spring (October) 2023, autumn (May) 2024 and spring (October) 2024 (BIO-ANALYSIS, 2018-2024).

Stygofauna Assessment

Seven accessible bores (MP-BH1-3, MP-BH3b, 18298, 7000D000(u) and WRA1L) were sampled for stygofauna for the Mount Pleasant Optimisation Project Aquatic Ecology Assessment on 27 and 28 November 2018 (BA, 2020). Of these, 100 litres of water was able to be pumped from four boreholes (MP-BH1, MP-BH2, 7000D000(u) and WRA1(L)) within three groundwater systems (i.e. Alluvium, Interburden and Permian).

Three likely stygofauna (Cyclopoida, Ostracoda and Isotomidae) were identified from bore samples in the alluvial aquifer (east of the MPO, along the Hunter River), where the groundwater was relatively fresh. Each of these taxa are known from previous surveys of stygofauna within the Hunter alluvium.

2.3 Performance Measures and Indicators

Stream health performance criteria were developed for the SWMP by MACH Energy for two sites on the Hunter River (Table 1), by combining riffle and edge habitat scores obtained at those sites in the mid-1990s using the New South Wales Australian River System (AUSRIVAS) techniques (MACH Energy, 2019). Should an AUSRIVAS score deteriorate below the range for its historical band of impairment score for two successive monitoring rounds, a stream health investigation protocol is to be initiated under the MPO's Surface and Ground Water Response Plan (SGWRP) (MACH Energy, 2019).

Table 1. Stream Health Performance Criteria

Site Identification	Band of Impairment Score	Trigger Value (O/E Taxa)
Hunt 571	**B**	**0.54**
Hunt 854	**A**	**0.84**

Location of sites: Hunt 571: Hunter River @ Muswellbrook; Hunt 854: Hunter River downstream of Aberdeen (Figure 2)

Band of impairment scores for sites sampled at Dart Brook (Site Hunt 585: Band B) and Muscle Creek (Hunt 506: Band B) were also presented within the SWMP (MACH Energy, 2019).

Mangoola Coal Operations has established stream health trigger levels for a monitoring site on Sandy Creek (i.e. Site 'Sandy 1'). In the event of deterioration in stream health being observed by Mangoola Coal Operations at this site, MACH Energy would consult with Mangoola Coal Operations during implementation of their response plan as required by the SWMP.

2.4 Field Methods

2.4.1 Stream Health Monitoring

To fulfil the requirements of the SWMP, a stream health assessment was required to be completed at two sites along the Hunter River (HR-3 and HR-4) and at sites situated on Dart Brook (DB), Muscle Creek (MC) and Sandy Creek (SC) (Table 2, Figure 2).

An additional four sites were included in the monitoring programme from the spring 2017 survey (BIO-ANALYSIS, 2018), to provide an indication of variability among sites along the Hunter River and of stream health in the river upstream (Site HR-1 and HR-2) and downstream (HR-5 and HR-6) of the MPO area (Table 2, Figure 2).

For the autumn 2025 survey, sites were sampled on 13 & 14 May 2025. Each site was approximately 100 m in length with their GPS co-ordinates listed in Appendix A. Collections of fish and macroinvertebrates were completed in accordance with Section 37 of the *NSW Fisheries Management Act 1994* using Scientific Collection Permit Number FP23/124.

Table 2. Stream Health Monitoring Sites

BA Site Code	Historical Site Code	Site Location	Description
HR1	**W1**	Hunter River u/s River Street	Upstream MPO
HR2	**W1**	Hunter River d/s of River Street	Upstream MPO
HR3	**Hunt 854**	Hunter River @ Burtons Lane	Midstream/Adjacent to MPO
HR4	**Hunt 571**	Hunter River @ Muswellbrook	Midstream/Adjacent to MPO
HR5	**W15**	Hunter River off Bengalla Road	Downstream MPO
HR6	**SW17**	Hunter River near Roxburgh	Downstream MPO
SC	**Sandy 1**	Sandy Creek @ Wybong Rd	Hunter tributary
DB	**Hunt 585**	Dart Brook @ MacIntyre Bridge	Hunter tributary
MC	**Hunt 506**	Muscle Creek @ Muswellbrook	Hunter tributary

u/s – upstream; d/s - downstream

Figure 2. Stream Health Monitoring Sites

2.4.2 Habitat Assessment

The condition of the aquatic habitat at each site was assessed using a modified version of the Riparian Channel and Environmental (RCE) inventory method (Chessman et al., 1997). This method involves evaluation and scoring of the characteristics of the adjacent land, the condition of riverbanks, channel and bed of the watercourse, and degree of disturbance evident at each site. The maximum score (52) indicates a stream with little or no obvious physical disruption and the lowest score (13) indicates a heavily channelled stream without any riparian vegetation.

Based on the original classification established by Peterson (1992), site condition was rated:

- Poor for RCE scores of 0-24%;
- Fair for RCE scores of 25-43%;
- Good for RCE scores of 44-62%;
- Very good for RCE scores of 63-81%; and
- Excellent for RCE scores of 82-100%.

The condition of aquatic habitat at each site was also assessed according to the NSW Department of Primary Industries Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI, 2013). The two key indices are habitat *type* and *class*.

The in-stream and emergent aquatic macrophytes at each site were surveyed to provide an indication of the dominant species present and their cover.

Each stream health monitoring site within the Study Area was photographed and the locations recorded with a hand-held GPS (satellite-based Global Positioning System).

2.4.3 Water Quality

Water quality is measured at each site using a water quality probe and meter. The physico-chemical properties measured were electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L), pH (pH units), temperature (°C), oxygen-reduction potential (mV) and turbidity (NTU). Alkalinity was also measured, using a CHEMetrics alkalinity kit.

Three replicate measures of each variable were collected from just below the water surface at each site, except for alkalinity, where only one measurement was taken at each site. It should be noted that water quality measurements collected during the biological sampling provide a snapshot of quality at the time of sampling under the prevailing flow conditions. Routine monthly and rain event surface water monitoring is undertaken at selected sites within the Study Area for MACH Energy by AECOM.

2.4.4 Aquatic Macroinvertebrates

Aquatic macroinvertebrates were sampled using the AUSRIVAS protocol (Turak et al., 2004). Samples of stream edge habitats and riffle habitats (where available) were collected over a total length of 10 m (usually in 1-2 m sections) at each site using a 250 µm dip net.

The contents of each net sample were placed into a white sorting tray and animals collected for a minimum period of 30 minutes. Thereafter, removals were done in 10-minute periods, up to a total of one hour (Turak et al., 2004). If no new taxa were found within a 10-minute period, removals ceased (Turak et al., 2004). The animals collected were placed inside a labelled container and preserved with 70 % alcohol.

Environmental variables required for running the AUSRIVAS predictive model, including modal river width, percentage boulder or cobble cover, latitude and longitude were recorded at each site.

2.4.5 Fish

Fish were sampled using a Smith-Root LR-24 Electrofisher backpack unit. The Electrofisher was used to stun the fish in open water, around the edge of pools, around snags and aquatic vegetation, overhanging banks and rocky crevices. Four replicate electrofishing ‘shots’ were completed at each suitable site sampled. All stunned fish were collected using a dip net and placed into plastic trays filled with water to be counted and identified. Incidental observations such as evidence of disease were noted. Native fish species were subsequently returned to the water.

Additional sampling of fish was undertaken at two sites in the Hunter River, by deploying fyke nets (panels up to 4 m long on either side of a central funnel 2.5 m long, with 5 mm mesh) and bait traps.

2.4.6 Stygofauna Monitoring

Stygofauna taxa were sampled within eight bores within the vicinity of the Hunter River in May 2025 (Table 3), using methods in accordance with stygofauna sampling and groundwater dependent ecosystem (GDE) assessment guidelines (Hancock and Boulton 2005; Hose and Lategan, 2012; Hose et al., 2015; Department of Environment and Science, 2018a and 2018b; Doody et al., 2019).

Table 3. Bores sampled for Stygofauna.

Bore	Easting	Northing	Depth to Water	Depth to Bottom	Notes (MPO, 2025)
MP-BH1	301136	6432569	10.10	18.03	Good recharge rate. Extract 230 L on an annual basis
MP-BH1-C	301136	6432569	10.25	76.78	Not a good recharge rate. Sampling method is purge & return
MP-BH1-HR	301136	6432569	35.28	52.26	Not a good recharge rate. Sampling method is purge & return
MP-BH2	299404	6428717	12.17	17.41	Good recharge rate. Extract 130L on an annual basis
MP-BH2-C	299385	6428747	12.46	74.90	Good recharge rate. Extract 400L on an annual basis
MP-BH2-HR	299385	6428747	12.41	53.50	Not a good recharge rate. Sampling method is purge & return
GDE D	296720	6434574	DRY	6.98	Bores newly drilled. Bore was dry on first visit this month
GDE S	296722	6434584	10.67	25.02	Bores newly drilled. Bore recharge rate unknown

Firstly, a weighted stygofauna net (50 µm mesh with a 40 mm diameter opening) was lowered to the bottom of each bore, bounced four times to dislodge resting invertebrate fauna and slowly (to avoid a bow-wave) retrieved to the surface. Once at the surface, net contents were emptied into a 50 µm mesh sieve. The net, vial and sinkers were rinsed over the sieve. In total, six net hauls were collected. The cumulative contents of the sieve were then transferred to a labelled plastic container and preserved with 100% ethanol.

After each sampling, nets were washed in Decon90, rinsed in deionized water and air-dried to prevent the transfer of stygofauna between bores during the survey.

Pump samples were collected immediately after netting. A Watterra PowerPack PP1 groundwater pump was used to extract up to 300 L of water from each bore. A sampling hose was fed into the bore until it reached the bottom of the bore casing, then lifted approximately 2 m above the bottom of the bore. Prior to pumping, three rows of ten x 10L buckets were set out. Buckets were carefully (to avoid splashing and overflows) filled sequentially.

Once the buckets were filled, a Yeo-Kal 618 probe was used to measure temperature, electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L) and pH (pH units) in the first bucket and then every 5 buckets.

Subsequently, water from the first 10 buckets was passed through a 50 µm mesh sieve, the sieve contents transferred to a labelled plastic container and preserved with 100 % ethanol. The second and third rows of buckets were then sieved separately, to give three x 100 L samples per bore site (not including the net sample).

Net and pump samples were later transported to the laboratory to be processed in a sorting dish under a ISSCO ML400 series Stereo Microscope and identified as far as possible using taxonomic keys.

2.5 Laboratory Methods

In the laboratory, aquatic macroinvertebrate samples were sorted under a magnification lamp and preserved in 80% alcohol. Samples were later identified using a binocular microscope (at 40X magnification) and identified to family level with the exception of Acarina (to order), Chironomidae (to sub-family), Nematoda (to phylum), Nemertea (to phylum), Oligochaeta (to class), Ostracoda (to subclass) and Polychaeta (to class). Some families of Anisoptera (dragonfly larvae) were identified to species, because they could potentially include threatened aquatic species listed under the *Fisheries Management Act, 1994* (FM Act).

Up to 25 animals of each family were counted, in accordance with the AUSRIVAS protocol (Turak et al., 2004) and the SIGNAL2 (Stream Invertebrate Grade Number Average Level) biotic index developed by Chessman (2003).

Stygofauna samples were sorted and identified to the lowest level possible using a binocular microscope (at 40X magnification).

2.6 Data Analyses

The objective of analyses of water quality and aquatic macroinvertebrate data was to determine whether any significant changes to stream health indices may have occurred following commencement of mining at the MPO. Any significant change in stream health as determined by stream health trigger levels adjacent or immediately downstream of the Project would be investigated to determine the source of the change. For this report, data collected in spring 2017, autumn and spring 2018, autumn and spring 2019, autumn and spring 2020, autumn and spring 2021, autumn and spring 2022, autumn and spring 2023 and autumn and spring 2024 and autumn 2025 were examined.

Stygofauna data collected by the current survey were compared to data collected from the bores sampled within November 2018.

Water Quality

The water quality measurements taken during each survey were compared with guideline values recommended by the ANZECC and ARMCANZ (2000) for slightly disturbed upland rivers in south-east Australia.

Data were also compared to surface water quality trigger levels developed for the MPO's SWMP for two sites (i.e. W1 and W6) situated within the Hunter River near Sites HR2 and HR3 (MACH Energy, 2018). The trigger levels were developed using the approach recommended by ANZECC & ARMCANZ (2000).

Aquatic Macroinvertebrates

AUSRIVAS

Data were analysed using the appropriate AUSRIVAS predictive models developed for New South Wales. The ecological health of a waterway is assessed by comparing the macroinvertebrates collected at a site (i.e. Observed) to those predicted to occur (Expected) if the site is in an undisturbed or 'reference' condition. The principal outputs of the AUSRIVAS model include:

- Observed to Expected ratio (OE50): the ratio of the number of macroinvertebrate families collected at a site which had a predicted probability of occurrence of greater than 50 % (i.e. Observed) to the sum of the probabilities of all of the families predicted with greater than a 50 % chance of occurrence (i.e. Expected) (Ransom et al., 2004)
- BAND: for each model, the OE50 taxa ratios are divided into bands representing different levels of impairment. Band X represents a more diverse assemblage of macroinvertebrates than control sites; Band A is considered equivalent to reference condition; Band B represents sites below reference condition (i.e. significantly impaired); Band C represents sites well below reference condition (i.e. severely impaired); and Band D represents impoverished sites (i.e. extremely impaired) (Ransom et al., 2004).

SIGNAL 2

The SIGNAL2 biotic index (Stream Invertebrate Grade Number Average Level) developed by Chessman (2003) is commonly used to give an indication of water quality at the sites sampled. The SIGNAL score for a macroinvertebrate sample is calculated by averaging the pollution sensitivity grade numbers of the families present, which may range from 10 (most sensitive) to 1 (most tolerant). The SIGNAL2 scores from samples collected between spring 2017 and spring 2024 are presented graphically to provide an indication of changes over time.

Statistical Methods

The objective of this assessment was to examine whether any significant changes to selected aquatic macroinvertebrate indicators of stream health may have occurred following commencement of mining at the MPO.

The analytical design took into consideration:

- Survey: A random factor with 16 levels (spring 2017 to autumn 2025 surveys);
- Treatment: a fixed factor with 2 levels: Control and Impact;
- Reach: a random factor with 2 levels nested within Treatment (Midstream (Site HR3 & HR4) and Downstream (Sites HR5 & HR6) reaches are nested within the level 'Impact', while Upstream (Site HR1& HR2) and Tributary (Site MC, SC and DB) reaches are nested in the level 'Control', of the factor Treatment.

A factor representing variation associated with different phases of the MPO (i.e. Baseline- and During-mining) was not included in the design as only one survey could be undertaken prior to the commencement of mining, hence there was no replication for the Baseline-phase. The statistically significant interaction of Survey x Treatment (i.e. Impact and Control) and/or Survey x Reach(Treatment) could potentially provide evidence that a change in stream health had occurred due to mining.

Multivariate Analyses

A matrix of differences in the types of taxa between all possible pairs of samples was created by calculating their respective Bray-Curtis dissimilarity coefficients. Permutational Multivariate Analyses of Variance (PERMANOVA, Anderson 2001; Anderson et al, 2008) was used to examine spatial differences and temporal changes, and their interaction, in aquatic macroinvertebrate presence/absence data collected using AUSRIVAS. Any statistically significant differences (i.e. $P < 0.05$) in the levels of factors and interaction terms were examined by *Post-hoc* permutational t-tests. Significant differences between groups (e.g. impact versus control) may arise due to differences between group means, differences in dispersion (variance) among groups or a combination of both. Each of these outcomes could be indicative of an impact.

Apparent multivariate patterns in the data were examined by Principal Coordinates Analyses (PCoA), which provide a graphical representation of relationships between samples from two-dimensional ordination plots. The amount of variation "explained" by the *x*- and *y*-axis is indicated and the dissimilarity between data points can be determined from their distances apart on the axis (Anderson et al., 2008).

Similarity of percentages (SIMPER) was then used to determine those taxa primarily responsible for the observed similarities (or dissimilarities) between groups (e.g. Location) of interest (Clarke and Warwick, 1994).

Univariate Analyses

Using the same analytical design as for multivariate analyses, PERMANOVA was used to examine spatial and temporal patterns in the total number of taxa, OE50 and Signal scores. The analyses were based on a Euclidean distance matrix of all possible pairs of samples.

2.7 Quality Assurance/Quality Control (QA/QC)

Data collected in the field were checked for accuracy and completeness before leaving each site. In the office, field data and other records were incorporated into appropriate excel data sheets and checked. Spreadsheets were locked prior to analysis to prevent accidental over-writes or corruption.

In the laboratory, macroinvertebrate and stygofauna samples were identified by Dr Sharon Cummins. Data for each sample were entered into an excel spreadsheet and then checked.

3.0 RESULTS

3.1 Aquatic Habitat Characteristics

Since 2013, annual rainfall recorded at Muswellbrook (Station 61192), ranged from 434.2 mm (2023) to 1117.8 mm (2022) (Figure 3). Within the two months prior to the 2025 autumn survey (13 & 14 May 2025), a total of 198.4 mm of rain was recorded by a meteorological station situated approximately 25 km from Muswellbrook (i.e. Station 61095). A total of 0.4 mm of rain was recorded by the meteorological station situated on the MPO site (Station ID: A-PF4) in the week prior to the 2025 autumn survey (i.e. 5 to 12 May 2025).

Within the two months prior the 2025 autumn survey, mean water levels measured in the Hunter River at Muswellbrook Bridge (Station 210002) ranged from approximately 0.46 m to 0.71 m (BOM, 2025a). At the time of the 2025 autumn survey, water level ranged from 1.109 m (13 May 2025) to 1.126 m (14 May 2025) (BOM, 2025a).

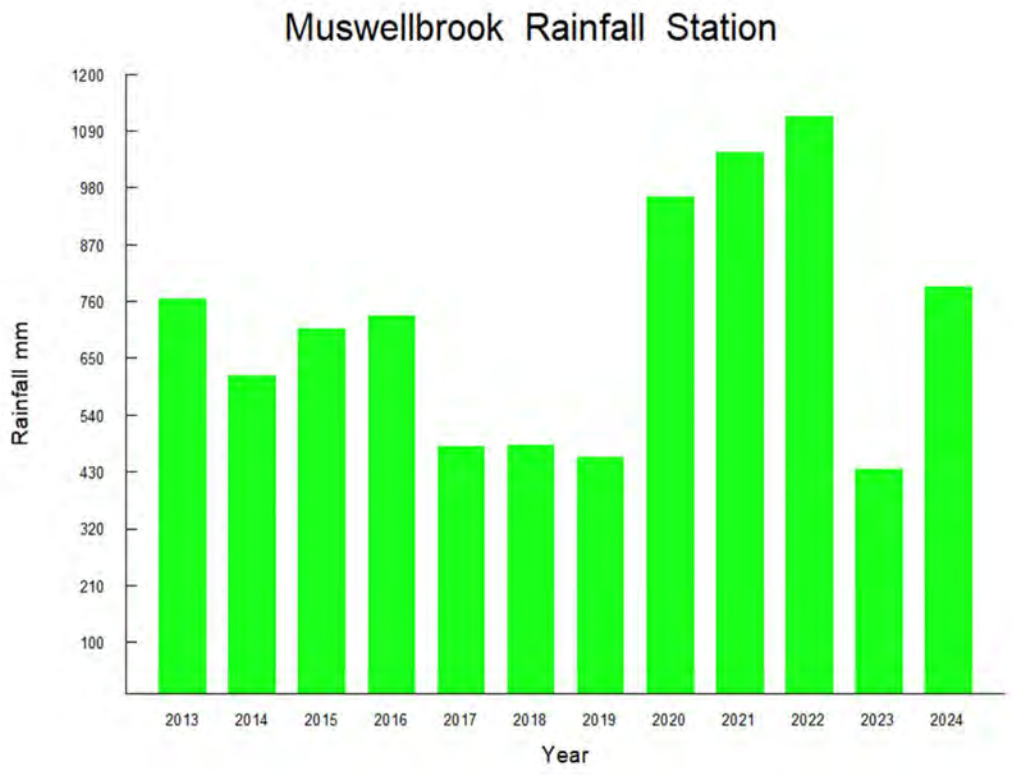

Figure 3. Annual rainfall (mm) measured at Muswellbrook from 1 January 2013 to 31 December 2024. NB Rainfall data for 2013-2017 and 2020-2023 were collected at Station 61192 (Muswellbrook – Spring Creek (Castle Vale), data for 2018 and 2019 was collected at Station 61095 Rouchel Brook (Albano).

3.1.1 Hunter River

The section of the Hunter River within the Study Area is generally characterised by a series of continuous, slow flowing pools up to approximately 28 m wide and greater than 1 meter deep (Plates 1-12). The channel substratum is composed primarily of silts and fine sands (as are the banks of the main channel) overlying a mostly gravel bed.

Vegetation of the riparian zone is dense, comprising mixed native and exotic trees and shrubs including River Oak (*Casuarina cunninghamiana*) and River Red Gum (*Eucalyptus camaldulensis*), Morning Glory (*Ipomoea indica*), Privet (*Ligustrum* species), Trad (*Tradescantia albiflora*), Bamboo (*Bambusa* sp.), Balloon Vine (*Cardiospermum grandiflorum*) and Willow (*Salix* spp.) are common. Emergent macrophyte assemblages were characterised by Typha spp., Umbrella Sedge (*Cyperus eragrostis*), Common Reed/ Phragmites (*Phragmites australis*), Mat Rush (*Lomandra longifolia*), Common Rush (*Juncus usitatus*) and Marsh Club-rush (*Bolboschoenus fluviatilis*). The submerged species of macrophyte, Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp., have commonly been noted at several of the sites sampled. The species identified within the Study Area have a wide distribution and are abundant in similar aquatic habitats elsewhere in south-eastern Australia.

The section of the Hunter River within the study area was classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification.

Hunter River upstream of the MPO (HR1 & HR2)

The most upstream site (HR1) is situated within farming land, approximately 200 m upstream of the confluence with Dart Brook (Figure 1, Plate 1). Vegetation of the riparian zone is relatively dense, mostly comprised by River Oak and Willow trees interspersed by Balloon Vine, Giant Reed (*Arundo donax*), Bamboo and Trad in areas that had not been scoured from the bank by recent high flows. At the time of the autumn 2025 survey, the river was flowing relatively fast. Water clarity at HR1 was good. The RCE score was 42 (80%) in autumn 2025 (range = 38/73% to 43/83% between spring 2017 and spring 2024).



Plate 1: Hunter River – Site HR1 (au-25)
View upstream



Plate 2: Hunter River – Site HR1 (au-25)
View downstream

Site HR2, a large pool up to approximately 25 m wide and 1.6 m deep (Plate 3&4), is situated approximately 900 m downstream of the confluence of the Hunter River with Dart Brook (Figure 1). The substratum in the edge habitat has consistently been predominantly cobble, gravel and pebble overlayed with a sandy-silt matrix. The steep right bank has gradually been revegetated by mostly grasses and small shrubs since sampling commenced in spring 2017 (Plate 3&4). River Oak and Willow trees were present. Riparian vegetation mostly consisted of Giant Reed, Balloon Vine, Trad and Bamboo with occasional native species, including *Persicaria decipiens, Typha* spp. and *Schoenoplectus validus*. At the time of the autumn 2025 water clarity was good and flow moderate-high. This site was given an RCE score of 38 (73%) in autumn 2025 (range = 37/71% to 45/87% between spring 2017 and spring 2024).



Plate 3: Hunter River – Site HR2 (au-25)
View upstream



Plate 4: Hunter River – Site HR2 (au-25)
View downstream

Hunter River adjacent to the MPO (HR3 & HR4)

Site HR3 is situated approximately 6.8 km downstream of Site HR2 (Figure 1). Similar to the upstream sites, riparian vegetation was mostly comprised by River Oaks, Willows and scattered Eucalypts. A considerable proportion of the exotic plant understorey had been scoured by floodwaters during late 2021 (Plates 5&6). Small sections of the right bank (facing downstream) had slumped, causing small trees and shrubs to fall into the river (Plates 5&6). At the time of the autumn 2025 survey, a large proportion of understorey vegetation (predominantly exotic grass) observed on the right bank by the spring 2024 survey was absent (Plates 5 & 6).

The river channel at Site HR3 is up to approximately 14 m wide and 1.1 m deep. Substratum in the edge habitat was predominantly composed of gravel (approximately 70 %) with a mixture of sand and silt. Large woody debris was abundant within the channel and the left bank (facing downstream) (Plates 5 & 6). *Persicaria decipiens* and *Schoenoplectus validus* were less common than observed by previous surveys. Water clarity was good and flow moderate to high. This site was given an RCE score of 41 (78%) in autumn 2025 (range = 37/71% to 42/81% between spring 2017 and spring 2024).



Plate 5: Hunter River – Site HR3 (au-25)
View downstream



Plate 6: Hunter River – Site HR3 (au-25)
View across stream

Site HR4 is situated near the Water Treatment Plant at Muswellbrook and the inlet to the approved water pipeline between the Hunter River and the MPO Mine Water Dam. The study reach consists of long pools up to 10.5 m wide with infrequent short riffles.

The riverbanks are stabilised by trees (mostly Willow and River Oak) and shrubs (including Balloon Vine and Bamboo). During the autumn 2025 survey, two large willow trees were observed to have fallen into the river, likely as a result of recent high river flows (see Plates 7 & 8). Large woody debris has always been common alongside the stream banks.

The substratum in the edge habitat is predominantly gravel and cobble with boulders, pebble and silty sand. The submerged macrophytes, Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp., have commonly been observed at this site. At the time of the current survey, water clarity was good and water level high. This site obtained an RCE score of 42 (80%) at the time of the autumn 2025 survey (range = 39/75% to 43/83% between spring 2017 and spring 2024).



Plate 7: Hunter River – Site HR4 (au-25)
View upstream



Plate 8: Hunter River – Site HR4 (au-25)
View downstream

Hunter River downstream of the MPO (HR5 and HR6)

Site HR5 is situated immediately downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). This site consists of a long, relatively deep pool with a small area of riffle habitat at the top of the site (Plates 9&10). River Oaks, Willows and scattered Eucalypts are present along the stream bank.

Fallen trees, particularly Willows and large accumulations of woody debris were common along the river channel and banks. Balloon Vine is once again common along either bank, as well as Giant Reed, Typha and *Persicaria decipiens*. The substratum in the edge habitat is predominantly a gravel-pebble matrix with a silt overlay.

Submerged macrophytes have not been recorded at this site. At the time of this survey and surveys done since autumn and 2023, carp were seen feeding near the stream bank. Water clarity was good and flow moderate (Plates 9&10). This site was given an RCE score of 41 (79%) in autumn 2025 (range = 36/69% to 44/85% between the spring 2017 and spring 2024 surveys).



Plate 9: Hunter River – Site HR5 (au-25)
View upstream



Plate 10: Hunter River – Site HR5 (au-25)
View downstream

Site HR6 is situated approximately 4 km downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). The width of the riparian strip is relatively narrow (i.e. between 5 and 30 m) and comprised by mixed native and exotic trees and shrubs (Plates 11&12). This site consists of a long, relatively deep pool with a short section of riffle habitat at the top of the study reach (Plates 11&12). The substratum in the edge habitat is predominantly a gravel matrix overlayed with silt. Fallen trees and other woody debris are common within the river channel.

At the time of the current survey, flow and water level were elevated while water clarity was good (Plates 11&12). Balloon Vine is once again common along either bank, as well as Giant Reed, Typha and *Persicaria decipiens.* There were signs of recent collapse of a section of the stream bank and Willows into the river channel. This site was given an RCE score of 42 (80%) in autumn 2025 (range = 38/73% to 42/81% between the spring 2017 and spring 2024 surveys).



Plate 11: Hunter River – Site HR6 (au-25)
View upstream



Plate 12: Hunter River – Site HR6 (au-25)
View downstream

3.1.2 Hunter River Tributaries

Due to the highly ephemeral nature of drainage lines within the MPO's ML boundaries, stream health monitoring locations were chosen in tributaries with more reliable flows to the Hunter River, consequently outside of the MPO boundary.

Muscle Creek

The site sampled on Muscle Creek is situated on the floodplain approximately 1 km upstream of the confluence with the Hunter River (Figure 2). It consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook. Since the spring 2020 survey, planned works by the Australian Rail Track Corporation Limited to replace the Muscle Creek underbridge, located near the confluence of the Hunter River, have been observed.

The stream channel is highly modified, particularly in the downstream reaches of the study site, with large boulders used in places to stabilise the stream bank (Plates 13&14). Trees have been planted along both sides of the creek to help stabilise the banks. For the past 2-3 years, a colony of bats has commonly been observed roosting in trees at the survey site. At the time of the current survey, a large number of bats were present and bat guano (poo) deposits were common on riparian vegetation and habitat (Plates 13&14).

Emergent macrophytes, including Typha, Phragmites, and Mat Rush, were moderately abundant along the stream bank and in-stream (Plates 13&14). *Lomandra longifolia* and *Persicaria decipiens* were also common, as was Balloon Vine, Trad and exotic grasses.

The average stream width is approximately 10 m with a depth of up to approximately 1.5 m. The substratum is mostly comprised by a gravel/cobble/pebble matrix covered by silt and fine sand. At the time of the autumn 2025 survey, there was flow along the study reach. Water clarity was poor at the time of sampling.

The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification. The site received an RCE score of 29 (55%) in autumn 2025. The RCE score has ranged between 21 (40%) and 34 (65%) between the spring 2017 and spring 2024 surveys.



Plate 13: Muscle Creek – Site MC (au-25)
View upstream



Plate 14: Muscle Creek– Site MC (au-25)
View across stream

Sandy Creek

The site sampled on Sandy Creek is located downstream of the MPO and upstream of the Mangoola Coal Operations (Figure 2). Wybong Road bridge crosses the stream at the bottom of the study reach. The stream banks at the survey site are approximately 3 m high and heavily disturbed on either side by historical agricultural activities. Wombat burrows were also present. The stream channel commonly ranges from about 1 m to greater than 7 m wide, with an average of around 5 m (Plates 15&16).

Unlike the findings from surveys done between spring 2017 and spring 2022, the channel connecting pools along the study reach was inundated and flow was apparent (Plates 15&16). The substratum is dominated by poorly sorted gravel overlain by fine-grained sediments and clay with occasional cobbles.

In the large pool at the top of the site, accumulations of green filamentous algae commonly observed up to the spring 2022 have been less common, most likely due to flows along the reach having been re-established. At the time of the current survey, green filamentous algae and Chara/Nitella spp. were present in the pool. The pool substratum was covered by a thin layer of fine silt.

The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification and scored an RCE value of 37 (71%) in autumn 2025. Previously (i.e., since the spring 2017 survey), the RCE score ranged between 21/40% and 35/67%. The higher score is mostly due to inundation and recovery of flow along the stream channel and increased vegetation along the stream bank after drought and stream bank erosion.



Plate 15: Sandy Creek – Site SC (sp-24)
View upstream



Plate 16: Sandy Creek– Site SC (sp-24)
View upstream

Dart Brook

Sampling site Dart Brook was chosen near a road crossing approximately 700 m upstream from the confluence with the Hunter River. The surrounding land use was mostly agriculture. This site consists of pools up to 6.4 m wide and 1.2 m deep and a run at the downstream end (Plates 17&18). The bed is dominated by poorly sorted gravel overlain by sand and silt with occasional boulders.

The stream banks are composed of cohesive fine-grained sediments with gravel. Small areas of active erosion are apparent along the top of the steep (approximately 8 m) right bank and along sections of the channel. Emergent macrophytes included Typha, River Club-Rush (*Schoenoplectus validus)* and Umbrella sedge (*Cyperus eragrostis*).

At the time of the autumn 2025 survey, flow and water level were elevated while water clarity was fair (Plate 17&18). Fallen trees, woody debris and exotic weeds were common along the stream bank. Balloon vine appeared to have increased its distribution along both sides of the stream bank.

The site is classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification. It received an RCE score of 37 (71%) in autumn 2025. Previously, the RCE scores have ranged between 32 (62%) and 41 (79%) (between the spring 2017 and spring 2024 surveys).



Plate 17: Dart Brook – Site DB (au-25)
View downstream



Plate 18: Dart Brook – Site DB (au-25)
View upstream

3.2 Water Quality

Mean physico-chemical water quality measurements from spring 2017 to autumn 2025 are summarised in Table 3. Values highlighted in bold type indicate where results were outside the appropriate default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000). Where appropriate, pH and conductivity data were also compared with site specific trigger criteria[2].

The main findings for the autumn 2025 survey are summarised as follows:

- Mean water temperature ranged from 16.0 (Site SC) to 19.3 °C (Site HR3). Water temperatures have ranged from 12.5 to 25.4 °C in edge habitats throughout the survey period
- pH levels (range = 7.2 – 8.2) exceeded the upper DTVs recommended by the ANZECC/ARMCANZ (2000) guidelines at Site SC;
- Mean conductivity levels (range = 378 to 6,054 µS/cm) exceeded the upper DTV at HR1, HR2, DB, MC and SC. Notably:
    - Conductivity measured at Site HR1 (range = 256 to 843 µS/cm) and Site HR2 (range = 267 to 800 µS/cm) during autumn 2025 did not exceed the site-specific criteria established for those site's (i.e., 589 µS/cm[2])[2]
    - Conductivity measured at Site DB in autumn 2025 (i.e., 1,350 µS/cm) was within the range collected by surveys done at that site since spring 2017 (range = 980 to 5,905 µS/cm), as was conductivity measured at Site SC (6,054 µS/cm) (i.e. range = 914 to 11,200 µS/cm)
    - Conductivity measured at Site MC exceeded the upper guideline value in autumn 2025 (i.e., 2,957 µS/cm), spring 2023 (2,673 µS/cm) and autumn 2023 (2,799).
- Dissolved oxygen levels (range = 65 to 119 % saturation) were below the lower DTVs at the Site MC and DB but elevated at HR5 and HR6.
- Turbidity levels (range = 7.4 to 16.1 NTU) were within the recommended DTVs at all sites at the time of the autumn 2025 survey (Table 3)

The raw water quality data are provided in Appendix 3.

[2] Using the approach recommended by ANZECC & ARMCANZ (2000), surface water quality trigger levels were developed at two sites (W1: situated between Site HR1 and HR2; and W6: situated at HR3) situated within the Hunter River (MACH Energy, 2018). Sites W1 and W6 are sampled monthly and during rain events by AECOM. The 80th percentile trigger values for pH and conductivity (EC) are: Site W1: pH = 7.8 – 8.3, EC = 589 µS/cm; Site W6: pH = 7.8-8.4, EC = 496 µS/cm.

Table 4. Mean (± SE) values of water quality variables recorded between spring 2017 and autumn 2025.

Variable	DTV[3]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR1											
Temperature °C		22.4 (0.0)	17.1 (0.0)	20.2 (0.0)	15.5 (0.0)	19.6	13.3 (0.0)	N/R	17.3 (0.0)	19.2 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.3** (0.0)	**8.6** (0.0)	**8.1** (0.0)	**8.1** (0.0)	**8.29**	**8.6** (0.0)	**8.7** (0.0)	8.0 (0.0)	7.0 (0.0)	8.3 (0.0)
EC (µS/cm)	30 – 350	264 (0.0)	256 (0.0)	276 (0.3)	321 (0.0)	**356**	**445** (0.3)	**528** (0.0)	**528** (0.0)	**622.0** (0.0)	**720** (0.9)
DO (% Sat)	90–110	95.5 (0.4)	93.7 (0.0)	95.4 (0.1)	**87.6** (0.1)	108.2	**75.1** (0.2)	97.8 (0.0)	92.6 (0.2)	**75.8** (0.2)	94.6 (0.0)
Turbidity (NTU)	< 50	16.4 (1.4)	**44.6** (0.4)	13.8 (0.3)	**42.6** (0.9)	2.9	**98.6** (3.2)	14.9 (1.0)	**38.9** (0.5)	9.7 (0.3)	8.8 (0.3)
Site HR2											
Temperature °C		22.9 (0.0)	16.2 (0.0)	19.3 (0.0)	15.7 (0.0)	22.1	13.4 (0.1)	N/R	17.4 (0.0)	19.5 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.2** (0.0)	**8.5** (0.0)	**8.2** (0.1)	7.9 (0.0)	**8.3**	**8.3** (0.1)	**8.5** (0.0)	7.9 (0.0)	7.1 (0.0)	**8.3** (0.0)
EC (µS/cm)	30 – 350	267 (1.3)	311 (0.0)	276 (0.0)	323 (2.2)	**387**	**474** (7.0)	**534** (0.0)	**629** (0.0)	**658.0** (0.0)	**800** (0.0)
DO (% Sat)	90–110	**141.2** (3.6)	**85.8** (0.1)	92.5 (0.2)	**89.3** (0.5)	97.8	**59.5** (0.5)	**81.2** (0.3)	**89.4** (0.1)	**72.9** (0.2)	92.1 (0.0)
Turbidity (NTU)	< 50	**26.7** (1.2)	**43.2** (0.2)	12.8 (0.2)	**43.8** (0.7)	2.6	**118.7** (1.2)	**59.7** (0.2)	10.6 (0.4)	14.7 (1.3)	14.7 (0.5)
Site HR3											
Temperature °C		24.7 (0.0)	16.1 (0.0)	18.7 (0.0)	14.5 (0.0)	21.7	13.7 (0.0)	N/R	16.8 (0.0)	21.8 (0.0)	16.9 (0.0)
pH	6.5 – 8.5	8.2 (0.0)	**8.6** (0.0)	7.9 (0.0)	7.7 (0.0)	8.27	**8.7** (0.0)	**8.8** (0.0)	8.0 (0.0)	7.5 (0.0)	8.3 (0.0)
EC (µS/cm)	125–2,200	272 (1.3)	266 (0.0)	313 (0.0)	329 (0.0)	357	419 (0.0)	540 (0.0)	640 (0.3)	633.0 (0.0)	815 (0.3)
DO (% Sat)	85 – 110	101.7 (0.5)	85.7 (0.1)	**80.9** (0.1)	**72.3** (0.1)	**115.1**	**81.8** (0.1)	91.2 (0.2)	**81.0** (0.1)	93.4 (0.1)	91.6 (0.1)
Turbidity (NTU)	< 50	46.4 (0.3)	49.4 (0.2)	6.9 (0.2)	18.9 (0.8)	3.3	45.0 (0.0)	26.2 (2.1)	23.4 (1.0)	19.4 (1.0)	14.7 (0.3)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[3] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers will be used for these sites here and for subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[4]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25				
Site HR1											
Temperature °C		13.8 (0.0)	17.8 (0.0)	22.2 (0.0)	17.9 (0.0)	17.1 (0.0)	19.0 (0.0)				
pH	6.5 – 8.0	**8.1** (0.0)	**8.2** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)				
EC (µS/cm)	30 – 350	**382** (2.0)	**843.0** (0.0)	307 (0.0)	**418.0** (0.0)	**630** (0.3)	**378** (0.0)				
DO (% Sat)	90–110	97.7 (0.2)	109.9 (0.0)	**21.6** (0.1)	104.2 (0.2)	**81.2** (0.7)	93.4 (0.1)				
Turbidity (NTU)	< 50	2.5 (0.1)	1.8 (0.0)	5.5 (0.5)	5.7 (0.0)	10.7 (0.2)	8.3 (0.0)				
Site HR2											
Temperature °C		14.1 (0.0)	17.5 (0.0)	22.0 (0.0)	17.7 (0.0)	17.1 (0.0)	19.2 (0.0)				
pH	6.5 – 8.0	**8.1** (0.0)	**8.1** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)				
EC (µS/cm)	30 – 350	**409** (2.0)	**997.0** (0.0)	**485** (0.3)	**436.3** (0.3)	**714.3** (0.3)	**403** (0.3)				
DO (% Sat)	90–110	92.3 (0.2)	108.6 (0.1)	**20.2** (0.3)	90.9 (0.1)	**81.3** (0.5)	99.5 (1.5)				
Turbidity (NTU)	< 50	2.8 (0.4)	1.4 (0.0)	6.0 (0.2)	10.4 (0.7)	12.5 (0.2)	8.3 (0.2)				
Site HR3											
Temperature °C		15.9 (0.0)	18.6 (0.0)	22.1 (0.0)	18.9 (0.0)	17.1 (0.0)	19.3 (0.0)				
pH	6.5 – 8.5	7.9 (0.0)	8.2 (0.0)	8.2 (0.0)	7.8 (0.0)	7.9 (0.0)	7.5 (0.0)				
EC (µS/cm)	125–2,200	490 (3.2)	1018 (0.0)	515 (1.0)	436.7 (0.3)	734.7 (0.3)	406 (0.3)				
DO (% Sat)	85 – 110	104.8 (1.1)	113.8 (0.2)	**19.6** (0.4)	108.3 (0.1)	**76.6** (0.2)	103 (1.5)				
Turbidity (NTU)	< 50	**5.2** (0.0)	3.0 (0.1)	13.1 (0.2)	10.2 (0.2)	16.7 (0.3)	9.2 (0.2)				

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[4] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[5]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR4											
Temperature °C		24.6 (0.0)	16.6 (0.0)	21.5 (0.0)	15.2 (0.0)	22.2	13.9 (0.0)	N/R	17.0 (0.0)	22.2 (0.0)	16.7 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.4 (0.0)	8.0 (0.0)	7.7 (0.0)	8.24	8.3 (0.0)	8.5 (0.0)	7.9 (0.0)	7.2 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	296 (1.3)	274 (20.0)	290 (0.0)	368 (1.7)	361	467.0 (0.0)	1,610 (0.0)	623 (0.3)	669.0 (0.0)	861 (0.0)
DO (% Sat)	85 – 110	93.2 (0.6)	100.0 (0.2)	101.0 (0.1)	**79.3** (0.1)	**120.8**	**61.6** (0.0)	**58.2** (0.1)	**83.4** (0.2)	85.1 (0.0)	88.3 (0.0)
Turbidity (NTU)	< 50	26.5 (0.9)	**55.7** (0.1)	28.5 (0.4)	**51.7** (0.7)	6.7	46.0 (0.3)	28.2 (0.2)	12.0 (1.4)	17.7 (0.1)	18.2 (0.1)
Site HR5											
Temperature °C		25.4 (0.0)	15.5 (0.0)	22.3 (0.1)	15.3 (0.0)	22.3	14.8 (0.0)	N/R	17.1 (0.0)	21.3 (0.1)	16.6 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.5 (0.0)	7.7 (0.0)	7.8 (0.0)	8.08	8.4 (0.0)	**8.7** (0.0)	7.9 (0.0)	6.6 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	318 (1.3)	338 (2.0)	322 (0.9)	424 (0.0)	365	407.3 (0.7)	657 (18.0)	669 (0.0)	698.7 (0.3)	908 (0.3)
DO (% Sat)	85 – 110	**66.5** (0.8)	90.3 (0.6)	89.5 (0.2)	**79.7** (0.7)	107.9	**56.2** (0.1)	**61.7** (0.2)	**77.5** (0.1)	**67.5** (1.1)	86.6 (0.0)
Turbidity (NTU)	< 50	30.5 (0.5)	**57.2** (0.2)	35.3 (0.1)	45.2 (1.4)	6.8	**68.8** (1.4)	44.6 (0.7)	12.1 (0.3)	26.8 (1.7)	16.9 (0.4)
Site HR6											
Temperature °C		25.9 (0.0)	17.0 (0.1)	22.5 (0.0)	15.9 (0.0)	22.2	14.9 (0.0)	N/R	16.9 (0.0)	21.5 (0.0)	16.4 (0.0)
pH	6.5 – 8.5	8.1 (0.0)	8.4 (0.0)	7.8 (0.0)	7.9 (0.0)	8.07	8.5 (0.0)	**8.9** (0.0)	7.9 (0.0)	7.2 (0.1)	8.3 (0.0)
EC (µS/cm)	125–2,200	329 (0.0)	331 (1.2)	321 (0.3)	448 (0.0)	364	387.3 (0.3)	636.0 (0.6)	739 (0.3)	715.0 (0.0)	914 (0.3)
DO (% Sat)	85 – 110	**74.7** (0.0)	**83.8** (0.6)	100.8 (0.3)	91.7 (1.5)	107	**72.2** (0.0)	**57.1** (1.0)	**73.0** (0.2)	**78.6** (0.1)	88.9 (0.0)
Turbidity (NTU)	< 50	35.3 (0.8)	**59.1** (0.6)	34.3 (0.2)	35.8 (0.5)	12.7	41.6 (0.3)	23.4 (1.2)	6.5 (0.3)	22.2 (0.2)	17.8 (0.4)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in lowland rivers (i.e. systems at < 150 m altitude) in southeast Australia.

[5] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[6]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25				
Site HR4											
Temperature °C		15.7 (0.0)	17.2 (0.0)	22.2 (0.0)	18.4 (0.0)	17.0 (0.0)	19.2 (0.0)				
pH	6.5 – 8.5	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)	7.7 (0.0)	7.8 (0.0)	7.9 (0.0)				
EC (µS/cm)	125–2,200	393 (0.0)	1111 (0.0)	604 (9.8)	460.3 (0.3)	770.7 (0.3)	414.0 (0.0)				
DO (% Sat)	85 – 110	95.0 (0.1)	106.0 (0.0)	**18.7** (0.6)	97.5 (0.1)	**76.7** (0.2)	106.0 (0.7)				
Turbidity (NTU)	< 50	7.9 (0.2)	2.6 (0.0)	10.3 (0.3)	12.2 (0.3)	22.9 (1.3)	7.4 (0.2)				
Site HR5											
Temperature °C		15.7 (0.0)	16.8 (0.0)	21.3 (0.0)	17.9 (0.0)	17.5 (0.0)	18.5 (0.1)				
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.2 (0.0)	7.7 (0.0)	7.9 (0.0)	8.1* (0.0)				
EC (µS/cm)	125–2,200	455 (7.0)	1272 (0.3)	680 (0.3)	492.3 (0.7)	869.0 (0.0)	419.0 (0.0)				
DO (% Sat)	85 – 110	N/R	99.4 (0.0)	**15.4** (0.4)	88.9 (0.0)	**74.7** (0.3)	**118.7** (0.4)				
Turbidity (NTU)	< 50	6.9 (0.2)	5.7 (0.1)	19.9 (0.7)	22.7 (0.1)	26.8 (0.6)	10.1 (0.4)				
Site HR6											
Temperature °C		15.6 (0.0)	17.0 (0.0)	21.3 (0.1)	17.7 (0.0)	17.2 (0.0)	18.8 (0.0)				
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.1 (0.0)	7.8 (0.0)	7.7 (0.0)	8.2* (0.0)				
EC (µS/cm)	125–2,200	423 (0.0)	1299 (1.2)	730 (0.3)	493.7 (0.3)	917.7 (0.3)	422.7 (0.3)				
DO (% Sat)	85 – 110	N/R	96.5 (0.1)	**16.7** (0.1)	90.2 (0.1)	**66.2** (0.1)	95.4 (0.0)				
Turbidity (NTU)	< 50	6.2 (0.1)	3.3 (0.1)	20.3 (0.2)	18.8 (0.6)	32.0 (0.5)	10.7 (0.4)				

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

- pH measurements appear to be out by 1 pH unit

N/R = Not Recorded

[6] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[7].	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-21
DB											
Temperature °C		25.1 (0.0)	12.6 (0.0)	22.1 (0.1)	13.5 (0.0)	20.3	12.5 (0.0)	N/R	16.2 (0.0)	20.8 (0.0)	17.1 (0.0)
pH	6.5 – 8.0	**8.1** (0.0)	**8.8** (0.0)	**8.2** (0.0)	8.0 (0.0)	**8.24**	**8.4** (0.0)	**8.4** (0.0)	8.0 (0.0)	7.1 (0.0)	**8.1** (0.0)
EC (µS/cm)	30 – 350	**4,257** (1.3)	**5,905** (5.0)	**4,400** (0.0)	**3,648** (0.6)	**5,210**	**1,230** (0.6)	**980** (0.0)	**1014** (0.3)	**914.0** (0.0)	**1013 (0.0)**
DO (% Sat)	90–110	**64.2** (0.8)	**60.5** (0.3)	**88.7** (0.4)	**54.9** (0.2)	**63.9**	**73.9** (0.2)	**56.6** (0.2)	**72.6** (0.0)	**73.2** (0.0)	**88.0 (0.0)**
Turbidity (NTU)	< 25	24.2 (0.5)	**52.4** (0.7)	**26.5** (0.7)	**53.2** (0.4)	**31**	**31.4** (0.8)	19.9 (0.2)	**40.0** (0.1)	32.8 (0.1)	23.6 (0.4)
MC											
Temperature °C		23.3 (0.0)	15.1 (0.0)	23.9 (0.0)	15.0 (0.0)	24.5	14.1 (0.0)	N/R	16.4 (0.0)	21.9 (0.0)	16.1 (0.0)
pH	6.5 – 8.5	7.7 (0.2)	**8.3** (0.0)	7.7 (0.0)	7.5 (0.0)	7.79	8.0 (0.0)	8.4 (0.0)	7.6 (0.0)	6.7 (0.0)	8.0 (0.0)
EC (µS/cm)	125–2,200	1589 (2.6)	1406 (15)	1232 (1.0)	1517 (0.3)	1327	1599 (0.0)	1163 (0.0)	1872 (0.3)	1592 (2.9)	2113 (0.3)
DO (% Sat)	85 – 110	86.6 (0.1)	**83.9** (0.1)	107.3 (0.2)	**52.5** (0.2)	**113.9**	**40.3** (0.0)	**41.3** (0.1)	**64.6** (0.2)	**57.0** (0.1)	**83.0** (0.0)
Turbidity (NTU)	< 50	26.9 (0.9)	**45.8** (0.1)	23.5 (0.7)	**42.2** (2.1)	2.7	35.9 (0.0)	**4.6** (0.0)	15.3 (0.3)	4.3 (0.1)	14.6 (0.2)
SC											
Temperature °C		21.1 (0.0)	14.1 (0.1)	17.3 (0.0)	12.9 (0.0)	22	12.8 (0.0)	N/R	13.9 (0.0)	18.3 (0.0)	15.7 (0.0)
pH	6.5 – 8.0	**8.5** (0.0)	**8.6** (0.0)	8.0 (0.0)	7.9 (0.0)	7.91	**8.8** (0.0)	**8.9** (0.0)	7.7 (0.0)	7.6 (0.0)	**8.4** (0.0)
EC (µS/cm)	30 – 350	**8,000** (0.0)	**8,027** (0.3)	**9,600** (0.0)	**7,064** (13)	**11,200**	**3,006** (0.6)	**6,068** (0.3)	**4,326** (0.3)	**914.0** (0.0)	**4299** (0.3)
DO (% Sat)	90–110	**43.7** (0.0)	**49.0** (5.3)	**10.9** (0.0)	**40.8** (1.4)	**39.1**	**73.4** (0.0)	**39.6** (0.0)	**39.6** (0.1)	94.4 (0.5)	**75.6** (0.0)
Turbidity (NTU)	< 25	10.1 (0.1)	**77.1** (5.2)	4.8 (0.2)	**28.0** (0.2)	2.1	18.8 (0.3)	8.0 (0.1)	1.1 (0.0)	16.8 (0.1)	3.5 0.0)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[7] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[8].	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25				
DB											
Temperature °C		14.6 (0.0)	16.4 (0.7)	18.8 (0.1)	17.5 (0.0)	16.9 (0.0)	18.0 (0.0)				
pH	6.5 – 8.0	**8.2** (0.0)	7.9 (0.0)	**8.2** (0.0)	7.6 (0.0)	7.9 (0.0)	7.2 (0.0)				
EC (µS/cm)	30 – 350	**456** (0.0)	**2,029** (0.0)	**3110** (5.8)	**2,905 (**1.2)	**1,051** (0.0)	**1,350** (0.0)				
DO (% Sat)	90–110	89.8 (0.1)	**87.8** (0.0)	**23.6** (0.1)	**79.9** (0.3)	**70.6** (0.0)	**83.3** (1.1)				
Turbidity (NTU)	< 25	3.2 (0.0)	3.7 (0.1)	17.6 (0.5)	**29.1 (**0.3)	14.8 (0.5)	16.1 (0.3)				
MC											
Temperature °C		16.1 (0.0)	16.4 (0.0)	19.7 (0.0)	17.2 (0.0)	16.8 (0.0)	18.4 (0.0)				
pH	6.5 – 8.5	7.5 (0.0)	7.6 (0.0)	7.7 (0.0)	7.4 (0.0)	7.5 (0.0)	7.9 (0.0)				
EC (µS/cm)	125–2,200	710 (1.9)	**2,799** (0.0)	**2,673** (3.3)	2,000 (0.3)	2,000 (0.0)	**2,957** (0.7)				
DO (% Sat)	85 – 110	N/R (0.3)	**71.1** (0.0)	**13.5** (0.5)	**63.4** (0.0)	**57.1** (0.2)	**65.0** (0.8)				
Turbidity (NTU)	< 25	7.8 (0.1)	3.2 (0.0)	13.2 (0.2)	**25.0** (0.1)	21.3 (0.2)	9.2 (0.1)				
SC											
Temperature °C		14.6 (0.0)	15.0 (0.0)	17.4 (0.3)	14.9 (0.0)	16.9 (0.0)	16.0 (0.0)				
pH	6.5 – 8.0	7.7 (0.0)	7.9 (0.0)	8.0 (0.0)	7.8 (0.0)	7.9 (0.0)	**8.2** (0.0)				
EC (µS/cm)	30 – 350	**1,481** (1.7)	**4,934** (0.3)	**5,617** (15)	**5,888 (**1.0)	**1,051** (0.0)	**6,054** (1.5)				
DO (% Sat)	90–110	N/R (0.3)	**65.4** (0.2)	**54.9** (0.2)	**88.4 (0.1)**	**70.6** (0.0)	**128.6** (0.1)				
Turbidity (NTU)	< 25	9.6 (0.0)	1.3 (0.0)	7.6 (0.3)	15.1 (0.5)	14.8 (0.5)	3.5 (0.1)				

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.
N/R = Not Recorded. NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[8] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

3.3 Aquatic Macroinvertebrates

3.3.1 General Findings

A total of 23 taxon were identified from the edge habitat samples collected at the nine sites sampled in autumn 2025 (Appendix 4). The number of taxa ranged from 4 at Site MC and 10 at Site SC (Appendix 4). Chironominae (non-biting midges) were collected at each of the nine sites sampled, while Atyidae (Freshwater shrimp) were collected at eight sites (Appendix 4). The alien fish, Mosquito fish (*Gambusi*a *holbrooki*), was also collected, at six of the survey sites, using the AUSRIVAS technique (Appendix 4).

The OE50 scores ranged between 0.22 (MC) and 0.54 (HR1) (Table 4). At the time of the autumn 2025 survey, three sites were grouped in Band B (i.e. HR1, HR2 and SC) and six were grouped within Band C (i.e. HR3-6, MC and DB) (Table 4). Thus, fewer families of macroinvertebrates than expected were collected from all sites sampled in autumn 2025 compared to reference sites selected by the AUSRIVAS model (Table 4).

Taxon with > 0.80 probability of occurrence, but not collected, included the caddis fly family Leptoceridae (at all sites except Site DB and SC). The mayfly families, Leptophlebiidae, at all sites except H1, and Caenidae, at HR1-3 and MC, were also expected but not collected. Also missing was the fly larvae family, Tanypodinae, from all sites, and Freshwater shrimps (Atyidae), from SC.

The SIGNAL 2 scores ranged from 2.65 (Site HR2) to 3.85 (Site DB) (Table 4). The results obtained for all sites (i.e., SIGNAL-2 score = < 4.0) indicate severe pollution (Chessman, 2003).

Table 5. AUSRIVAS outputs for sites sampled (autumn 2025) (n = 1).

Watercourse	BA Site Code	Historical Site Code	No Taxa	SIGNAL-2	OE50	Band
Hunter River	HR1	W1	7	3.38	0.31	C
	HR2	W1	8	2.65	0.36	C
	HR3	Hunt 854	6	3.00	0.22	C
	HR4	Hunt 571	6	2.88	0.35	C
	HR5	W15	7	3.20	0.29	C
	HR6	SW17	6	3.18	0.29	C
Muscle Creek	MC	Hunt 506	4	3.00	0.14	C
Sandy Creek	SC	Sandy 1	10	3.10	0.39	C
Dart Brook	DB	Hunt 585	8	3.85	0.35	C

3.3.2 Stream Health Performance Indicators

Site HR3 has consistently scored below its historical band of impairment score (i.e. Band A – equivalent to AUSRIVAS reference condition) and the score obtained by the baseline survey (i.e. Band B – significantly impaired) (Table 5). Site HR4 has regularly scored below its historical band of impairment score (i.e. Band B) but not below its Baseline band level (i.e. Band C – severely impaired), except for during spring 2023 (Table 5).

Notably, deviations from historical AUSRIVAS band levels have also been recorded at sites sampled at Dart Brook (DB) and Muscle Creek (MC), which are not exposed to mining activities at the MPO (Table 5).

Criteria developed for the MPO sites were based on data collected on a single occasion in the mid-1990s. Given that ecological measurements vary from one place to another, and few ecological variables are constant through time, statistical analyses were used to formally examine trends in the condition of aquatic macroinvertebrate fauna and the stream health performance indicators in Section 3.3.3. To date, formal analyses have not detected any statistically significant changes that could be indicative of an impact associated with the MPO.

Table 6. Band of Impairment Scores (spring 2017 to autumn 2025).

BA Site Code	Historical Site Code	AUSRIVAS Band Levels				
		mid-1990s	Sp17	Aut18	Sp18	Aut19
DB	Hunt 585	B	B	B	C	B
MC	Hunt 506	B	B	C	C	C
HR3	Hunt 854	A	B	C	C	B
HR4	Hunt 571	B	C	C	C	B
		mid-1990s	Sp19	Aut20	Sp20	Aut21
DB	Hunt 585	B	D	C	B	C
MC	Hunt 506	B	C	C	C	B
HR3	Hunt 854	A	C	C	B	B
HR4	Hunt 571	B	C	C	C	C
		mid-1990s	Sp21	Aut22	Sp22	Aut23
DB	Hunt 585	B	B	B	B	C
MC	Hunt 506	B	C	B	C	C
HR3	Hunt 854	A	B	C	C	C
HR4	Hunt 571	B	B	C	C	B
		mid-1990s	Sp23	Au24	Sp24	Au25
DB	Hunt 585	B	C	C	C	C
MC	Hunt 506	B	D	C	C	C
HR3	Hunt 854	A	D	C	C	C
HR4	Hunt 571	B	D	C	C	C

3.3.3 Changes in Aquatic Macroinvertebrate Fauna

Assemblages

Similar to the findings of previous surveys, PERMANOVA did not detect any evidence to suggest that the structure of assemblages of aquatic macroinvertebrates at locations situated downstream of mining activities at the MPO changed significantly in relation to the control locations (Table 6, Figure 4). Visual examination of the Principal Component Ordination (PCO) shows symbols representing assemblages collected at the Midstream-Impact and Downstream-Impact treatments have changed in a similar manner (i.e., direction and dispersion) as assemblages situated at the Hunter River and Tributary Control reaches, including at the time of the autumn 2025 survey (Figure 4).

Similar to the findings of the previous surveys, SIMPER analyses examining the autumn 2025 data indicated that Atyidae made a considerable contribution to the structure of assemblages within each of the study reaches (Table 7, Figure 4). The aquatic bug, Corixidae, also contributed greatly to assemblages within the Hunter River (Table 7). Chironominae (fly larvae) and the dragonfly larvae, Coenagrionidae, made important contributions to the structure of assemblages within the Tributary sites (Table 7, Figure 4). The mayfly larvae, Caenidae, contributed greatly (ranked second) to the structure of assemblages within the downstream reaches within the Hunter River (Table 7).

Table 7. Summary of PERMANOVA analysis. Bold numbers indicate significant results at P < 0.05. Percentages of Components of Variation (% CV) are shown.

Source	*df*	MS	Pseudo-*F*	*P*	%CV
Survey	**15**	**5802**	**3.32**	**0.000**	**22.43**
Treatment	1	7390	1.43	0.175	8.82
Reach(Treatment)	**4**	**7714**	**4.42**	**0.000**	**18.87**
Survey x Treatment	15	1746	1.00	0.496	0.19
Survey x Reach(Treatment)	**28**	**1746**	**1.11**	**0.163**	**9.04**
Residual	80	1575			40.67
Total	143				

Table 8. Results of SIMPER analyses indicating the relative contribution of individual taxa to the structure of assemblages of macroinvertebrates at each of the study reaches in autumn 2025.

Taxa	US-Control	MS-Impact	DS-Impact	Tributary-Control
Atyidae	2 (38 %)	2 (18%)	1 (67 %)	1 (60 %)
Chironominae		3 (18%)	3 (11 %)	2 (24%)
Corixidae	1 (54 %)	1 (64 %)	4 (11 %)	
Caenidae			2 (11 %)	
Coenagrionidae				3 (8 %)

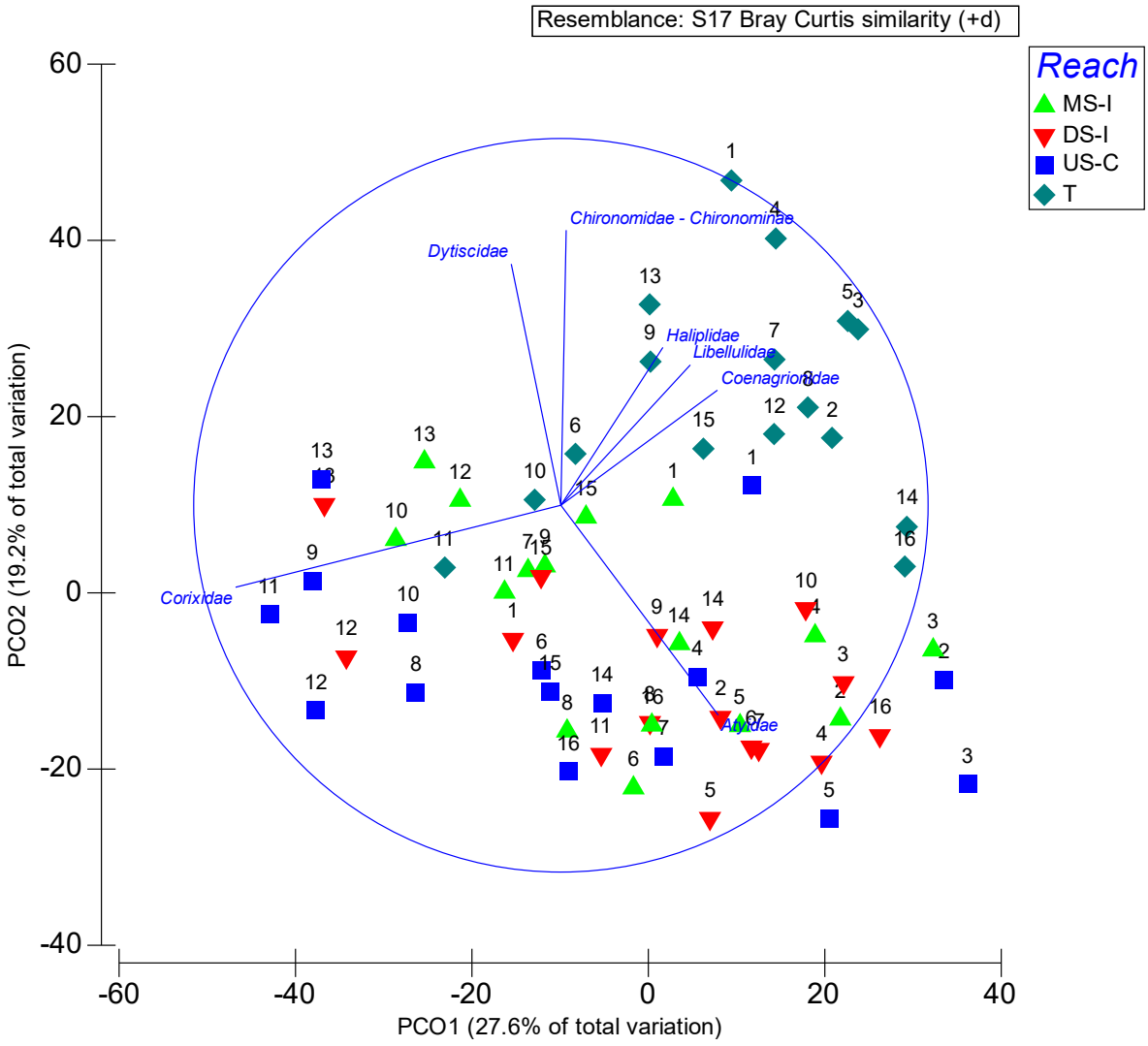

Figure 4. Principal Component Ordination (PCO) of the centroids estimated for AUSRIVAS macroinvertebrate assemblages sampled from edge habitat (MS-I = Midstream-Impact; DS-I = Downstream-Impact; US-C = Upstream-Control; T = Tributary-Control) between spring 2017 (Time 1) and autumn 2025 (Time 16).

Number of Taxa

The mean number of taxa sampled within each 'reach' has ranged from 3.0 (± 1.0) (HR-D in spring 2023 and spring 2022) to 15.5 (± 0.5) (HR-M in autumn 2019) (Figure 5). The PERMANOVA analysis detected significant differences among Surveys and Reaches but no terms were indicative of an impact (i.e. Survey x Treatment) (Table 8, Figure 5). Graphically, fewer taxa have commonly (eleven of fifteen surveys) been collected within the downstream reach situated within the Hunter River (i.e., HR-D) than at the other reaches sampled (Figure 5). Similar numbers of taxa have been collected over time (Figure 5).

Table 9. Summary of PERMANOVA analysis of the Number of Taxa. Bold numbers indicate significant results at P < 0.05. T = Time. NB 'Time' is a random factor.

Source	df	MS	Pseudo-*F*	*P*
Survey	**15**	**43.32**	**8.59**	**0.001**
Treatment	1	0.27	0.03	0.994
Reach(Treatment)	**4**	**25.27**	**5.01**	**0.001**
Survey x Treatment	15	4.86	0.96	0.531
Survey x Reach(Treatment)	28	5.04	0.73	0.805
Residual	80	6.94		
Total	143			

OE50 Scores

The OE50 Taxa Scores ranged from 0.07 (±0.0) (HR-D in spring 2023) to 0.75 (±0.03) (HR-M in autumn 2019), indicating that the macroinvertebrate assemblage within the Hunter River have ranged from severely to significantly impaired relative to reference sites selected by the AUSRIVAS model (Figure 6).

Similar to the findings of previous surveys, PERMANOVA detected significant differences among surveys, but no terms were indicative of an impact (Table 9, Figure 6). Graphically, the condition of aquatic macroinvertebrate fauna improved at each of the reaches sampled between autumn and spring 2024 (Figure 6). The OE50 score's obtained at the time of the autumn 2025 survey were lower than the values obtained at the time of the spring 2017 survey (Figure 6). Importantly, scores obtained for the reaches situated downstream of mining activities during autumn 2025 were similar to those obtained at the control locations (Figure 6).

Table 10. Summary of PERMANOVA analysis for OE50 Scores. Bold numbers indicate significant results at P < 0.05.

Source	*df*	MS	Pseudo-*F*	*P*
Survey	15	**0.123**	**7.293**	**0.001**
Treatment	1	0.000	0.004	0.958
Reach(Treatment)	4	0.038	2.131	0.077
Survey x Treatment	15	0.016	0.938	0.543
Survey x Reach(Treatment)	28	0.017	0.945	0.542
Residual	80	0.018		
Total	143			

SIGNAL2 Indices

The mean SIGNAL2 Index ranged from to 2.42 (±0.1) (HR-D in spring 2023) to 4.25 (±0.8) (HR-M in spring 2022) throughout the survey period (Figure 7). SIGNAL 2 values less than 4 indicate that macroinvertebrate assemblages have consistently been dominated by pollution tolerant taxa (Figure 7).

PERMANOVA detected a significant Survey x Reach(Treatment) interaction, but no terms were indicative of an impact (Table 10, Figure 7). Graphically, the SIGNAL 2 scores obtained during autumn 2025 were similar to surveys done previously (Figure 7). Continued low diversity and presence of less pollution tolerant species, particularly mayflies and caddisflies, obtained at those sites and is likely to have contributed to the lower scores.

Table 11. Summary of PERMANOVA analysis. Bold numbers indicate significant results at P < 0.05.

Source	df	MS	Pseudo-*F*	*P*
Survey	15	0.56	1.60	0.144
Treatment	1	0.02	0.14	0.820
Reach(Treatment)	4	0.41	1.17	0.354
Survey x Treatment	15	0.15	0.43	0.952
Survey x Reach(Treatment)	**28**	**0.35**	**2.31**	**0.006**
Residual	80	0.15		
Total	143			

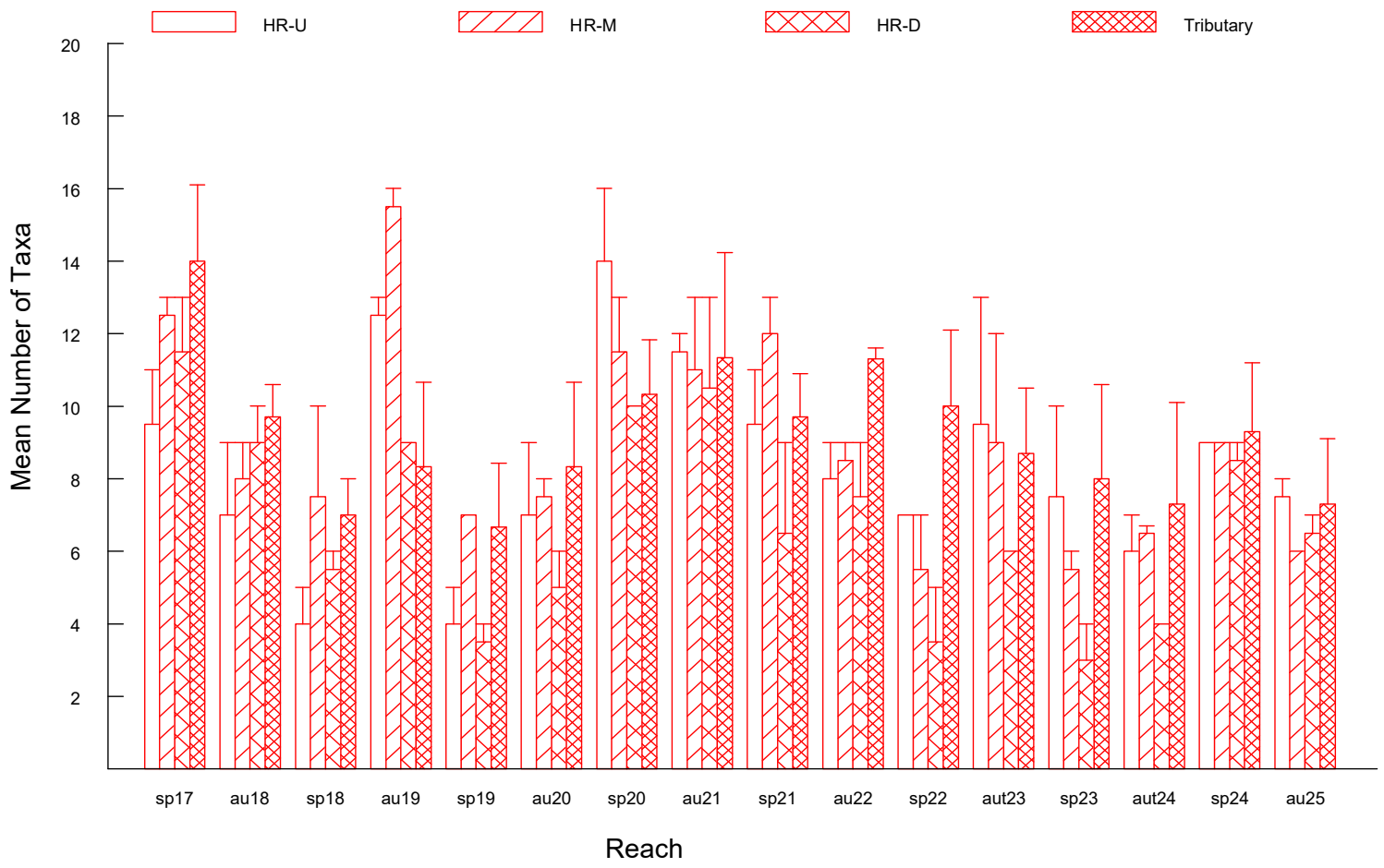

Figure 5. Mean number of taxa collected from edge habitat within the river (n =2 sites) and tributary (n = 3 sites) reaches between spring 2017 and autumn 2025.



Figure 6. Mean OE50 Taxa Scores and their respective Band Scores (B-C) for AUSRIVAS samples collected between spring 2017 and autumn 2025.

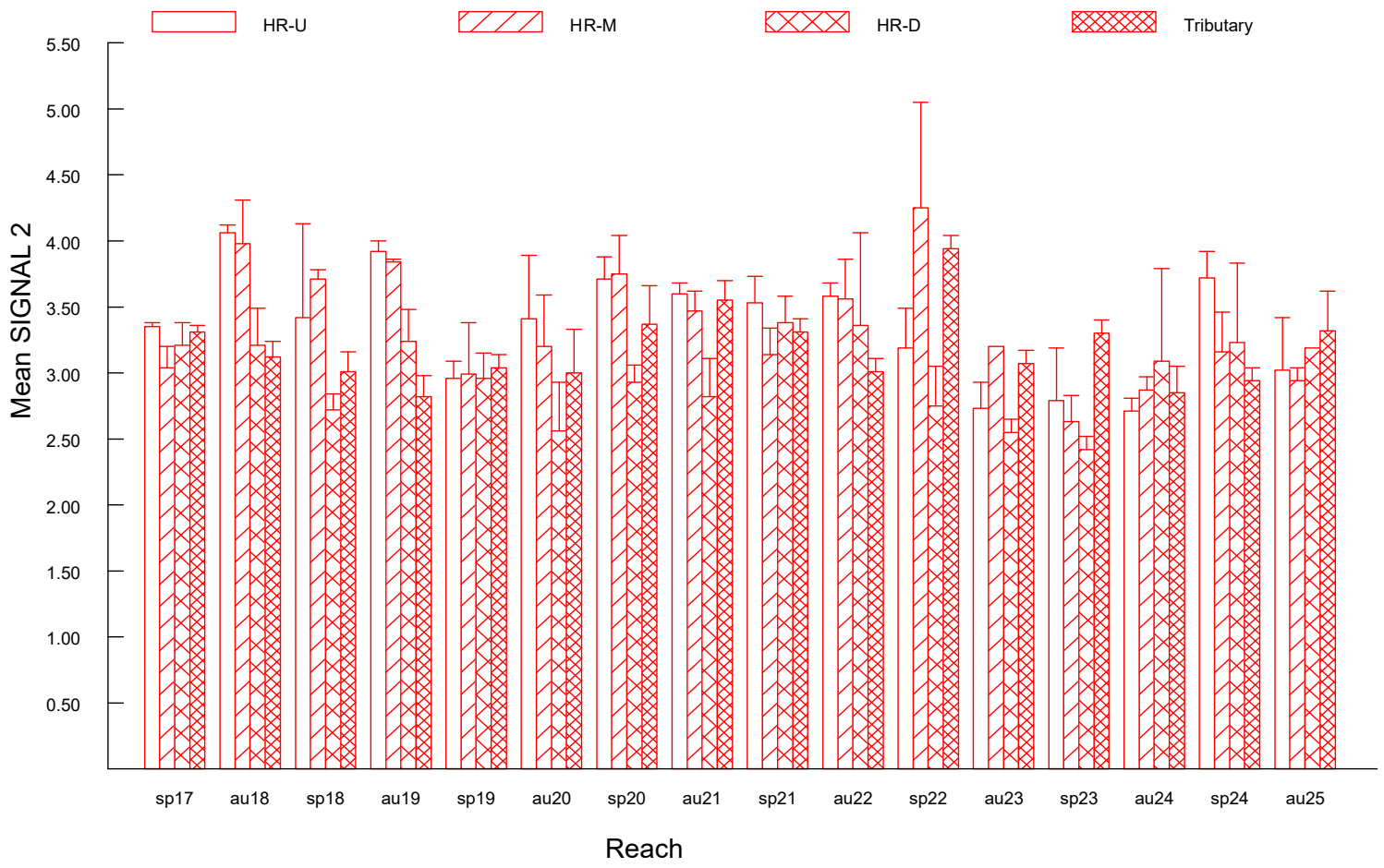

Figure 7. Mean SIGNAL2 Indices for AUSRIVAS samples collected from edge habitat at each site between spring 2017 and autumn 2025.

3.4 Fish

Six species of fish (including two introduced species), freshwater shrimp and freshwater prawns were recorded at the eight sites able to be sampled for fish at the time of the autumn 2025 survey (Table 13). Eels (ranging between 70-120 cm in length) were observed/caught at two of the six Hunter River sites sampled (i.e. Sites HR-2&5), Muscle Creek and Dartbrook (Table 13). Carp (up to ~ 50 cm in length) were caught/observed at Site HR3, HR5 and DB (Table 13). Mosquito Fish (*Gambusia holbrooki*) were collected at all sites except Site HR3, at the time of the autumn 2026 survey (Table 13). Freshwater shrimps (Atyidae) and freshwater prawns (Palaemonidae) were also collected.

Altogether, ten[9] species of fish, including eight native and two alien species, have been collected at the sites sampled since spring 2017 (Table 14). Most notably, a platypus (*Ornithorhynchus anatinus*) was collected in a fyke net set at Site HR1 in autumn 2021. Carp, Flat head gudgeon and Australian smelt were collected at Sandy Creek for the first time in autumn 2024 (Table 14).

All the species caught have been recorded during previous fish surveys done on the Hunter River (McDowall, 1996; DPI 2006; Howell and Creese, 2010). No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) were recorded in the Study Area on this sampling occasion (Table 10) or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

[9] One dead individual observed at Site HR1 in spring 2019 was incorrectly identified as a Wild goldfish (*Carassius auratus*), instead of Common carp.

Table 12. Species of fish and crustaceans observed and/or collected using a Backpack Electrofisher (at sites HR1-HR6, MC and DB) and Dip nets (all sites) in autumn 2025 survey (13&14 May 2025).

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB
Anguilla reinhardtii	Long-finned eel					√	√	√		√
Anguilla australis	Short-finned eel									
Cyprinus carpio	Common carp*			√		√				√
Gambusia holbrooki	Mosquito fish*	√	√		√	√	√	√	√	√
Gobiomorphus australis	Striped gudgeon									
Macquaria novemaculeata	Australian bass									
Mugil cephalus	Sea mullet			√	√					
Philypnodon grandiceps	Flat head gudgeon						√	√		
Retropinna semoni	Australian smelt									
Tandanus tandanus	Freshwater catfish	√								√
Emydura macquarii	Eastern short-neck turtle									
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√		√
Palaemonidae sp.	Freshwater prawns	√	√	√	√		√	√		√

*Non-native/Alien species.
[A]Unable to be electrofished due to elevated levels of conductivity.

Table 13. Species of fish and crustaceans collected/observed at the survey sites between spring 2017 and spring 2024.

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB[B]
Anguilla reinhardtii	Long-finned eel	√	√	√	√	√	√	√		√
Cyprinus carpio	Common carp*	√	√	√	√	√	√	√		√
Gobiomorphus australis	Striped gudgeon	√	√	√		√	√			
Macquaria novemaculeata	Australian bass	√	√	√		√	√			√
Mugil cephalus	Sea mullet			√	√		√			
Gambusia holbrooki	Mosquito fish*	√	√	√	√	√	√	√	√	√
Philypnodon grandiceps	Flat head gudgeon		√	√		√				
Hypseleotris klunzingeri	Western carp gudgeon				√					
Retropinna semoni	Australian smelt	√	√	√	√	√	√			
Tandanus tandanus	Freshwater catfish	√				√				
Emydura macquarii	Eastern short-neck turtle			√						
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√	√	√
Palaemonidae sp.	Freshwater prawns	√	√	√	√	√	√	√	√	√

*Non-native/Alien species.

[A]Sandy Creek was unable to be electrofished in spring 2021, autumn 2021, spring 2020, autumn 2020, spring 2019, autumn 2019, spring 2018, autumn 2018, autumn 2022, autumn 2023 and autumn 2024 due to elevated levels of conductivity.

[B]Dartbrook was unable to be electrofished in autumn 2023, mostly likely due to elevated levels of conductivity

3.5 Groundwater Monitoring

3.5.1 Groundwater Habitat

Of the eight groundwater bores proposed to be sampled, one (GDE-D) was unable to be sampled because it was dry (Table 10). Of the bores that were able to be sampled, between approximately 4 to 300 L was pumped from two groundwater systems (Table 10). At the time of sampling, groundwater in the alluvial aquifers was relatively fresh (611 to 1,490 µS/cm) (Table 10). The pH measured in the bores ranged from 6.8 to 8.5 and dissolved oxygen concentrations from 24.9% to 53.1% saturation (Table 7).

3.5.2 Stygofauna Taxa

Low numbers of invertebrates were collected from three of the seven bores sampled (Table 11). No invertebrates were collected from Bore's MP-BH1-C, MP-BH1-HR, MP-BH2-HR or GDE (Table 11).

Two likely stygofauna (Neoniphargidae and Isotomidae) were identified from the invertebrate samples collected (Table 11). Hypogastruridae were not considerably to be stygofauna due to the presence of pigmentation (Table 11). Each of these taxa are known from previous surveys of stygofauna within the Hunter alluvium (Hancock and Boulton, 2008; Hose et al., 2015; ELA, 2013 and 2019).

Table 14. Invertebrates recorded from bores near the MPO (12 May 2025).

Class/Order	Lower taxa	MP-BH1	MP-BH2	MP-BH2 C	Likelihood of Stygofauna
Amphipoda	Neoniphargidae	1	(1)	-	Likely
Collembola	Isotomidae	2	-	-	Likely
Collembola	Hypogastruridae	-	-	1	Unlikely
Coleoptera	Elmidae	-	1	-	Unlikely
Number of Taxa		**2**	**2**	**1**	
Total Individuals		**3**	**2**	**1**	

Note[1]: Numbers in brackets represent samples collected using the net. Pump samples were unable to be collected from GDE-D.

Note[2]: Macroinvertebrate taxa were not present in samples collected from MP-BH1-C, MP-BH1-HR, MP-BH2-HR or GDE-S.

Table 15. Mean (+ SE) Values of Groundwater Quality Recorded in the First and Fifth Bucket and then every Five Buckets Collected from each Bore (n = 7, where there is sufficient groundwater recharge).

Bore	Date Sampled	Aquifer	Water Level (mbgl)	Volume Pumped (L)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (% Sat)
MP-BH1	13/5/2025	Alluvium	9.42	300	19.4 (0.1)	6.8 (0.1)	611 (0.4)	40.4 (2.1)
MP-BH1-C	13/5/2025	Alluvium	9.60	100	20.2 (0.0)	7.1 (0.1)	699 (15.8)	42.6 (13.5)
MP-BH1-HR	13/5/2025	Alluvium	30.59	4	20.8 (0.3)	7.1 (0.2)	1,184 (270)	40.1 (0.2)
MP-BH2	13/5/2025	Alluvium	12.24	300	20.0 (0.1)	6.7 (0.2)	1,268 (0.4)	53.1 (0.8)
MP-BH2-C	13/5/2025	Alluvium	12.55	300	21.1 (0.1)	8.5 (0.2)	1,490 (29.6)	27.4 (5.3)
MP-BH2-HR	13/5/2025	Alluvium	12.52	8	22.1 (0.5)	7.3 (0.1)	1,376 (86.2)	49.6 (7.7)
GDE-D	13/5/2025	Mt Arthur Seam	Dry	Dry	N/R	N/R	N/R	N/R
GDE-S	13/5/2025	Alluvium	10.92	300	20.2 (0.2)	7.4 (0.3)	12,376 (280.3)	24.9 (5.5)

[#]The well was unable to be pumped. N/R: Not Recorded

5.0 DISCUSSION

Discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 51 discharge credits as of June 2023. As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made to date. Two Sediment Dam releases were made to the eastern portion of the MPO area, on 8/03/2022 and 21/10/2022.

There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

5.1 Aquatic Habitat

The aquatic habitat in sections of the Hunter River, Dartbrook, Muscle Creek and Sandy Creek visited by this survey continues to be in relatively good condition despite historical clearing of vegetation to the top of the bank, stream bank erosion and weed infestation in the riparian zone. Relatively dense vegetation (including Casuarina and Willow trees) within a large proportion of the riparian strip (between approximately 5 to 30 m wide) continue to help stabilise banks and reduce erosion and sediment mobilisation.

Deep pools, large woody debris and rocks continue to provide important habitat for many species of aquatic fauna, including fish. Beds of emergent and submerged species plants observed at the study sites would also fulfill many important ecological roles, including the provision of refuge and nursery for aquatic fauna, a source of food for macroinvertebrates and fish and are important in nutrient cycling. Australian bass, Long-finned eels, Sea mullet, Australian smelt, Freshwater catfish and gudgeons, have commonly been caught at the Hunter River sites, confirming that the river is providing habitat for native species of fish.

The overall condition of riparian habitat at the smaller tributary site at Dart Brook has consistently been classified as ‘moderate’. Although relatively narrow (between 5 and 30 m), mixed native and exotic trees and shrubs are abundant within the riparian strip. A range of habitats available to fish and macroinvertebrates are present, including rocks, logs and emergent macrophytes (including Phragmites, Typha and Mat Rush). Australian bass have been caught at this site although not since the autumn 2018 survey, respectively. Long finned eels and carp were common at the time of the autumn 2025 survey.

Conductivity levels (up to 5,905 µS/cm) have consistently exceeded ANZECC/ARMCANZ (2000) guidelines, including at the time of the autumn 2025 survey (i.e. 1,350 µS/cm).

The Muscle Creek site consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook. Muswellbrook Shire Council with the support of the local community have been working to rehabilitate the riparian zone within the downstream reaches of the creek. At the time of the current survey, a large colony of bats was observed roosting in trees adjacent to the creek. Notably, the release of bat guano into a water body has been shown to cause measurable changes in water quality, including elevated turbidity and conductivity levels and concentrations of nitrate, ammonia and phosphate (Perera et al., 2019).

The western portion of the MPO lies within the Sandy Creek catchment. Similar to the findings of surveys done since autumn 2023, the stream channel between previously isolated pools was inundated and flow was apparent in autumn 2025, improving connectivity along the creek and salinity (6,054 µS/cm at the time of the autumn 2025 survey compared to 11,200 µS/cm during spring 2019).

5.2 Water Quality

Water quality patterns have generally been consistent with data collected prior to the commencement of operations at the MPO. Electrical conductivity has commonly exceeded the ANZECC/ARMCANZ (2000) guideline value (i.e., 350 µS/cm) at the Hunter River sites situated upstream of the MPO (i.e. Sites HR1 and HR2: range = 256 to 800 µS/cm) and the Tributary sites (Dartbrook: range = 980 to 5,905 µS/cm; Muscle Creek: range = 1163 to 2,957µS/cm; Sandy Creek: range = 914 to 11,000 µS/cm), including prior to commencement of the Project and during the autumn 2025 survey. This is not surprising given that the Hunter River catchment includes a large proportion of salt bearing sedimentary rocks and soils, and surface and underground drainage from this contributes natural salinity to the river (see Krogh et al., 2013). Importantly, conductivity levels measured at the sites situated downstream of MPO inputs continue to be within the ANZECC guideline values, and the range in values measured at those sites since the spring 2017 survey.

The pH levels measured at the Hunter River sites continue to show slightly alkaline values, particularly at the upstream sites sampled (Sites HR1 and HR2). Both sites, however, continue to be within the site-specific trigger criteria for that section of the Hunter River (i.e., 7.8 – 8.3). Similarly, pH levels measured in Dartbrook (range = 7.1 to 8.8) and Sandy Creek (range = 7.6 to 8.9) have commonly been slightly alkaline.

5.3 Aquatic Macroinvertebrates

Similar to the spring 2024 survey, a total of 23 taxon were identified from edge habitat samples collected at the survey sites sampled in autumn 2025. Throughout the survey period, the mean number of taxa sampled within each of the study reaches (i.e., HR-U, HR-M, HR-DS and Tributary) has ranged from 3.0 (± 1.0) (HR-D in spring 2023) to 15.5 (± 0.5) (HR-M in autumn 2019).

The relatively low number of species collected by this and previous investigations (including prior to commencement of mining at the MPO), indicate that the macroinvertebrate assemblage has experienced some degree of environmental stress. This is evident in the OE50 Taxa Scores and Band levels obtained.

As discussed previously, lower than expected taxa scores are almost certainly related to the compounding effects from exposure to multiple historical stressors, including flow alteration, sedimentation, salinity, nutrient inputs, hydraulic disturbance and predation by exotic species of fish, such as Mosquito fish and Carp. Nevertheless, some pollution sensitive taxa have commonly been present, such as caddis fly and mayfly families, including at the time of the current survey. Importantly for this stream health study, none of the PERMANOVA tests indicated a change in autumn 2025 that could be attributed to a MPO related impact.

5.4 Fish

The section of the Hunter River within the Study Area is classified as Class 1, Type 1 fish habitat. Altogether ten species of fish have been collected at the sites sampled since spring 2017, including Australian bass, Long-finned eels, native gudgeons, Common carp and Mosquito fish. Eastern short-neck turtles and a platypus (*Ornithorhynchus anatinus*) have also been captured and released.

The distribution and abundance of Carp within the Hunter River appears to have increased considerably since the autumn 2023 survey, particularly at Site HR5 on the Hunter River and at Dartbrook where there are shallow areas adjacent to the main channel with fallen trees and vegetated areas. Numbers appear similar to those recorded prior to flood flows during spring 2021.

No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed using electrofishing, fyke nets or bait traps at the sites sampled in the Hunter River, or electrofishing in Muscle Creek, Sandy Creek or Dart Brook by this sampling programme or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

5.5 Stream Health Performance Indicators

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, Site HR3 has consistently scored below its indicator criteria (Band A) while Site HR4 (Band B) has scored lower on thirteen out of the sixteen (81%) sampling occasions. Similarly, band of impairment scores obtained at the 'control' sites sampled (i.e. at Muscle Creek and Dart Brook) have been lower than their indicator criteria on numerous occasions. Importantly, formal analyses have not detected any statistically significant changes in the stream health performance indicators that could be indicative of an impact associated with the MPO. Furthermore, the MPO continues to be a nil discharge site. Therefore, it is not considered appropriate for MACH Energy to initiate a stream health investigation under the SGWRP, in accordance with the SWMP.

5.6 Stygofauna Monitoring

Groundwater within the bores sampled in May 2025 was relatively fresh (611 to 1,490 µS/cm). Four likely stygofauna from two families (i.e., Neoniphargidae and Isotomidae) were identified from two (MP-BH1 and MP-BH2) of the seven bores sampled. These taxa are known from previous surveys of stygofauna within the Hunter River alluvium (Hancock and Boulton, 2008; Hose et al., 2015; ELA, 2013 and 2019; BIO-ANALYSIS, 2020).

6.0 CONCLUSIONS & RECOMMENDATIONS

There was no evidence to suggest a change in macroinvertebrate indicators occurred at HR3, HR4, HR5 or HR6 in autumn 2025 that could be associated with the MPO. Where changes did occur, they were comparable with those that occurred upstream at control site's HR1 and HR2 and at the Tributary sites (i.e., DB, MC and SC).

The MPO is licenced to discharge via HRSTS but no discharge has been made to date. For these reasons, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site. It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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APPENDICES

Appendix 1 - GPS positions (UTMs) for stream monitoring sites (autumn 2025).

Watercourse	Site Code	Easting	Northing
Hunter River	HR1	0299756	6435440
	HR2	0299785	6434794
	HR3	0300136	6430786
	HR4	0300739	6429276
	HR5	0293706	6424216
	HR6	0292299	6423021
Dart Brook	DB	0298881	6436241
Muscle Creek	MC	0301148	6427955
Sandy Creek	SC	0289157	6428193

Datum: WGS 84, Zone 56H

Appendix 2 - Riparian Channel & Environment (RCE) Score Sheet

	Descriptor & Category			Descriptor & Category	
1	Land use pattern beyond the immediate riparian zone		8	Riffle/pool sequence	
	-Undisturbed native vegetation	4		-Frequent alternation of riffles and pools	4
	-Mixed native vegetation and pasture/exotics	3		-Long pools with infrequent short riffles	3
	-Mainly pasture, crops or pine plantation	2		-Natural channel without riffle/pool sequence	2
	-Urban	1		-Artificial channel: no riffle/pool sequence	1
2	Width of riparian strip of woody vegetation		9	Retention devices in stream	
	- > 30 m	4		-Many large boulders and/or debris dams	4
	-Between 5 and 30 m	3		-Rocks/logs present: limited damming effect	3
	-< 5 m	2		-Rocks/logs present; but unstable, no damming	2
	-No woody vegetation	1		-Stream with few or no rocks/logs	1
3	Completeness of riparian strip of woody vegetation		10	Channel sediment accumulations	
	-Riparian strip without breaks in vegetation	4		-Little or no accumulation of loose sediments	4
	-Breaks at intervals of > 50 m	3		-Some gravel bars but little sand or silt	3
	-Breaks at intervals of 10 – 50 m	2		-Bars of sand and silt common	2
	-Breaks at intervals < 10 m	1		-Braiding by loose sediment	1
4	Vegetation of riparian zone within 10 m of channel		11	Stream bottom	
	-Native tree and shrub species	4		-Mainly clean stones with obvious interstices	4
	-Mixed native and exotic trees and shrubs	3		Mainly stones with some cover of algae/silt	3
	-Exotic trees and shrubs	2		-Bottom heavily silted but stable	2
	-Exotic grasses/weeds only	1		-Bottom mainly loose and mobile sediment	1
5	Stream bank structure		12	Stream detritus	
	-Banks fully stabilised by trees, shrubs, etc	4		-Mainly unsilted wood, bark, leaves	4
	-Banks firm but held mainly by grass and herbs	3		-Some wood, leaves etc, with much fine detritus	3
	-Banks loose, partly held by sparse grass etc	2		-Mainly fine detritus mixed with sediment	2
	-Banks unstable, mainly loose sand or soil	1		-Little or no organic detritus	1
6	Bank undercutting		13	Aquatic vegetation	
	-None or restricted by tree roots	4		-Little or no macrophyte or algal growth	4
	-Only on curves and at constrictions	3		-Substantial algal growth: few macrophytes	3
	-Frequent along all parts of stream	2		-Substantial macrophyte growth; little algae	2
	-Severe, bank collapses common	1		-Substantial macrophyte and algal growth	1
7	Channel form				
	-Deep: width/depth ratio < 7:1	4			
	-Medium: width/depth ratio < 8:1 to 15:1	3			
	-Shallow: width/depth ratio > 15:1	2			
	-Artificial: concrete or excavated channel	1			

Appendix 3 - Water Quality Data (autumn 2025)

Indicator Variable	HR1-1	HR1-2	HR1-3	HR2-1	HR2-2	HR2-3	HR3-1	HR3-2	HR3-3
Temperature °C	19	19	19	19.17	19.16	19.16	19.3	19.3	19.3
pH	7.25	7.26	7.27	7.24	7.25	7.27	7.45	7.47	7.48
Conductivity (µS/cm)	378	378	378	403	402	403	406	406	407
Dissolved Oxygen (% Saturation)	93.5	93.6	93.2	96.6	100.1	101.7	106.1	101.7	101.5
Turbidity (NTU)	8.2	8.3	8.3	8.6	8.2	8	9.6	9	9
Alkalinity	100			100			100		
	HR4-1	**HR4-2**	**HR4-3**	**HR5-1**	**HR5-2**	**HR5-3**	**HR6-1**	**HR6-2**	**HR6-3**
Temperature °C	19.2	19.2	19.2	18.4	18.8	18.4	18.82	18.82	18.82
pH	7.93	7.94	7.94	9.2	9.2	9.2	9.19	9.19	9.19
Conductivity (µS/cm)	414	414	414	419	419	419	423	422	423
Dissolved Oxygen (% Saturation)	107.3	104.9	105.7	118.1	118.7	119.4	95.4	95.5	95.4
Turbidity (NTU)	7	7.5	7.7	9.3	10.4	10.5	10.4	10.2	11.6
Alkalinity	90			90			100		
	DB-1	**DB-2**	**DB-3**	**MC-1**	**MC-2**	**MC-3**	**SC-1**	**SC-2**	**SC-3**
Temperature °C	18	18	18	18.36	18.35	18.35	15.96	15.96	15.96
pH	7.19	7.23	7.26	7.92	7.92	7.93	8.23	8.24	8.25
Conductivity (µS/cm)	1350	1350	1350	2956	2958	2958	6057	6054	6052
Dissolved Oxygen (% Saturation)	81.5	83.3	85.2	66.4	64.8	63.8	85.6	85.7	85.8
Turbidity (NTU)	15.7	16	16.7	9.2	9.1	9.4	3.8	3.3	3.5
Alkalinity	100			100			>100		

N/R: Not Recorded

Appendix 4 - Macroinvertebrate taxa collected using the AUSRIVAS protocol (autumn 2025).

Taxa	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	MC	SC	DB
Physidae	0	1	0	0	0	0	0	0	0
Corbiculidae	0	0	0	0	0	1	0	1	0
Oniscidae	0	0	0	0	0	0	0	0	1
Atyidae	14	15	25	2	6	30	32	18	0
Palamonidae	2	0	2	0	5	0	0	0	0
Baetidae	1	1	0	1	0	2	0	0	0
Caenidae	0	0	0	1	1	1	0	1	7
Leptophlebiidae	2	0	0	0	0	0	0	0	0
Coenagrionidae	0	0	0	0	0	0	1	1	2
Isostictidae	0	0	0	0	0	0	0	0	1
Libellulidae	0	0	0	0	0	0	0	0	5
Protoneuridae	1	0	1	0	0	0	1	0	0
Corixidae	20	25	19	7	1	3	0	0	0
Gerridae	0	2	3	0	0	0	0	0	0
Notonectidae	0	0	0	0	0	0	0	0	1
Dytiscidae	0	2	0	1	1	0	0	0	26
Gyrinidae	0	0	0	0	0	0	0	0	6
Hydraenidae	0	1	0	0	0	0	0	0	0
Ceratopogonidae	0	0	0	0	1	0	0	0	0
Chironomidae - Chironominae	2	4	3	2	1	1	2	5	7
Simuliidae	0	0	0	0	0	0	0	5	0
Leptoceridae	0	0	0	0	0	0	0	2	2
Hydropsychidae	0	0	0	0	0	0	0	1	0
Number of Taxa	**7**	**8**	**6**	**6**	**7**	**6**	**4**	**8**	**10**
Gambusia	1	0	0	1	4	0	21	11	21

MOUNT PLEASANT OPERATION

STREAM HEALTH & STYGOFAUNA MONITORING

Spring 2025 SURVEY



Prepared for
AECOM Australia on behalf of MACH Energy Australia

30 March 2026

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Disclaimer

This report has been prepared by BIO-ANALYSIS Pty Ltd (BA) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with AECOM Pty Ltd on behalf of MACH Energy Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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EXECUTIVE SUMMARY

Introduction

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton. The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively.

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs and in accordance with Development Consent DA 92/97, consent SSD10418 (activated in February 2024) and Environmental Protection Licence (EPL) 20850. Any discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 51 discharge credits.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Monitoring Plan (SWMP). MACH Energy are required to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries.

The spring 2017 survey forms the basis for the ongoing monitoring to assess stream health in accordance with the Surface Water Management Plan (SWMP) (MACH Energy, 2019), to determine any change in selected aquatic indicators throughout the life of the MPO and ascertain whether these changes can be attributed to the MPO. The stream health monitoring programme focusses on three main indicators:

- Aquatic habitat, including riparian habitat, aquatic macrophytes and fish habitat;
- Aquatic macroinvertebrates sampled using the Australian River Assessment System (AUSRIVAS) protocol;
- Fish sampled using backpack electrofishing and fyke nets.

Limited *in situ* water quality sampling is also done to assist in interpreting trends in the above indicators. Stream health monitoring is required to be done in spring and autumn each year.

The results of the current survey (spring 2025) are compared with those obtained in each of spring and autumn since the spring 2017 survey.

An additional requirement this year was to monitor alluvial bores in the vicinity of the Hunter River, to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores were sampled in May 2025. Bores are to be sampled next in May 2026.

Results

Six species of fish (including two introduced species), freshwater shrimp and freshwater prawns were collected in spring 2025. Australian bass were collected at Site HR3&HR5, while Long-finned eels (ranging between approximately 12-120 cm in length) were collected at five of the six Hunter River sites sampled (Sites HR-1-4 & 6), Muscle Creek and Dartbrook. Numbers of Carp appear to have declined since the last survey.

Altogether, ten species of fish have been caught/observed by the stream health monitoring programme since spring 2017, including Australian bass, Long-finned eels, Freshwater catfish, Australian smelt, Sea mullet, native gudgeons, Common carp and Mosquito fish. Overall, the species composition of assemblages has been comparable throughout the survey period. No threatened species of fish listed under the NSW *Fisheries Management Act, 1994* (FM Act) or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed.

Macroinvertebrate assemblages have consistently (i.e. before and during mining activities at the MPO) been dominated by pollution tolerant taxa, particularly the fly larvae family, Chironomidae. Some pollution sensitive taxa have also commonly been collected, including caddis fly and mayfly families, upstream and downstream of the MPO area, including at the time of the spring 2025 survey.

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, one site (Site HR3) has consistently scored below its indicator criteria (Band A - equivalent to AUSRIVAS reference condition) while the other (Site HR4: Band B - significantly impaired) has scored lower on thirteen out of the seventeen sampling occasions. Similar deviations from historical AUSRIVAS band levels have been recorded at sites sampled at Dart Brook and Muscle Creek, which are not exposed to mining activities at the MPO.

Importantly for this stream health study, none of the statistical tests used to formally examine trends in the condition of aquatic macroinvertebrate fauna (assemblage structure, diversity, OE50 and SIGNAL2 scores) have indicated a change that could be attributed to a MPO related impact.

Therefore, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site.

Conclusions and Recommendations

As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made to date. There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

Examination of results from the spring 2025 survey found no measurable changes in the indicator variables examined in relation to the findings of the baseline survey that could be indicative of an impact associated with the MPO.

It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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1.0 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively (Figure 1).

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs. MPO is operated in accordance with Development Consent DA 92/97, as subsequently modified[1], consent SSD10418 (activated in February 2024) and Environmental Protection Licence 20850 Currently MPO is approved to produce up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 2026. MACH Energy commenced mining operations in January 2018.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Management Plan (SWMP) (MACH Energy, 2019), to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries (Figure 2).

An additional requirement in May 2025 was to monitor alluvial bores in the vicinity of the Hunter River to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores are to be sampled next in May 2026.

This Report provides the results of investigations undertaken in spring (13&14 October) 2025 in accordance with requirements outlined in the SWMP and the Water Management Plan (SSD10418). The objectives of this survey were to:

[1] To date, four applications to modify the Minister's consent for the MPO have been submitted. A copy of the consolidated Development Consent DA 92/97 incorporating Mods 1, 2, 3, and 4 is provided as Attachment 1 in (REF).

- Undertake the 2025 autumn survey within the Study Area as required by the SWMP and the Water Management Plan (SSD10418)
- Determine whether any changes in stream health have occurred since the 2017 spring survey and whether changes, if any, are due to potential mining-related impacts at the MPO,
- Provide MPO with recommendations on further surveys or response mechanisms, as required, by the SWMP if stream health within the Study Area has deteriorated.

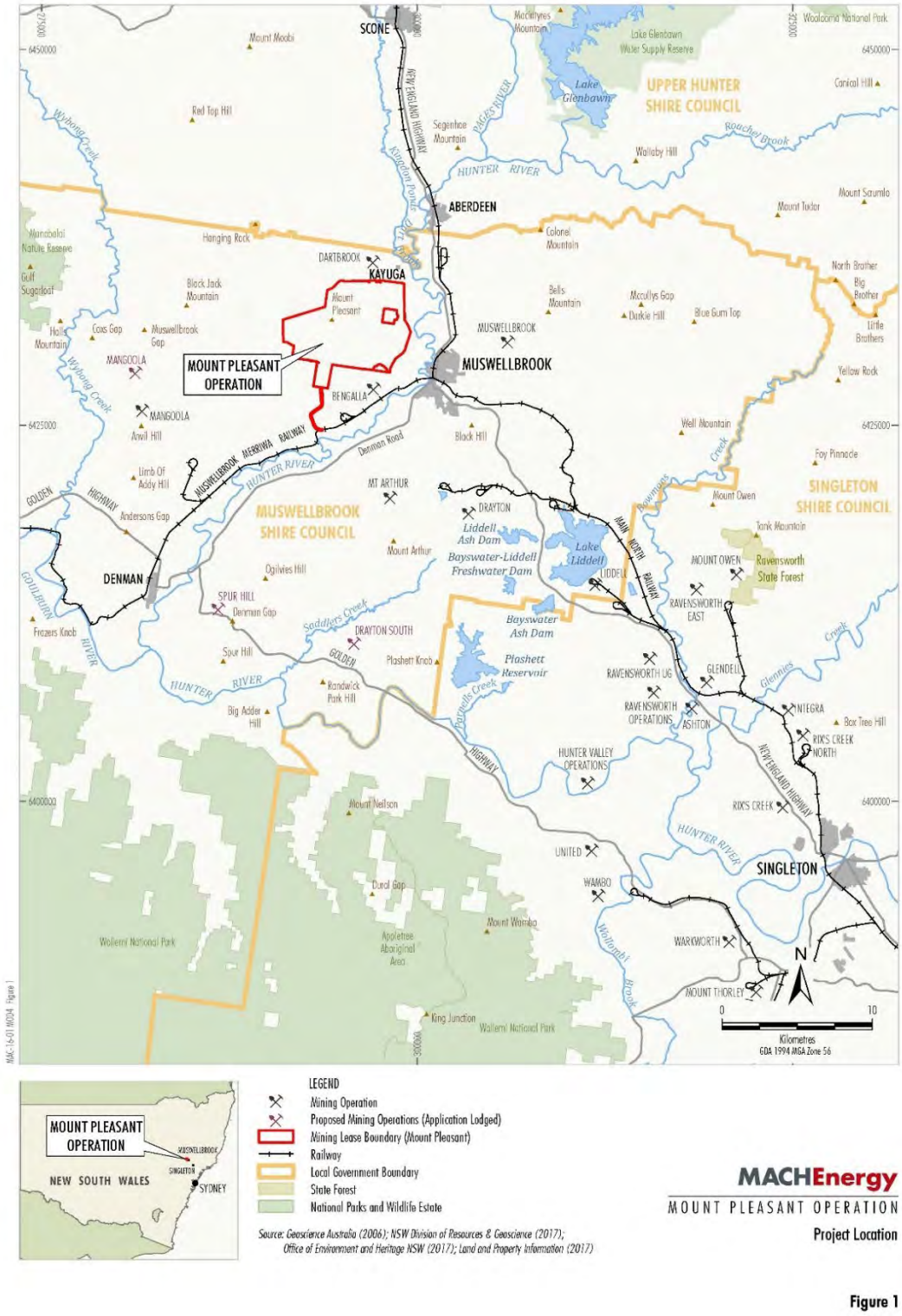

Figure 1. Project Area

2.0 METHODS

2.1 Study Area

MPO is located within the Muswellbrook Local Government Area (LGA). The locality of Kayuga is immediately to the north of MPO and the township of Aberdeen is located further northeast, on the eastern side of the Hunter River. Muswellbrook township is located approximately 4 km south-east of the MPO (Figure 1).

The township of Denman is located approximately 18 km to the southwest near the confluence of the Hunter and Goulburn Rivers (Figure 1).

The drainage network in the vicinity of the MPO is generally characterised by steep gullies which drain from the surrounding hills into the flat alluvial plains adjacent to the Hunter River. The Hunter River flows in a southerly direction approximately 1 km to the east of the MPO's mining lease boundaries and is the largest drainage feature within the catchment.

A number of ephemeral drainage lines traverse the MPO area and drain into the Hunter River. The eastern portion of the MPO area drains via Rosebrook Creek (Figure 1), as well as other ephemeral, unnamed drainages. Areas in the south and west of the MPO boundary drain to an ephemeral drainage line (commonly referred to as Dry Creek) and Sandy Creek, respectively, both of which flow into the Hunter River (Figure 1). No permanently flowing waterways are present within MPO's ML boundaries.

Surrounding land uses include agriculture (grazing, dairy, vineyards, horse and cattle studs, turf, flower and market gardens) and coal mining (ERM Mitchell McCotter, 1997). The Bengalla Coal Mine immediately adjoins the southern boundary of MPO. The Mount Arthur Coal Mine is located approximately 5 km to the south. The Mangoola Coal Mine is located approximately 8 km to the west. The Dartbrook Coal Mine immediately adjoins to the north (Figure 1). As such, the catchment area in the region of MPO has been historically cleared and altered.

The regional climate for the Muswellbrook areas is warm temperate with an average annual rainfall of approximately 600 mm (BOM, 2020).

2.2 Previous Investigations

Stream Health Monitoring

The initial stream health monitoring was implemented in November 2017. The results of the first survey are described in the "Stream Health Monitoring Spring 2017 Survey" report (BIO-ANALYSIS, 2018). Since the Spring 2017 Survey, surveys have been done in autumn (May) and spring (November) 2018, autumn (May) 2019 and spring (October) 2019, autumn (May) 2020 and spring (November) 2020, autumn (May) 2021, spring (October) 2021, autumn (May) 2022, spring (September) 2022, autumn (May) 2023, spring (October) 2023, autumn (May) 2024, spring (October) 2024 and autumn 2025 (May)(BIO-ANALYSIS, 2018-2025).

Stygofauna Assessment

Seven accessible bores (MP-BH1-3, MP-BH3b, 18298, 7000D000(u) and WRA1L) were sampled for stygofauna for the Mount Pleasant Optimisation Project Aquatic Ecology Assessment on 27 and 28 November 2018 (BA, 2020). Of these, 100 litres of water was able to be pumped from four boreholes (MP-BH1, MP-BH2, 7000D000(u) and WRA1(L)) within three groundwater systems (i.e. Alluvium, Interburden and Permian). Three likely stygofauna (Cyclopoida, Ostracoda and Isotomidae) were identified from bore samples in the alluvial aquifer (east of the MPO, along the Hunter River), where the groundwater was relatively fresh. Each of these taxa are known from previous surveys of stygofauna within the Hunter alluvium.

Low numbers of invertebrates were collected from three of the seven bores sampled in May 2025. Three likely stygofauna (Amphipoda and Isotomidae species) were collected from alluvial bores MP-BH-1, MP-BH2 and MP-BH2 C.

2.3 Performance Measures and Indicators

Stream health performance criteria were developed for the SWMP by MACH Energy for two sites on the Hunter River (Table 1), by combining riffle and edge habitat scores obtained at those sites in the mid-1990s using the New South Wales Australian River System (AUSRIVAS) techniques (MACH Energy, 2019).

Should an AUSRIVAS score deteriorate below the range for its historical band of impairment score for two successive monitoring rounds, a stream health investigation protocol is to be initiated under the MPO's Surface and Ground Water Response Plan (SGWRP) (MACH Energy, 2019).

Table 1. Stream Health Performance Criteria

Site Identification	Band of Impairment Score	Trigger Value (O/E Taxa)
Hunt 571	**B**	**0.54**
Hunt 854	**A**	**0.84**

Location of sites: Hunt 571: Hunter River @ Muswellbrook; Hunt 854: Hunter River downstream of Aberdeen (Figure 2)

Band of impairment scores for sites sampled at Dart Brook (Site Hunt 585: Band B) and Muscle Creek (Hunt 506: Band B) were also presented within the SWMP (MACH Energy, 2019).

Mangoola Coal Operations has established stream health trigger levels for a monitoring site on Sandy Creek (i.e. Site 'Sandy 1'). In the event of deterioration in stream health being observed by Mangoola Coal Operations at this site, MACH Energy would consult with Mangoola Coal Operations during implementation of their response plan as required by the SWMP.

2.4 Field Methods

2.4.1 Stream Health Monitoring

To fulfil the requirements of the SWMP, a stream health assessment was required to be completed at two sites along the Hunter River (HR-3 and HR-4) and at sites situated on Dart Brook (DB), Muscle Creek (MC) and Sandy Creek (SC) (Table 2, Figure 2).

An additional four sites were included in the monitoring programme from the spring 2017 survey (BIO-ANALYSIS, 2018), to provide an indication of variability among sites along the Hunter River and of stream health in the river upstream (Site HR-1 and HR-2) and downstream (HR-5 and HR-6) of the MPO area (Table 2, Figure 2).

For the autumn 2025 survey, sites were sampled on 13 & 14 May 2025. Each site was approximately 100 m in length with their GPS co-ordinates listed in Appendix A. Collections of fish and macroinvertebrates were completed in accordance with Section 37 of the *NSW Fisheries Management Act 1994* using Scientific Collection Permit Number FP23/124.

Table 2. Stream Health Monitoring Sites

BA Site Code	Historical Site Code	Site Location	Description
HR1	**W1**	Hunter River u/s River Street	Upstream MPO
HR2	**W1**	Hunter River d/s of River Street	Upstream MPO
HR3	**Hunt 854**	Hunter River @ Burtons Lane	Midstream/Adjacent to MPO
HR4	**Hunt 571**	Hunter River @ Muswellbrook	Midstream/Adjacent to MPO
HR5	**W15**	Hunter River off Bengalla Road	Downstream MPO
HR6	**SW17**	Hunter River near Roxburgh	Downstream MPO
SC	**Sandy 1**	Sandy Creek @ Wybong Rd	Hunter tributary
DB	**Hunt 585**	Dart Brook @ MacIntyre Bridge	Hunter tributary
MC	**Hunt 506**	Muscle Creek @ Muswellbrook	Hunter tributary

u/s – upstream; d/s - downstream

Figure 2. Stream Health Monitoring Sites

2.4.2 Habitat Assessment

The condition of the aquatic habitat at each site was assessed using a modified version of the Riparian Channel and Environmental (RCE) inventory method (Chessman et al., 1997). This method involves evaluation and scoring of the characteristics of the adjacent land, the condition of riverbanks, channel and bed of the watercourse, and degree of disturbance evident at each site. The maximum score (52) indicates a stream with little, or no obvious physical disruption and the lowest score (13) indicates a heavily channelled stream without any riparian vegetation.

Based on the original classification established by Peterson (1992), site condition was rated:

- Poor for RCE scores of 0-24%;
- Fair for RCE scores of 25-43%;
- Good for RCE scores of 44-62%;
- Very good for RCE scores of 63-81%;
- Excellent for RCE scores of 82-100%.

The condition of aquatic habitat at each site was also assessed according to the NSW Department of Primary Industries Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI, 2013). The two key indices are habitat *type* and *class*.

The in-stream and emergent aquatic macrophytes at each site were surveyed to provide an indication of the dominant species present and their cover.

Each stream health monitoring site within the Study Area was photographed and the locations recorded with a hand-held GPS (satellite-based Global Positioning System).

2.4.3 Water Quality

Water quality is measured at each site using a water quality probe and meter. The physico-chemical properties measured were electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L), pH (pH units), temperature (^{o}C), oxygen-reduction potential (mV) and turbidity (NTU). Alkalinity was also measured, using a CHEMetrics alkalinity kit.

Three replicate measures of each variable were collected from just below the water surface at each site, except for alkalinity, where only one measurement was taken at each site. It should be noted that water quality measurements collected during the biological sampling provide a snapshot of quality at the time of sampling under the prevailing flow conditions. Routine monthly and rain event surface water monitoring is undertaken at selected sites within the Study Area for MACH Energy by AECOM.

2.4.4 Aquatic Macroinvertebrates

Aquatic macroinvertebrates were sampled using the AUSRIVAS protocol (Turak et al., 2004). Samples of stream edge habitats and riffle habitats (where available) were collected over a total length of 10 m (usually in 1-2 m sections) at each site using a 250 µm dip net.

The contents of each net sample were placed into a white sorting tray and animals collected for a minimum period of 30 minutes. Thereafter, removals were done in 10-minute periods, up to a total of one hour (Turak et al., 2004). If no new taxa were found within a 10-minute period, removals ceased (Turak et al., 2004). The animals collected were placed inside a labelled container and preserved with 70 % alcohol.

Environmental variables required for running the AUSRIVAS predictive model, including modal river width, percentage boulder or cobble cover, latitude and longitude were recorded at each site.

2.4.5 Fish

Fish were sampled using a Smith-Root LR-24 Electrofisher backpack unit. The Electrofisher was used to stun the fish in open water, around the edge of pools, around snags and aquatic vegetation, overhanging banks and rocky crevices. Four replicate electrofishing ‘shots’ were completed at each suitable site sampled. All stunned fish were collected using a dip net and placed into plastic trays filled with water to be counted and identified. Incidental observations such as evidence of disease were noted. Native fish species were subsequently returned to the water.

Additional sampling of fish was undertaken at two sites in the Hunter River, by deploying fyke nets (panels up to 4 m long on either side of a central funnel 2.5 m long, with 5 mm mesh) and bait traps.

2.4.6 Stygofauna Monitoring

Stygofauna taxa will be sampled within eight bores within the vicinity of the Hunter River in May 2026 (Table 3), using methods in accordance with stygofauna sampling and groundwater dependent ecosystem (GDE) assessment guidelines (Hancock and Boulton 2005; Hose and Lategan, 2012; Hose et al., 2015; Department of Environment and Science, 2018a and 2018b; Doody et al., 2019).

Table 3. Bores to be sampled for Stygofauna.

Bore	Easting	Northing	Depth to Water	Depth to Bottom	Notes
MP-BH1	301136	6432569	10.10	18.03	Good recharge rate. Extract 230 L on an annual basis
MP-BH1-C	301136	6432569	10.25	76.78	Not a good recharge rate. Sampling method is purge & return
MP-BH1-HR	301136	6432569	35.28	52.26	Not a good recharge rate. Sampling method is purge & return
MP-BH2	299404	6428717	12.17	17.41	Good recharge rate. Extract 130L on an annual basis
MP-BH2-C	299385	6428747	12.46	74.90	Good recharge rate. Extract 400L on an annual basis
MP-BH2-HR	299385	6428747	12.41	53.50	Not a good recharge rate. Sampling method is purge & return
GDE D	296720	6434574	DRY	6.98	Bores newly drilled. Bore was dry on first visit this month
GDE S	296722	6434584	10.67	25.02	Bores newly drilled. Bore recharge rate unknown

Firstly, a weighted stygofauna net (50 µm mesh with a 40 mm diameter opening) was lowered to the bottom of each bore, bounced four times to dislodge resting invertebrate fauna and slowly (to avoid a bow-wave) retrieved to the surface. Once at the surface, net contents were emptied into a 50 µm mesh sieve. The net, vial and sinkers were rinsed over the sieve. In total, six net hauls will be collected. The cumulative contents of the sieve were then transferred to a labelled plastic container and preserved with 100% ethanol.

After each sampling, nets will be washed in Decon90, rinsed in deionized water and air-dried to prevent the transfer of stygofauna between bores during the survey.

Pump samples will be collected immediately after netting. A Watterra PowerPack PP1 groundwater pump will be used to extract up to 300 L of water from each bore. A sampling hose will be fed into the bore until it reaches the bottom of the bore casing, then lifted approximately 2 m above the bottom of the bore. Prior to pumping, three rows of ten x 10L buckets will be set out. Buckets will be carefully (to avoid splashing and overflows) filled sequentially.

Once the buckets are filled, a Yeo-Kal 618 probe will be used to measure temperature, electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L) and pH (pH units) in the first bucket and then every 5 buckets.

Subsequently, water from the first 10 buckets will be passed through a 50 µm mesh sieve, the sieve contents transferred to a labelled plastic container and preserved with 100 % ethanol. The second and third rows of buckets will then be sieved separately, to give three x 100 L samples per bore site (not including the net sample).

Net and pump samples will later transported to the laboratory to be processed in a sorting dish under a ISSCO ML400 series Stereo Microscope and identified as far as possible using taxonomic keys.

2.5 Laboratory Methods

In the laboratory, aquatic macroinvertebrate samples were sorted under a magnification lamp and preserved in 80% alcohol. Samples were later identified using a binocular microscope (at 40X magnification) and identified to family level with the exception of Acarina (to order), Chironomidae (to sub-family), Nematoda (to phylum), Nemertea (to phylum), Oligochaeta (to class), Ostracoda (to subclass) and Polychaeta (to class). Some families of Anisoptera (dragonfly larvae) were identified to species, because they could potentially include threatened aquatic species listed under the *Fisheries Management Act, 1994* (FM Act).

Up to 25 animals of each family were counted, in accordance with the AUSRIVAS protocol (Turak et al., 2004) and the SIGNAL2 (Stream Invertebrate Grade Number Average Level) biotic index developed by Chessman (2003).

2.6 Data Analyses

The objective of analyses of water quality and aquatic macroinvertebrate data was to determine whether any significant changes to stream health indices may have occurred following commencement of mining at the MPO. Any significant change in stream health as determined by stream health trigger levels adjacent or immediately downstream of the Project would be investigated to determine the source of the change. For this report, data collected in spring 2017, autumn and spring 2018, autumn and spring 2019, autumn and spring 2020, autumn and spring 2021, autumn and spring 2022, autumn and spring 2023, autumn and spring 2024 and autumn and spring 2025 were examined.

Water Quality

The water quality measurements taken during each survey were compared with guideline values recommended by the ANZECC and ARMCANZ (2000) for slightly disturbed upland rivers in south-east Australia.

Data were also compared to surface water quality trigger levels developed for the MPO's SWMP for two sites (i.e. W1 and W6) situated within the Hunter River near Sites HR2 and HR3 (MACH Energy, 2018). The trigger levels were developed using the approach recommended by ANZECC & ARMCANZ (2000).

Aquatic Macroinvertebrates

AUSRIVAS

Data were analysed using the appropriate AUSRIVAS predictive models developed for New South Wales. The ecological health of a waterway is assessed by comparing the macroinvertebrates collected at a site (i.e. Observed) to those predicted to occur (Expected) if the site is in an undisturbed or 'reference' condition. The principal outputs of the AUSRIVAS model include:

- Observed to Expected ratio (OE50): the ratio of the number of macroinvertebrate families collected at a site which had a predicted probability of occurrence of greater than 50 % (i.e. Observed) to the sum of the probabilities of all of the families predicted with greater than a 50 % chance of occurrence (i.e. Expected) (Ransom et al., 2004)
- BAND: for each model, the OE50 taxa ratios are divided into bands representing different levels of impairment. Band X represents a more diverse assemblage of macroinvertebrates than control sites; Band A is considered equivalent to reference condition; Band B represents sites below reference condition (i.e. significantly impaired); Band C represents sites well below reference condition (i.e. severely impaired); and Band D represents impoverished sites (i.e. extremely impaired) (Ransom et al., 2004).

SIGNAL 2

The SIGNAL2 biotic index (Stream Invertebrate Grade Number Average Level) developed by Chessman (2003) is commonly used to give an indication of water quality at the sites sampled. The SIGNAL score for a macroinvertebrate sample is calculated by averaging the pollution sensitivity grade numbers of the families present, which may range from 10 (most sensitive) to 1 (most tolerant). The SIGNAL2 scores from samples collected between spring 2017 and spring 2025 are presented graphically to provide an indication of changes over time.

Statistical Methods

The objective of this assessment was to examine whether any significant changes to selected aquatic macroinvertebrate indicators of stream health may have occurred following commencement of mining at the MPO.

The analytical design took into consideration:

- Survey: A random factor with 17 levels (spring 2017 to spring 2025 surveys);
- Treatment: a fixed factor with 2 levels: Control and Impact;
- Reach: a random factor with 2 levels nested within Treatment (Midstream (Site HR3 & HR4) and Downstream (Sites HR5 & HR6) reaches are nested within the level ‘Impact’, while Upstream (Site HR1& HR2) and Tributary (Site MC, SC and DB) reaches are nested in the level ‘Control’, of the factor Treatment.

A factor representing variation associated with different phases of the MPO (i.e. Baseline- and During-mining) was not included in the design as only one survey could be undertaken prior to the commencement of mining, hence there was no replication for the Baseline-phase. The statistically significant interaction of Survey x Treatment (i.e. Impact and Control) and/or Survey x Reach(Treatment) could potentially provide evidence that a change in stream health had occurred due to mining.

Multivariate Analyses

A matrix of differences in the types of taxa between all possible pairs of samples was created by calculating their respective Bray-Curtis dissimilarity coefficients. Permutational Multivariate Analyses of Variance (PERMANOVA, Anderson 2001; Anderson et al, 2008) was used to examine spatial differences and temporal changes, and their interaction, in aquatic macroinvertebrate presence/absence data collected using AUSRIVAS. Any statistically significant differences (i.e. $P < 0.05$) in the levels of factors and interaction terms were examined by *Post-hoc* permutational t-tests. Significant differences between groups (e.g. impact versus control) may arise due to differences between group means, differences in dispersion (variance) among groups or a combination of both. Each of these outcomes could be indicative of an impact.

Apparent multivariate patterns in the data were examined by Principal Coordinates Analyses (PCoA), which provide a graphical representation of relationships between samples from two-dimensional ordination plots. The amount of variation "explained" by the *x*- and *y*-axis is indicated and the dissimilarity between data points can be determined from their distances apart on the axis (Anderson et al., 2008).

Similarity of percentages (SIMPER) was then used to determine those taxa primarily responsible for the observed similarities (or dissimilarities) between groups (e.g. Location) of interest (Clarke and Warwick, 1994).

Univariate Analyses

Using the same analytical design as for multivariate analyses, PERMANOVA was used to examine spatial and temporal patterns in the total number of taxa, OE50 and Signal scores. The analyses were based on a Euclidean distance matrix of all possible pairs of samples.

2.7 Quality Assurance/Quality Control (QA/QC)

Data collected in the field were checked for accuracy and completeness before leaving each site. In the office, field data and other records were incorporated into appropriate excel data sheets and checked. Spreadsheets were locked prior to analysis to prevent accidental over-writes or corruption.

In the laboratory, macroinvertebrate and stygofauna samples were identified by Dr Sharon Cummins. Data for each sample were entered into an excel spreadsheet and then checked.

3.0 RESULTS

3.1 Aquatic Habitat Characteristics

Since 2013, annual rainfall recorded at Muswellbrook (Station 61192), ranged from 434.2 mm (2023) to 1117.8 mm (2022) (Figure 3). Within the two months prior to the 2025 spring survey (13 & 14 October 2025), a total of 64.8 mm of rain was recorded by a meteorological station situated approximately 25 km from Muswellbrook (i.e. Station 61095).

Within the three months prior the 2025 spring survey (i.e. 13 July to 13 October 2025), water level measured in the Hunter River at Muswellbrook Bridge (Station 210002) ranged from approximately 0.8 m to 9.8 m (BOM, 2025a; Appendix 1). At the time of the 2025 spring survey, water level ranged from approximately 0.76 m (13 October 2025) to 0.74 m (14 October 2025) (BOM, 2025a; Appendix 1).

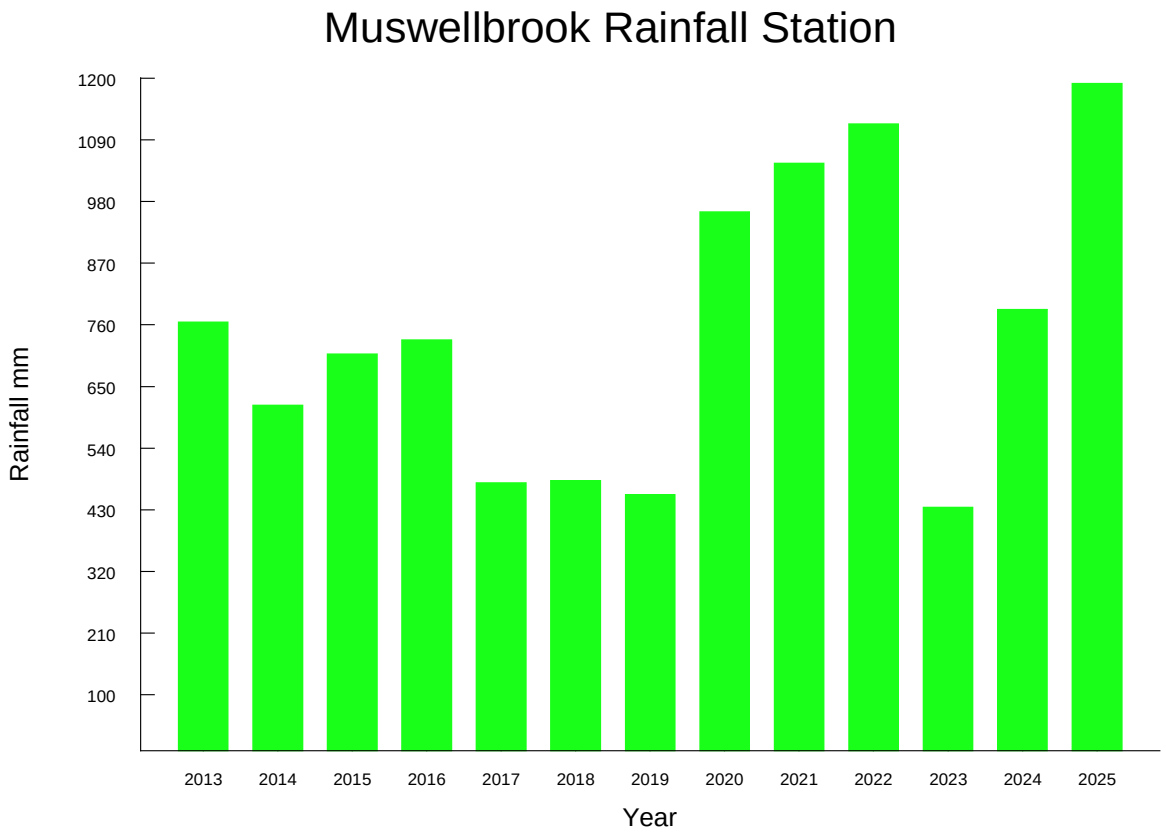

Figure 3. Annual rainfall (mm) measured at Muswellbrook from 1 January 2013 to 31 December 2025. NB Rainfall data for 2013-2017 and 2020-2023 were collected at Station 61192 (Muswellbrook – Spring Creek (Castle Vale), data for 2018 and 2019 was collected at Station 61095 Rouchel Brook (Albano).

3.1.1 Hunter River

The section of the Hunter River within the Study Area is generally characterised by a series of continuous, slow flowing pools up to approximately 28 m wide and greater than 1 meter deep (Plates 1-12). The channel substratum is composed primarily of silts and fine sands (as are the banks of the main channel) overlying a mostly gravel bed.

Vegetation of the riparian zone is dense, comprising mixed native and exotic trees and shrubs including River Oak (*Casuarina cunninghamiana*) and River Red Gum (*Eucalyptus camaldulensis*), Morning Glory (*Ipomoea indica*), Privet (*Ligustrum* species), Trad (*Tradescantia albiflora*), Bamboo (*Bambusa* sp.), Balloon Vine (*Cardiospermum grandiflorum*) and Willow (*Salix* spp.) are common. Emergent macrophyte assemblages were characterised by Typha spp., Umbrella Sedge (*Cyperus eragrostis*), Common Reed/ Phragmites (*Phragmites australis*), Mat Rush (*Lomandra longifolia*), Common Rush (*Juncus usitatus*) and Marsh Club-rush (*Bolboschoenus fluviatilis*). The submerged species of macrophyte, Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp., have commonly been noted at several of the sites sampled. The species identified within the Study Area have a wide distribution and are abundant in similar aquatic habitats elsewhere in south-eastern Australia.

The section of the Hunter River within the study area was classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification.

Hunter River upstream of the MPO (HR1 & HR2)

The most upstream site (HR1) is situated within farming land, approximately 200 m upstream of the confluence with Dart Brook (Figure 1, Plate 1). Vegetation of the riparian zone is relatively dense, mostly comprised by River Oak and Willow trees interspersed by Balloon Vine, Giant Reed (*Arundo donax*), Bamboo and Trad in areas that had not been scoured from the bank by recent high flows.

At the time of the spring 2025 survey, significant alterations were observed within the riparian zone. Large trees had fallen into the river channel and/or been flattened by recent (i.e. since the autumn 2025 survey) high flows.

Sections of the right bank had been eroded by high flows, causing some sections to collapse into the river channel (Plate 1). Flattened vegetation and debris were common along the left bank (Plates 1&2).

Water clarity at HR1 was good. The RCE score was 38 (72%) in spring 2025 (range = 38/73% to 43/83% between spring 2017 and spring 2025).



Plate 1: Hunter River – Site HR1 (sp-25)
View upstream



Plate 2: Hunter River – Site HR1 (sp-25)
View across stream

At Site HR2, located approximately 900 m downstream of the confluence of the Hunter River and Dart Brook, a sizable pool (up to approximately 25 m wide and 1.6 m deep) (Plate 3&4) is present (Figure 1). Edge habitat has consistently been comprised by cobble, gravel and pebble overlayed by a sandy-silt matrix.

Vegetation mostly consists of occasional River Oak and Willow trees with an understorey comprised by exotic grasses and small shrubs, which included Giant Reed, Balloon Vine, Trad and Bamboo (Plate 3&4). Several small trees and a large proportion of vegetation within the riparian zone had been flattened by elevated water levels and flow since the previous survey. Small stands of *Typha* spp. and *Schoenoplectus validus* were still present, as well as the trailing native plant, *Persicaria decipiens*. At the time of the spring 2025 water clarity was good and flow moderate to high. This site was given an RCE score of 38 (73%) in spring 2025 (range = 37/71% to 45/87% between spring 2017 and spring 2025).



Plate 3: Hunter River – Site HR2 (sp-25)
View upstream



Plate 4: Hunter River – Site HR2 (sp-25)
View downstream

Hunter River adjacent to the MPO (HR3 & HR4)

Site HR3 is situated approximately 6.8 km downstream of Site HR2 (Figure 1). Similar to the upstream sites, riparian vegetation was mostly comprised by River Oaks, Willows and scattered Eucalypts. A considerable proportion of the exotic plant understorey had been scoured by floodwaters during late 2021, causing small sections of the right bank (facing downstream) to slump into the river channel, along with several small trees and shrubs (Plates 5&6).

Significant alterations to the riparian zone had also occurred since the autumn 2025 survey: several large trees had been flattened by elevated water level and flow and a considerable portion of the understorey vegetation, primarily made up of exotic grasses, had vanished. Habitat at the edges of the river channel continues to be comprised by gravel (approximately 70 %) with a mixture of sand and silt. Large woody debris was also abundant adjacent to the left bank (facing downstream) (Plates 5&6). *Persicaria decipiens* and *Schoenoplectus validus* were less common than observed by previous surveys. Water clarity was good and flow moderate to high. This site was given an RCE score of 36 (69%) in spring 2025 (range = 36/69% to 42/81% between spring 2017 and spring 2025).



Plate 5: Hunter River – Site HR3 (sp-25)
View upstream



Plate 6: Hunter River – Site HR3 (sp-25)
View downstream

Site HR4 is situated near the Water Treatment Plant at Muswellbrook and the inlet to the approved water pipeline between the Hunter River and the MPO Mine Water Dam. The study reach consists of long pools up to 10.5 m wide with infrequent short riffles. The riverbanks are stabilised by trees (mostly Willow and River Oak) and shrubs (including Balloon Vine and Bamboo) but several trees have been flattened by recent high river flows (see Plates 7&8).

Similar to past surveys, large woody debris was common within and adjacent to the river channel. Edge habitat was predominantly gravel and cobble with occasional boulders, pebbles and silty sand. Submerged macrophytes commonly observed at this site (i.e., Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp.) were absent. At the time of the current survey, water clarity was good and water level high. This site obtained an RCE score of 37 (71%) at the time of the spring 2025 survey (range = 37/71% to 43/83% between spring 2017 and spring 2025).



Plate 7: Hunter River – Site HR4 (sp-25)
View upstream



Plate 8: Hunter River – Site HR4 (sp-25)
View across-stream

Hunter River downstream of the MPO (HR5 and HR6)

Site HR5 is situated immediately downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). This site consists of a long, relatively deep pool with a small area of riffle habitat at the top of the site (Plates 9&10). River Oaks, Willows, Balloon Vine and Giant Reed and scattered Eucalypts comprise a large proportion of the bank vegetation.

At the time of the spring 2025 survey, fallen trees, particularly Willows, and large accumulations of woody debris were common along the river channel, the substratum of which is predominantly a gravel-pebble matrix with a silt overlay. Occasional patches of Typha and *Persicaria decipiens* were present. Submerged macrophytes have not been recorded at this site. Water clarity was good and flow moderate (Plates 9&10). This site was given an RCE score of 38 (72%) in spring 2025 (range = 36/69% to 44/85% between the spring 2017 and spring 2025 surveys).



Plate 9: Hunter River – Site HR5 (sp-25)
View upstream



Plate 10: Hunter River – Site HR5 (sp-25)
View downstream

Site HR6 is situated approximately 4 km downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). The width of the riparian strip is relatively narrow (i.e. between 5 and 30 m) and comprised by mixed native and exotic trees and shrubs (Plates 11&12). Giant Reed and Balloon Vine are common.

This site consists of a long, relatively deep pool with a short section of riffle habitat at the top of the study reach (Plates 11&12). The substratum in the edge habitat is predominantly a gravel matrix overlayed with silt. Fallen trees and other woody debris are common within the river channel.

At the time of the current survey, flow and water level were elevated while water clarity was good (Plates 11&12). Recent signs of bank collapse and trees that had fallen into the river channel were common. This site was given an RCE score of 37 (71%) in spring 2025 (range = 37/71% to 42/81% between the spring 2017 and spring 2025 surveys).



Plate 11: Hunter River – Site HR6 (sp-25)
View upstream



Plate 12: Hunter River – Site HR6 (sp-25)
View downstream

3.1.2 Hunter River Tributaries

Due to the highly ephemeral nature of drainage lines within the MPO's ML boundaries, stream health monitoring locations were chosen in tributaries with more reliable flows to the Hunter River, consequently outside of the MPO boundary.

Muscle Creek

The site sampled on Muscle Creek is situated on the floodplain approximately 1 km upstream of the confluence with the Hunter River (Figure 2). It consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook. Since the spring 2020 survey, planned works by the Australian Rail Track Corporation Limited to replace the Muscle Creek underbridge, located near the confluence of the Hunter River, have been observed.

The stream channel is highly modified, particularly in the downstream reaches of the study site, with large boulders used in places to stabilise the stream bank (Plates 13&14). Trees have been planted along both sides of the creek to help stabilise the banks. The large bat colony observed by recent surveys (~ 2-3 years) appear to have been absent for some time (Plates 13&14).

Emergent macrophytes, including Typha, Phragmites, and Mat Rush, were moderately abundant along the stream bank and in-stream (Plates 13&14). *Lomandra longifolia* and *Persicaria decipiens* were also common, as was Balloon Vine, Trad and exotic grasses.

The average stream width is approximately 10 m with a depth of up to approximately 1.5 m. The substratum is mostly comprised by a gravel/cobble/pebble matrix covered by silt and fine sand. At the time of the spring 2025 survey, there was flow along the study reach. Water clarity was moderate at the time of sampling. Large accumulations of filamentous green algae are suggestive of nutrient (particularly nitrogen and phosphorous) enrichment.

The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification. The site received an RCE score of 32 (62%) in spring 2025. The RCE score has ranged between 21 (40%) and 34 (65%) between the spring 2017 and spring 2025 surveys.



Plate 13: Muscle Creek – Site MC (sp-25)
View upstream



Plate 14: Muscle Creek– Site MC (sp-25)
View across stream

Sandy Creek

The site sampled on Sandy Creek is located downstream of the MPO and upstream of the Mangoola Coal Operations (Figure 2). Wybong Road bridge crosses the stream at the bottom of the study reach. The stream banks at the survey site are approximately 3 m high and heavily disturbed on either side by historical agricultural activities: a large proportion of the stream banks have been colonised by exotic grasses. *Juncus acutus* (Spiny rush) and *Asparagus setaceus* (Asparagus grass) were present. Wombat burrows were also present. The stream channel commonly ranges from about 1 m to greater than 7 m wide, with an average of around 5 m (Plates 15&16).

At the time of the current survey, there was evidence of recent high flow along the stream channel, in particular, a relatively large River oak tree growing close to the stream channel had been flattened by elevated flows. The substratum is dominated by poorly sorted gravel overlain by fine-grained sediments and clay with occasional cobbles. Typha continues to be common within the downstream channel.

The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification and scored an RCE value of 36 (69%) in spring 2025. Previously (i.e., since the spring 2017 survey), the RCE score ranged between 21/40% and 36/69%. The higher score is mostly due to inundation and recovery of flow along the stream channel and increased vegetation along the stream bank after drought and stream bank erosion.



Plate 15: Sandy Creek – Site SC (sp-25)
View upstream



Plate 16: Sandy Creek– Site SC (sp-25)
View downstream

Dart Brook

Sampling site Dart Brook was chosen near a road crossing approximately 700 m upstream from the confluence with the Hunter River. The surrounding land use was mostly agriculture. This site consists of pools up to 6.4 m wide and 1.2 m deep and a run at the downstream end (Plates 17&18). The bed is dominated by poorly sorted gravel overlain by sand and silt with occasional boulders.

The stream banks are composed of cohesive fine-grained sediments with gravel. Small areas of active erosion are apparent along the top of the steep (approximately 8 m) right bank and along sections of the channel. Emergent macrophytes included Typha, River Club-Rush (*Schoenoplectus validus)* and Umbrella sedge (*Cyperus eragrostis*). Balloon vine continues to be common on both sides of the stream.

At the time of the spring 2025 survey, flow and water level were elevated while water clarity was fair (Plates 17&18). Fallen trees, woody debris and exotic weeds were common along the stream bank. Carp and carp plumes were common.

The site is classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification. It received an RCE score of 38 (72%) in spring 2025. Previously, the RCE scores have ranged between 32 (62%) and 41 (79%) (between the spring 2017 and spring 2025 surveys).



Plate 17: Dart Brook – Site DB (sp-25)
View upstream



Plate 18: Dart Brook – Site DB (sp-25)
View downstream

3.2 Water Quality

Mean physico-chemical water quality measurements from spring 2017 to spring 2025 are summarised in Table 3. Values highlighted in bold type indicate where results were outside the appropriate default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000). Where appropriate, pH and conductivity data were also compared with site specific trigger criteria[2].

The main findings for the spring 2025 survey are summarised as follows:

- Mean water temperature ranged from 17.0 (Site SC) to 21.7 °C (Site HR3). Water temperatures have ranged from 12.5 to 25.4 °C in edge habitats throughout the survey period
- pH levels (range = 8.5 – 9.9) exceeded the upper DTVs recommended by the ANZECC/ARMCANZ (2000) guidelines at Site SC;
- Mean conductivity levels (range = 747 to 4,920 µS/cm) exceeded the upper DTV at HR1, HR2, DB, MC and SC. Notably:
    - Conductivity measured at Site HR1 (range = 256 to 843 µS/cm) and Site HR2 (range = 267 to 824 µS/cm) during spring 2025 exceeded the site-specific criteria established for those site's (i.e., 589 µS/cm[2])[2]
    - Conductivity measured at Site DB in spring 2025 (i.e., 1,317 µS/cm) was within the range collected by surveys done at that site since spring 2017 (range = 980 to 5,905 µS/cm), as was conductivity measured at Site SC (4,920 µS/cm) (i.e. range = 914 to 11,200 µS/cm)
    - Conductivity measured at Site MC exceeded the upper guideline value in spring 2025 (2,455 µS/cm), autumn 2025 (2,957 µS/cm), spring 2023 (2,673 µS/cm) and autumn 2023 (2,799).
- Dissolved oxygen levels (range = 71.7 to 109 % saturation) were below the lower DTVs at the Site HR-1, HR-2, HR-6 and DB.
- Turbidity levels (range = 5.7 to 17.6 NTU) were within the recommended DTVs at all sites at the time of the spring 2025 survey (Table 3)

The raw water quality data are provided in Appendix 3.

[2] Using the approach recommended by ANZECC & ARMCANZ (2000), surface water quality trigger levels were developed at two sites (W1: situated between Site HR1 and HR2; and W6: situated at HR3) situated within the Hunter River (MACH Energy, 2018). Sites W1 and W6 are sampled monthly and during rain events by AECOM. The 80th percentile trigger values for pH and conductivity (EC) are: Site W1: pH = 7.8 – 8.3, EC = 589 µS/cm; Site W6: pH = 7.8-8.4, EC = 496 µS/cm.

Table 4. Mean (+ SE) values of water quality variables recorded between spring 2017 and spring 2025.

Variable	DTV[3]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR1											
Temperature °C		22.4 (0.0)	17.1 (0.0)	20.2 (0.0)	15.5 (0.0)	19.6	13.3 (0.0)	N/R	17.3 (0.0)	19.2 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.3** (0.0)	**8.6** (0.0)	**8.1** (0.0)	**8.1** (0.0)	**8.29**	**8.6** (0.0)	**8.7** (0.0)	8.0 (0.0)	7.0 (0.0)	8.3 (0.0)
EC (µS/cm)	30 – 350	264 (0.0)	256 (0.0)	276 (0.3)	321 (0.0)	**356**	**445** (0.3)	**528** (0.0)	**528** (0.0)	**622.0** (0.0)	**720** (0.9)
DO (% Sat)	90–110	95.5 (0.4)	93.7 (0.0)	95.4 (0.1)	**87.6** (0.1)	108.2	**75.1** (0.2)	97.8 (0.0)	92.6 (0.2)	**75.8** (0.2)	94.6 (0.0)
Turbidity (NTU)	< 50	16.4 (1.4)	**44.6** (0.4)	13.8 (0.3)	**42.6** (0.9)	2.9	**98.6** (3.2)	14.9 (1.0)	**38.9** (0.5)	9.7 (0.3)	8.8 (0.3)
Site HR2											
Temperature °C		22.9 (0.0)	16.2 (0.0)	19.3 (0.0)	15.7 (0.0)	22.1	13.4 (0.1)	N/R	17.4 (0.0)	19.5 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.2** (0.0)	**8.5** (0.0)	**8.2** (0.1)	7.9 (0.0)	**8.3**	**8.3** (0.1)	**8.5** (0.0)	7.9 (0.0)	7.1 (0.0)	**8.3** (0.0)
EC (µS/cm)	30 – 350	267 (1.3)	311 (0.0)	276 (0.0)	323 (2.2)	**387**	**474** (7.0)	**534** (0.0)	**629** (0.0)	**658.0** (0.0)	**800** (0.0)
DO (% Sat)	90–110	**141.2** (3.6)	**85.8** (0.1)	92.5 (0.2)	**89.3** (0.5)	97.8	**59.5** (0.5)	**81.2** (0.3)	**89.4** (0.1)	**72.9** (0.2)	92.1 (0.0)
Turbidity (NTU)	< 50	**26.7** (1.2)	**43.2** (0.2)	12.8 (0.2)	**43.8** (0.7)	2.6	**118.7** (1.2)	**59.7** (0.2)	10.6 (0.4)	14.7 (1.3)	14.7 (0.5)
Site HR3											
Temperature °C		24.7 (0.0)	16.1 (0.0)	18.7 (0.0)	14.5 (0.0)	21.7	13.7 (0.0)	N/R	16.8 (0.0)	21.8 (0.0)	16.9 (0.0)
pH	6.5 – 8.5	8.2 (0.0)	**8.6** (0.0)	7.9 (0.0)	7.7 (0.0)	8.27	**8.7** (0.0)	**8.8** (0.0)	8.0 (0.0)	7.5 (0.0)	8.3 (0.0)
EC (µS/cm)	125–2,200	272 (1.3)	266 (0.0)	313 (0.0)	329 (0.0)	357	419 (0.0)	540 (0.0)	640 (0.3)	633.0 (0.0)	815 (0.3)
DO (% Sat)	85 – 110	101.7 (0.5)	85.7 (0.1)	**80.9** (0.1)	**72.3** (0.1)	**115.1**	**81.8** (0.1)	91.2 (0.2)	**81.0** (0.1)	93.4 (0.1)	91.6 (0.1)
Turbidity (NTU)	< 50	46.4 (0.3)	49.4 (0.2)	6.9 (0.2)	18.9 (0.8)	3.3	45.0 (0.0)	26.2 (2.1)	23.4 (1.0)	19.4 (1.0)	14.7 (0.3)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[3] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers will be used for these sites here and for subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[4]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25			
Site HR1											
Temperature °C		13.8 (0.0)	17.8 (0.0)	22.2 (0.0)	17.9 (0.0)	17.1 (0.0)	19.0 (0.0)	20.1 (0.0)			
pH	6.5 – 8.0	**8.1** (0.0)	**8.2** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)	**8.9** (0.0)			
EC (µS/cm)	30 – 350	**382** (2.0)	**843.0** (0.0)	307 (0.0)	**418.0** (0.0)	**630** (0.3)	**378** (0.0)	**747** (0.0)			
DO (% Sat)	90–110	97.7 (0.2)	109.9 (0.0)	**21.6** (0.1)	104.2 (0.2)	**81.2** (0.7)	93.4 (0.1)	**82.8** (0.9)			
Turbidity (NTU)	< 50	2.5 (0.1)	1.8 (0.0)	5.5 (0.5)	5.7 (0.0)	10.7 (0.2)	8.3 (0.0)	11.0 (0.5)			
Site HR2											
Temperature °C		14.1 (0.0)	17.5 (0.0)	22.0 (0.0)	17.7 (0.0)	17.1 (0.0)	19.2 (0.0)	20.6 (0.0)			
pH	6.5 – 8.0	**8.1** (0.0)	**8.1** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)	**9.1** (0.0)			
EC (µS/cm)	30 – 350	**409** (2.0)	**997.0** (0.0)	**485** (0.3)	**436.3** (0.3)	**714.3** (0.3)	**403** (0.3)	**824** (0.3)			
DO (% Sat)	90–110	92.3 (0.2)	108.6 (0.1)	**20.2** (0.3)	90.9 (0.1)	**81.3** (0.5)	99.5 (1.5)	**87.9** (1.6)			
Turbidity (NTU)	< 50	2.8 (0.4)	1.4 (0.0)	6.0 (0.2)	10.4 (0.7)	12.5 (0.2)	8.3 (0.2)	12.2 (0.2)			
Site HR3											
Temperature °C		15.9 (0.0)	18.6 (0.0)	22.1 (0.0)	18.9 (0.0)	17.1 (0.0)	19.3 (0.0)	21.7 (0.0)			
pH	6.5 – 8.5	7.9 (0.0)	8.2 (0.0)	8.2 (0.0)	7.8 (0.0)	7.9 (0.0)	7.5 (0.0)	**9.0** (0.0)			
EC (µS/cm)	125–2,200	490 (3.2)	1018 (0.0)	515 (1.0)	436.7 (0.3)	734.7 (0.3)	406 (0.3)	830 (0.0)			
DO (% Sat)	85 – 110	104.8 (1.1)	113.8 (0.2)	**19.6** (0.4)	108.3 (0.1)	**76.6** (0.2)	103 (1.5)	107 (7.4)			
Turbidity (NTU)	< 50	**5.2** (0.0)	3.0 (0.1)	13.1 (0.2)	10.2 (0.2)	16.7 (0.3)	9.2 (0.2)	15.9 (0.1)			

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[4] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[5]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR4											
Temperature °C		24.6 (0.0)	16.6 (0.0)	21.5 (0.0)	15.2 (0.0)	22.2	13.9 (0.0)	N/R	17.0 (0.0)	22.2 (0.0)	16.7 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.4 (0.0)	8.0 (0.0)	7.7 (0.0)	8.24	8.3 (0.0)	8.5 (0.0)	7.9 (0.0)	7.2 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	296 (1.3)	274 (20.0)	290 (0.0)	368 (1.7)	361	467.0 (0.0)	1,610 (0.0)	623 (0.3)	669.0 (0.0)	861 (0.0)
DO (% Sat)	85 – 110	93.2 (0.6)	100.0 (0.2)	101.0 (0.1)	**79.3** (0.1)	**120.8**	**61.6** (0.0)	**58.2** (0.1)	**83.4** (0.2)	85.1 (0.0)	88.3 (0.0)
Turbidity (NTU)	< 50	26.5 (0.9)	**55.7** (0.1)	28.5 (0.4)	**51.7** (0.7)	6.7	46.0 (0.3)	28.2 (0.2)	12.0 (1.4)	17.7 (0.1)	18.2 (0.1)
Site HR5											
Temperature °C		25.4 (0.0)	15.5 (0.0)	22.3 (0.1)	15.3 (0.0)	22.3	14.8 (0.0)	N/R	17.1 (0.0)	21.3 (0.1)	16.6 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.5 (0.0)	7.7 (0.0)	7.8 (0.0)	8.08	8.4 (0.0)	**8.7** (0.0)	7.9 (0.0)	6.6 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	318 (1.3)	338 (2.0)	322 (0.9)	424 (0.0)	365	407.3 (0.7)	657 (18.0)	669 (0.0)	698.7 (0.3)	908 (0.3)
DO (% Sat)	85 – 110	**66.5** (0.8)	90.3 (0.6)	89.5 (0.2)	**79.7** (0.7)	107.9	**56.2** (0.1)	**61.7** (0.2)	**77.5** (0.1)	**67.5** (1.1)	86.6 (0.0)
Turbidity (NTU)	< 50	30.5 (0.5)	**57.2** (0.2)	35.3 (0.1)	45.2 (1.4)	6.8	**68.8** (1.4)	44.6 (0.7)	12.1 (0.3)	26.8 (1.7)	16.9 (0.4)
Site HR6											
Temperature °C		25.9 (0.0)	17.0 (0.1)	22.5 (0.0)	15.9 (0.0)	22.2	14.9 (0.0)	N/R	16.9 (0.0)	21.5 (0.0)	16.4 (0.0)
pH	6.5 – 8.5	8.1 (0.0)	8.4 (0.0)	7.8 (0.0)	7.9 (0.0)	8.07	8.5 (0.0)	**8.9** (0.0)	7.9 (0.0)	7.2 (0.1)	8.3 (0.0)
EC (µS/cm)	125–2,200	329 (0.0)	331 (1.2)	321 (0.3)	448 (0.0)	364	387.3 (0.3)	636.0 (0.6)	739 (0.3)	715.0 (0.0)	914 (0.3)
DO (% Sat)	85 – 110	**74.7** (0.0)	**83.8** (0.6)	100.8 (0.3)	91.7 (1.5)	107	**72.2** (0.0)	**57.1** (1.0)	**73.0** (0.2)	**78.6** (0.1)	88.9 (0.0)
Turbidity (NTU)	< 50	35.3 (0.8)	**59.1** (0.6)	34.3 (0.2)	35.8 (0.5)	12.7	41.6 (0.3)	23.4 (1.2)	6.5 (0.3)	22.2 (0.2)	17.8 (0.4)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in lowland rivers (i.e. systems at < 150 m altitude) in southeast Australia.

[5] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[6]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25			
Site HR4											
Temperature °C		15.7 (0.0)	17.2 (0.0)	22.2 (0.0)	18.4 (0.0)	17.0 (0.0)	19.2 (0.0)	20.2 (0.0)			
pH	6.5 – 8.5	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)	7.7 (0.0)	7.8 (0.0)	7.9 (0.0)	**9.3** (0.0)			
EC (µS/cm)	125–2,200	393 (0.0)	1111 (0.0)	604 (9.8)	460.3 (0.3)	770.7 (0.3)	414.0 (0.0)	879 (0.0)			
DO (% Sat)	85 – 110	95.0 (0.1)	106.0 (0.0)	**18.7** (0.6)	97.5 (0.1)	**76.7** (0.2)	106.0 (0.7)	88.9 (2.8)			
Turbidity (NTU)	< 50	7.9 (0.2)	2.6 (0.0)	10.3 (0.3)	12.2 (0.3)	22.9 (1.3)	7.4 (0.2)	13.4 (0.2)			
Site HR5											
Temperature °C		15.7 (0.0)	16.8 (0.0)	21.3 (0.0)	17.9 (0.0)	17.5 (0.0)	18.5 (0.1)	20.2 (0.0)			
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.2 (0.0)	7.7 (0.0)	7.9 (0.0)	8.1* (0.0)	**9.9** (0.0)			
EC (µS/cm)	125–2,200	455 (7.0)	1272 (0.3)	680 (0.3)	492.3 (0.7)	869.0 (0.0)	419.0 (0.0)	904 (0.0)			
DO (% Sat)	85 – 110	N/R	99.4 (0.0)	**15.4** (0.4)	88.9 (0.0)	**74.7** (0.3)	**118.7** (0.4)	87.0 (7.7)			
Turbidity (NTU)	< 50	6.9 (0.2)	5.7 (0.1)	19.9 (0.7)	22.7 (0.1)	26.8 (0.6)	10.1 (0.4)	13.1 (0.2)			
Site HR6											
Temperature °C		15.6 (0.0)	17.0 (0.0)	21.3 (0.1)	17.7 (0.0)	17.2 (0.0)	18.8 (0.0)	20.2 (0.0)			
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.1 (0.0)	7.8 (0.0)	7.7 (0.0)	8.2* (0.0)	**9.4** (0.0)			
EC (µS/cm)	125–2,200	423 (0.0)	1299 (1.2)	730 (0.3)	493.7 (0.3)	917.7 (0.3)	422.7 (0.3)	919 (0.3)			
DO (% Sat)	85 – 110	N/R	96.5 (0.1)	**16.7** (0.1)	90.2 (0.1)	**66.2** (0.1)	95.4 (0.0)	**71.7** (0.4)			
Turbidity (NTU)	< 50	6.2 (0.1)	3.3 (0.1)	20.3 (0.2)	18.8 (0.6)	32.0 (0.5)	10.7 (0.4)	15.1 (0.0)			

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

- pH measurements appear to be out by 1 pH unit

N/R = Not Recorded

[6] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[7].	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-21
DB											
Temperature °C		25.1 (0.0)	12.6 (0.0)	22.1 (0.1)	13.5 (0.0)	20.3	12.5 (0.0)	N/R	16.2 (0.0)	20.8 (0.0)	17.1 (0.0)
pH	6.5 – 8.0	**8.1** (0.0)	**8.8** (0.0)	**8.2** (0.0)	8.0 (0.0)	**8.24**	**8.4** (0.0)	**8.4** (0.0)	8.0 (0.0)	7.1 (0.0)	**8.1** (0.0)
EC (µS/cm)	30 – 350	**4,257** (1.3)	**5,905** (5.0)	**4,400** (0.0)	**3,648** (0.6)	**5,210**	**1,230** (0.6)	**980** (0.0)	**1014** (0.3)	**914.0** (0.0)	**1013 (0.0)**
DO (% Sat)	90–110	**64.2** (0.8)	**60.5** (0.3)	**88.7** (0.4)	**54.9** (0.2)	**63.9**	**73.9** (0.2)	**56.6** (0.2)	**72.6** (0.0)	**73.2** (0.0)	**88.0 (0.0)**
Turbidity (NTU)	< 25	24.2 (0.5)	**52.4** (0.7)	**26.5** (0.7)	**53.2** (0.4)	**31**	**31.4** (0.8)	19.9 (0.2)	**40.0** (0.1)	32.8 (0.1)	23.6 (0.4)
MC											
Temperature °C		23.3 (0.0)	15.1 (0.0)	23.9 (0.0)	15.0 (0.0)	24.5	14.1 (0.0)	N/R	16.4 (0.0)	21.9 (0.0)	16.1 (0.0)
pH	6.5 – 8.5	7.7 (0.2)	**8.3** (0.0)	7.7 (0.0)	7.5 (0.0)	7.79	8.0 (0.0)	8.4 (0.0)	7.6 (0.0)	6.7 (0.0)	8.0 (0.0)
EC (µS/cm)	125–2,200	1589 (2.6)	1406 (15)	1232 (1.0)	1517 (0.3)	1327	1599 (0.0)	1163 (0.0)	1872 (0.3)	1592 (2.9)	2113 (0.3)
DO (% Sat)	85 – 110	86.6 (0.1)	**83.9** (0.1)	107.3 (0.2)	**52.5** (0.2)	**113.9**	**40.3** (0.0)	**41.3** (0.1)	**64.6** (0.2)	**57.0** (0.1)	**83.0** (0.0)
Turbidity (NTU)	< 50	26.9 (0.9)	**45.8** (0.1)	23.5 (0.7)	**42.2** (2.1)	2.7	35.9 (0.0)	**4.6** (0.0)	15.3 (0.3)	4.3 (0.1)	14.6 (0.2)
SC											
Temperature °C		21.1 (0.0)	14.1 (0.1)	17.3 (0.0)	12.9 (0.0)	22	12.8 (0.0)	N/R	13.9 (0.0)	18.3 (0.0)	15.7 (0.0)
pH	6.5 – 8.0	**8.5** (0.0)	**8.6** (0.0)	8.0 (0.0)	7.9 (0.0)	7.91	**8.8** (0.0)	**8.9** (0.0)	7.7 (0.0)	7.6 (0.0)	**8.4** (0.0)
EC (µS/cm)	30 – 350	**8,000** (0.0)	**8,027** (0.3)	**9,600** (0.0)	**7,064** (13)	**11,200**	**3,006** (0.6)	**6,068** (0.3)	**4,326** (0.3)	**914.0** (0.0)	**4299** (0.3)
DO (% Sat)	90–110	**43.7** (0.0)	**49.0** (5.3)	**10.9** (0.0)	**40.8** (1.4)	**39.1**	**73.4** (0.0)	**39.6** (0.0)	**39.6** (0.1)	94.4 (0.5)	**75.6** (0.0)
Turbidity (NTU)	< 25	10.1 (0.1)	**77.1** (5.2)	4.8 (0.2)	**28.0** (0.2)	2.1	18.8 (0.3)	8.0 (0.1)	1.1 (0.0)	16.8 (0.1)	3.5 0.0)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[7] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[8].	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25			
DB											
Temperature °C		14.6 (0.0)	16.4 (0.7)	18.8 (0.1)	17.5 (0.0)	16.9 (0.0)	18.0 (0.0)	19.9 (0.0)			
pH	6.5 – 8.0	**8.2** (0.0)	7.9 (0.0)	**8.2** (0.0)	7.6 (0.0)	7.9 (0.0)	7.2 (0.0)	**8.7** (0.0)			
EC (µS/cm)	30 – 350	**456** (0.0)	**2,029** (0.0)	**3110** (5.8)	**2,905 (**1.2)	**1,051** (0.0)	**1,350** (0.0)	**1,317** (0.3)			
DO (% Sat)	90–110	89.8 (0.1)	**87.8** (0.0)	**23.6** (0.1)	**79.9** (0.3)	**70.6** (0.0)	**83.3** (1.1)	**76.6** (0.1)			
Turbidity (NTU)	< 25	3.2 (0.0)	3.7 (0.1)	17.6 (0.5)	**29.1 (**0.3)	14.8 (0.5)	16.1 (0.3)	17.6 (0.1)			
MC											
Temperature °C		16.1 (0.0)	16.4 (0.0)	19.7 (0.0)	17.2 (0.0)	16.8 (0.0)	18.4 (0.0)	21.0 (0.0)			
pH	6.5 – 8.5	7.5 (0.0)	7.6 (0.0)	7.7 (0.0)	7.4 (0.0)	7.5 (0.0)	7.9 (0.0)	**9.3** (0.0)			
EC (µS/cm)	125–2,200	710 (1.9)	**2,799** (0.0)	**2,673** (3.3)	2,000 (0.3)	2,000 (0.0)	**2,957** (0.7)	**2,455** (0.9)			
DO (% Sat)	85 – 110	N/R (0.3)	**71.1** (0.0)	**13.5** (0.5)	**63.4** (0.0)	**57.1** (0.2)	**65.0** (0.8)	109 (0.2)			
Turbidity (NTU)	< 25	7.8 (0.1)	3.2 (0.0)	13.2 (0.2)	**25.0** (0.1)	21.3 (0.2)	9.2 (0.1)	9.6 (0.5)			
SC											
Temperature °C		14.6 (0.0)	15.0 (0.0)	17.4 (0.3)	14.9 (0.0)	16.9 (0.0)	16.0 (0.0)	17.0 (0.1)			
pH	6.5 – 8.0	7.7 (0.0)	7.9 (0.0)	8.0 (0.0)	7.8 (0.0)	7.9 (0.0)	**8.2** (0.0)	**8.5** (0.0)			
EC (µS/cm)	30 – 350	**1,481** (1.7)	**4,934** (0.3)	**5,617** (15)	**5,888 (**1.0)	**1,051** (0.0)	**6,054** (1.5)	**4,920** (5.5)			
DO (% Sat)	90–110	N/R (0.3)	**65.4** (0.2)	**54.9** (0.2)	**88.4 (0.1)**	**70.6** (0.0)	**128.6** (0.1)	103.5 (1.3)			
Turbidity (NTU)	< 25	9.6 (0.0)	1.3 (0.0)	7.6 (0.3)	15.1 (0.5)	14.8 (0.5)	3.5 (0.1)	5.7 (0.1)			

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.
N/R = Not Recorded. NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[8] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

3.3 Aquatic Macroinvertebrates

3.3.1 General Findings

A total of 33 taxon were identified from the edge habitat samples collected at the nine sites sampled in spring 2025 (Appendix 4). The number of taxa ranged from 5 at Site HR6 and 14 at Site MC (Appendix 4). Chironominae (non-biting midges) were collected at eight of the nine sites sampled, while Atyidae (Freshwater shrimp) were collected at seven sites (Appendix 4). The alien fish, Mosquito fish (*Gambusia holbrooki*), was also collected, at three of the survey sites, using the AUSRIVAS technique (Appendix 4).

The OE50 scores ranged between 0.20 (HR6) and 0.60 (HR4) (Table 4). At the time of the spring 2025 survey, three sites were grouped in Band B (i.e. HR4, HR5 and MC) and six were grouped within Band C (i.e. HR1-3, HR6, SC and DB) (Table 4). Thus, fewer families of macroinvertebrates than expected were collected from all sites sampled in spring 2025 compared to reference sites selected by the AUSRIVAS model (Table 4).

Taxon with ≥ 0.80 probability of occurrence, but not collected, included water mites (Acarina) at all sites. The mayfly families, Baetidae, at HR6, and Leptophlebiidae, at HR1 MC, DB and SC, were also expected but not collected. Also missing was the caddis fly family, Leptoceridae, at HR1-3 and SC.

The SIGNAL 2 scores ranged from 2.92 (Site SC) to 4.53 (Site HR2) (Table 4). The results obtained for sites H1, H3, H5, H6, MC, SC and DB (i.e., SIGNAL-2 score = < 4.0) indicate severe pollution (Chessman, 2003). SIGNAL2 scores for Site H2 (4.53) and H4 (4.43) indicate that water quality at the sites is moderately impacted.

Table 5. AUSRIVAS outputs for sites sampled (spring 2025) (n = 1).

Watercourse	BA Site Code	Historical Site Code	No Taxa	SIGNAL-2	OE50	Band
Hunter River	HR1	W1	6	3.67	0.28	C
	HR2	W1	9	4.53	0.40	C
	HR3	Hunt 854	9	3.69	0.39	C
	HR4	Hunt 571	11	4.43	0.60	B
	HR5	W15	11	3.67	0.57	B
	HR6	SW17	5	3.83	0.20	C
Muscle Creek	MC	Hunt 506	14	3.38	0.53	B
Sandy Creek	SC	Sandy 1	6	2.92	0.30	C
Dart Brook	DB	Hunt 585	11	3.31	0.33	C

3.3.2 Stream Health Performance Indicators

Site HR3 has consistently scored below its historical band of impairment score (i.e. Band A – equivalent to AUSRIVAS reference condition) and the score obtained by the baseline survey (i.e. Band B – significantly impaired) (Table 5). Site HR4 has regularly scored below its historical band of impairment score (i.e. Band B) but not below its Baseline band level (i.e. Band C – severely impaired), except for during spring 2023 (Table 5).

Notably, deviations from historical AUSRIVAS band levels have also been recorded at sites sampled at Dart Brook (DB) and Muscle Creek (MC), which are not exposed to mining activities at the MPO (Table 5).

Criteria developed for the MPO sites were based on data collected on a single occasion in the mid-1990s. Given that ecological measurements vary from one place to another, and few ecological variables are constant through time, statistical analyses were used to formally examine trends in the condition of aquatic macroinvertebrate fauna and the stream health performance indicators in Section 3.3.3. To date, formal analyses have not detected any statistically significant changes that could be indicative of an impact associated with the MPO.

Table 6. Band of Impairment Scores (spring 2017 to spring 2025).

BA Site Code	Historical Site Code	AUSRIVAS Band Levels				
		mid-1990s	Sp17	Aut18	Sp18	Aut19
DB	Hunt 585	B	B	B	C	B
MC	Hunt 506	B	B	C	C	C
HR3	Hunt 854	A	B	C	C	B
HR4	Hunt 571	B	C	C	C	B
		mid-1990s	Sp19	Aut20	Sp20	Aut21
DB	Hunt 585	B	D	C	B	C
MC	Hunt 506	B	C	C	C	B
HR3	Hunt 854	A	C	C	B	B
HR4	Hunt 571	B	C	C	C	C
		mid-1990s	Sp21	Aut22	Sp22	Aut23
DB	Hunt 585	B	B	B	B	C
MC	Hunt 506	B	C	B	C	C
HR3	Hunt 854	A	B	C	C	C
HR4	Hunt 571	B	B	C	C	B
		mid-1990s	Sp23	Au24	Sp24	Au25
DB	Hunt 585	B	C	C	C	C
MC	Hunt 506	B	D	C	C	C
HR3	Hunt 854	A	D	C	C	C
HR4	Hunt 571	B	D	C	C	C
		mid-1990s	Sp25			
DB	Hunt 585	B	C			
MC	Hunt 506	B	B			
HR3	Hunt 854	A	C			
HR4	Hunt 571	B	B			

3.3.3 Changes in Aquatic Macroinvertebrate Fauna

Assemblages

Similar to the findings of previous surveys, PERMANOVA did not detect any evidence to suggest that the structure of assemblages of aquatic macroinvertebrates at locations situated downstream of mining activities at the MPO changed significantly in relation to the control locations (Table 6, Figure 4). Visual examination of the Principal Component Ordination (PCO) shows symbols representing assemblages collected at the Midstream-Impact and Downstream-Impact treatments have changed in a similar manner (i.e., direction and dispersion) as assemblages situated at the Hunter River and Tributary Control reaches, including at the time of the spring 2025 survey (Figure 4).

SIMPER analyses examining the spring 2025 data indicated that Chironomidae made a considerable contribution to the structure of assemblages within each of the study reaches (Table 8, Figure 4). Chironominae (fly larvae) contributed greatly to the structure of assemblages at all locations (Table 7, Figure 4). The aquatic bug, Corixidae, made a considerable contribution to all locations except the Upstream-Control (Table 7, Figure 4). Notably, the mayfly larvae, Caenidae, contributed greatly to the structure of assemblages within the upstream and downstream reaches sampled within the Hunter River (Table 7).

Table 7. Summary of PERMANOVA analysis. Bold numbers indicate significant results at *P* < 0.05. Percentages of Components of Variation (% CV) are shown.

Source	*df*	MS	Pseudo-*F*	*P*	%CV
Survey	**16**	**5957**	**3.29**	**0.000**	**21.7**
Treatment	1	7957	1.31	0.196	7.0
Reach(Treatment)	**4**	**7524**	**4.16**	**0.000**	**17.1**
Survey x Treatment	16	1966	1.09	0.290	6.0
Survey x Reach(Treatment)	30	1809	1.10	0.157	8.4
Residual	85	1647			39.8
Total	152				

Table 8. Results of SIMPER analyses indicating the relative contribution of individual taxa to the structure of assemblages of macroinvertebrates at each of the study reaches in spring 2025.

Taxa	US-Control	MS-Impact	DS-Impact	Tributary-Control
Atyidae		4 (6%)		2 (24%)
Chironominae	1 (70 %)	1 (35%)	2 (14%)	3 (13%)
Corixidae		2 (29 %)	3 (14%)	1 (44%)
Caenidae	2 (20 %)		1 (57%)	
Dytiscidae				5 (5%
Leptophlebiidae		3 (12%)		
Leptoceridae			4 (14.3%)	4 (7%)

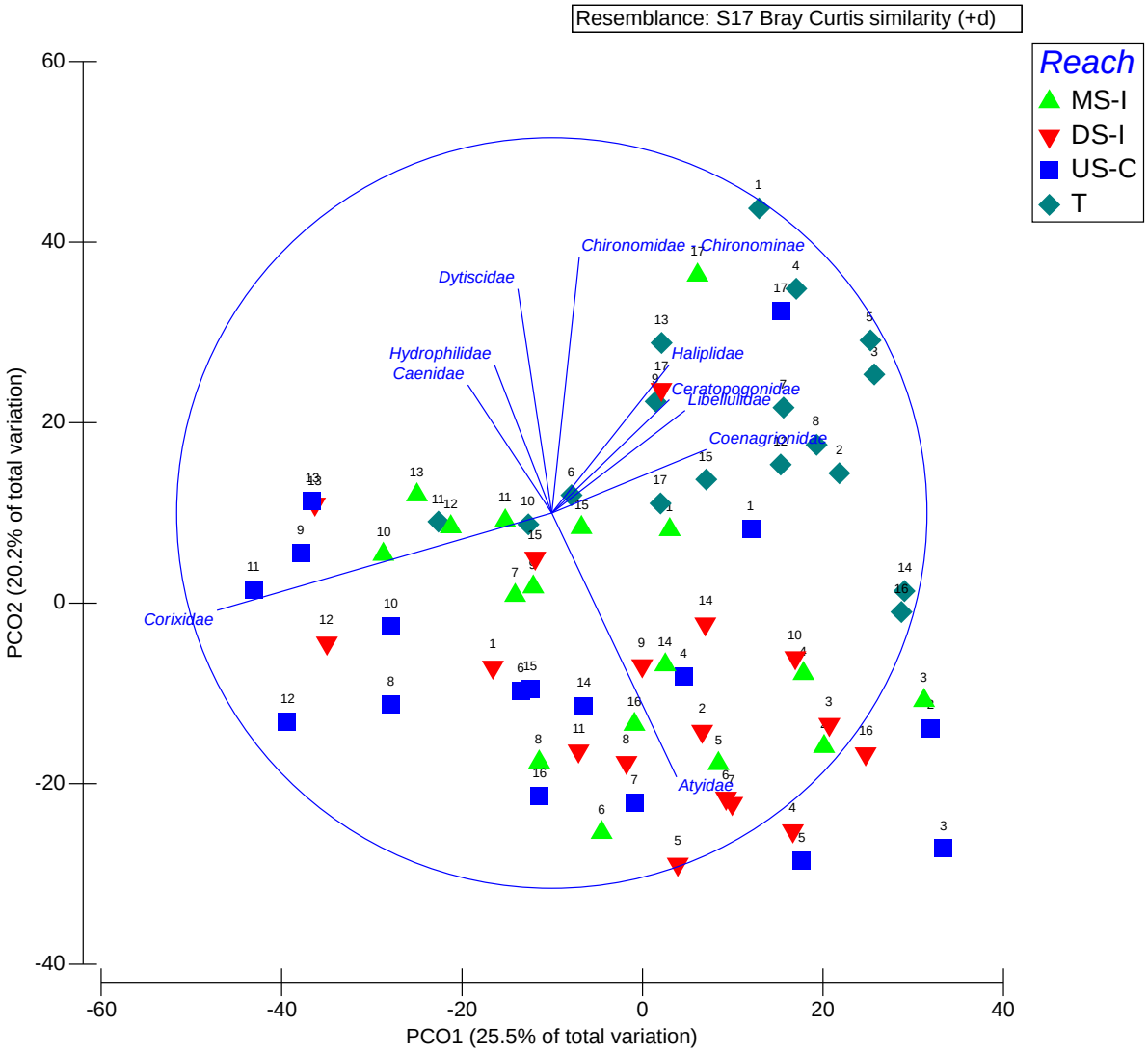

Figure 4. Principal Component Ordination (PCO) of the centroids estimated for AUSRIVAS macroinvertebrate assemblages sampled from edge habitat (MS-I = Midstream-Impact; DS-I = Downstream-Impact; US-C = Upstream-Control; T = Tributary-Control) between spring 2017 (Time 1) and spring 2025 (Time 17).

Number of Taxa

The mean number of taxa sampled within each 'reach' has ranged from 3.0 (± 1.0) (HR-D in spring 2023 and spring 2022) to 15.5 (± 0.5) (HR-M in autumn 2019) (Figure 5). The PERMANOVA analysis detected significant differences among Surveys and Reaches but no terms were indicative of an impact (i.e. Survey x Treatment) (Table 8, Figure 5). Graphically, fewer taxa have commonly (eleven of sixteen surveys) been collected within the downstream reach situated within the Hunter River (i.e., HR-D) than at the other reaches sampled (Figure 5). Similar numbers of taxa have been collected over time (Figure 5).

Table 9. Summary of PERMANOVA analysis of the Number of Taxa. Bold numbers indicate significant results at *P* < 0.05. T = Time. NB 'Time' is a random factor.

Source	df	MS	Pseudo-*F*	*P*
Survey	**16**	**40.59**	**8.24**	**0.001**
Treatment	1	1.97	0.16	0.973
Reach(Treatment)	**4**	**26.86**	**5.46**	**0.007**
Survey x Treatment	16	4.57	0.93	0.519
Survey x Reach(Treatment)	30	4.92	0.68	0.868
Residual	85	7.20		
Total	152			

OE50 Scores

The OE50 Taxa Scores ranged from 0.07 (±0.0) (HR-D in spring 2023) to 0.75 (±0.03) (HR-M in autumn 2019), indicating that the macroinvertebrate assemblage within the Hunter River have ranged from severely to significantly impaired relative to reference sites selected by the AUSRIVAS model (Figure 6).

Similar to the findings of previous surveys, PERMANOVA detected significant differences among surveys, but no terms were indicative of an impact (Table 9, Figure 6). Graphically, the condition of aquatic macroinvertebrate fauna improved at HR-M improved from Band C to Band B between autumn and spring 2025 (Figure 6). The OE50 scores obtained at the time of the spring 2025 survey were lower than the values obtained at the time of the spring 2017 survey (Figure 6). Importantly, scores obtained for the reaches situated downstream of mining activities during spring 2025 were similar to those obtained at the control locations (Figure 6).

Table 10. Summary of PERMANOVA analysis for OE50 Scores. Bold numbers indicate significant results at *P* < 0.05.

Source	*df*	MS	Pseudo-*F*	*P*
Survey	**16**	0.115	6.743	**0.001**
Treatment	1	0.006	0.339	0.774
Reach(Treatment)	4	0.034	2.021	0.116
Survey x Treatment	16	0.015	0.862	0.610
Survey x Reach(Treatment)	30	0.017	0.930	0.591
Residual	85	0.018		
Total	152			

SIGNAL2 Indices

The mean SIGNAL2 Index ranged from to 2.42 (±0.1) (HR-D in spring 2023) to 4.25 (±0.8) (HR-M in spring 2022) throughout the survey period (Figure 7). SIGNAL 2 values less than 4 indicate that macroinvertebrate assemblages have consistently been dominated by pollution tolerant taxa (Figure 7).

PERMANOVA detected a significant Survey x Reach(Treatment) interaction, but no terms were indicative of an impact (Table 10, Figure 7). Graphically, the SIGNAL 2 scores obtained during spring 2025 were similar to surveys done previously (Figure 7). Mayflies were relatively common at the time of the current survey, particularly at HR4, and are likely to have contributed to the higher scores compared to the autumn 2025 survey.

Table 11. Summary of PERMANOVA analysis. Bold numbers indicate significant results at *P* < 0.05.

Source	df	MS	Pseudo-*F*	*P*
Survey	**16**	**0.67**	**2.04**	**0.042**
Treatment	1	0.03	0.30	0.828
Reach(Treatment)	4	0.46	1.38	0.261
Survey x Treatment	16	0.18	0.54	0.898
Survey x Reach(Treatment)	**30**	**0.33**	**2.18**	**0.006**
Residual	85	**0.15**		
Total	152			

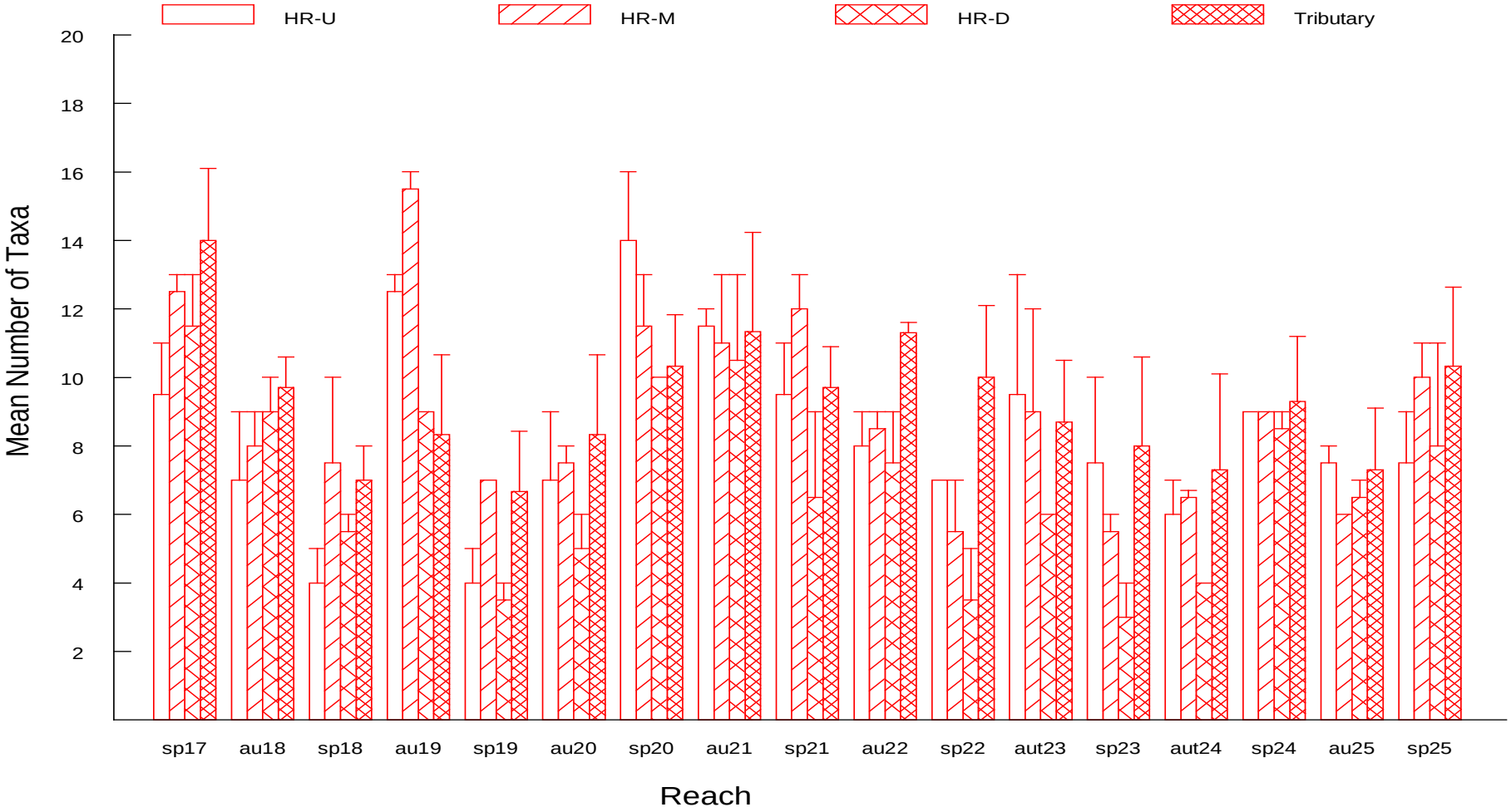

Figure 5. Mean number of taxa collected from edge habitat within the river (*n* =2 sites) and tributary (n = 3 sites) reaches between spring 2017 and spring 2025.



Figure 6. Mean OE50 Taxa Scores and their respective Band Scores (B-C) for AUSRIVAS samples collected between spring 2017 and spring 2025.

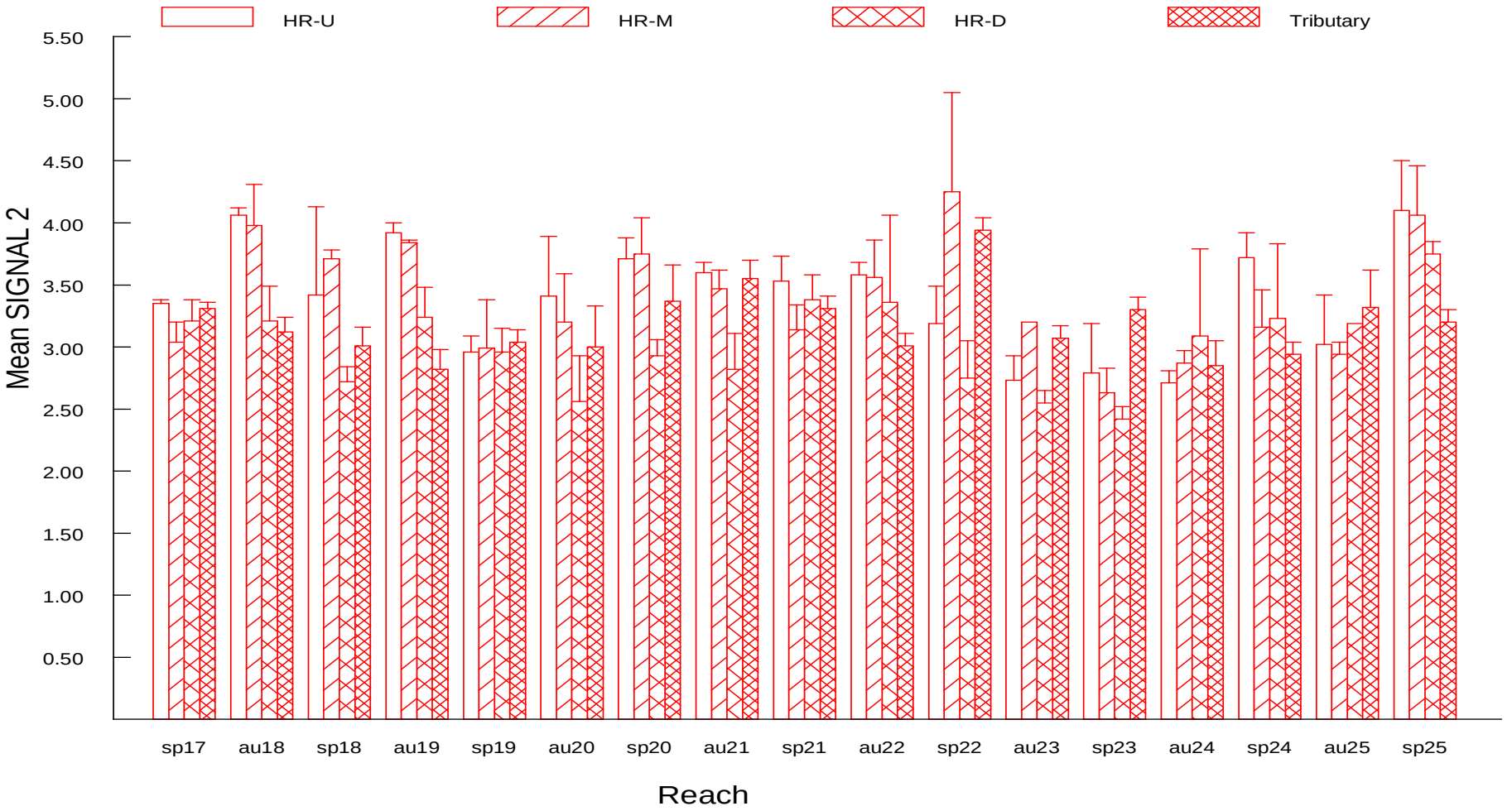

Figure 7. Mean SIGNAL2 Indices for AUSRIVAS samples collected from edge habitat at each site between spring 2017 and spring 2025.

3.4 Fish

Six species of fish (including two introduced species), freshwater shrimp and freshwater prawns were recorded at the eight sites able to be sampled for fish at the time of the spring 2025 survey (Table 13). Australian bass were collected at Site HR3&HR5 (Table 13). Eels (ranging between 12-120 cm in length) were observed/caught at five of the six Hunter River sites sampled (i.e. Sites HR-1-4&6), Muscle Creek and Dartbrook (Table 13). Carp (up to ~ 50 cm in length) were caught/observed at Site HR1, HR2 and HR6 (Table 13). Mosquito Fish (*Gambusia holbrooki*) were collected at Site HR1, HR3 and HR4 (Table 13). Freshwater shrimps (Atyidae) and freshwater prawns (Palaemonidae) were also collected.

Altogether, ten[9] species of fish, including eight native and two alien species, have been collected at the sites sampled since spring 2017 (Table 14). Most notably, a platypus (*Ornithorhynchus anatinus*) was collected in a fyke net set at Site HR1 in autumn 2021. Carp, Flat head gudgeon and Australian smelt were collected at Sandy Creek for the first time in autumn 2024 (Table 14).

All the species caught have been recorded during previous fish surveys done on the Hunter River (McDowall, 1996; DPI 2006; Howell and Creese, 2010). No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) were recorded in the Study Area on this sampling occasion (Table 10) or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

[9] One dead individual observed at Site HR1 in spring 2019 was incorrectly identified as a Wild goldfish (*Carassius auratus*), instead of Common carp.

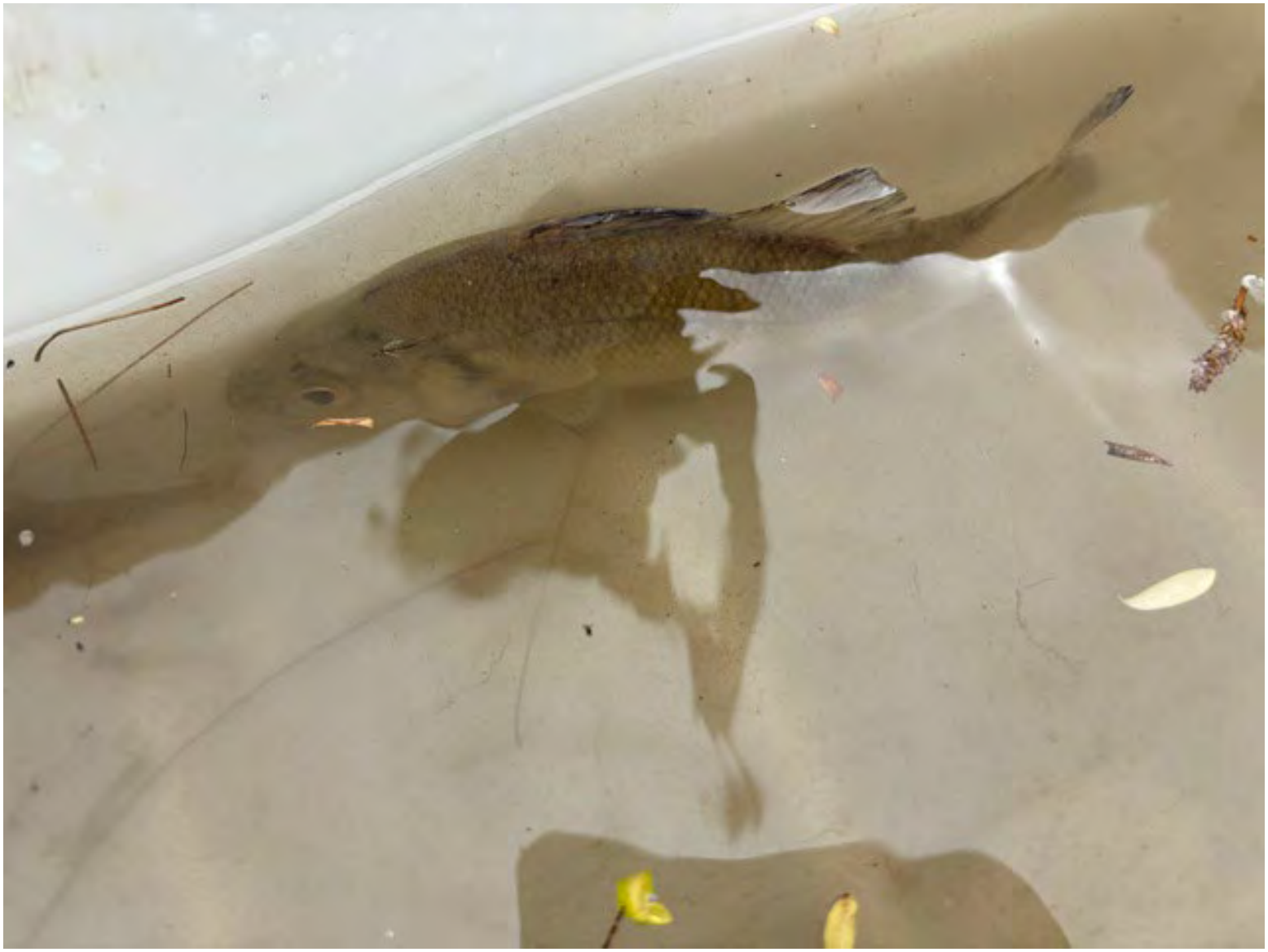

Plate 19. Australian bass caught in fyke nets left overnight at Site HR5 (14/10/2025).

Table 12. Species of fish and crustaceans observed and/or collected using a Backpack Electrofisher (at sites HR1-HR6, MC and DB) and Dip nets (all sites) in spring 2025 survey (13&14 October 2025).

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB
Anguilla reinhardtii	Long-finned eel	√	√	√	√		√	√		√
Anguilla australis	Short-finned eel									
Cyprinus carpio	Common carp*	√	√				√			
Gambusia holbrooki	Mosquito fish*	√		√	√					
Gobiomorphus australis	Striped gudgeon			√			√	√		
Macquaria novemaculeata	Australian bass			√		√				
Mugil cephalus	Sea mullet		√			√				
Philypnodon grandiceps	Flat head gudgeon									
Retropinna semoni	Australian smelt			√		√				
Tandanus tandanus	Freshwater catfish									
Emydura macquarii	Eastern short-neck turtle			√		√	√			
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√	√	√
Palaemonidae sp.	Freshwater prawns	√		√	√	√	√	√		√

*Non-native/Alien species.

[A]Unable to be electrofished due to elevated levels of conductivity.

Table 13. Species of fish and crustaceans collected/observed at the survey sites between spring 2017 and spring 2025.

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB[B]
Anguilla reinhardtii	Long-finned eel	√	√	√	√	√	√	√		√
Cyprinus carpio	Common carp*	√	√	√	√	√	√	√		√
Gobiomorphus australis	Striped gudgeon	√	√	√		√	√			
Macquaria novemaculeata	Australian bass	√	√	√		√	√			√
Mugil cephalus	Sea mullet			√	√		√			
Gambusia holbrooki	Mosquito fish*	√	√	√	√	√	√	√	√	√
Philypnodon grandiceps	Flat head gudgeon		√	√		√	√	√		
Hypseleotris klunzingeri	Western carp gudgeon				√					
Retropinna semoni	Australian smelt	√	√	√	√	√	√			
Tandanus tandanus	Freshwater catfish	√				√				√
Emydura macquarii	Eastern short-neck turtle			√						
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√	√	√
Palaemonidae sp.	Freshwater prawns	√	√	√	√	√	√	√	√	√

*Non-native/Alien species.

[A]Sandy Creek was unable to be electrofished in spring 2021, autumn 2021, spring 2020, autumn 2020, spring 2019, autumn 2019, spring 2018, autumn 2018, autumn 2022, autumn 2023 and autumn 2024 due to elevated levels of conductivity.

[B]Dartbrook was unable to be electrofished in autumn 2023, mostly likely due to elevated levels of conductivity

5.0 DISCUSSION

Discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 51 discharge credits as of June 2023. As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made to date. Two Sediment Dam releases have been made to the eastern portion of the MPO area, on 8/03/2022 and 21/10/2022.

There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

5.1 Aquatic Habitat

Since the autumn 2025 survey, significant alterations had occurred within the riparian zone and channel at the sites sampled within the Hunter River, Dartbrook, Muscle Creek and Sandy Creek: in places, sections of the streambank had been eroded by high flows (up to 9.8 m within the Hunter River at Muswellbrook), causing some sections to collapse into the river. Large trees had also fallen into the channel. Flattened vegetation and debris were common.

Deep pools, large woody debris, rocks and aquatic vegetation continue to provide important habitat for many species of aquatic fauna, including fish. Australian bass, Long-finned eels, Sea mullet, Australian smelt, Freshwater catfish and gudgeons, have commonly been caught at the Hunter River sites, confirming that the river is providing habitat for native species of fish. Common carp and Mosquito fish are also relatively common.

The overall condition of riparian habitat at the smaller tributary site at Dart Brook has consistently been classified as ‘moderate’. Although relatively narrow (between 5 and 30 m), mixed native and exotic trees and shrubs are abundant within the riparian strip. A range of habitats available to fish and macroinvertebrates are present, including rocks, logs and emergent macrophytes (including Phragmites, Typha and Mat Rush). Australian bass have been caught at this site although not since the autumn 2018 survey. Long finned eels were common at the time of the spring 2025 survey. Conductivity levels (up to 5,905 µS/cm) have consistently exceeded ANZECC/ARMCANZ (2000) guidelines, including at the time of the spring 2025 survey (i.e. 1,317 µS/cm).

The Muscle Creek site consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook. Muswellbrook Shire Council with the support of the local community have been working to rehabilitate the riparian zone within the downstream reaches of the creek. The large colony of bats observed by recent surveys had disappeared.

The western portion of the MPO lies within the Sandy Creek catchment. Similar to the findings of surveys done since autumn 2023, the stream channel between previously isolated pools was inundated and flow was apparent in spring 2025, improving connectivity along the creek and salinity (4,920 µS/cm at the time of the spring 2025 survey compared to 11,200 µS/cm during spring 2019).

5.2 Water Quality

Water quality patterns have generally been consistent with data collected prior to the commencement of operations at the MPO. Electrical conductivity has commonly exceeded the ANZECC/ARMCANZ (2000) guideline value (i.e., 350 µS/cm) at the Hunter River sites situated upstream of the MPO (i.e. Sites HR1 and HR2: range = 256 to 800 µS/cm) and the Tributary sites (Dartbrook: range = 980 to 5,905 µS/cm; Muscle Creek: range = 1163 to 2,957µS/cm; Sandy Creek: range = 914 to 11,000 µS/cm), including prior to commencement of the Project and during the spring 2025 survey. This is not surprising given that the Hunter River catchment includes a large proportion of salt bearing sedimentary rocks and soils, and surface and underground drainage from this contributes natural salinity to the river (see Krogh et al., 2013). Importantly, conductivity levels measured at the sites situated downstream of MPO inputs continue to be within the ANZECC guideline values, and the range in values measured at those sites since the spring 2017 survey.

The pH levels measured at the Hunter River sites continue to show slightly alkaline values, particularly at the upstream sites sampled (Sites HR1 and HR2). At the time of the spring 2025 survey, conductivity exceeded the site-specific trigger criteria for that section of the Hunter River (i.e., 7.8 – 8.3) and at the downstream sites (range = 8.9 at HR1 to 9.9 at HR5). Similarly, pH levels measured in Dartbrook (range = 7.1 to 8.8) and Sandy Creek (range = 7.6 to 8.9) have commonly been slightly alkaline, including at the time of the soring 2025 survey.

5.3 Aquatic Macroinvertebrates

A total of 33 taxon were identified from edge habitat samples collected at the survey sites sampled in spring 2025. Throughout the survey period, the mean number of taxa sampled within each of the study reaches (i.e., HR-U, HR-M, HR-DS and Tributary) has ranged from 3.0 (± 1.0) (HR-D in spring 2023) to 15.5 (± 0.5) (HR-M in autumn 2019).

The relatively low number of species collected by this and previous investigations (including prior to commencement of mining at the MPO), indicate that the macroinvertebrate assemblage has experienced some degree of environmental stress. This is evident in the OE50 Taxa Scores and Band levels obtained.

As discussed previously, lower than expected taxa scores are almost certainly related to the compounding effects from exposure to multiple historical stressors, including flow alteration, sedimentation, salinity, nutrient inputs, hydraulic disturbance and predation by exotic species of fish, such as Mosquito fish and Carp. Nevertheless, some pollution sensitive taxa have commonly been present, such as caddis fly and mayfly families, including at the time of the current survey. Importantly for this stream health study, none of the PERMANOVA tests indicated a change in spring 2025 that could be attributed to a MPO related impact.

5.4 Fish

The section of the Hunter River within the Study Area is classified as Class 1, Type 1 fish habitat. Altogether ten species of fish have been collected at the sites sampled since spring 2017, including Australian bass, Long-finned eels, native gudgeons, Common carp and Mosquito fish. Eastern short-neck turtles and a platypus (*Ornithorhynchus anatinus*) have also been captured and released.

The distribution and abundance of Carp within the Hunter River and Dartbrook appears to have decreased considerably since the autumn 2025 survey, most likely related to recent high flows. In contrast, Long-finned eels (ranging between 12-120 cm in length) were common, appearing at seven of the nine sites sampled. Australian bass (~ 15-20 cm in length) were present at two of the six Hunter River sites sampled, including at Site HR5, situated downstream of the Mt Pleasant Operation.

No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed using electrofishing, fyke nets or bait traps at the sites sampled in the Hunter River, or electrofishing in Muscle Creek, Sandy Creek or Dart Brook by this sampling programme or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

5.5 Stream Health Performance Indicators

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, Site HR3 has consistently scored below its indicator criteria (Band A) while Site HR4 (Band B) has scored lower on thirteen out of the seventeen (76%) sampling occasions. Similarly, band of impairment scores obtained at the 'control' sites sampled (i.e. at Muscle Creek and Dart Brook) have been lower than their indicator criteria on numerous occasions. Importantly, formal analyses have not detected any statistically significant changes in the stream health performance indicators that could be indicative of an impact associated with the MPO. Furthermore, the MPO continues to be a nil discharge site. Therefore, it is not considered appropriate for MACH Energy to initiate a stream health investigation under the SGWRP, in accordance with the SWMP.

6.0 CONCLUSIONS & RECOMMENDATIONS

There was no evidence to suggest a change in macroinvertebrate indicators occurred at HR3, HR4, HR5 or HR6 in spring 2025 that could be associated with the MPO. Where changes did occur, they were comparable with those that occurred upstream at control site's HR1 and HR2 and at the Tributary sites (i.e., DB, MC and SC).

The MPO is licenced to discharge via HRSTS but no discharge has been made to date. For these reasons, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site. It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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APPENDICES

Appendix 1 - GPS positions (UTMs) for stream monitoring sites (spring 2025).

Watercourse	Site Code	Easting	Northing
Hunter River	HR1	0299766	6435435
	HR2	0299820	6434759
	HR3	0300154	6430797
	HR4	0300784	6429279
	HR5	0293709	6424220
	HR6	0292210	6423043
Dart Brook	DB	0298892	6436233
Muscle Creek	MC	0301148	6427955
Sandy Creek	SC	0289156	6428195

Datum: WGS 84, Zone 56H

Appendix 2 - Riparian Channel & Environment (RCE) Score Sheet

	Descriptor & Category			Descriptor & Category	
1	Land use pattern beyond the immediate riparian zone -Undisturbed native vegetation -Mixed native vegetation and pasture/exotics -Mainly pasture, crops or pine plantation -Urban	 4 3 2 1	8	Riffle/pool sequence -Frequent alternation of riffles and pools -Long pools with infrequent short riffles -Natural channel without riffle/pool sequence -Artificial channel: no riffle/pool sequence	 4 3 2 1
2	Width of riparian strip of woody vegetation - > 30 m -Between 5 and 30 m -< 5 m -No woody vegetation	 4 3 2 1	9	Retention devices in stream -Many large boulders and/or debris dams -Rocks/logs present: limited damming effect -Rocks/logs present; but unstable, no damming -Stream with few or no rocks/logs	 4 3 2 1
3	Completeness of riparian strip of woody vegetation -Riparian strip without breaks in vegetation -Breaks at intervals of > 50 m -Breaks at intervals of 10 – 50 m -Breaks at intervals < 10 m	 4 3 2 1	10	Channel sediment accumulations -Little or no accumulation of loose sediments -Some gravel bars but little sand or silt -Bars of sand and silt common -Braiding by loose sediment	 4 3 2 1
4	Vegetation of riparian zone within 10 m of channel -Native tree and shrub species -Mixed native and exotic trees and shrubs -Exotic trees and shrubs -Exotic grasses/weeds only	 4 3 2 1	11	Stream bottom -Mainly clean stones with obvious interstices Mainly stones with some cover of algae/silt -Bottom heavily silted but stable -Bottom mainly loose and mobile sediment	 4 3 2 1
5	Stream bank structure -Banks fully stabilised by trees, shrubs, etc -Banks firm but held mainly by grass and herbs -Banks loose, partly held by sparse grass etc -Banks unstable, mainly loose sand or soil	 4 3 2 1	12	Stream detritus -Mainly unsilted wood, bark, leaves -Some wood, leaves etc, with much fine detritus -Mainly fine detritus mixed with sediment -Little or no organic detritus	 4 3 2 1
6	Bank undercutting -None or restricted by tree roots -Only on curves and at constrictions -Frequent along all parts of stream -Severe, bank collapses common	 4 3 2 1	13	Aquatic vegetation -Little or no macrophyte or algal growth -Substantial algal growth: few macrophytes -Substantial macrophyte growth; little algae -Substantial macrophyte and algal growth	 4 3 2 1
7	Channel form -Deep: width/depth ratio < 7:1 -Medium: width/depth ratio < 8:1 to 15:1 -Shallow: width/depth ratio > 15:1 -Artificial: concrete or excavated channel	 4 3 2 1			

Appendix 3 - Water Quality Data (spring 2025)

Indicator Variable	HR1-1	HR1-2	HR1-3	HR2-1	HR2-2	HR2-3	HR3-1	HR3-2	HR3-3
Temperature °C	20.07	20.07	20.07	20.58	20.6	20.6	21.7	21.7	21.7
pH	8.91	8.92	8.97	9.05	9.13	9.14	9	9.03	9.06
Conductivity (µS/cm)	747	747	747	823	824	824	830	830	830
Dissolved Oxygen (% Saturation)	84.2	81.2	83	84.7	89.6	89.3	112.8	91.9	115.1
Turbidity (NTU)	11.8	10	11.1	12	12.7	12	15.9	15.8	16
Alkalinity	70			70			70		
	HR4-1	**HR4-2**	**HR4-3**	**HR5-1**	**HR5-2**	**HR5-3**	**HR6-1**	**HR6-2**	**HR6-3**
Temperature °C	20.2	20.2	20.3	20.2	20.2	20.23	20.18	20.19	20.18
pH	9.3	9.32	9.34	9.92	9.91	9.9	9.39	9.4	9.42
Conductivity (µS/cm)	879	879	879	904	904	904	919	919	918
Dissolved Oxygen (% Saturation)	83.4	92.2	91.2	75.9	83.3	101.7	72.5	71	71.6
Turbidity (NTU)	13.6	13.5	13	13.5	12.7	13	15	15.2	15.2
Alkalinity	100			>100			70		
	DB-1	**DB-2**	**DB-3**	**MC-1**	**MC-2**	**MC-3**	**SC-1**	**SC-2**	**SC-3**
Temperature °C	19.86	19.85	19.87	21.06	20.96	20.96	17.13	17.01	16.93
pH	8.7	8.73	8.75	9.29	9.3	9.31	8.44	8.5	8.52
Conductivity (µS/cm)	1317	1318	1317	2457	2454	2455	4927	4909	4923
Dissolved Oxygen (% Saturation)	76.4	76.7	76.6	108.3	109	109	67.2	68.8	70.9
Turbidity (NTU)	17.4	17.8	17.7	10.5	9.2	9	5.9	5.7	5.4
Alkalinity	70			70			>100		

N/R: Not Recorded

Appendix 4 - Macroinvertebrate taxa collected using the AUSRIVAS protocol (spring 2025).

Taxa	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	MC	SC	DB
Lumbriculidae	0	0	0	0	1	0	0	0	0
Hydrobiidae	0	0	0	0	0	0	0	1	0
Physidae	0	0	0	0	0	0	0	2	0
Sphaeriidae	1	0	0	0	0	0	0	0	0
Atyidae	2	0	2	1	4	0	2	2	6
Palamonidae	0	0	0	0	0	0	1	6	0
Baetidae	0	8	1	48	0	0	2	0	0
Caenidae	3	2	5	28	8	4	2	0	0
Leptophlebiidae	0	1	2	12	8	0	0	0	0
Coenagrionidae	0	0	0	0	0	0	0	1	0
Gripopterygidae	0	9	0	0	0	0	0	0	0
Corixidae	0	2	1	0	11	1	8	12	2
Gerridae	0	0	0	0	0	0	0	0	0
Mesoveliidae	0	0	0	0	0	0	2	0	0
Notonectidae	0	1	0	0	2	0	2	0	0
Pleidae	0	0	0	0	0	0	2	0	0
Veliidae	0	1	0	0	0	0	21	0	0
Dytiscidae	0	0	5	1	6	0	0	1	20
Elmidae	0	0	0	0	1	0	0	0	0
Gyrinidae	0	0	0	0	0	0	0	0	1
Hydraenidae	0	0	1	0	0	0	5	0	0
Hydrophilidae	1	2	0	6	0	0	3	0	0
Psepheniidae	1	0	0	0	0	0	0	0	0
Scirtidae	0	0	0	0	0	0	1	0	1
Ceratopogonidae	0	0	0	1	0	0	0	0	0
Chironomidae - Chironominae	7	7	6	50	13	1	4	0	7
Chironomidae - Tanypodinae	0	0	0	0	1	0	0	0	0
Culicidae	0	0	0	0	0	0	0	1	0

Taxa	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	MC	SC	DB
Tipuliidae	0	0	0	1	0	0	0	0	0
Ecnomidae	0	0	0	0	0	1	0	0	0
Leptoceridae	0	0	0	1	1	2	18	2	0
Hydrobiosidae	0	0	0	0	0	0	0	1	0
Hydropsychidae	0	0	1	1	0	0	0	1	0
Number of Taxa	**6**	**9**	**9**	**11**	**11**	**5**	**14**	**11**	**6**
Gambusia	1	0	0	0	0	0	1	0	1

MOUNT PLEASANT OPERATION

STREAM HEALTH & STYGOFAUNA MONITORING

Autumn 2026 SURVEY



Prepared for AECOM Australia
on behalf of MACH Energy Australia

15 September 2026

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Disclaimer

This report has been prepared by BIO-ANALYSIS Pty Ltd (BA) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with AECOM Pty Ltd on behalf of MACH Energy Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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EXECUTIVE SUMMARY

Introduction

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton. The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively.

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs and in accordance with Development Consent DA 92/97, consent SSD10418 (activated in February 2024) and Environmental Protection Licence (EPL) 20850. Any discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 59 discharge credits.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Monitoring Plan (SWMP). MACH Energy are required to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries.

The spring 2017 survey forms the basis for the ongoing monitoring to assess stream health in accordance with the Surface Water Management Plan (SWMP) (MACH Energy, 2019), to determine any change in selected aquatic indicators throughout the life of the MPO and ascertain whether these changes can be attributed to the MPO. The stream health monitoring programme focusses on three main indicators:

- Aquatic habitat, including riparian habitat, aquatic macrophytes and fish habitat;
- Aquatic macroinvertebrates sampled using the Australian River Assessment System (AUSRIVAS) protocol;
- Fish sampled using backpack electrofishing and fyke nets.

Limited *in situ* water quality sampling is also done to assist in interpreting trends in the above indicators. Stream health monitoring is required to be done in spring and autumn each year.

The results of the current survey (autumn 2026) are compared with those obtained in each of spring and autumn since the spring 2017 survey.

An additional requirement this year was to monitor alluvial bores in the vicinity of the Hunter River, to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores were sampled in May 2026.

Results

Eight species of fish (including two introduced species), freshwater shrimp and freshwater prawns were collected in autumn 2026. Long-finned eels (ranging between approximately 8 and 120 cm in length) were collected at four of the six Hunter River sites sampled (HR2-4 &6), Muscle Creek and Dartbrook. Carp was collected at four of the Hunter River sites and continues to be abundant within the lower reaches of Dartbrook. Mosquito Fish were collected at all sites except Site HR3.

Altogether, ten species of fish have been caught/observed by the stream health monitoring programme since spring 2017, including Australian bass, Long-finned eels, Freshwater catfish, Australian smelt, Sea mullet, native gudgeons, Common carp and Mosquito fish. Overall, the species composition of assemblages has been comparable throughout the survey period. No threatened species of fish listed under the NSW *Fisheries Management Act, 1994* (FM Act) or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed.

Two individuals of likely stygofauna from one family (Neonipharidae) were identified from one (MP-BH1) of eight bores sampled in May 2026. This taxon is known from previous surveys of stygofauna within the Hunter River alluvium.

Macroinvertebrate assemblages have consistently (i.e. before and during mining activities at the MPO) been dominated by pollution tolerant taxa. Some pollution sensitive taxa have also commonly been collected, including caddis fly and mayfly families, upstream and downstream of the MPO area, including at the time of the autumn 2026 survey.

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, one site (Site HR3) has consistently scored below its indicator criteria (Band A - equivalent to AUSRIVAS reference condition) while the other (Site HR4: Band B - significantly impaired) has scored lower on fourteen out of the seventeen sampling occasions. Similar deviations from historical AUSRIVAS band levels have been recorded at sites sampled at Dart Brook and Muscle Creek, which are not exposed to mining activities at the MPO.

Importantly for this stream health study, none of the statistical tests used to formally examine trends in the condition of aquatic macroinvertebrate fauna (assemblage structure, diversity, OE50 and SIGNAL2 scores) have indicated a change that could be attributed to a MPO related impact.

Therefore, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site.

Conclusions and Recommendations

As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made since 2019. There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

Examination of results from the autumn 2026 survey found no measurable changes in the indicator variables examined in relation to the findings of the baseline survey that could be indicative of an impact associated with the MPO.

It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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1.0 INTRODUCTION

The Mount Pleasant Operation (MPO) is located in the Upper Hunter Valley of New South Wales (NSW), approximately 3 km north-west of Muswellbrook and approximately 50 km north-west of Singleton (Figure 1). The village of Aberdeen and locality of Kayuga are also located approximately 5 km north-northeast and 1 km north of the MPO boundary, respectively (Figure 1).

Development of the MPO is undertaken within Mining Lease (ML) 1645, ML 1713, ML 1708, ML 1709, ML 1750 and ML 1808 and is operated in accordance with the relevant Authorities for the above MLs. MPO is operated in accordance with Development Consent DA 92/97, as subsequently modified[1], consent SSD10418 (activated in February 2024) and Environmental Protection Licence 20850 Currently MPO is approved to produce up to 10.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 2026. MACH Energy commenced mining operations in January 2018.

The proponent of the MPO is MACH Energy Australia Pty Ltd (MACH Energy).

BIO-ANALYSIS Pty Ltd was commissioned by AECOM on behalf of MACH Energy in 2017 to implement a stream health monitoring programme, as required by MACH Energy's Surface Water Management Plan (SWMP) (MACH Energy, 2019), to assess the biological health of the aquatic ecology at selected locations along the Hunter River and its tributaries (the Study Area), outside and surrounding the MPO mining lease boundaries (Figure 2).

An additional requirement was to monitor alluvial bores in the vicinity of the Hunter River to determine the presence of any stygofauna taxa. As per MPO's approved Water Management Plan (SSD10418), bores were sampled in May 2026.

This Report provides the results of investigations undertaken from 7-8 May 2026 in accordance with requirements outlined in the SWMP and the Water Management Plan (SSD10418). The objectives of this survey were to:

[1] To date, four applications to modify the Minister's consent for the MPO have been submitted. A copy of the consolidated Development Consent DA 92/97 incorporating Mods 1, 2, 3, and 4 is provided as Attachment 1 in (REF).

- Undertake the 2026 autumn survey within the Study Area as required by the SWMP and the Water Management Plan (SSD10418)
- Determine the presence of any stygofauna taxa in selected bores;
- Determine whether any changes in stream health have occurred since the 2017 spring survey and whether changes, if any, are due to potential mining-related impacts at the MPO,
- Provide MPO with recommendations on further surveys or response mechanisms, as required, by the SWMP if stream health within the Study Area has deteriorated.

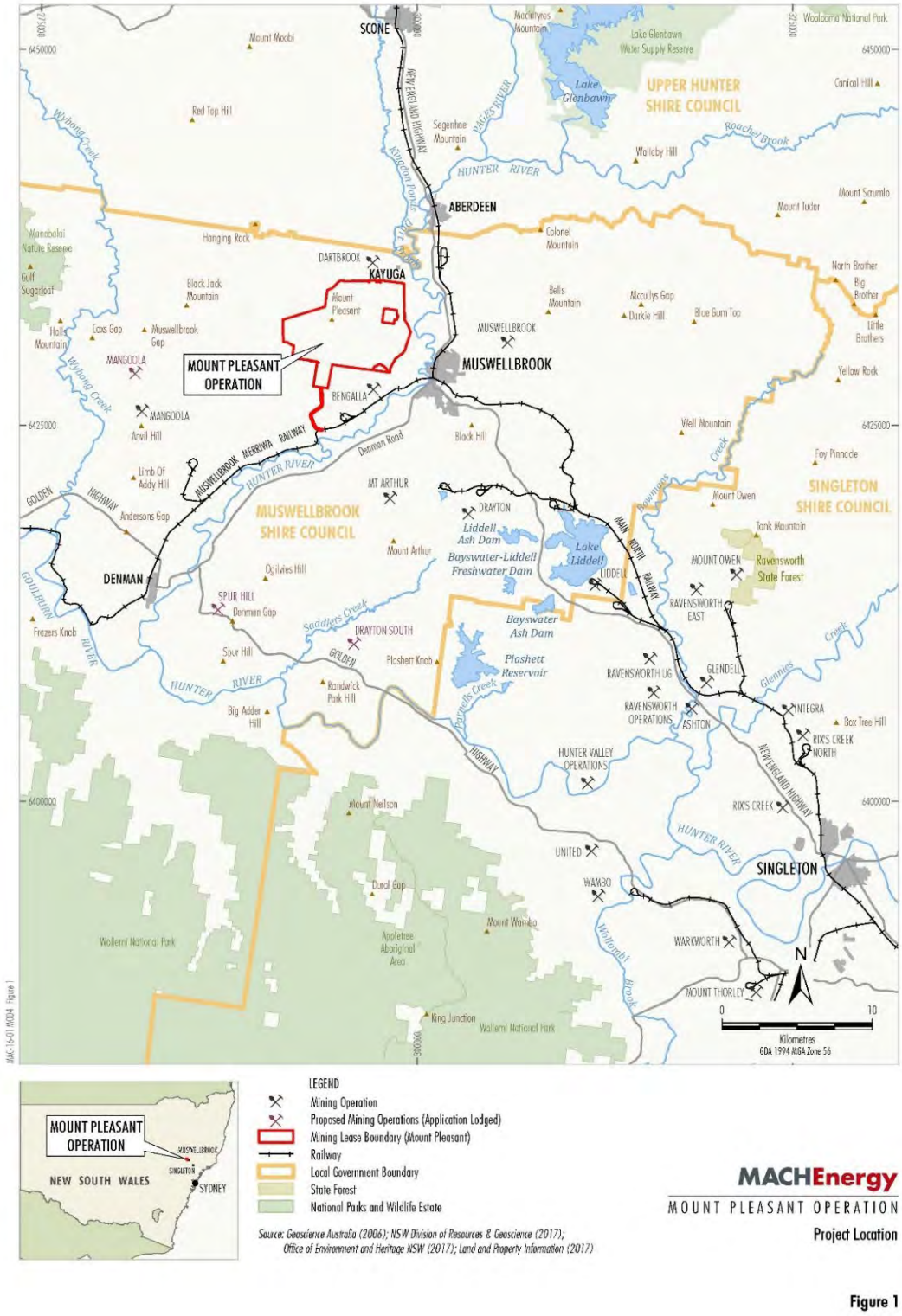

Figure 1. Project Area

2.0 METHODS

2.1 Study Area

MPO is located within the Muswellbrook Local Government Area (LGA). The locality of Kayuga is immediately to the north of MPO and the township of Aberdeen is located further northeast, on the eastern side of the Hunter River. Muswellbrook township is located approximately 4 km south-east of the MPO (Figure 1).

The township of Denman is located approximately 18 km to the southwest near the confluence of the Hunter and Goulburn Rivers (Figure 1).

The drainage network in the vicinity of the MPO is generally characterised by steep gullies which drain from the surrounding hills into the flat alluvial plains adjacent to the Hunter River. The Hunter River flows in a southerly direction approximately 1 km to the east of the MPO's mining lease boundaries and is the largest drainage feature within the catchment.

A number of ephemeral drainage lines traverse the MPO area and drain into the Hunter River. The eastern portion of the MPO area drains via Rosebrook Creek (Figure 1), as well as other ephemeral, unnamed drainages. Areas in the south and west of the MPO boundary drain to an ephemeral drainage line (commonly referred to as Dry Creek) and Sandy Creek, respectively, both of which flow into the Hunter River (Figure 1). No permanently flowing waterways are present within MPO's ML boundaries.

Surrounding land uses include agriculture (grazing, dairy, vineyards, horse and cattle studs, turf, flower and market gardens) and coal mining (ERM Mitchell McCotter, 1997). The Bengalla Coal Mine immediately adjoins the southern boundary of MPO. The Mount Arthur Coal Mine is located approximately 5 km to the south. The Mangoola Coal Mine is located approximately 8 km to the west. The Dartbrook Coal Mine immediately adjoins to the north (Figure 1). As such, the catchment area in the region of MPO has been historically cleared and altered.

The regional climate for the Muswellbrook areas is warm temperate with an average annual rainfall of approximately 600 mm (BOM, 2020).

2.2 Previous Investigations

Stream Health Monitoring

The initial stream health monitoring was implemented in November 2017. The results of the first survey are described in the "Stream Health Monitoring Spring 2017 Survey" report (BIO-ANALYSIS, 2018). Since the Spring 2017 Survey, surveys have been done in autumn (May) and spring (November) 2018, autumn (May) 2019 and spring (October) 2019, autumn (May) 2020 and spring (November) 2020, autumn (May) 2021, spring (October) 2021, autumn (May) 2022, spring (September) 2022, autumn (May) 2023, spring (October) 2023, autumn (May) and spring (October) 2024 and autumn (May) and spring (October) 2025 (BIO-ANALYSIS, 2018-2026).

Stygofauna Assessment

Seven accessible bores (MP-BH1-3, MP-BH3b, 18298, 7000D000(u) and WRA1L) were sampled for stygofauna for the Mount Pleasant Optimisation Project Aquatic Ecology Assessment on 27 and 28 November 2018 (BA, 2020). Of these, 100 litres of water was able to be pumped from four boreholes (MP-BH1, MP-BH2, 7000D000(u) and WRA1(L)) within three groundwater systems (i.e. Alluvium, Interburden and Permian).

Three likely stygofauna (Cyclopoida, Ostracoda and Isotomidae) were identified from bore samples in the alluvial aquifer (east of the MPO, along the Hunter River), where the groundwater was relatively fresh. Each of these taxa are known from previous surveys of stygofauna within the Hunter alluvium.

Subsequently, four likely stygofauna from two families (i.e., Neoniphargidae and Isotomidae) were identified from two (MP-BH1 and MP-BH2) of seven bores sampled for the Stream Health and Stygofauna Monitoring programme implemented in Autumn 2025, as per MPO's approved Water Management Plan (SSD10418). These taxa are known from previous surveys of stygofauna within the Hunter River alluvium.

2.3 Performance Measures and Indicators

Stream health performance criteria were developed for the SWMP by MACH Energy for two sites on the Hunter River (Table 1), by combining riffle and edge habitat scores obtained at those sites in the mid-1990s using the New South Wales Australian River System (AUSRIVAS) techniques (MACH Energy, 2019). Should an AUSRIVAS score deteriorate below the range for its historical band of impairment score for two successive monitoring rounds, a stream health investigation protocol is to be initiated under the MPO's Surface and Ground Water Response Plan (SGWRP) (MACH Energy, 2019).

Table 1. Stream Health Performance Criteria

Site Identification	Band of Impairment Score	Trigger Value (O/E Taxa)
Hunt 571	**B**	**0.54**
Hunt 854	**A**	**0.84**

Location of sites: Hunt 571: Hunter River @ Muswellbrook; Hunt 854: Hunter River downstream of Aberdeen (Figure 2)

Band of impairment scores for sites sampled at Dart Brook (Site Hunt 585: Band B) and Muscle Creek (Hunt 506: Band B) were also presented within the SWMP (MACH Energy, 2019).

Mangoola Coal Operations has established stream health trigger levels for a monitoring site on Sandy Creek (i.e. Site 'Sandy 1'). In the event of deterioration in stream health being observed by Mangoola Coal Operations at this site, MACH Energy would consult with Mangoola Coal Operations during implementation of their response plan as required by the SWMP.

2.4 Field Methods

2.4.1 Stream Health Monitoring

To fulfil the requirements of the SWMP, a stream health assessment was required to be completed at two sites along the Hunter River (HR-3 and HR-4) and at sites situated on Dart Brook (DB), Muscle Creek (MC) and Sandy Creek (SC) (Table 2, Figure 2).

An additional four sites were included in the monitoring programme from the spring 2017 survey (BIO-ANALYSIS, 2018), to provide an indication of variability among sites along the Hunter River and of stream health in the river upstream (Site HR-1 and HR-2) and downstream (HR-5 and HR-6) of the MPO area (Table 2, Figure 2).

For the autumn 2026 survey, sites were sampled on 7 & 8 May 2026. Each site was approximately 100 m in length with their GPS co-ordinates listed in Appendix A. Collections of fish and macroinvertebrates were completed in accordance with Section 37 of the *NSW Fisheries Management Act 1994* using Scientific Collection Permit Number FP23/124.

Table 2. Stream Health Monitoring Sites

BA Site Code	Historical Site Code	Site Location	Description
HR1	**W1**	Hunter River u/s River Street	Upstream MPO
HR2	**W1**	Hunter River d/s of River Street	Upstream MPO
HR3	**Hunt 854**	Hunter River @ Burtons Lane	Midstream/Adjacent to MPO
HR4	**Hunt 571**	Hunter River @ Muswellbrook	Midstream/Adjacent to MPO
HR5	**W15**	Hunter River off Bengalla Road	Downstream MPO
HR6	**SW17**	Hunter River near Roxburgh	Downstream MPO
SC	**Sandy 1**	Sandy Creek @ Wybong Rd	Hunter tributary
DB	**Hunt 585**	Dart Brook @ MacIntyre Bridge	Hunter tributary
MC	**Hunt 506**	Muscle Creek @ Muswellbrook	Hunter tributary

u/s – upstream; d/s - downstream

Figure 2. Stream Health Monitoring Sites

2.4.2 Habitat Assessment

The condition of the aquatic habitat at each site was assessed using a modified version of the Riparian Channel and Environmental (RCE) inventory method (Chessman et al., 1997). This method involves evaluation and scoring of the characteristics of the adjacent land, the condition of riverbanks, channel and bed of the watercourse, and degree of disturbance evident at each site. The maximum score (52) indicates a stream with little or no obvious physical disruption and the lowest score (13) indicates a heavily channelled stream without any riparian vegetation.

Based on the original classification established by Peterson (1992), site condition was rated:

- Poor for RCE scores of 0-24%;
- Fair for RCE scores of 25-43%;
- Good for RCE scores of 44-62%;
- Very good for RCE scores of 63-81%; and
- Excellent for RCE scores of 82-100%.

The condition of aquatic habitat at each site was also assessed according to the NSW Department of Primary Industries Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI, 2013). The two key indices are habitat *type* and *class*.

The in-stream and emergent aquatic macrophytes at each site were surveyed to provide an indication of the dominant species present and their cover.

Each stream health monitoring site within the Study Area was photographed and the locations recorded with a hand-held GPS (satellite-based Global Positioning System).

2.4.3 Water Quality

Water quality is measured at each site using a water quality probe and meter. The physico-chemical properties measured were electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L), pH (pH units), temperature (^{o}C), oxygen-reduction potential (mV) and turbidity (NTU). Alkalinity was also measured, using a CHEMetrics alkalinity kit.

Three replicate measures of each variable were collected from just below the water surface at each site, except for alkalinity, where only one measurement was taken at each site. It should be noted that water quality measurements collected during the biological sampling provide a snapshot of quality at the time of sampling under the prevailing flow conditions. Routine monthly and rain event surface water monitoring is undertaken at selected sites within the Study Area for MACH Energy by AECOM.

2.4.4 Aquatic Macroinvertebrates

Aquatic macroinvertebrates were sampled using the AUSRIVAS protocol (Turak et al., 2004). Samples of stream edge habitats and riffle habitats (where available) were collected over a total length of 10 m (usually in 1-2 m sections) at each site using a 250 µm dip net.

The contents of each net sample were placed into a white sorting tray and animals collected for a minimum period of 30 minutes. Thereafter, removals were done in 10-minute periods, up to a total of one hour (Turak et al., 2004). If no new taxa were found within a 10-minute period, removals ceased (Turak et al., 2004). The animals collected were placed inside a labelled container and preserved with 70 % alcohol.

Environmental variables required for running the AUSRIVAS predictive model, including modal river width, percentage boulder or cobble cover, latitude and longitude were recorded at each site.

2.4.5 Fish

Fish were sampled using a Smith-Root LR-24 Electrofisher backpack unit. The Electrofisher was used to stun the fish in open water, around the edge of pools, around snags and aquatic vegetation, overhanging banks and rocky crevices. Four replicate electrofishing ‘shots’ were completed at each suitable site sampled. All stunned fish were collected using a dip net and placed into plastic trays filled with water to be counted and identified. Incidental observations such as evidence of disease were noted. Native fish species were subsequently returned to the water.

Additional sampling of fish was undertaken at two sites in the Hunter River, by deploying fyke nets (panels up to 4 m long on either side of a central funnel 2.5 m long, with 5 mm mesh) and bait traps.

2.4.6 Stygofauna Monitoring

Stygofauna taxa were sampled within eight bores within the vicinity of the Hunter River in May 2025 (Table 3), using methods in accordance with stygofauna sampling and groundwater dependent ecosystem (GDE) assessment guidelines (Hancock and Boulton 2005; Hose and Lategan, 2012; Hose et al., 2015; Department of Environment and Science, 2018a and 2018b; Doody et al., 2019).

Table 3. Bores sampled for Stygofauna.

Bore	Easting	Northing	Depth to Water	Depth to Bottom	Notes (MPO, 2025)
MP-BH1	301136	6432569	10.10	18.03	Good recharge rate. Extract 230 L on an annual basis
MP-BH1-C	301136	6432569	10.25	76.78	Not a good recharge rate. Sampling method is purge & return
MP-BH1-HR	301136	6432569	35.28	52.26	Not a good recharge rate. Sampling method is purge & return
MP-BH2	299404	6428717	12.17	17.41	Good recharge rate. Extract 130L on an annual basis
MP-BH2-C	299385	6428747	12.46	74.90	Good recharge rate. Extract 400L on an annual basis
MP-BH2-HR	299385	6428747	12.41	53.50	Not a good recharge rate. Sampling method is purge & return
GDE D	296720	6434574	DRY	6.98	Bores newly drilled. Bore was dry on first visit this month
GDE S	296722	6434584	10.67	25.02	Bores newly drilled. Bore recharge rate unknown

Firstly, a weighted stygofauna net (50 µm mesh with a 40 mm diameter opening) was lowered to the bottom of each bore, bounced four times to dislodge resting invertebrate fauna and slowly (to avoid a bow-wave) retrieved to the surface. Once at the surface, net contents were emptied into a 50 µm mesh sieve. The net, vial and sinkers were rinsed over the sieve. In total, six net hauls were collected. The cumulative contents of the sieve were then transferred to a labelled plastic container and preserved with 100% ethanol.

After each sampling, nets were washed in Decon90, rinsed in deionized water and air-dried to prevent the transfer of stygofauna between bores during the survey.

Pump samples were collected immediately after netting. A Watterra PowerPack PP1 groundwater pump was used to extract up to 300 L of water from each bore. A sampling hose was fed into the bore until it reached the bottom of the bore casing, then lifted approximately 2 m above the bottom of the bore. Prior to pumping, three rows of ten x 10L buckets were set out. Buckets were carefully (to avoid splashing and overflows) filled sequentially.

Once the buckets were filled, a Yeo-Kal 618 probe was used to measure temperature, electrical conductivity (µS/cm), dissolved oxygen (% saturation and mg/L) and pH (pH units) in the first bucket and then every 5 buckets.

Subsequently, water from the first 10 buckets was passed through a 50 µm mesh sieve, the sieve contents transferred to a labelled plastic container and preserved with 100 % ethanol. The second and third rows of buckets were then sieved separately, to give three x 100 L samples per bore site (not including the net sample).

Net and pump samples were later transported to the laboratory to be processed in a sorting dish under a ISSCO ML400 series Stereo Microscope and identified as far as possible using taxonomic keys.

2.5 Laboratory Methods

In the laboratory, aquatic macroinvertebrate samples were sorted under a magnification lamp and preserved in 80% alcohol. Samples were later identified using a binocular microscope (at 40X magnification) and identified to family level with the exception of Acarina (to order), Chironomidae (to sub-family), Nematoda (to phylum), Nemertea (to phylum), Oligochaeta (to class), Ostracoda (to subclass) and Polychaeta (to class). Some families of Anisoptera (dragonfly larvae) were identified to species, because they could potentially include threatened aquatic species listed under the *Fisheries Management Act, 1994* (FM Act).

Up to 25 animals of each family were counted, in accordance with the AUSRIVAS protocol (Turak et al., 2004) and the SIGNAL2 (Stream Invertebrate Grade Number Average Level) biotic index developed by Chessman (2003).

Stygofauna samples were sorted and identified to the lowest level possible using a binocular microscope (at 40X magnification).

2.6 Data Analyses

The objective of analyses of water quality and aquatic macroinvertebrate data was to determine whether any significant changes to stream health indices may have occurred following commencement of mining at the MPO. Any significant change in stream health as determined by stream health trigger levels adjacent or immediately downstream of the Project would be investigated to determine the source of the change. For this report, data collected in spring 2017, autumn and spring 2018, autumn and spring 2019, autumn and spring 2020, autumn and spring 2021, autumn and spring 2022, autumn and spring 2023, autumn and spring 2024, autumn and spring 2025 and autumn 2026 were examined.

Stygofauna data collected by the current survey were compared to data collected from the bores sampled within November 2018.

Water Quality

The water quality measurements taken during each survey were compared with guideline values recommended by the ANZECC and ARMCANZ (2000) for slightly disturbed upland rivers in south-east Australia.

Data were also compared to surface water quality trigger levels developed for the MPO's SWMP for two sites (i.e. W1 and W6) situated within the Hunter River near Sites HR2 and HR3 (MACH Energy, 2018). The trigger levels were developed using the approach recommended by ANZECC & ARMCANZ (2000).

Aquatic Macroinvertebrates

AUSRIVAS

Data were analysed using the appropriate AUSRIVAS predictive models developed for New South Wales. The ecological health of a waterway is assessed by comparing the macroinvertebrates collected at a site (i.e. Observed) to those predicted to occur (Expected) if the site is in an undisturbed or 'reference' condition. The principal outputs of the AUSRIVAS model include:

- Observed to Expected ratio (OE50): the ratio of the number of macroinvertebrate families collected at a site which had a predicted probability of occurrence of greater than 50 % (i.e. Observed) to the sum of the probabilities of all of the families predicted with greater than a 50 % chance of occurrence (i.e. Expected) (Ransom et al., 2004)
- BAND: for each model, the OE50 taxa ratios are divided into bands representing different levels of impairment. Band X represents a more diverse assemblage of macroinvertebrates than control sites; Band A is considered equivalent to reference condition; Band B represents sites below reference condition (i.e. significantly impaired); Band C represents sites well below reference condition (i.e. severely impaired); and Band D represents impoverished sites (i.e. extremely impaired) (Ransom et al., 2004).

SIGNAL 2

The SIGNAL2 biotic index (Stream Invertebrate Grade Number Average Level) developed by Chessman (2003) is commonly used to give an indication of water quality at the sites sampled. The SIGNAL score for a macroinvertebrate sample is calculated by averaging the pollution sensitivity grade numbers of the families present, which may range from 10 (most sensitive) to 1 (most tolerant). The SIGNAL2 scores from samples collected between spring 2017 and autumn 2026 are presented graphically to provide an indication of changes over time.

Statistical Methods

The objective of this assessment was to examine whether any significant changes to selected aquatic macroinvertebrate indicators of stream health may have occurred following commencement of mining at the MPO.

The analytical design took into consideration:

- Survey: A random factor with 18 levels (spring 2017 to autumn 2026 surveys);
- Treatment: a fixed factor with 2 levels: Control and Impact;
- Reach: a random factor with 2 levels nested within Treatment (Midstream (Site HR3 & HR4) and Downstream (Sites HR5 & HR6) reaches are nested within the level 'Impact', while Upstream (Site HR1& HR2) and Tributary (Site MC, SC and DB) reaches are nested in the level 'Control', of the factor Treatment.

A factor representing variation associated with different phases of the MPO (i.e. Baseline- and During-mining) was not included in the design as only one survey could be undertaken prior to the commencement of mining, hence there was no replication for the Baseline-phase. The statistically significant interaction of Survey x Treatment (i.e. Impact and Control) and/or Survey x Reach(Treatment) could potentially provide evidence that a change in stream health had occurred due to mining.

Multivariate Analyses

A matrix of differences in the types of taxa between all possible pairs of samples was created by calculating their respective Bray-Curtis dissimilarity coefficients. Permutational Multivariate Analyses of Variance (PERMANOVA, Anderson 2001; Anderson et al, 2008) was used to examine spatial differences and temporal changes, and their interaction, in aquatic macroinvertebrate presence/absence data collected using AUSRIVAS. Any statistically significant differences (i.e. $P < 0.05$) in the levels of factors and interaction terms were examined by *Post-hoc* permutational t-tests. Significant differences between groups (e.g. impact versus control) may arise due to differences between group means, differences in dispersion (variance) among groups or a combination of both. Each of these outcomes could be indicative of an impact.

Apparent multivariate patterns in the data were examined by Principal Coordinates Analyses (PCoA), which provide a graphical representation of relationships between samples from two-dimensional ordination plots. The amount of variation "explained" by the *x*- and *y*-axis is indicated and the dissimilarity between data points can be determined from their distances apart on the axis (Anderson et al., 2008).

Similarity of percentages (SIMPER) was then used to determine those taxa primarily responsible for the observed similarities (or dissimilarities) between groups (e.g. Location) of interest (Clarke and Warwick, 1994).

Univariate Analyses

Using the same analytical design as for multivariate analyses, PERMANOVA was used to examine spatial and temporal patterns in the total number of taxa, OE50 and Signal scores. The analyses were based on a Euclidean distance matrix of all possible pairs of samples.

2.7 Quality Assurance/Quality Control (QA/QC)

Data collected in the field were checked for accuracy and completeness before leaving each site. In the office, field data and other records were incorporated into appropriate excel data sheets and checked. Spreadsheets were locked prior to analysis to prevent accidental over-writes or corruption.

In the laboratory, macroinvertebrate and stygofauna samples were identified and data for each sample were entered into an excel spreadsheet and then double checked.

3.0 RESULTS

3.1 Aquatic Habitat Characteristics

Since 2013, annual rainfall recorded at Muswellbrook (Station 61192), ranged from 434.2 mm (2023) to 1117.8 mm (2022) (Figure 3). Within the two months prior to the 2026 autumn survey (7 & 8 May 2026), a total of 17.9 mm of rain was recorded by a meteorological station situated approximately 25 km from Muswellbrook (i.e. Station 61095).

Within the two months prior the 2026 autumn survey, mean water levels measured in the Hunter River at Muswellbrook Bridge (Station 210002) ranged from approximately 0.35 m to 0.87 m (WaterNSW, 2026). At the time of the 2026 autumn survey, water level ranged from 0.87 m (7 May 2026) to 0.90 m (8 May 2026) (WaterNSW, 2026).

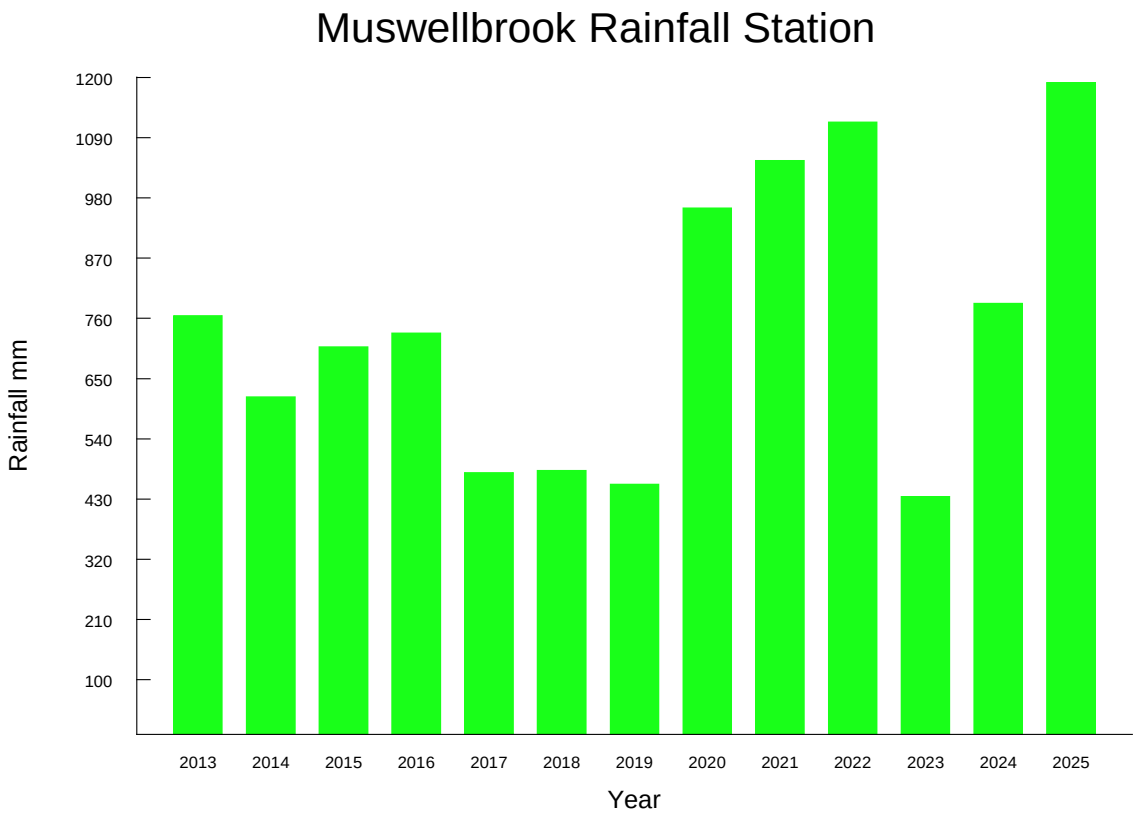

Figure 3. Annual rainfall (mm) measured at Muswellbrook from 1 January 2013 to 31 December 2025. NB Rainfall data for 2013-2017 and 2020-2023 were collected at Station 61192 (Muswellbrook – Spring Creek (Castle Vale), data for 2018 and 2019 was collected at Station 61095 Rouchel Brook (Albano).

3.1.1 Hunter River

The section of the Hunter River within the Study Area is generally characterised by a series of continuous, slow flowing pools up to approximately 28 m wide and greater than 1 meter deep (Plates 1-12). The channel substratum is composed primarily of silts and fine sands (as are the banks of the main channel) overlying a mostly gravel bed.

Vegetation of the riparian zone is dense, comprising mixed native and exotic trees and shrubs including River Oak (*Casuarina cunninghamiana*) and River Red Gum (*Eucalyptus camaldulensis*), Morning Glory (*Ipomoea indica*), Privet (*Ligustrum* species), Trad (*Tradescantia albiflora*), Bamboo (*Bambusa* sp.), Balloon Vine (*Cardiospermum grandiflorum*) and Willow (*Salix* spp.) are common. Giant Reed (*Arundo donax*) has also become common within recent years. Emergent macrophyte assemblages were characterised by Typha spp., Umbrella Sedge (*Cyperus eragrostis*), Common Reed/ Phragmites (*Phragmites australis*), Mat Rush (*Lomandra longifolia*), Common Rush (*Juncus usitatus*), Marsh Club-rush (*Bolboschoenus fluviatilis*) and Slender Knotweed (*Persicaria decipiens*). The submerged species of macrophyte, Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp., have commonly been noted at several of the sites sampled. The species identified within the Study Area have a wide distribution and are abundant in similar aquatic habitats elsewhere in south-eastern Australia.

The section of the Hunter River within the study area is classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification.

Hunter River upstream of the MPO (HR1 & HR2)

The most upstream site (HR1) is situated within farming land, approximately 200 m upstream of the confluence with Dart Brook (Figure 1, Plate 1). Vegetation of the riparian zone is relatively dense, mostly comprised by River Oak and Willow trees interspersed by Balloon Vine, Giant Reed, Bamboo and Trad in areas that had not been scoured from the bank by recent high flows. At the time of the autumn 2026 survey, the sedge, *Cyperus eragrostis*, was also relatively abundant. The river was flowing. Water clarity at HR1 was good. The RCE score was 41 (79%) in autumn 2026 (range = 38/73% to 43/83%).



Plate 1: Hunter River – Site HR1 (au-26)
View upstream



Plate 2: Hunter River – Site HR1 (au-26)
View downstream

Site HR2, a large pool up to approximately 25 m wide and 1.6 m deep (Plate 3&4), is situated approximately 900 m downstream of the confluence of the Hunter River with Dart Brook (Figure 1). The substratum in the edge habitat has consistently been predominantly cobble, gravel and pebble overlayed with a sandy-silt matrix. Riparian vegetation mostly consisted of occasional River Oak and Willow trees with Giant Reed, Balloon Vine, Trad, Bamboo, exotic grasses and native species, including *Persicaria decipiens*, *Typha* spp. and *Schoenoplectus validus* (Plate 3&4). At the time of the autumn 2026 survey, water clarity was good and flow moderate to high. This site was given an RCE score of 40 (77%) in autumn 2026 (range = 37/71% to 45/87%).

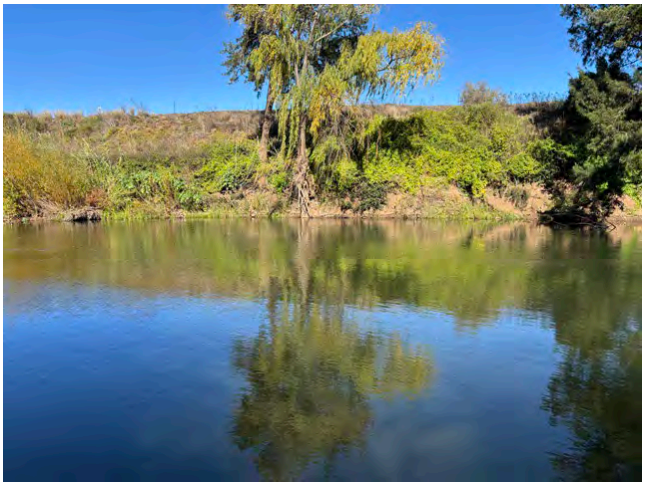

Plate 3: Hunter River – Site HR2 (au-26)
View across-stream



Plate 4: Hunter River – Site HR2 (au-26)
View downstream

Hunter River adjacent to the MPO (HR3 & HR4)

Site HR3 is situated approximately 6.8 km downstream of Site HR2 (Figure 1). Similar to the upstream sites, riparian vegetation was mostly comprised by River Oaks, Willows and scattered Eucalypts. Giant reed was also relatively abundant. A considerable proportion of the exotic plant understorey scoured by floodwaters during late 2021 has mostly recovered (Plates 5&6).

The river channel at Site HR3 is up to approximately 14 m wide and 1.1 m deep. Substratum in the edge habitat was predominantly composed of gravel (approximately 70 %) with a mixture of sand and silt. Large woody debris was relatively abundant within the channel, particularly adjacent to the left bank (facing downstream) (Plates 5 & 6). *Cyperus* sp., *Persicaria decipiens* and *Schoenoplectus validus* were relatively common. Water clarity was good and flow moderate to high. This site was given an RCE score of 39 (75%) in autumn 2026 (range = 37/71% to 42/81%).



Plate 5: Hunter River – Site HR3 (au-26)
View across-stream



Plate 6: Hunter River – Site HR3 (au-26)
View upstream

Site HR4 is situated near the Water Treatment Plant at Muswellbrook and the inlet to the approved water pipeline between the Hunter River and the MPO Mine Water Dam. The study reach consists of long pools up to 10.5 m wide with infrequent short riffles.

The riverbanks are stabilised by trees (mostly Willow and River Oak) and shrubs (including Balloon Vine and Bamboo). During the autumn 2025 survey, two large willow trees were observed to have fallen into the river, likely as a result of recent high river flows (see Plates 7 & 8). Large woody debris has always been common alongside the stream banks.

The substratum in the edge habitat is predominantly gravel and cobble with boulders, pebble and silty sand. *Cyperus* sp., and *Persicaria decipiens* were relatively common. The submerged macrophytes, Clasped Pondweed (*Potamogeton perfoliatus*) and *Myriophyllum* sp., have commonly been observed at this site. At the time of the current survey, water clarity was good and water level high. This site obtained an RCE score of 41 (79%) (range = 39/75% to 43/83%).



Plate 7: Hunter River – Site HR4 (au-26)
View across-stream



Plate 8: Hunter River – Site HR4 (au-26)
View upstream

Hunter River downstream of the MPO (HR5 and HR6)

Site HR5 is situated immediately downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). This site consists of a long, relatively deep pool with a small area of riffle habitat at the top of the site (Plates 9&10). River Oaks, Willows and scattered Eucalypts are present along the stream bank. The Caster oil plant

Willows and large accumulations of woody debris were common along the river channel and banks. Balloon Vine is once again common along either bank, as well as Giant Reed, Typha and *Persicaria decipiens*. The substratum in the edge habitat is predominantly a gravel-pebble matrix with a silt overlay.

Submerged macrophytes have not been recorded at this site. At the time of this survey and surveys done since autumn and 2023, carp were seen feeding near the stream bank. Water clarity was good and flow moderate (Plates 9&10). This site was given an RCE score of 41 (79%) in autumn 2026 (range = 36/69% to 44/85%).



Plate 9: Hunter River – Site HR5 (au-26)
View upstream



Plate 10: Hunter River – Site HR5 (au-26)
View across-stream

Site HR6 is situated approximately 4 km downstream of the proposed discharge point from the MPO and the discharge point from Bengalla Coal Mine (Figure 2). The width of the riparian strip is relatively narrow (i.e. between 5 and 30 m) and comprised by mixed native and exotic trees and shrubs (Plates 11&12). This site consists of a long, relatively deep pool with a short section of riffle habitat at the top of the study reach (Plates 11&12). The substratum in the edge habitat is predominantly a gravel matrix overlayed with silt.

At the time of the current survey, flow and water level were elevated while water clarity was good (Plates 11&12). Balloon Vine is once again common along either bank, as well as Giant Reed, Typha and *Persicaria decipiens*. There were signs of recent collapse of a section of the stream bank and Willows into the river channel. This site was given an RCE score of 42 (81%) in autumn 2026 (range = 38/73% to 42/81%).



Plate 11: Hunter River – Site HR6 (au-26)
View upstream



Plate 12: Hunter River – Site HR6 (au-26)
View downstream

3.1.2 Hunter River Tributaries

Due to the highly ephemeral nature of drainage lines within the MPO's ML boundaries, stream health monitoring locations were chosen in tributaries with more reliable flows to the Hunter River, consequently outside of the MPO boundary.

Muscle Creek

The site sampled on Muscle Creek is situated on the floodplain approximately 1 km upstream of the confluence with the Hunter River (Figure 2). It consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook.

The stream channel is highly modified, particularly in the downstream reaches of the study site, with large boulders used in places to stabilise the stream bank (Plates 13&14). Trees have been planted along both sides of the creek to help stabilise the banks. Emergent macrophytes, including Typha, Phragmites, Mat Rush and *Scirpus validis* were moderately abundant along the stream bank and in-stream (Plates 13&14). *Lomandra longifolia* and *Persicaria decipiens* were also common, as was Balloon Vine, Trad and exotic grasses.

The average stream width is approximately 10 m with a depth of up to approximately 1.5 m. The substratum is mostly comprised by a gravel/cobble/pebble matrix covered by silt and fine sand. Accumulations of green macro-algae and epiphytic cover of rocks in shallower water were also common, which is often an indicator of nutrient enrichment.

At the time of the autumn 2026 survey, there was flow along the study reach. Water clarity was fair at the time of sampling. The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification. The site received an RCE score of 32 (62%) in autumn 2026. The RCE score has ranged between 21 (40%) and 34 (65%).



Plate 13: Muscle Creek – Site MC (au-26)
View upstream



Plate 14: Muscle Creek– Site MC (au-26)
View downstream

Sandy Creek

The site sampled on Sandy Creek is located downstream of the MPO and upstream of the Mangoola Coal Operations (Figure 2). Wybong Road bridge crosses the stream at the bottom of the study reach. The stream banks at the survey site are approximately 3 m high and heavily disturbed on either side by historical agricultural activities. Wombat burrows were also present. The stream channel commonly ranges from about 1 m to greater than 7 m wide, with an average of around 5 m (Plates 15&16).

Unlike the findings from surveys done between spring 2017 and spring 2022, the channel connecting pools along the study reach was inundated although there was no apparent flow (Plates 15&16). Typha had colonised a large proportion of the channel since the previous survey. The substratum is dominated by poorly sorted gravel overlain by fine-grained sediments and clay with occasional cobbles.

An algal bloom in the large pool at the top of the site was suggestive of nutrient enrichment. The pool substratum was covered by a thin layer of fine silt.

The site is classified as Class 1, Type 1 fish habitat according to the DPI (2013) classification and scored an RCE value of 33 (63%) in autumn 2026. The RCE score has ranged between 21/40% and 36/69%. The higher score has been due to inundation and recovery of flow along the stream channel and increased vegetation along the stream bank after drought and stream bank erosion.



Plate 15: Sandy Creek – Site SC (au-25)
View upstream



Plate 16: Sandy Creek– Site SC (au-25)
View upstream

Dart Brook

Sampling site Dart Brook was chosen near a road crossing approximately 700 m upstream from the confluence with the Hunter River. The surrounding land use was mostly agriculture. This site consists of pools up to 6.4 m wide and 1.2 m deep and a run at the downstream end (Plates 17&18). The bed is dominated by poorly sorted gravel overlain by sand and silt with occasional boulders. The stream banks are composed of cohesive fine-grained sediments with gravel. Emergent macrophytes included Typha, River Club-Rush (*Schoenoplectus validus),* Phragmites and Umbrella sedge (*Cyperus eragrostis*).

At the time of the autumn 2026 survey, water clarity was fair (Plate 17&18). Fallen trees, woody debris and exotic weeds were common along the stream bank. Balloon vine appeared to have increased its distribution along both sides of the stream bank. The site is classified as Class 1, Type 1 fish habitat according to the DPI NSW (2013) classification. It received an RCE score of 37 (71%) in autumn 2026. Previously, the RCE scores have ranged between 32 (62%) and 41 (79%) (between the spring 2017 and spring 2025 surveys).



Plate 17: Dart Brook – Site DB (au-26)
View upstream



Plate 18: Dart Brook – Site DB (au-26)
Australian bass caught electrofishing

3.2 Water Quality

Mean physico-chemical water quality measurements from spring 2017 to autumn 2026 are summarised in Table 4. Values highlighted in bold type indicate where results were outside the appropriate default trigger values (DTVs) recommended by ANZECC/ARMCANZ (2000). Where appropriate, pH and conductivity data were also compared with site specific trigger criteria[2].

The main findings for the autumn 2026 survey are summarised as follows:

- Mean water temperature ranged from 13.7 (Site SC) to 17.6 °C (Site HR3 & HR4). Water temperatures have ranged from 12.5 to 25.4 °C in edge habitats throughout the survey period.
- pH levels (range = 8.9 to 9.7) exceeded the upper DTVs recommended by the ANZECC/ARMCANZ (2000) guidelines at all sites.
- Mean conductivity levels (range = 350 to 6,277 µS/cm) exceeded the upper DTV at sites HR2, DB, MC and SC. Notably:
    - Conductivity measured at Site HR1 (range = 256 to 843 µS/cm) and Site HR2 (range = 267 to 800 µS/cm) during autumn 2026 did not exceed the site-specific criteria established for those site's (i.e., 589 µS/cm[2])[2]

[2] Using the approach recommended by ANZECC & ARMCANZ (2000), surface water quality trigger levels were developed at two sites (W1: situated between Site HR1 and HR2; and W6: situated at HR3) situated within the Hunter River (MACH Energy, 2018). Sites W1 and W6 are sampled monthly and during rain events by AECOM. The 80th percentile trigger values for pH and conductivity (EC) are: Site W1: pH = 7.8 – 8.3, EC = 589 µS/cm; Site W6: pH = 7.8-8.4, EC = 496 µS/cm.

    - Conductivity measured at Site DB in autumn 2026 (i.e., 2,935 µS/cm) was within the range collected by surveys done at that site since spring 2017 (range = 980 to 5,905 µS/cm), as was conductivity measured at Site SC (6,277 µS/cm) (i.e. range = 914 to 11,200 µS/cm)
    - Conductivity measured at Site MC (range = 710 to 2,957 µS/cm) did not exceed the upper guideline value in autumn 2026 (i.e., 2,111 µS/cm).
- Dissolved oxygen levels (range = 48 to 104.5 % saturation) were below the lower DTVs at sites HR1, MC and DB.
- Turbidity levels (range = 8.5 to 31.4 NTU) were within the recommended DTVs at all sites at the time of the autumn 2026 survey (Table 4)

The raw water quality data are provided in Appendix 3.

Table 4. Mean (+ SE) values of water quality variables recorded between spring 2017 and autumn 2026.

Variable	DTV[3]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR1											
Temperature °C		22.4 (0.0)	17.1 (0.0)	20.2 (0.0)	15.5 (0.0)	19.6	13.3 (0.0)	N/R	17.3 (0.0)	19.2 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.3** (0.0)	**8.6** (0.0)	**8.1** (0.0)	**8.1** (0.0)	**8.29**	**8.6** (0.0)	**8.7** (0.0)	8.0 (0.0)	7.0 (0.0)	8.3 (0.0)
EC (µS/cm)	30 – 350	264 (0.0)	256 (0.0)	276 (0.3)	321 (0.0)	**356**	**445** (0.3)	**528** (0.0)	**528** (0.0)	**622.0** (0.0)	**720** (0.9)
DO (% Sat)	90–110	95.5 (0.4)	93.7 (0.0)	95.4 (0.1)	**87.6** (0.1)	108.2	**75.1** (0.2)	97.8 (0.0)	92.6 (0.2)	**75.8** (0.2)	94.6 (0.0)
Turbidity (NTU)	< 50	16.4 (1.4)	**44.6** (0.4)	13.8 (0.3)	**42.6** (0.9)	2.9	**98.6** (3.2)	14.9 (1.0)	**38.9** (0.5)	9.7 (0.3)	8.8 (0.3)
Site HR2											
Temperature °C		22.9 (0.0)	16.2 (0.0)	19.3 (0.0)	15.7 (0.0)	22.1	13.4 (0.1)	N/R	17.4 (0.0)	19.5 (0.0)	17.0 (0.0)
pH	6.5 – 8.0	**8.2** (0.0)	**8.5** (0.0)	**8.2** (0.1)	7.9 (0.0)	**8.3**	**8.3** (0.1)	**8.5** (0.0)	7.9 (0.0)	7.1 (0.0)	**8.3** (0.0)
EC (µS/cm)	30 – 350	267 (1.3)	311 (0.0)	276 (0.0)	323 (2.2)	**387**	**474** (7.0)	**534** (0.0)	**629** (0.0)	**658.0** (0.0)	**800** (0.0)
DO (% Sat)	90–110	**141.2** (3.6)	**85.8** (0.1)	92.5 (0.2)	**89.3** (0.5)	97.8	**59.5** (0.5)	**81.2** (0.3)	**89.4** (0.1)	**72.9** (0.2)	92.1 (0.0)
Turbidity (NTU)	< 50	**26.7** (1.2)	**43.2** (0.2)	12.8 (0.2)	**43.8** (0.7)	2.6	**118.7** (1.2)	**59.7** (0.2)	10.6 (0.4)	14.7 (1.3)	14.7 (0.5)
Site HR3											
Temperature °C		24.7 (0.0)	16.1 (0.0)	18.7 (0.0)	14.5 (0.0)	21.7	13.7 (0.0)	N/R	16.8 (0.0)	21.8 (0.0)	16.9 (0.0)
pH	6.5 – 8.5	8.2 (0.0)	**8.6** (0.0)	7.9 (0.0)	7.7 (0.0)	8.27	**8.7** (0.0)	**8.8** (0.0)	8.0 (0.0)	7.5 (0.0)	8.3 (0.0)
EC (µS/cm)	125–2,200	272 (1.3)	266 (0.0)	313 (0.0)	329 (0.0)	357	419 (0.0)	540 (0.0)	640 (0.3)	633.0 (0.0)	815 (0.3)
DO (% Sat)	85 – 110	101.7 (0.5)	85.7 (0.1)	**80.9** (0.1)	**72.3** (0.1)	**115.1**	**81.8** (0.1)	91.2 (0.2)	**81.0** (0.1)	93.4 (0.1)	91.6 (0.1)
Turbidity (NTU)	< 50	46.4 (0.3)	49.4 (0.2)	6.9 (0.2)	18.9 (0.8)	3.3	45.0 (0.0)	26.2 (2.1)	23.4 (1.0)	19.4 (1.0)	14.7 (0.3)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[3] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers will be used for these sites here and for subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[4]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25	Aut-26		
Site HR1											
Temperature °C		13.8 (0.0)	17.8 (0.0)	22.2 (0.0)	17.9 (0.0)	17.1 (0.0)	19.0 (0.0)	20.1 (0.0)	15.3 (0.0)		
pH	6.5 – 8.0	**8.1** (0.0)	**8.2** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)	**8.9** (0.0)	**9.7** (0.01)		
EC (µS/cm)	30 – 350	**382** (2.0)	**843.0** (0.0)	307 (0.0)	**418.0** (0.0)	**630** (0.3)	**378** (0.0)	**747** (0.0)	350 (0.6)		
DO (% Sat)	90–110	97.7 (0.2)	109.9 (0.0)	**21.6** (0.1)	104.2 (0.2)	**81.2** (0.7)	93.4 (0.1)	**82.8** (0.9)	**87.4** (0.0)		
Turbidity (NTU)	< 50	2.5 (0.1)	1.8 (0.0)	5.5 (0.5)	5.7 (0.0)	10.7 (0.2)	8.3 (0.0)	11.0 (0.5)	31.4 (1.3)		
Site HR2											
Temperature °C		14.1 (0.0)	17.5 (0.0)	22.0 (0.0)	17.7 (0.0)	17.1 (0.0)	19.2 (0.0)	20.6 (0.0)	15.3 (0.0)		
pH	6.5 – 8.0	**8.1** (0.0)	**8.1** (0.0)	**8.3** (0.0)	7.9 (0.0)	8.0 (0.0)	7.3 (0.0)	**9.1** (0.0)	**9.4** (0.0)		
EC (µS/cm)	30 – 350	**409** (2.0)	**997.0** (0.0)	**485** (0.3)	**436.3** (0.3)	**714.3** (0.3)	**403** (0.3)	**824** (0.3)	**361** (0.0)		
DO (% Sat)	90–110	92.3 (0.2)	108.6 (0.1)	**20.2** (0.3)	90.9 (0.1)	**81.3** (0.5)	99.5 (1.5)	**87.9** (1.6)	93.1 (0.07)		
Turbidity (NTU)	< 50	2.8 (0.4)	1.4 (0.0)	6.0 (0.2)	10.4 (0.7)	12.5 (0.2)	8.3 (0.2)	12.2 (0.2)	10.9 (0.09)		
Site HR3											
Temperature °C		15.9 (0.0)	18.6 (0.0)	22.1 (0.0)	18.9 (0.0)	17.1 (0.0)	19.3 (0.0)	21.7 (0.0)	17.6 (0.01)		
pH	6.5 – 8.5	7.9 (0.0)	8.2 (0.0)	8.2 (0.0)	7.8 (0.0)	7.9 (0.0)	7.5 (0.0)	**9.0** (0.0)	**9.2** (0.01)		
EC (µS/cm)	125–2,200	490 (3.2)	1018 (0.0)	515 (1.0)	436.7 (0.3)	734.7 (0.3)	406 (0.3)	830 (0.0)	367 (0.3)		
DO (% Sat)	85 – 110	104.8 (1.1)	113.8 (0.2)	**19.6** (0.4)	108.3 (0.1)	**76.6** (0.2)	103 (1.5)	107 (7.4)	96.0 (0.1)		
Turbidity (NTU)	< 50	**5.2** (0.0)	3.0 (0.1)	13.1 (0.2)	10.2 (0.2)	16.7 (0.3)	9.2 (0.2)	15.9 (0.1)	10.7 (0.5)		

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for HR1 and HR2 and in lowland rivers (i.e. < 150 m altitude) for HR3.

[4] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[5]	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-22
Site HR4											
Temperature °C		24.6 (0.0)	16.6 (0.0)	21.5 (0.0)	15.2 (0.0)	22.2	13.9 (0.0)	N/R	17.0 (0.0)	22.2 (0.0)	16.7 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.4 (0.0)	8.0 (0.0)	7.7 (0.0)	8.24	8.3 (0.0)	8.5 (0.0)	7.9 (0.0)	7.2 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	296 (1.3)	274 (20.0)	290 (0.0)	368 (1.7)	361	467.0 (0.0)	1,610 (0.0)	623 (0.3)	669.0 (0.0)	861 (0.0)
DO (% Sat)	85 – 110	93.2 (0.6)	100.0 (0.2)	101.0 (0.1)	**79.3** (0.1)	**120.8**	**61.6** (0.0)	**58.2** (0.1)	**83.4** (0.2)	85.1 (0.0)	88.3 (0.0)
Turbidity (NTU)	< 50	26.5 (0.9)	**55.7** (0.1)	28.5 (0.4)	**51.7** (0.7)	6.7	46.0 (0.3)	28.2 (0.2)	12.0 (1.4)	17.7 (0.1)	18.2 (0.1)
Site HR5											
Temperature °C		25.4 (0.0)	15.5 (0.0)	22.3 (0.1)	15.3 (0.0)	22.3	14.8 (0.0)	N/R	17.1 (0.0)	21.3 (0.1)	16.6 (0.0)
pH	6.5 – 8.5	7.9 (0.0)	8.5 (0.0)	7.7 (0.0)	7.8 (0.0)	8.08	8.4 (0.0)	**8.7** (0.0)	7.9 (0.0)	6.6 (0.0)	8.2 (0.0)
EC (µS/cm)	125–2,200	318 (1.3)	338 (2.0)	322 (0.9)	424 (0.0)	365	407.3 (0.7)	657 (18.0)	669 (0.0)	698.7 (0.3)	908 (0.3)
DO (% Sat)	85 – 110	**66.5** (0.8)	90.3 (0.6)	89.5 (0.2)	**79.7** (0.7)	107.9	**56.2** (0.1)	**61.7** (0.2)	**77.5** (0.1)	**67.5** (1.1)	86.6 (0.0)
Turbidity (NTU)	< 50	30.5 (0.5)	**57.2** (0.2)	35.3 (0.1)	45.2 (1.4)	6.8	**68.8** (1.4)	44.6 (0.7)	12.1 (0.3)	26.8 (1.7)	16.9 (0.4)
Site HR6											
Temperature °C		25.9 (0.0)	17.0 (0.1)	22.5 (0.0)	15.9 (0.0)	22.2	14.9 (0.0)	N/R	16.9 (0.0)	21.5 (0.0)	16.4 (0.0)
pH	6.5 – 8.5	8.1 (0.0)	8.4 (0.0)	7.8 (0.0)	7.9 (0.0)	8.07	8.5 (0.0)	**8.9** (0.0)	7.9 (0.0)	7.2 (0.1)	8.3 (0.0)
EC (µS/cm)	125–2,200	329 (0.0)	331 (1.2)	321 (0.3)	448 (0.0)	364	387.3 (0.3)	636.0 (0.6)	739 (0.3)	715.0 (0.0)	914 (0.3)
DO (% Sat)	85 – 110	**74.7** (0.0)	**83.8** (0.6)	100.8 (0.3)	91.7 (1.5)	107	**72.2** (0.0)	**57.1** (1.0)	**73.0** (0.2)	**78.6** (0.1)	88.9 (0.0)
Turbidity (NTU)	< 50	35.3 (0.8)	**59.1** (0.6)	34.3 (0.2)	35.8 (0.5)	12.7	41.6 (0.3)	23.4 (1.2)	6.5 (0.3)	22.2 (0.2)	17.8 (0.4)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in lowland rivers (i.e. systems at < 150 m altitude) in southeast Australia.

[5] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[6]	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25	Aut-26		
Site HR4											
Temperature °C		15.7 (0.0)	17.2 (0.0)	22.2 (0.0)	18.4 (0.0)	17.0 (0.0)	19.2 (0.0)	20.2 (0.0)	17.6 (0.0)		
pH	6.5 – 8.5	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)	7.7 (0.0)	7.8 (0.0)	7.9 (0.0)	**9.3** (0.0)	**8.9** (0.0)		
EC (µS/cm)	125–2,200	393 (0.0)	1111 (0.0)	604 (9.8)	460.3 (0.3)	770.7 (0.3)	414.0 (0.0)	879 (0.0)	387.7 (0.3)		
DO (% Sat)	85 – 110	95.0 (0.1)	106.0 (0.0)	**18.7** (0.6)	97.5 (0.1)	**76.7** (0.2)	106.0 (0.7)	88.9 (2.8)	99.3 (0.1)		
Turbidity (NTU)	< 50	7.9 (0.2)	2.6 (0.0)	10.3 (0.3)	12.2 (0.3)	22.9 (1.3)	7.4 (0.2)	13.4 (0.2)	12.4 (0.2)		
Site HR5											
Temperature °C		15.7 (0.0)	16.8 (0.0)	21.3 (0.0)	17.9 (0.0)	17.5 (0.0)	18.5 (0.1)	20.2 (0.0)	17.0 (0.02)		
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.2 (0.0)	7.7 (0.0)	7.9 (0.0)	8.1* (0.0)	**9.9** (0.0)	**9.0** (0.0)		
EC (µS/cm)	125–2,200	455 (7.0)	1272 (0.3)	680 (0.3)	492.3 (0.7)	869.0 (0.0)	419.0 (0.0)	904 (0.0)	417.0 (0.6)		
DO (% Sat)	85 – 110	N/R	99.4 (0.0)	**15.4** (0.4)	88.9 (0.0)	**74.7** (0.3)	**118.7** (0.4)	87.0 (7.7)	98.2 (0.4)		
Turbidity (NTU)	< 50	6.9 (0.2)	5.7 (0.1)	19.9 (0.7)	22.7 (0.1)	26.8 (0.6)	10.1 (0.4)	13.1 (0.2)	12.6 (0.2)		
Site HR6											
Temperature °C		15.6 (0.0)	17.0 (0.0)	21.3 (0.1)	17.7 (0.0)	17.2 (0.0)	18.8 (0.0)	20.2 (0.0)	15.8 (0.0)		
pH	6.5 – 8.5	7.9 (0.0)	8.1 (0.0)	8.1 (0.0)	7.8 (0.0)	7.7 (0.0)	8.2* (0.0)	**9.4** (0.0)	**9.3** (0.01)		
EC (µS/cm)	125–2,200	423 (0.0)	1299 (1.2)	730 (0.3)	493.7 (0.3)	917.7 (0.3)	422.7 (0.3)	919 (0.3)	417.0 (0.0)		
DO (% Sat)	85 – 110	N/R	96.5 (0.1)	**16.7** (0.1)	90.2 (0.1)	**66.2** (0.1)	95.4 (0.0)	**71.7** (0.4)	104.5 (0.1)		
Turbidity (NTU)	< 50	6.2 (0.1)	3.3 (0.1)	20.3 (0.2)	18.8 (0.6)	32.0 (0.5)	10.7 (0.4)	15.1 (0.0)	15.7 (0.1)		

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

- pH measurements appear to be out by 1 pH unit

N/R = Not Recorded

[6] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[7].	Sp-17	Aut-18	Sp-18	Aut-19	Sp-19[#]	Aut-20	Sp-20	Aut-21	Sp-21	Aut-21
DB											
Temperature °C		25.1 (0.0)	12.6 (0.0)	22.1 (0.1)	13.5 (0.0)	20.3	12.5 (0.0)	N/R	16.2 (0.0)	20.8 (0.0)	17.1 (0.0)
pH	6.5 – 8.0	**8.1** (0.0)	**8.8** (0.0)	**8.2** (0.0)	8.0 (0.0)	**8.24**	**8.4** (0.0)	**8.4** (0.0)	8.0 (0.0)	7.1 (0.0)	**8.1** (0.0)
EC (µS/cm)	30 – 350	**4,257** (1.3)	**5,905** (5.0)	**4,400** (0.0)	**3,648** (0.6)	**5,210**	**1,230** (0.6)	**980** (0.0)	**1014** (0.3)	**914.0** (0.0)	**1013 (0.0)**
DO (% Sat)	90–110	**64.2** (0.8)	**60.5** (0.3)	**88.7** (0.4)	**54.9** (0.2)	**63.9**	**73.9** (0.2)	**56.6** (0.2)	**72.6** (0.0)	**73.2** (0.0)	**88.0 (0.0)**
Turbidity (NTU)	< 25	24.2 (0.5)	**52.4** (0.7)	**26.5** (0.7)	**53.2** (0.4)	**31**	**31.4** (0.8)	19.9 (0.2)	**40.0** (0.1)	32.8 (0.1)	23.6 (0.4)
MC											
Temperature °C		23.3 (0.0)	15.1 (0.0)	23.9 (0.0)	15.0 (0.0)	24.5	14.1 (0.0)	N/R	16.4 (0.0)	21.9 (0.0)	16.1 (0.0)
pH	6.5 – 8.5	7.7 (0.2)	**8.3** (0.0)	7.7 (0.0)	7.5 (0.0)	7.79	8.0 (0.0)	8.4 (0.0)	7.6 (0.0)	6.7 (0.0)	8.0 (0.0)
EC (µS/cm)	125–2,200	1589 (2.6)	1406 (15)	1232 (1.0)	1517 (0.3)	1327	1599 (0.0)	1163 (0.0)	1872 (0.3)	1592 (2.9)	2113 (0.3)
DO (% Sat)	85 – 110	86.6 (0.1)	**83.9** (0.1)	107.3 (0.2)	**52.5** (0.2)	**113.9**	**40.3** (0.0)	**41.3** (0.1)	**64.6** (0.2)	**57.0** (0.1)	**83.0** (0.0)
Turbidity (NTU)	< 50	26.9 (0.9)	**45.8** (0.1)	23.5 (0.7)	**42.2** (2.1)	2.7	35.9 (0.0)	**4.6** (0.0)	15.3 (0.3)	4.3 (0.1)	14.6 (0.2)
SC											
Temperature °C		21.1 (0.0)	14.1 (0.1)	17.3 (0.0)	12.9 (0.0)	22	12.8 (0.0)	N/R	13.9 (0.0)	18.3 (0.0)	15.7 (0.0)
pH	6.5 – 8.0	**8.5** (0.0)	**8.6** (0.0)	8.0 (0.0)	7.9 (0.0)	7.91	**8.8** (0.0)	**8.9** (0.0)	7.7 (0.0)	7.6 (0.0)	**8.4** (0.0)
EC (µS/cm)	30 – 350	**8,000** (0.0)	**8,027** (0.3)	**9,600** (0.0)	**7,064** (13)	**11,200**	**3,006** (0.6)	**6,068** (0.3)	**4,326** (0.3)	**914.0** (0.0)	**4299** (0.3)
DO (% Sat)	90–110	**43.7** (0.0)	**49.0** (5.3)	**10.9** (0.0)	**40.8** (1.4)	**39.1**	**73.4** (0.0)	**39.6** (0.0)	**39.6** (0.1)	94.4 (0.5)	**75.6** (0.0)
Turbidity (NTU)	< 25	10.1 (0.1)	**77.1** (5.2)	4.8 (0.2)	**28.0** (0.2)	2.1	18.8 (0.3)	8.0 (0.1)	1.1 (0.0)	16.8 (0.1)	3.5 0.0)

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.

NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[7] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

Table 4. (Cont'd).

Variable	DTV[8].	Sp-22	Aut-23	Sp-23	Aut-24	Sp-24	Aut-25	Sp-25	Aut-26		
DB											
Temperature °C		14.6 (0.0)	16.4 (0.7)	18.8 (0.1)	17.5 (0.0)	16.9 (0.0)	18.0 (0.0)	19.9 (0.0)	15.5 (0.0)		
pH	6.5 – 8.0	**8.2** (0.0)	7.9 (0.0)	**8.2** (0.0)	7.6 (0.0)	7.9 (0.0)	7.2 (0.0)	**8.7** (0.0)	**8.9** (0.0)		
EC (µS/cm)	30 – 350	**456** (0.0)	**2,029** (0.0)	**3110** (5.8)	**2,905 (**1.2)	**1,051** (0.0)	**1,350** (0.0)	**1,317** (0.3)	**2,935** (0.6)		
DO (% Sat)	90–110	89.8 (0.1)	**87.8** (0.0)	**23.6** (0.1)	**79.9** (0.3)	**70.6** (0.0)	**83.3** (1.1)	**76.6** (0.1)	**76.4** (0.3)		
Turbidity (NTU)	< 25	3.2 (0.0)	3.7 (0.1)	17.6 (0.5)	**29.1 (**0.3)	14.8 (0.5)	16.1 (0.3)	17.6 (0.1)	12.9 (0.1)		
MC											
Temperature °C		16.1 (0.0)	16.4 (0.0)	19.7 (0.0)	17.2 (0.0)	16.8 (0.0)	18.4 (0.0)	21.0 (0.0)	14.4 (0.02)		
pH	6.5 – 8.5	7.5 (0.0)	7.6 (0.0)	7.7 (0.0)	7.4 (0.0)	7.5 (0.0)	7.9 (0.0)	**9.3** (0.0)	**9.1** (0.0)		
EC (µS/cm)	125–2,200	710 (1.9)	**2,799** (0.0)	**2,673** (3.3)	2,000 (0.3)	2,000 (0.0)	**2,957** (0.7)	**2,455** (0.9)	**2,920** (1.5)		
DO (% Sat)	85 – 110	N/R (0.3)	**71.1** (0.0)	**13.5** (0.5)	**63.4** (0.0)	**57.1** (0.2)	**65.0** (0.8)	109 (0.2)	**48.0** (0.1)		
Turbidity (NTU)	< 25	7.8 (0.1)	3.2 (0.0)	13.2 (0.2)	**25.0** (0.1)	21.3 (0.2)	9.2 (0.1)	9.6 (0.5)	13.5 (0.1)		
SC											
Temperature °C		14.6 (0.0)	15.0 (0.0)	17.4 (0.3)	14.9 (0.0)	16.9 (0.0)	16.0 (0.0)	17.0 (0.1)	13.7 (0.0)		
pH	6.5 – 8.0	7.7 (0.0)	7.9 (0.0)	8.0 (0.0)	7.8 (0.0)	7.9 (0.0)	**8.2** (0.0)	**8.5** (0.0)	**9.4** (0.01)		
EC (µS/cm)	30 – 350	**1,481** (1.7)	**4,934** (0.3)	**5,617** (15)	**5,888 (**1.0)	**1,051** (0.0)	**6,054** (1.5)	**4,920** (5.5)	**6,277** (2.2)		
DO (% Sat)	90–110	N/R (0.3)	**65.4** (0.2)	**54.9** (0.2)	**88.4 (0.1)**	**70.6** (0.0)	**128.6** (0.1)	**103.5** (1.3)	92.2 (0.4)		
Turbidity (NTU)	< 25	9.6 (0.0)	1.3 (0.0)	7.6 (0.3)	15.1 (0.5)	14.8 (0.5)	3.5 (0.1)	5.7 (0.1)	8.5 (0.1)		

[#] Replicate measurements of water quality were unable to be collected at the time of the spring 2019 survey, due to technical issues with BA's water quality instrument. Temperature, pH, conductivity and dissolved oxygen measurements were collected using AECOM's water quality instrument. Water samples were collected and sent to ALS Water – Newcastle to be analysed for turbidity.
N/R = Not Recorded. NB Default trigger values are based on the ANZECC/ARMCANZ (2000) guidelines for the protection of slightly disturbed aquatic ecosystems in upland rivers (i.e. systems at > 150 m altitude) in southeast Australia for DB and SC but for lowland rivers (i.e. < 150 m altitude) for MC.

[8] In reports done prior to the autumn 2020 survey, the DTVs were based on the ANZECC/ARMCANZ (2000) guidelines for upland rivers (i.e. >150 m altitude). However, Sites HR3, HR4, HR5, HR6 and MC occur at <150 m altitude. For this reason, guideline values for lowland rivers were used for these sites for the autumn 2020 and subsequent surveys.

3.3 Aquatic Macroinvertebrates

3.3.1 General Findings

A total of 25 taxa were identified from the edge habitat samples collected at the nine sites sampled in autumn 2026 (Appendix 4). The number of taxa ranged from 4 at Site MC and 11 at Site HR1 (Appendix 4). Atyidae (freshwater shrimp) were collected at each of the nine sites sampled, while Dytiscidae (predacious diving beetles) and Chironominae (non-biting midges) were collected at seven sites (Appendix 4). The alien fish, Mosquito fish (*Gambusi*a *holbrooki*), was also collected, at eight of the survey sites, using the AUSRIVAS technique (Appendix 4).

The OE50 scores ranged between 0.14 (HR5 and MC) and 0.29 (HR3 and HR6) (Table 5). At the time of the autumn 2026 survey, all sites were grouped within Band C (Table 4). Band C represents sites well below reference condition (i.e. severely impaired) (Table 5). Taxon with > 0.85 probability of occurrence, but not collected, included the fly larvae family, Tanypodinae, and the mayfly family, Leptophlebiidae, from all sites. Also expected but not collected included the mayfly family, Baetidae, at HR1 and HR5, and the caddisfly family, Leptoceridae, at all sites except Site MC. The SIGNAL 2 scores ranged from 2.67 (Site HR1) to 3.95 (Site DB) (Table 5). The results obtained for all sites (i.e., SIGNAL-2 score = < 4.0) indicate severe pollution (Chessman, 2003).

Table 5. AUSRIVAS outputs for sites sampled (autumn 2026) (n = 1).

Watercourse	BA Site Code	Historical Site Code	No Taxa	SIGNAL-2	OE50	Band
Hunter River	HR1	W1	11	2.67	0.22	C
	HR2	W1	10	3.00	0.28	C
	HR3	Hunt 854	8	2.82	0.29	C
	HR4	Hunt 571	9	2.80	0.28	C
	HR5	W15	5	2.76	0.14	C
	HR6	SW17	6	2.81	0.29	C
Muscle Creek	MC	Hunt 506	4	3.50	0.14	C
Sandy Creek	SC	Sandy 1	8	3.61	0.17	C
Dart Brook	DB	Hunt 585	7	3.95	0.15	C

3.3.2 Stream Health Performance Indicators

Site HR3 has consistently scored below its historical band of impairment score (i.e. Band A – equivalent to AUSRIVAS reference condition) and the score obtained by the baseline survey (i.e. Band B – significantly impaired) (Table 6). Site HR4 has regularly scored below its historical band of impairment score (i.e. Band B) but not below its Baseline band level (i.e. Band C – severely impaired), except at the time of the spring 2023 (Table 6).

Notably, deviations from historical AUSRIVAS band levels have also been recorded at sites sampled at Dart Brook (DB) and Muscle Creek (MC), which are not exposed to mining activities at the MPO (Table 5).

Criteria developed for the MPO sites were based on data collected on a single occasion in the mid-1990s. Given that ecological measurements vary from one place to another, and few ecological variables are constant through time, statistical analyses were used to formally examine trends in the condition of aquatic macroinvertebrate fauna and the stream health performance indicators in Section 3.3.3. To date, formal analyses have not detected any statistically significant changes that could be indicative of an impact associated with the MPO.

Table 6. Band of Impairment Scores (spring 2017 to autumn 2026).

BA Site Code	Historical Site Code	AUSRIVAS Band Levels				
		mid-1990s	Sp17	Aut18	Sp18	Aut19
DB	Hunt 585	B	B	B	C	B
MC	Hunt 506	B	B	C	C	C
HR3	Hunt 854	A	B	C	C	B
HR4	Hunt 571	B	C	C	C	B
		mid-1990s	Sp19	Aut20	Sp20	Aut21
DB	Hunt 585	B	D	C	B	C
MC	Hunt 506	B	C	C	C	B
HR3	Hunt 854	A	C	C	B	B
HR4	Hunt 571	B	C	C	C	C
		mid-1990s	Sp21	Aut22	Sp22	Aut23
DB	Hunt 585	B	B	B	B	C
MC	Hunt 506	B	C	B	C	C
HR3	Hunt 854	A	B	C	C	C
HR4	Hunt 571	B	B	C	C	B
		mid-1990s	Sp23	Au24	Sp24	Au25
DB	Hunt 585	B	C	C	C	C
MC	Hunt 506	B	D	C	C	C
HR3	Hunt 854	A	D	C	C	C
HR4	Hunt 571	B	D	C	C	C
		mid-1990s	Sp25	Au26		
DB	Hunt 585	B	C	C		
MC	Hunt 506	B	B	C		
HR3	Hunt 854	A	C	C		
HR4	Hunt 571	B	B	C		

3.3.3 Changes in Aquatic Macroinvertebrate Fauna

Assemblages

Similar to the findings of previous surveys, PERMANOVA did not detect any evidence to suggest that the structure of assemblages of aquatic macroinvertebrates at locations situated downstream of mining activities at the MPO changed significantly in relation to the control locations (Table 7, Figure 4). Visual examination of the Principal Component Ordination (PCO) shows symbols representing assemblages collected at the Midstream-Impact and Downstream-Impact treatments have changed in a similar manner (i.e., direction and dispersion) as assemblages situated at the Hunter River and Tributary Control reaches, including at the time of the autumn 2026 survey (Figure 4).

Similar to the findings of the previous surveys, SIMPER analyses examining the autumn 2026 data indicated that Corixidae and Atyidae made a considerable contribution to the structure of assemblages within each of the study reaches (Table 8, Figure 4). The aquatic bug, Corixidae, also contributed greatly to assemblages within the Hunter River (Table 7). Chironominae (fly larvae) made important contributions to the structure of assemblages within the impact sites (Table 8, Figure 4). The mayfly larvae, Baetidae, contributed (ranked fifth) to the structure of assemblages within the middle reaches within the Hunter River (Table 8).

Table 7. Summary of PERMANOVA analysis. Bold numbers indicate significant results at $P < 0.05$. Percentages of Components of Variation (% CV) are shown.

Source	*df*	MS	Pseudo-*F*	*P*	%CV
Survey	**17**	**6048**	**3.23**	**0.000**	**22.5**
Treatment	1	7181	1.08	0.362	3.5
Reach(Treatment)	**4**	**7548**	**4.03**	**0.000**	**17.2**
Survey x Treatment	17	1984	1.06	0.346	5.2
Survey x Reach(Treatment)	32	1873	1.14	0.082	10.2
Residual	90	1650			41.3
Total	161				

Table 8. Results of SIMPER analyses indicating the relative contribution of individual taxa to the structure of assemblages of macroinvertebrates at each of the study reaches in autumn 2026.

Taxa	US-Control	MS-Impact	DS-Impact	Tributary-Control
Corixidae	3 (8%)	1 (50 %)	1 (51 %)	
Atyidae	1 (75 %)	2 (14 %)	2 (37 %)	1 (82 %)
Chironominae		3 (14 %)	3 (10 %)	
Gyrinidae		4 (9 %)		
Baetidae		5 (9 %)		
Dytiscidae	2 (10%)			
Palaemonidae				2 (13%)

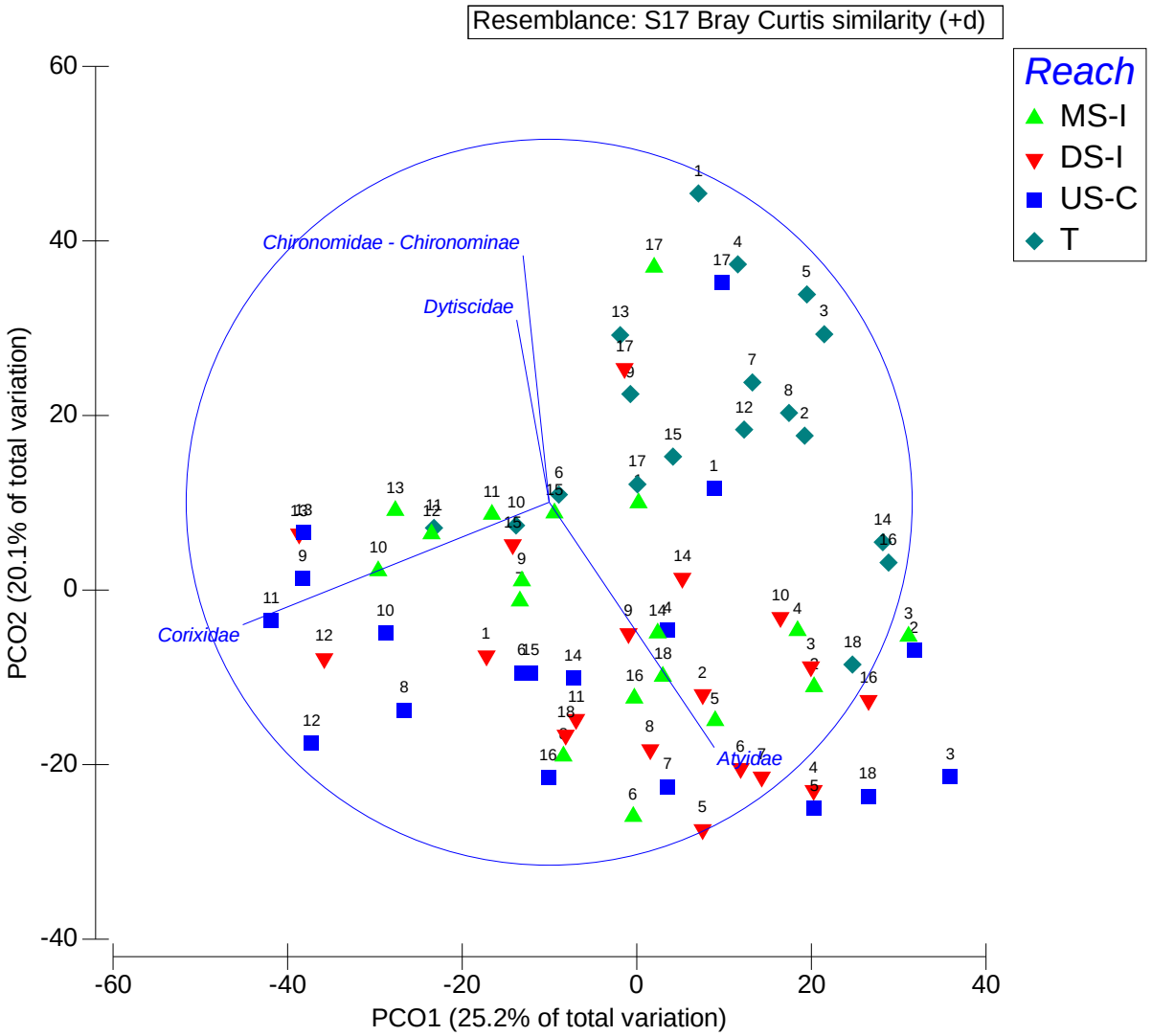

Figure 4. Principal Component Ordination (PCO) of the centroids estimated for AUSRIVAS macroinvertebrate assemblages sampled from edge habitat (MS-I = Midstream-Impact; DS-I = Downstream-Impact; US-C = Upstream-Control; T = Tributary-Control) between spring 2017 (Time 1) and autumn 2026 (Time 18).

Number of Taxa

The mean number of taxa sampled within each 'reach' has ranged from 3.0 (± 1.0) (HR-D in spring 2023 and spring 2022) to 15.5 (± 0.5) (HR-M in autumn 2019) (Figure 5). The PERMANOVA analysis detected significant differences among Surveys and Reaches but no terms were indicative of an impact (i.e. Survey x Treatment) (Table 9, Figure 5). Graphically, fewer taxa have commonly (twelve of sixteen surveys) been collected within the downstream reach situated within the Hunter River (i.e., HR-D) than at the other reaches sampled (Figure 5). Similar numbers of taxa have been collected over time (Figure 5).

Table 9. Summary of PERMANOVA analysis of the Number of Taxa. Bold numbers indicate significant results at *P* < 0.05. T = Time. NB 'Time' is a random factor.

Source	df	MS	Pseudo-*F*	*P*
Survey	**17**	**38.82**	**8.14**	**0.001**
Treatment	1	0.16	0.10	1.000
Reach(Treatment)	**4**	**27.04**	**5.67**	**0.001**
Survey x Treatment	17	5.43	1.14	0.373
Survey x Reach(Treatment)	32	4.77	0.69	0.889
Residual	90	6.94		
Total	161			

OE50 Scores

The OE50 Taxa Scores ranged from 0.07 (±0.0) (HR-D in spring 2023) to 0.75 (±0.03) (HR-M in autumn 2019), indicating that the macroinvertebrate assemblage within the Hunter River have ranged from severely to significantly impaired relative to reference sites selected by the AUSRIVAS model (Figure 6).

Similar to the findings of previous surveys, PERMANOVA detected significant differences among surveys, but no terms were indicative of an impact (Table 10, Figure 6). Graphically, the condition of aquatic macroinvertebrate fauna decreased at each of the reaches sampled between spring 2025 and autumn 2026 (Figure 6). The OE50 scores obtained at the time of the autumn 2026 survey were lower than the values obtained at the time of the spring 2017 survey (Figure 6). Importantly, scores obtained for the reaches situated downstream of mining activities during autumn 2026 were similar to those obtained at the control locations (Figure 6).

Table 10. Summary of PERMANOVA analysis for OE50 Scores. Bold numbers indicate significant results at *P* < 0.05.

Source	*df*	MS	Pseudo-*F*	*P*
Survey	**17**	**0.122**	**7.472**	**0.001**
Treatment	1	0.009	0.463	0.742
Reach(Treatment)	4	0.033	2.008	0.112
Survey x Treatment	17	0.015	0.896	0.581
Survey x Reach(Treatment)	32	0.016	0.937	0.569
Residual	90	0.017		
Total	161			

SIGNAL2 Indices

The mean SIGNAL2 Index ranged from to 2.42 (±0.1) (HR-D in spring 2023) to 4.25 (±0.8) (HR-M in spring 2022) throughout the survey period (Figure 7). SIGNAL 2 values less than 4 indicate that macroinvertebrate assemblages have consistently been dominated by pollution tolerant taxa (Figure 7).

PERMANOVA detected a significant Survey x Reach(Treatment) interaction, but no terms were indicative of an impact (Table 11, Figure 7). Graphically, the SIGNAL 2 scores obtained during autumn 2026 were similar to surveys done previously (Figure 7). Continued low diversity and presence of less pollution tolerant species, particularly mayflies and caddisflies, obtained at those sites and is likely to have contributed to the lower scores.

Table 11. Summary of PERMANOVA analysis. Bold numbers indicate significant results at *P* < 0.05.

Source	df	MS	Pseudo-*F*	*P*
Survey	17	0.65	1.88	0.052
Treatment	1	0.02	0.43	0.791
Reach(Treatment)	4	0.39	1.11	0.362
Survey x Treatment	17	0.20	0.58	0.888
Survey x Reach(Treatment)	**32**	**0.35**	**2.41**	**0.001**
Residual	90	0.14		
Total	161			

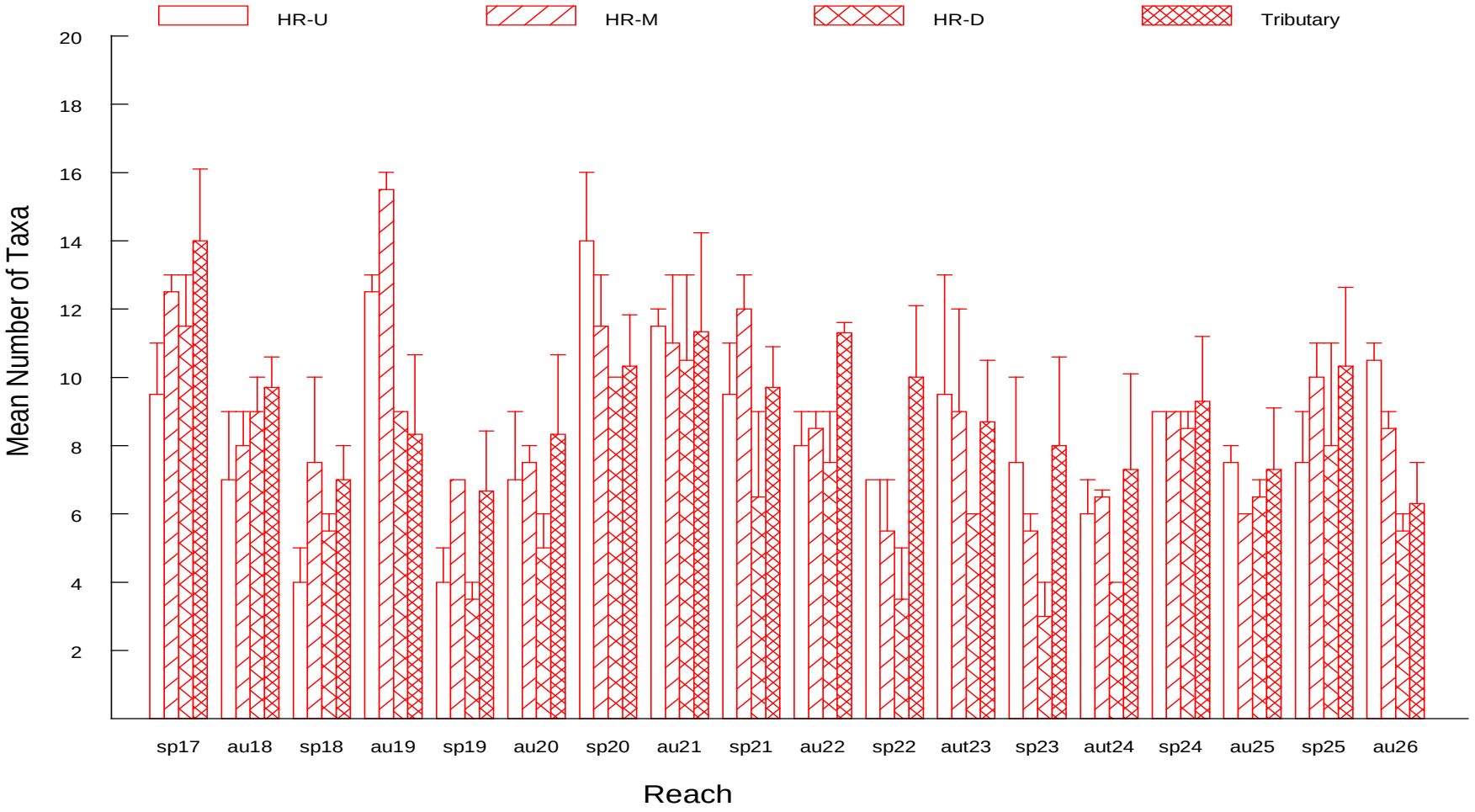

Figure 5. Mean number of taxa collected from edge habitat within the river (n =2 sites) and tributary (n = 3 sites) reaches between spring 2017 and autumn 2026.

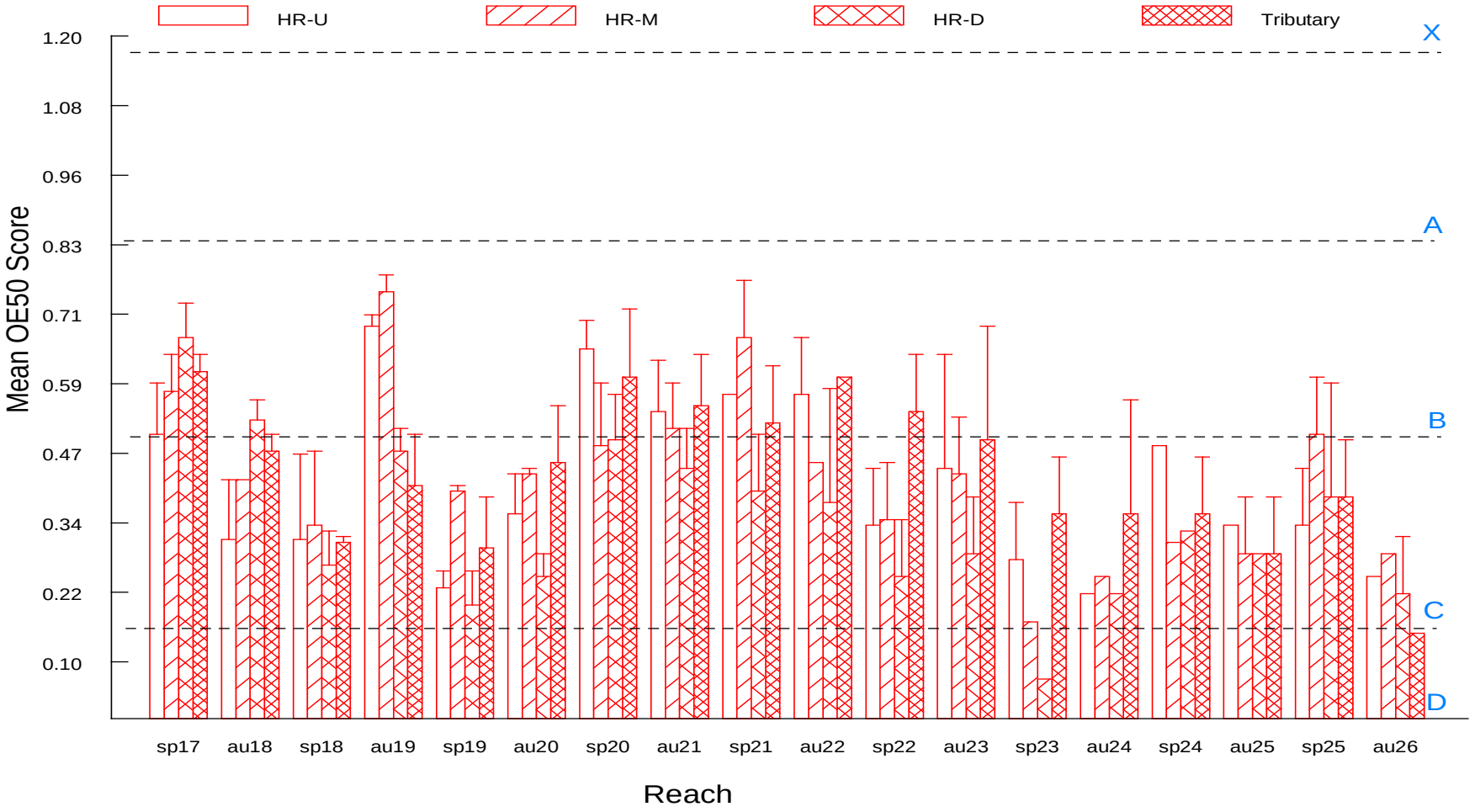

Figure 6. Mean OE50 Taxa Scores and their respective Band Scores (B-C) for AUSRIVAS samples collected between spring 2017 and autumn 2026.



Figure 7. Mean SIGNAL2 Indices for AUSRIVAS samples collected from edge habitat at each site between spring 2017 and autumn 2026.

3.4 Fish

Eight species of fish (including two introduced species), freshwater shrimp and freshwater prawns were recorded at the eight sites able to be sampled for fish at the time of the autumn 2026 survey (Table 12). Eels (ranging between 8-120 cm in length) were observed/caught at two of the six Hunter River sites sampled (i.e. Sites HR-2-4 and HR6), Muscle Creek and Dartbrook (Table 13). Carp (up to ~ 60 cm in length) were caught/observed at Site HR1-3, HR6 and DB (Table 13). Mosquito Fish (*Gambusia holbrooki*) were collected at all sites except Site HR3, at the time of the autumn 2026 survey (Table 12). Freshwater shrimps (Atyidae) and freshwater prawns (Palaemonidae) were also collected.

Altogether, ten[9] species of fish, including eight native and two alien species, have been collected at the sites sampled since spring 2017 (Table 12). Most notably, a platypus (*Ornithorhynchus anatinus*) was collected in a fyke net set at Site HR1 in autumn 2021. Carp, Flat head gudgeon and Australian smelt were collected at Sandy Creek in autumn 2024 (Table 13).

All the species caught have been recorded during previous fish surveys done on the Hunter River (McDowall, 1996; DPI 2006; Howell and Creese, 2010). No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) were recorded in the Study Area on this sampling occasion (Table 12) or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

[9] One dead individual observed at Site HR1 in spring 2019 was incorrectly identified as a Wild goldfish (*Carassius auratus*), instead of Common carp.

Table 12. Species of fish and crustaceans observed and/or collected using a Backpack Electrofisher (at sites HR1-HR6, MC and DB), Fyke nets (HR3 and HR5) and Dip nets (all sites) in autumn 2026 survey (7&8 May 2026).

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB
Anguilla reinhardtii	Long-finned eel		√	√	√		√	√		√
Cyprinus carpio	Common carp*	√	√	√			√			√
Gambusia holbrooki	Mosquito fish*	√	√		√	√	√	√	√	√
Gobiomorphus australis	Striped gudgeon			√						√
Macquaria novemaculeata	Australian bass			√						√
Mugil cephalus	Sea mullet					√				
Retropinna semoni	Australian smelt			√		√				√
Tandanus tandanus	Freshwater catfish		√							
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√	√	√
Palaemonidae sp.	Freshwater prawns	√	√	√	√	√	√	√		√

*Non-native/Alien species.

[A]Unable to be electrofished due to elevated levels of conductivity.

Table 13. Species of fish and crustaceans collected/observed at the survey sites between spring 2017 and autumn 2026.

Species	Common Name	HR1	HR2	HR3	HR4	HR5	HR6	MC	SC[A]	DB[B]
Anguilla reinhardtii	Long-finned eel	√	√	√	√	√	√	√		√
Cyprinus carpio	Common carp*	√	√	√	√	√	√	√		√
Gobiomorphus australis	Striped gudgeon	√	√	√		√	√	√		
Macquaria novemaculeata	Australian bass	√	√	√		√	√			√
Mugil cephalus	Sea mullet		√	√	√	√	√			
Gambusia holbrooki	Mosquito fish*	√	√	√	√	√	√	√	√	√
Philypnodon grandiceps	Flat head gudgeon		√	√		√				
Hypseleotris klunzingeri	Western carp gudgeon				√					
Retropinna semoni	Australian smelt	√	√	√	√	√	√			
Tandanus tandanus	Freshwater catfish	√				√				
Emydura macquarii	Eastern short-neck turtle			√		√	√			
Atyidae sp.	Freshwater shrimps	√	√	√	√	√	√	√	√	√
Palaemonidae sp.	Freshwater prawns	√	√	√	√	√	√	√	√	√

*Non-native/Alien species.

[A]Sandy Creek has not been electrofished due to elevated levels of conductivity.

[B]Dartbrook was unable to be electrofished in autumn 2023, mostly likely due to elevated levels of conductivity

3.5 Groundwater Monitoring

3.5.1 Groundwater Habitat

Of the eight groundwater bores sampled, between approximately 2.5 and 300 L was pumped from the two groundwater systems (Table 10). With the exception of GDE-S, groundwater in the alluvial aquifer was relatively fresh (609 to 1,416 µS/cm) (Table 10). The pH measured in the bores ranged from 7.4 to 9.0 and dissolved oxygen concentrations from 16.0% to 52.21% saturation (Table 7).

3.5.2 Stygofauna Taxa

Two individuals of likely stygofauna, from the family Neoniphargidae (Amphipoda), were collected in the net sample from Bore MP-BH1. This family is known from previous surveys of stygofauna within the Hunter alluvium (Hancock and Boulton, 2008; Hose et al., 2015; ELA, 2013 and 2019), including Bore MP-BH1 (BIO-ANALYSIS, 2025a).

Table 14. Mean (+ SE) Values of Groundwater Quality Recorded in the First and Fifth Bucket and then every Five Buckets Collected from each Bore, where there was sufficient groundwater recharge.

Bore	Date Sampled	Aquifer	Water Level (mbgl)	Volume Pumped (L)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Dissolved Oxygen (% Sat)
MP-BH1	6/5/2026	Alluvium	9.42	300	18.7 (0.2)	7.6 (0.0)	609 (2.2)	27.7 (1.1)
MP-BH1-C	6/5/2026	Alluvium	9.60	60	19.6 (0.2)	8.1 (0.04)	669 (5.3)	22.5 (3.2)
MP-BH1-HR	6/5/2026	Alluvium	30.59	3	19.2 (0.4)	7.9 (0.4)	825.5 (36.5)	35.5 (5.1)
MP-BH2	6/5/2026	Alluvium	12.24	300	21.1 (0.3)	7.4 (0.03)	1,069 (2.3)	52.2 (0.9)
MP-BH2-C	6/5/2026	Alluvium	12.55	300	20.9 (0.1)	9.0 (0.1)	1,416 (44.2)	20.8 (2)
MP-BH2-HR	6/5/2026	Alluvium	12.52	80	21.0 (0.2)	7.9 (0.1)	1,169 (68)	28.7 (4.1)
GDE-D	7/5/2026	Mt Arthur Seam	6.09	150	19.5 (0.2)	7.5 (0.1)	9,082 (243)	16.0 (4.4)
GDE-S	7/5/2026	Alluvium	10.92	150	19.2 (0.2)	7.5 (0.03)	6,831(303.7)	4.9 (1.0)

5.0 DISCUSSION

Discharges at the MPO will be undertaken in accordance with the Hunter River Salinity Trading Scheme (HRSTS) and EPL 20850. MACH Energy currently holds 59 discharge credits as of June 2023. As of June 2023, MPO has an established HRSTS Discharge Point however, no discharges have been made to date. Two Sediment Dam releases were made to the eastern portion of the MPO area, on 8/03/2022 and 21/10/2022.

There has been no flow recorded in the ephemeral waterways that drain the eastern portion of the MPO area to the Hunter River, including Rosebrook Creek, since October 2022.

5.1 Aquatic Habitat

Riparian vegetation at the survey sites sampled within the Hunter River has largely recovered since scouring by flood flows (up to 9.8 m measured at Muswellbrook Bridge in August 2025) occurred prior to the spring 2025 survey. Relatively dense vegetation (including Casuarina and Willow trees) within a large proportion of the riparian strip (between approximately 5 to 30 m wide) continue to help stabilise banks and reduce erosion and sediment mobilisation. At the time of the current survey, the mostly rocky substratum was relatively free of cover by silt and sediments.

Deep pools, large woody debris and rocks continue to provide important habitat for many species of aquatic fauna, including fish. Six species of native fish, including Long-finned eels (*Anguilla reinhardtii*), Australian bass (*Macquaria novemaculeata*), Striped gudgeon (*Gobiomorphus australis*), Sea mullet (*Mugil cephalus*), Australian smelt (*Retropinna semoni*) and Freshwater catfish (*Tandanus tandanus*) were collected by the current survey, confirming that the river and its tributaries (including Dartbrook and Muscle Creek) are providing habitat for native species of fish. Exotic species of fish, including Common carp (*Cyprinus carpio*) and Mosquito fish (*Gambusia holbrooki*) were also common.

The overall condition of riparian habitat at the smaller tributary site at Dart Brook has consistently been classified as ‘moderate’. Although relatively narrow (between 5 and 30 m), mixed native and exotic trees and shrubs are abundant within the riparian strip. A range of habitats available to fish and macroinvertebrates are present, including rocks, logs and emergent macrophytes (including Phragmites, Typha and Mat Rush). Australian bass have

commonly been caught at this site, including at the time of the autumn 2026 survey. Long finned eels and Australian smelt were common.

The Muscle Creek site consists of a highly modified urbanised environment that has been greatly disturbed as a result of the existing rail line and associated rail infrastructure, previous fuel depot, roadways and the township of Muswellbrook. Muswellbrook Shire Council with the support of the local community have been working to rehabilitate the riparian zone within the downstream reaches of the creek. Long finned eels and Mosquito fish have commonly been collected at this site.

The western portion of the MPO lies within the Sandy Creek catchment. Similar to the findings of surveys done since autumn 2023, the stream channel between previously isolated pools was inundated and flow was apparent in autumn 2026, improving connectivity along the creek and salinity (6,277 µS/cm at the time of the autumn 2026 survey compared to 11,200 µS/cm during spring 2019).

5.2 Water Quality

Water quality patterns have generally been consistent with data collected prior to the commencement of operations at the MPO. The pH levels measured at the Hunter River sites continue to show slightly alkaline values, particularly at the upstream sites (i.e., Sites HR1 and HR2). Sites HR1, HR2, HR4-HR6, were above the default trigger values for those sites at the time of the autumn 2026 survey. Similarly, pH levels measured in Dartbrook (range = 7.1 to 8.8), Muscle Creek (range = 6.7 to 9.3) and Sandy Creek (range = 7.6 to 8.9) were elevated at the time of the autumn 2026 survey (i.e., Dartbrook = 8.9; Muscle Creek = 9.1 and Sandy Creek = 9.4).

Electrical conductivity has commonly exceeded the ANZECC/ARMCANZ (2000) guideline value (i.e., 350 µS/cm) at the Hunter River sites situated upstream of the MPO (i.e. Sites HR1 and HR2: range = 256 to 800 µS/cm) and the Tributary sites (Dartbrook: range = 980 to 5,905 µS/cm; Muscle Creek: range = 1163 to 2,957µS/cm; Sandy Creek: range = 914 to 11,000 µS/cm), including prior to commencement of the Project. This is not surprising given that the Hunter River catchment includes a large proportion of salt bearing sedimentary rocks and soils, and surface and underground drainage from this contributes natural salinity to the river

(see Krogh et al., 2013). Notably, electrical conductivity and pH are positively related: increased pH often leads to an increase in ions, enhancing a solutions ability to conduct electricity. Importantly, conductivity levels measured at the sites situated downstream of MPO inputs continue to be within the ANZECC guideline values, and the range in values measured at those sites since the spring 2017 survey.

5.3 Aquatic Macroinvertebrates

Similar to past surveys, a total of 25 taxon were identified from edge habitat samples collected at the survey sites sampled in autumn 2026. Throughout the survey period, the mean number of taxa sampled within each of the study reaches (i.e., HR-U, HR-M, HR-DS and Tributary) has ranged from 3.0 (± 1.0) (HR-D in spring 2023) to 15.5 (± 0.5) (HR-M in autumn 2019).

The relatively low number of species collected by this and previous investigations (including prior to commencement of mining at the MPO), indicate that the macroinvertebrate assemblage has experienced some degree of environmental stress. This is evident in the OE50 Taxa Scores and Band levels obtained.

As discussed previously, lower than expected taxa scores are almost certainly related to the compounding effects from exposure to multiple historical stressors, including flow alteration, sedimentation, salinity, nutrient inputs, hydraulic disturbance and predation by exotic species of fish, including Mosquito fish and Carp which are commonly collected in samples. Nevertheless, some pollution sensitive taxa have commonly been present, such as caddis fly and mayfly families, including at the time of the current survey. Importantly for this stream health study, none of the PERMANOVA tests indicated a change in autumn 2026 that could be attributed to a MPO related impact.

5.4 Fish

The section of the Hunter River within the Study Area is classified as Class 1, Type 1 fish habitat. Altogether ten species of fish have been collected at the sites sampled since spring 2017, including Australian bass, Long-finned eels, Sea mullet, native gudgeons, Australian smelt, Freshwater catfish, Common carp and Mosquito fish. Eastern short-neck turtles and a platypus (*Ornithorhynchus anatinus*) have also been captured and released.

The distribution and abundance of Carp within the Hunter River appears to have increased considerably since the autumn 2023 survey, particularly at Site HR5 on the Hunter River and at Dartbrook where there are shallow areas adjacent to the main channel with fallen trees and vegetated areas. Numbers appear similar to those recorded prior to flood flows during spring 2021.

No threatened species of fish listed under the NSW FM Act or the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) have been observed using electrofishing, fyke nets or bait traps at the sites sampled in the Hunter River, or electrofishing in Muscle Creek, Sandy Creek or Dart Brook by this sampling programme or by previous surveys (McDowall, 1996; DPI NSW 2006; Howell and Creese, 2010).

5.5 Stream Health Performance Indicators

Of the two sites sampled on the Hunter River to assess changes (if any) associated with the MPO, Site HR3 has consistently scored below its indicator criteria (Band A) while Site HR4 (Band B) has scored lower on fourteen out of the eighteen (82%) sampling occasions. Similarly, band of impairment scores obtained at the 'control' sites sampled (i.e. at Muscle Creek and Dart Brook) have been lower than their indicator criteria on numerous occasions. Importantly, formal analyses have not detected any statistically significant changes in the stream health performance indicators that could be indicative of an impact associated with the MPO. Furthermore, the MPO continues to be a nil discharge site. Therefore, it is not considered appropriate for MACH Energy to initiate a stream health investigation under the SGWRP, in accordance with the SWMP.

5.6 Stygofauna Monitoring

With the exception of Bore GDE-S and GD-D, groundwater within the eight bores sampled in in May 2026 was relatively fresh (609 to 1,416 µS/cm). Mean conductivity within groundwater sampled within Bore GDE-S (alluvium) and GDE-D (Mt Arthur seam) measured 6,831 (± 304) µS/cm and 9,082 (± 243) µS/cm, respectively. Two likely stygofauna from the amphipod family, Neoniphargidae, were identified from Bore MP-BH1. These taxa are known from previous surveys of stygofauna within the Hunter River alluvium (Hancock and Boulton, 2008; Hose et al., 2015; ELA, 2013 and 2019; BIO-ANALYSIS, 2020 and 2026).

6.0 CONCLUSIONS & RECOMMENDATIONS

There was no evidence to suggest a change in macroinvertebrate indicators occurred at HR3, HR4, HR5 or HR6 in autumn 2026 that could be associated with the MPO. Where changes occurred, they were comparable with those that occurred upstream at control sites HR1 and HR2 and at the tributary sites (i.e., DB, MC and SC).

The MPO is licenced to discharge via HRSTS but no discharge has been made to date. For these reasons, it is not considered necessary for MACH Energy to initiate a stream health investigation under their Surface and Ground Water Response Plan, particularly since the MPO continues to be a nil discharge site. It is recommended that the stream health monitoring programme is continued using the methods employed for baseline and operation phase surveys, to ensure continuity of the programme.

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APPENDICES

Appendix 1 - GPS positions (UTMs) for stream monitoring sites (autumn 2026).

Watercourse	Site Code	Easting	Northing
Hunter River	HR1	0299756	6435440
	HR2	0299785	6434794
	HR3	0300136	6430786
	HR4	0300739	6429276
	HR5	0293706	6424216
	HR6	0292299	6423021
Dart Brook	DB	0298881	6436241
Muscle Creek	MC	0301148	6427955
Sandy Creek	SC	0289157	6428193

Datum: WGS 84, Zone 56H

Appendix 2 - Riparian Channel & Environment (RCE) Score Sheet

	Descriptor & Category			Descriptor & Category	
1	Land use pattern beyond the immediate riparian zone -Undisturbed native vegetation -Mixed native vegetation and pasture/exotics -Mainly pasture, crops or pine plantation -Urban	 4 3 2 1	8	Riffle/pool sequence -Frequent alternation of riffles and pools -Long pools with infrequent short riffles -Natural channel without riffle/pool sequence -Artificial channel: no riffle/pool sequence	 4 3 2 1
2	Width of riparian strip of woody vegetation - > 30 m -Between 5 and 30 m -< 5 m -No woody vegetation	 4 3 2 1	9	Retention devices in stream -Many large boulders and/or debris dams -Rocks/logs present: limited damming effect -Rocks/logs present; but unstable, no damming -Stream with few or no rocks/logs	 4 3 2 1
3	Completeness of riparian strip of woody vegetation -Riparian strip without breaks in vegetation -Breaks at intervals of > 50 m -Breaks at intervals of 10 – 50 m -Breaks at intervals < 10 m	 4 3 2 1	10	Channel sediment accumulations -Little or no accumulation of loose sediments -Some gravel bars but little sand or silt -Bars of sand and silt common -Braiding by loose sediment	 4 3 2 1
4	Vegetation of riparian zone within 10 m of channel -Native tree and shrub species -Mixed native and exotic trees and shrubs -Exotic trees and shrubs -Exotic grasses/weeds only	 4 3 2 1	11	Stream bottom -Mainly clean stones with obvious interstices Mainly stones with some cover of algae/silt -Bottom heavily silted but stable -Bottom mainly loose and mobile sediment	 4 3 2 1
5	Stream bank structure -Banks fully stabilised by trees, shrubs, etc -Banks firm but held mainly by grass and herbs -Banks loose, partly held by sparse grass etc -Banks unstable, mainly loose sand or soil	 4 3 2 1	12	Stream detritus -Mainly unsilted wood, bark, leaves -Some wood, leaves etc, with much fine detritus -Mainly fine detritus mixed with sediment -Little or no organic detritus	 4 3 2 1
6	Bank undercutting -None or restricted by tree roots -Only on curves and at constrictions -Frequent along all parts of stream -Severe, bank collapses common	 4 3 2 1	13	Aquatic vegetation -Little or no macrophyte or algal growth -Substantial algal growth: few macrophytes -Substantial macrophyte growth; little algae -Substantial macrophyte and algal growth	 4 3 2 1
7	Channel form -Deep: width/depth ratio < 7:1 -Medium: width/depth ratio < 8:1 to 15:1 -Shallow: width/depth ratio > 15:1 -Artificial: concrete or excavated channel	 4 3 2 1			

Appendix 3 - Water Quality Data (Autumn 2026)

Indicator Variable	HR1-1	HR1-2	HR1-3	HR2-1	HR2-2	HR2-3	HR3-1	HR3-2	HR3-3
Temperature °C	15.29	15.29	15.28	15.35	15.34	15.34	17.64	17.62	17.64
pH	9.67	9.7	9.71	9.41	9.41	9.41	9.21	9.22	9.23
Conductivity (µS/cm)	349	351	350	361	361	361	366	367	367
Dissolved Oxygen (% Saturation)	87.4	87.4	87.4	93.2	93	93	96	95.9	96.1
Turbidity (NTU)	34	30.4	29.8	10.7	10.9	11	10.8	11.5	9.7
Alkalinity	70			100			70		
	HR4-1	**HR4-2**	**HR4-3**	**HR5-1**	**HR5-2**	**HR5-3**	**HR6-1**	**HR6-2**	**HR6-3**
Temperature °C	17.59	17.59	17.59	17.05	16.99	17.02	15.79	15.79	15.79
pH	8.95	8.95	8.95	8.99	8.99	9	9.26	9.27	9.28
Conductivity (µS/cm)	388	388	387	418	417	416	417	417	417
Dissolved Oxygen (% Saturation)	99.4	99.2	99.2	97.4	98.8	98.4	104.7	104.5	104.3
Turbidity (NTU)	12.4	12	12.7	12.7	12.2	13	15.9	15.6	15.7
Alkalinity	50			60			80		
	DB-1	**DB-2**	**DB-3**	**MC-1**	**MC-2**	**MC-3**	**SC-1**	**SC-2**	**SC-3**
Temperature °C	15.47	15.47	15.47	14.48	14.42	14.44	13.66	13.66	13.65
pH	8.85	8.85	8.86	9.07	9.07	9.07	9.4	9.42	9.45
Conductivity (µS/cm)	2934	2936	2935	2920	2923	2918	6279	6280	6273
Dissolved Oxygen (% Saturation)	75.8	76.7	76	47.9	48.1	48.1	92.7	92.3	91.6
Turbidity (NTU)	12.8	12.7	13.1	13.4	13.7	13.3	8.7	8.6	8.3
Alkalinity	70			90			>100		

Appendix 4 - Macroinvertebrate taxa collected using the AUSRIVAS protocol (Autumn 2026).

Taxa	HR-1	HR-2	HR-3	HR-4	HR-5	HR-6	MC	SC	DB
Temnocephalidea	0	0	0	0	0	0	0	0	7
Physidae	1	0	0	0	0	0	0	0	0
Atyidae	45	30	30	3	25	15	31	3	50
Palamonidae	2	0	0	0	9	0	10	0	6
Baetidae	0	2	2	5	0	5	0	0	0
Caenidae	0	1	0	0	0	0	0	12	0
Coenagrionidae	0	0	0	1	0	0	0	0	0
Libellulidae	0	0	1	0	0	0	0	2	2
Hemicorduliidae	0	0	0	0	0	0	0	9	0
Corixidae	3	7	13	11	31	21	0	0	0
Gerridae	4	1	0	0	0	0	0	0	0
Notonectidae	1	0	0	0	0	0	0	0	0
Dytiscidae	4	6	0	1	3	1	1	22	0
Elmidae	1	0	0	0	0	0	0	0	0
Gyrinidae	0	1	3	2	0	0	0	0	30
Hydraenidae	1	0	0	0	0	0	0	0	0
Hydrophilidae	0	0	1	1	0	1	0	0	0
Ceratopogoninae	0	0	1	0	0	0	0	0	0
Forcipomyiinae	0	0	0	0	0	0	0	1	0
Chironomidae - Chironominae	1	1	3	5	4	8	0	0	1
Simuliidae	0	5	0	0	0	0	0	0	3
Stratiomyidae	1	1	0	1	0	0	0	0	0
Ecnomidae	0	0	0	0	0	0	0	1	0
Leptoceridae	0	0	0	0	0	0	1	0	0
Hydropsychidae	0	0	0	0	0	0	0	1	4
Number of Taxa	**11**	**10**	**8**	**9**	**5**	**6**	**4**	**8**	**7**
Gambusia	17	35	0	4	27	2	24	33	20

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Mount Pleasant Operation



MOUNT PLEASANT OPERATION

2025 ANNUAL REVIEW



Extract; Water related sections of the 2025 Annual Review



Company:	MACH Energy Australia Pty Ltd		
Effective Date:	31 March 2026	**Status:**	Approved
Approved By:	Michael Redman	**Revision Number:**	00

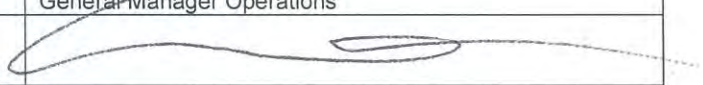
MOUNT PLEASANT OPERATION 2025 ANNUAL REVIEW	
Name of Operation	Mount Pleasant Operation
Name of Operator	MACH Energy Australia Pty Ltd
Development Consent	Development Consent DA 92/97 Development Consent SSD 10418
Name of Holder of Development Consent	MACH Energy Australia Pty Ltd
Mining Leases	Mining Lease 1645, Mining Lease 1708, Mining Lease 1709, Mining Lease 1713, Mining Lease 1750, Mining Lease 1808 and Mining Lease 1829.
Name of Holder of Mining Leases	MACH Energy Australia Pty Ltd J.C.D Australia Pty Ltd
Water Licences	Water Access Licences – see Table 3 Bore Licence Certificate 20BL168734
Name of Holder of Water Licences	MACH Energy Australia Pty Ltd
Annual Review Start Date	1 January 2025
Annual Review End Date	31 December 2025

I, Michael Redman, certify that this audit report is a true and accurate record of the compliance status of the Mount Pleasant Operation for the period 1 January to 31 December 2025 and that I am authorised to make this statement on behalf of MACH Energy Australia Pty Ltd.

Note.

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).*

Name of Authorised Reporting Officer	Michael Redman
Title of Authorised Reporting Officer	General Manager Operations
Signature of Authorised Reporting Officer	
Date	31 March 2026

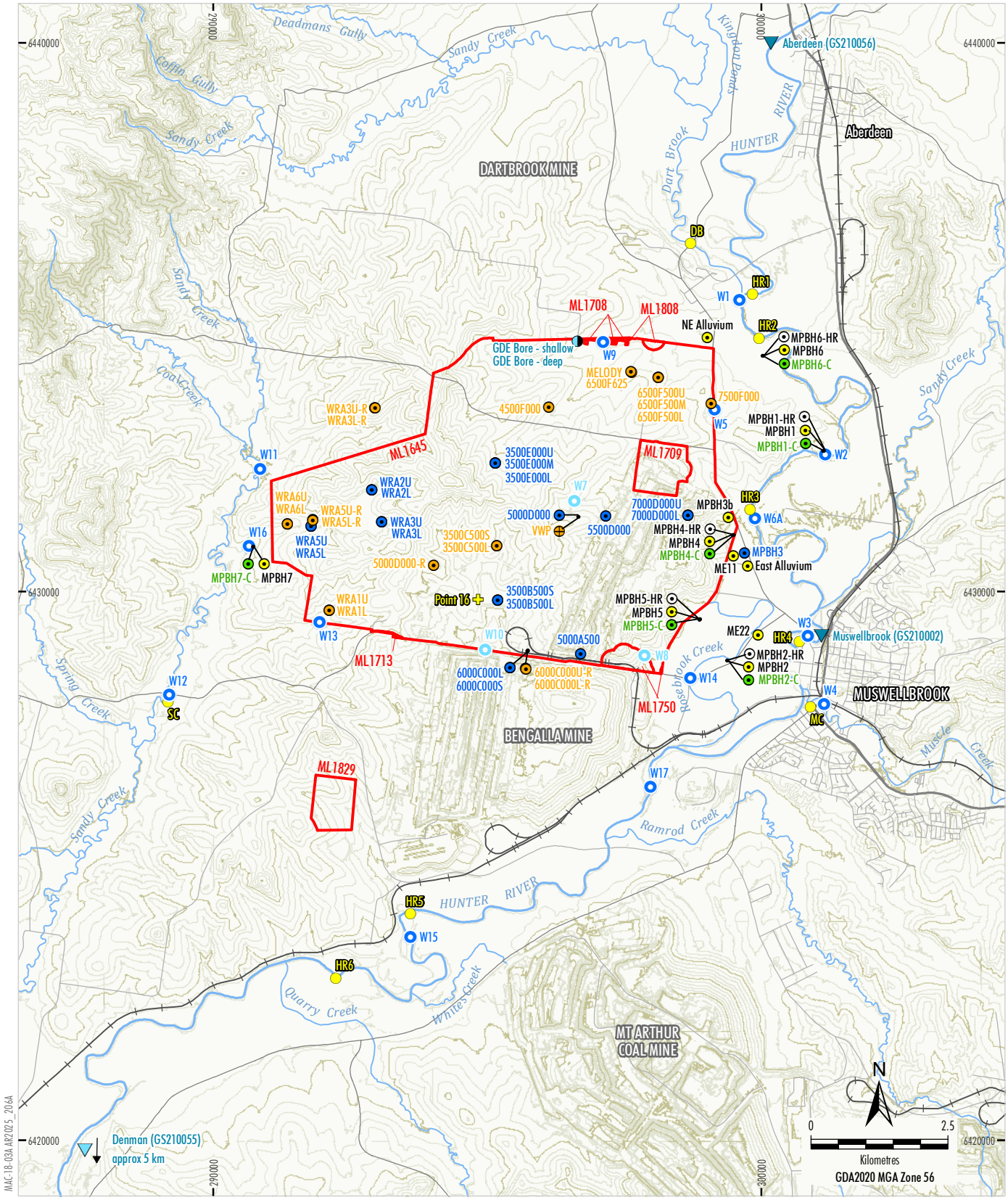
6 WATER MANAGEMENT

A WMP was prepared by MACH Energy in accordance with Condition B52, Schedule 2 of Development Consent SSD 10418, which was approved on 7 February 2025. This Annual Review reports against the currently approved WMP.

The WMP includes the following monitoring network (Figure 7):

- 14 surface water monitoring locations (W1 – W17).
- nine stream health monitoring locations (HR1 – HR6, DB, MC and SC).
- groundwater monitoring bores covering all major hydrogeological units
- Water discharge/ monitoring Point 16 (Hunter River Salinity Trading Scheme [HRSTS]) from EPL 20850

There were no water discharge events from MPO in 2025. Any future discharges of mine water will be undertaken in accordance with Condition 26, Schedule 3 of Development Consent DA 92/97, Condition B49, Schedule 2 of Development Consent SSD 10418, Development Consent SSD-5170 (Bengalla Mine's Development Consent) and EPL 20850.



MAC-18-03A AR2025_206A

Source: MACH (2025); NSW Spatial Services (2026); NSW Department of Primary Industries - Water (2016)

LEGEND

- Mining Lease Boundary
- Contour (10 m Intervals)
- DCCEEW Water Gauging Station

Surface Water Monitoring

- Stream Health Monitoring Site
- Surface Water Monitoring Site
- Historical Surface Water Monitoring Site
- Water Discharge/Monitoring Point (EPL 20850)

Mount Pleasant Monitoring

- GDE Bore
- Vibrating Wire Piezometer
- Standpipe
- Standpipe - Alluvium
- Standpipe - Interburden
- Standpipe - Coal Seam
- Standpipe - Historical

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MOUNT PLEASANT OPERATION

Surface Water and Groundwater Monitoring Locations

Figure 7

6.1 SURFACE WATER

6.1.1 Approval Criteria

Surface Water Quality

Surface water monitoring is undertaken monthly and/or event based at 14 locations (Figure 7) for pH, electrical conductivity (EC), total suspended solids (TSS) and total dissolved solids (TDS), with additional monitoring conducted if triggered by a rain event.

Surface water quality triggers have been developed using the *Australian New Zealand Guidelines* (ANZG) (2018) / the *Australian and New Zealand Environment and Conservation Council* (ANZECC) & *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ARMCANZ) (2000) in conjunction with baseline data collected at the site. Site- specific reference values have been established for sites upstream of the MPO (i.e. W1, W4 and W11), to provide an indication of a change in water quality trends outside of the influence of potential mining related effects. Site-specific trigger values have been developed for sites W2, W6A and W15 on the Hunter River, in addition to site W12 on Sandy Creek. Other sites are frequently dry and do not have sufficient data to develop site-specific trigger levels. ANZG (2018) / ANZECC & ARMCANZ (2000) default trigger levels for these sites have been adopted, until such time as sufficient data is available to develop site-specific triggers.

W17 has been assigned preliminary trigger values from the Bengalla Water Management Plan (Bengalla Mining Company [BMC], 2017). MACH Energy has established preliminary triggers at this site as it is the only site downstream of MPO's footprint on the Hunter River that is upstream of the Bengalla Mine footprint. MACH Energy therefore considers this site particularly important for assessing potential surface water impacts associated with the MPO (i.e. in the absence of any potential influence from Bengalla Mine).

Trigger levels are not regarded as assessment criteria, rather they are used as an indicator of potential impacts and to initiate investigations into the surface water quality as reported by the monitoring program.

An investigation is triggered when:

- a water quality indicator at a downstream receiving water monitoring location is above (or outside the range of) the trigger levels for three consecutive sampling events;
- the same has not occurred at the relevant upstream reference site(s); and
- a water quality indicator at a downstream receiving water monitoring location is above (or below in event of a trigger of the lower pH limit) the indicator of the corresponding upstream monitoring location (where such a monitoring location exists) sampled on the same day.

The majority of sites are located on ephemeral drainage lines and therefore do not regularly experience flow for sampling.

The site-specific trigger levels are listed in Table 18.

Table 18
Surface Water Quality Trigger Levels

Site	pH	EC (µS/cm)	TSS (mg/L)
	20th – 80th Percentile Trigger Levels**	80th Percentile Trigger Level	80th Percentile Trigger Level
Site Specific Reference / Trigger Levels			
Hunter River			
W1 (reference site)	6.5 – 8.2	529	18
W2	6.5 – 8.3	539	18
W6*	6.5 – 8.4	496	19
W17#	6.5 – 8.1	650	40
W15	6.5 – 8	460	23
Sandy Creek			
W11 (reference site)	6.5 – 8	7,050	10
W12	6.5 – 8.1	6,420	30
Muscle Creek			
W4 (reference site)	6.5 – 8	2,480	11

* Due to safe access no longer being available at site W6, triggers developed for this site will now be used at the new monitoring location W6A, approximately 500 m downstream of W6.

** Where the 20th – 80th percentile trigger values were within the default trigger levels, the default trigger levels were adopted. Default triggers are based on ANZECC & ARMCANZ (2000) guideline values for upland rivers in south-east Australia.

Trigger values have been sourced from the Bengalla Water Management Plan (BMC, 2017), which have been established from baseline data for monitoring sites adjacent to W17 (e.g. Bengalla sites W01, W02 and W03 [Figure 4]), as well as the ANZECC & ARMCANZ (2000) guideline.

Stream Health

Stream health monitoring continued during the reporting period at six sites outlined in the WMP located on the Hunter River (HR1, HR2, HR3, HR4, HR5 and HR6), as well as three additional sites located on Sandy Creek (SC), Dart Brook (DB) and Muscle Creek (MC) (Figure 7).

Stream health is monitored bi-annually during Spring and Autumn using the Australian River Assessment System (AusRivAS) aquatic invertebrate monitoring protocol. In addition to the aquatic macroinvertebrate sampling, monitoring also includes fish observations, site water quality, stream condition and presence of aquatic and riparian edge plants. Two rounds of monitoring were undertaken during the reporting period, in May 2025 (Autumn) and October 2025 (Spring). The stream health trigger levels are outlined in Table 19.

Table 19
Stream Health Trigger Levels

Historical Site ID	Updated Site ID	Baseline Band of Impairment Score*	Observed/Expected Taxa^
Reference Site			
W1	HR1	C	0.41
W1	HR2	B	0.59
Hunt 506	MC	B	0.55
Hunt 585	DB	B	0.66
Potential Impact Site			
Hunt 854	HR3	B	0.64
W15	HR5	B	0.61
SW17	HR6	B	0.73
Sandy 1	SC	B	0.61

* Band X- More biologically diverse than reference sites, Band A- Reference Condition, Band B- Significantly Impaired, Band C, Severely Impaired, Band D- Extremely Impaired.

^ Derived from the Spring 2017 monitoring round.

Should a measured band of impairment score at a particular downstream monitoring site degrade below the baseline band level outlined in Table 19, and the band level at a corresponding reference site remain the same for two successive monitoring rounds, the stream health investigation protocol would be initiated.

6.1.2 Performance During the Reporting Period

Surface Water Monitoring

Surface water monitoring for the reporting period has been split into three groups:

- monitoring in the Hunter River (sites W1, W2, W3, W6(A), W15 and W17)
- monitoring in Sandy, Muscle and Rosebrook Creeks (sites W4, W11, W12, W13, W14 and W16)
- monitoring in other ephemeral creeks and gullies (sites W5, W7, W9)

When there is no data available (e.g. due to prolonged dry conditions), charts are not presented in the following sub-sections.

Additional event-based monitoring was carried out in March, May and August due to wet- weather events resulting in multiple monitoring records in the month instead of one.

Hunter River

Monitored pH values for the Hunter River monitoring sites during the reporting period are shown in Chart 4. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 pH values is provided in Chart 5.

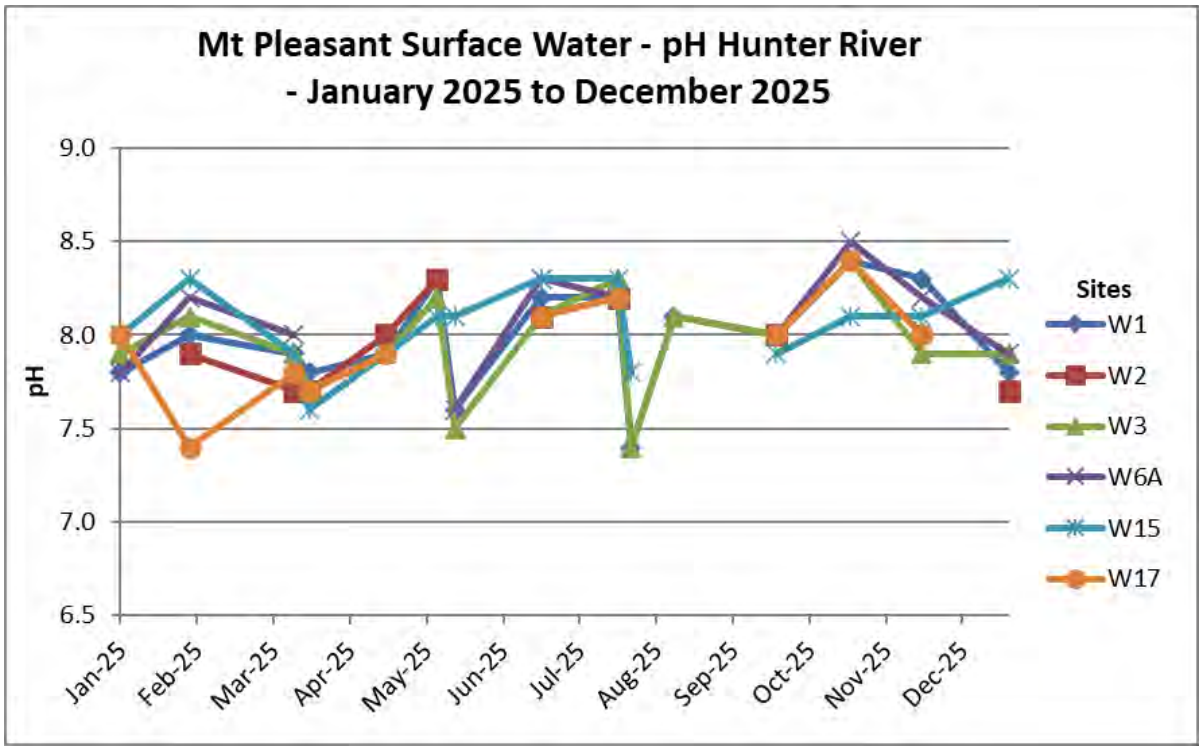

Chart 4: Hunter River pH Levels 2025

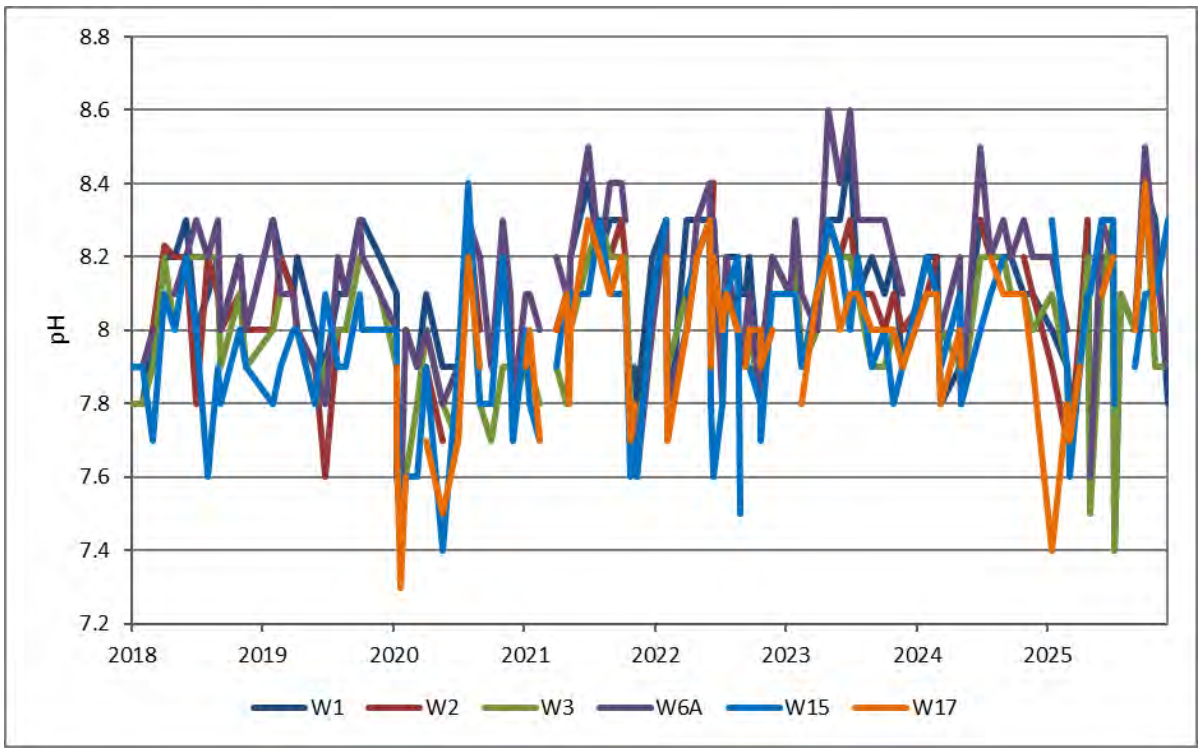

Chart 5: Hunter River pH Levels 2018 – 2025

Monitored EC values for the Hunter River monitoring sites during the reporting period are shown in Chart 6. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 EC values is provided in Chart 7.

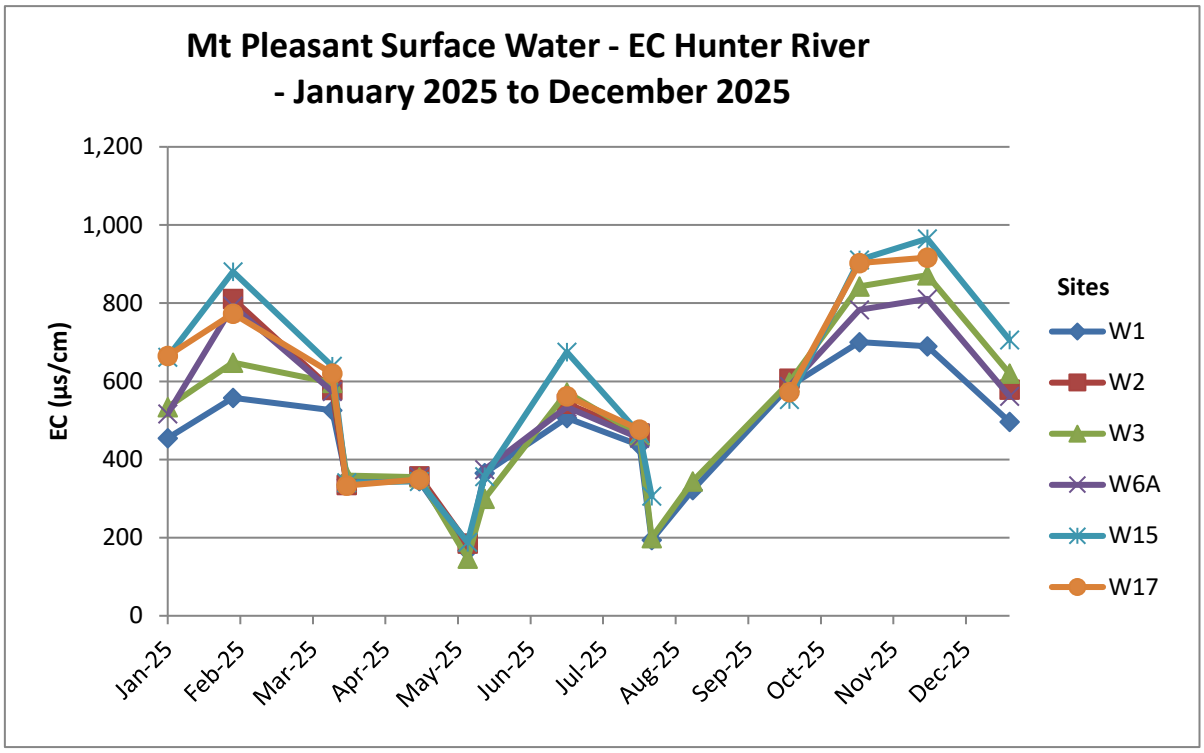

Chart 6: Hunter River EC Levels 2025

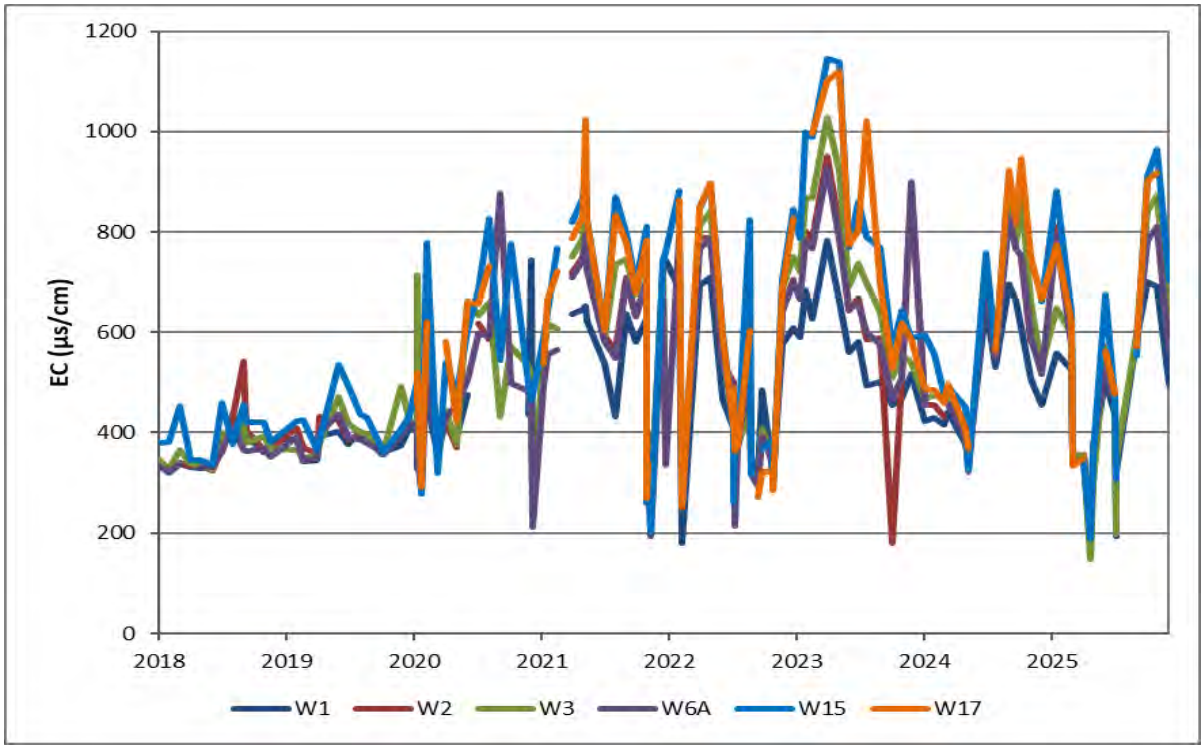

Chart 7: Hunter River EC Levels 2018 – 2025

Monitored TSS values for the Hunter River monitoring sites during the reporting period are shown in Chart 8. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 TSS values is provided in Chart 9.

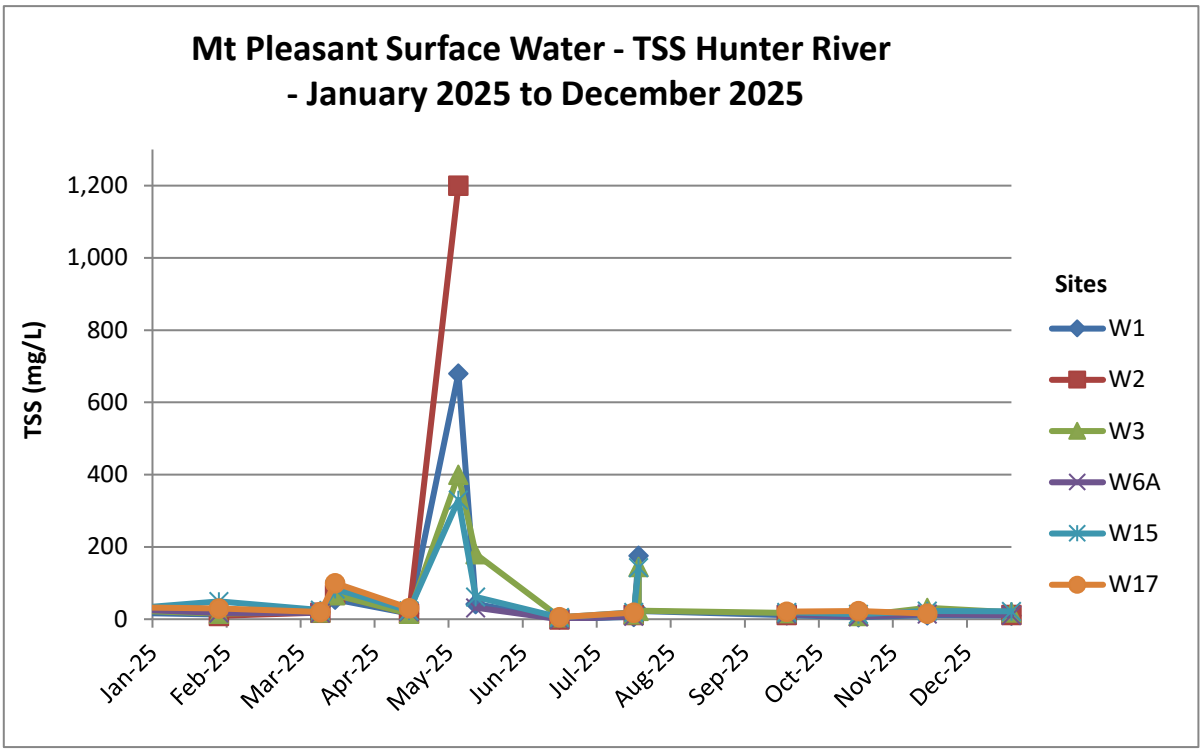

Chart 8: Hunter River TSS Levels 2025

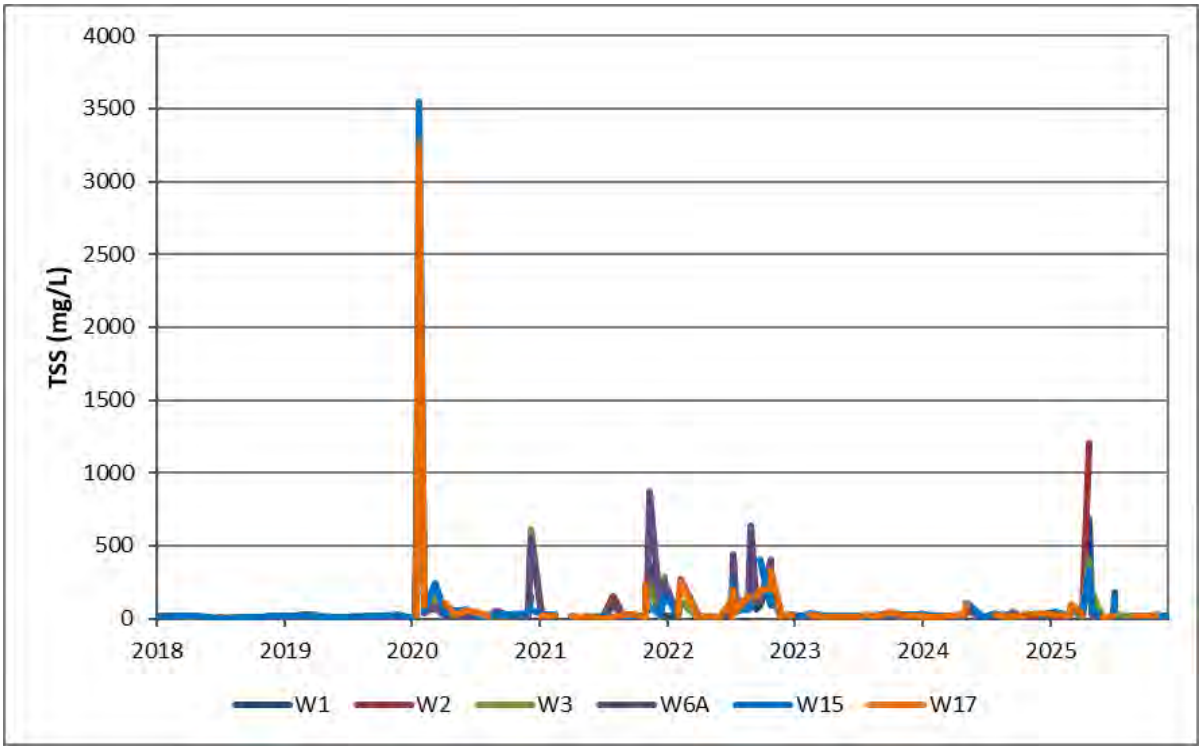

Chart 9: Hunter River TSS Levels 2018 – 2025

Monitored TDS values for the Hunter River monitoring sites during the reporting period are shown in Chart 10. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 TDS values is provided in Chart 11.

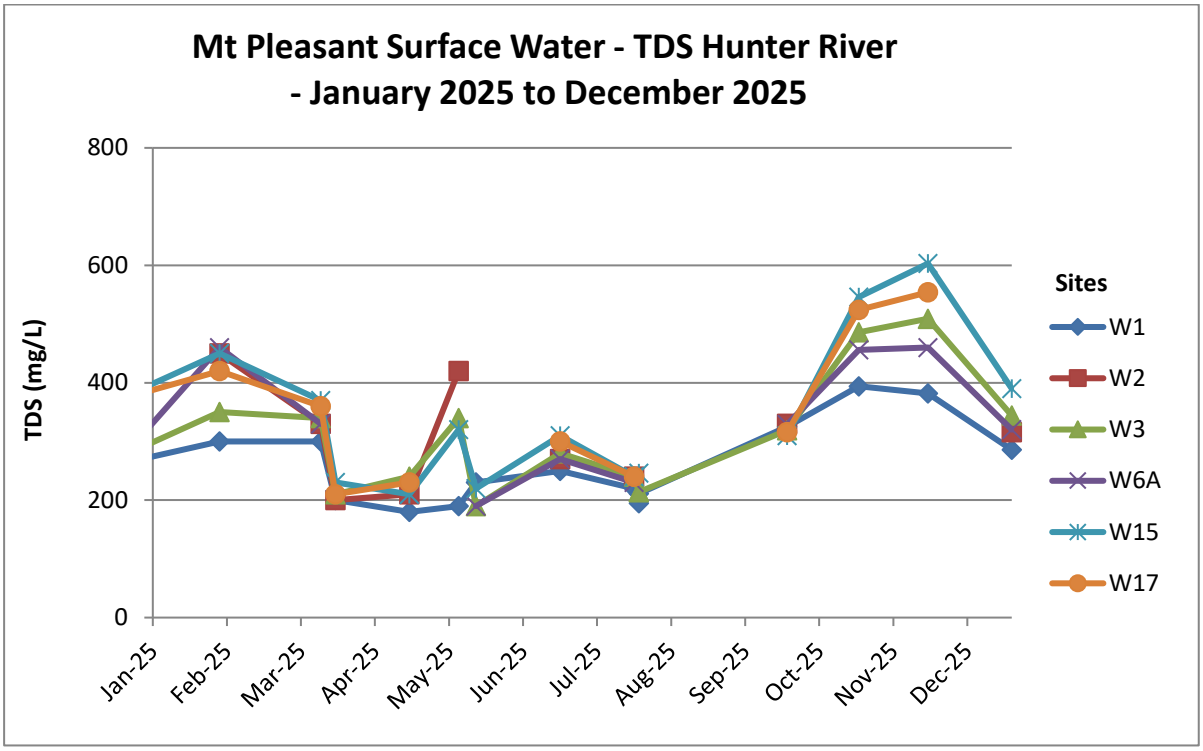

Chart 10: Hunter River TDS Levels 2025

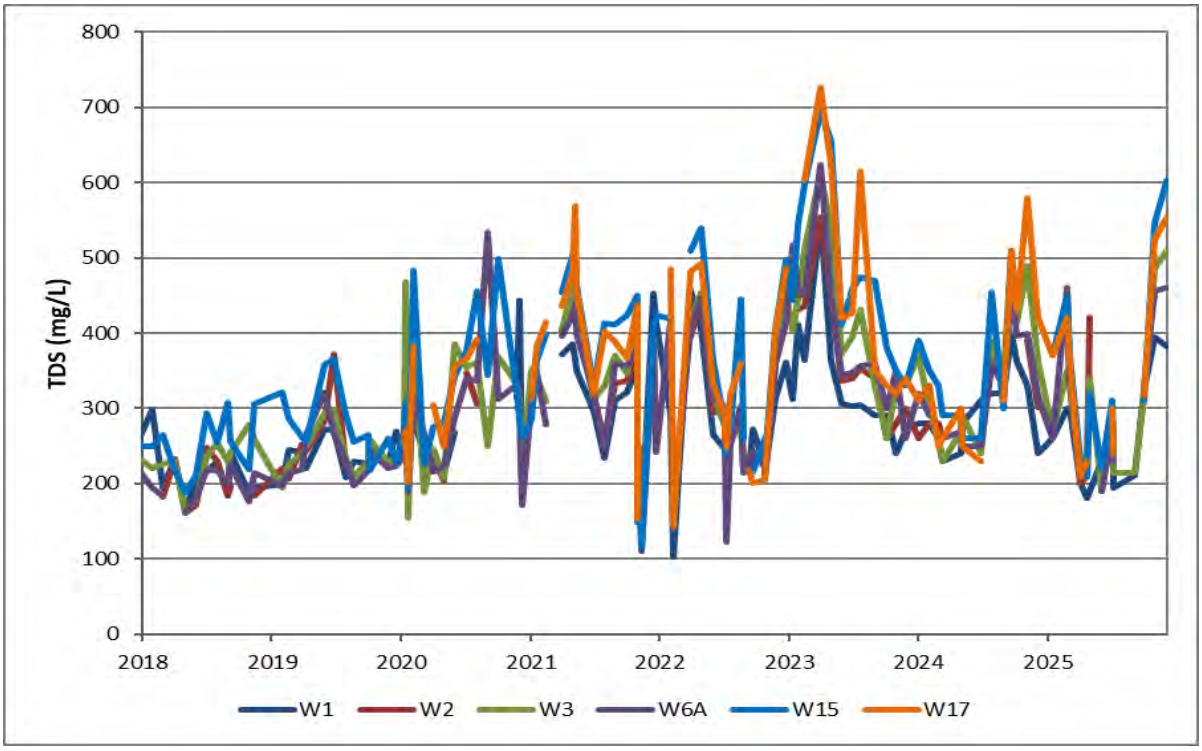

Chart 11: Hunter River TDS Levels 2018 – 2025

Sandy, Muscle and Rosebrook Creeks

Monitored pH values for the Sandy, Muscle and Rosebrook Creek monitoring sites during the reporting period are shown in Chart 12. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 pH values is provided in Chart 13.

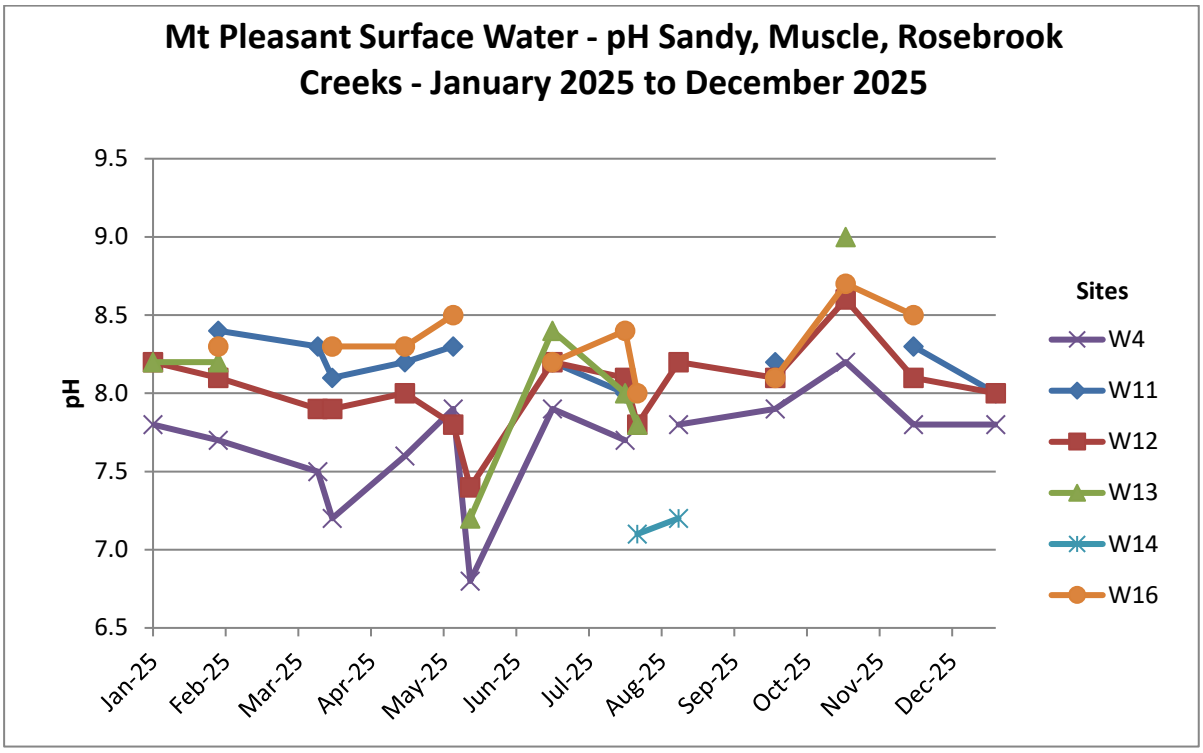

Chart 12: Sandy, Muscle and Rosebrook Creeks pH Levels 2025

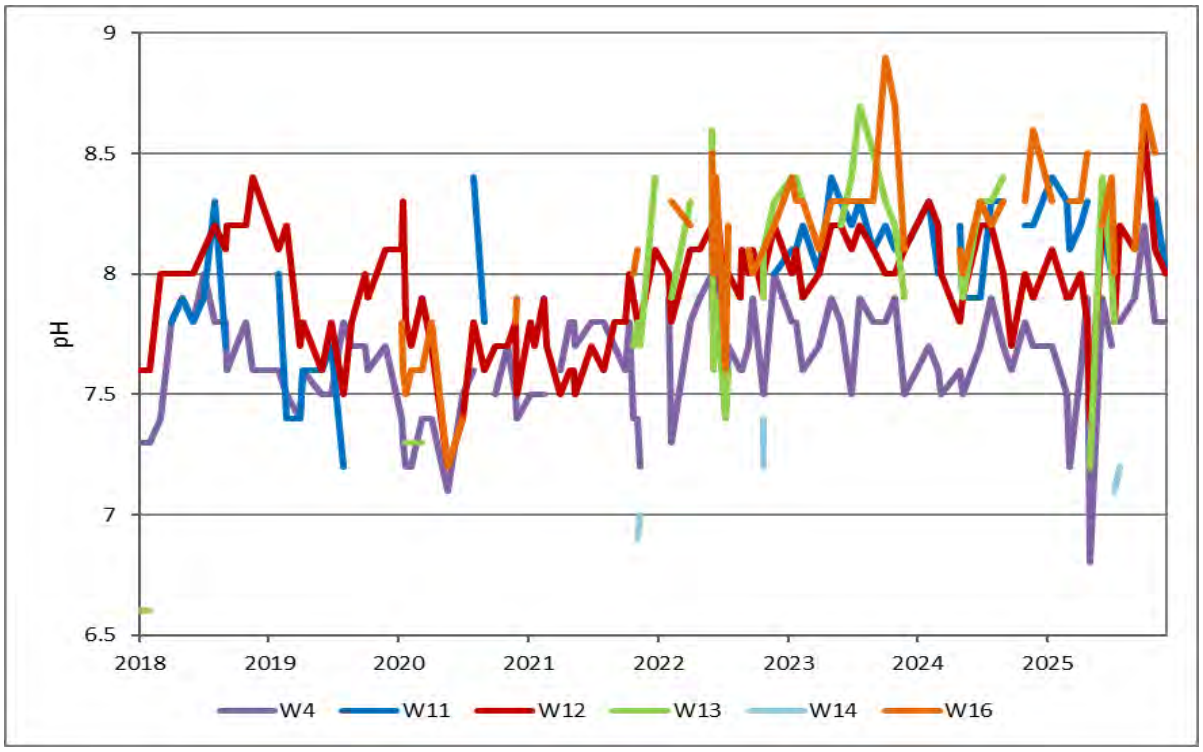

Chart 13: Sandy, Muscle and Rosebrook Creeks pH Levels 2018 – 2025

Monitored EC values for the Sandy, Muscle and Rosebrook Creek monitoring sites during the reporting period are shown in Chart 14. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 EC values is provided in Chart 15.

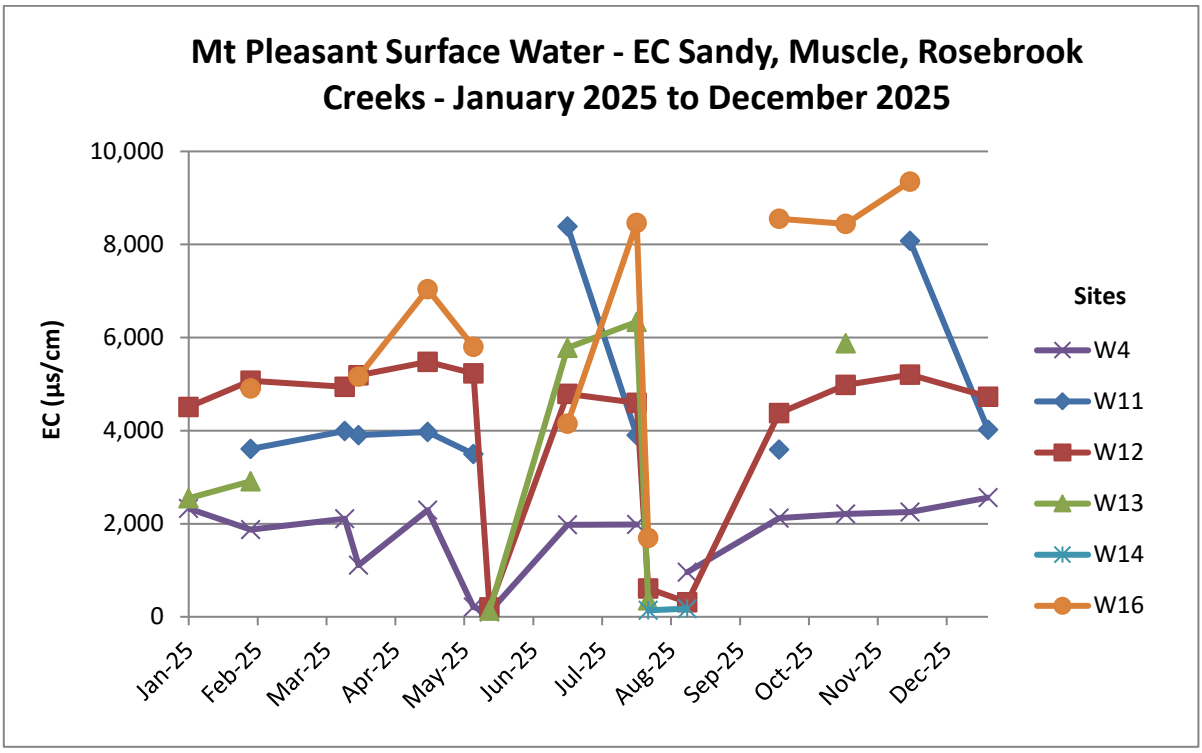

Chart 14: Sandy, Muscle and Rosebrook Creeks EC Levels 2025

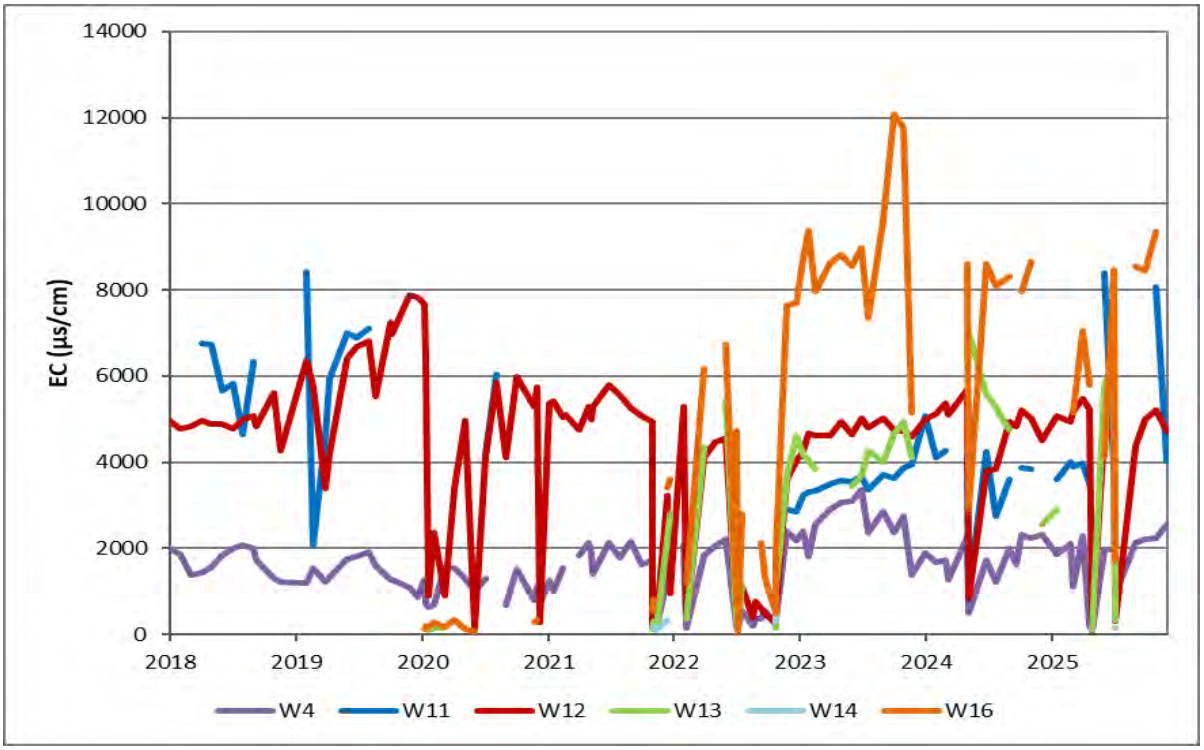

Chart 15: Sandy, Muscle and Rosebrook Creeks EC Levels 2018 – 2025

Monitored TSS values for the Sandy, Muscle and Rosebrook Creek monitoring sites during the reporting period are shown in Chart 16. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 TSS values is provided in Chart 17.

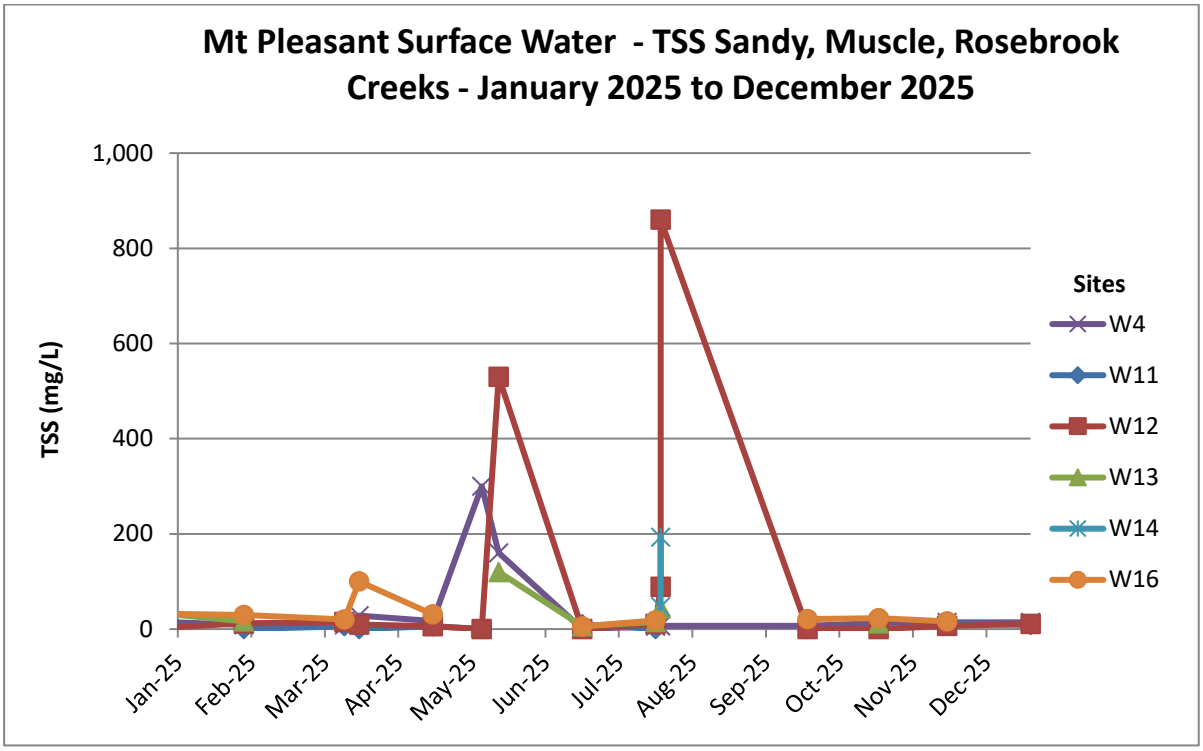

Chart 16: Sandy, Muscle and Rosebrook Creeks TSS Levels 2025

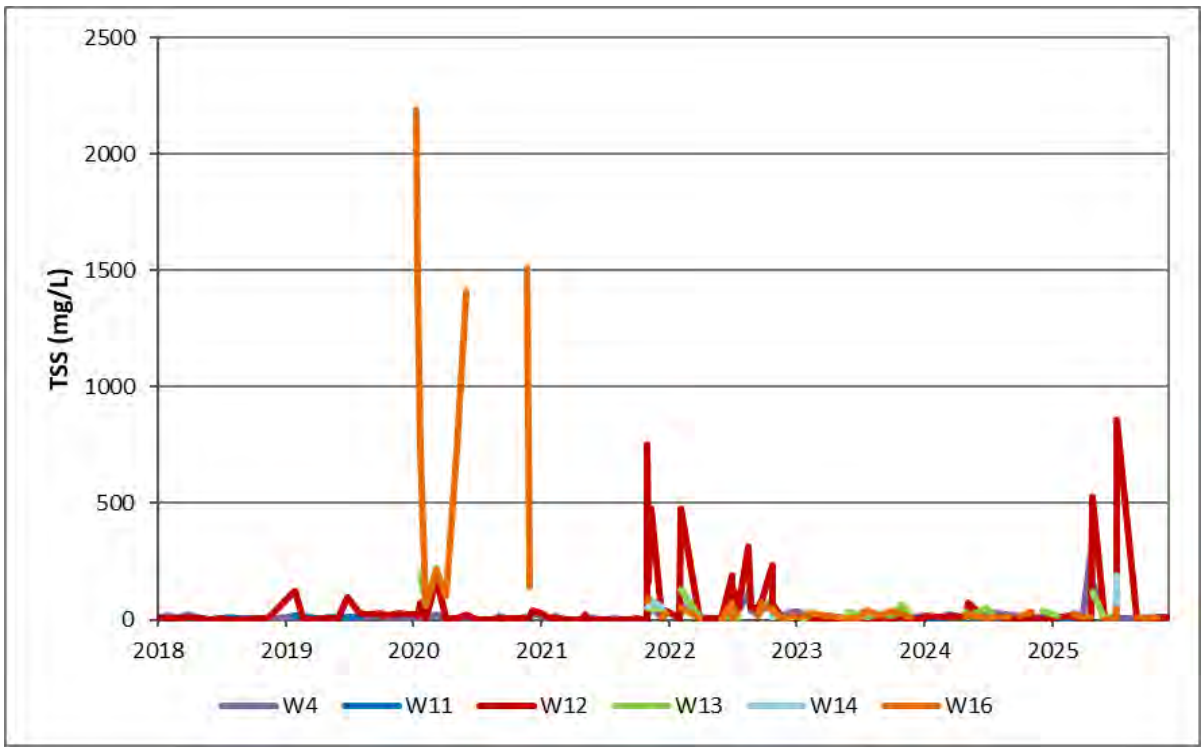

Chart 17: Sandy, Muscle and Rosebrook Creeks TSS Levels 2018 - 2025

Monitored TDS values for the Sandy, Muscle and Rosebrook Creek monitoring sites during the reporting period are shown in Chart 18. Additionally, a comparison between 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 TDS values is provided in Chart 19.

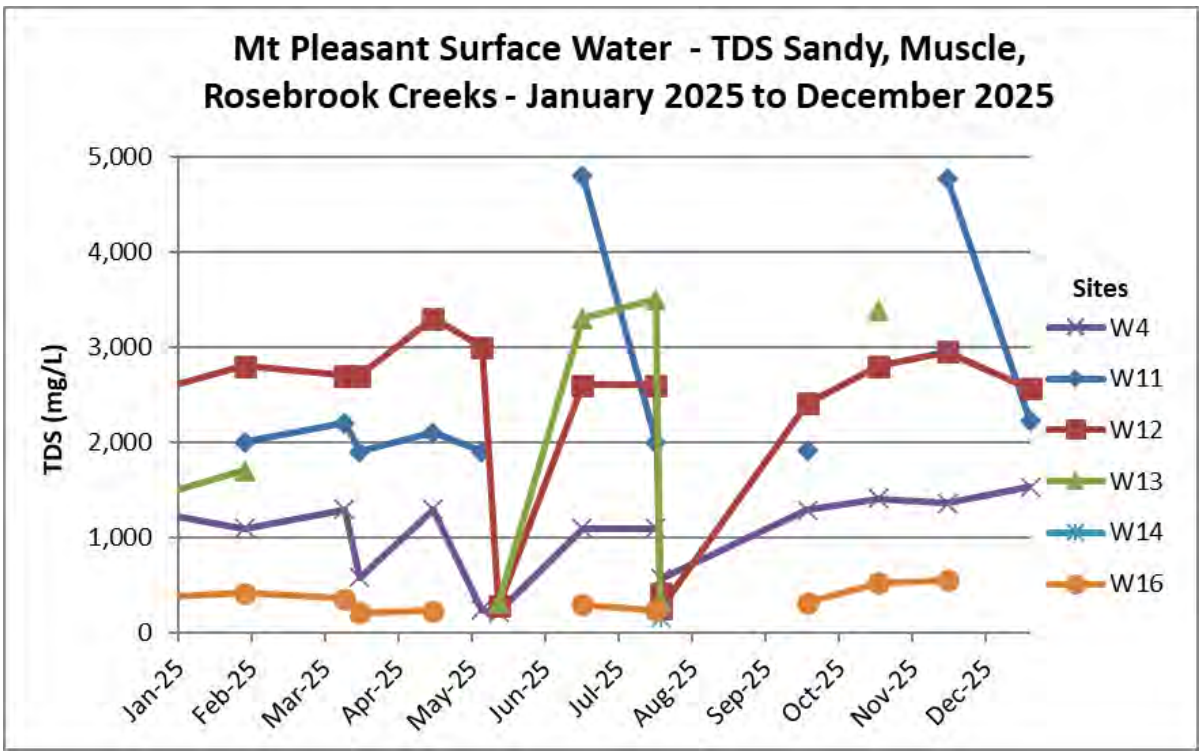

Chart 18: Sandy, Muscle and Rosebrook Creeks TDS Levels 2025

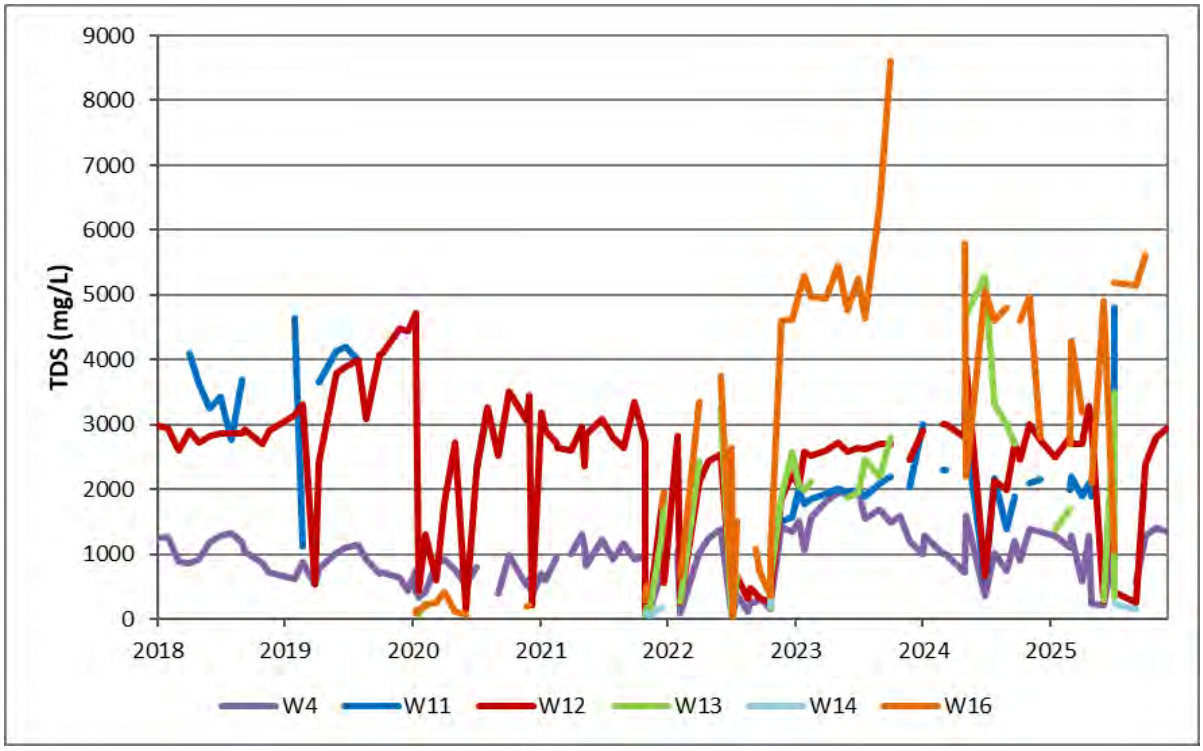

Chart 19: Sandy, Muscle and Rosebrook Creeks TDS Levels 2018–2025

6.1.3 Trends and Key Management Implications

Surface Water Monitoring

Hunter River Sites (W1, W2, W3, W6A, W15 & W17)

During the reporting period, pH levels at the Hunter River sites ranged from 7.4 to 8.5. W15 was above the pH trigger for three consecutive sampling events in July. An investigation was undertaken in accordance with the MPO WMP. The investigation determined the trigger was a result of significant flood flows in the Hunter River during the reporting period and was not caused by activities at MPO. A comparison since 2018 shows that pH levels have stayed consistently between 7.1 and 8.6 to date.

EC values varied over the reporting period at all sites, ranging between 150 and 965. The EC readings for site W6A was triggered several times, however no further investigation was undertaken in accordance with Table 26 of the WMP as the upstream reference site, W2 was also triggered.

TSS levels for all sites were above trigger levels on a number of occasions during the reporting period. No sites triggered for consecutively more than three events.

TDS levels for all Hunter River sites generally fluctuated between approximately 150 mg/L and 650 mg/L.

Sandy, Muscle and Rosebrook Creek Sites (W4, W11, W12, W13, W14 & W16)

Monitored pH values during the reporting period at the Sandy, Muscle and Rosebrook Creek sites ranged from 6.8 to 9.0. Only site W4 has been consistently measured for water quality since 2017. Monitoring since 2017 shows generally consistent values of pH for site W4.

EC monitoring results varied across all sites except for W4. All sites experienced a decrease in EC during the May and August monitoring periods, which correlated with a high amount of rainfall in these months. The monitored EC levels for the sites is generally consistent over 2018 – 2025, apart from monitoring site W16 which has experienced elevated EC since 2023 but does not have site-specific trigger levels.

TSS values were generally consistent at the Sandy, Muscle and Rosebrook Creek sites during the reporting period except for a spike in W4 and W12 recorded during the May and August monitoring rounds. Both these months had a high amount of rainfall.

TDS values generally correlated with the trend recorded for EC levels at the sites. All sites recorded drops in TDS values in May and August.

The line graph appears to be fragmented as a result of sites been dry during sampling. In the reporting period, W14 was dry every month except August.

Stream Health Monitoring

The Autumn and Spring 2025 Stream Health Monitoring Reports were prepared following the May and October 2025 monitoring rounds. The key findings of the reports were as follows:

- Examination of results from the 2025 Autumn survey found no measurable changes that could be indicative of an impact associated with the MPO.
- Overall, the species composition of assemblages has been comparable with that observed by previous surveys.
- Macroinvertebrate assemblages at the sites sampled have consistently (i.e. before and during mining activities at the MPO) been dominated by pollution tolerant taxa.
- No threatened species of fish listed under the NSW *Fisheries Management Act, 1994* or the *Environment Protection and Biodiversity Conservation Act, 1999* have been observed.

The stream health trigger levels established within the WMP were triggered on each sampling occasion since 2017. These consecutive triggers require the stream health investigation protocol to be activated in accordance with the Surface and Groundwater Response Protocol (SGWRP). However, as stated in the Stream Health Monitoring Reports prepared by Bio-Analysis Pty Ltd, the investigation is not considered warranted as:

- the trigger levels developed within the SWMP are based on historical data presented in Hose and Turak (2004), which were collected on one sampling occasion at the sites
- no discharges from MPO in accordance with EPL 20850 have occurred throughout the monitoring period
- external influences including rural and urban run-off and flow regulations are likely to have impacted aquatic biota within the monitoring sites since the baseline survey was carried out
- seasonal variation of the structure of assemblages of macroinvertebrates occurred (Stark and Phillips, 2009).

MACH Energy will continue to monitor stream health during Autumn and Spring in future monitoring periods.

6.2 GROUNDWATER

6.2.1 Approval Criteria and Management Plan Requirements

The updated MPO Groundwater Management Plan (GWMP) was approved in February 2025.

Groundwater monitoring is undertaken at a network of bores which are broadly distributed across the MPO area (Figure 7), and which cover all major hydrogeological units.

MPO engaged groundwater specialist Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to prepare a groundwater report covering the 2025 calendar year, The Mt Pleasant Groundwater Report for the 2025 Calendar Year is attached as Appendix G and provides the following:

- comprehensive review of the groundwater monitoring results at the MPO over the past year, which includes a comparison of the results to evaluate compliance against:
    - relevant statutory requirements, limits or performance measures/criteria

    - monitoring results of the previous years
    - relevant predictions in the Mount Pleasant Operation EIS and MOD 1, MOD 2, MOD 3 and MOD 4 EAs (prior to the surrender of Development Consent DA 92/97)
- identifies any groundwater-related non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance
- identifies any trends in the groundwater monitoring data over the life of the MPO
- identifies any discrepancies between the predicted and actual groundwater impacts of the MPO, and analyses the potential cause of any significant discrepancies
- Review of observed groundwater levels against the groundwater model predictions
    - determine when water levels deviate significantly from that predicted by the model and the reason for this deviation.
    - consider of the impact of mining, and other factors that could result in varying water levels including climatic conditions, rainfall recharge and pumping from privately-owned bores and/or other mining operations.

In summary, the 2025 AGE Groundwater Report concluded that during the reporting period, 36 out of 42 designated bores achieved 100% water level measurement data recovery whilst the other six bores recorded recovery rates of 75%. The lower data recovery in these bores was due to bores being inaccessible (5000D000, WRA5L-R, WRA5U-R and NE Alluvium) and impacted by roadworks (GDE Bore Deep and GDE Bore Shallow). In addition, water quality was measured at 35 bores.

Groundwater levels in the Hunter River Alluvium have remained stable throughout the year, with short-term fluctuations observed in response to rainfall events. This indicates that the alluvial aquifer is primarily sustained by hydraulic connectivity with the Hunter River rather than direct recharge from precipitation. Furthermore, water levels in the Hunter River are significantly influenced by the controlled releases from Glenbawn Dam. During significant rainfall periods, discharge volumes from the dam are typically reduced, further affecting river water levels and, consequently, the adjacent alluvial aquifer.

Groundwater behaviour in the Permian measures within the Western Domain showed variability across different locations. At monitoring sites like WRA5 and WRA5-R, water levels in both the regolith and underlying strata were similar, indicating hydraulic connectivity with minimal vertical gradients. At sites like WRA3 and WRA3-R and, to a lesser extent, WRA6, significant differences in groundwater levels were observed, suggesting limited connectivity and stronger vertical gradients. The groundwater flow through the regolith was found to follow the natural topography, with moderate flow expected. While the regolith has the potential to create hydraulic connectivity between the alluvium and mine workings, its generally dry, thin nature, combined with its separation from the open-cut pits by a drainage divide, restricts any direct interaction.

The measured drawdown across the monitoring bores in the Hunter River Alluvium ranged from -0.66m at MPBH4 to 1.3m at MPBH2. In the Western domain, regolith monitoring bores ranged from -0.99m at WRA6U-R to 3.48m at WRA5U. The bores in the Permian measures have the greatest variability ranging from -7.64m at WRA2L to 11.72m at WRA3L. In the Central Domain, total groundwater level change ranges from -57.99m at 5000D000 to 10.89 at Melody. These variations reflect differences in groundwater behaviour across the different domains and strata over the reporting period. The study also highlights that the drawdown is not uniform across the network, with some regions experiencing more significant impacts than others, depending on their proximity to mining activities and geological features. Overall, groundwater in shallower layers is less affected by mining, while deeper coal seams are more sensitive to mining-induced depressurisation. Results of standing water level in mBGL are found in Table 20. Results of standing water level in m AHD can be found in Appendix G.

Electrical conductivity (EC) measurements from monitoring bores within the Hunter River alluvium adjacent to the MPO indicate a gradient from fresh to saline groundwater conditions. MPBH1 recorded the lowest EC value at 576 µS/cm (fresh water), while MPBH7 exhibited the highest at 11,480 µS/cm (saline). Bores MPBH2, MPBH3, and MPBH6 fall within the lower brackish range, while MPBH3b and MPBH4 are classified as moderately saline. In the Western Domain, regolith bores indicate moderately saline conditions, with median EC values ranging from 5,980 µS/cm at WRA5U to 9,010 µS/cm at WRA6U. EC values in the Permian measures in this domain are moderately saline, with EC values spanning from 2,940 µS/cm (moderately saline) at WRA1L to 8,110 µS/cm (saline) at WRA3L. EC

measurements in the Central Domain for Permian measures have been intermittent, with fluctuations over time. These values range from 914 µS/cm (brackish) at bore Melody to 12,920 µS/cm (saline) at GDE Bore Deep.

In the Hunter River Alluvium, groundwater pH values range from 6.7 at MPBH2 to 7.7 at MPBH3b. In the Western domain, pH values range between 6.8 at WRA6U and 7.5 at WRA3L and WRA5U. In the central domain, pH values within the Permian measures range from 6.7 at bore 6500F625 to 8.4 at 6000C000L. Most pH measurements fell within the neutral to slightly alkaline range, with considerable local variations influenced by specific geological and hydrological factors at each monitoring location.

The major ion chemistry of 35 groundwater samples collected across the MPO was analysed using a Piper plot. The analysis revealed significant variability in the geochemical composition of groundwater within the Permian strata, particularly the coal measures. The dominant ions in these areas were sodium, potassium, and chloride, classifying the groundwater as a sodium chloride type. The groundwater in the alluvial deposits exhibited a magnesium carbonate type profile due to high concentrations of magnesium (Mg^{2+}) and bicarbonate (HCO_3^-) ions. A full chemical analysis of the groundwater bores can be found in Appendix F.

Water level data from key monitoring bores, such as MPBH1, MPBH3b and MPBH7, consistently remained below the trigger levels specified in the WMP throughout the monitoring period, including 2025. EC measurements at MPBH2 were above trigger levels during 2025, with an average EC of 1,148 µS/cm (23% higher than its trigger level of 930 µS/cm). An investigation was triggered (AGE, 2024) examining the cause of elevated EC values in MPBH2. The data strongly suggested that the cause of the increase in EC is persistent above-average stage in the adjacent Hunter River caused from above-average rainfall since 2020. Further investigations have been undertaken in 2025 and in accordance with recommendations from AGE, the WMP has been revised to increase the trigger levels for MPBH2. The revised plan was submitted in August 2025 and is currently awaiting approval from the DPHI.

To validate the groundwater model in accordance with the GWMP, a comprehensive comparison was made between newly collected monitoring data and the previous model calibration conducted in 2020. This validation process involved assessing water level measurements from 45 monitoring bores within the MPO, covering a time span from 2003 to 2025. While the root mean squared (RMS) and the scaled RMS (SRMS) values for the post-2020 dataset showed a slight reduction in model accuracy, the results still meet the acceptable standards outlined in the Australian Groundwater Modelling Guidelines. The global SRMS value of 5.30% falls below the recommended 10% benchmark, indicating that the model is adequately calibrated for its intended purpose and does not require immediate recalibration.

Simulated drawdown predictions indicate limited groundwater impacts in the alluvium surrounding the MPO, with minimal drawdown in the Hunter River alluvium due to the majority of the target seams subcropping to the west. The predicted drawdown in the Edderton Seam is constrained to the north and south by the concurrent drawdowns from neighbouring mines, and to the east by the subcrop, further limiting its extent.

The analysis of the difference between the simulated and measured heads in 2025, calculated at various monitoring bores, reveals a range of residual head differences. These differences range from -23.91 m at bore 3500C500L to 56.39 m at 5500D000. Out of 45 model-data comparisons, 73% exhibit a difference of less than 10 m between the simulated and observed heads, demonstrating a generally good alignment between the model and the observed data.

Table 20
Results of Standing Water Level (mBGL)

Bore ID	Aquifer/Unit	Trigger level (m BGL)	Water level (m BGL)			
			Q1	Q2	Q3	Q4
MPO Central Domain						
3500C500L	Mount Arthur Seam	NA	25.98	26.42	27.11	27.54
3500C500S	Warkworth Seam	NA	25.08	25.70	25.44	24.51
4500F000	Vaux Seam	NA	22.34	22.33	22.09	22.10
5000D000	Wynn/Edderton Seams	NA	ND	134.32	134.92	139.60
5000D000-R	Wynn/Edderton Seams	NA	138.43	138.63	138.92	139.14
5500D000	Interburden #7/Wynn Seam	NA	ND	ND	ND	ND
6000C000L-R	Vaux Seam	NA	138.40	138.43	145.02	139.23
6000C000U-R	Mount Arthur Seam	NA	89.45	89.45	89.49	87.20
6500F500L	Maitland Group	NA	50.48	52.10	52.16	50.73
6500F500M	Interburden #6/Wynn Seam	NA	52.49	52.77	52.61	51.21
6500F500U	Interburden #4/Broonie Seam	NA	31.8	31.74	26.56	28.03
6500F625	Permian	NA	16.1	16.18	14.45	14.04
7500F000	Edderton Seam	NA	36.36	36.55	36.51	36.18
GDE Bore Deep	Warkworth Seam	NA	10.86	10.92	10.50	ND
Melody	Unknown	NA	13.1	13.14	10.00	10.13
MPO Eastern Domain						
MPBH1	Hunter Alluvium	10.7	9.72	9.06	7.01	9.52
MPBH1-C	Coal Seam	NA	9.623	8.97	6.863	9.383
MPBH1-HR	Interburden	NA	32.22	30.00	34.73	45.69
MPBH2	Hunter Alluvium	13.59	11.82	11.81	11.03	10.74
MPBH2-C	Coal Seam	NA	11.833	11.83	11.063	10.733
MPBH2-HR	Interburden	NA	11.856	11.87	28.916	14.246
MPBH3b	Hunter Alluvium	13.04	11.89	11.68	10.56	10.89
MPBH4	Regolith	NA	12.19	11.70	11.00	11.21
MPBH4-C	Coal Seam	NA	10.913	10.41	9.503	9.923
MPBH4-HR	Interburden	NA	49.875	49.82	49.605	50.045
MPBH5	Hunter Alluvium	NA	Dry	Dry	Dry	Dry
MPBH5-C	Coal Seam	NA	11.479	11.51	12.179	10.659
MPBH5-HR	Interburden	NA	11.52	11.53	11.11	10.3
MPBH6	Hunter Alluvium	NA	9.441	8.85	8.391	8.601
MPBH6-C	Coal Seam	NA	10.848	10.18	9.738	9.998
MPBH6-HR	Interburden	NA	10.355	8.88	8.815	9.795
NE Alluvium	Alluvium	NA	ND	Dry	Dry	Dry
East Alluvium	Alluvium	NA	Dry	Dry	Dry	Dry
MPO Western Domain						
MPBH7	Hunter Alluvium	10.1	5.297	5.42	4.327	4.827
MPBH7-C	Coal Seam	NA	17.435	17.62	17.415	17.045
WRA1L	Warkworth/Permian	NA	2.44	2.73	1.77	1.02

WRA3L-R	Permian	NA	90.69	87.95	87.22	86.94
WRA3U-R	Alluvium/ Weathered Regolith	NA	30.74	30.7	30.74	30.74
WRA5L-R	Permian	NA	0	0	ND	0
WRA5U-R	Alluvium/ Weathered Regolith	NA	2.60	2.18	ND	3.40
WRA6L	Warkworth/Permian	NA	0.37	0.03	0.15	0.52
WRA6U	Alluvium/Regolith	NA	0.91	0.75	0.82	1.14

6.3 HUNTER RIVER SALINITY TRADING SCHEME DISCHARGES

MACH Energy has a total of 70 credits under the HRSTS, however no discharges to the Hunter River occurred during the reporting period.

6.4 WATER TAKE

A total of 1,669 megalitres (ML) of water was taken from the Hunter Regulated River Water Source for use at the MPO during the 2025 reporting period, and 1628ML in the 2024/2025 water year (Table 21). No other water sources were used within the reporting period. This was 383ML less than the 2023-2024 water reporting period. MACH Energy holds a number of water licences as detailed in Section 2. There are licence allocations that are dedicated to the mining operations and others to Agriculture uses, although these may interchange between purposes from time-to-time depending on climatic conditions and operational needs. The water take from the Hunter Regulated River Water Source was less than the MPO total entitlement (3,758 ML) and less than the allocated mining operational use for the 2025 water year (2,104 ML) (Table 21). Table 21 compares the water licence allocation for the water year (June 2024 to July 2025) with the water usage this period. Table 21 also shows water usage for the 2025 calendar year which does not directly align with the 2024/2025 water year allocation hence why there appears to be exceedances.

A total of 1 ML of water was taken from groundwater sources. Volumes were determined using the site Goldsim water model. Water take from groundwater sources were less than the total MPO Sydney Basin - North Coast Groundwater Source entitlement (730ML).

Table 21
MPO Water Take Licence Summary

		2024/2025		2025
WALs	**Licence**	**Allocation**	**Total**	
Regulated River- General Security		**ML**		
8406	20AL200497	168.0	4.9	14.6
974	20AL201262	210.0	0	55.5
Regulated River- High Security				
638	20AL200446	225.0	225.0	237.5
880	20AL201052	124.0	0	68.4
Hunter Regulated River Water				
639	20AL200447	577.5	577.4	549.5
879	20AL201050	243.0	243.0	203.0
8598	20AL201436	3.0	1.5	1.5
1113	20AL201612	366.0	41.7	41.7
41438	20AL219053	455.0	375.3	372.6
988	20AL201290	156.0	25.2	51.1
10775	20AL201740	243.0	73.6	73.6
1227	20AL201893	99.0	60.4	0
	TOTAL	**2869.5**	**1628**	**1669**

Note:
1. A full listing of all MACH Energy Water Licences is shown in Section 2: Approvals, this table presents only those licences that were used to supply water from the Hunter River to the operations in the 2025 calendar year.
2. Temporary licenses 20AL213262-71T, 20AL200042-71T, 20AL212803-71T and 20AL201133-71T allocated to WAL 639 included in allocation amount for 2025.

6.5 SITE WATER BALANCE

The Site Water Balance is reviewed annually against on-site water inventories and pumping data. The Site Water Balance for the reporting period (i.e. 1 January 2025 to 31 December 2025) is provided in Table 22 in comparison to the 2024 Site Water Balance.

The surface water runoff increased from the previous reporting period due to a larger disturbed area as mining production and surrounding project infrastructure increased in size and the rainfall intensities. In the reporting period, May and August both had large rainfall events resulting in high runoff during these periods in comparison to 2024, which had steady rainfall throughout the year. Dust suppression on the haul roads increased in response to warmer and dusty conditions. The dust suppression on the stockpiles decreased during the reporting period due to an upgrade to the system meaning the stockpile dust suppression was non-operational during part of the upgrade period.

2025 model improvements include:

- Installation of additional flow meters
- Implementation of improved methods for the calculation of dry tailings
- Goldsim water balance updated to be representative of current mine plan, catchment areas, new dam and water infrastructure, dam storages.

Table 22
MPO Annual Water Balance

	2024	2025
Water Sources	**Volume (ML/yr)**	**Volume (ML/yr)**
Surface Water Runoff	985[1]	2125[1]
Groundwater	4[1]	1[1]
Fine Rejects Bleed Water	1011[1]	1089[1]
Hunter River Pumping (via WALs)	1460	1669
Water Usage	**Volume (ML/yr)**	**Volume (ML/yr)**
CHPP Demand	3186	3061
Dust Suppression (Stockpiles)	184	5
Dust Suppression (Haul Roads)	695	927
Vehicle Wash Demand	66	72
Water Loss	**Volume (ML/yr)**	**Volume (ML/yr)**
Discharge to Hunter River (via HRSTS)	0	0
Evaporation	1816[1]	1793[1]
Entrainment	1989[1]	2112[1]
Non-Sediment Dam Spillage	0	0
Sediment Dam Spillage	0	0

Note: ML/yr = Megalitres per year.

1 This volume is a modelled output

APPENDIX F

GROUNDWATER ANNUAL LABORATORY ANALYSIS 2025

Annual Groundwater Laboratory Analysis

Site ID	Sodium	Potassium	Calcium	Chloride	Sulfate as SO_4	Total Phosphorus	Nitrate as N	Nitrite as N	Nitrate & Nitrite as N	Ammonia as N	Reactive Silica
3500C500L	870	3.6	5.1	570	33	0.2	0.05	0.02	0.1	0.67	15
3500C500S	1200	9.1	32	1300	110	0.03	3.5	2	5.5	0.03	16
4500F000	1200	10	57	2300	370	0.07	0.41	<0.02	0.41	0.43	24
5000D000-R	1000	10	28	690	730	0.19	0.03	0.05	0.08	1.4	14
6000C000L-R	1100	3.9	6.4	770	37	0.11	0.4	<0.02	<0.05	1.6	11
6500F500L	480	5.9	31	360	110	0.13	0.09	<0.02	0.09	1.7	17
6500F500M	470	6	32	350	41	0.1	0.04	<0.02	<0.05	1.8	17
6500F500U	640	11	120	1100	130	7.8	1.6	<0.02	1.6	<0.01	16
6500F625	540	12	91	890	36	0.7	0.15	<0.02	0.16	4.5	32
7500F000	1600	3.4	4.2	790	4.1	0.24	0.04	<0.02	<0.05	2.4	18
GDE Bore Deep	2200	24	140	3700	350	0.06	0.04	<0.02	<0.05	1.2	19
Melody	730	10	150	1600	160	0.04	1.2	<0.02	1.2	<0.01	29
MPBH1	30	1.6	54	48	26	0.18	0.68	<0.02	0.69	<0.01	25
MPBH1-C	320	0.9	8.2	130	58	0.19	0.03	<0.02	<0.05	0.33	15
MPBH1-HR	400	1.0	7.5	78	100	0.06	<0.02	<0.02	<0.05	0.22	13
MPBH2	58	0.8	110	83	69	0.18	22	<0.02	22	<0.01	35
MPBH2-C	260	2.1	38	100	78	0.76	7.1	<0.02	7.1	0.51	63
MPBH2-HR	99	2.1	76	100	72	0.02	7.4	<0.02	7.4	<0.01	27
MPBH3b	960	3.6	93	1400	200	0.15	8.8	<0.02	8.8	<0.01	14
MPBH4	670	4.8	260	1600	330	0.09	0.1	<0.02	0.1	0.15	33
MPBH4-C	1100	2.4	13	1200	110	0.12	1.7	< 0.02	1.7	< 0.01	23
MPBH4-HR	1300	3.2	13	350	70	0.06	320	0.13	320	0.21	8.3
MPBH5-C	160	1.9	7.2	97	76	0.06	0.31	0.18	0.49	0.77	30
MPBH5-HR	86	1.7	53	67	34	0.05	< 0.02	< 0.02	< 0.05	0.11	28
MPBH6	95	0.8	89	210	52	0.08	1.6	< 0.02	1.6	< 0.01	27
MPBH6-C	860	6.4	31	420	<20	0.1	< 0.02	< 0.02	< 0.05	1.7	19
MPBH6-HR	1500	7.9	19	700	<40	0.04	< 0.02	< 0.02	< 0.05	2.3	15
MPBH7	1200	28	11	2300	150	0.1	7.5	< 0.02	7.5	< 0.01	24
MPBH7-C	2000	26	15	2800	190	0.05	< 0.02	< 0.02	< 0.05	4.3	17
WRA1L	500	11	20	520	63	0.01	0.18	< 0.02	0.18	< 0.01	18
WRA3L-R	1700	12	41	1200	1300	0.43	5.5	0.12	5.6	1.4	13
WRA5L-R	980	13	45	890	170	0.04	< 0.02	< 0.02	< 0.05	2.9	14
WRA5U-R	990	18	11	1500	440	0.02	0.82	< 0.02	0.82	< 0.01	16
WRA6L	1000	17	31	1600	320	0.07	1.8	< 0.02	1.8	0.11	21
WRA6U	1200	28	16	2200	260	0.01	0.03	< 0.02	< 0.05	< 0.01	19

Site ID	Zinc	Ionic Balance	Acidity as $CaCO_3$	Bicarbonate Alkalinity as $CaCO_3$	Hydroxide Alkalinity as $CaCO_3$	Total alkalinity as $CaCO_3$	Carbonate alkalinity as $CaCO_3$	Total Hardness as $CaCO_3$	Magnesium	Aluminium	Antimony
3500C500L	0.019	4.9	<10	1300	<20	1300	<20	35	5.4	0.12	<0.005
3500C500S	0.039	4.4	<10	1400	<20	1400	<20	440	87	0.24	<0.005
4500F000	0.024	7.3	<10	1300	<20	1300	<20	1700	270	<0.05	<0.005
5000D000-R	0.058	4.9	<10	1000	<20	1000	<20	270	50	0.8	<0.005
6000C000L-R	0.053	1.9	<10	1300	<20	1400	110	34	4.3	0.24	<0.005
6500F500L	0.087	2.7	15	810	<20	810	<10	290	51	0.87	0.014
6500F500M	0.013	3	12	890	<20	890	<10	300	54	<0.05	<0.005
6500F500U	0.075	2	76	790	<20	790	<10	1200	220	<0.05	<0.005
6500F625	0.015	1.4	34	930	<20	930	<20	980	180	<0.05	<0.005
7500F000	0.016	2.9	<10	2600	<20	2600	<20	23	3.1	0.06	<0.005
GDE Bore Deep	0.018	2.1	20	1300	<20	1300	<10	1800	340	0.1	<0.005
Melody	0.029	3.1	100	1000	<20	1000	<10	1600	300	<0.05	<0.005
MPBH1	0.021	2.2	<10	220	<20	220	<10	250	27	2.1	<0.005
MPBH1-C	0.027	7.0	<10	560	<20	600	42	43	4.2	0.20	<0.005
MPBH1-HR	0.025	3.3	<10	750	<20	750	<20	35	3	0.12	<0.005
MPBH2	0.022	3.5	<10	370	<20	370	<10	530	64	1.9	<0.005
MPBH2-C	0.031	2.1	<10	580	<20	580	<10	720	25	3.7	<0.005
MPBH2-HR	0.014	2	<10	390	<20	390	<20	410	54	<0.05	<0.005
MPBH3b	0.062	4.1	<10	950	<20	950	<20	790	140	1.1	<0.005
MPBH4	0.008	5	26	660	<20	660	<20	1500	200	<0.05	<0.005
MPBH4-C	0.025	2.6	<10	790	<20	790	<20	67	8.5	0.23	< 0.005
MPBH4-HR	0.02	6.4	<10	1600	<20	1600	<20	78	9.6	<0.05	< 0.005
MPBH5-C	0.034	2.2	<10	<20	<20	170	150	32	1.4	0.98	< 0.005
MPBH5-HR	0.014	3.7	<10	350	<20	350	<20	270	30	< 0.05	< 0.005
MPBH6	0.014	0.4	<10	330	<20	330	<20	470	59	0.2	< 0.005
MPBH6-C	0.025	3.7	<10	1600	<20	1600	<20	150	19	< 0.05	< 0.005
MPBH6-HR	0.005	3	<10	2600	<20	2600	<20	110	14	< 0.05	< 0.005
MPBH7	0.027	3.7	13	910	<20	910	< 20	1300	320	0.74	< 0.005
MPBH7-C	0.017	0.4	< 10	1400	<20	1400	< 20	1200	280	< 0.05	< 0.005
WRA1L	0.016	1.2	< 10	930	<20	930	< 20	600	130	< 0.05	< 0.005
WRA3L-R	0.048	4.9	< 10	1300	<20	1300	< 10	230	31	0.89	< 0.005
WRA5L-R	0.01	3.5	< 10	1700	<20	1700	< 20	790	160	< 0.05	< 0.005
WRA5U-R	0.009	0.1	< 10	740	<20	740	< 20	1100	270	0.07	< 0.005
WRA6L	0.006	0.5	27	1000	<20	1000	< 20	1300	310	< 0.05	< 0.005
WRA6U	0.013	4.6	52	1600	<20	1600	< 20	1900	450	< 0.05	< 0.005

Site ID	Arsenic	Barium	Beryllium	Boron	Cadmium	Selenium	Cobalt	Copper	Fluoride	Iron	Lead
3500C500L	0.002	0.17	<0.001	0.25	<0.0002	<0.001	<0.001	0.004	1.6	2.7	<0.001
3500C500S	0.003	0.12	<0.001	0.3	<0.0002	<0.001	<0.001	0.016	1.2	7.7	0.002
4500F000	<0.01	0.12	<0.01	0.3	<0.0002	<0.001	<0.001	<0.001	<2	0.1	<0.001
5000D000-R	0.004	0.16	<0.001	0.27	<0.0002	<0.001	0.001	0.007	3.9	1.3	0.005
6000C000L-R	0.001	0.14	<0.001	<0.5	<0.0002	<0.001	<0.001	0.003	3.3	1.2	0.001
6500F500L	<0.001	0.4	<0.001	0.2	<0.0002	<0.026	<0.001	0.011	1.7	1.9	0.004
6500F500M	<0.001	0.27	<0.001	0.18	<0.0002	<0.001	<0.001	<0.001	1.4	0.07	<0.001
6500F500U	0.001	0.23	<0.001	0.2	<0.0002	<0.001	<0.001	<0.001	2	1.6	<0.001
6500F625	0.003	0.13	<0.001	0.16	<0.0002	<0.001	<0.001	0.001	1.4	1.1	<0.001
7500F000	0.001	0.66	<0.001	0.42	<0.0002	<0.001	<0.001	0.001	2.9	0.28	<0.001
GDE Bore Deep	0.001	0.15	<0.001	<0.5	<0.0002	<0.001	<0.001	<0.001	2.1	0.94	<0.001
Melody	<0.001	0.27	<0.001	0.21	<0.0002	0.002	<0.001	<0.001	1.5	0.25	<0.001
MPBH1	0.001	0.08	<0.001	<0.05	<0.0002	<0.001	0.002	0.005	0.2	3.6	0.002
MPBH1-C	<0.001	0.11	<0.001	0.79	<0.0002	<0.001	<0.001	<0.001	1.6	0.63	<0.001
MPBH1-HR	<0.001	0.26	<0.001	0.86	<0.0002	<0.001	<0.001	0.001	<0.5	0.45	<0.001
MPBH2	0.001	0.09	<0.001	0.06	<0.0002	0.004	0.003	0.004	0.3	3.7	0.001
MPBH2-C	0.002	0.21	<0.001	0.20	<0.0002	0.002	0.004	0.015	0.4	3.8	0.005
MPBH2-HR	<0.001	0.06	<0.001	0.10	<0.0002	0.002	<0.001	0.002	0.2	<0.05	<0.001
MPBH3b	0.003	0.11	<0.001	0.36	<0.0002	0.005	0.002	0.097	0.9	2.3	0.007
MPBH4	<0.001	0.05	<0.001	0.14	<0.0002	<0.001	0.004	<0.001	<1	0.4	<0.001
MPBH4-C	< 0.001	0.38	< 0.001	0.54	< 0.0002	< 0.001	< 0.001	0.001	< 1	0.48	< 0.001
MPBH4-HR	< 0.001	0.65	< 0.001	0.88	< 0.0002	< 0.001	< 0.001	< 0.001	< 1	0.08	< 0.001
MPBH5-C	0.003	0.06	< 0.001	0.11	< 0.0002	< 0.001	< 0.001	0.012	0.7	0.84	0.002
MPBH5-HR	< 0.001	0.39	< 0.001	0.08	< 0.0002	< 0.001	< 0.001	0.002	< 0.2	0.16	< 0.001
MPBH6	< 0.001	0.02	< 0.001	0.06	< 0.0002	0.002	< 0.001	0.001	0.6	0.33	< 0.001
MPBH6-C	< 0.001	1.1	< 0.001	0.15	< 0.0002	< 0.001	< 0.001	0.001	3.6	0.15	< 0.001
MPBH6-HR	< 0.001	2	< 0.001	0.2	< 0.0002	< 0.001	< 0.001	< 0.001	4.4	0.08	< 0.001
MPBH7	< 0.001	0.08	< 0.001	0.2	< 0.0002	0.003	< 0.001	0.006	4.2	1.4	< 0.001
MPBH7-C	0.002	0.27	<0.001	0.26	< 0.0002	< 0.001	< 0.001	< 0.001	3.4	1.1	< 0.001
WRA1L	< 0.001	< 0.02	< 0.001	0.13	< 0.0002	< 0.001	0.001	< 0.001	1.8	< 0.05	< 0.001
WRA3L-R	0.007	0.11	<0.001	< 0.5	< 0.0002	0.001	0.005	0.006	2.8	4.5	0.004
WRA5L-R	< 0.001	0.08	< 0.001	0.22	< 0.0002	< 0.001	< 0.001	< 0.001	3.6	0.07	< 0.001
WRA5U-R	< 0.001	0.05	< 0.001	0.24	< 0.0002	< 0.001	< 0.001	< 0.001	4.8	0.09	< 0.001
WRA6L	< 0.001	0.05	< 0.001	0.2	< 0.0002	0.002	< 0.001	< 0.001	4.3	< 0.05	< 0.001
WRA6U	< 0.001	0.03	< 0.001	0.26	< 0.0002	< 0.001	0.002	< 0.001	3.9	0.05	< 0.001

	Manganese	Mercury	Stontium	Nickel
3500C500L	0.032	<0.0001	1	0.001
3500C500S	0.023	<0.0001	9.3	0.005
4500F000	0.24	<0.0001	9.3	0.003
5000D000-R	0.11	0.001	0.98	0.011
6000C000L-R	0.045	<0.001	0.3	0.002
6500F500L	0.052	0.0002	4.3	0.005
6500F500M	0.026	<0.0001	4.4	0.001
6500F500U	0.071	<0.0001	6.3	0.004
6500F625	0.39	<0.0001	3.7	0.002
7500F000	0.013	<0.0001	1.4	0.001
GDE Bore Deep	0.002	<0.0001	19	0.002
Melody	0.018	<0.0001	7.6	0.002
MPBH1	0.22	<0.0001	0.41	0.005
MPBH1-C	0.10	<0.0001	0.18	<0.001
MPBH1-HR	0.05	<0.0001	0.35	0.001
MPBH2	0.16	<0.0001	0.82	0.004
MPBH2-C	0.077	<0.0001	0.61	0.005
MPBH2-HR	<0.005	<0.0001	0.78	0.002
MPBH3b	0.64	<0.0001	2.9	0.004
MPBH4	4.7	<0.0001	4.6	0.002
MPBH4-C	0.12	< 0.0001	0.91	0.001
MPBH4-HR	0.17	< 0.0001	1.5	0.001
MPBH5-C	0.033	< 0.0001	0.21	0.004
MPBH5-HR	0.078	< 0.0001	0.72	< 0.001
MPBH6	0.02	< 0.0001	0.74	0.001
MPBH6-C	0.069	< 0.0001	1.6	< 0.001
MPBH6-HR	0.026	< 0.0001	2.9	< 0.001
MPBH7	0.03	< 0.0001	1.3	0.005
MPBH7-C	0.041	< 0.0001	0.81	0.001
WRA1L	0.1	< 0.0001	0.71	0.006
WRA3L-R	0.17	< 0.0001	0.42	0.015
WRA5L-R	0.024	< 0.0001	0.87	< 0.001
WRA5U-R	0.021	< 0.0001	1.4	0.002
WRA6L	0.006	< 0.0001	1.3	0.002
WRA6U	0.42	< 0.0001	1.1	0.012

APPENDIX G

MOUNT PLEASANT OPERATION – 2025 ANNUAL GROUNDWATER REPORT

Australasian Groundwater & Environmental Consultants

Report on

Mt Pleasant Groundwater Report for the 2025 Calendar Year

Prepared for
MACH Mount Pleasant Operations Pty Ltd

Project No. 20250132.MPO
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ageconsultants.com.au

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Mt Pleasant Groundwater Report for the 2025 Calendar Year

1 Introduction

The Mount Pleasant Operation (MPO) is situated approximately three kilometres northwest of Muswellbrook, in the Upper Hunter Valley of New South Wales (NSW) (Figure 1.1).

MACH Energy Australia Pty Ltd (MACH Energy) acquired the MPO from Coal and Allied Operations Pty Ltd on 4 August 2016. Construction activities at the MPO commenced in November 2016, followed by the start of mining operations in October 2017, in accordance with Development Consent DA 92/97 and EPBC 2011/5795. The MPO is managed by MACH Mount Pleasant Operations Pty Ltd as an agent for the unincorporated Mount Pleasant Joint Venture, comprising MACH Energy (95% ownership) and J.C.D. Australia Pty Ltd (5% ownership), collectively referred to as MACH hereafter.

Development Consent for the MPO (DA 92/97) was granted on 22 December 1999, under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). In addition, the MPO received approval under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in 2012 (EPBC 2011/5795).

The Mount Pleasant Continuation Project was approved by the NSW Independent Planning Commission on 6 September 2022. Appendix 2 of Development Consent SSD 10418 illustrates the General Project Arrangement for 2026, 2028, 2031, 2034, 2041, 2044 and 2047, as well as staging of Project disturbance areas, and the indicative mine infrastructure area layout. In addition, the MPO received approval under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) in 2024 (EPBC 2020/8735).

The most resent modification, Modification 6 (MOD6), was submitted to modify Development Consent DA 92/97 and was approved on 6 November 2023. MOD6 allows for the construction and operation of a re-transmission facility including a tower or mast, shed, and associated transmission infrastructure to re-transmit local digital television signals from the Broadcast Australia site at Rossgole Lookout. Appendix 2 of the modified Development Consent DA 92/97 illustrates the Revised Approved Surface Disturbance Plan.

MACH currently operates in accordance with both DA 92/97 and SSD 10418

Development Consent DA 92/97 permits the construction and operation of an open-cut coal mine, coal preparation plant, transport and rail loading facilities, and associated infrastructure at the MPO. The consent allows operations to run 24 hours a day, seven days a week, with the extraction of up to 197 million tonnes (Mt) of run-of-mine (ROM) coal over a 21-year period, at a maximum rate of 10.5 Mt of ROM coal per year.

SSD 10418 permits an increase in extraction, handling and processing of ROM coal up to 21 million tonnes per annum, upgrades to existing infrastructure and new infrastructure to support mining and an extension to the time limit on mining to 2048.

MACH Energy has requested Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to prepare
a groundwater report covering the 2025 calendar year, to be included in the Annual Review.

1.1 Objectives and scope of work

The objective of this project is to prepare a groundwater report for inclusion in the 2025 Annual Review. To achieve this, we propose the following tasks:

- Task 1 – Review groundwater monitoring data;
- Task 2 – Assess numerical model predictions; and
- Task 3 – Prepare a comprehensive report.

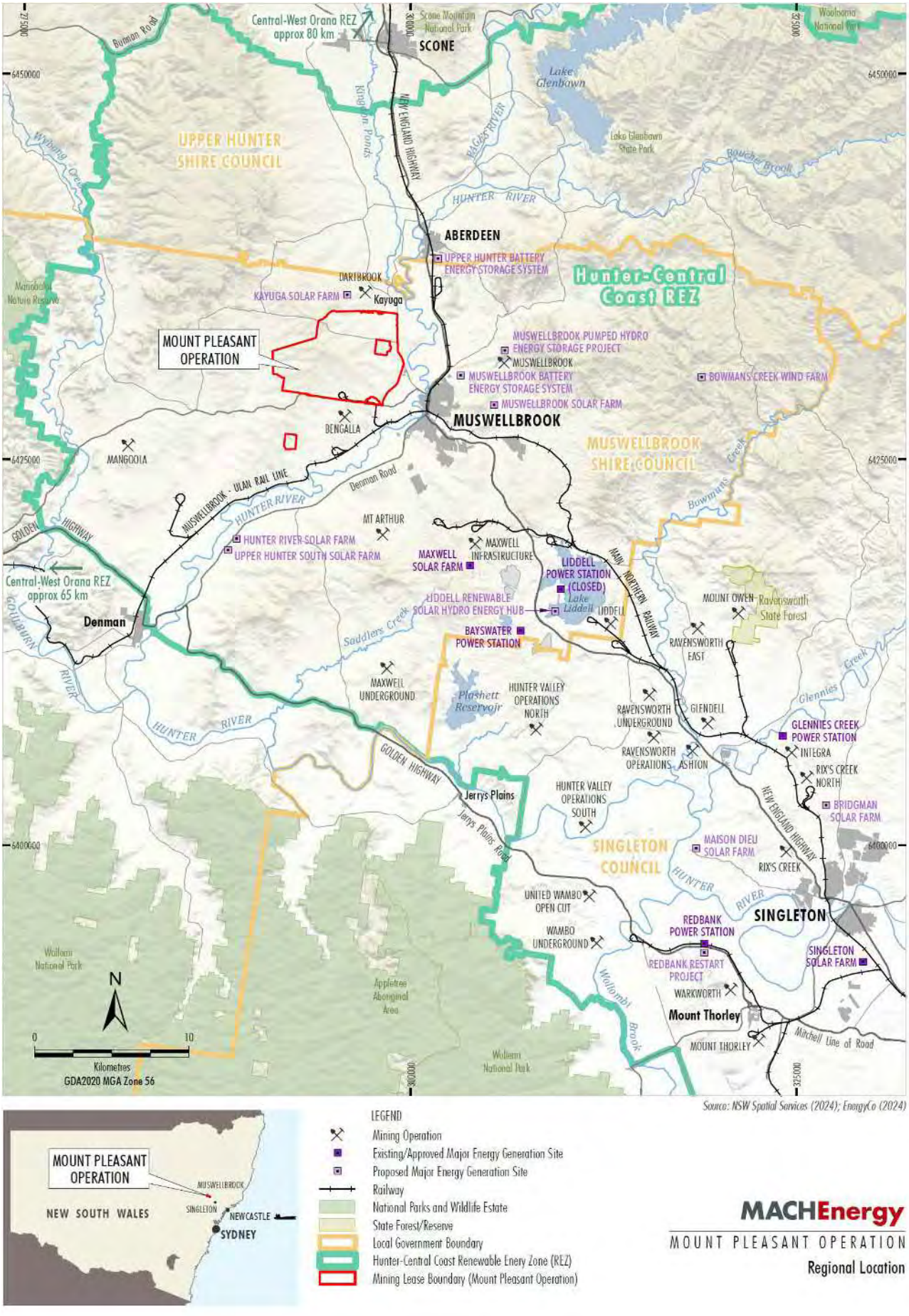


Figure 1.1 Regional Location

2 Review groundwater monitoring data

2.1 Groundwater monitoring network

MPO continuously monitors groundwater levels and quality through an extensive network of observation bores. This network spans the Hunter River alluvium, regolith, and Permian interburden/coal seams within the MPO region. Monitoring bores within the Hunter River alluvium are typically shallow (<20 m), reflecting the limited depth of the local alluvial deposits. In contrast, the Permian strata are evaluated through bores installed at various depths throughout the geological sequence. The locations of both existing MPO monitoring bores and those planned for installation are shown in Figure 2.1. The nearby Bengalla Mine also operates its own groundwater monitoring network, with both sites sharing groundwater data. Appendix A summarises the current and historical MPO groundwater monitoring network.

The key aspects of the MPO monitoring network, as illustrated in Figure 2.1, are as follows:

- The network is divided into three areas: Central, Eastern, and Western.
- The Central network monitors groundwater in the coal seams and interburden units near the open-cut pits.
- The Eastern network monitors groundwater in the alluvial aquifer associated with the Hunter River through ten bores (i.e., MPBH1–MPBH6, MPBH3b, NE Alluvium and East Alluvium).
- The Western network monitors groundwater in the alluvium/regolith as well as in the underlying Permian strata, within drainage lines that discharge westward, such as Sandy Creek.

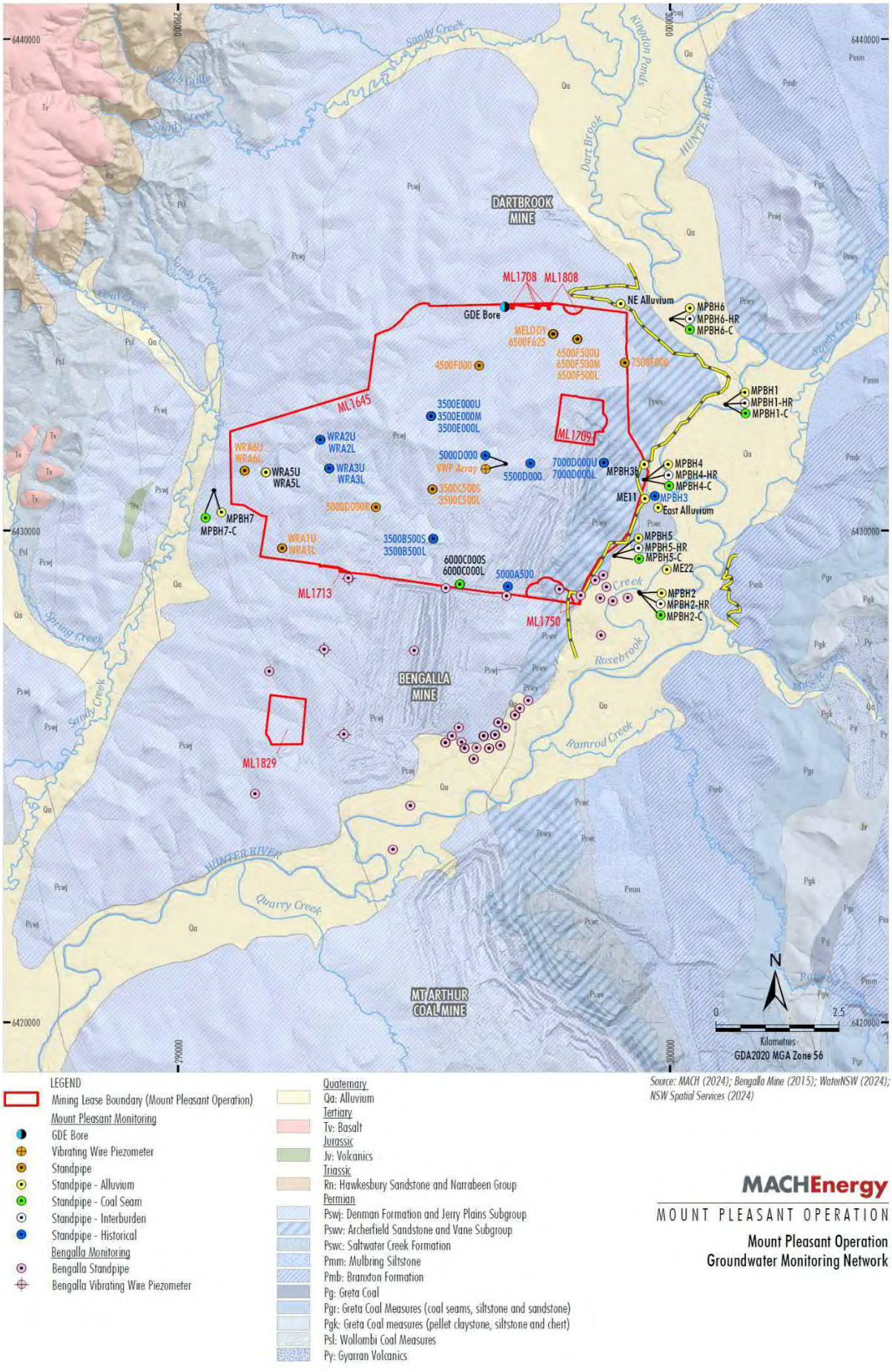


Figure 2.1 MPO groundwater monitoring network

2.2 Data recovery

The latest MPO WMP (MACH Energy, 2025) defines the monitoring frequency and trigger levels for both groundwater levels and groundwater quality within the monitoring network. The MPO monitoring network described in the WMP includes 69 monitoring sites for water level monitoring, comprising one proposed vibrating wire piezometer (VWP) with eight sensors and ten proposed bores. Water-level trigger levels are defined for only four monitoring sites (i.e., MPBH1, MPBH2, MPBH3b and MPBH7) in the MPO WMP. In contrast, groundwater quality trigger levels for pH and EC are defined in the MPO WMP for 33 and 30 monitoring sites, respectively.

During the reporting period, groundwater levels were monitored at 42 existing bores. Bores with less than100% data recovery during the reporting period are identified in Table 2.1. Reduced data recovery was primarily attributed to instances where bores could not be accessed (WRA5L-R, WRA5U-R and NE Alluvium) or were impacted by mining (5500D000) or roadworks (GDE Bore Deep and GDE Bore Shallow). Of the 42 existing bores, water quality monitoring was conducted at 35 bores, which recorded field measurements of pH and electrical conductivity (EC) throughout the reporting period. Some bores, such as WRA1U, NE Alluvium, MPBH5, GDE Bore Shallow, and East Alluvium, were dry, while others, including 6000C000U-R and WRA3U-R, had insufficient water to allow for water quality sampling.

Table 2.1 Groundwater monitoring data recovery

Bore ID	Aquifer/Unit	Data recovery (%)	Comment
5500D000	Interburden #7/Wynn Seam	0	Bore has been mined through and will not be replaced.
5000D000	Wynn/Edderton Seams	75	The bore was monitored in Q2, Q3, and Q4; however, no monitoring was conducted in Q1.
GDE Bore Deep	Warkworth Seam	75	Bore was monitored in Q1, Q2, and Q3; however, monitoring in Q4 was impacted by roadworks. The bore is being replaced.
GDE Bore Shallow	Mount Arthur Seam	75	Bore was monitored in Q1, Q2, and Q3; however, monitoring in Q4 was impacted by roadworks. The bore is being replaced.
NE Alluvium	Alluvium	75	Bore was monitored in Q2, Q3, and Q4 and was recorded as dry; however, monitoring was not possible in Q1 as the bore lid could not be opened.
WRA5L-R	Permian	75	Bore was monitored in Q1, Q2, and Q4; however, access was blocked in Q3.
WRA5U-R	Alluvium/weathered regolith	75	Bore was monitored in Q1, Q2, and Q4; however, access was blocked in Q3.

2.3 Groundwater levels

Groundwater levels for the WMP bore network, as shown in Figure 2.1, are summarised in this section. Details of the monitoring bores are provided in Appendix A. Hydrographs for all bores are presented in Appendix B, with trigger levels included where a trigger level was set for the corresponding bores. The hydrographs also display the cumulative rainfall departure (CRD), which is calculated by cumulatively summing the difference between actual monthly rainfall and the long-term average monthly rainfall. A rising CRD indicates above-average rainfall, while a declining CRD signifies below-average rainfall. CRD trends are relevant because groundwater hydrographs, particularly for shallow aquifers, tend to follow similar patterns—declining groundwater levels during periods of below-average rainfall and rising levels during periods of above-average rainfall.

Long-term rainfall data used to generate the CRD were sourced from the Scientific Information for Land Owners (SILO) database (https://www.longpaddock.qld.gov.au/silo/). SILO, operated by the Queensland Department of Environment, Science and Innovation (DESI), integrates data from the Bureau of Meteorology (BoM) to produce high-quality climate datasets. By interpolating data from neighbouring BoM stations, SILO generates a continuous daily time series. The long-term rainfall dataset used in this report was obtained from a point at latitude -32.25, longitude 150.85, which is located within the project site.

2.3.1 Hunter River alluvium

Figure 2.2 presents groundwater levels in the Hunter River alluvium, measured from 2003 to 2026 at eight monitoring bores: MPBH1-MPBH6, MPBH3b and NE Alluvium (refer to Figure 2.1). It should be noted that the East Alluvium bore was dry (see Table 2.1) and is therefore not included in this figure. Additionally, the figure includes the CRD, derived from SILO data as described earlier. The data indicate that groundwater levels in the alluvium remained generally stable during the monitoring period, with only minor increases observed following rainfall events and a discernible upward trend in the CRD. This stability suggests that the alluvial aquifer in this area is primarily sustained by losses from the surface water system rather than direct recharge from precipitation. It is important to note that water levels in the Hunter River are significantly influenced by controlled releases from Glenbawn Dam. During periods of significant rainfall, discharge volumes from the dam are typically reduced, further impacting river water levels and, consequently, the adjacent alluvial aquifer.



Figure 2.2 Water levels – Hunter River alluvium

The measured hydrographs for other MPBH bores targeting coal seams (e.g., MPBH1-C, MPBH2-C, MPBH4-C, MPBH5-C, MPBH6-C, and MPBH7-C) and interburden layers (e.g., MPBH1-HR, MPBH2-HR, MPBH4-HR, MPBH5-HR, and MPBH6-HR) are presented in Appendix B. Comparison of these hydrographs with the corresponding bores in the alluvium layer indicates that, in some cases, the coal seam and interburden bores exhibit groundwater level trends similar to the alluvium bores. For example, MPBH1-C closely follows the CRD trend observed in MPBH1, and a similar pattern is evident for MPBH2-HR, MPBH2-C, and MPBH2, as well as MPBH6-HR, MPBH6-C, and MPBH6. This correlation suggests the presence of hydraulic connectivity between the alluvium layer and the underlying interburden and coal seam layers at these locations. Where such connectivity exists, groundwater levels in the deeper layers respond partially to climatic drivers, as reflected in the CRD patterns observed in the overlying alluvium. In contrast, other bores with limited connectivity show a more muted response to rainfall, indicating that local geological stratigraphy and the presence of low-permeability materials influence the degree of vertical hydraulic interaction between layers.

2.3.2 Permian measures and regolith – Western Domain

Monitoring bores in the Western Domain of the MPO (WRA1, WRA2, WRA3, WRA5, WRA6, and MPBH7) (see Figure 2.1) are located within shallow Permian measures. With the exception of MPBH7, which targets the regolith, these bores are nested, with separate piezometers installed in both the regolith and the underlying unweathered Permian strata. The upper piezometer (U) in the bores is screened within the regolith (i.e., weathered rock), while the lower piezometer (L) is positioned in either Permian interburden or coal seams, beneath the weathered zone. It should be noted that WRA2 has been blocked since November 2018, while WRA3 and WRA5 were decommissioned in November 2022 and August 2021, respectively. Two replacement bores for WRA3 and WRA5 (denoted by "-R") were installed in November 2024. Additionally, WRA1U has remained dry since August 2023.

Figure 2.3 and Figure 2.4 show water level in Permian measures and regolith in the MPO Western Domain, respectively. As illustrated in Figure 2.3 and Figure 2.4, groundwater levels in these units vary by location. At sites such as WRA5 and WRA5-R, water levels in the regolith and the underlying strata are similar, indicating hydraulic connectivity and minimal vertical gradients. In contrast, locations like WRA3 and WRA3-R—and to a lesser extent, WRA6—show more pronounced differences in water levels, suggesting limited connectivity and stronger vertical gradients. Groundwater levels in WRA1L showed a gradual increase over the monitoring period, whereas levels in WRA6L and WRA6U remained relatively stable throughout the same period. Figure 2.3 and Figure 2.4 also presents the CRD. A comparison with the CRD indicates that groundwater levels in the monitored strata respond weakly to rainfall variations. Groundwater flow through the regolith is expected to be moderate, following the natural topography. While the regolith has the potential to establish hydraulic connectivity between the alluvium and the mine workings, it is generally dry, thin, and topographically separated from the open-cut pits by a drainage divide, which restricts direct interaction.



Figure 2.3 Water levels – MPO Western Domain Permian measures



Figure 2.4 Water levels – MPO Western Domain regolith

2.3.3 Permian measures – Central Domain

Groundwater in the Central Domain of the MPO, located north and west of the open-cut pits, is monitored through a network of 18 sites. This network includes one replacement bore (5000D000-R) and three monitoring sites, 6000C000(L–U) and the GDE Bore Deep, that were included in the proposed list of bores in the WMP (see Figure 2.1). It should be noted that the GDE Bore Shallow was dry or inaccessible during the reporting period. These bores target Permian measures, including interburden, coal seams, and the underlying Maitland Group (6500F500L and 7000D000L). Details on the Permian strata in which these bores are screened are provided in Appendix A. Five locations—3500B500, 3500C500, 6000C000, 6500F500, and 7000D000—contain nested monitoring bores, each with an upper piezometer (U) and a lower piezometer (L). Water level observations for these bores are presented in Figure 2.5. Bores 3500B500L and 3500B500U are no longer recording data. Bore 5000D000 was replaced by 5000D000-R in August 2022.

Figure 2.5 indicates that water levels within the upper interburden units (3500C500U) have remained relatively stable over the recorded period. In general, these water levels exhibit minimal response to rainfall variations, as illustrated by the CRD. A notable feature in Figure 2.4 is the sudden decline in groundwater elevation at 5000D000 and 5500D000, and the gradual decline observed at 3500C500L and 5000D000-R. Potential outliers appear in the water level data for bore 3500C500L between August 2022 and November 2025. Potential outliers are also present in the 5500D000 dataset between August 2021 and November 2024. Excluding these values, the rapid decline in water levels observed in bore 5500D000 can likely be attributed to mining activities in the vicinity of the bore. Groundwater levels at 5000D000-R, 5500D000 and 3500C500L have continued to decline during 2025, while levels at all other Central Domain bores have remained stable or increased. While the decline in groundwater levels at 6500F00U roughly coincides with the onset of a below-average rainfall period in 2017, the declines at 5000D000 and 5500D000 do not occur until late 2019—almost two years after the start of this dry period. Additionally, groundwater level recovery in these bores does not align with the onset of above-average rainfall recorded from early 2020 onward. Instead, recovery trends become evident from May 2021 at 5500D000 and from June 2022 at 6500F00U. Prior to 2017, groundwater levels in these bores showed little to no correlation with the CRD.

Groundwater levels in the mixed interburden and coal units (6500F500U, 6500F500M, and 7000D000U) have remained relatively stable over time, with some minor increases recorded during 2025. Bore Melody and GDE Bore Deep demonstrated consistent stability throughout the monitoring period. These bores did not display any definitive indications of drawdown attributable to mining activities at MPO or to operations at the adjacent Dartbrook or Bengalla Mines.

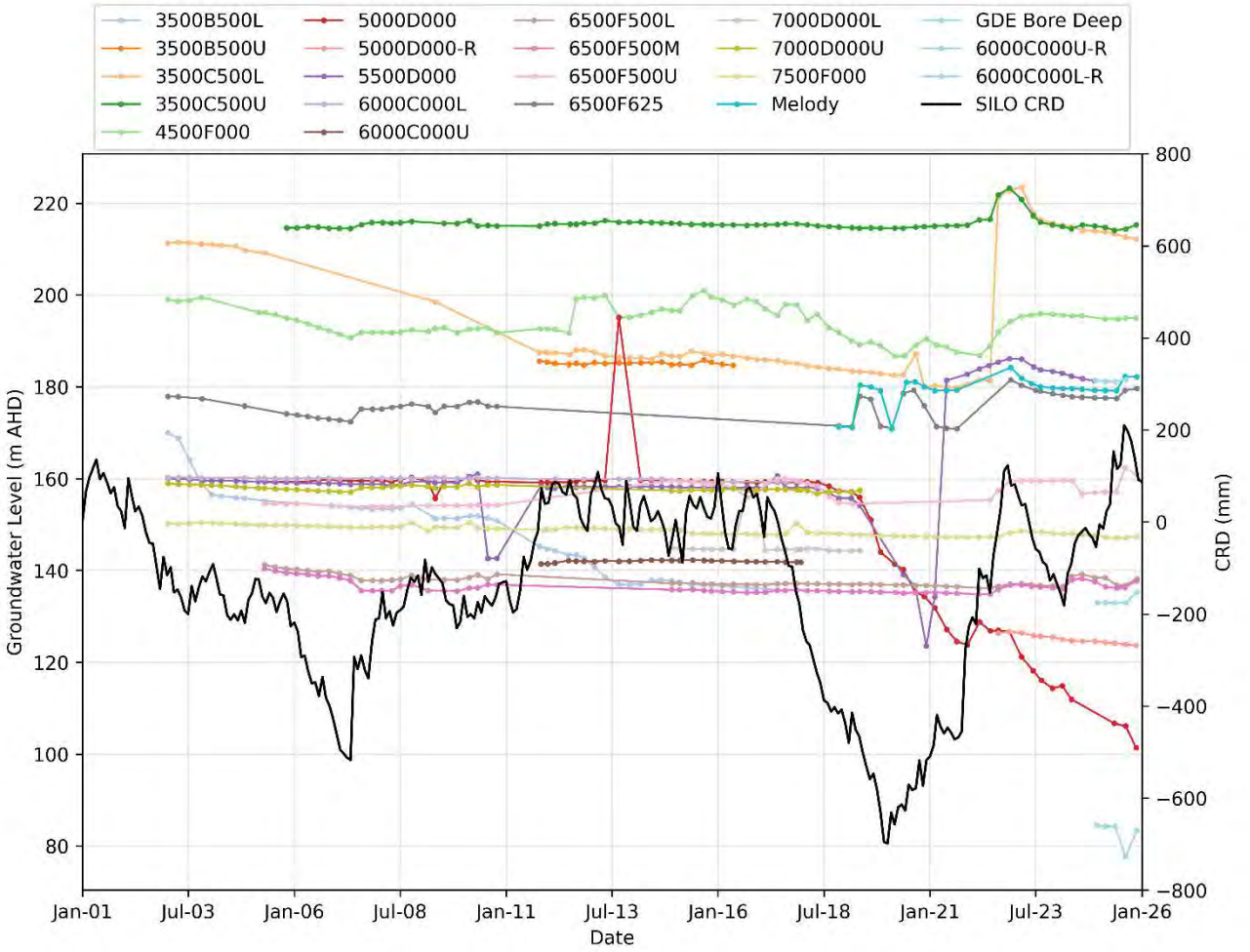


Figure 2.5 Water levels – MPO Central Domain Permian measures

The measured water levels in MPO monitoring bores over the reporting period, along with corresponding trigger levels where a trigger level was set, are summarised in Table 2.2. Water level trigger levels have been established in the WMP for MPBH1, MPBH2, MPBH3b, and MPBH7.

Table 2.2 Summary of measured water levels in MPO monitoring bores during the reporting period

Bore ID	Aquifer/Unit	Trigger level (m AHD)	Water level (m AHD)			
			Q1	Q2	Q3	Q4
MPO Central Domain						
3500C500L	Mount Arthur Seam	NA	213.76	213.32	212.63	212.20
3500C500U	Warkworth Seam	NA	214.72	214.10	214.36	215.29
4500F000	Vaux Seam	NA	194.78	194.79	195.03	195.02
5000D000	Wynn/Edderton Seams	NA	ND	134.32	134.92	139.60
5500D000-R	Interburden #7/Wynn Seam	NA	124.41	124.21	123.92	123.70
5500D000	Interburden #7/Wynn Seam	NA	ND	ND	ND	ND
6000C000L-R	Vaux Seam	NA	84.28	84.25	77.66	83.45
6000C000U-R	Mount Arthur Seam	NA	133.00	133.00	132.96	135.25
6500F500L	Maitland Group	NA	138.45	136.83	136.77	138.20
6500F500M	Interburden #6/Wynn Seam	NA	136.44	136.16	136.32	137.72
6500F500U	Interburden #4/Broonie Seam	NA	157.13	157.19	162.37	160.90
6500F625	Permian	NA	177.57	177.49	179.22	179.63
7500F000	Edderton Seam	NA	147.27	147.08	147.12	147.45
GDE Bore Deep	Warkworth Seam	NA	181.21	181.15	181.57	ND
Melody	Unknown	NA	179.20	179.16	182.30	182.17
MPO Eastern Domain						
MPBH1	Hunter Alluvium	136.16	137.14	137.80	139.85	137.33
MPBH1-C	Coal Seam	NA	143.32	143.97	146.08	143.56
MPBH1-HR	Interburden	NA	120.70	122.92	118.19	107.23
MPBH2	Hunter Alluvium	131.84	133.61	133.62	134.40	134.69
MPBH2-C	Coal Seam	NA	133.47	133.47	134.24	134.57
MPBH2-HR	Interburden	NA	133.59	133.58	116.53	131.20
MPBH3b	Hunter Alluvium	137.04	138.19	138.40	139.52	139.19
MPBH4	Hunter Alluvium	NA	137.43	137.12	137.82	137.61
MPBH4-C	Coal Seam	NA	138.12	138.62	139.53	139.11
MPBH4-HR	Interburden	NA	98.94	99.00	99.21	98.77
MPBH5	Hunter Alluvium	NA	136.50	ND	ND	ND
MPBH5-C	Coal Seam	NA	133.77	133.74	133.07	134.59
MPBH5-HR	Interburden	NA	133.89	133.88	134.30	135.11
MPBH6	Hunter Alluvium	NA	147.62	148.21	148.67	148.46
MPBH6-C	Coal Seam	NA	146.25	146.92	147.36	147.10
MPBH6-HR	Interburden	NA	146.71	148.20	148.26	147.27
NE Alluvium	Alluvium	NA	ND	ND	155.38	ND

Bore ID	Aquifer/Unit	Trigger level (m AHD)	Water level (m AHD)			
			Q1	Q2	Q3	Q4
East Alluvium	Alluvium	NA	ND	ND	ND	ND
MPO Western Domain						
MPBH7	Regolith	185.42	190.22	190.10	191.19	190.69
MPBH7-C	Coal Seam	NA	177.64	177.45	177.65	178.02
WRA1L	Warkworth/Permian	NA	215.04	214.75	215.71	216.46
WRA3L-R	Permian	NA	211.10	213.84	214.57	214.85
WRA3U-R	Alluvium/weathered regolith	NA	271.56	271.60	271.56	271.56
WRA5L-R	Permian	NA	226.90	226.90	ND	226.90
WRA5U-R	Alluvium/weathered regolith	NA	224.42	224.84	ND	223.62
WRA6L	Warkworth/Permian	NA	211.13	211.47	211.35	210.98
WRA6U	Alluvium/Regolith	NA	210.51	210.67	210.60	210.28

Note: m AHD = metres above Australian Height Datum; NA = Not Assigned; ND = No Data.

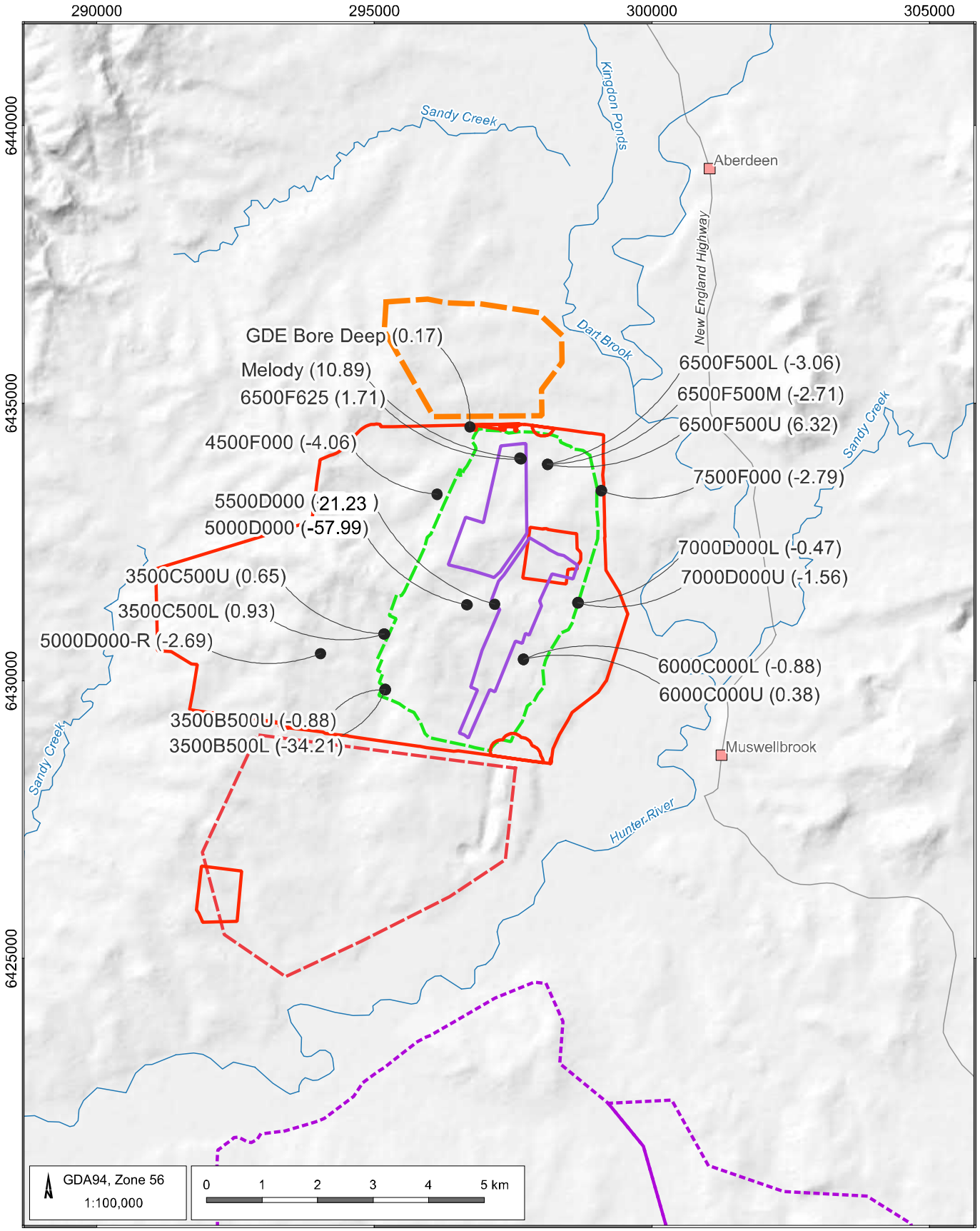
2.4 Drawdown

The total drawdown is determined by subtracting the first measured groundwater level from the last measured groundwater level at each monitoring bore, as detailed in Appendix A. It is important to note that the drawdown calculation spans different time periods, ranging from 2011 to 2025, depending on data availability. A negative value indicates a decline in groundwater levels, while a positive value signifies a rise in water levels over the measurement period.

Figure 2.6 illustrates the changes in groundwater levels within the MPO Central Domain, Figure 2.7 depicts the changes in groundwater levels within the MPO Eastern Domain, and Figure 2.8 shows the changes in groundwater levels in the MPO Western Domain. These figures provide a visual representation of how groundwater levels have fluctuated across the different domains over the monitoring period.

The measured total drawdown in the Hunter River alluvium (MPBH1-MPBH6, and MPBH3b) ranges from -0.66 m at MPBH4 to 1.3 m at MPBH2. In the MPO Western Domain, which includes regolith and Permian measures (WRA1, WRA2, WRA3, WRA5, WRA6, MPBH7 and MPBH7-C), drawdown in the regolith ranges from -0.99 m at WRA6U-R to 3.48 m at WRA5U. In contrast, drawdown in the Permian measures varies from -7.64 m at WRA2L to 11.72 m at WRA3L. In the MPO Central Domain, which targets Permian measures (3500B500, 3500C500, 4500F000, 5000D000, 5500D000, 6000C000, 6500F500, 6500F625, 7000D000, and Melody), drawdown ranges from -57.99 m at 5000D000 to 10.89. m at Melody. The total water level rise was 21.23 m at 5500D000. However, it should be noted that this bore has been mined through, and a potential outlier was observed in the water level data between August 2021 and November 2024 (see Figure 2.5).

The higher drawdown observed in bores such as 5000D000 (-57.99 m) and 3500B500L (-34.21 m), which target coal seams, appears to be related to their proximity to the mining pit and the influence of mining activities in the surrounding area. In contrast, the smaller drawdown observed in the overlying regolith and alluvium layers indicates limited hydraulic connectivity between the near-surface layers and the deeper coal seams. These variations highlight differences in groundwater response across the various domains and strata, reflecting the complex interaction between natural hydrogeological conditions and mining-induced impacts over the monitoring period. Furthermore, the data suggest that groundwater in the shallower layers is less affected by mining activities, likely due to the presence of low-permeability materials that restrict vertical flow. In deeper coal seam layers, however, groundwater levels are more sensitive to mining-induced depressurisation, resulting in pronounced drawdowns in bores located near the mining pit. These observations are consistent with the expected hydrogeological behaviour in stratified systems where connectivity between layers is limited.



LEGEND

- Populated place
- Drainage
- Road
- Bengalla Project Extent
- Dartbrook Project Extent
- MPO Pit Extent
- Project Boundary
- Pit Floor Extent
- MAC Pit Extent

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Groundwater level changes (drawdown) within the MPO Central Domain

AGE

DATE 10/03/2026

FIGURE No: **2.6**

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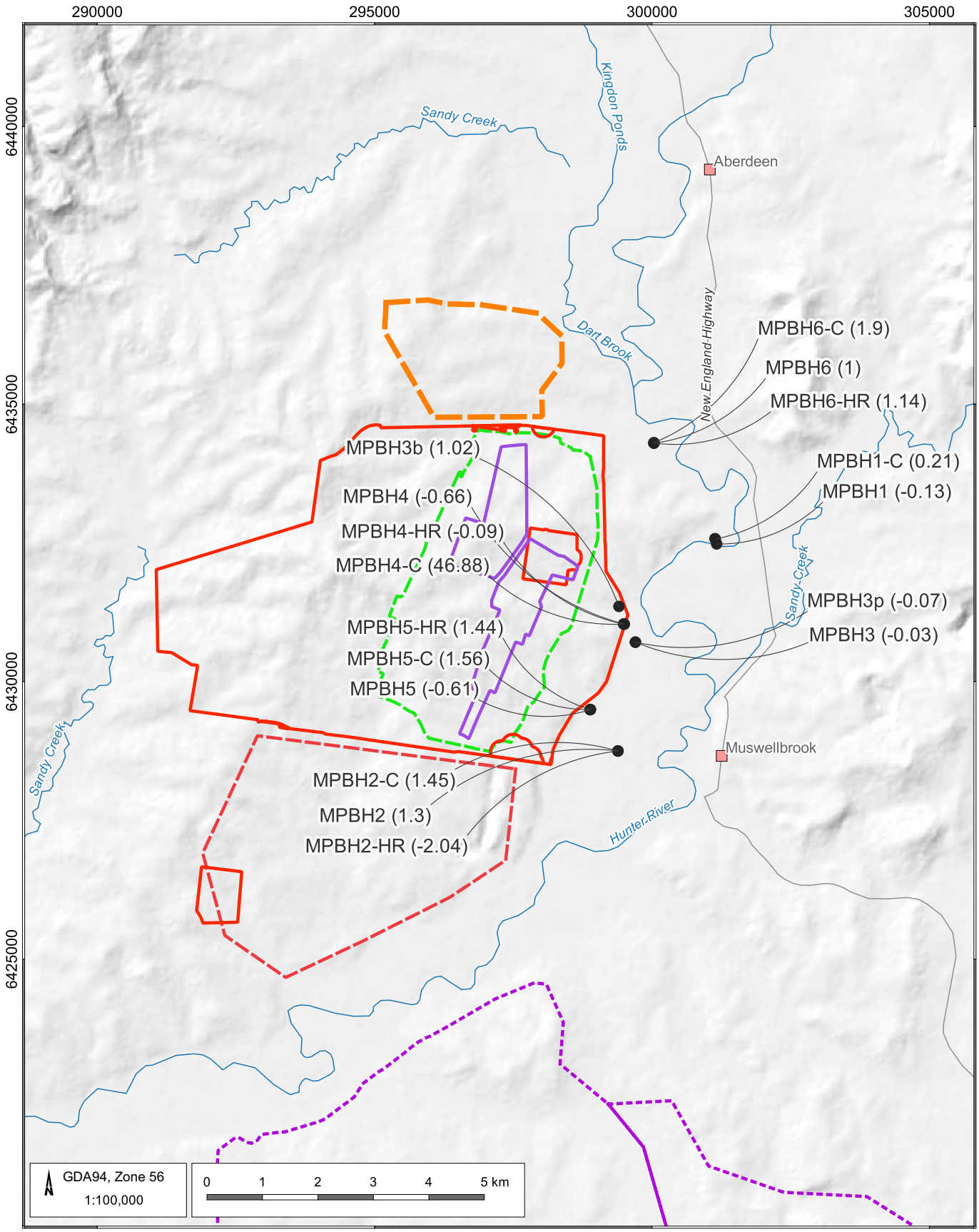

LEGEND

- Populated place
- Drainage
- Road
- Bengalla Project Extent
- Dartbrook Project Extent
- MPO Pit Extent
- Project Boundary
- Pit Floor Extent
- MAC Pit Extent

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Groundwater level changes (drawdown) within the MPO Eastern Domain

AGE

DATE 10/03/2026

FIGURE No: **2.7**

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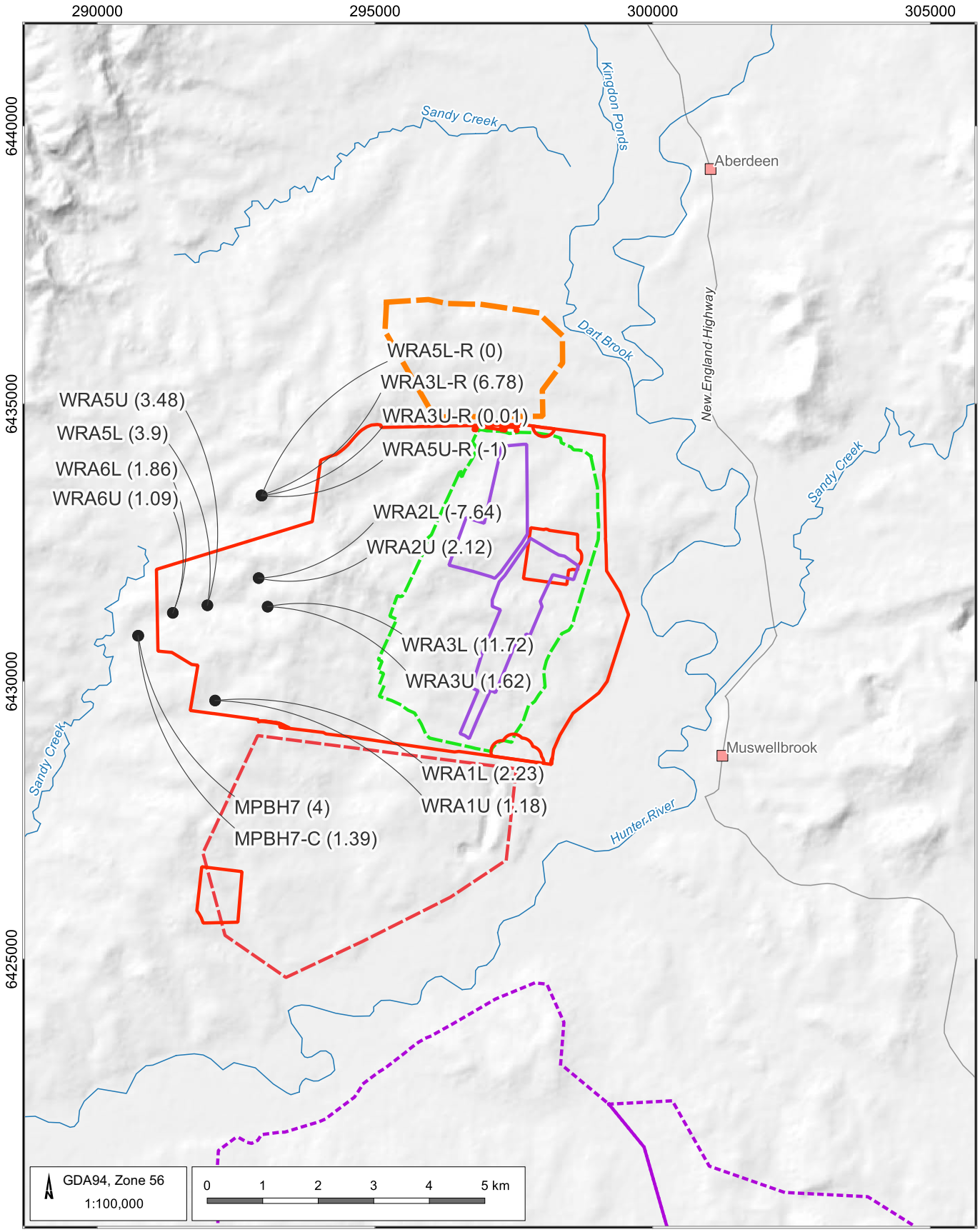

LEGEND

- Populated place
- Drainage
- Road
- Bengalla Project Extent
- Dartbrook Project Extent
- MPO Pit Extent
- Project Boundary
- Pit Floor Extent
- MAC Pit Extent

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Groundwater level changes (drawdown) within the MPO Western Domain

AGE

DATE 10/03/2026

FIGURE No: **2.8**

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G:\Projects\MPO.20250132 Mt Pleasant Groundwater Report for the 2025 Calendar Year\3_GIS\Workspaces\999_Working\02.05_MPO5007_Drawdown in Central domain.qgz

2.5 Groundwater quality and beneficial use

2.5.1 Salinity and pH

This section outlines the groundwater quality within the Quaternary alluvium and Permian measures. Salinity, which is the primary limitation for groundwater use, is typically measured by Total Dissolved Solids (TDS) concentrations. TDS levels are commonly classified on a scale from fresh to extremely saline. The Food and Agriculture Organisation of the United Nations (FAO, 2013) provides a useful classification system for salinity based on TDS concentrations, as outlined below:

- Fresh water: <500 mg/L (approximately 750 µS/cm).
- Brackish (slightly saline): 500 to 1,500 mg/L (approximately 750 to 2,250 µS/cm).
- Moderately saline: 1,500 to 7,000 mg/L (approximately 2,250 to 10,500 µS/cm).
- Saline: 7,000 to 15,000 mg/L (approximately 10,500 to 22,400 µS/cm).
- Highly saline: 15,000 to 35,000 mg/L (approximately 22,400 to 55,250 µS/cm).
- Brine: >35,000 mg/L (approximately 55,250 µS/cm).

As mentioned in Section 2.1, MACH operates a groundwater monitoring network at the MPO, as depicted in Figure 2.1 and detailed in Appendix A. 35 monitoring bores are sampled quarterly for the measurement of field parameters, including pH and EC. Since EC is proportional to the total dissolved ions in a water sample, it can be used to estimate TDS concentrations by multiplying the EC value by 0.67 (ANZG, 2019). Figure 2.9, Figure 2.10 and Figure 2.12 display the ranges in groundwater EC recorded across the MPO monitoring bore network.

Figure 2.9 presents the EC measurements from monitoring bores within the Hunter River alluvium adjacent to the MPO. The long-term average EC at MPBH1 (561 µS/cm) indicates fresh groundwater. EC values at MPBH2 (892 µS/cm) and MPBH6 (1,145 µS/cm) are higher, placing these bores within the lower range of the brackish category. In contrast, EC levels at MPBH3b (average 4,394 µS/cm) and MPBH4 (average 5,700 µS/cm) are significantly higher than those recorded in other alluvial bores and are classified as “moderately” saline.

Other bores targeting coal seams, such as MPBH1-C, MPBH2-C, MPBH4-C, MPBH5-C, MPBH6-C, and MPBH7-C, exhibit long-term EC values ranging from 944 µS/cm (MPBH5-C) to 10,678 µS/cm (MPBH7-C), indicating water quality from fresh to saline. In comparison, bores targeting interburden layers, including MPBH1-HR, MPBH2-HR, MPBH4-HR, MPBH5-HR, and MPBH6-HR, show long-term average EC values ranging from 866 µS/cm (MPBH5-HR) to 5,559 µS/cm (MPBH4-HR), corresponding to water ranging from fresh to moderately saline. The EC time series for these bores are provided in Appendix C.

Figure 2.10 and Figure 2.11 present the measured groundwater EC within the Permian measures and regolith of the Western Domain monitoring network, respectively. This network comprises bores located near minor drainage features that discharge into Sandy Creek. Groundwater in this area exhibits the highest EC levels across the MPO monitoring network. Long-term average EC values in the regolith of the Western Domain range from brackish to moderately saline, with averages between 1,702 µS/cm (brackish) at WRA2U and 11,263 µS/cm (saline) at MPBH7. In contrast, bores targeting the Permian measures record higher salinity, with long-term average EC values ranging from moderately saline to saline, from 3,576 µS/cm at WRA1L to 15,607 µS/cm at WRA3L.

Groundwater EC measurements in the Permian measures of the Central Domain monitoring bores have been intermittent, as shown in Figure 2.12. EC levels in these bores fluctuate over time, with occasional abrupt changes observed throughout the monitoring period. Long-term average EC values are generally moderately saline, ranging from 1,650 µS/cm at 7000D000L to 5,625 µS/cm at 3500B500L. Exceptions include bore 5000D000, which indicates slightly brackish groundwater with an average EC of 772 µS/cm, and the GDE Bore Deep, which is classified as saline with an average EC of 11,930 µS/cm. EC values recorded in monitoring bore 3500C500U (formerly 3500C500S) declined to levels below prescribed trigger thresholds in 2025, following four consecutive exceedances of the EC trigger criteria in 2024. These exceedances were investigated and the report concluded the most likely cause of the elevated EC in this bore was due to persistent above-average precipitation in 2022-2023, which resulted in increased groundwater levels mobilising salts that had previously accumulated in the soil during a prior period of below-average rainfall (AGE, 2024). Whilst Melody bore recorded a similar EC response to 3500C500U over a comparable timeframe, no EC trigger criteria apply to this bore, and EC values have since returned to values within historic ranges.

Figure 2.13 to Figure 2.16 illustrate the range of groundwater pH values recorded across the MPO monitoring bore network. The calculated long-term average pH across the Central, Eastern, and Western monitoring domains is 7.2, indicating generally neutral groundwater conditions. Minor variability is observed across the network, with pH values ranging from 6.7 at 7000D000L (slightly acidic) to 8.7 at 3500B500U (alkaline).

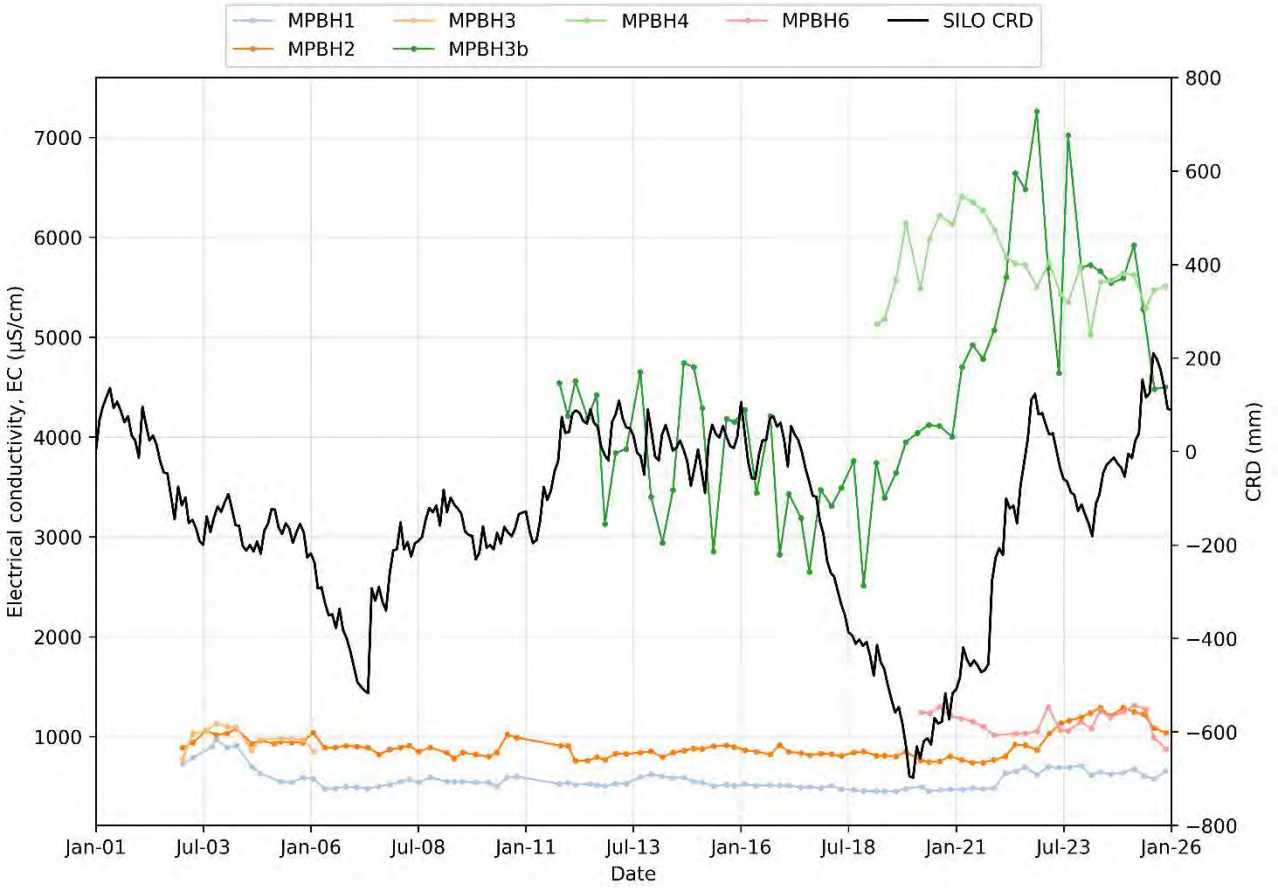

Figure 2.9 Electrical conductivity (EC) – Hunter River alluvium

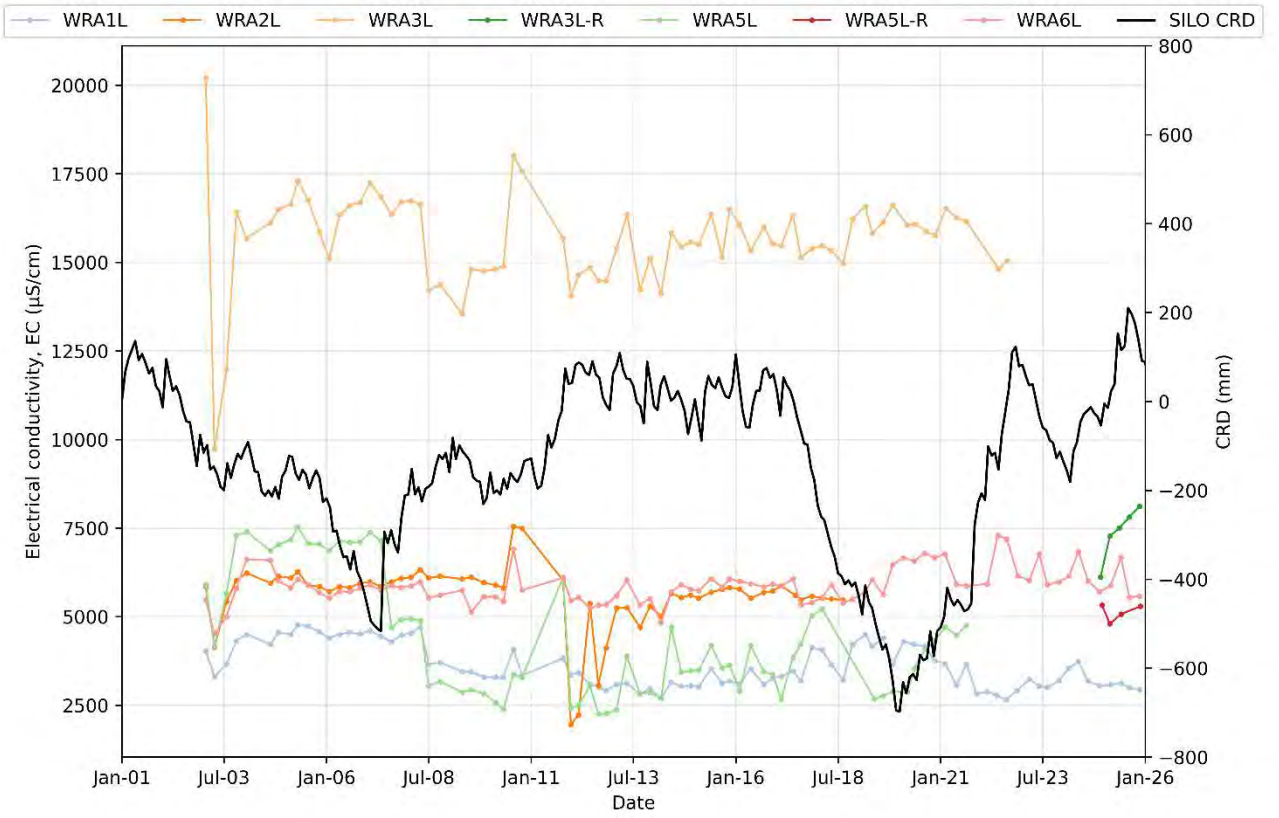

Figure 2.10 Electrical conductivity (EC) – MPO Western Domain Permian measures

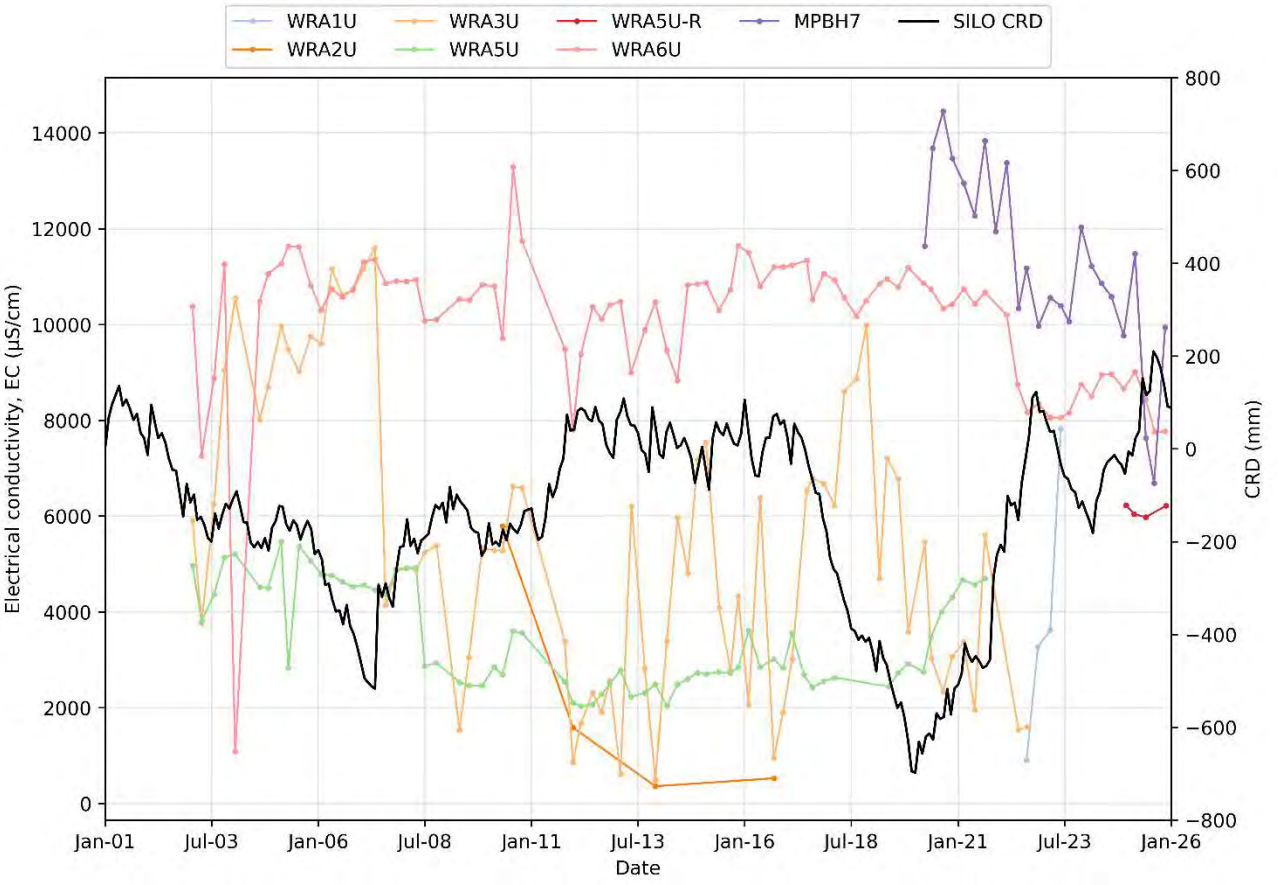

Figure 2.11 Electrical conductivity (EC) – MPO Western Domain regolith

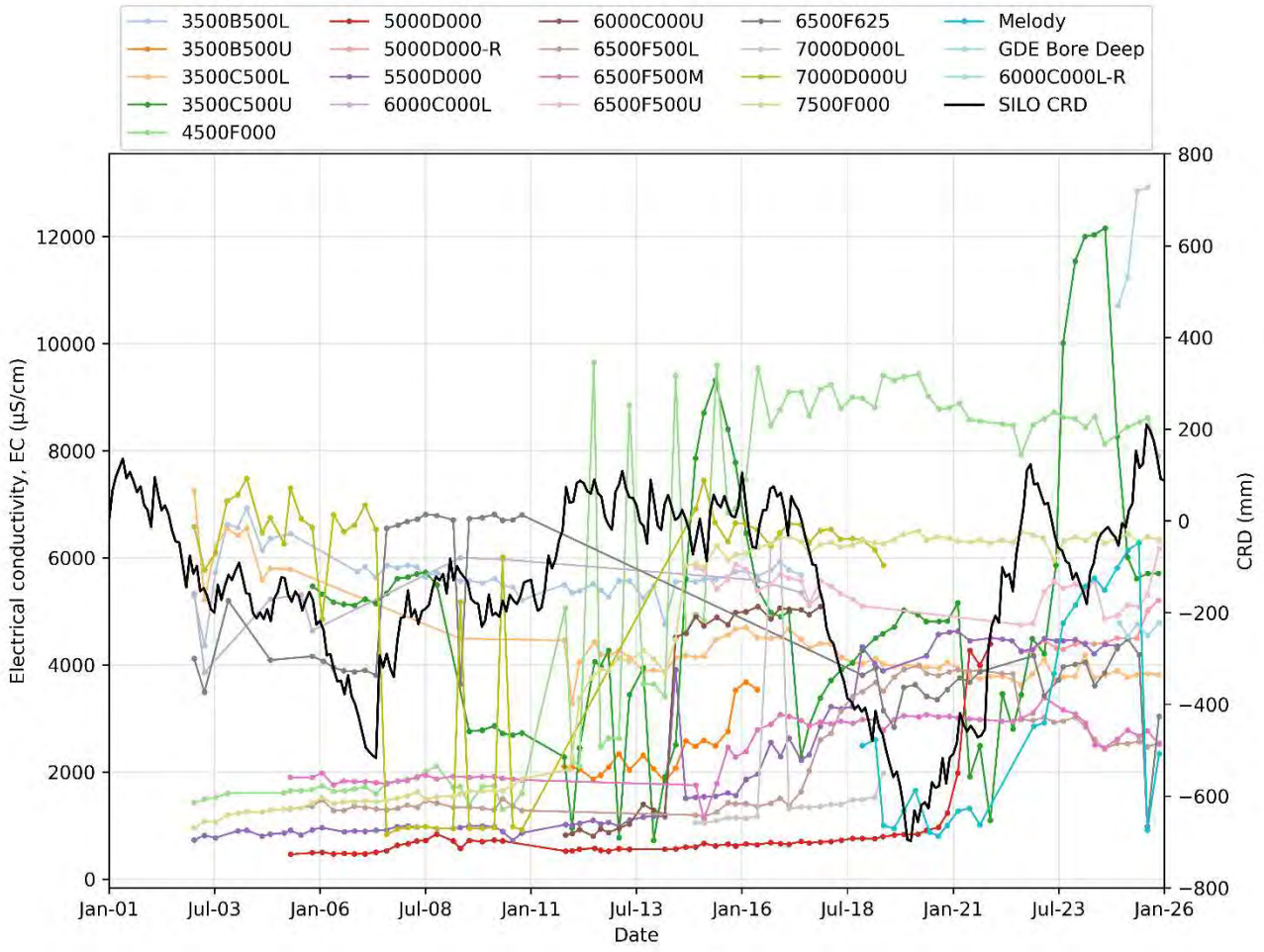

Figure 2.12 Electrical conductivity (EC) – MPO Central Domain Permian measures

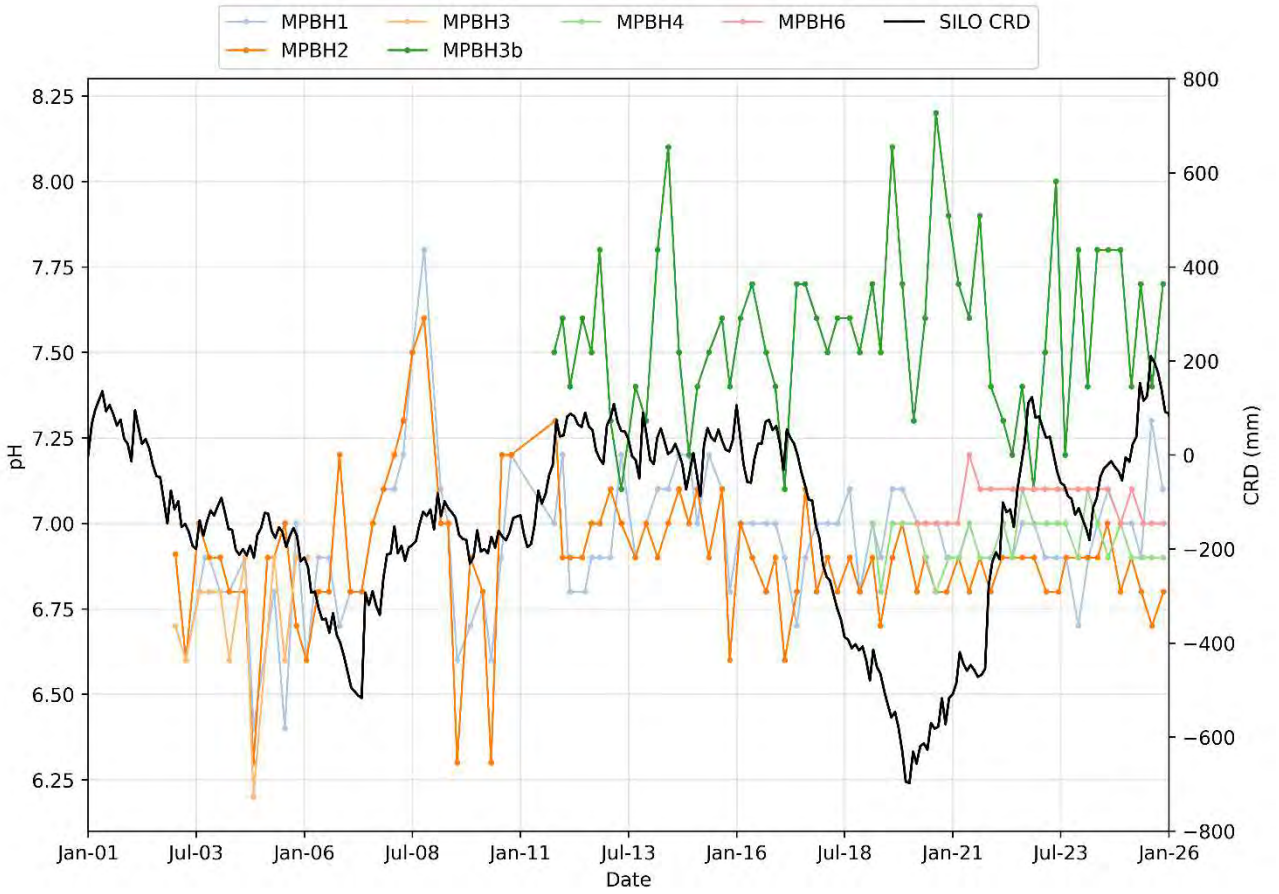

Figure 2.13 pH – Hunter River alluvium

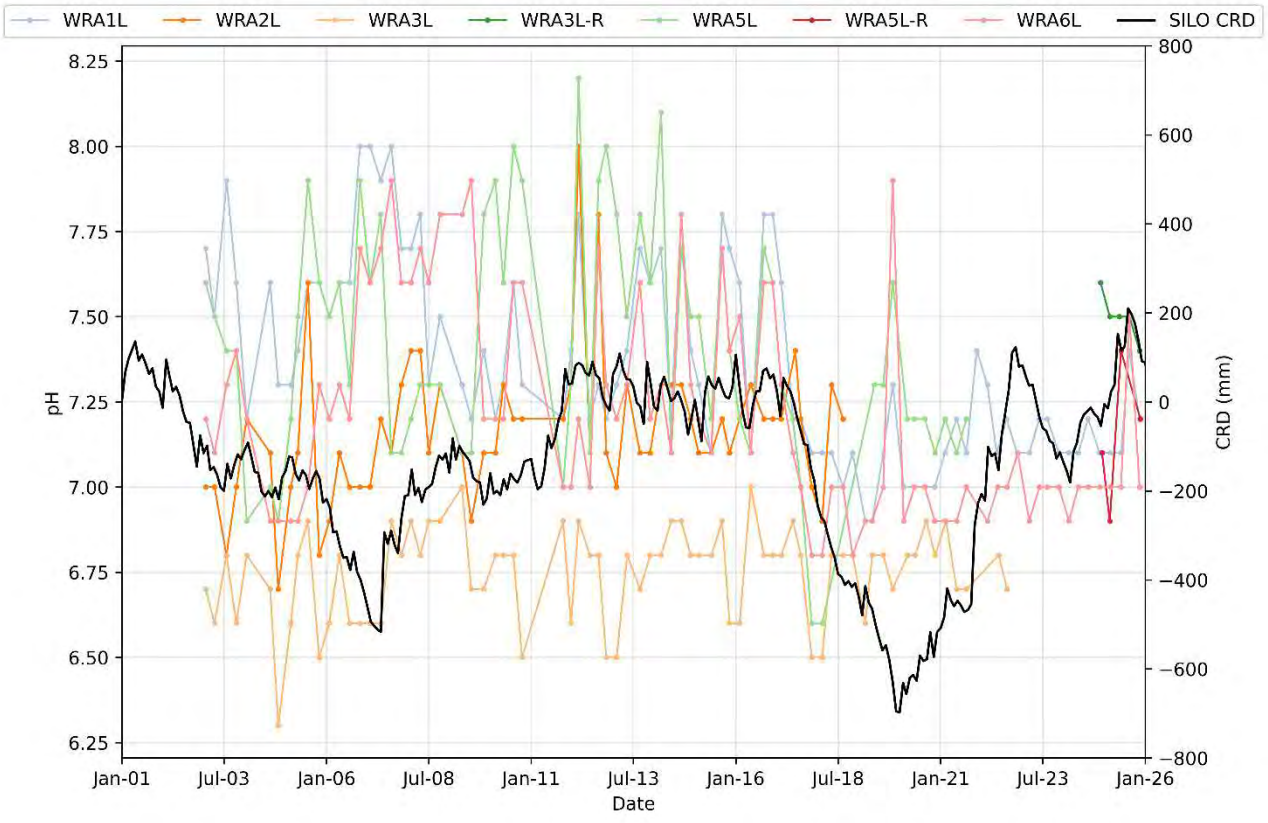

Figure 2.14 pH– MPO Western Domain regolith and Permian measures

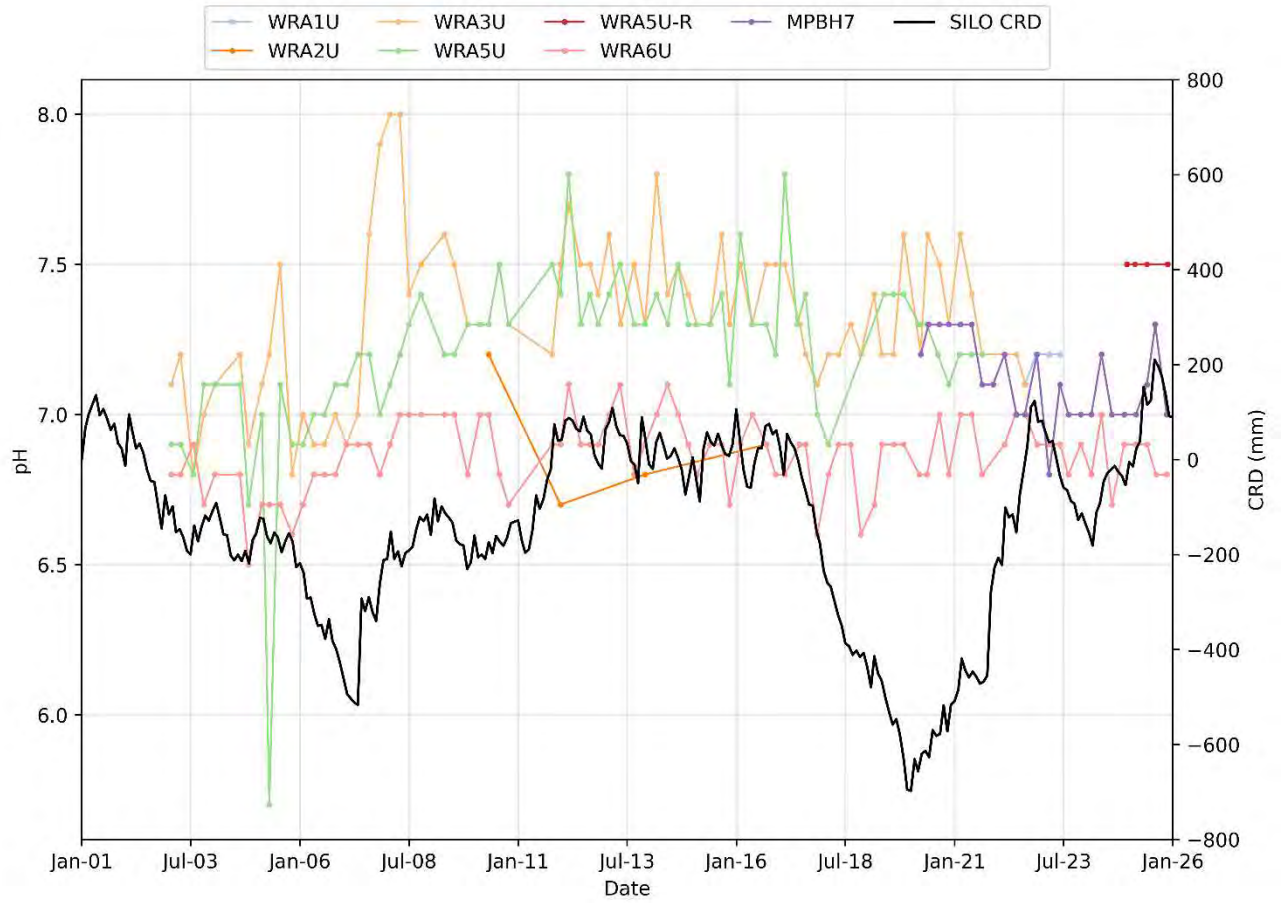

Figure 2.15 pH– MPO Western Domain regolith

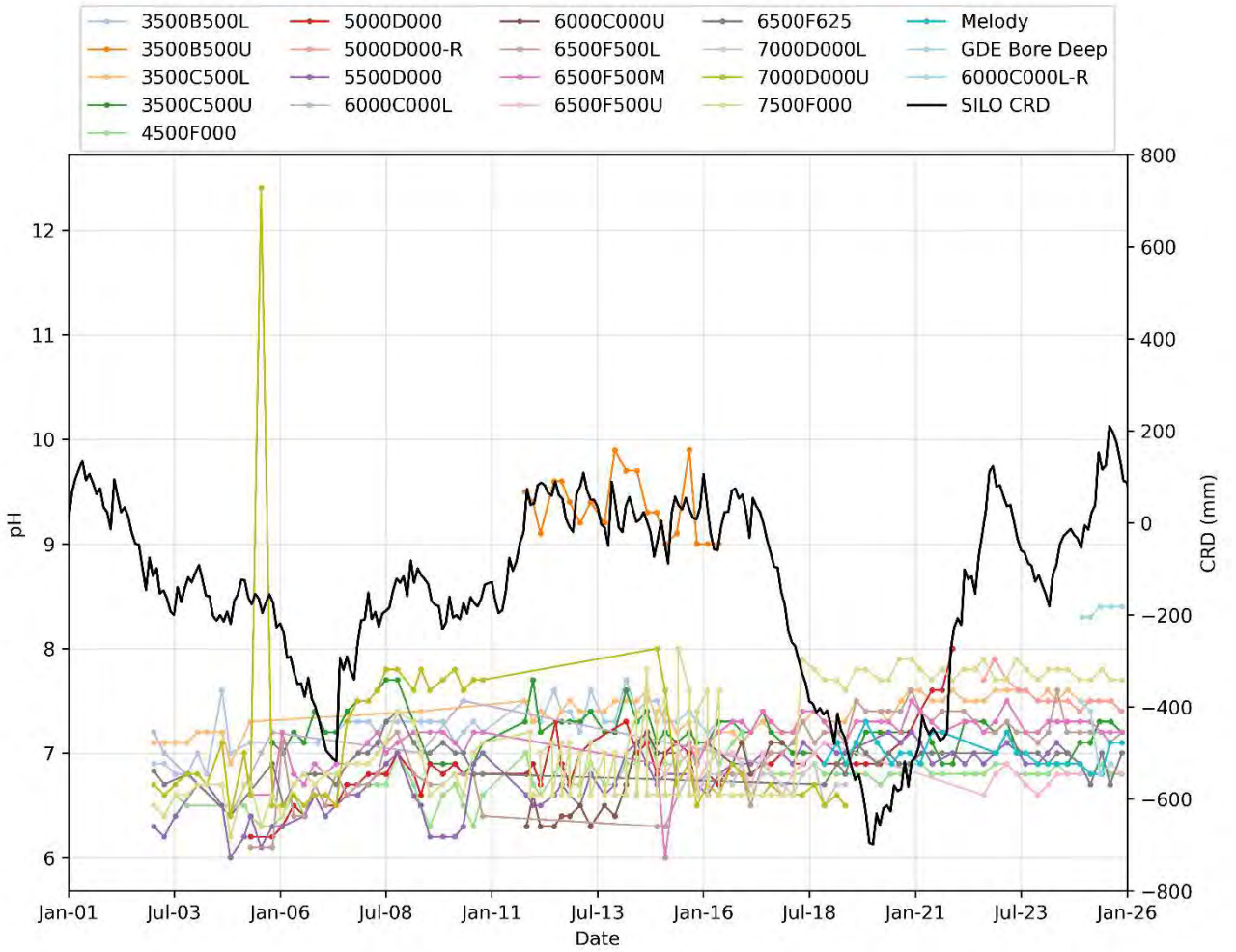

Figure 2.16 pH – MPO Central Domain Permian measures

The measured EC and pH in MPO monitoring bores over the reporting period, along with their corresponding trigger levels established in the WMP, are summarised in Table 2.3.

The EC measurements across the MPO monitoring bore network in 2025 exhibit considerable variability between monitoring domains. Within the Hunter River alluvium, EC values range from 576 µS/cm (fresh) at MPBH1 to 5,920 µS/cm (brackish) at MPBH3b. In the Western Domain, EC values measured in the regolith at MPBH7, WRA5U-R and WRA6U indicate moderately saline to saline conditions, ranging from 5,980 µS/cm at WRA5U-R to 11,480 µS/cm at MPBH7. Similarly, EC values in the Permian measures at WRA1L, WRA3L-R, WRA5L-R, and WRA6L are also moderately saline, ranging from 2,940 µS/cm to 8,110 µS/cm. In the Central Domain, EC values within the Permian measures range from 914 µS/cm (brackish) at bore Melody to a maximum of 12,920 µS/cm (saline) at GDE Bore Deep, indicating substantial variability in groundwater salinity.

For MPBH bores targeting coal seams (MPBH1-C, MPBH2-C, MPBH4-C, MPBH5-C, MPBH6-C, and MPBH7-C), EC values over the reporting period (2025) ranged from 612 µS/cm (fresh; MPBH1-C) to 10,760 µS/cm (saline; MPBH7-C). In comparison, MPBH bores targeting interburden layers (MPBH1-HR, MPBH2-HR, MPBH4-HR, MPBH5-HR, and MPBH6-HR) exhibited EC values ranging from 813 µS/cm (brackish; MPBH5-HR) to 6,150 µS/cm (moderately saline; MPBH6-HR).

In the Hunter River alluvium, groundwater pH values range from 6.7 at MPBH2 to 7.7 at MPBH3b, indicating near-neutral to slightly alkaline conditions. In the Western Domain, pH values in the regolith were measured at WRA5U-R and WRA6U and range from 6.8 to 7.5. For the Permian measures in this domain, pH values recorded at WRA1L, WRA3L-R, WRA5L-R, and WRA6L vary between 6.9 and 7.5, reflecting minor fluctuations in acidity. In the Central Domain, pH values within the Permian measures range from 6.7 at bore 6500F625 to a maximum of 8.4 at 6000C000L. Several bores recorded elevated pH values during 2025 (MPBH1-C, MPBH1-HR, MPBH2-C, MPBH2-HR, MPBH4-C, and MPBH5-C). These bores target coal seams and do not have assigned water quality trigger values; therefore, no management action is required at this stage.

Table 2.3 Summary of measured EC and pH in MPO monitoring bores during the reporting period

Bore ID	Aquifer/Unit	pH						EC (µS/cm)				
		Lower trigger	Upper Trigger	Q1	Q2	Q3	Q4	Trigger	Q1	Q2	Q3	Q4
MPO Central Domain												
3500C500L	Mount Arthur Seam	6	8.5	7.5	7.5	7.5	7.4	7,800	3,770	3,820	3,830	3,820
3500C500U	Warkworth Seam	6	8.5	7.1	7.3	7.3	7.2	7,800	6,010	5,610	5,710	5,710
4500F000	Vaux Seam	6	8.5	6.8	6.9	6.8	6.8	22,000	8,440	8,540	8,620	7,900
5000D000-R	Wynn/Edderton Seams	NA	NA	7.5	7.5	7.5	7.4	NA	4,490	4,500	5,020	5,210
6000C000L-R	Vaux Seam	NA	NA	8.3	8.4	8.4	8.4	NA	4,530	4,760	4,550	4,790
6500F500L	Maitland Group	6	8.5	7.2	7.2	7.1	7.2	7,800	2,530	2,570	2,470	2,540
6500F500M	Interburden #6/Wynn Seam	6	8.5	7.3	7.2	7.2	7.2	7,800	2,780	2,670	2,770	2,520
6500F500U	Interburden #4/Broonie Seam	6	8.5	6.8	6.8	6.9	6.8	7,800	5,120	5,080	5,300	6,180
6500F625	Permian	6	8.5	6.7	7	6.7	7	7,800	4,480	4,190	987	3,040
7500F000	Edderton Seam	6	8.5	7.7	7.8	7.7	7.7	7,800	6,450	6,290	6,390	6,330
GDE Bore Deep	Warkworth Seam	NA	NA	7.4	6.8	6.9	ND	NA	11,240	12,850	12,920	ND
Melody	Unknown	6	8.5	6.8	6.8	7.1	7.1	NA	6,140	6,280	914	2,340
MPO Eastern Domain												
MPBH1	Hunter Alluvium	6	8.5	7	6.9	7.3	7.1	800	675	604	576	658
MPBH1-C	Coal Seam	NA	NA	8.7	8.6	7.2	8.7	NA	1,450	1,426	612	1,596
MPBH1-HR	Interburden	NA	NA	8	7.8	7.6	7.7	NA	1,580	1,713	1,626	1,715
MPBH2	Hunter Alluvium	6	8.5	6.9	6.8	6.7	6.8	930	1,247	1,222	1,083	1,038
MPBH2-C	Coal Seam	NA	NA	10.2	7.4	8.1	7.9	NA	1,436	1,363	1,223	1,198
MPBH2-HR	Interburden	NA	NA	8.4	7.7	7.5	7	NA	1,631	1,113	1,424	1,159
MPBH3b	Hunter Alluvium	6	8.5	7.4	7.7	7.4	7.7	7,800	5,920	5,280	4,480	4,500

Bore ID	Aquifer/Unit	pH						EC (µS/cm)				
		Lower trigger	Upper Trigger	Q1	Q2	Q3	Q4	Trigger	Q1	Q2	Q3	Q4
MPBH4	Hunter Alluvium	6	8.5	6.9	6.9	6.9	6.9	7,800	5,620	5,290	5,470	5,510
MPBH4-C	Coal Seam	NA	NA	8	8	7.4	8	NA	4,950	4,820	4,870	4,890
MPBH4-HR	Interburden	NA	NA	7.2	7.4	7.4	7.4	NA	5,880	5,450	5,240	5,570
MPBH5-C	Coal Seam	NA	NA	9.1	10.5	11.1	11	NA	1,042	834	831	728
MPBH5-HR	Interburden	NA	NA	7.4	7.4	7.6	7.5	NA	842	813	1,149	827
MPBH6	Hunter Alluvium	NA	NA	7.1	7	7	7	NA	1,310	1,274	989	873
MPBH6-C	Coal Seam	NA	NA	7	7.2	7.2	7.1	NA	2,710	3,770	2,650	2,500
MPBH6-HR	Interburden	NA	NA	7.3	7.4	7	7.1	NA	1,490	6,150	1,543	1,418
MPO Western Domain												
MPBH7	Regolith	NA	NA	7.0	7.1	7.3	7.0	NA	11,480	7,630	6,690	9,940
MPBH7-C	Coal Seam	NA	NA	7.1	7.1	7.1	7.0	NA	10,760	10,220	10,290	10,430
WRA1L	Warkworth/Permian	6	8.5	7.1	7.1	7.4	7.2	7,800	3,080	3,120	2,990	2,940
WRA3L-R	Permian	NA	NA	7.5	7.5	7.5	7.4	NA	7,270	7,500	7,810	8,110
WRA5L-R	Permian	NA	NA	6.9	7.4	ND	7.2	NA	4,800	5,070		5,290
WRA5U-R	Alluvium/weathered regolith	NA	NA	7.5	7.5	ND	7.5	NA	6,040	5,980		6,220
WRA6L	Warkworth/Permian	6	8.5	7.0	7.0	7.5	7.0	7,800	5,880	6,670	5,540	5,580
WRA6U	Alluvium/Regolith	6	8.5	6.9	6.9	6.8	6.8	22,000	9,010	8,430	7,760	7,770

Notes: NA = Not Assigned.

ND = No Data.

= EC exceedance is based on the trigger levels defined in the latest MPO WMP (MACH Energy, 2025).

2.5.2 Major ions

The analysis of dissolved ions in groundwater provides valuable insights into its chemical composition, which can be used to classify different types of groundwater. The presence and concentration of various ions are influenced by factors such as the groundwater's origin, its interactions with the surrounding aquifer materials, and processes like the dissolution and precipitation of minerals. By examining the major ions in a groundwater sample, it becomes possible to classify the water chemically, which in turn helps in developing conceptual models of groundwater systems.

The major ion chemistry of 35 groundwater samples collected at the MPO in 2025 was analysed using a Piper plot (Figure 2.17), which is a graphical method that represents the proportions of major cations and anions in groundwater. The Piper plot consists of two tri-linear diagrams: the lower-left plot shows the relative concentrations of cations ($Na^+ + K^+$, Ca^{2+}, Mg^{2+}), while the lower-right plot illustrates the relative concentrations of anions ($HCO_3^- + CO_3^{2-}$, Cl^-, SO_4^{2-}). These individual ion concentrations are then projected onto a third rhombohedral plot located at the top, which classifies the groundwater sample into a specific water type based on its overall chemical composition. This method provides a clear visual representation of the chemical characteristics of groundwater, aiding in the classification and interpretation of different water types across the monitoring network.

The review of the Piper plot reveals significant variability in the geochemical composition of groundwater within the Permian strata, including the coal measures. Despite this variability, a consistent trend is observed, with the water predominantly dominated by sodium, potassium, and chloride ions. This composition classifies the groundwater as a sodium chloride type. In contrast, groundwater in the alluvial deposits exhibits a distinct geochemical profile, primarily characterised by a magnesium carbonate type water. This is mainly due to the high concentrations of magnesium (Mg^{2+}) and bicarbonate (HCO_3^-) ions observed in the samples, suggesting a different hydrochemical influence compared to the Permian strata.

A summary of the quarterly water quality laboratory results for the year 2025 is presented in Appendix E.

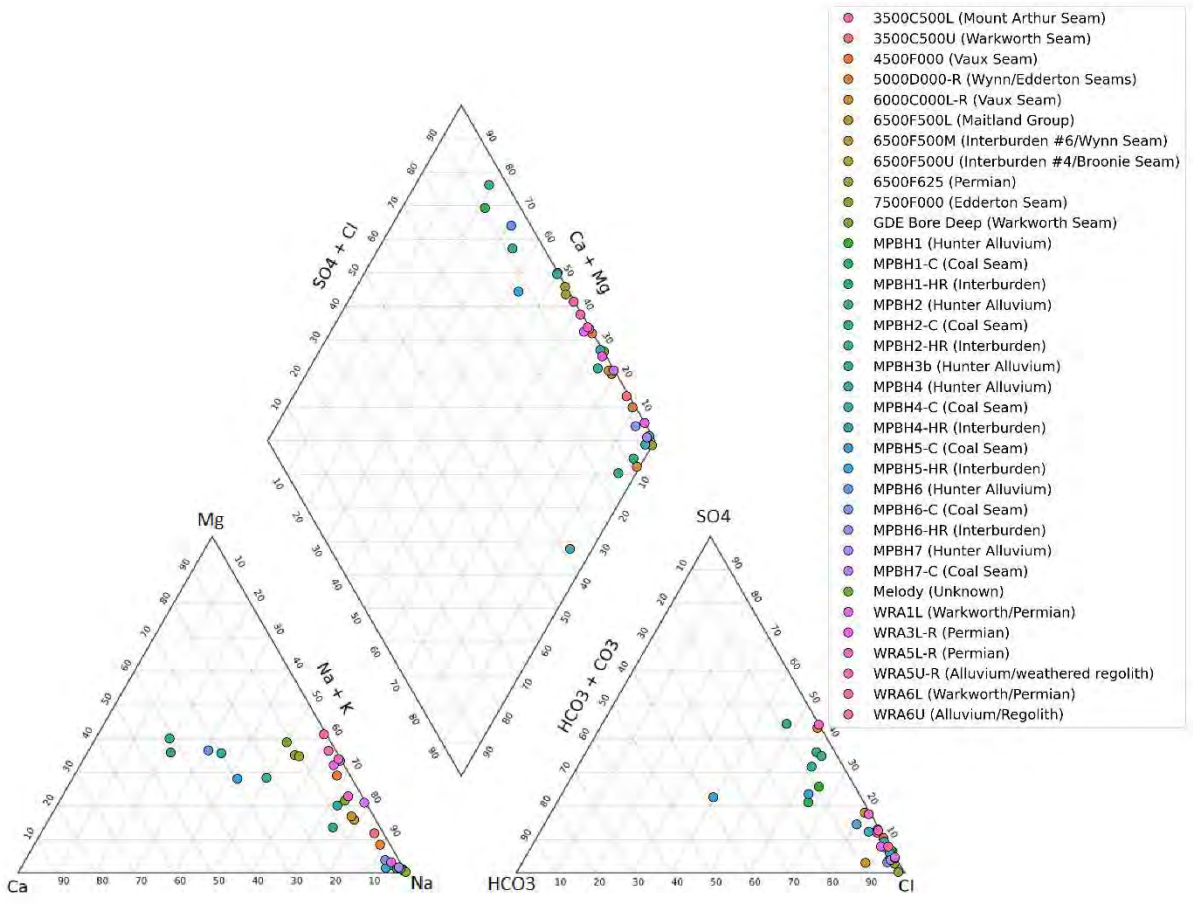

Figure 2.17 2025 Piper plot of groundwater composition from the MPO monitoring bores

2.6 Trigger exceedances

WMP (MACH Energy, 2025) specified groundwater level triggers for alluvium system. Groundwater level triggers have been established to monitor potential impacts on the alluvial groundwater system near the Hunter River. These triggers are designed to detect trends that could lead to a private bore experiencing more than 2 m of drawdown and to manage drawdown risks to groundwater-dependent ecosystems (GDEs). Water level triggers for the alluvial (MPBH1, MPBH2, MPBH3b) and regolith (MPBH7) monitoring bores as listed in Table 2.2, have been calculated using the criteria of "less than or equal to a 10% cumulative variation in the water table". This is based on the minimum recorded saturated thickness of the aquifer, which was derived from the alluvium thickness and the deepest recorded groundwater level in each bore, as reported in the WMP (MACH Energy, 2025). The deepest recorded level reflects climate variability, with no evidence of mine-related impacts in the bore data. For MPBH7, the water level trigger is set at the base of the screened interval, approximately 1.3 m below the maximum recorded groundwater level.

As shown in Table 2.2 and the hydrographs in Appendix B, water levels in bores MPBH1, MPBH2, MPBH3b, and MPBH7 have not exceeded the trigger levels specified in the WMP throughout the monitoring period, including in 2025.

ANZECC & ARMCANZ (2000) recommends using site-specific data for defining environmental trigger values, but a single pH range of 6 – 8.5 was suggested in the WMP (MACH Energy, 2025) across all bores due to inaccuracies in the proposed percentile ranges. This pH range aligns with ANZECC & ARMCANZ (2000) guidelines to prevent infrastructure corrosion and the Australian Drinking Water Quality Guidelines (NHMRC & NRMMC, 2011). Baseline monitoring shows that EC values near the MPO vary widely. Therefore, site-specific EC trigger levels have been developed (MACH Energy, 2025) based on baseline data to monitor the MPO's impact. The pH and EC trigger levels for the MPO monitoring bores are provided in Table 2.3.

As shown in Table 2.3 and the EC time-series plots in Appendix C, measured EC values for all monitoring bores during 2025 remained below their respective EC trigger levels specified in the WMP, with the exception of MPBH2. At MPBH2, EC measurements consistently exceeded the trigger level defined in the latest WMP (MACH Energy, 2025) throughout 2025. The average EC at this bore during 2025 was 1,148 µS/cm, approximately 23% higher than the trigger level of 930 µS/cm. However, the updated Groundwater Management Plan (GWMP), currently under approval, defines a revised EC trigger level for this bore of 1,500 µS/cm. Considering this updated trigger value, the EC at MPBH2 does not exceed the new limit, and no further investigation is required.

As shown in Table 2.3 and the pH time-series plots in Appendix D, none of the monitoring bores exceeded the pH trigger range (6.0–8.5, as specified in the WMP) during 2025.

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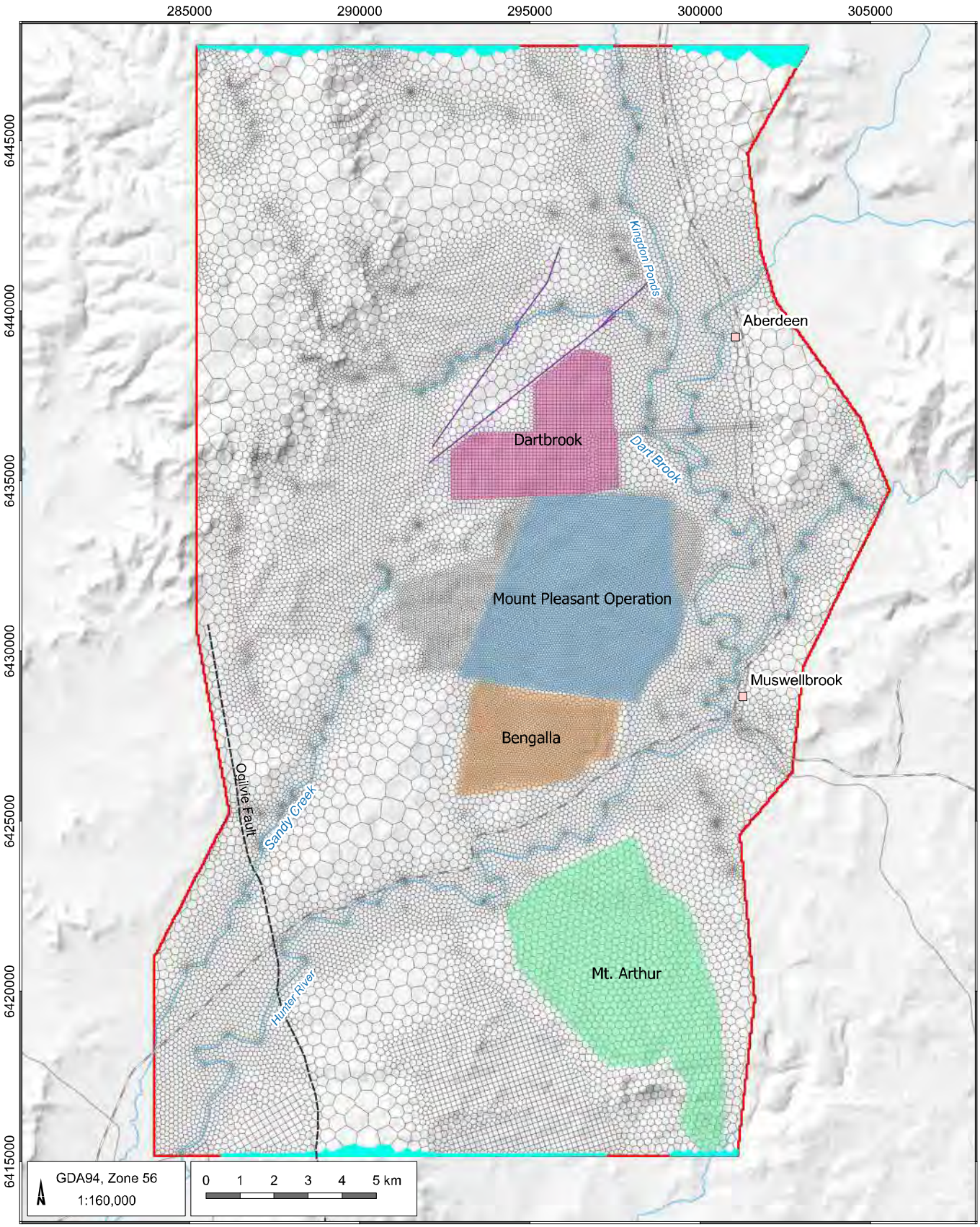
3 Assess numerical model predictions

The three-dimensional (3D) numerical groundwater flow model was originally developed for the Groundwater Impact Assessment (GIA) of the Mount Pleasant Optimisation Project (AGE, 2020). The model was constructed using the MODFLOW-USG code, and a summary of its key components is provided in this section. Initial calibration was undertaken by AGE (2020) using data available at the time of model development. The model was subsequently validated in March 2025 (AGE, 2025a) and updated to incorporate monitoring data collected up to August 2025 from the MPO monitoring bore network. Validation was based on groundwater level observations from monitoring bores within the MPO area, spanning the period from 2003 to 2025, thereby extending the temporal coverage beyond that used in the original 2020 calibration dataset. The AGE (2020) model was subsequently applied as part of the Modification application. In this context, AGE (2025b) completed an updated GIA to assess the potential impacts of the proposed modification on groundwater levels, hydraulic connectivity, groundwater-dependent ecosystems (GDEs), private bores, and surface water–groundwater interactions.

3.1 Model grid

The model grid covers the MPO and surrounding mining operations, including Bengalla Mine, Dartbrook Mine, and Mt Arthur Coal Mine, with a domain approximately 19 km wide (west to east) and 30 km long (north to south), as shown in Figure 3.1. The active model extends to the outcrop of Maitland Group units to the east, which is the unit below the deepest seam at the MPO. The Mount Ogilvie fault is simulated as a no-flow boundary in the southwest. The nearest model edge to the MPO is 9 km, ensuring that boundary conditions do not affect key predicted impacts.

Boundary conditions include a General Head Boundary (GHB) for coal seams at the northern and southern extents, allowing water transfer into and out of the model domain, while other boundaries are no-flow. The model is discretised into 20 layers with 32,915 cell nodes per layer. Cell sizes vary for detail, with smaller cells in areas of open-cut and underground mining (100 m × 100 m to 300 m × 100 m), streams, alluvial flood plains (100 m × 100 m to 200 m × 200 m), and the Dartbrook Mine Hunter Tunnel (100 m × 100 m), while peripheral areas have larger cells (up to 700 m). The model layers represent major hydrostratigraphic units, including shallow geological units, coal seams, and interburden.



LEGEND

- Populated place
- Road
- Rail
- Olgilvie Fault
- Major Dyke
- Drainage
- Grid
- Bengalla
- Dartbrook
- Mount Pleasant Operation
- Mt. Arthur
- General head boundary
- No-Flow Boundary

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Model extent and mesh

AGE

DATE 24/02/2026

FIGURE No: **3.1**

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G:\Projects\MPO5007.001 Mount Pleasant GW Model Validation\3_GIS\Workspaces\999_Working\03.01_MPO5007_Model extent and mesh.qgz

3.2 Model layer

The model uses 20 layers to represent key hydrostratigraphic horizons, ranging from the Quaternary alluvium to deeper Permian formations. These layers were based on horizons from the MPO site geological model, using drill hole data from exploration drilling, and were extrapolated beyond the geological model's limits using publicly available data and expert judgment. The model layering is summarized in Table 3.1.

All model cells within each layer are active and assigned to a single hydrostratigraphic unit. In areas where a hydrostratigraphic unit sub-crops or disappears, the layer's thickness is reduced to 5 cm. To improve geological representation, hydraulic properties have been assigned from the underlying major unit where the targeted hydrostratigraphic unit does not exist.

Table 3.1 Model layers

Layer	Representative aquifer/Unit
1 and 2	Surficial alluvium and weathered zone/regolith
2	Weathered overburden
3	Overburden
4	Warkworth Seam
5	Interburden 1
6	Mount Arthur Seam (and Kayuga Seam at Dartbrook Mine)
7	Interburden 2
8	Piercefield Seam
9	Interburden 3
10	Vaux Seam
11	Interburden 4
12	Broonie Seam
13	Interburden 5
14	Bayswater Seam
15	Interburden 6
16	Wynn Seam
17	Interburden 7
18	Edderton Seam
19	Vane Subgroup/Saltwater Creek Formation
20	Maitland Group and older units

3.3 Timing

The numerical groundwater model simulates groundwater flow from 1990 to 3049 with the following time periods:

- Last day of 1990 – steady-state stress period representing pre-mining conditions;
- 1991 to the end of 2010 – 21 annual stress periods;
- 2011 to the end of 2017 – 24 quarterly stress periods;
- 2018 to the end of 2048 – 31 annual stress periods;
- 2049 to 3049 – recovery stress periods of progressively increasing length; and
- The last stress period is a steady-state stress period representing post-mining equilibrium conditions.

Quarterly stress periods were introduced to better capture seasonal variability in recharge and the progression of mining activities at Bengalla Mine and Mt Arthur Coal Mine.

3.4 Recharge

The MODFLOW-USG recharge package (RCH) was used to simulate deep drainage from diffuse rainfall. The primary recharge mechanism to the groundwater system is the infiltration of rainfall through the soil profile, followed by deep drainage to the underlying groundwater systems. To simplify the model, MODFLOW-USG options were selected to exclude flow through the vadose zone, as there were no available parameters to accurately represent unsaturated flow.

The rainfall data was obtained from the nearby BoM stations: Muswellbrook (St Heliers) (BoM station 061374) and Muswellbrook (Spring Creek, Castle Vale) (BoM station 061192). The average (mean) annual rainfall at Muswellbrook (Spring Creek, Castle Vale) was approximately 678.5 mm at the time of model construction (2020).

The model domain was divided into three zones, each representing areas where factors affecting recharge were considered consistent. This division was mainly based on the locations of various geological outcrops and the potential for recharge in those areas. Table 3.2 presents the calibrated recharge rates for each geological unit.

Table 3.2 Calibrated recharge rate and percentage for each zone

Zone	Diffuse recharge rate – transient			
	% of annual rainfall	Min (mm/year)	Mean (mm/year)	Max (mm/year)
Alluvium	3.20%	12.4	23.9	28.4
Triassic Sandstone	2.80%	10.9	20.9	24.8
Permian	0.5%	1.9	3.7	4.4

3.5 Evapotranspiration

Evapotranspiration from shallow water tables was modelled using the evapotranspiration (EVT) package in MODFLOW-USG, applied to the uppermost model cells (Layer 1). Evapotranspiration occurs when the water table is close enough to the surface, within the extinction depth, below which evapotranspiration ceases. The effect is incorporated into the net recharge rate. A maximum evaporation rate of 600 mm/year is assigned at the surface, decreasing linearly with depth to zero at the extinction depth. These depths were derived from the plant rooting depths of dominant species in the vegetation communities. Table 3.3 presents evapotranspiration rooting zones, including the vegetation zone and rooting depth.

Table 3.3 Evapotranspiration rooting zones

Vegetation zone	Rooting depth (m)
Open grassland	1
Open/grassy woodland	2.5
Forest	**5**

3.6 Water courses and surface drainage

Groundwater interaction with surface drainage was modelled using the river (RIV) package in MODFLOW-USG. Major streams near the MPO, such as the Hunter River and Dart Brook, have river stage elevations interpolated between gauging stations to assign water depths, replicating the consistent flow and allowing for recharge from these streams. Minor, ephemeral watercourses, which only flow briefly after rainfall, were simulated with a river depth of zero, meaning groundwater is only removed as baseflow when groundwater levels are high enough. River cells in the model were assigned to either Layer 1 (where alluvium exists) or Layer 2 (where Layer 1 is absent). Table 3.4 summarises the river cell parameters in the model.

Table 3.4 River (RIV) cell parameters

River No	River name	K_v (m/day)	Width (m)	Water depth (m)	Bed thickness (m)
1	Hunter River	0.05	20	Steady state (1–2 m) Transient (historical monthly average)	1
2	Dart Brook	0.05	10	Steady state (0.7 m) Transient (historical monthly average)	1
3	Sandy Creek	1	5	0	1
4	Other creeks	1	5	0	1

Note: K_v = Vertical hydraulic conductivity.

3.7 Mining

The MPO is located between several coal mines in the Hunter region, including Bengalla, Mt Arthur Coal, and Dartbrook Mines, requiring consideration of cumulative impacts. The Mount Ogilvie Thrust Fault, located west of the MPO, offsets coal seams against lower permeability interburden, significantly reducing the potential for cumulative impacts between the MPO and Mangoola Coal.

3.7.1 Bengalla Mine and Mt Arthur Coal Mine open cut

The model used the drain (DRN) package to simulate open-cut mining for Bengalla and Mt Arthur Coal Mines, with drain cells assigned to all model layers within the pit shell. Water removal was based on the head difference and conductance. Backfilling with spoil was modelled by adjusting permeability and storage properties using the MODFLOW-USG Time-Variant Materials (TVM) package, with increased recharge simulated using the MODFLOW-USG RCH package. Table 3.5 outlines the hydraulic properties and recharge rates for the spoil.

Table 3.5 Hydraulic properties assigned to the spoil material

K_h (m/day)	K_v (m/day)	S_y (-)	S_s (m^{-1})	Recharge
0.3	0.1	0.1	1×10-5	2% rainfall

Notes: K_h = Horizontal hydraulic conductivity; K_v = Vertical hydraulic conductivity; S_y = Specific yield; S_s = Specific storage.

3.7.2 Dartbrook Mine

Underground mining at Dartbrook Mine was simulated using the DRN package, with drain cells applied to the Wynn and Kayuga / Mt Arthur seams. The model replicated mining progression by gradually adding drain cells. It also simulated changes to aquifer properties due to longwall mining using the TVM package. Hydraulic conductivities were enhanced in the deformation zone above the mined seams using multipliers, with values decreasing with distance from the mined seam. The maximum height of cracking was calculated using the Ditton/Merrick equation. Table 3.6 shows the fractured zone multipliers for the Wynn and Kayuga seams.

Table 3.6 Fracture zone multipliers for Wynn and Kayuga longwall mining at Dartbrook Mine

Lithology	Layer	Median height above seam (m)	K_h multiplier	K_v multiplier
Wynn Seam				
Alluvium and Regolith	1	285	2	3
Alluvium and Weathered Overburden	2	283		
Overburden	3	283		3
Warkworth Seam	4	283		
Interburden 1	5	260		
Kayuga / Mount Arthur Seam	6	234		
Interburden 2	7	190		5
Piercefield Seam	8	145		
Interburden 3	9	127		
Vaux Seam	10	109		
Interburden 4	11	82	6	20
Broonie Seam	12	56		
Interburden 5	13	48		
Bayswater Seam	14	39		75
Interburden 6	15	19	68	115
Wynn Seam	16	0	83	152
Kayuga Seam				
Alluvium and Regolith	1	2	2	3
Alluvium and Weathered Overburden	2	0		
Overburden	3	0		
Warkworth Seam	4	23		47
Interburden 1	5	24	3	73
Kayuga / Mount Arthur Seam	6	0	10	115

Notes: K_h = Horizontal hydraulic conductivity; K_v = Vertical hydraulic conductivity.

3.8 Hydraulic and storage properties

Table 3.7 presents the calibrated hydraulic conductivity values for each hydrostratigraphic unit in the model domain, representing the base case for each layer. Table 3.7 summarises the calibrated values for specific storage and specific yield. Unlike hydraulic conductivities, the storage parameters are uniform across the whole model domain at each layer. Specific yield is only relevant in the model where the layers become unconfined, so the parameter is not necessarily utilised in the deeper model layers. Specific storage is only applied where the model layers are confined.

Table 3.7 Calibrated hydraulic and storage properties

Model layer	Lithology	K_h (m/day)	K_v:K_h	S_y (-)	S_s (m^{-1})
1 and 2	Alluvium and regolith	4.61	0.2	7.0×10^{-2}	1.3×10^{-5}
2	Weathered overburden	0.01	0.6	3.2×10^{-2}	3.3×10^{-6}
3	Overburden	0.01	0.003	1.7×10^{-3}	2.3×10^{-7}
4	Warkworth Seam	0.28	0.005	3.8×10^{-3}	5.0×10^{-6}
5	Interburden 1	0.03	0.001	1.1×10^{-2}	7.6×10^{-7}
6	Mount Arthur Seam	0.05	0.006	1.1×10^{-3}	5.0×10^{-6}
7	Interburden 2	0.02	0.008	1.3×10^{-3}	6.7×10^{-7}
8	Piercefield Seam	0.05	0.003	1.6×10^{-4}	2.3×10^{-7}
9	Interburden 3	0.01	0.008	1.3×10^{-4}	3.0×10^{-6}
10	Vaux Seam	0.05	0.008	1.3×10^{-4}	2.2×10^{-6}
11	Interburden 4	0.003	0.003	1.6×10^{-4}	1.1×10^{-6}
12	Broonie Seam	0.14	0.005	1.0×10^{-4}	1.8×10^{-6}
13	Interburden 5	0.02	0.005	2.1×10^{-4}	2.8×10^{-7}
14	Bayswater Seam	0.05	0.002	1.2×10^{-4}	2.3×10^{-7}
15	Interburden 6	0.03	0.003	1.0×10^{-4}	2.3×10^{-7}
16	Wynn Seam	0.14	0.002	2.4×10^{-3}	3.1×10^{-7}
17	Interburden 7	0.05	0.001	1.0×10^{-4}	2.3×10^{-7}
18	Edderton Seam	0.06	0.001	6.3×10^{-3}	2.3×10^{-7}
19	Vane Subgroup/Saltwater Creek Formation	0.02	0.001	1.0×10^{-4}	2.5×10^{-6}
20	Maitland Group and older units	0.06	0.03	4.6×10^{-4}	2.7×10^{-6}

Notes: K_h = Horizontal hydraulic conductivity; K_v = Vertical hydraulic conductivity; S_y = Specific yield; S_s = Specific storage.

3.9 Groundwater model validation

This section aims to validate the model in accordance with the requirements of the GMP within the WMP (MACH Energy, 2025), which specifies that model predictions and performance should be included in the Annual Review. It is important to note that only the data from the MPO monitoring bore network was used for this model validation, and not all the data used in the AGE 2020 model calibration (i.e., Bengalla, Dartbrook, Mt. Arthur data). The full dataset can be used for the comprehensive peer review required every three years under the Development Consent DA 92/97.

To validate the model, a comprehensive comparison was conducted using newly collected monitoring data obtained since the previous model calibration in 2020 (see Figure 3.2). The validation process involved assessing water level measurements from 45 monitoring bores located within the MPO, as detailed in Appendix A. This dataset spans from 2003 to 2025, providing an extended timeframe beyond the data utilised in the 2020 model calibration. By incorporating more recent observations and updates to mine progression, the validation aimed to assess the model's accuracy in simulating groundwater conditions and identifying any deviations or trends that may have emerged since the last calibration.

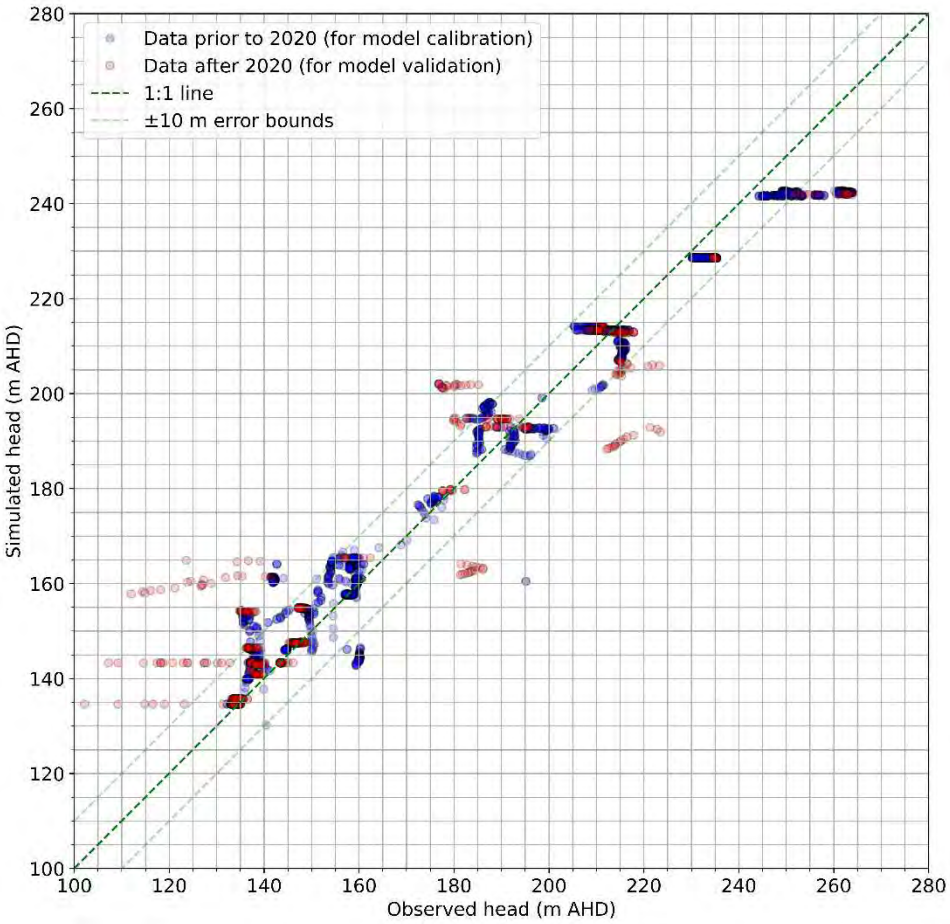


Figure 3.2 Simulated-observed head comparison

The deviation of data points from an exact match between modelled and observed heads is represented by the root mean squared (RMS) error, calculated as follows:

$$RMS = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(h_o - h_s)^2}$$

Where h_o and h_s represent the observed and simulated heads at n different locations and times, respectively.

Calculating the RMS error allows for the derivation of the scaled RMS (SRMS) error, which serves as a measure of goodness of fit in evaluating the quality of model predictions (Barnett et al., 2012). The SRMS is defined as the RMS error divided by the range of observed groundwater levels, calculated as follows:

$$SRMS = \frac{100}{\Delta h}\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(w_i(h_o - h_s)\right)^2}$$

Where Δh represents the range of measured heads across the model domain, and w_i is a weighting factor between 0 and 1, calculated at each location by $1/\sqrt{m}$, with m being the number of data points for that location. However, a weighting factor of 1 was assumed here to calculate the natural (unweighted) residual.

Table 3.8 provides a summary of the statistical measurements, including number of data point, range of observation head, RMS and SRMS errors. These measurements are evaluated based on three data sets: the previous data, the new data, and a combined dataset incorporating both the old and new data. This comparison helps assess the impact of the updated data on overall statistical accuracy.

Table 3.8 Summary of statistical measures for data before and after 2020

Dataset	Number of data points	Min observed head (m AHD)	Max observed head (m AHD)	RMS (m)	SRMS (%)
Prior 2020	2,180	132.11	264.02	8.41	6.38
After 2020	632	82.67	263.90	12.9	7.13
All	2,812	82.67	264.02	9.61	5.30

Notes: Min = minimum; Max = maximum; m AHD = metres Australian Height Datum; RMS = root mean squared error; SRMS = scaled root mean squared error.

According to Table 3.8, the number of data points used for calculating statistical measures in the model-data comparison for this study is almost one-third of that used in the previous model calibration (AGE, 2020). However, the updated dataset covers a wider range of observed head values, from 82.67m AHD to 263.9 m AHD, whereas the observed head range in the 2020 dataset was between 132.11 m AHD and 264.02 m AHD. The RMS and SRMS values for the post-2020 dataset was 12.9 m and 7.13%, respectively, compared to 8.41 m and 6.38% for the pre-2020 dataset, indicating a slight reduction in model accuracy for the post-2020 dataset.

Globally, considering both the pre- and post-2020 datasets, the RMS value was 9.61 m, showing a slight increase compared to the RMS of the pre-2020 dataset (8.41 m), which represents a 14% increase. Meanwhile, the global SRMS value was 5.30%, reflecting a 17% reduction compared to the SRMS of the pre-2020 dataset (6.38%). This SRMS value falls below the 10% benchmark recommended in the Australian Groundwater Modelling Guidelines (Barnett et al., 2012), indicating that the model calibration meets acceptable standards. These results suggest that the model, derived from the AGE 2020 model, remains adequately calibrated for its intended purpose, and further calibration is not necessary at this stage.

Additional validation of the model's performance was conducted by analysing hydrographs, provided in Appendix F, which illustrate both model-predicted and observed groundwater levels at monitoring points within the model domain. While some discrepancies exist between the predicted and observed values, the model effectively captures the overall groundwater level trends, particularly in areas where monitoring data indicates significant drawdown due to mine dewatering. In cases where deviations are observed, the model tends to predict a greater decline in groundwater levels than what has been measured. This is likely due to the use of conservative assumptions in the model, as well as the simplified model layering, which may overestimate vertical hydraulic connectivity compared to actual site conditions.

Overall, the model demonstrates a robust capacity to simulate regional groundwater behaviour and mine-related impacts. While some localised differences between observed and simulated values exist, these are within acceptable limits given the inherent uncertainties in groundwater modelling. The model is therefore deemed reliable for decision-making and impact assessments within the MPO and surrounding areas.

3.10 Groundwater model predictions

The following subsections provide a detailed description of the model predictions for the calendar year 2025. These predictions focus on the cumulative drawdown, which was calculated as the difference between two distinct scenarios. The first scenario includes the full range of mining activities as active within the model, while the second scenario assumes no mining activities are occurring. Both scenarios were evaluated using the numerical groundwater model outlined in this section. The predicted drawdown contours represent a composite of the maximum drawdown values anticipated for each model cell over the operational life of the mining project. These contours reflect the highest drawdown value predicted at any given time within each cell during the entire operational period. However, it is important to note that the actual timing and duration of the maximum predicted drawdown within each cell will vary. This variation is largely influenced by the proximity and intensity of mining activities throughout the life of the MPO, which can cause fluctuations in the timing and extent of the drawdown effects.

Drawdown maps for the alluvium and regolith (Layers 1 and 2), as well as for the Edderton Seam (Layer 18), are presented at the end of the calendar year 2025. These maps are shown in Figure 3.3 and Figure 3.4, respectively, illustrating the predicted changes in groundwater levels within these layers.

The simulated drawdown, as presented in Figure 3.3 (drawdown ranging from 1m - 5m), indicates that groundwater impacts in the alluvium to the north and south of the MPO are limited. In particular, the predicted drawdown in the Hunter River alluvium is minimal, as the majority of the target seams subcrop to the west of the alluvial extent. This reduces the impact of mining activities on this area, as the influence on groundwater levels is less pronounced. To the north, however, the Edderton Seam subcrops closer to the alluvium associated with the Hunter River, with the seam extending beneath the alluvial layer. This proximity results in a minor predicted drawdown in the northern portion of the MPO, primarily due to the interaction between mining activities and the underlying groundwater system in this region.

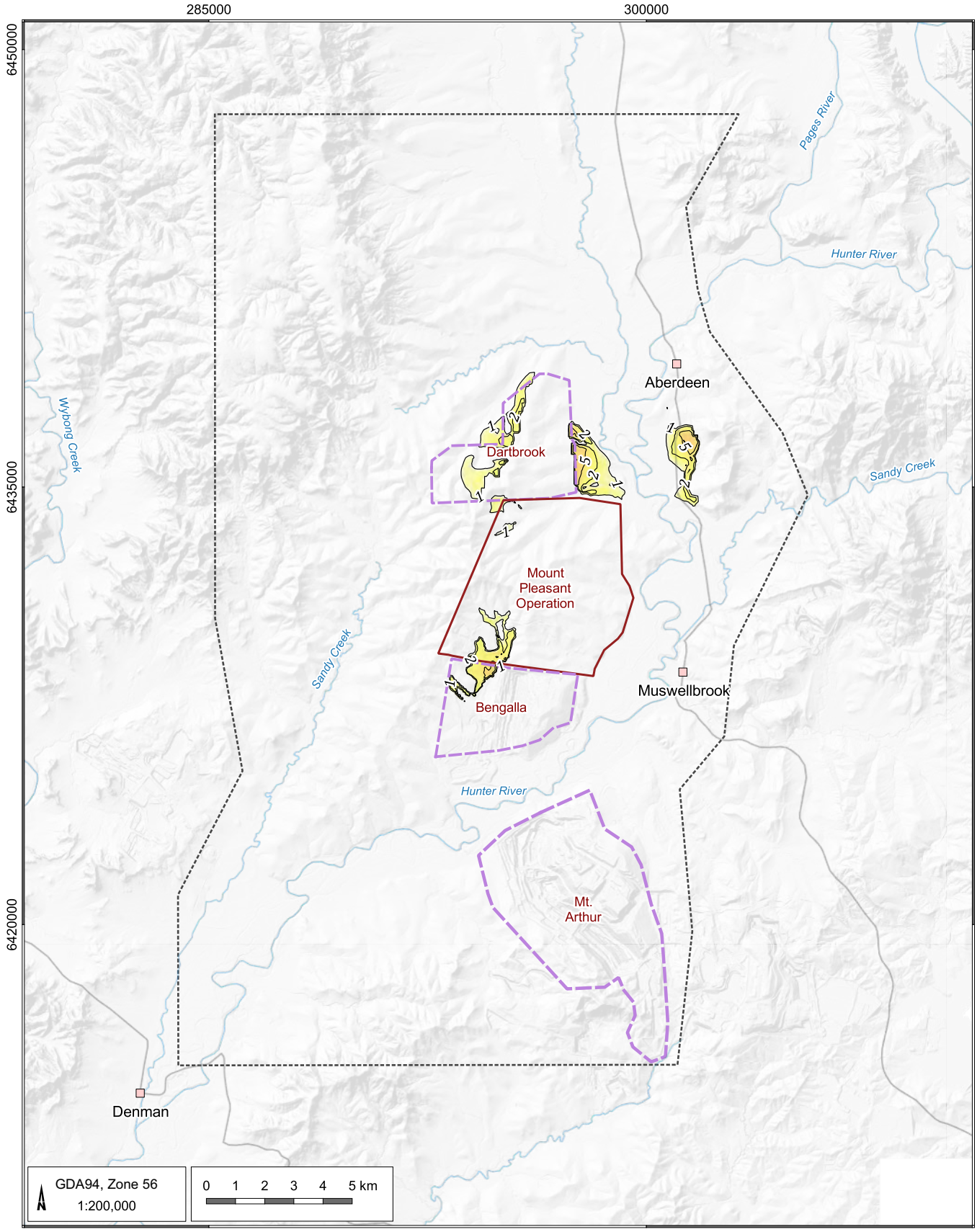
As shown in Figure 3.4, the predicted drawdown in the Edderton Seam is predominantly constrained to the north and south by concurrent drawdowns from neighbouring mining operations. To the east, the drawdown is limited by the subcrop, which is clearly visible in the contour maps. Furthermore, the subcrop extending beneath the alluvium to the north-east of the MPO is also apparent in the extent of the drawdown contours, helping to further define the boundaries of the predicted drawdown in this region. This spatial interaction emphasises the influence of surrounding geological features and mining activities on the groundwater system.

The difference between the simulated head and the measured head in 2025, as calculated at the monitoring bores, is presented in Figure 3.5. A positive value indicates that the model overestimates the head at a given location, while a negative value suggests that the model underestimates the head. The details of the simulated head and drawdown corresponding to each monitoring bore are provided in Appendix A. The residual head between the model and observed data ranges from -23.91 m at monitoring bore 3500C500L to 56.39 m at 5000D000. Out of 45 model-data comparisons, 73% show a difference of less than 10 m between the simulated and observed heads. The maximum deviations between the model and observed data occur at the following monitoring bores: 3500C500(L-U), 5000D000, 5500D000, 6000C000(L-U), 6500F500M, MPBH1-HR, WRA2U, WRA3(L-U), and MPBH7-C.

A bore census conducted for the MPO identified 39 privately owned bores, wells, and springs used for irrigation, stock watering, and domestic supply in the surrounding area of MPO (AGE, 2025b). Some of these features are also included in current and historical groundwater monitoring networks associated with nearby coal mining operations. An assessment of predicted drawdown at private water sources was undertaken, considering both the impacts of the modified MPO up to December 2025 and the cumulative effects of surrounding mining activities, including the Dartbrook Mine, Bengalla Mine, and Mt Arthur Coal Mine. Of the 39 identified bores, 35 were included in the assessment, with the remainder excluded due to being abandoned or no longer in use. For bores without recorded depths, it was assumed that they intersect the most productive hydrostratigraphic unit at their location. For example, bores situated within the Hunter River alluvium were assumed to be screened within alluvial deposits. The BELGRAVE bore is interpreted to be completed within regolith associated with the relatively lower-yielding Sydney Basin – North Coast Groundwater Source. Model results indicate that six privately owned bores are predicted to experience drawdown exceeding 2 m as a result of cumulative impacts from the modified MPO (to December 2025) in combination with nearby mining operations. A summary of these bores and the corresponding predicted drawdowns is provided in Table 3.9. No private bores are predicted to exceed 2 m of drawdown due solely to the modified MPO. Groundwater monitoring data from CAS1_G and CAS4_G, collected as part of the Dartbrook Mine monitoring program, indicate that these bores have already experienced drawdown of approximately 15 m, attributed to the operation of the Dartbrook Mine.

Table 3.9 Drawdown in private bored up to December 2025

Bore ID	Depth (mTOC)	Maximum cumulative drawdown (m)	Maximum drawdown for Modified MPO only (m)	Type
BELGRAVE	23.85	4.76	0.03	Well – Stock & Monitoring
CASE1_G	28.23	7.75	0.04	Bore – Not in use
CASE2_G	65	13.09	0.03	Bore – Monitoring (Not in use)
CASE3_G	76.7	14.13	0.03	Bore – Monitoring (Not in use)
CASE4_G	34.8	12.11	0.01	Bore – Monitoring (Not in use)
JLON1	52	4.02	0.16	Well & Bore – Monitoring



LEGEND

- Populated place
- Drainage
- Road

Drawdown contour (m)
- Mount Pleasant Operation
- Surrounding mines
- Model boundary

Drawdown (m)

1
2
5
10
20
50
100
200
500

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Model prediction of cumulative drawdown at the end of 2025 for alluvium/regolith (Layers 1 and 2)

AGE

DATE
24/02/2026

FIGURE No:
3.3

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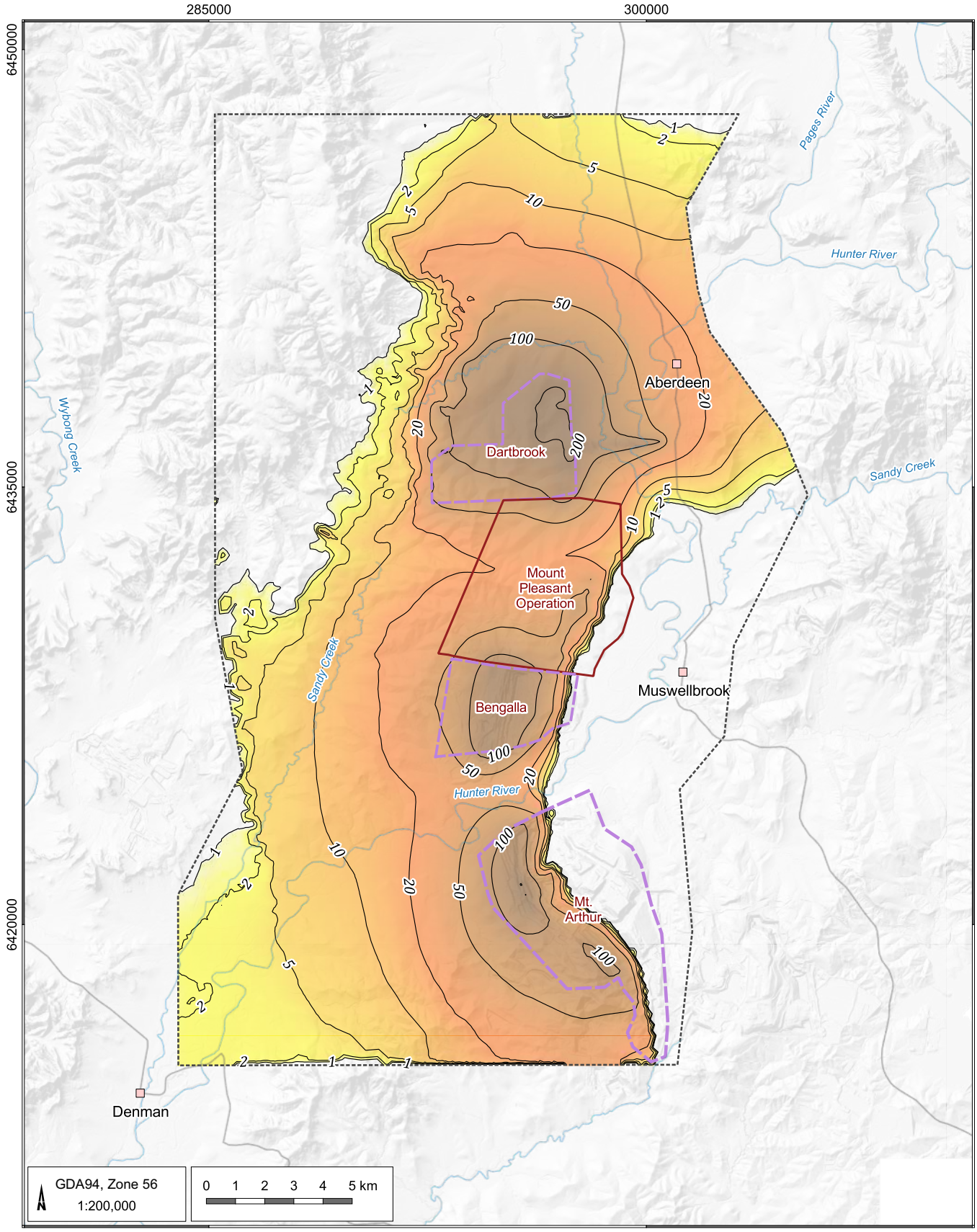
Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:\Projects\MPO.20250132 Mt Pleasant Groundwater Report for the 2025 Calendar Year\3_GIS\Workspaces\999_Working\03.03_MPO20250132Predicted drawdown in alluvium - regolith (Layer 2) at end of 2025.qgz



LEGEND

- Populated place
- Drainage
- Road

Drawdown contour (m)
- Mount Pleasant Operation
- Surrounding mines
- Model boundary

Drawdown (m)

1, 2, 5, 10, 20, 50, 100, 200, 500

Mt Pleasant Groundwater Report for the 2024 Calendar Year (MPO5007.001)

Model prediction of cumulative drawdown at the end of 2025 for Edderton Seam (Layer 18)

AGE

DATE 24/02/2026

FIGURE No: **3.4**

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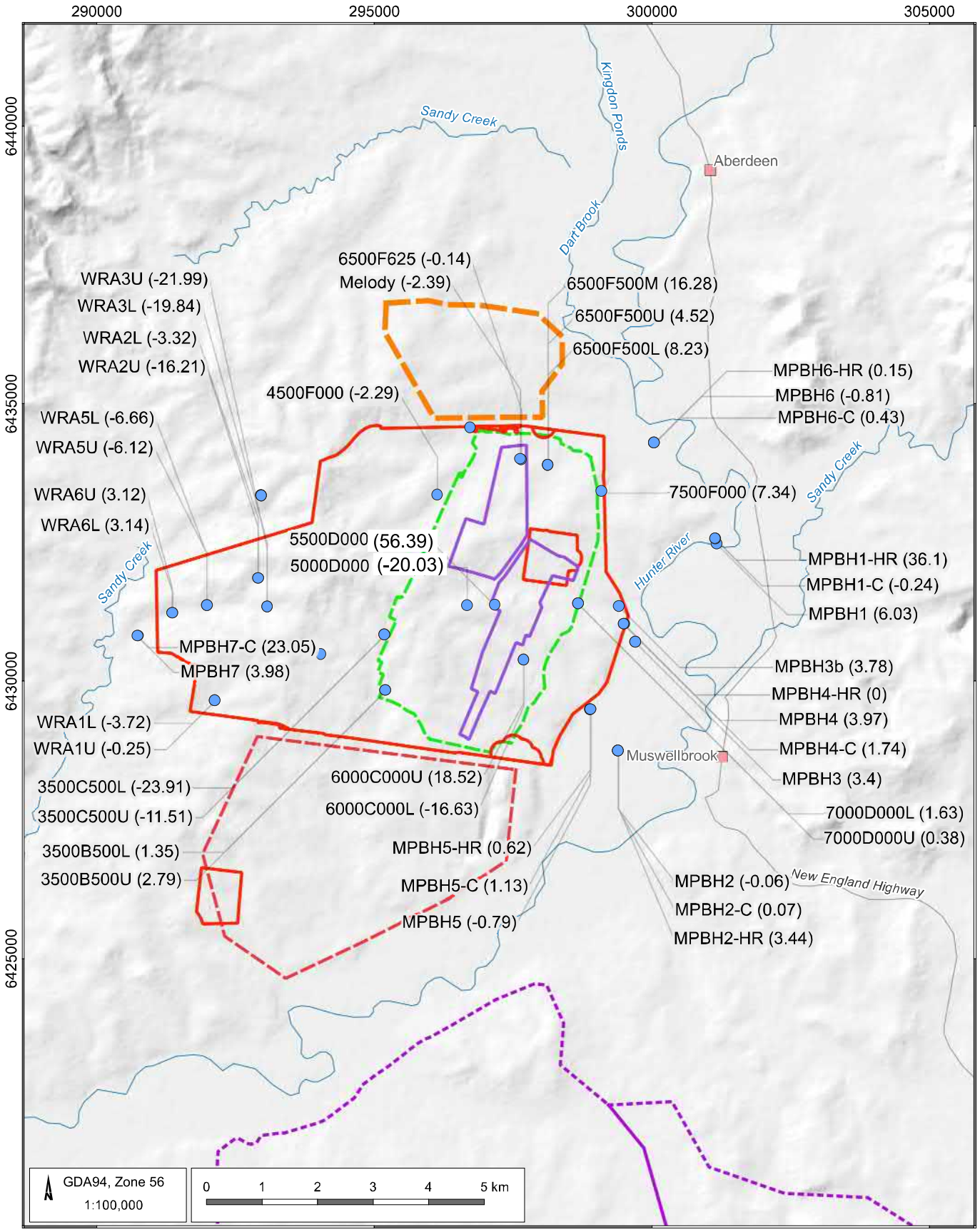
G:\Projects\MPO.20250132 Mt Pleasant Groundwater Report for the 2025 Calendar Year\3_GIS\Workspaces\999_Working\03.03_MPO20250132Predicted drawdown in alluvium - regolith (Layer 2) at end of 2025.qgz



LEGEND

- Populated place
- Drainage
- Road
- Bengalla Project Extent
- Dartbrook Project Extent
- MPO Pit Extent
- Project Boundary
- Pit Floor Extent
- MAC Pit Extent

Mt Pleasant Groundwater Report for the 2025 Calendar Year (MPO20250132)

Modelled versus measured head in 2025

AGE

DATE 10/03/2026

FIGURE No: **3.5**

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G:\Projects\MPO.20250132 Mt Pleasant Groundwater Report for the 2025 Calendar Year\3_GIS\Workspaces\999_Working\03.05_MPO20250132_Residual_2025.qgz

4 Summary and conclusions

This report presents a summary of groundwater monitoring data collected from the MPO monitoring network during the 2025 calendar year. he monitoring network comprises three primary domains: Central, Eastern, and Western. During the reporting period, 36 of the 42 designated monitoring bores achieved 100% recovery of groundwater level data. Of the remaining six bores, data recovery averaged 75%, primarily due to bores being inaccessible (WRA5L-R, WRA5U-R, and NE Alluvium) or impacted by mining (5500D000) and roadworks (GDE Bore Deep and GDE Bore Shallow). Groundwater quality monitoring was undertaken at 35 of the 42 designated monitoring sites during the reporting period. Some bores, such as WRA1U, NE Alluvium, MPBH5, GDE Bore Shallow, East Alluvium, and 5500D000, were dry, while others, including 6000C000U-R and WRA3U-R, had insufficient water to allow for water quality sampling.

Groundwater levels within the Hunter River alluvium have remained generally stable over the monitoring period from 2003 to 2025, with only minor short-term increases associated with rainfall events. Despite an overall upward trend in cumulative rainfall departure, no corresponding long-term rise in alluvial groundwater levels is evident. This indicates that the alluvial aquifer in this area is primarily sustained by hydraulic connectivity with the Hunter River rather than direct recharge from rainfall. Groundwater levels are therefore strongly influenced by regulated river flows, including controlled releases from Glenbawn Dam, which moderate river and adjacent alluvial water levels, particularly during periods of significant rainfall.

Monitoring in the Western Domain indicates that groundwater conditions within the shallow Permian measures and overlying regolith vary spatially across the MPO. Nested monitoring bores demonstrate that, at some locations (e.g. WRA5 and WRA5-R), groundwater levels in the regolith and underlying Permian strata are similar, indicating hydraulic connectivity and minimal vertical gradients. In contrast, other locations (notably WRA3/WRA3-R and, to a lesser extent, WRA6) exhibit distinct water level differences between units, suggesting limited vertical connectivity and the presence of stronger vertical hydraulic gradients. Groundwater levels in the Permian measures generally show limited temporal variability and a weak response to rainfall, consistent with comparison to cumulative rainfall departure. Regolith groundwater flow is expected to be moderate and controlled by local topography. Although the regolith has the potential to provide hydraulic connectivity between the alluvium and mine workings, this potential is constrained by its generally thin and often dry nature, as well as topographic separation from the open-cut pits by a drainage divide.

Groundwater monitoring in the Central Domain indicates generally stable conditions within the Permian measures north and west of the MPO open-cut pits. Most monitoring bores show limited temporal variability and a weak correlation with cumulative rainfall departure, suggesting that groundwater levels are not strongly influenced by short-term climatic conditions. Localised groundwater level declines have been observed at a small number of bores (including 5000D000-R, 5000D000, and 3500C500L), with declines continuing through 2025. The timing and pattern of these changes do not align consistently with regional rainfall trends, indicating that factors such as nearby mining activities are likely influencing groundwater behaviour at these locations. In contrast, groundwater levels across the majority of the Central Domain have remained stable or have shown minor increases. Groundwater levels in mixed interburden and coal seam units, as well as at Bore Melody and GDE Bore Deep, have remained stable throughout the monitoring period. There is no clear evidence of sustained drawdown attributable to mining activities at MPO or to operations at nearby mines.

Total groundwater drawdown was calculated as the difference between the first and most recent groundwater level recorded at each monitoring bore, with assessment periods varying between 2011 and 2025 depending on data availability. Across the MPO monitoring network, groundwater level changes vary by domain and hydrostratigraphic unit. In the Hunter River alluvium, total drawdown is generally minor, ranging from -0.66 m at MPBH4 to 1.3 m at MPBH2.In the Western Domain, groundwater responses differ between units. Regolith bores show moderate drawdown, ranging from -0.99 m at WRA6U-R to 3.48 m at WRA5U. In contrast, bores screened in the Permian measures display greater variability, with total groundwater level changes ranging from -7.64 m at WRA2L to a rise of 11.72 m at WRA3L. In the Central Domain, which targets Permian measures, the greatest variability in groundwater levels is observed. Total groundwater level change ranges from a significant -57.99 m at 5000D000 to 10.89 m at Melody. Higher drawdowns were observed in coal seam bores near the mining pit, including 5000D000 (-57.99 m) and 3500B500L (-34.21 m), reflecting the influence of nearby mining activities. In contrast, smaller drawdowns in the overlying regolith and alluvium layers indicate limited hydraulic connectivity between shallow and deeper strata. Overall, groundwater in shallower layers is less affected by mining, while deeper coal seams are more sensitive to mining-induced depressurisation. These patterns are consistent with expected behaviour in stratified hydrogeological systems.

Groundwater EC and pH measurements across the MPO monitoring network in 2025 demonstrate clear spatial variability between monitoring domains, reflecting differences in hydrogeological setting and groundwater salinity. EC values in the Hunter River alluvium range from fresh to saline, with the majority of bores indicating fresh to brackish groundwater. In the Western Domain, groundwater in both the regolith and underlying Permian measures is predominantly moderately saline. In the Central Domain, EC values within the Permian measures exhibit the widest range, from brackish to saline, indicating substantial local variability in groundwater salinity conditions. Groundwater pH across all domains is generally near-neutral to slightly alkaline. Minor spatial variability is observed, with pH values remaining within expected ranges for the monitored hydrostratigraphic units. Elevated pH values recorded at several coal seam bores during 2025 reflect the geochemical characteristics of these units. As these bores do not have assigned water quality trigger values, no management response is required.

The major ion chemistry of 35 groundwater samples collected across the MPO was analysed using a Piper plot. The analysis revealed significant variability in the geochemical composition of groundwater within the Permian strata, particularly the coal measures. The dominant ions in these areas were sodium, potassium, and chloride, classifying the groundwater as a sodium chloride type. In contrast, groundwater in the alluvial deposits exhibited a magnesium carbonate type profile due to high concentrations of magnesium (Mg^{2+}) and bicarbonate (HCO_3^-) ions.

Water level data from key monitoring bores, such as MPBH1, MPBH2, MPBH3b, and MPBH7, consistently remained below the trigger levels specified in the latest WMP throughout the monitoring period, including 2025. Measured EC values during 2025 generally remained below their respective WMP trigger levels, with the exception of MPBH2. At MPBH2, the average EC was 1,148 µS/cm, approximately 23% above the WMP trigger of 930 µS/cm. However, the updated GWMP (under approval) establishes a revised trigger of 1,500 µS/cm for this bore. Using this updated value, EC at MPBH2 remains below the trigger, and no further investigation is required. The pH values across all monitoring bores remained within the WMP trigger range (6.0–8.5) during 2025, with no exceedances recorded. However, some bores may warrant the addition of water quality trigger values in the next WMP update, as several measurements in 2025 were higher than their typical historical ranges.

To validate the groundwater model in accordance with the GMP section of WMP, a comprehensive comparison was made between newly collected monitoring data and the previous model calibration conducted in 2020. This validation process involved assessing water level measurements from 45 monitoring bores within the MPO, covering a time span from 2003 to 2025. While the RMS and SRMS values for the post-2020 dataset showed a slight reduction in model accuracy, the results still meet the acceptable standards outlined in the Australian Groundwater Modelling Guidelines. The global SRMS value of 5.30% falls below the recommended 10% benchmark, indicating that the model is adequately calibrated for its intended purpose and does not require immediate recalibration.

Simulated drawdown predictions indicate limited groundwater impacts in the alluvium surrounding the MPO, with minimal drawdown in the Hunter River alluvium due to the majority of the target seams subcropping to the west. The predicted drawdown in the Edderton Seam is constrained to the north and south by the concurrent drawdowns from neighbouring mines, and to the east by the subcrop, further limiting its extent. Of the 39 privately owned bores identified near the MPO, 35 were assessed for potential impacts. Six bores are predicted to experience drawdown exceeding 2 m under cumulative mining conditions; however, no exceedances are attributed to the modified project alone. Existing monitoring indicates that some bores (CAS1_G and CAS4_G) have already experienced significant drawdown due to Dartbriook mining activities.

The analysis of the difference between the simulated and measured heads in 2025, calculated at various monitoring bores, reveals a range of residual head differences. These differences range from -23.91 m at bore 3500C500L to 56.39 m at 5500D000. Out of 45 model-data comparisons, 73% exhibit a difference of less than 10 m between the simulated and observed heads, demonstrating a generally good alignment between the model and the observed data.

Based on the outcomes of this data review, AGE recommends establishing trigger levels for monitoring bores where the GWMP does not currently define them. This recommendation particularly applies to replacement bores, including 5000D000-R, 6000C000L-R, WRA3(L–U)-R, and WRA5(L–U). As these bores are located at different positions, screened at varying depths, and may target different geological units compared to the original installations, it is not appropriate to directly apply the trigger levels defined for the original bores. New trigger levels should be developed once sufficient monitoring data have been collected to support robust statistical assessment. Additionally, some monitoring bores may warrant inclusion of water quality trigger values in the next GWMP update, as several parameters recorded during 2025 exceeded their typical historical ranges. In particular, new trigger values for pH are recommended for several sites (6000C000L-R, MPBH1-C, MPBH2-C, MPBH4-C, and MPBH5-C), as recorded pH values were higher than typical historical ranges at these locations.

5 References

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Appendix A

Details of the monitoring bore network

Bore ID	Easting† (m)	Northing† (m)	Casing elevation (m AHD)	Ground elevation (m AHD)	Bore depth/Screened interval (m)	Aquifer/Unit	First record				Last record				Measured total drawdown (m)‡	Simulated total drawdown (m)‡
							Date	Measured		Simulated	Date	Measured		Simulated		
								WL (m BGL)	WL (m AHD)	WL (m AHD		WL (m BGL)	WL (m AHD	WL (m AHD)		
MPO Central Domain																
3500B500L	295194.4	6429840.4	203.90	203.40	Depth 175.36	Bayswater Seam	08-Jan-03	33.39	170.01	169.10	25-May-17	67.60	135.80	137.14	-34.21	-31.96
3500B500U	295194.4	6429840.4	203.80	203.40	Depth 21.43	Interburden #1	14-Oct-11	17.80	185.60	192.55	11-May-16	18.68	184.72	187.51	-0.88	-5.05
3500C500L	295176.1	6430842.6	240.62	239.74	Depth 86.77	Mount Arthur Seam	08-Jan-03	28.46	211.28	201.92	12-Nov-25	27.54	212.20	188.29	0.92	-13.62
3500C500U	295175.8	6430840.4	240.40	239.80	Screen 55.00 - 61.00	Warkworth Seam	28-Oct-05	25.15	214.65	211.24	12-Nov-25	24.51	215.29	203.78	0.64	-7.46
4500F000	296129.5	6433360.2	218.10	217.12	Depth 121.24	Vaux Seam	08-Jan-03	18.04	199.08	192.33	10-Nov-25	22.10	195.02	192.73	-4.06	0.39
5000D000	296666.3	6431368.4	241.94	241.04	Depth 171.35	Wynn/Edderton Seams	24-Feb-05	81.61	159.43	156.97	02-May-24	139.60	101.44	157.83	-57.99	0.86
5000D000-R	294028.6	6430488.9	ND	ND	ND	Wynn/Edderton Seams	11-Aug-22	ND	126.39	ND	12-Nov-25	ND	123.70	ND	-2.69	ND
5500D000	297166.7	6431378.1	222.98	222.27	Screen 130.00 - 136.00	Interburden #7/Wynn Seam	08-Jan-03	62.17	160.10	162.98	12-Nov-25	40.94	181.33	161.30	-21.23	-1.68
6000C000L	297685.1	6430387.0	180.70	180.30	Depth 20.69	Interburden #2	08-Jan-03	20.03	160.27	146.49	14-Dec-17	20.90	159.40	142.78	-0.87	-3.72
6000C000L-R	ND	ND	222.45	ND	Depth 70 - 80	Mount Arthur Seam	11-Dec-24	ND	84.51	ND	18-Nov-25	ND	83.45	ND	-1.06	ND
6000C000U	297685.1	6430387.0	180.70	180.30	Depth 51.27	Wynn Seam	27-Oct-11	38.85	141.45	161.38	14-Dec-17	38.48	141.82	160.33	0.37	-1.05
6000C000U-R	ND	ND	222.68	ND	Depth 140 - 150 (estimated)	Vaux Seam	11-Dec-24	ND	133.02	ND	18-Nov-25	ND	135.25	ND	2.23	ND
6500F500L	298120.4	6433897.8	189.85	188.93	Depth 115.20	Maitland Group	20-Apr-05	47.68	141.25	141.65	17-Nov-25	50.73	138.20	146.43	-3.05	4.78
6500F500M	298120.4	6433897.8	189.85	188.93	Depth 77.30	Interburden #6/Wynn Seam	20-Apr-05	48.50	140.43	130.20	17-Nov-25	51.21	137.72	154.00	-2.71	23.80
6500F500U	298120.35	6433897.8	189.85	188.93	Depth 35.10	Interburden #4/Broonie Seam	20-Apr-05	34.35	154.58	148.68	17-Nov-25	28.03	160.90	165.42	6.32	16.74
6500F625	297643.2	6433996.6	193.67	193.67	Depth 36.30	Permian	08-Jan-03	15.75	177.92	178.45	17-Nov-25	14.04	179.63	179.50	1.71	1.05
7000D000L	298666.5	6431403.6	162.70	162.40	Depth 98.73	Maitland Group	25-Nov-14	17.53	144.87	146.29	07-May-19	18.00	144.40	146.03	-0.47	-0.27
7000D000U	298666.5	6431403.6	162.70	162.40	Depth 12.89	Interburden #7/Edderton Seams	08-Jan-03	3.44	158.96	157.85	07-May-19	4.99	157.41	157.78	-1.55	-0.07
7500F000	299086.5	6433425.8	184.61	183.63	Depth 182.80	Edderton Seam	08-Jan-03	33.39	150.24	150.00	18-Nov-25	36.18	147.45	154.79	-2.79	4.78
GDE Bore Deep	296719.5	6434573.6	192.07	ND	Depth 22 (estimated)	Warkworth Seam	28-Nov-24	ND	181.398	ND	11-Aug-25	ND	181.57	ND	0.17	ND
Melody	297623.5	6434009.3	192.73	192.30	Depth 43.80	Unknown	07-Nov-18	12.81	171.28	179.80	17-Nov-25	10.13	182.17	179.78	10.89	0.11
MPO Eastern Domain																
MPBH1	301165.0	6432480.0	ND	146.855	Screen 12.6 – 18.6	Hunter Alluvium	08-Jan-03	143.36	137.46	143.36	10-Nov-25	9.39	137.33	143.36	-0.13	0.00
MPBH1-C	301140.3	6432568.8	153.57	152.94	Screen 68.77 – 74.77	Coal Seam	23-Mar-20	143.33	143.36	143.33	10-Nov-25	9.63	143.56	143.33	0.20	0.00
MPBH1-HR	301134.2	6432574.3	153.51	152.92	Screen 48.8 – 50.8	Interburden	11-Mar-20	143.32	143.30	143.32	10-Nov-25	9.56	107.23	143.32	-36.07	0.00
MPBH2	299383.3	6428749.4	146.15	145.43	Screen 11.5 – 17.5	Hunter Alluvium	08-Jan-03	134.64	133.39	134.66	17-Nov-25	12.04	134.69	134.64	1.30	-0.02
MPBH2-C	299385.5	6428747.7	146.04	145.30	Screen 66.5 – 76.5	Coal Seam	12-Mar-20	134.64	133.13	134.64	17-Nov-25	12.20	134.57	134.64	1.44	0.00
MPBH2-HR	299385.5	6428747.7	146.10	145.45	Screen 46.2 – 52.2	Interburden	12-Mar-20	134.64	133.24	134.63	17-Nov-25	12.16	131.20	134.64	-2.03	0.00

Bore ID	Easting† (m)	Northing† (m)	Casing elevation (m AHD)	Ground elevation (m AHD)	Bore depth/Screened interval (m)	Aquifer/Unit	First record				Last record				Measured total drawdown (m)‡	Simulated total drawdown (m)‡
							Date	Measured		Simulated	Date	Measured		Simulated		
								WL (m BGL)	WL (m AHD)	WL (m AHD		WL (m BGL)	WL (m AHD	WL (m AHD)		
MPBH3	299700.0	6430710.0	ND	148.52	Depth 14.0	Hunter Alluvium	08-Jan-03	139.92	136.54	139.94	13-Oct-10	11.98	136.52	139.92	-0.02	-0.02
MPBH3b	299403.0	6431354.0	150.51	150.08	Depth 14.0	Hunter Alluvium	12-Oct-11	ND	138.17	142.92	12-Nov-25	ND	139.19	142.97	1.02	0.05
MPBH3p	299700.0	6430710.0	ND	148.52	Depth 14.0	Hunter Alluvium	12-Oct-11	142.97	136.61	ND	12-May-16	11.91	136.55	ND	-0.06	ND
MPBH4	299500.9	6431034.2	149.62	148.82	Screen 6.0 – 12.0	Hunter Alluvium	01-Mar-19	141.58	138.27	141.57	12-Nov-25	11.47	137.61	141.58	-0.66	0.00
MPBH4-C	299489.0	6431036.5	149.89	149.03	Screen 71.9 – 81.9	Coal Seam	03-Mar-20	140.84	92.23	140.85	12-Nov-25	10.82	139.11	140.84	46.88	-0.01
MPBH4-HR	299489.0	6431036.5	149.62	148.815	Screen 45.15 – 51.15	Interburden	11-Mar-20	ND	98.86	ND	12-Nov-25	50.30	98.77	ND	-0.09	ND
MPBH5	298881.7	6429492.1	145.92	145.32	Screen 5.8 – 8.8	Hunter Alluvium	28-Feb-19	135.71	137.10	135.71	26-Feb-25	8.83	136.50	135.71	-0.60	0.00
MPBH5-C	298889.2	6429495.9	145.82	145.25	Screen 27.5 – 33.5	Coal Seam	11-Mar-20	135.71	133.03	135.71	10-Nov-25	11.79	134.59	135.71	1.55	0.00
MPBH5-HR	298889.2	6429495.9	146.02	145.41	Screen 19.5 – 22.5	Interburden	04-Mar-20	135.73	133.67	135.73	10-Nov-25	11.89	135.11	135.73	1.44	0.00
MPBH6	300032.9	6434295.0	157.85	157.06	Screen 10.63 – 16.63	Hunter Alluvium	12-Mar-20	147.65	147.46	147.65	17-Nov-25	9.54	148.46	147.65	1.00	0.00
MPBH6-C	300034.1	6434304.4	157.87	157.1	Screen 105.68 – 115.68	Coal Seam	12-Mar-20	147.53	145.20	147.54	17-Nov-25	11.85	147.10	147.53	1.90	-0.01
MPBH6-HR	300033.6	6434299.3	157.82	157.07	Screen 58.4 – 64.4	Interburden	12-Mar-20	147.42	146.14	147.43	17-Nov-25	10.41	147.27	147.42	1.13	0.00
MPO Western Domain																
MPBH7	290737.9	6430822.8	196.41	195.52	Screen 4.10 – 10.10	Hunter Alluvium	23-Mar-20	8.53	186.70	194.68	10-Nov-25	4.83	190.69	194.67	3.70	-0.01
MPBH7-C	290729.1	6430821.3	195.65	195.07	Screen 71.45 – 74.45	Coal Seam	03-Mar-20	18.31	176.64	202.09	10-Nov-25	17.05	178.02	201.07	1.26	-1.02
WRA1L	292118.4	6429654.5	217.93	217.48	Depth 19.40	Warkworth/Permian	20-Jan-03	3.25	214.23	213.42	10-Nov-25	1.02	216.46	212.74	2.23	-0.68
WRA1U	292119.7	6429655.1	218.59	217.59	Depth 6.50	Alluvium/Regolith	25-Jan-07	5.60	211.99	213.42	01-Jun-23	4.42	213.17	212.93	1.18	-0.49
WRA2L	292903.0	6431860.0	ND	262.28	Depth 18.95	Warkworth/Permian	20-Jan-03	9.74	252.54	241.74	15-Aug-18	17.38	244.90	241.59	-7.64	-0.16
WRA2U	292903.0	6431860.0	ND	262.28	Depth 5.50	Alluvium/Regolith	25-Jan-07	6.50	255.78	241.81	07-Sep-16	4.38	257.90	241.69	2.12	-0.11
WRA3L	293065.0	6431345.0	ND	266.10	Depth 22.19	Warkworth/Permian	20-Jan-03	16.08	250.02	242.71	17-Aug-22	4.36	261.74	241.91	11.72	-0.80
WRA3L-R	292952.3	6433352.1	301.79	ND	Depth 100 (estimated)	Permian	28-Nov-24	ND	208.07	ND	10-Nov-25	ND	214.85	ND	ND	ND
WRA3U	293065.0	6431345.0	ND	266.10	Depth 6.75	Alluvium/Regolith	20-Jan-03	3.82	262.28	242.72	17-Aug-22	2.20	263.90	241.92	1.62	-0.80
WRA3U-R	292958.5	6433345.7	302.30	ND	Depth 20 (estimated)	Alluvium/weathered regolith	28-Nov-24	ND	271.55	ND	10-Nov-25	ND	271.56	ND	ND	ND
WRA5L	291980.0	6431370.0	ND	234.66	Screen 13.40 – 19.30	Warkworth/Permian	20-Jan-03	3.36	231.30	228.60	19-Aug-21	-0.53	235.19	228.53	3.89	-0.07
WRA5L-R	292958.5	6433345.7	226.90	ND	Depth 20 (estimated)	Permian	11-Dec-24	ND	226.90	ND	18-Nov-25	ND	226.90	ND	ND	ND
WRA5U	291980.0	6431370.0	ND	234.66	Screen 1.64 – 7.64	Alluvium/Regolith	20-Jan-03	3.48	231.18	228.61	19-Aug-21	0.00	234.66	228.54	3.48	-0.07
WRA5U-R	292958.5	6433345.7	227.90	ND	Depth 5 (estimated)	Alluvium/weathered regolith	11-Dec-24	2.38	224.61	214.17	18-Nov-25	0.52	223.62	214.11	1.86	-0.05
WRA6L	291357.8	6431234.3	212.45	211.42	Depth 18.98	Alluvium/Regolith	20-Jan-03	2.22	209.12	213.40	10-Nov-25	1.14	210.98	213.39	1.08	-0.01

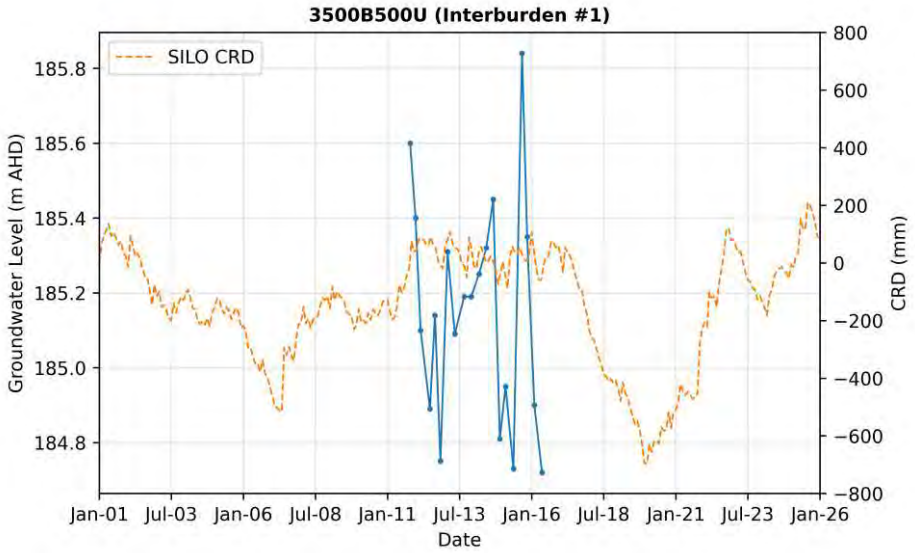
Notes: m AHD = meters Australian Height Datum; m BGL= meters Below Ground Level; WL = Water Level; ND = No Data.

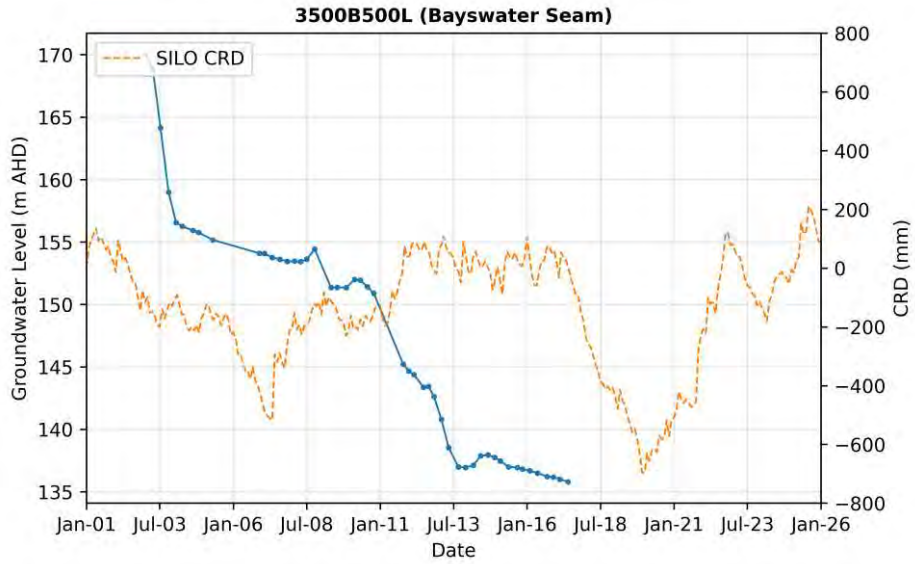
† Easting and Northing coordinates are based on the GDA94, Zone 56 coordinate system.

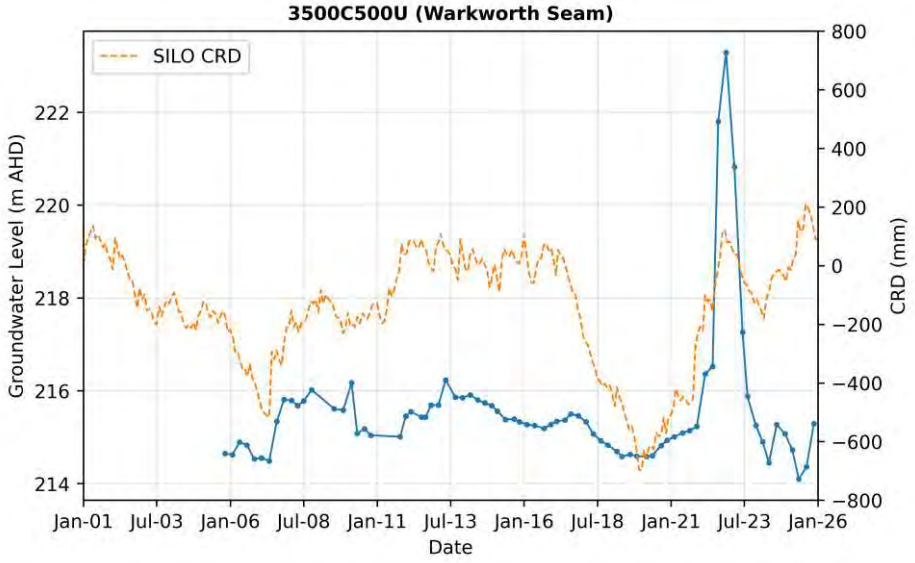
‡. Drawdown is calculated as the difference between the last water level and the first water level. A positive number indicates an increase in head, while a negative number indicates a decline.

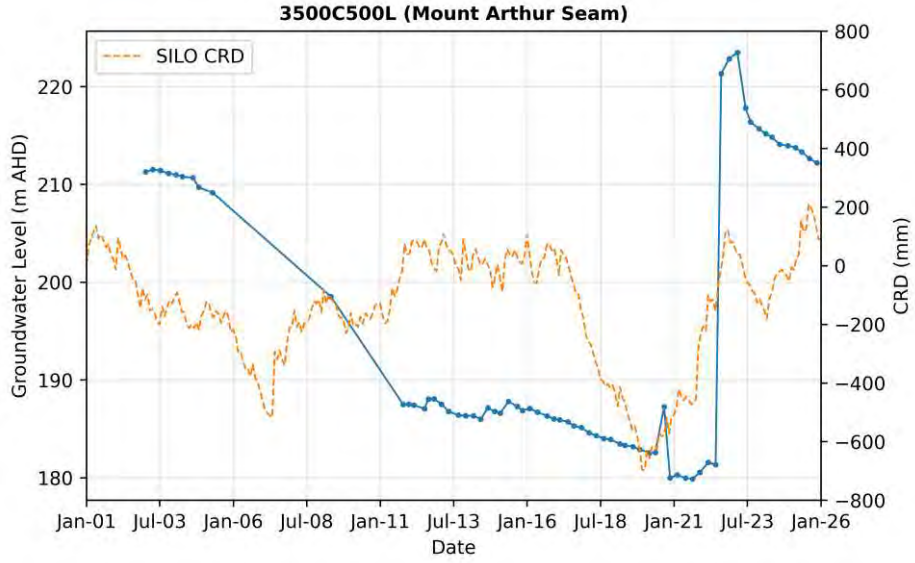
Appendix B

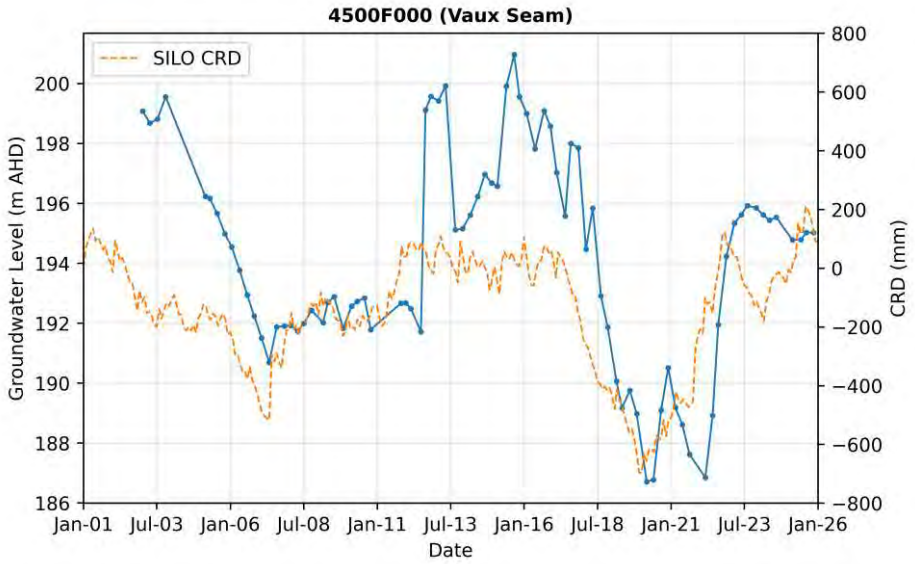
Measured water level hydrographs

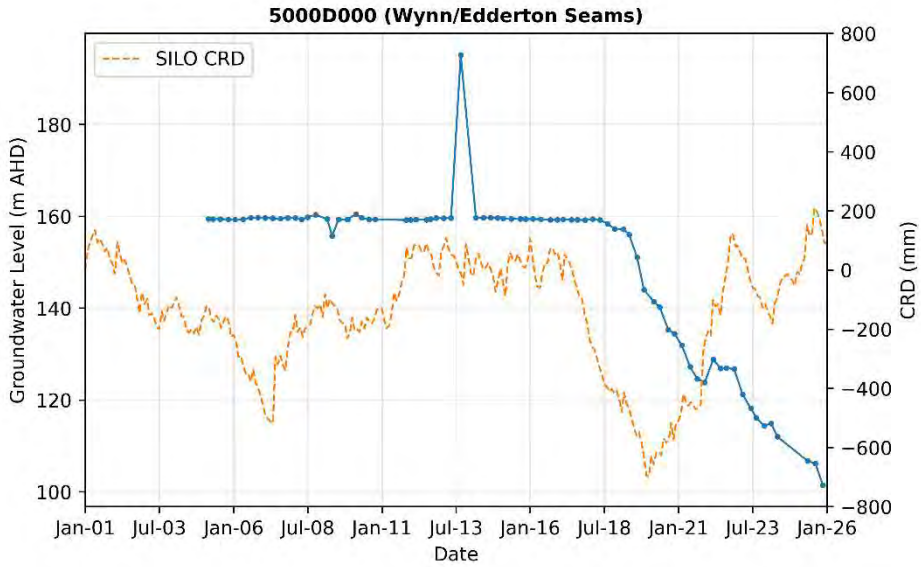

3500B500U (Interburden #1)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
185.8
185.6
185.4
185.2
185.0
184.8
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

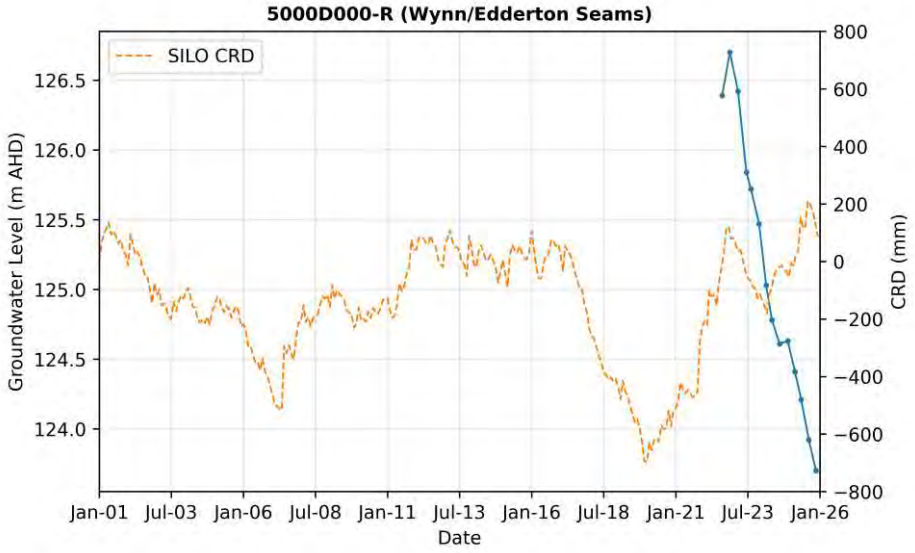

3500B500L (Bayswater Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
170
165
160
155
150
145
140
135
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

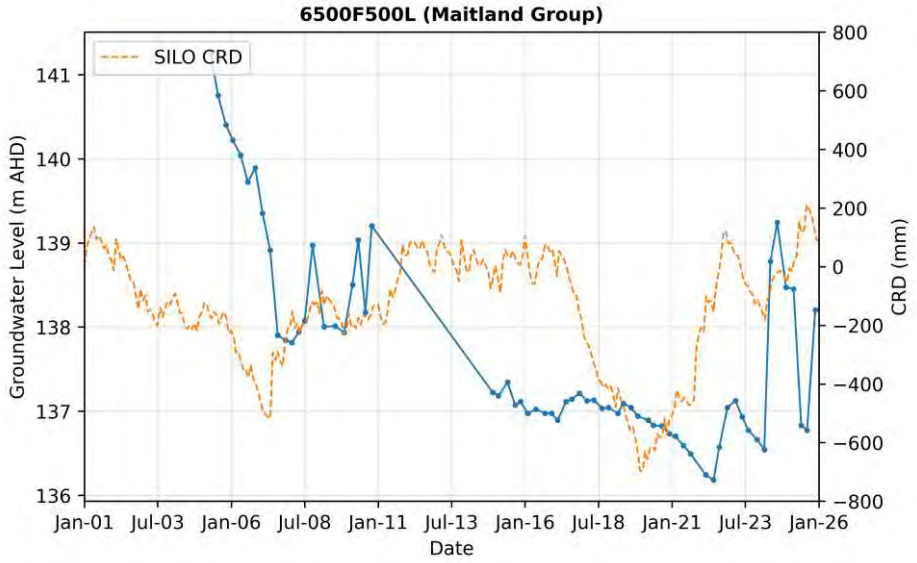

3500C500U (Warkworth Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
222
220
218
216
214
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

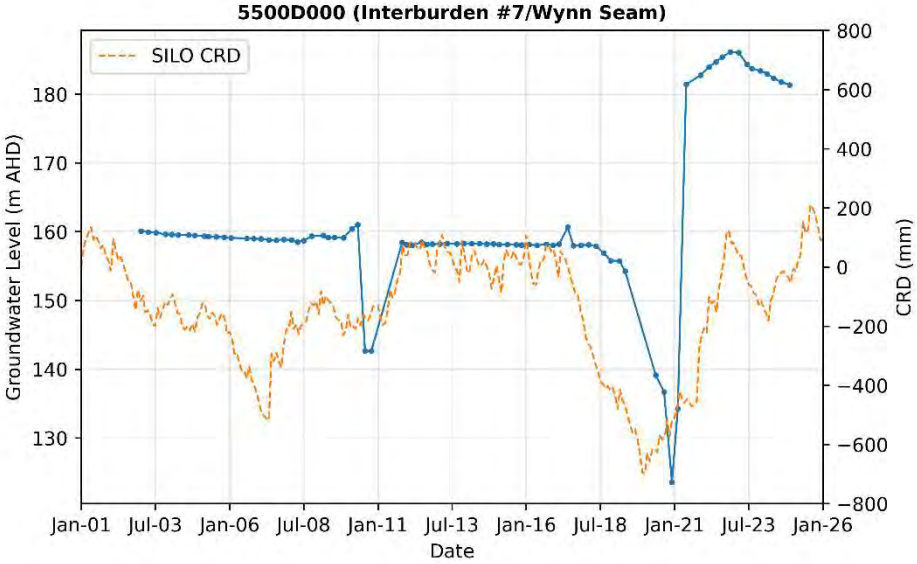

3500C500L (Mount Arthur Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
220
210
200
190
180
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

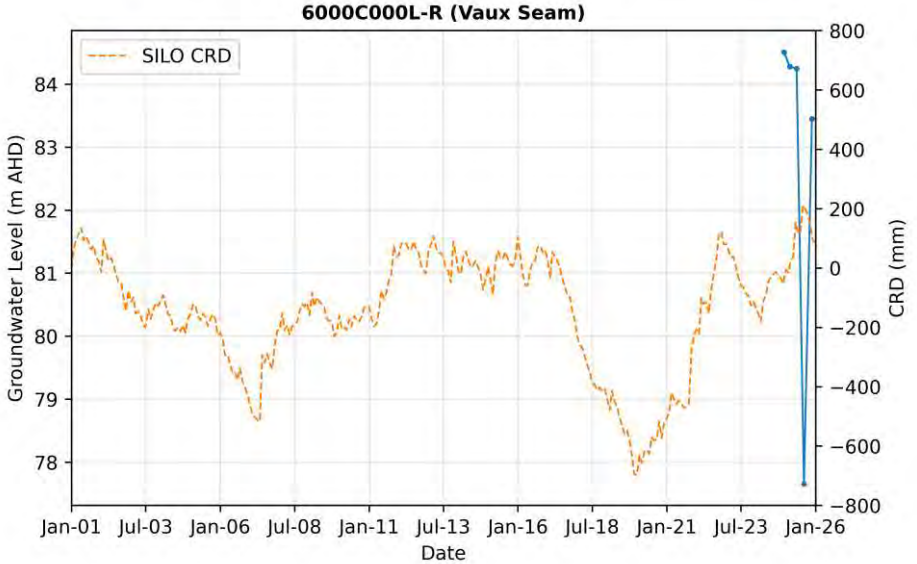

4500F000 (Vaux Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
186 188 190 192 194 196 198 200
−800 −600 −400 −200 0 200 400 600 800

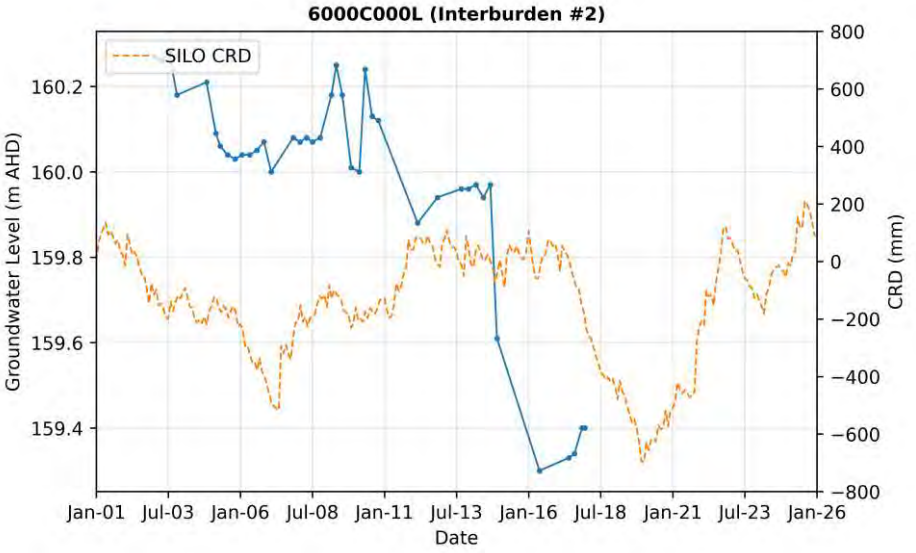

5000D000 (Wynn/Edderton Seams)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
100 120 140 160 180
−800 −600 −400 −200 0 200 400 600 800

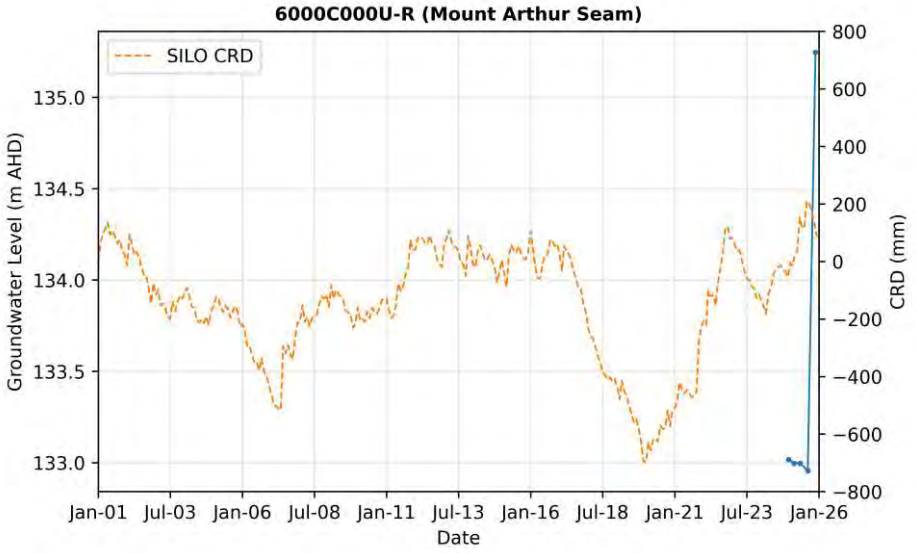

5000D000-R (Wynn/Edderton Seams)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
124.0 124.5 125.0 125.5 126.0 126.5
−800 −600 −400 −200 0 200 400 600 800

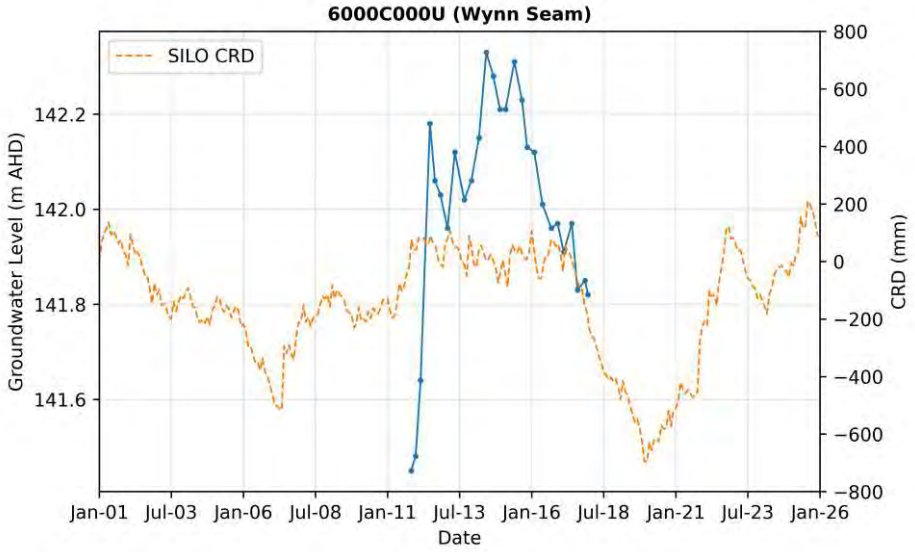

6500F500L (Maitland Group)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
136 137 138 139 140 141
−800 −600 −400 −200 0 200 400 600 800

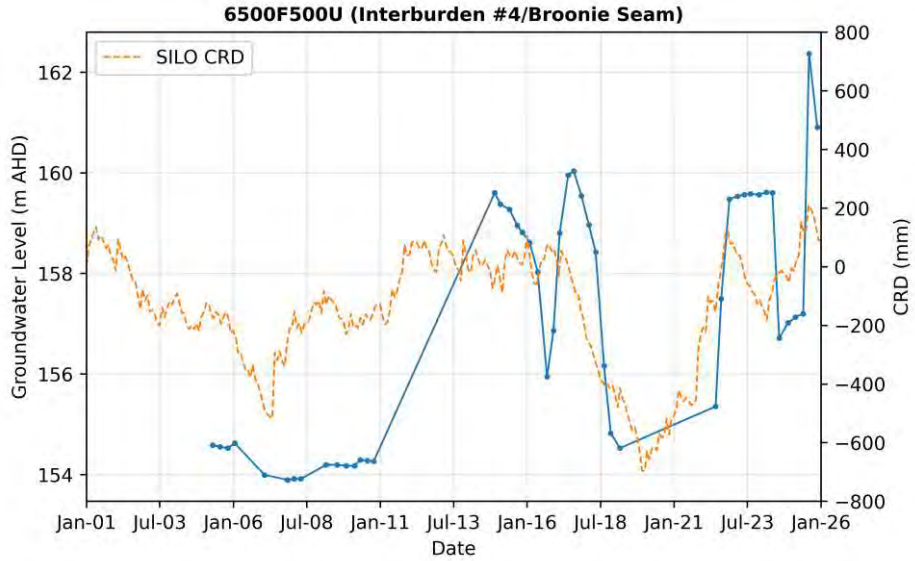

5500D000 (Interburden #7/Wynn Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

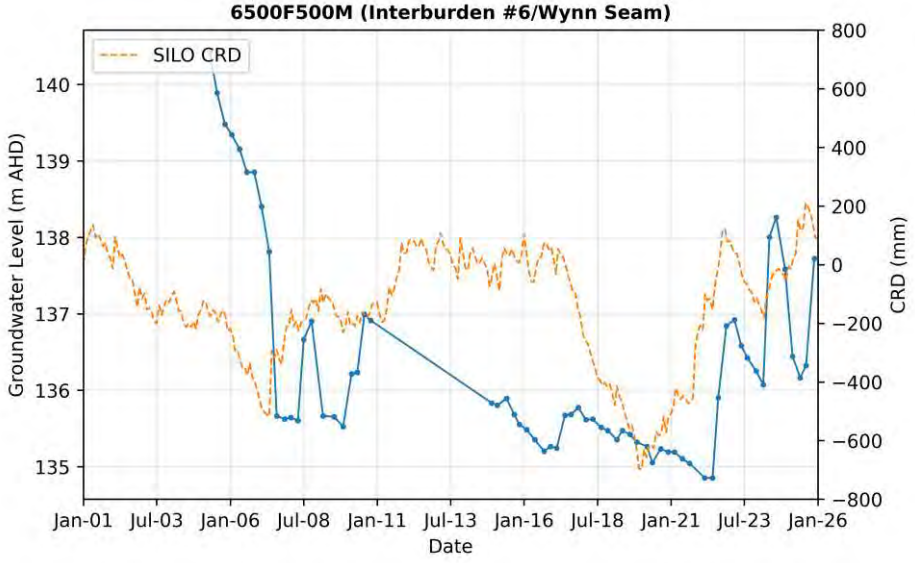

6000C000L-R (Vaux Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

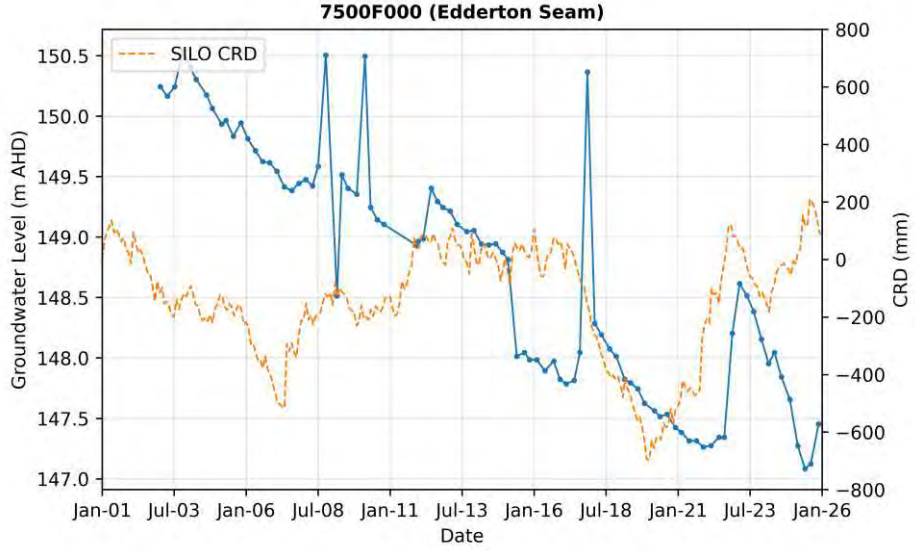

6000C000L (Interburden #2)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

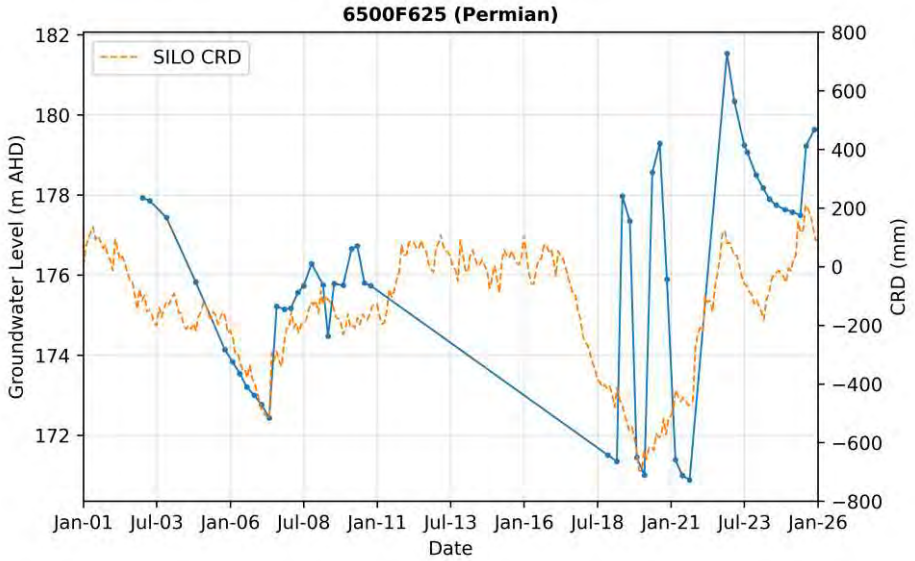

6000C000U-R (Mount Arthur Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

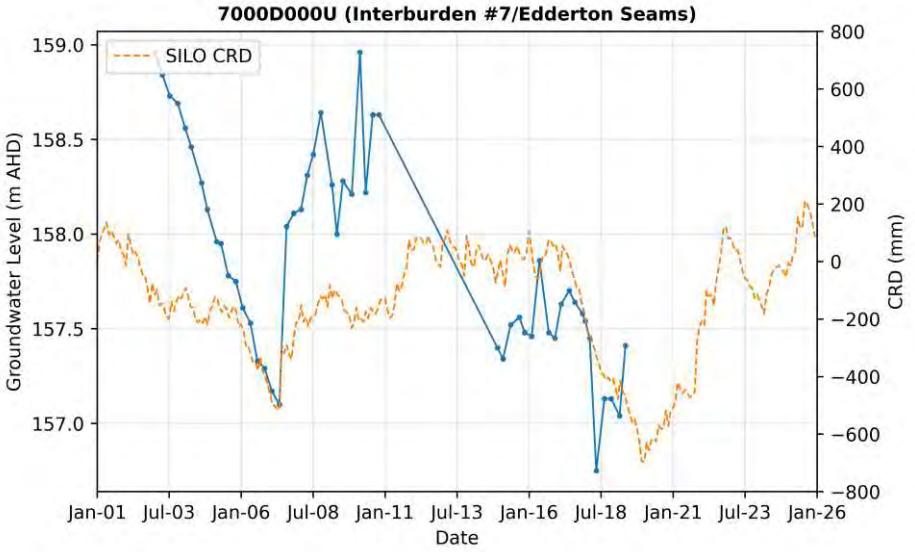

6000C000U (Wynn Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
142.2
142.0
141.8
141.6
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


6500F500U (Interburden #4/Broonie Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
162
160
158
156
154
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


6500F500M (Interburden #6/Wynn Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
140
139
138
137
136
135
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


7500F000 (Edderton Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
150.5
150.0
149.5
149.0
148.5
148.0
147.5
147.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


6500F625 (Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
182
180
178
176
174
172
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


7000D000U (Interburden #7/Edderton Seams)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
159.0
158.5
158.0
157.5
157.0
800
600
400
200
0
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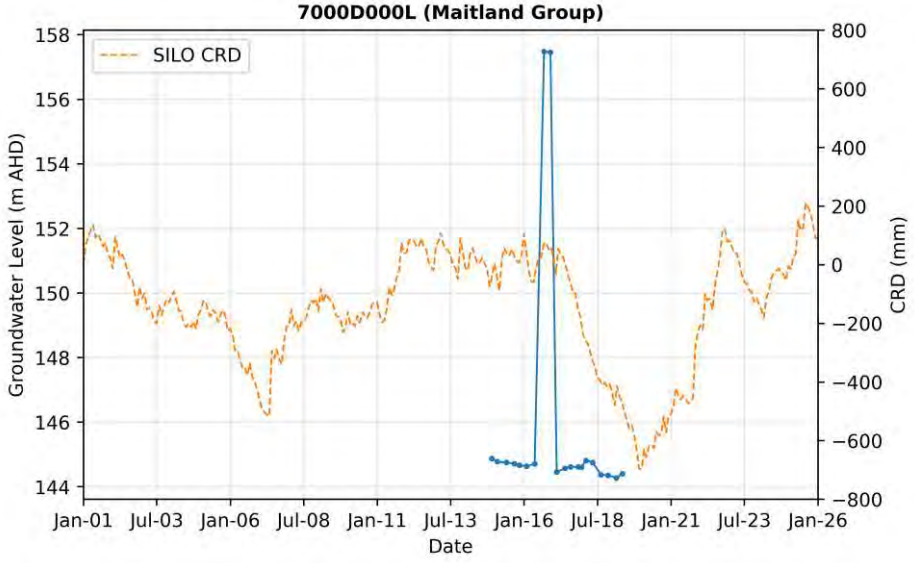
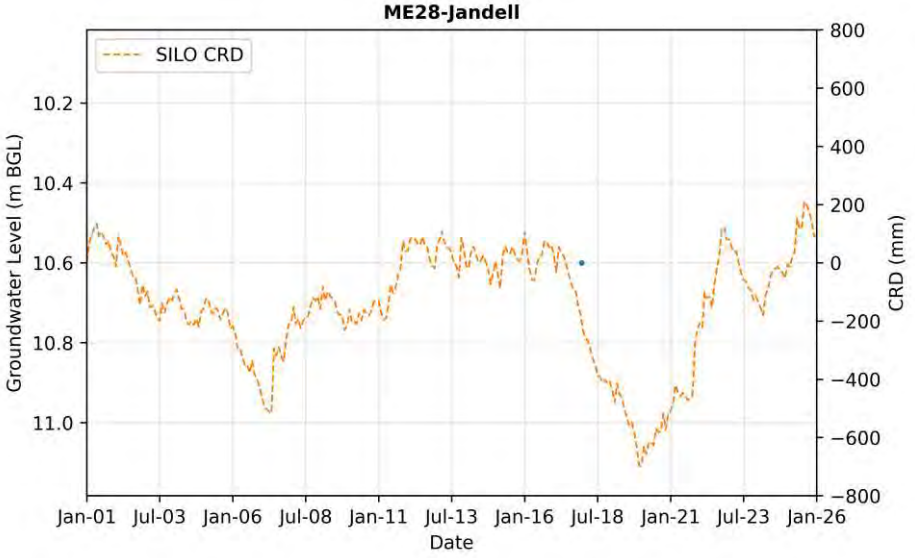
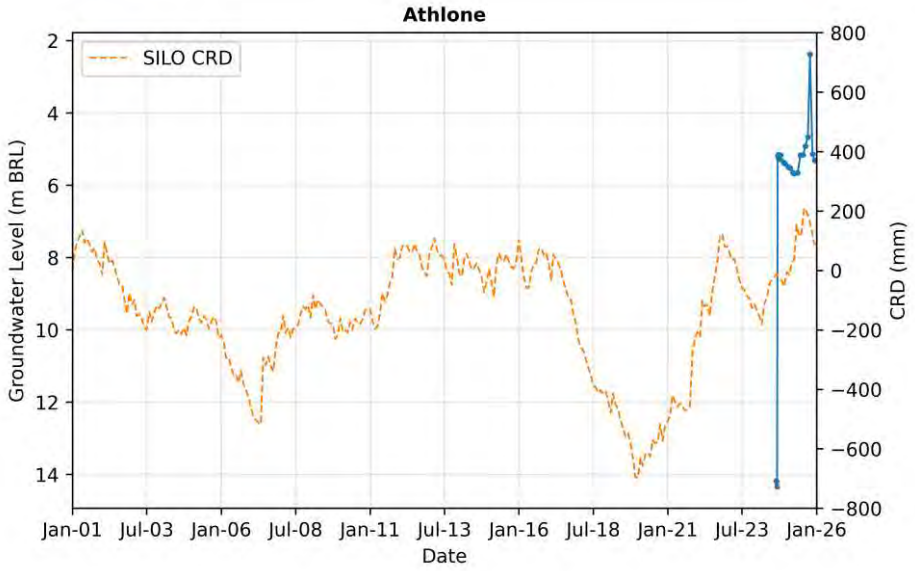
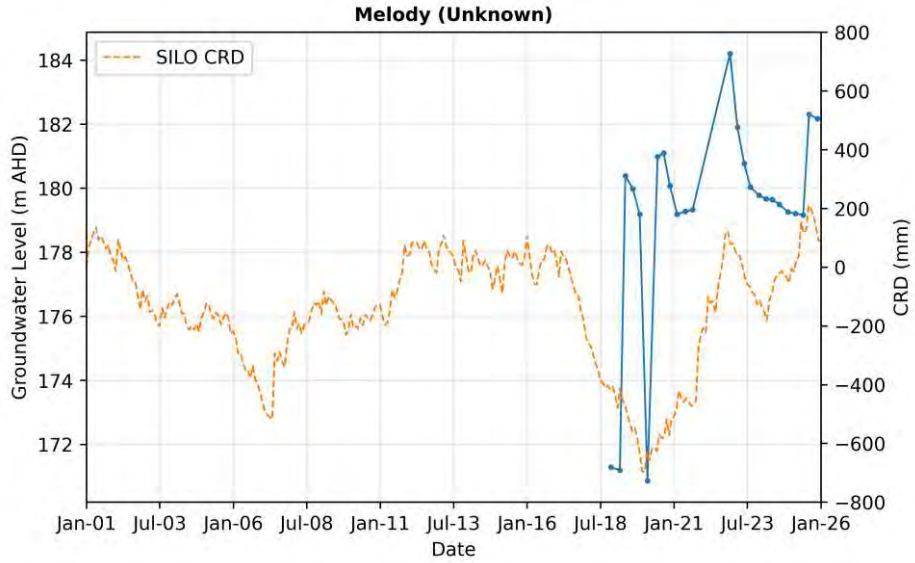
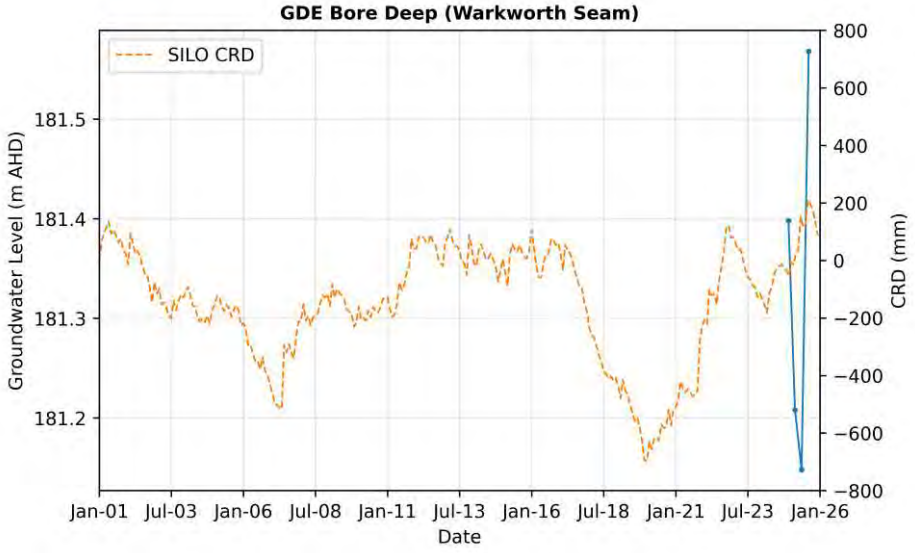
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

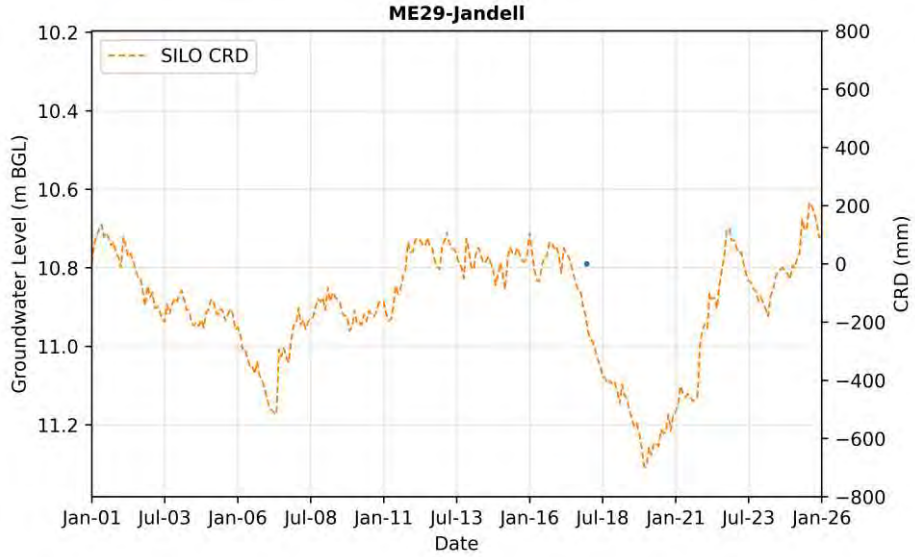

7000D000L (Maitland Group)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
158
156
154
152
150
148
146
144
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

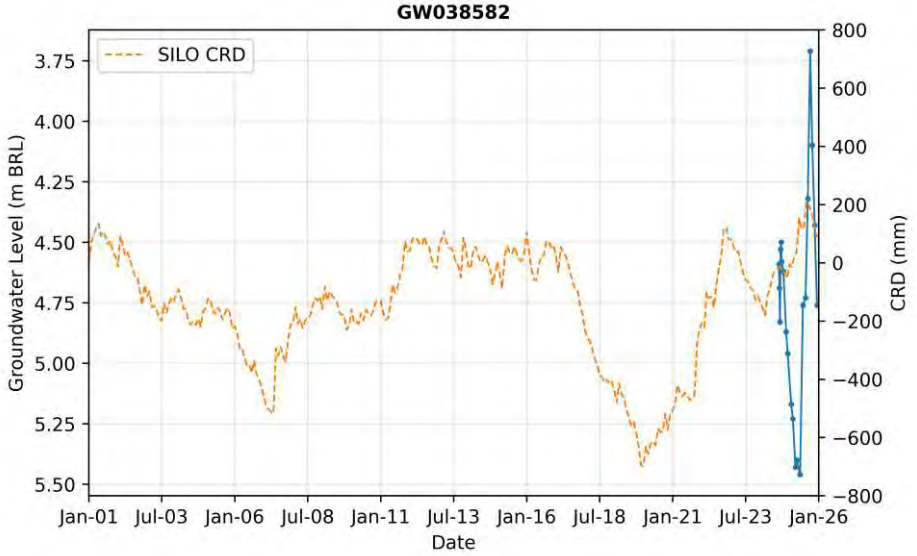

ME28-Jandell
SILO CRD
Groundwater Level (m BGL)
CRD (mm)
Date
10.2
10.4
10.6
10.8
11.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


Athlone
SILO CRD
Groundwater Level (m BRL)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


Melody (Unknown)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


GDE Bore Deep (Warkworth Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


ME29-Jandell
SILO CRD
Groundwater Level (m BGL)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


GW038582
SILO CRD
Groundwater Level (m BRL)
CRD (mm)
Date
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Jul-03
Jan-06
Jul-08
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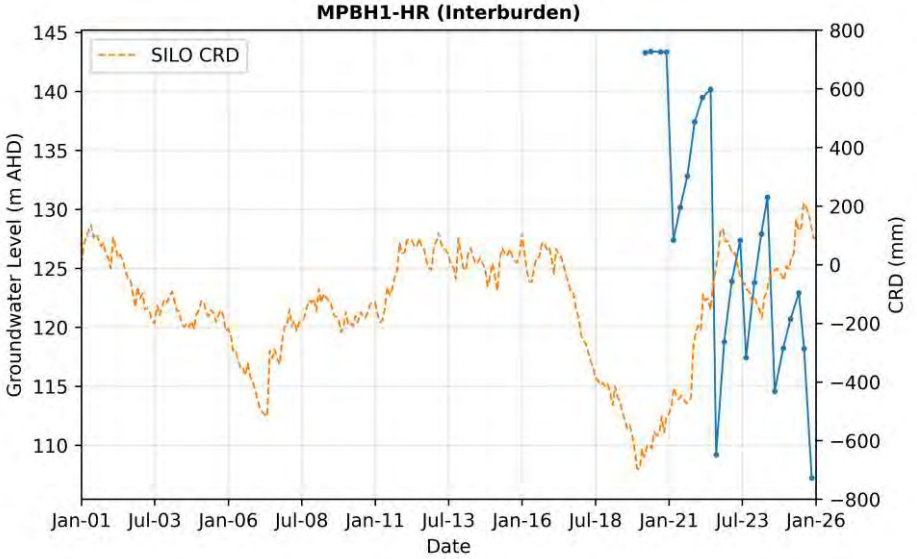
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH1-HR (Interburden)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
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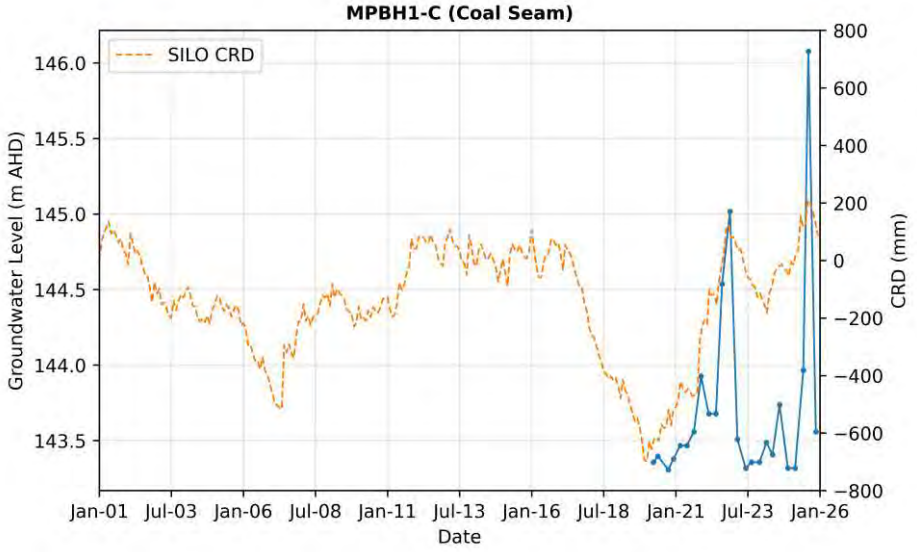
Jan-21
Jul-23
Jan-26


MPBH1-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
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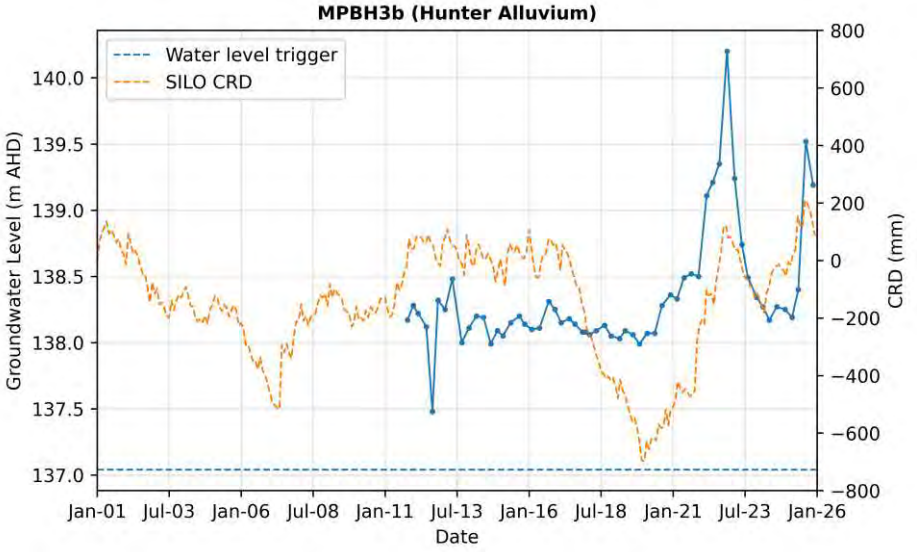
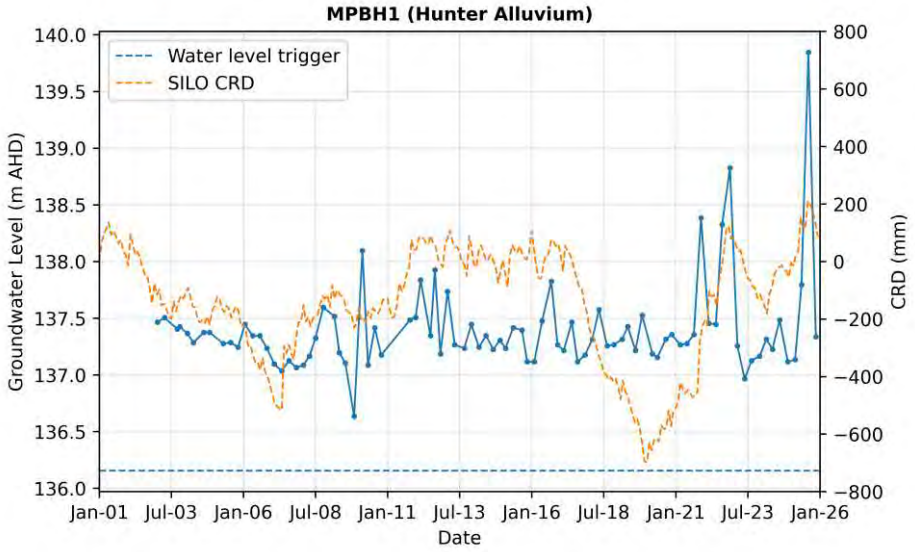
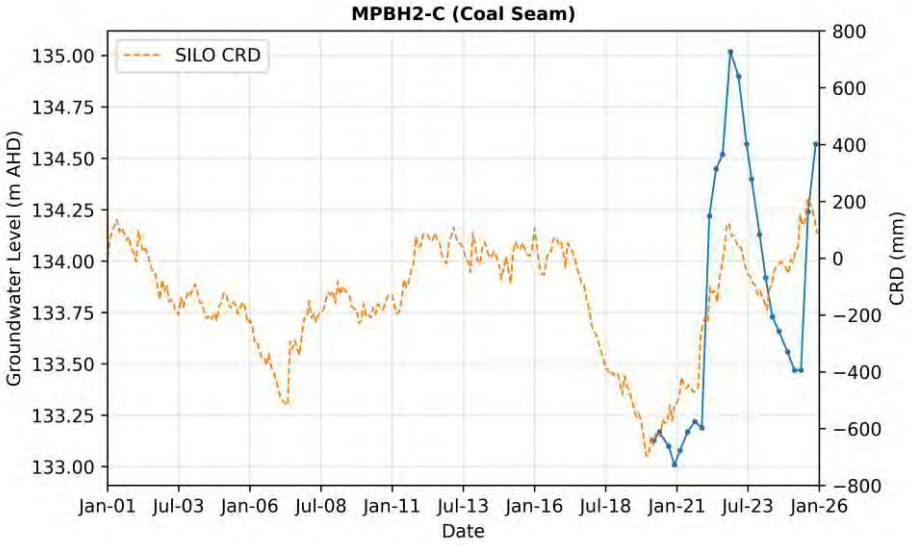
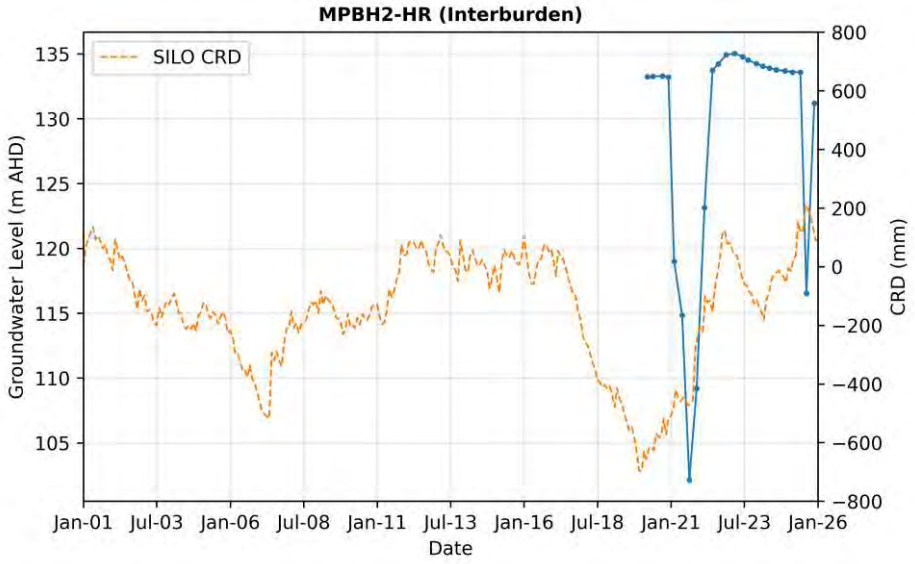
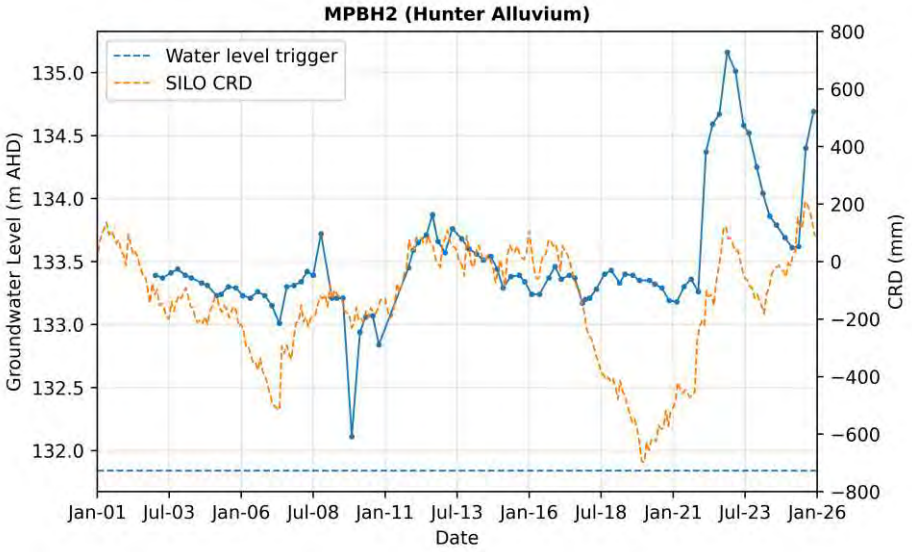
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

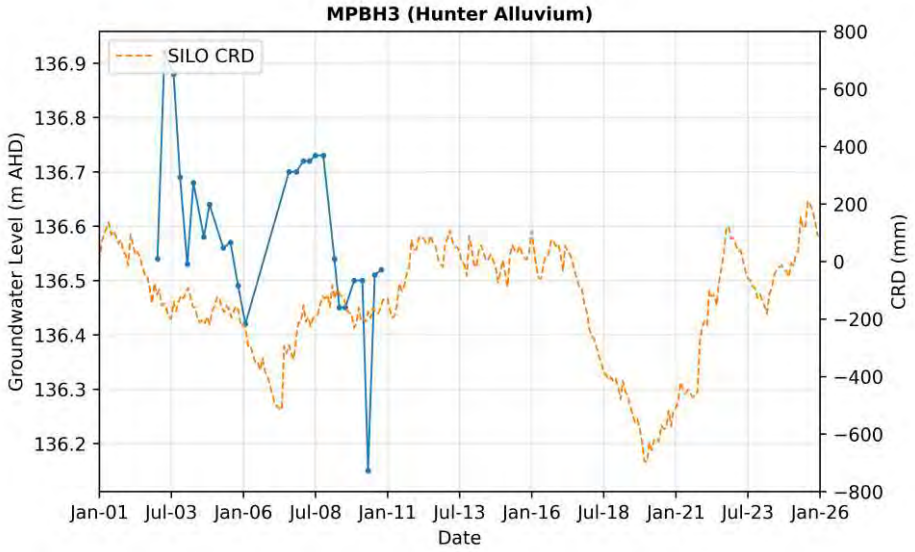

MPBH3b (Hunter Alluvium)
Water level trigger
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH1 (Hunter Alluvium)
Water level trigger
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date


MPBH2-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date


MPBH2-HR (Interburden)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date


MPBH2 (Hunter Alluvium)
Water level trigger
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date


MPBH3 (Hunter Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
136.9
136.8
136.7
136.6
136.5
136.4
136.3
136.2
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
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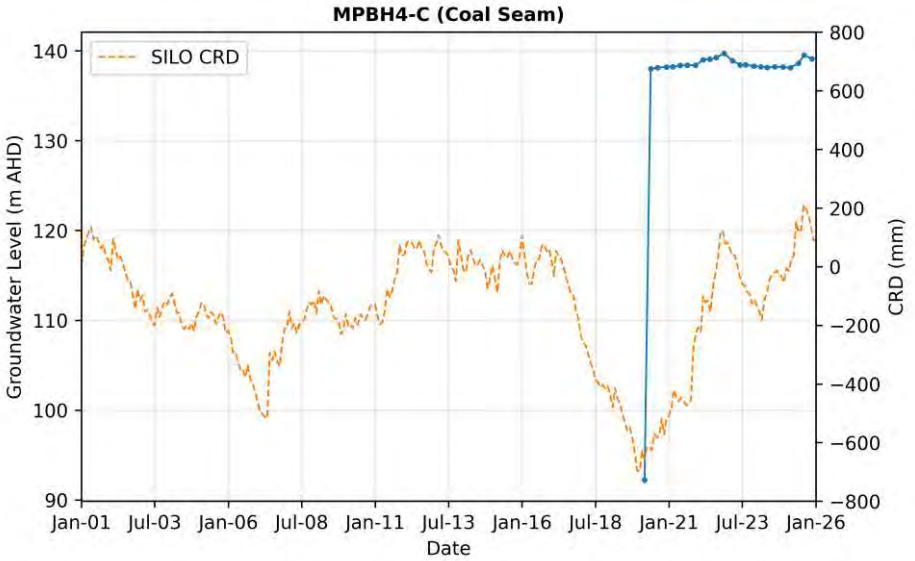
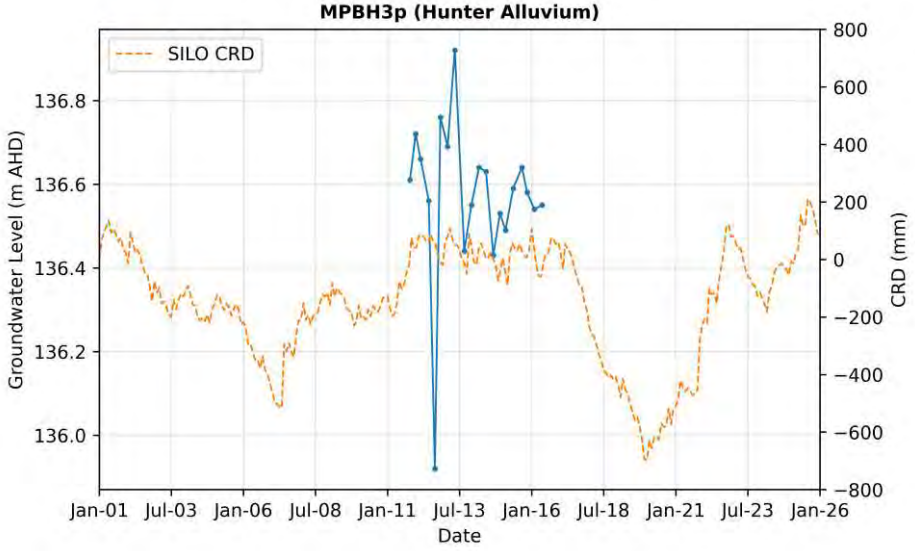
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH4-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
140
130
120
110
100
90
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH3p (Hunter Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
136.8
136.6
136.4
136.2
136.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
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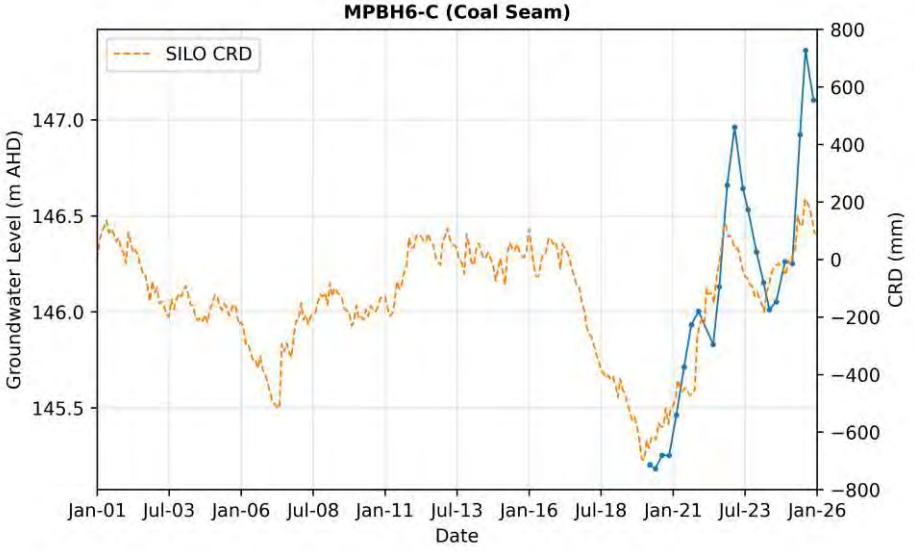
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH6-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
147.0
146.5
146.0
145.5
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
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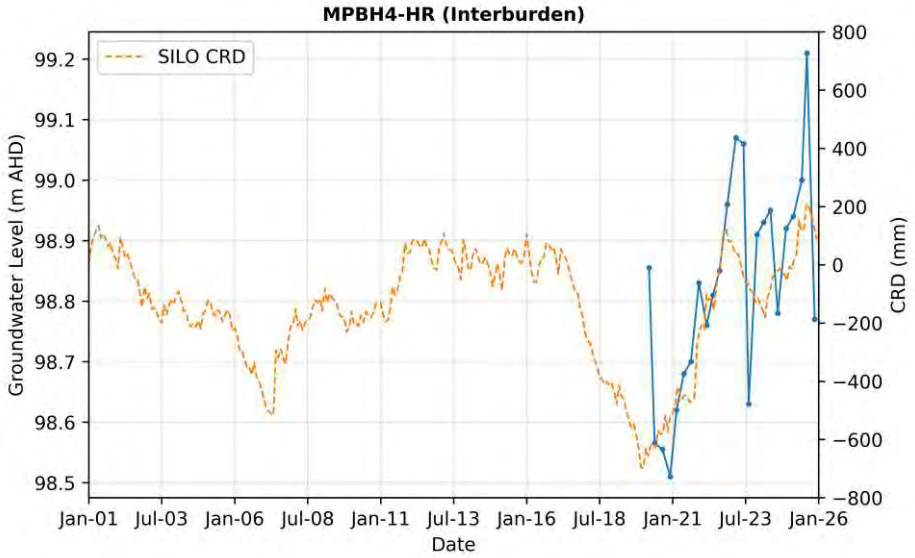
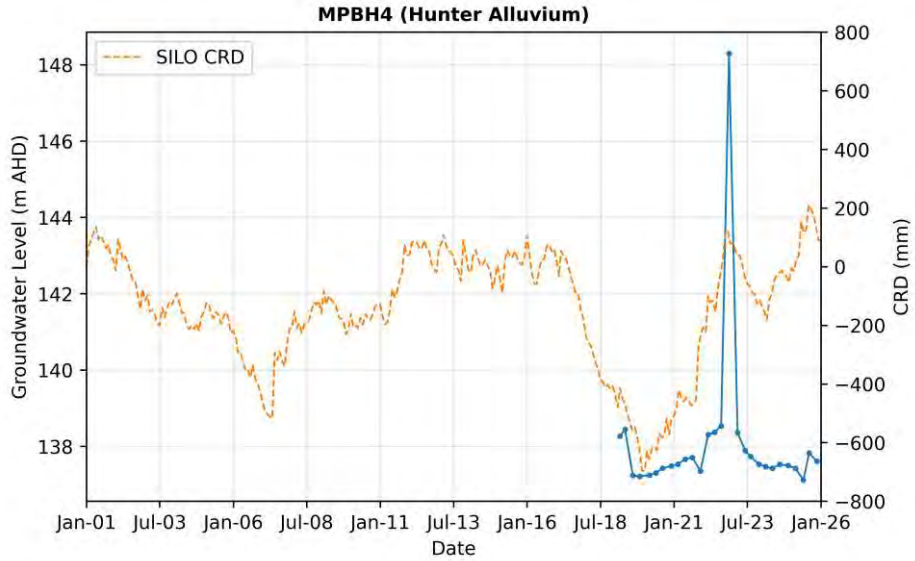
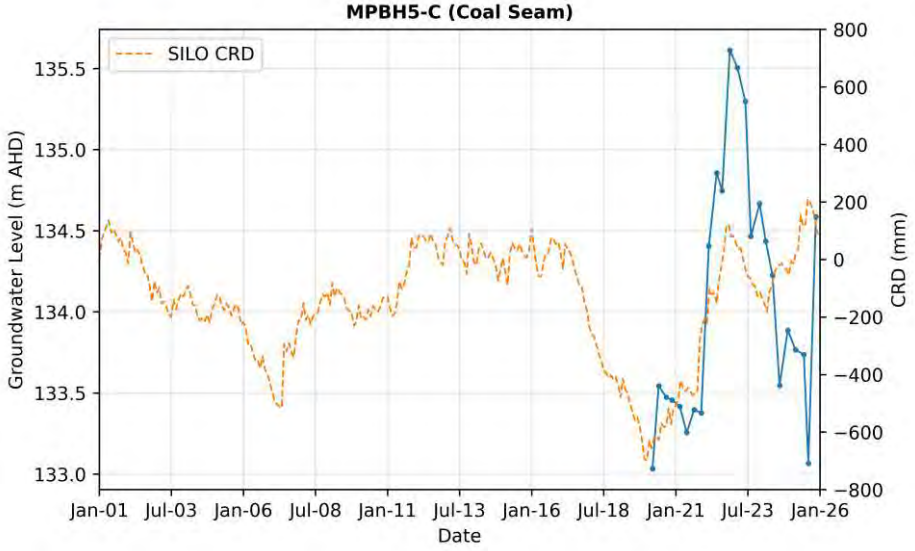
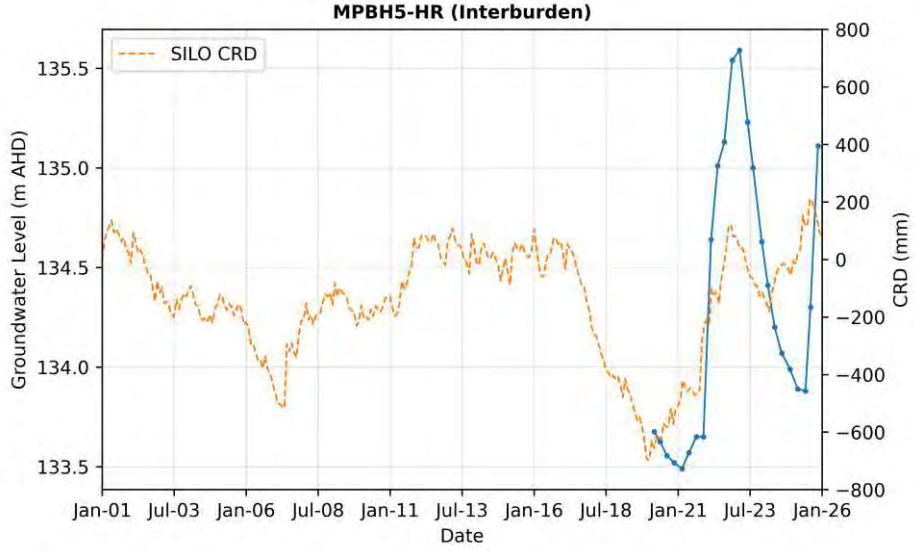
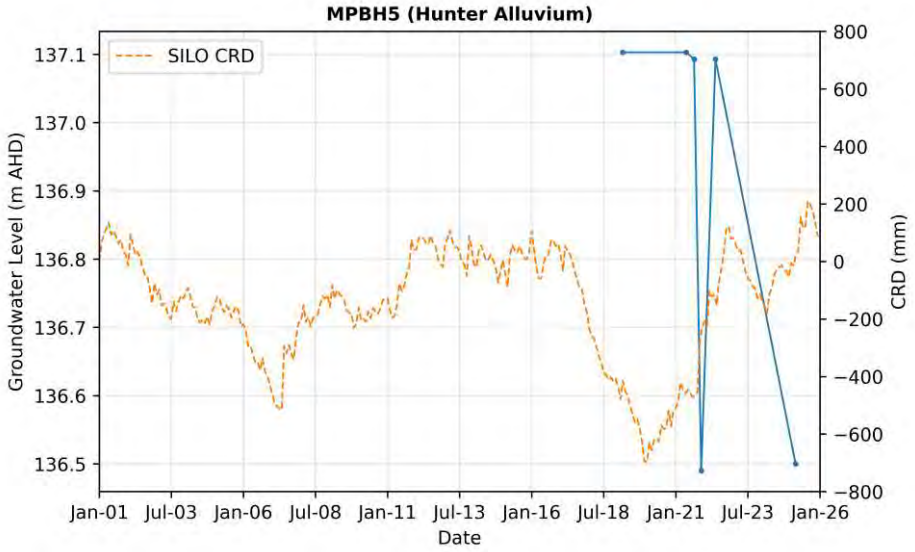
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

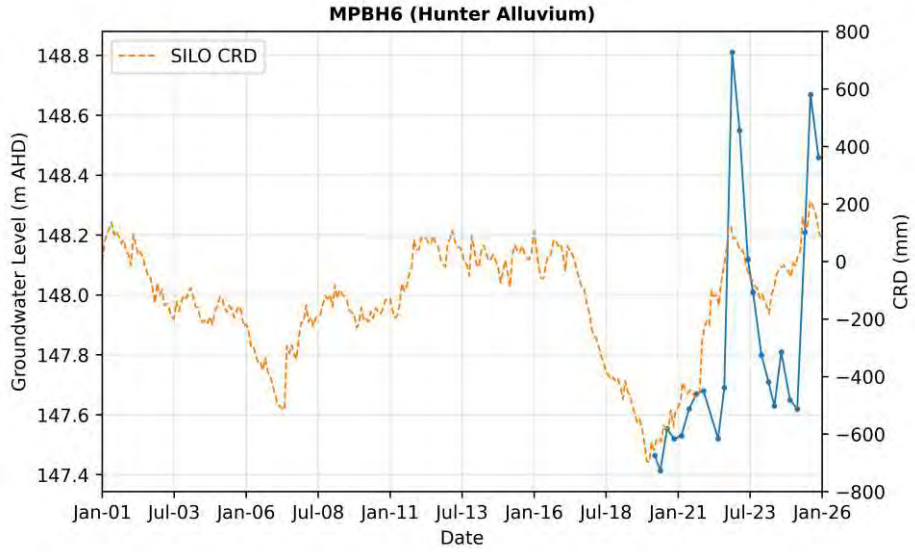

MPBH4-HR (Interburden)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
99.2
99.1
99.0
98.9
98.8
98.7
98.6
98.5
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

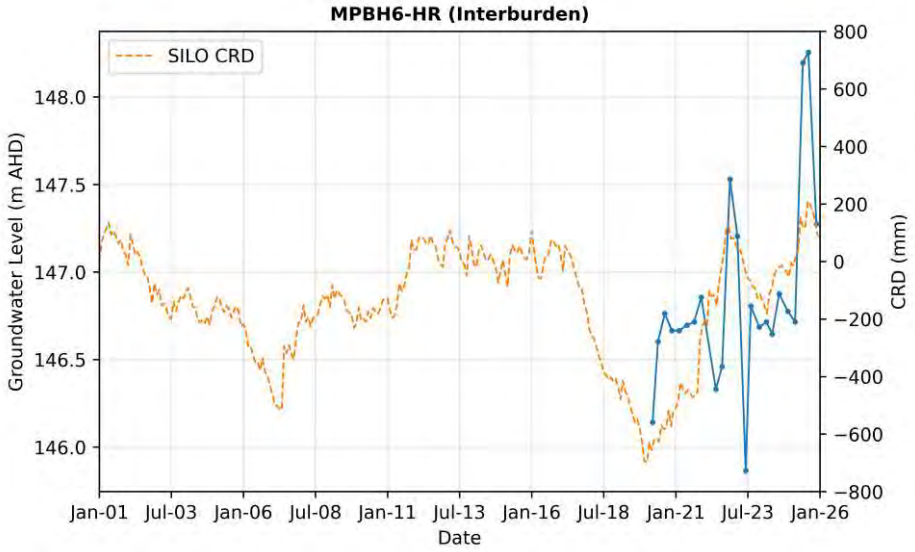

MPBH4 (Hunter Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
148
146
144
142
140
138
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

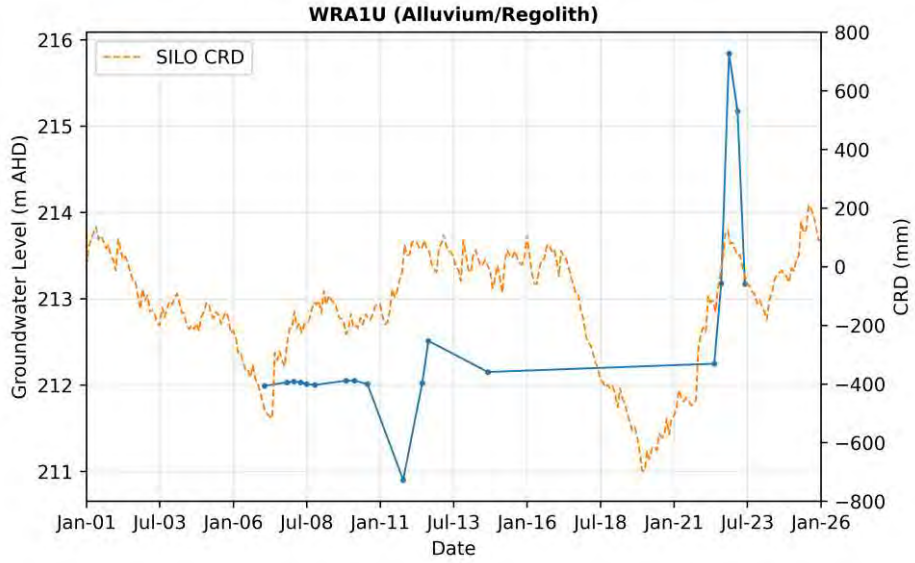

MPBH5-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
135.5
135.0
134.5
134.0
133.5
133.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

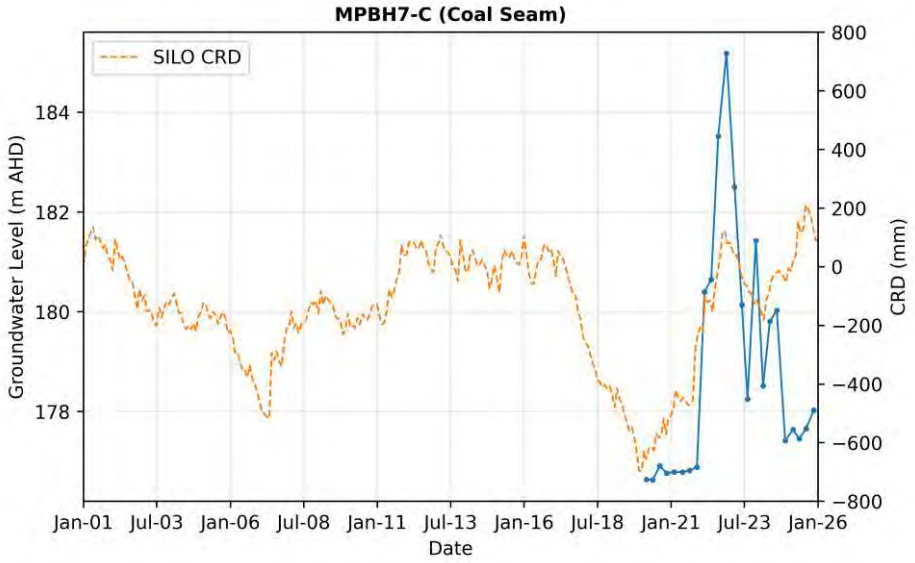

MPBH5-HR (Interburden)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
135.5
135.0
134.5
134.0
133.5
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

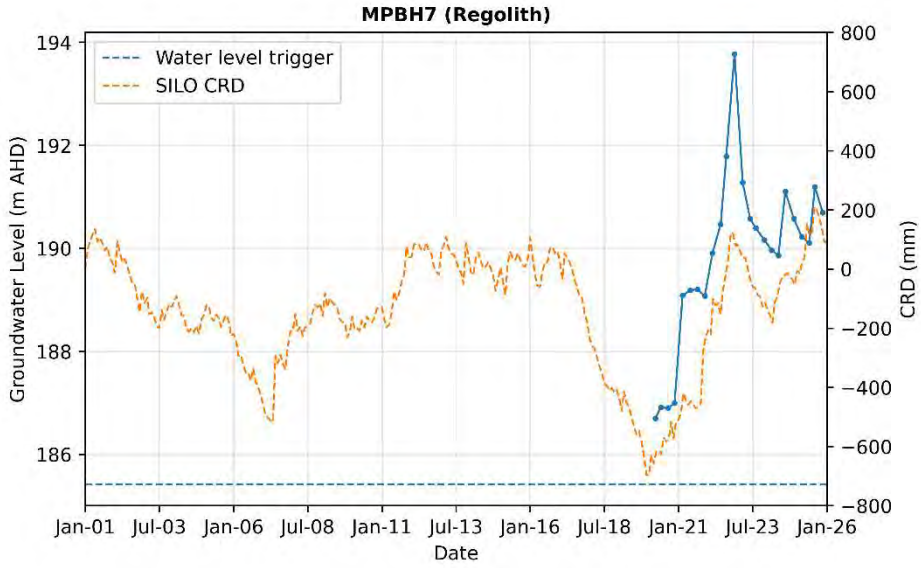

MPBH5 (Hunter Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
137.1
137.0
136.9
136.8
136.7
136.6
136.5
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

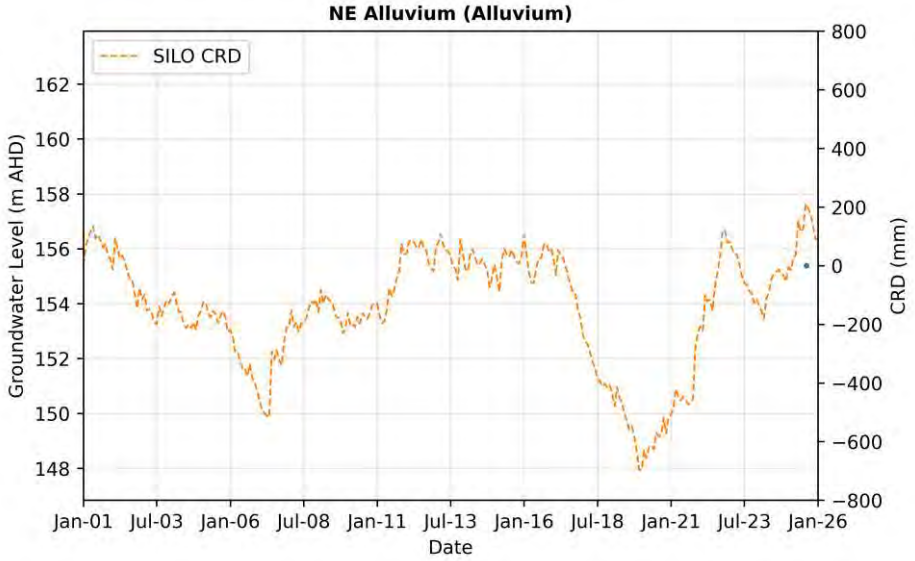

MPBH6 (Hunter Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
148.8
148.6
148.4
148.2
148.0
147.8
147.6
147.4
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

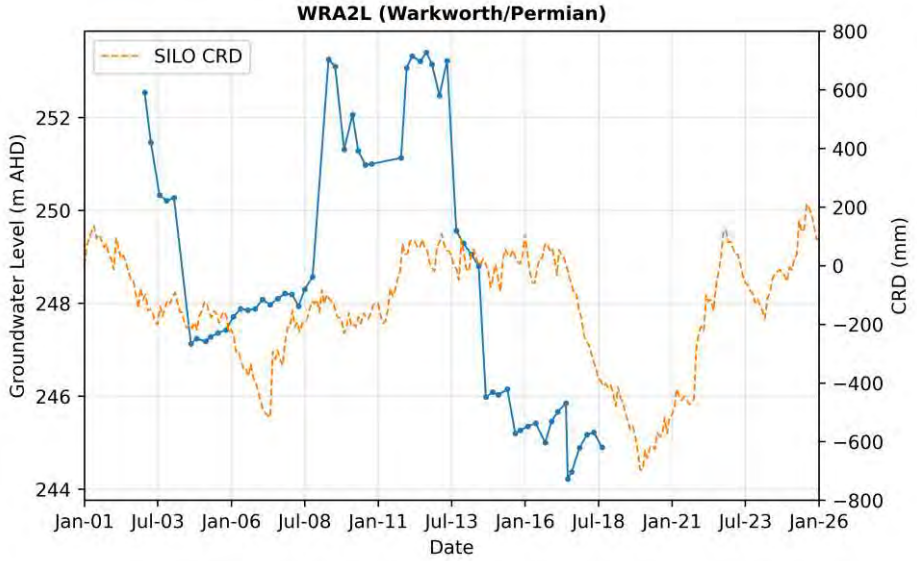

MPBH6-HR (Interburden)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
148.0
147.5
147.0
146.5
146.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

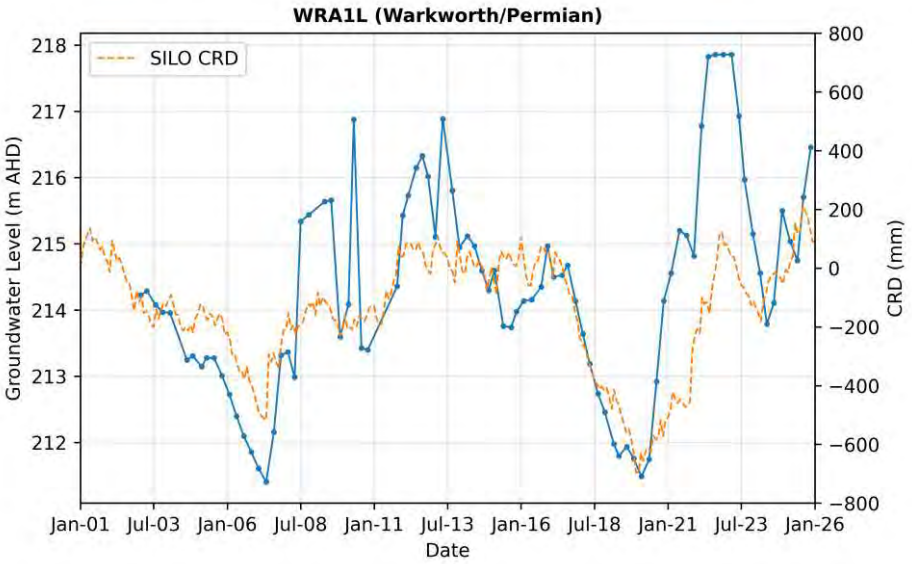

WRA1U (Alluvium/Regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
216
215
214
213
212
211
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

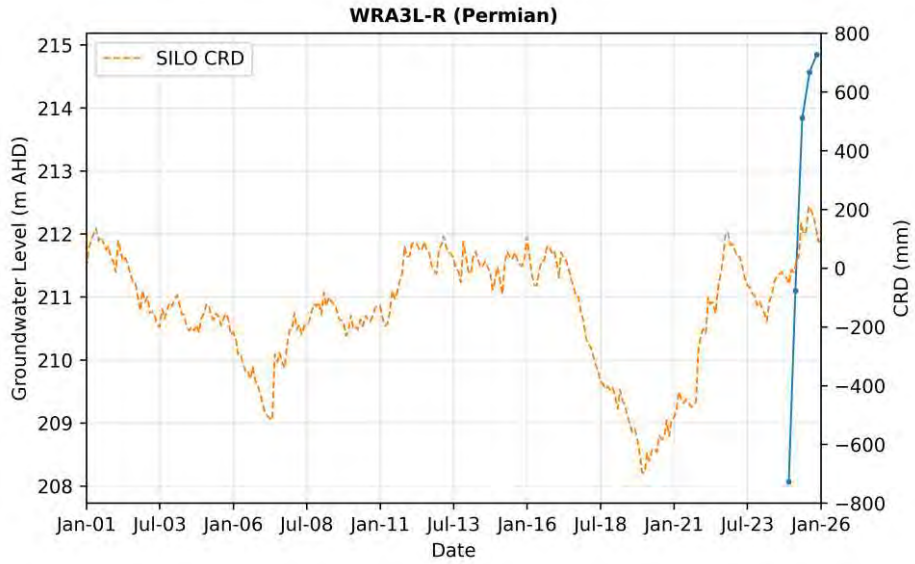

MPBH7-C (Coal Seam)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

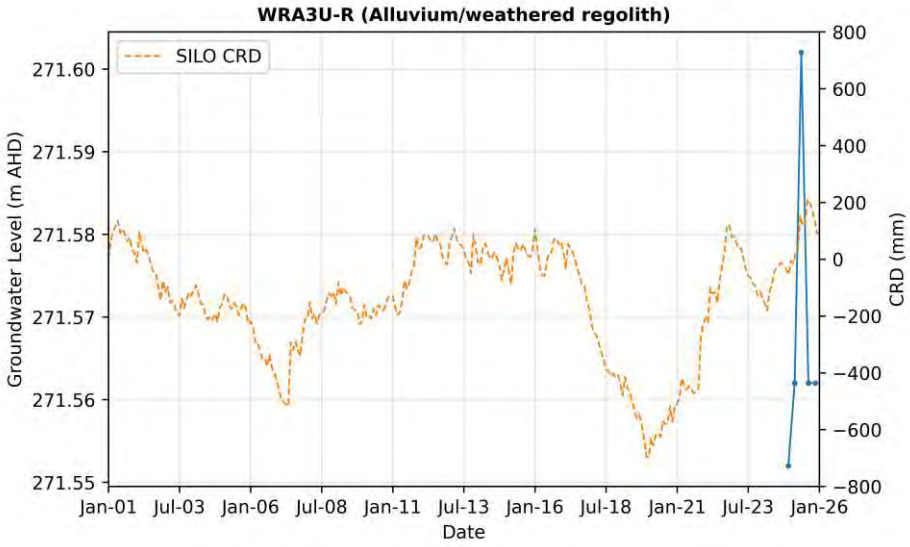

MPBH7 (Regolith)
Water level trigger
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

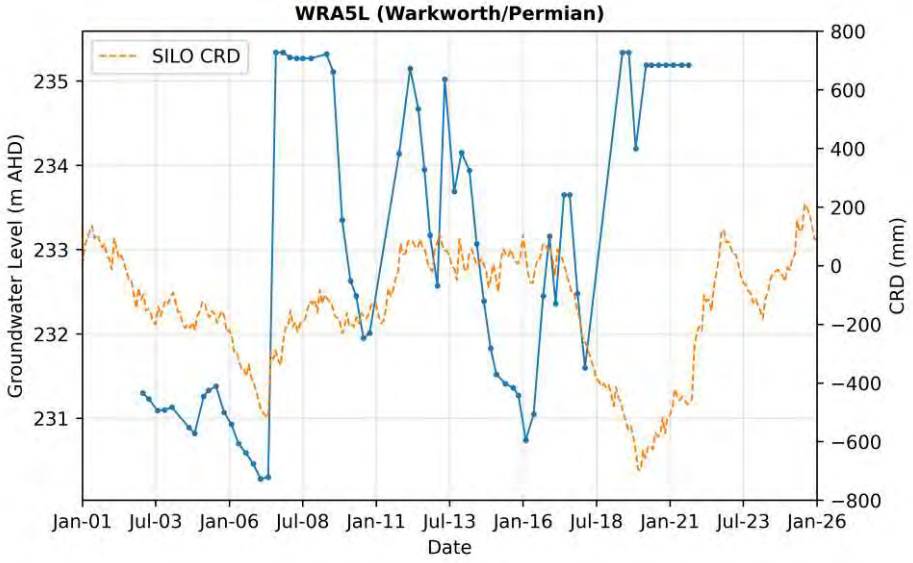

NE Alluvium (Alluvium)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

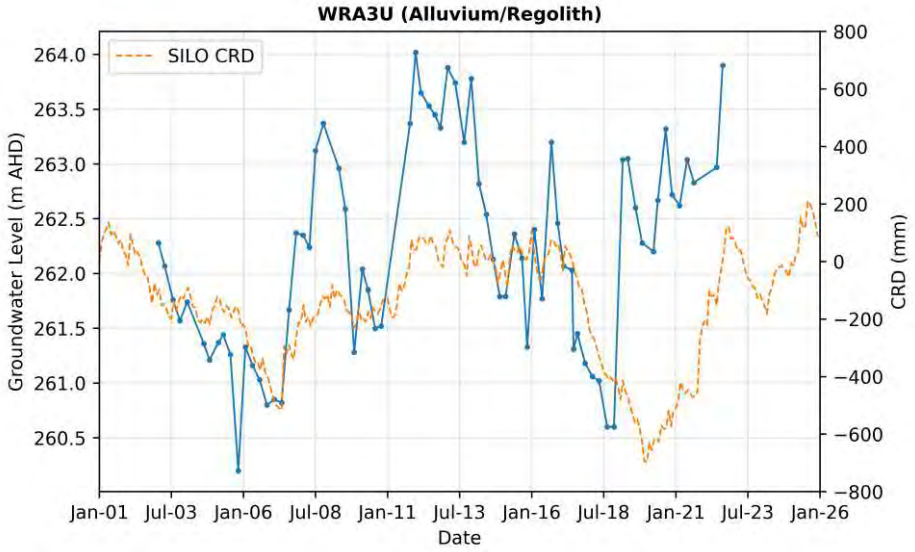

WRA2L (Warkworth/Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

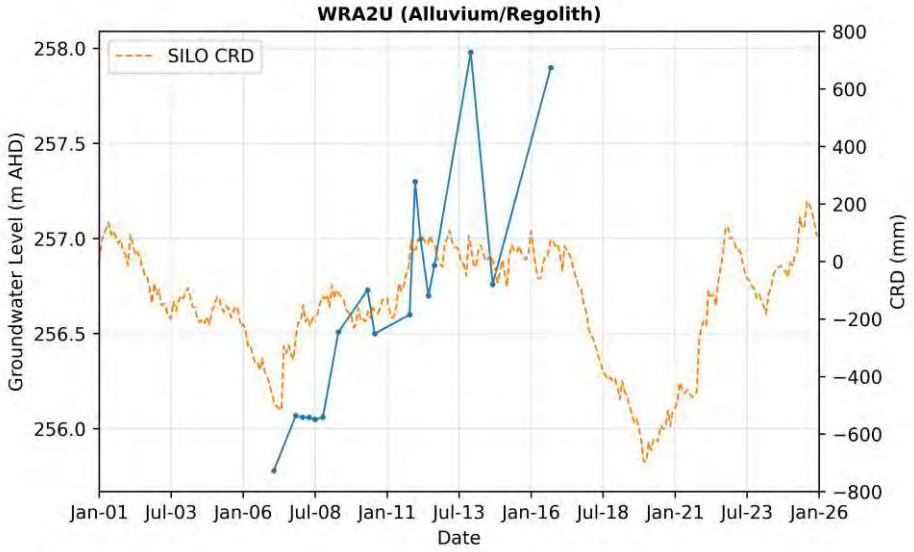

WRA1L (Warkworth/Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
218
217
216
215
214
213
212
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

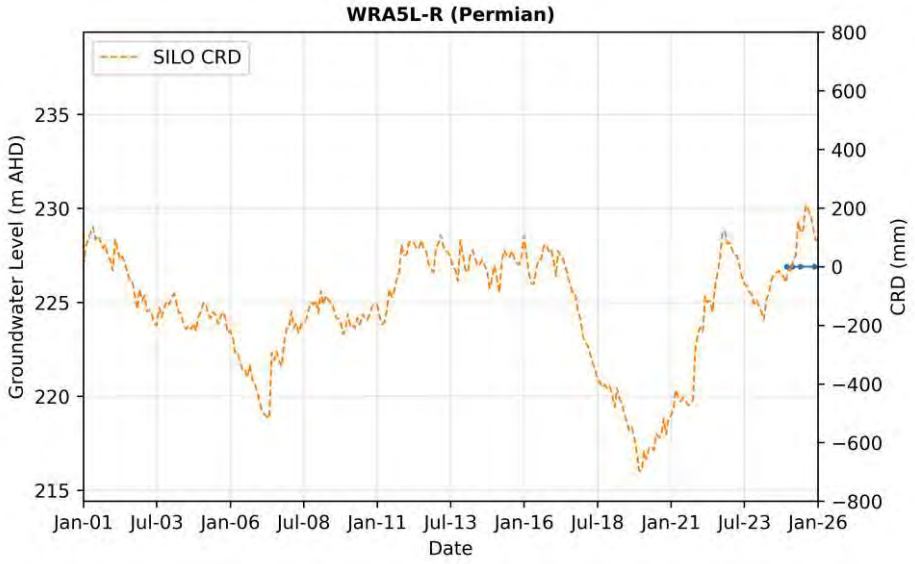

WRA3L-R (Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
215
214
213
212
211
210
209
208
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

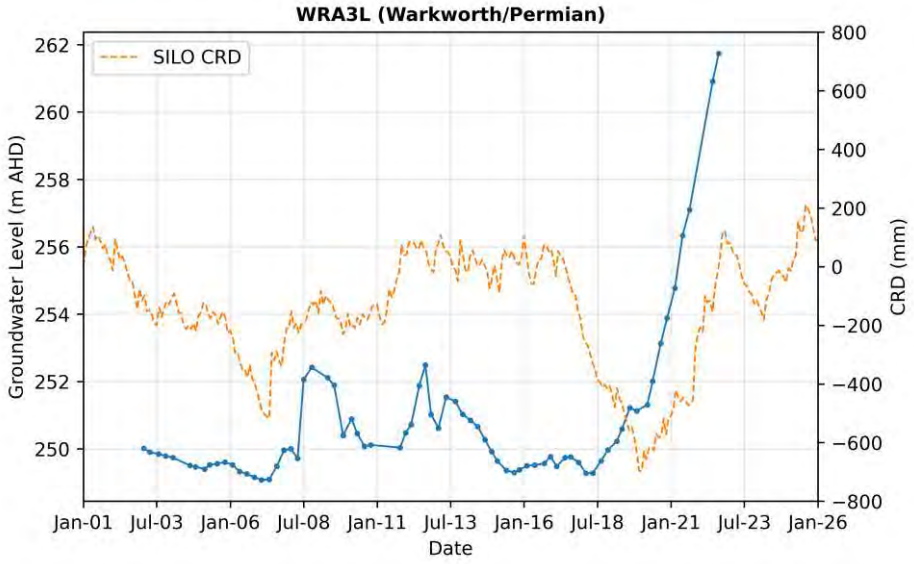

WRA3U-R (Alluvium/weathered regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
271.60
271.59
271.58
271.57
271.56
271.55
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

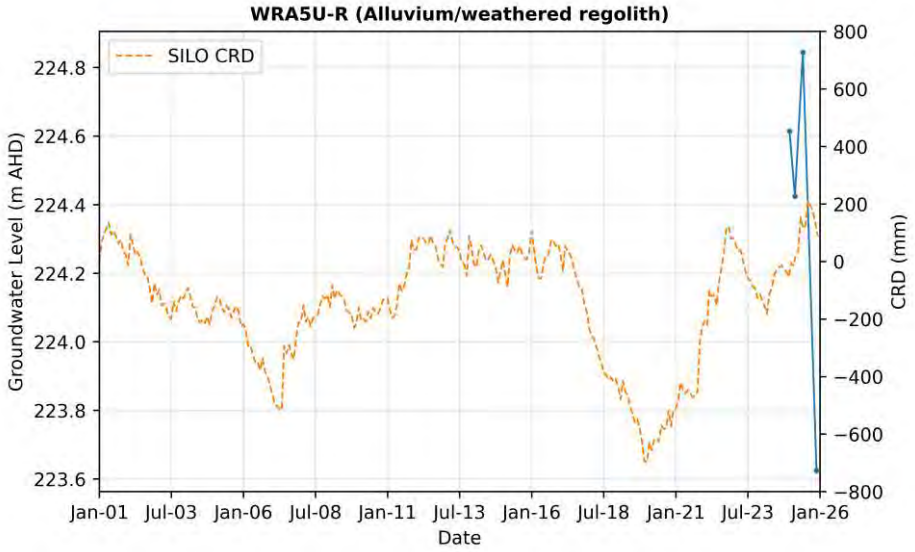

WRA5L (Warkworth/Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
235
234
233
232
231
800
600
400
200
0
−200
−400
−600
−800
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

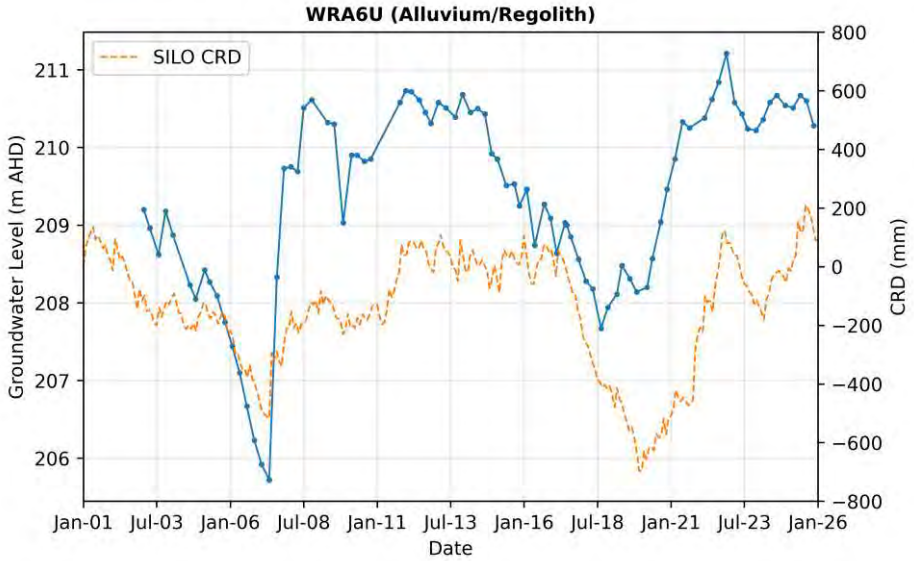

WRA3U (Alluvium/Regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
264.0
263.5
263.0
262.5
262.0
261.5
261.0
260.5
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

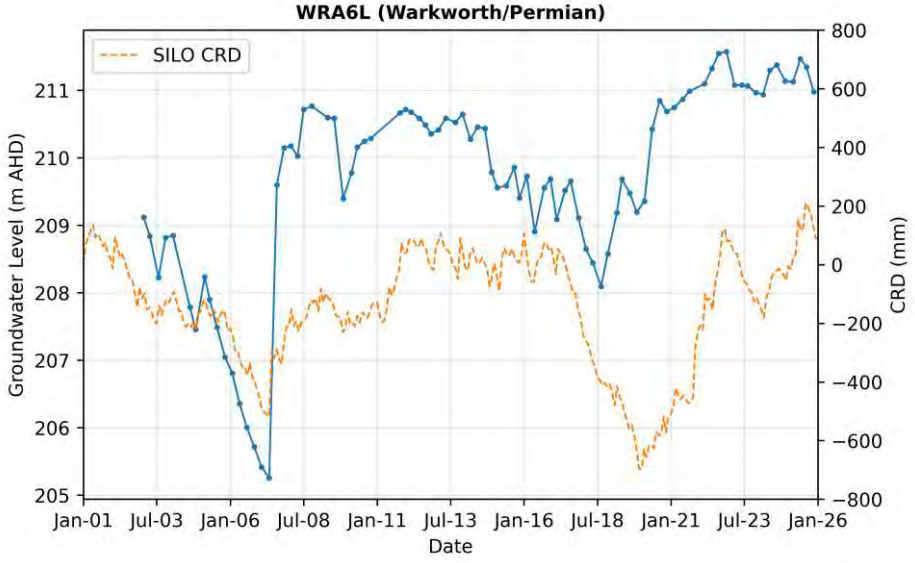

WRA2U (Alluvium/Regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
258.0
257.5
257.0
256.5
256.0
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

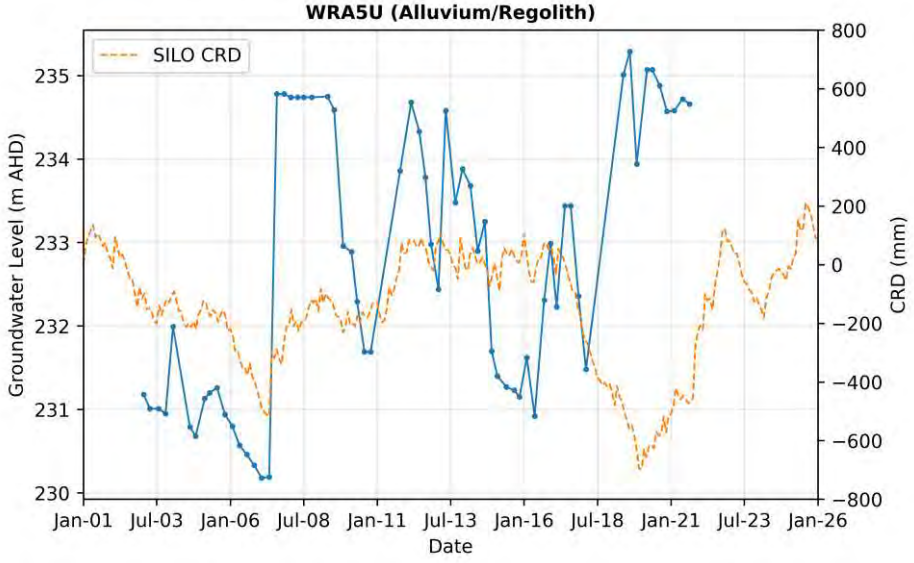

WRA5L-R (Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
235
230
225
220
215
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


WRA3L (Warkworth/Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
262
260
258
256
254
252
250
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


WRA5U-R (Alluvium/weathered regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
224.8
224.6
224.4
224.2
224.0
223.8
223.6
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

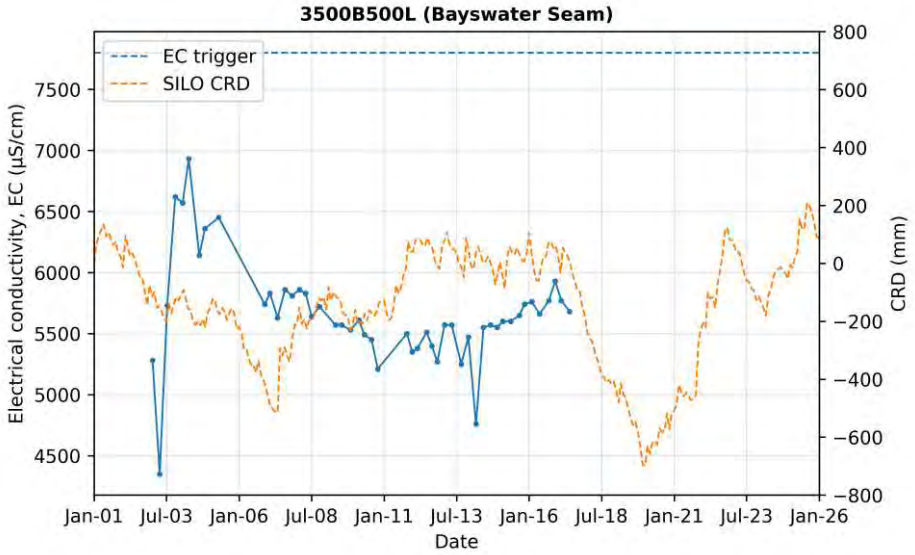

WRA6U (Alluvium/Regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
211
210
209
208
207
206
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

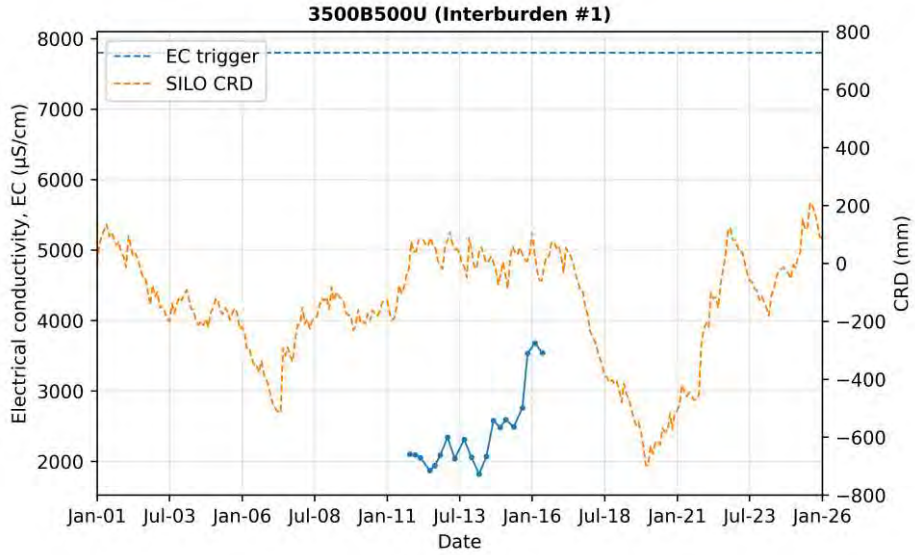

WRA6L (Warkworth/Permian)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
211
210
209
208
207
206
205
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

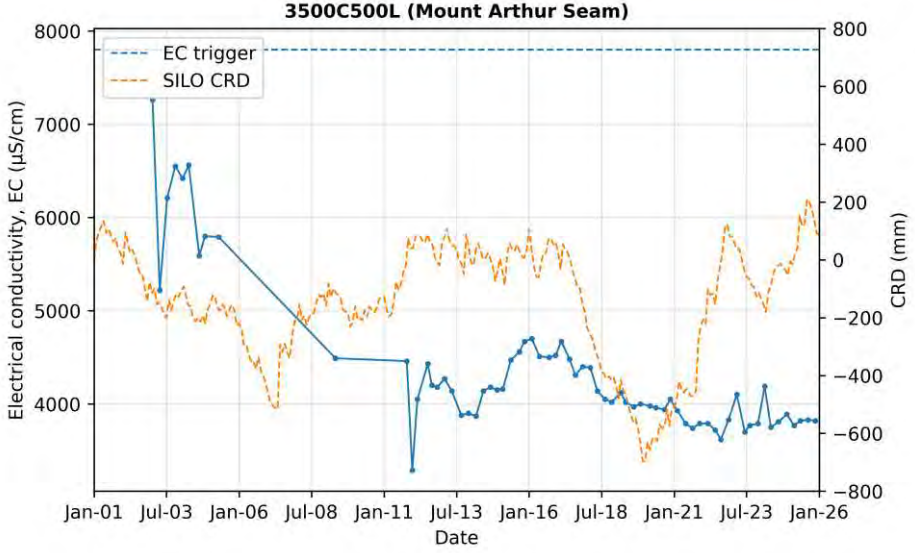

WRA5U (Alluvium/Regolith)
SILO CRD
Groundwater Level (m AHD)
CRD (mm)
Date
235
234
233
232
231
230
800
600
400
200
0
−200
−400
−600
−800
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

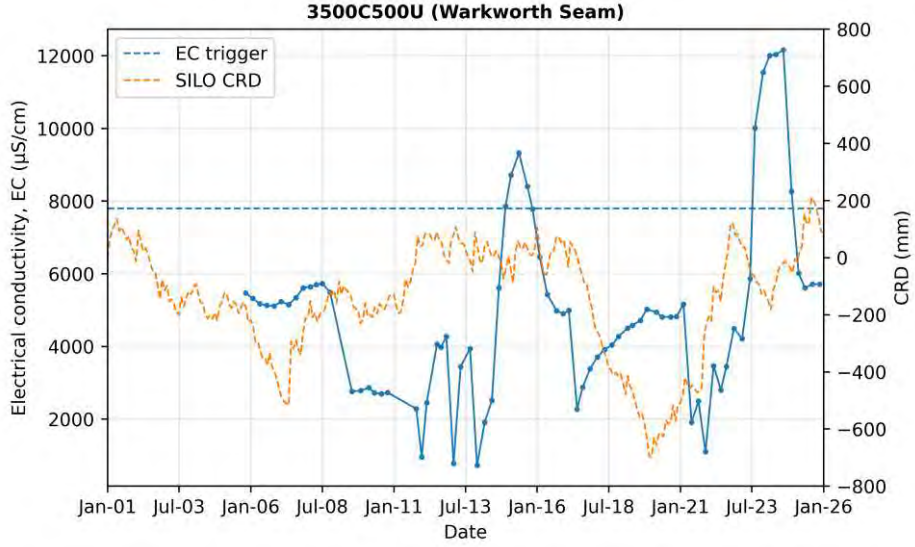
Appendix C

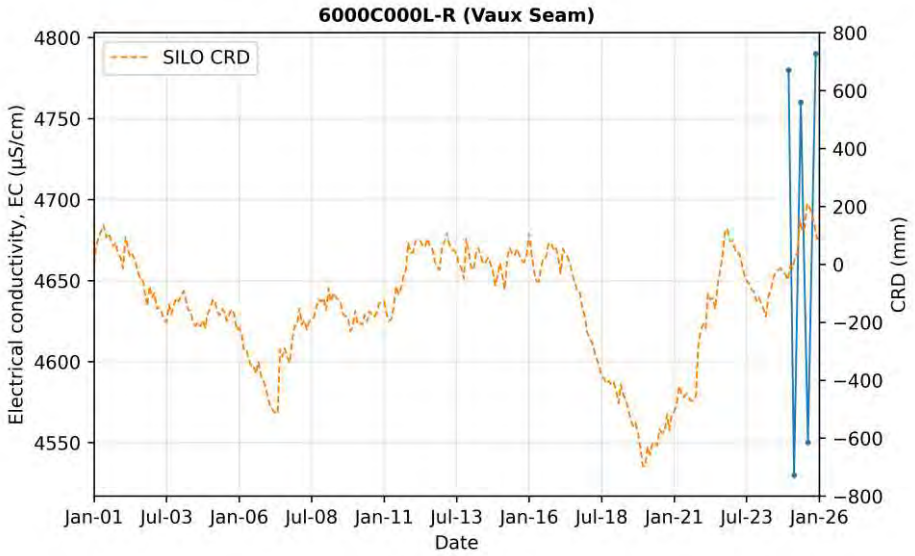
Field measured electrical conductivity (EC) time series

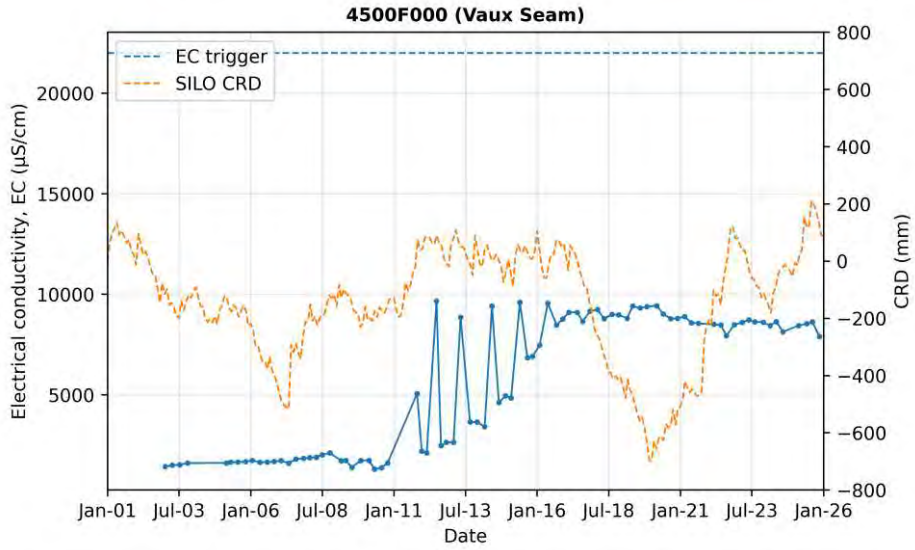

3500B500L (Bayswater Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

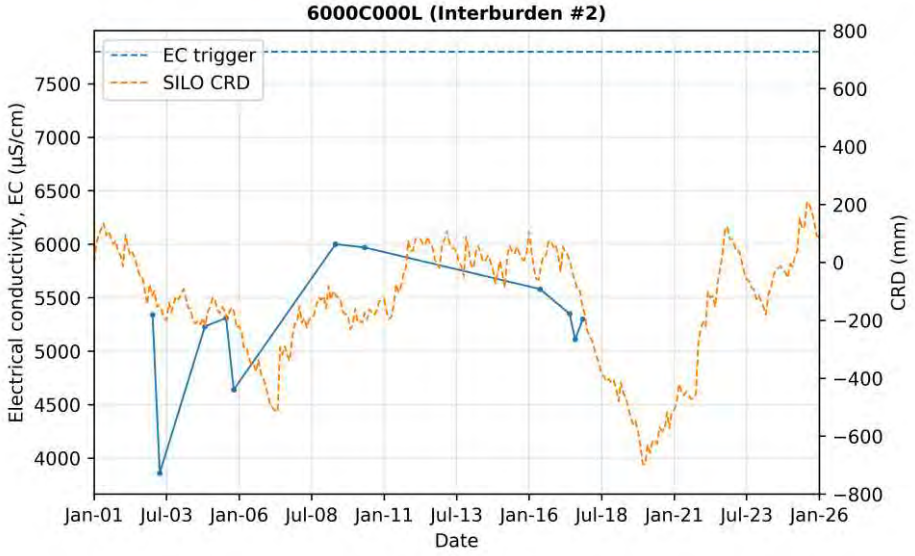

3500B500U (Interburden #1)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

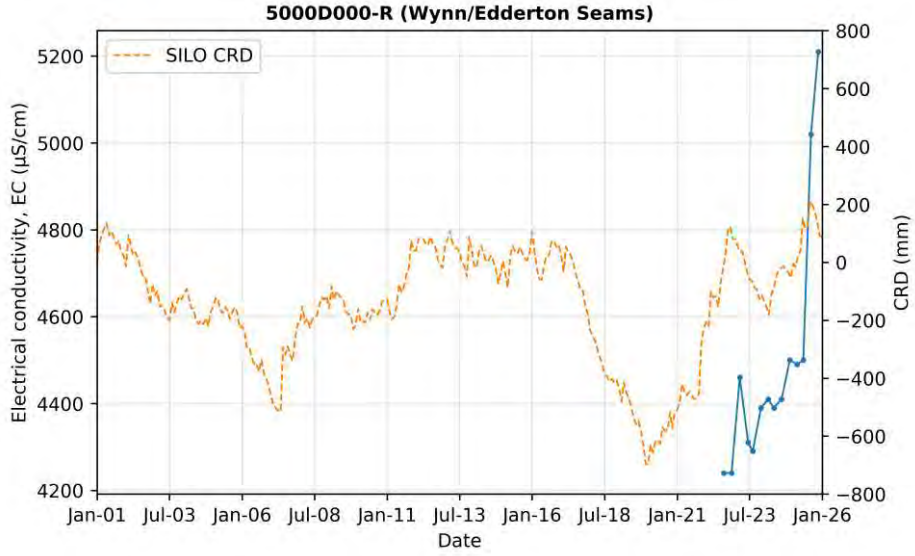

3500C500L (Mount Arthur Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

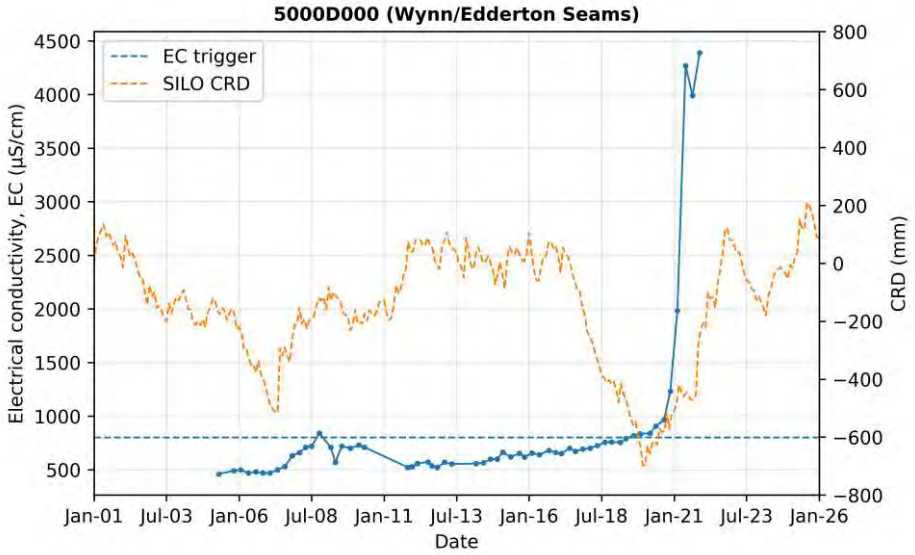

3500C500U (Warkworth Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

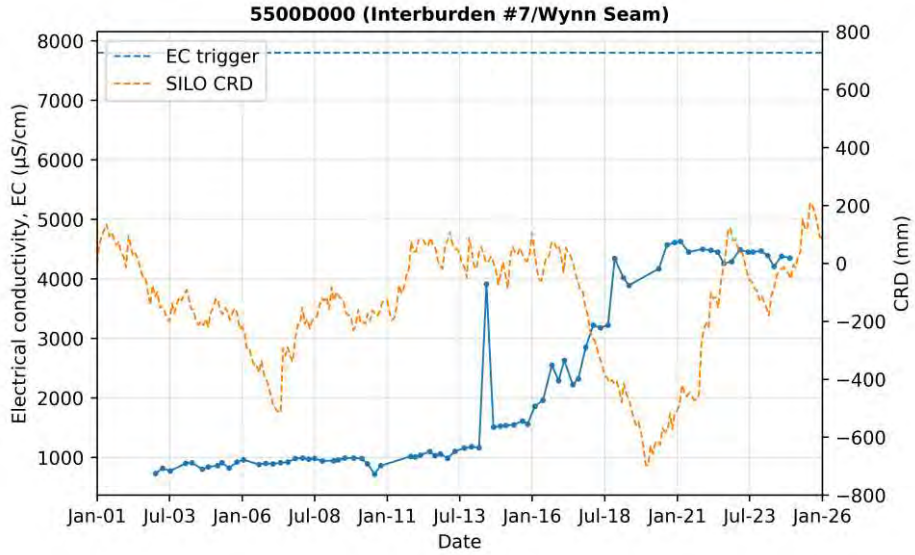

6000C000L-R (Vaux Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
4800 4750 4700 4650 4600 4550
800 600 400 200 0 −200 −400 −600 −800

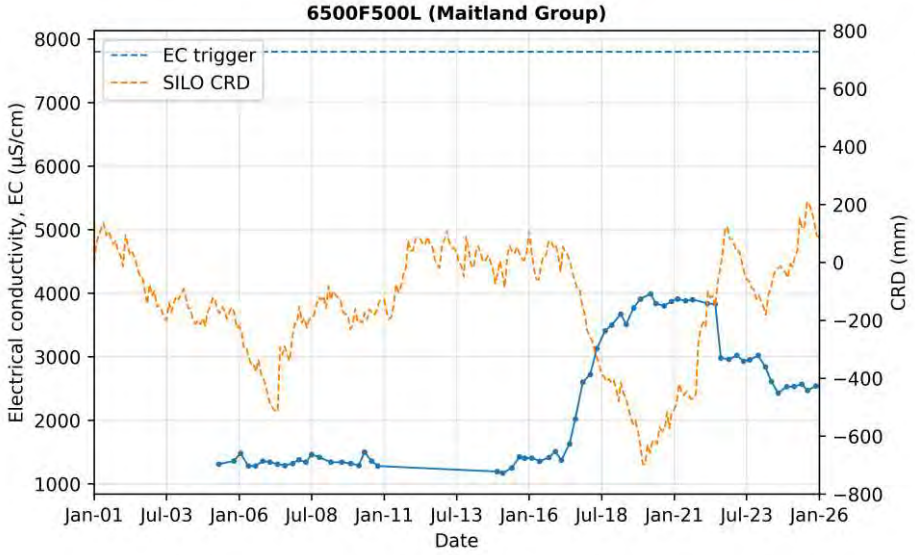

4500F000 (Vaux Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
20000 15000 10000 5000
800 600 400 200 0 −200 −400 −600 −800

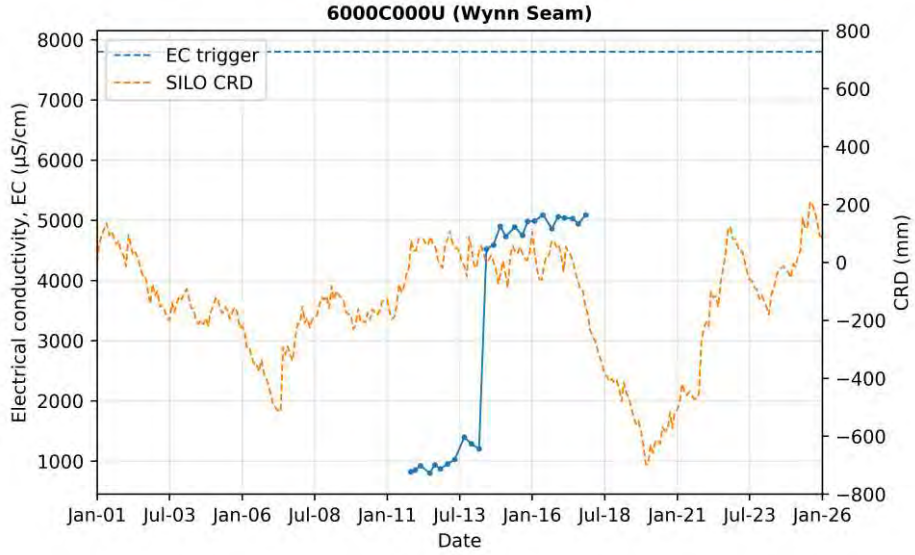

6000C000L (Interburden #2)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
7500 7000 6500 6000 5500 5000 4500 4000
800 600 400 200 0 −200 −400 −600 −800

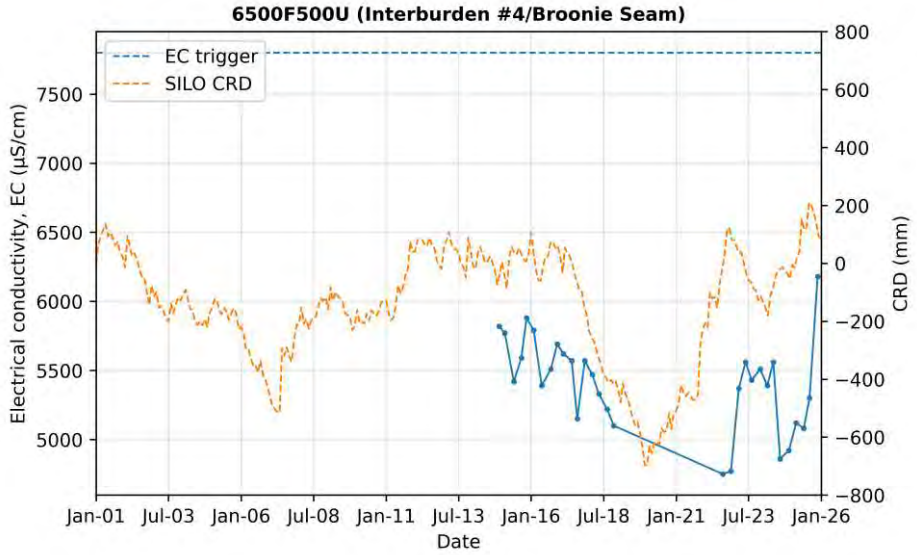

5000D000-R (Wynn/Edderton Seams)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
5200 5000 4800 4600 4400 4200
800 600 400 200 0 −200 −400 −600 −800

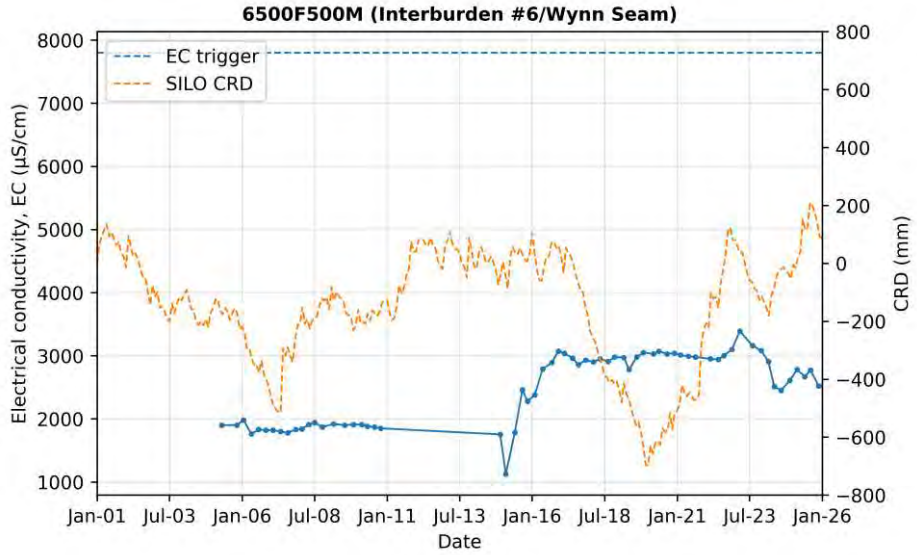

5000D000 (Wynn/Edderton Seams)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

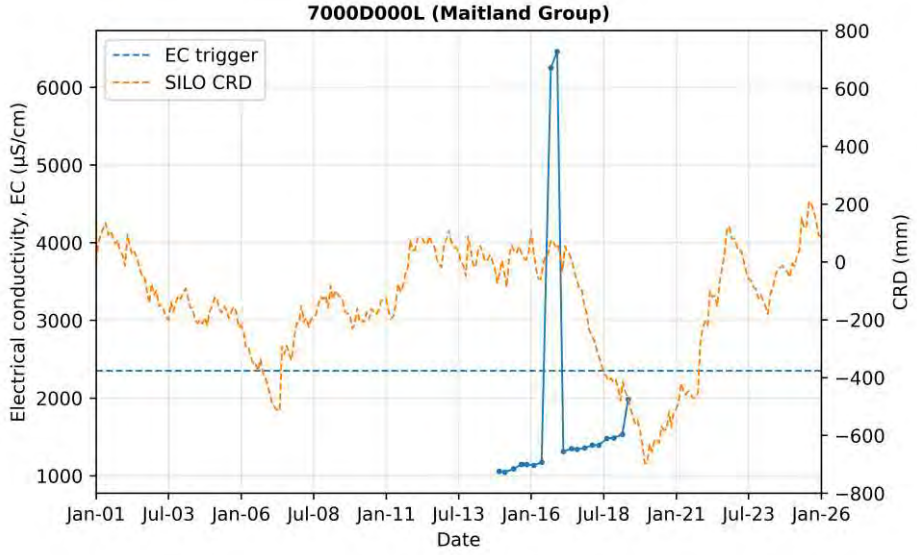

5500D000 (Interburden #7/Wynn Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

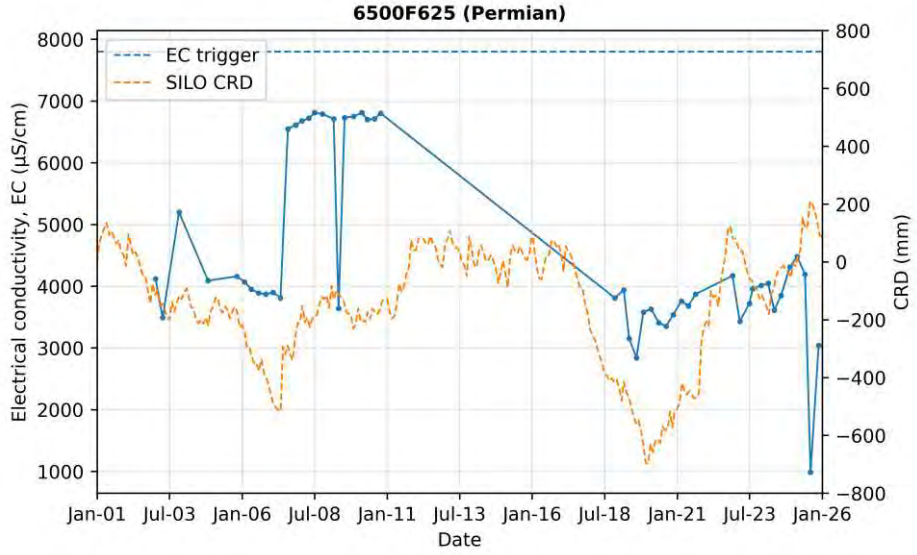

6500F500L (Maitland Group)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

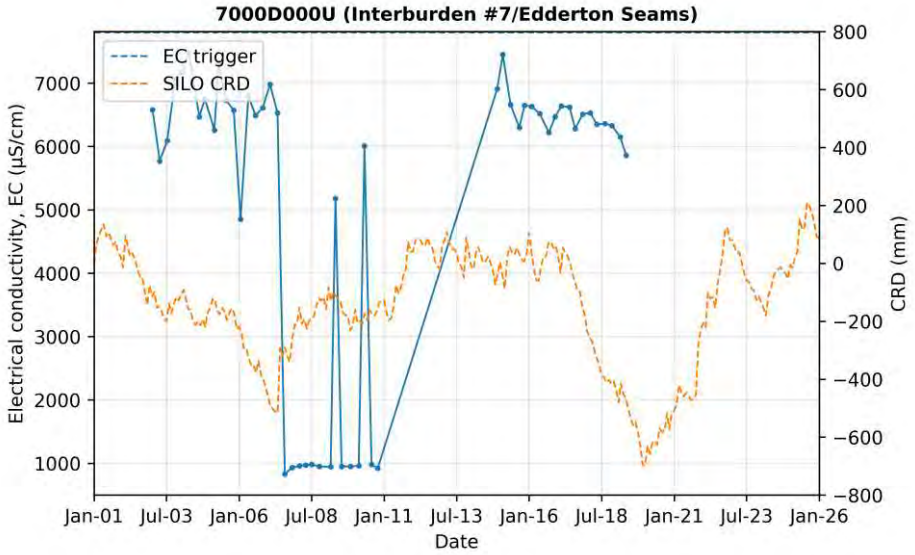

6000C000U (Wynn Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

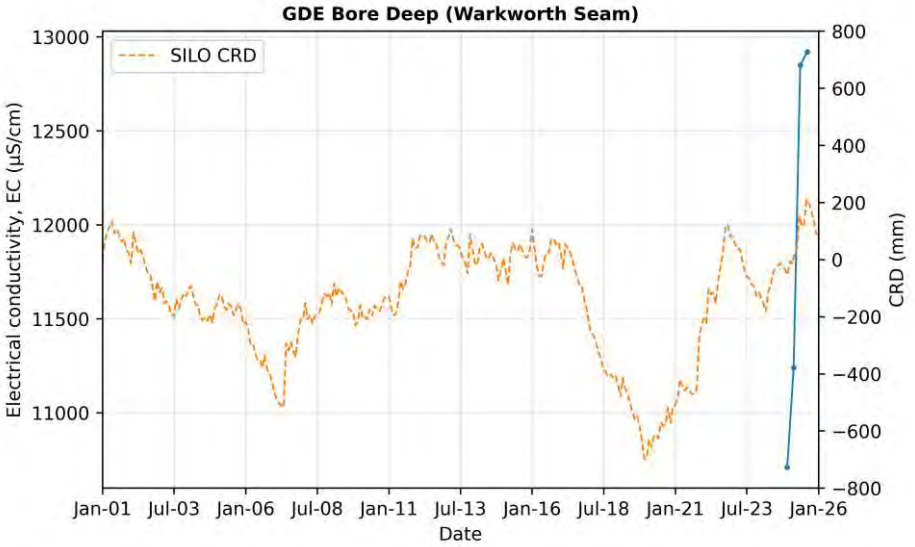

6500F500U (Interburden #4/Broonie Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

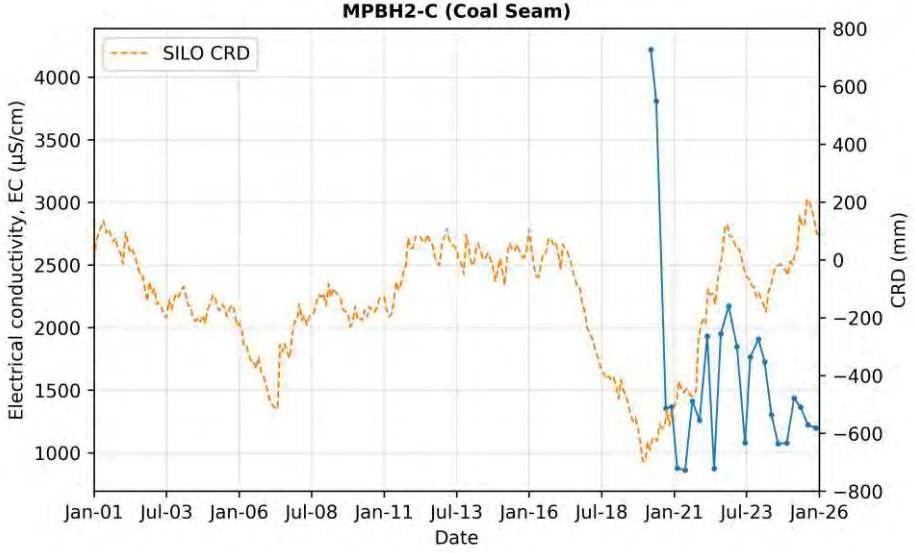

6500F500M (Interburden #6/Wynn Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

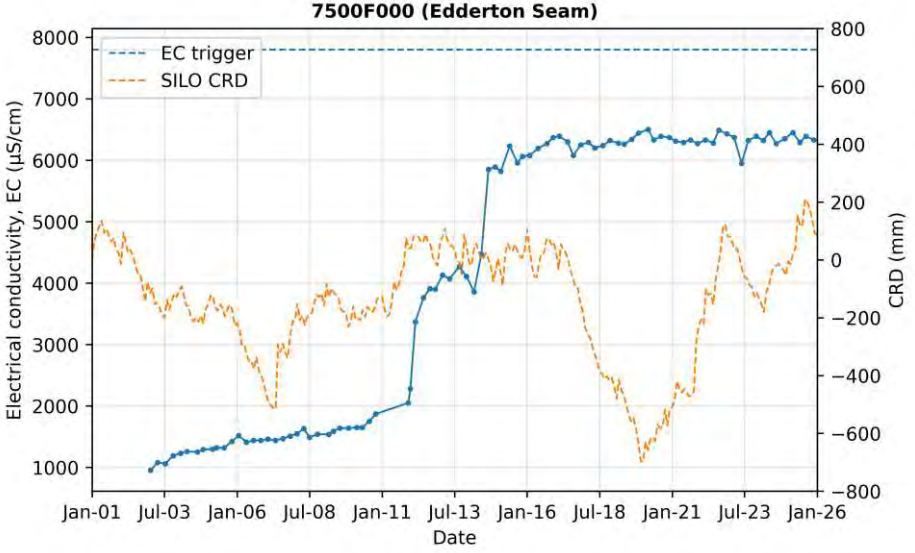

7000D000L (Maitland Group)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

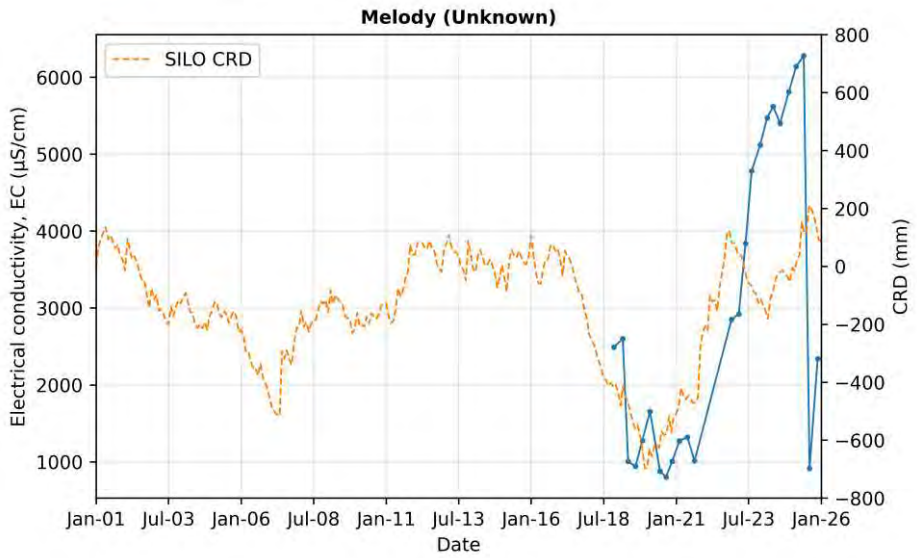

6500F625 (Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

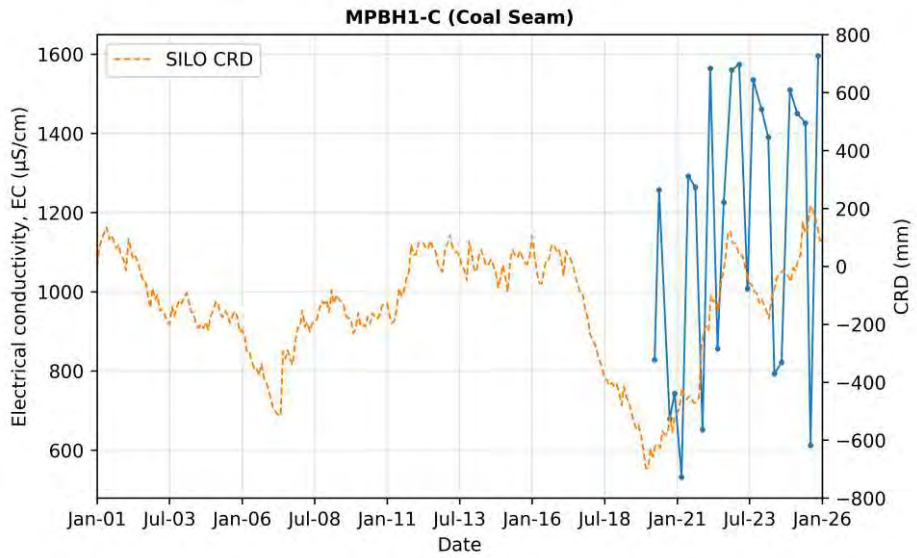

7000D000U (Interburden #7/Edderton Seams)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

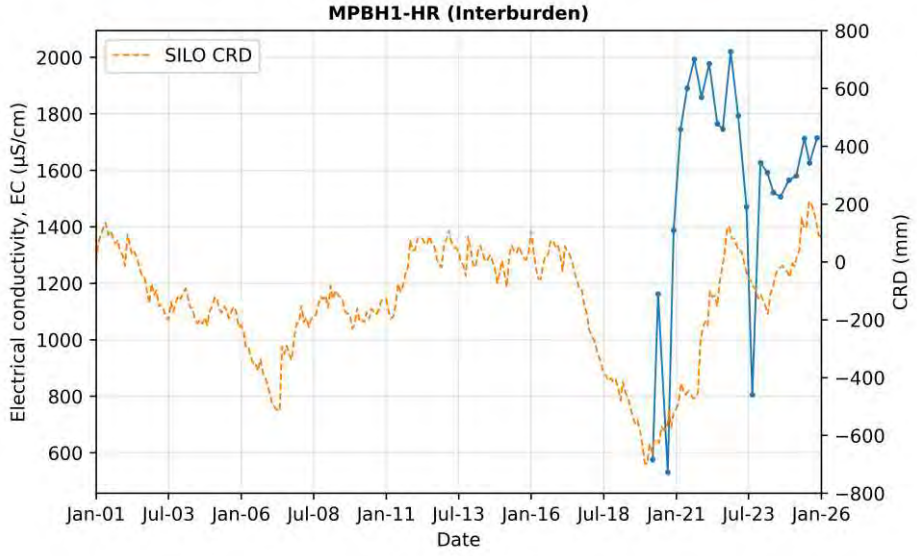

GDE Bore Deep (Warkworth Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

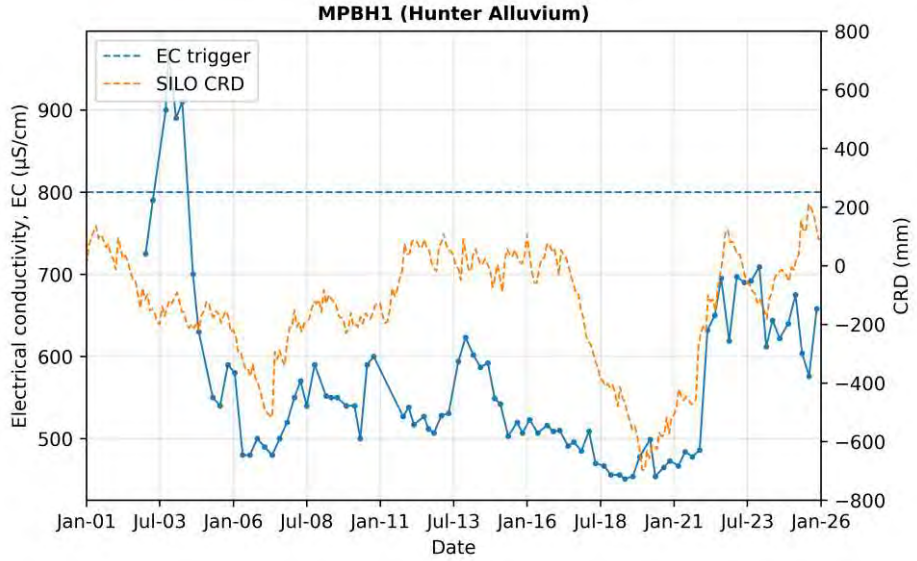

MPBH2-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

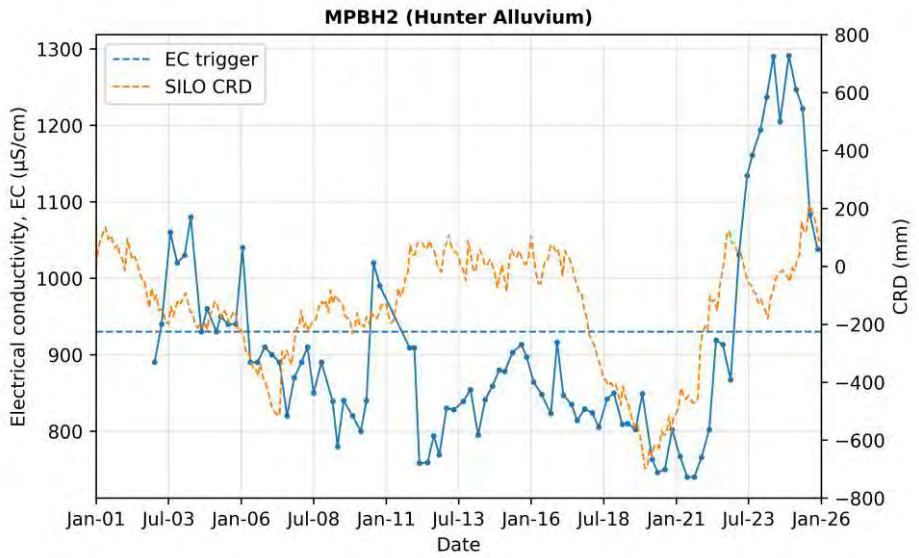

7500F000 (Edderton Seam)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

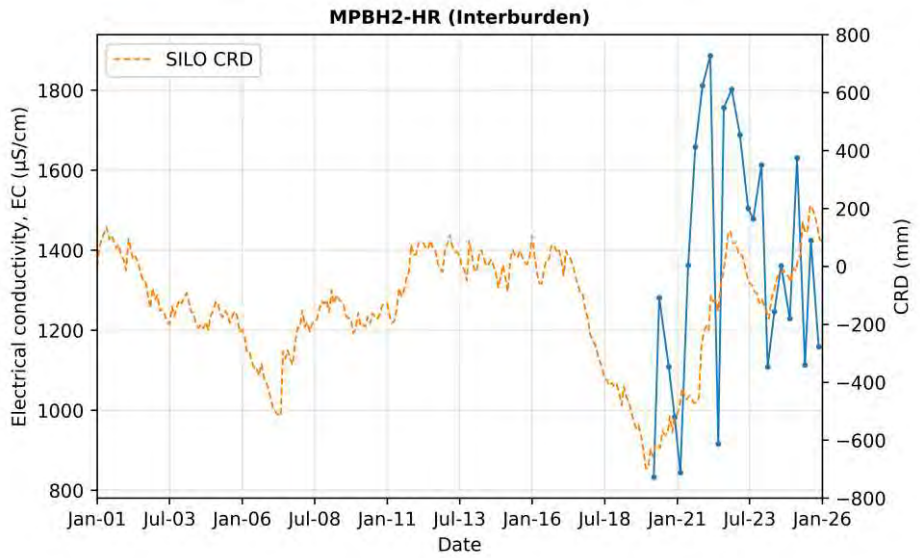

Melody (Unknown)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

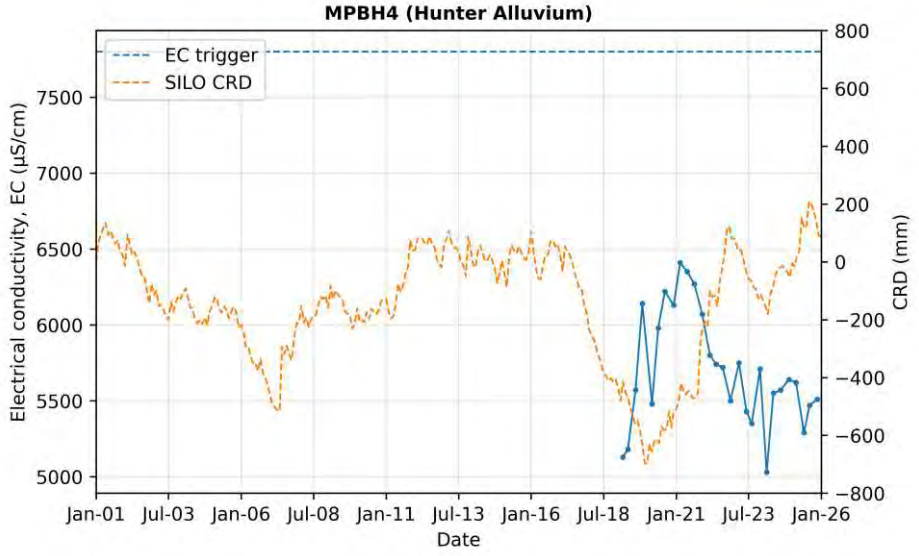

MPBH1-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

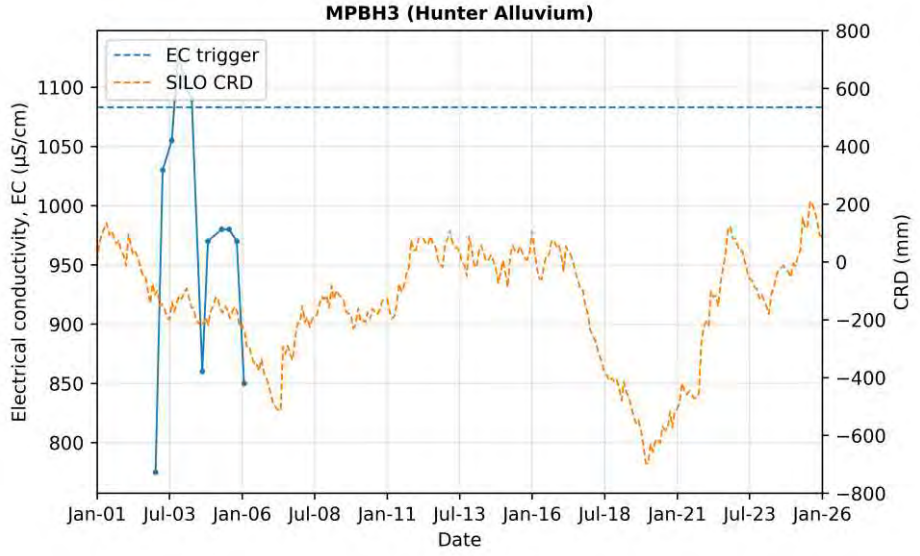

MPBH1-HR (Interburden)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

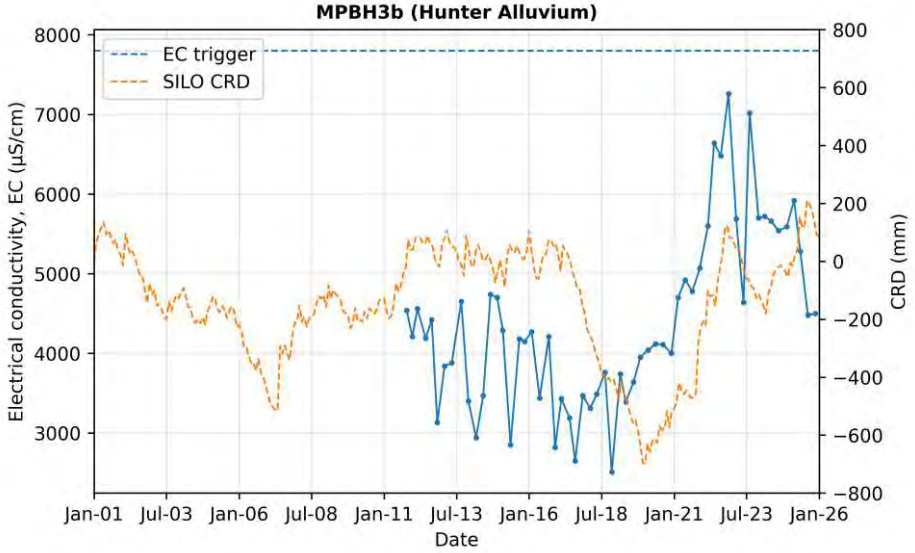

MPBH1 (Hunter Alluvium)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

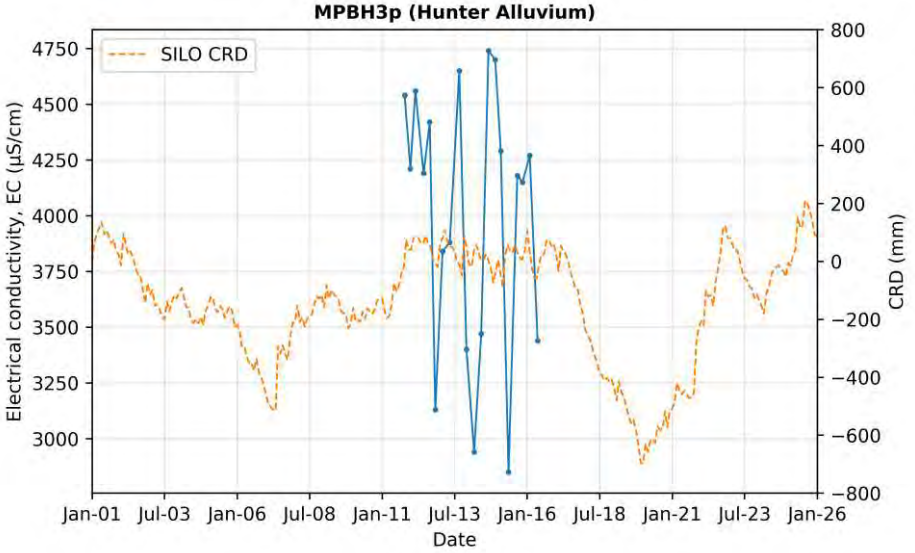

MPBH2 (Hunter Alluvium)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

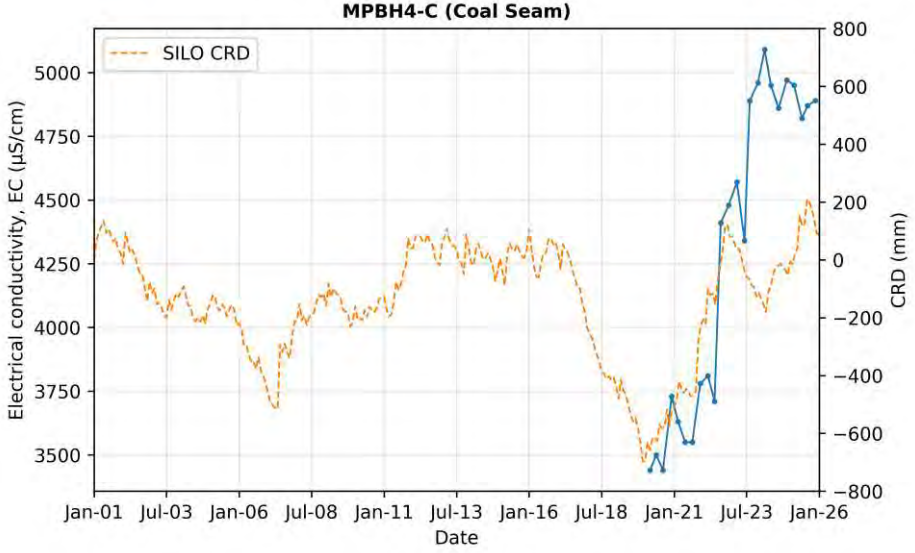

MPBH2-HR (Interburden)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

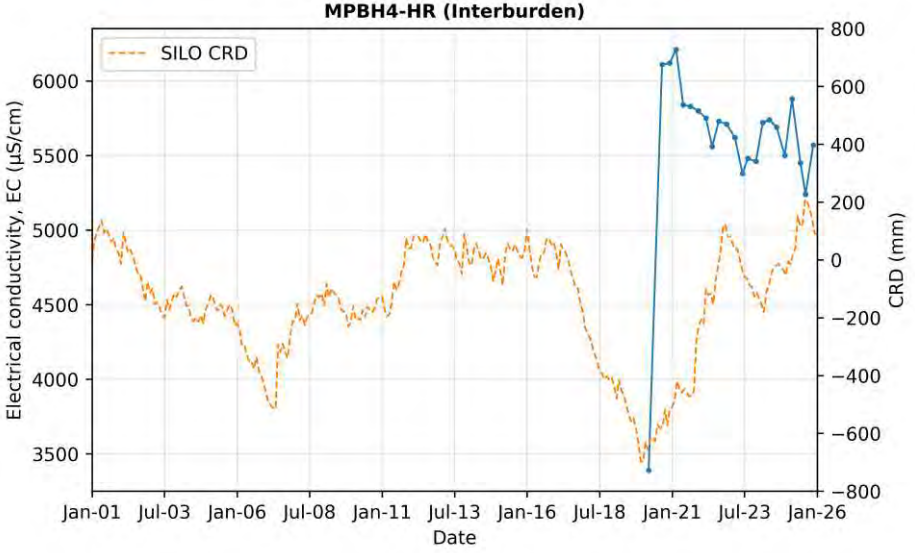

MPBH4 (Hunter Alluvium)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

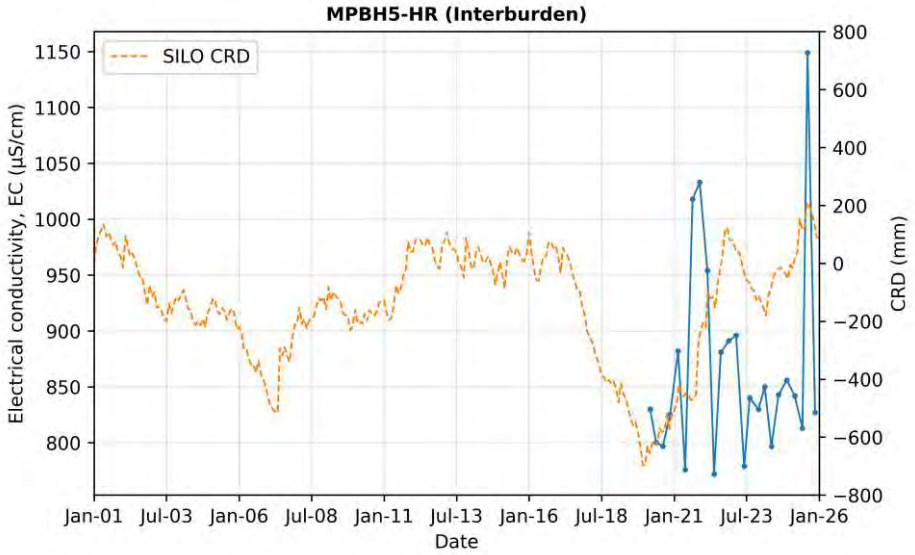

MPBH3 (Hunter Alluvium)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH3b (Hunter Alluvium)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH3p (Hunter Alluvium)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH4-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH4-HR (Interburden)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH5-HR (Interburden)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
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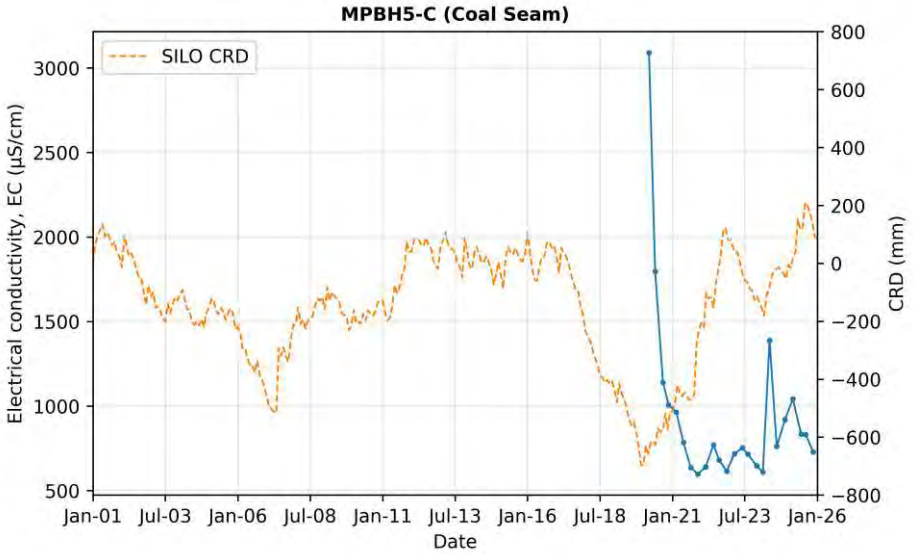
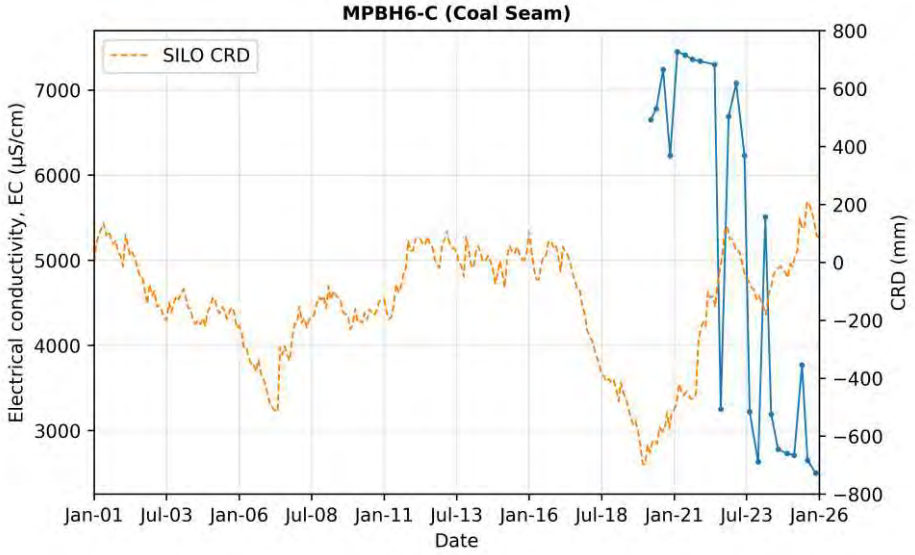
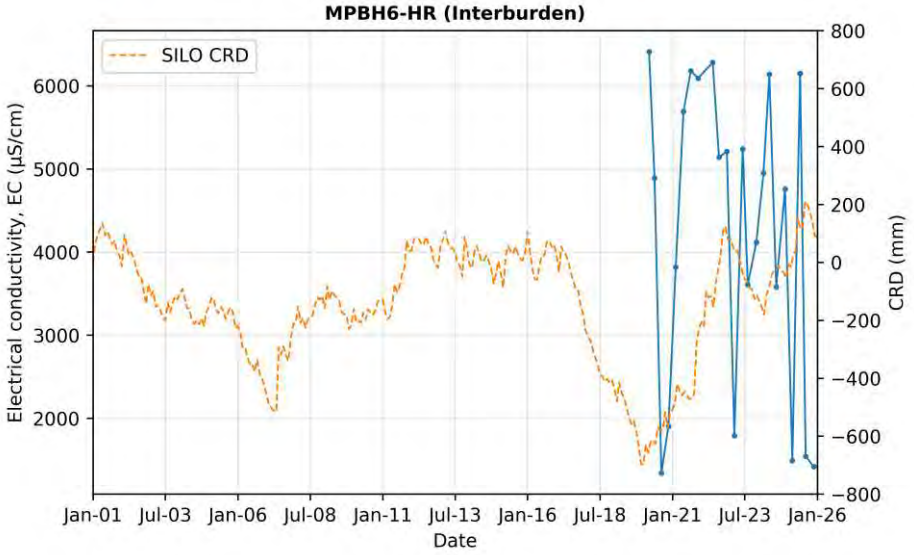
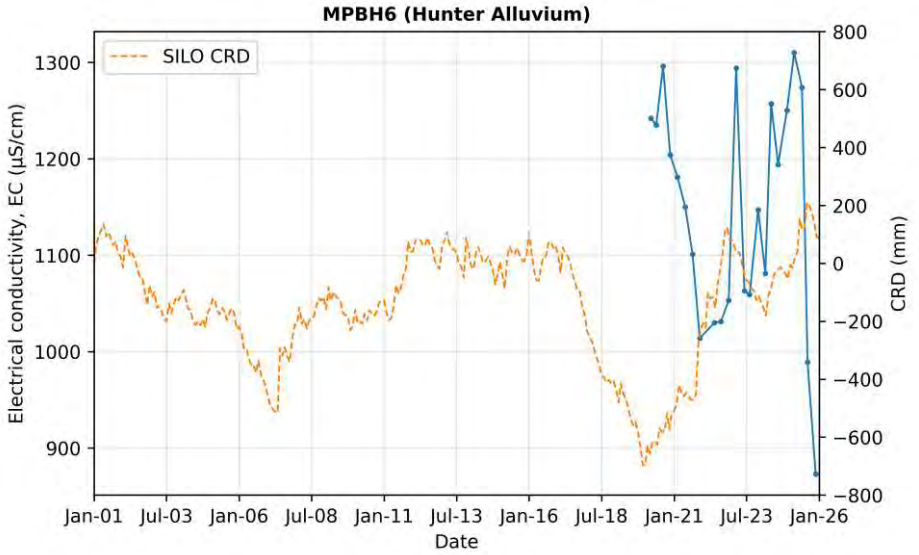

MPBH5-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH6-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH6-HR (Interburden)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH6 (Hunter Alluvium)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
900 1000 1100 1200 1300
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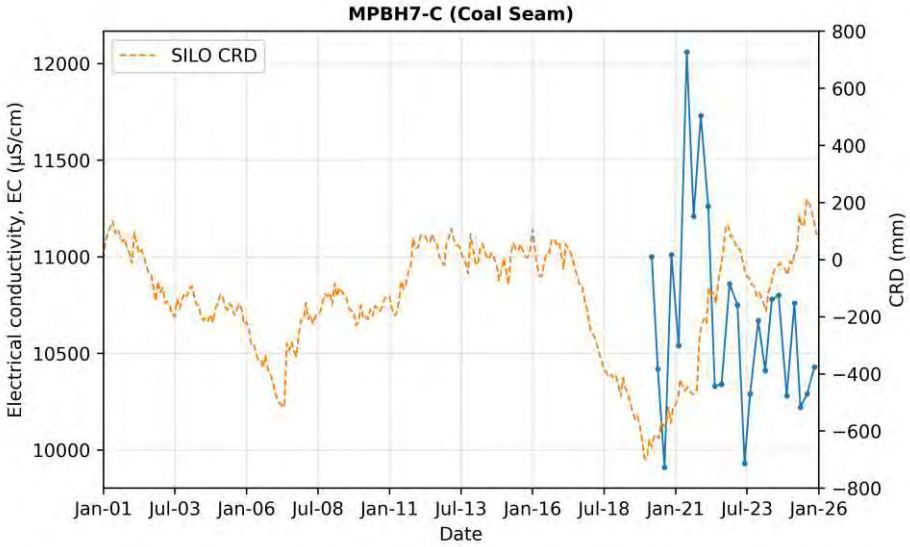
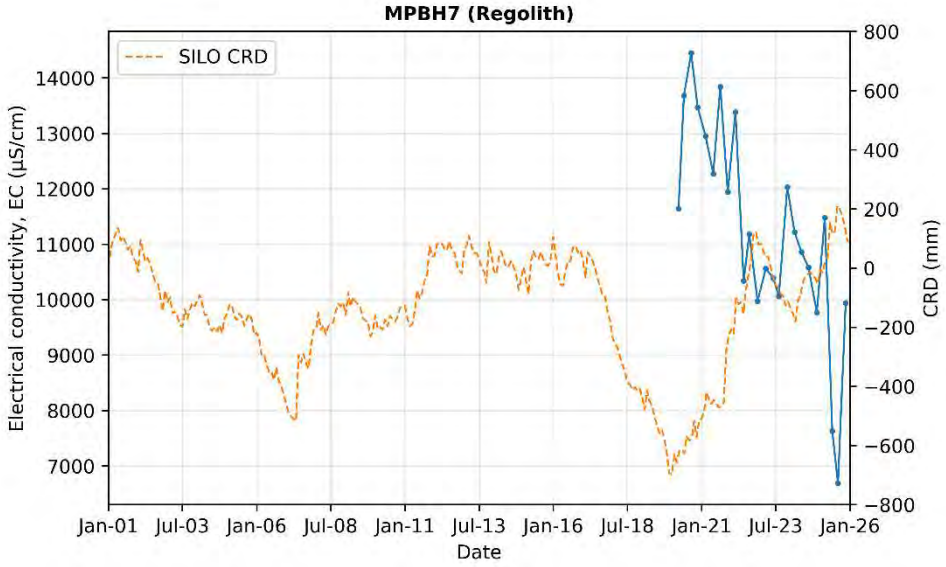

MPBH7-C (Coal Seam)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
10000 10500 11000 11500 12000
−800 −600 −400 −200 0 200 400 600 800


MPBH7 (Regolith)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
7000 8000 9000 10000 11000 12000 13000 14000
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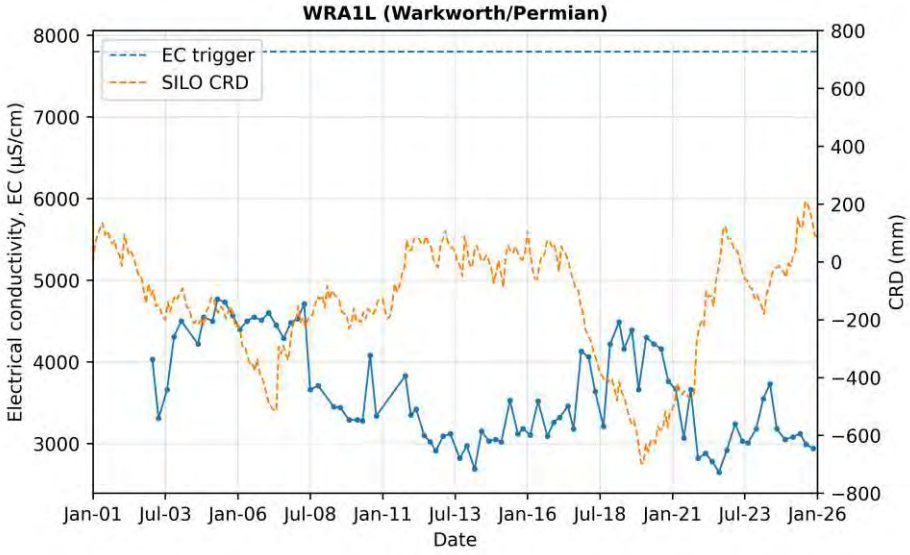
WRA1L (Warkworth/Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
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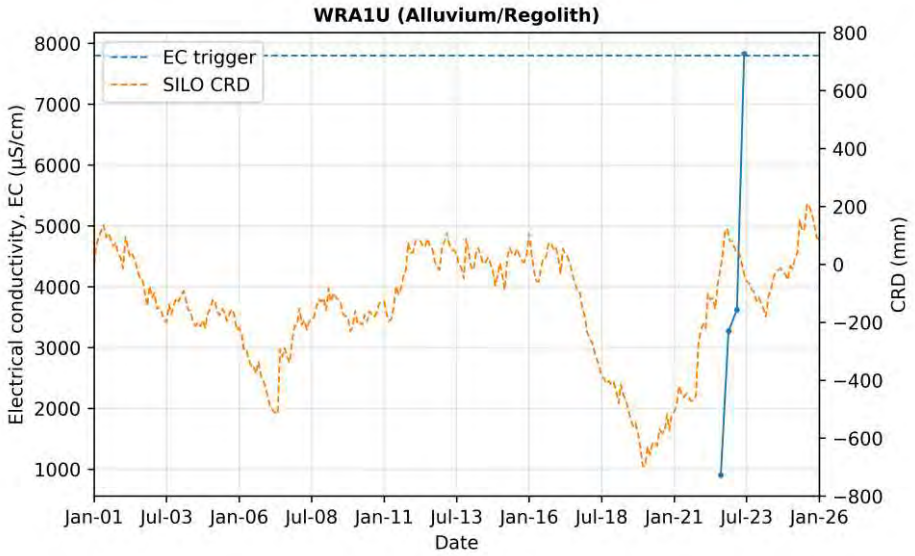
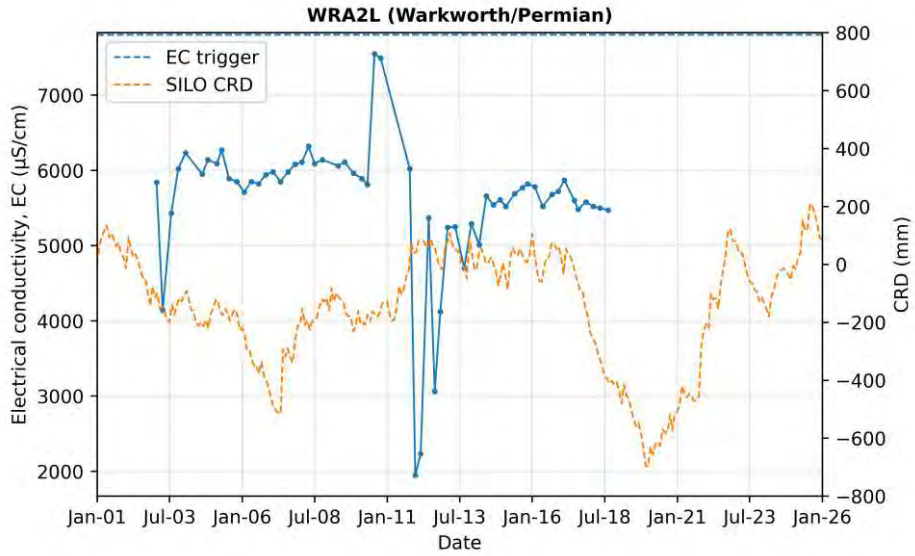
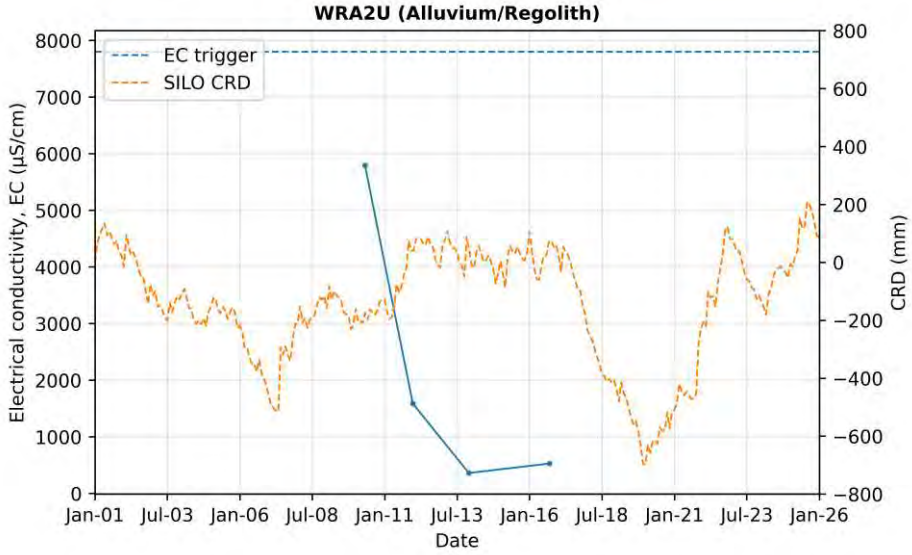
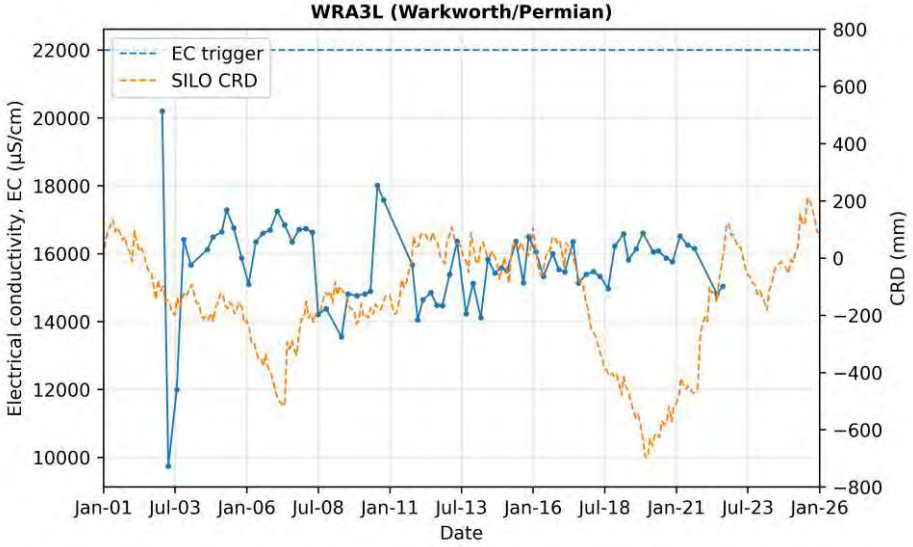
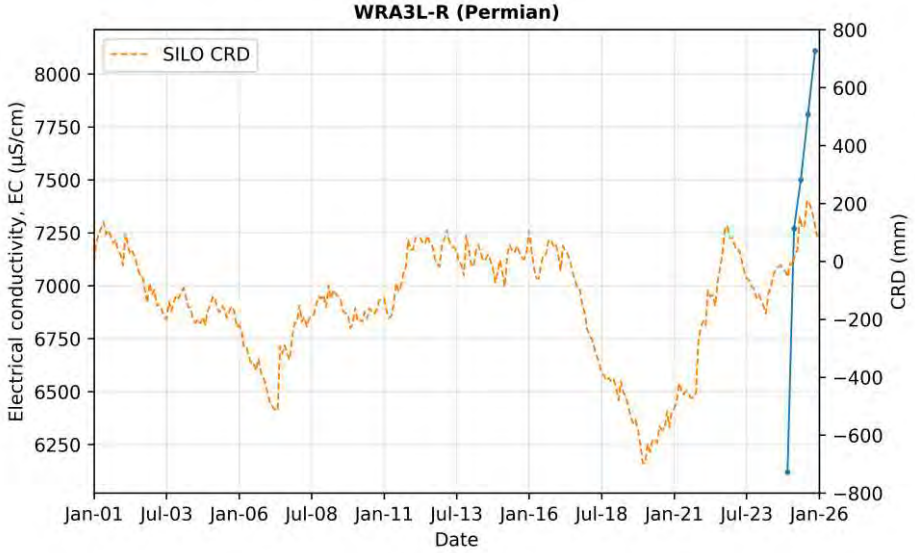
−800 −600 −400 −200 0 200 400 600 800

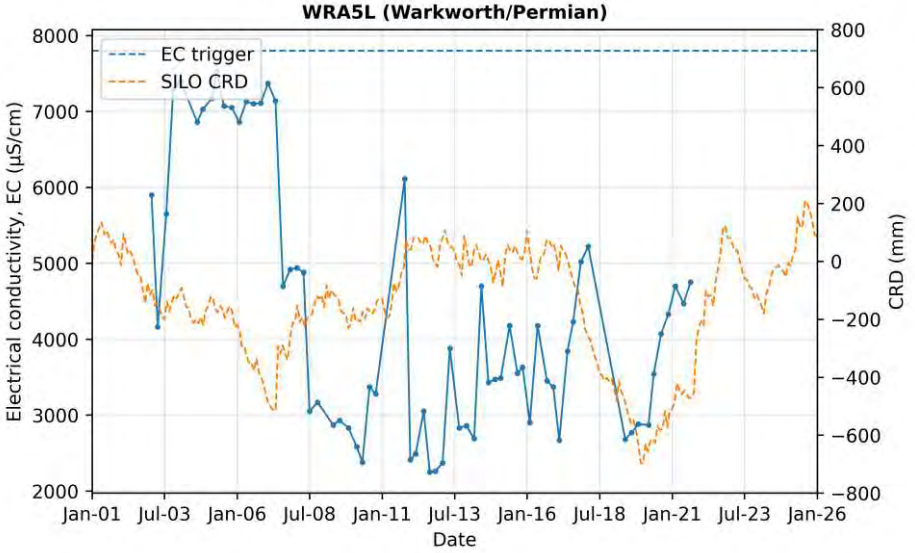

WRA1U (Alluvium/Regolith)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

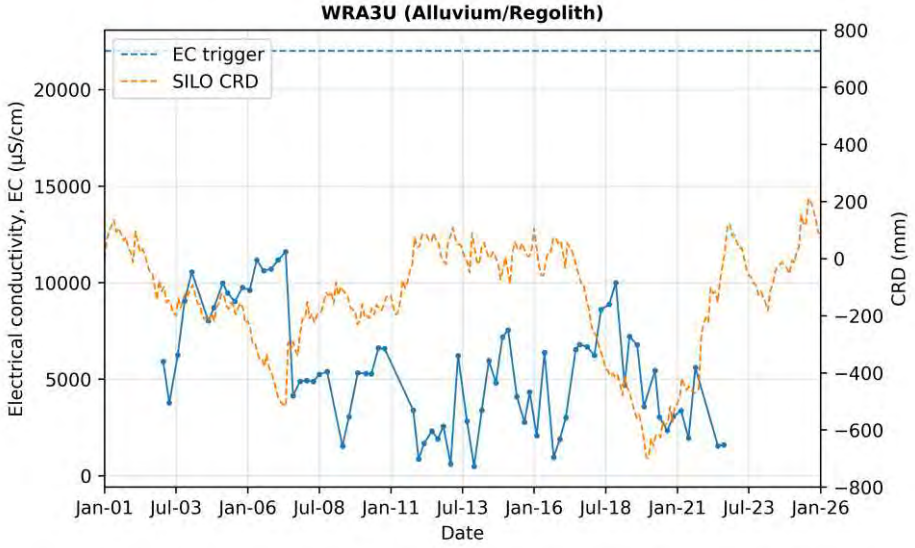

WRA2L (Warkworth/Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

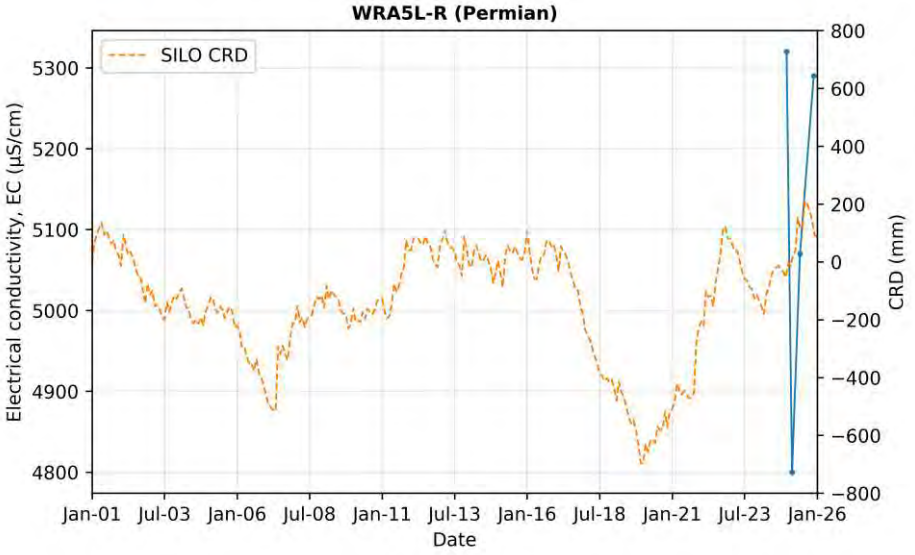

WRA2U (Alluvium/Regolith)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

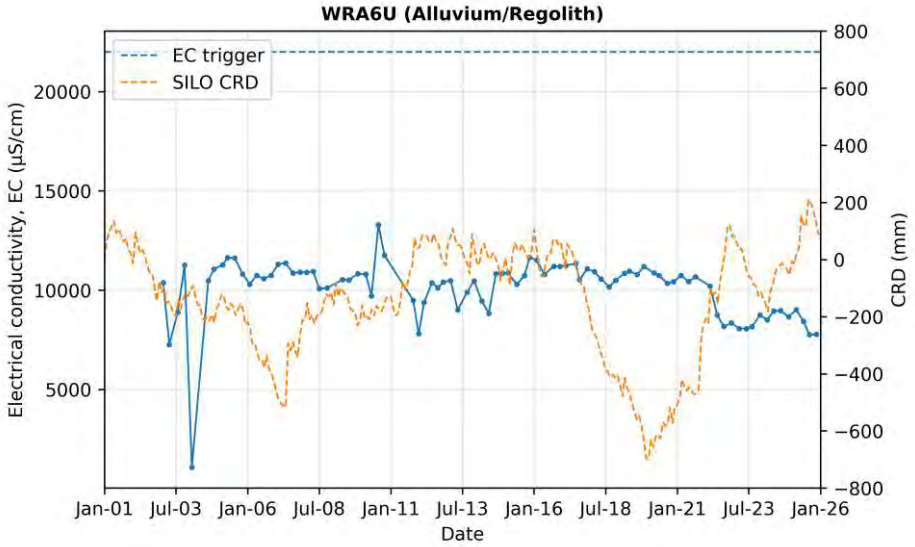

WRA3L (Warkworth/Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

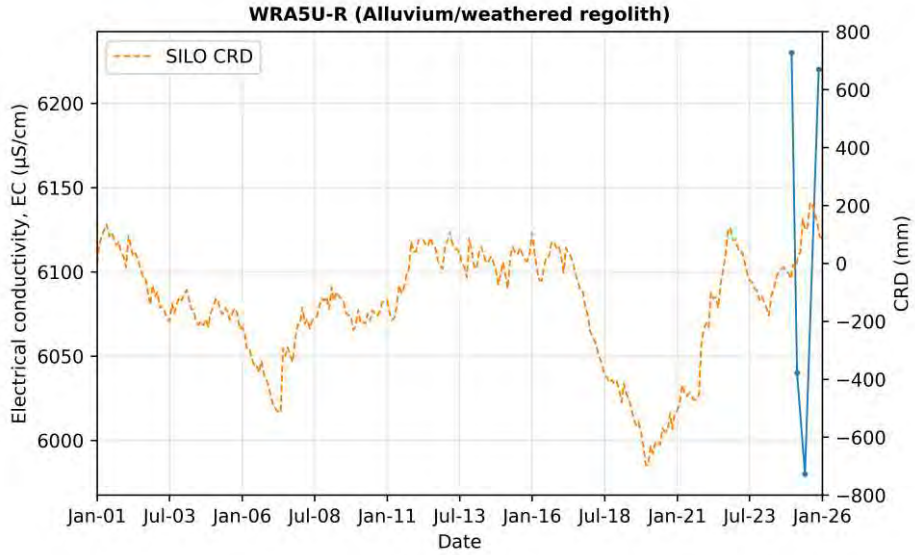

WRA3L-R (Permian)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

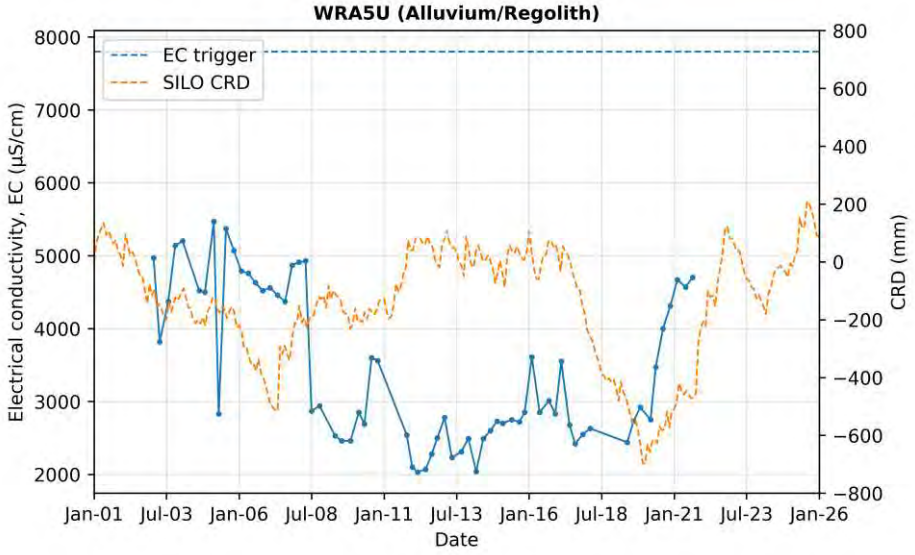

WRA5L (Warkworth/Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

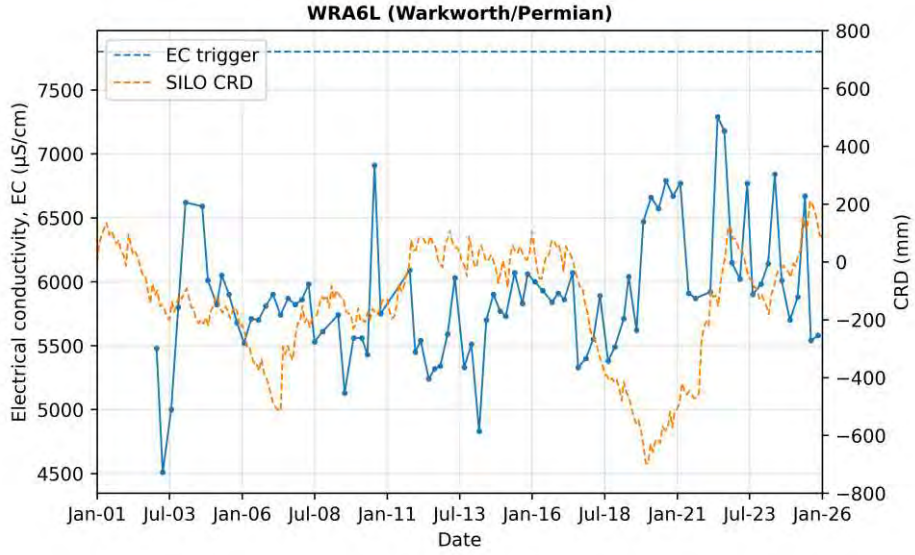

WRA3U (Alluvium/Regolith)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


WRA5L-R (Permian)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


WRA6U (Alluvium/Regolith)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

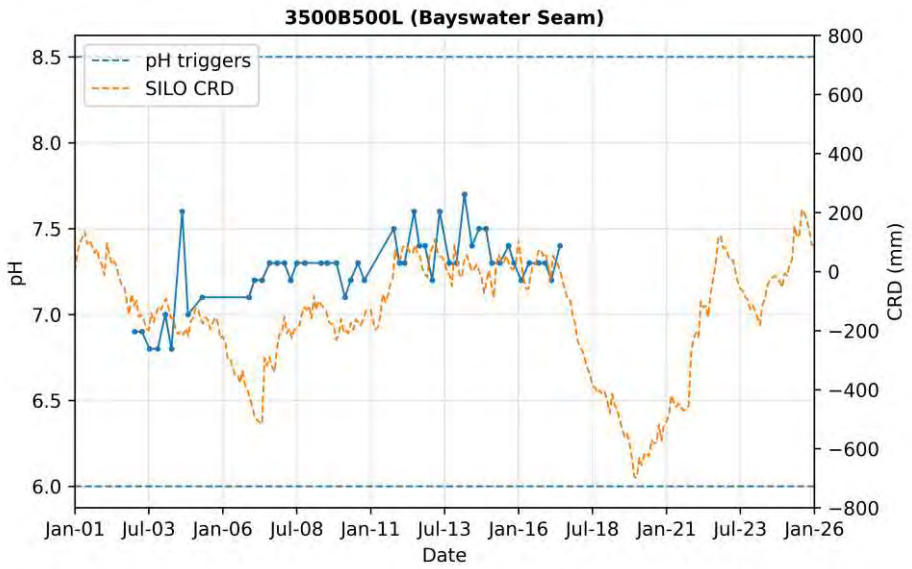

WRA5U-R (Alluvium/weathered regolith)
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

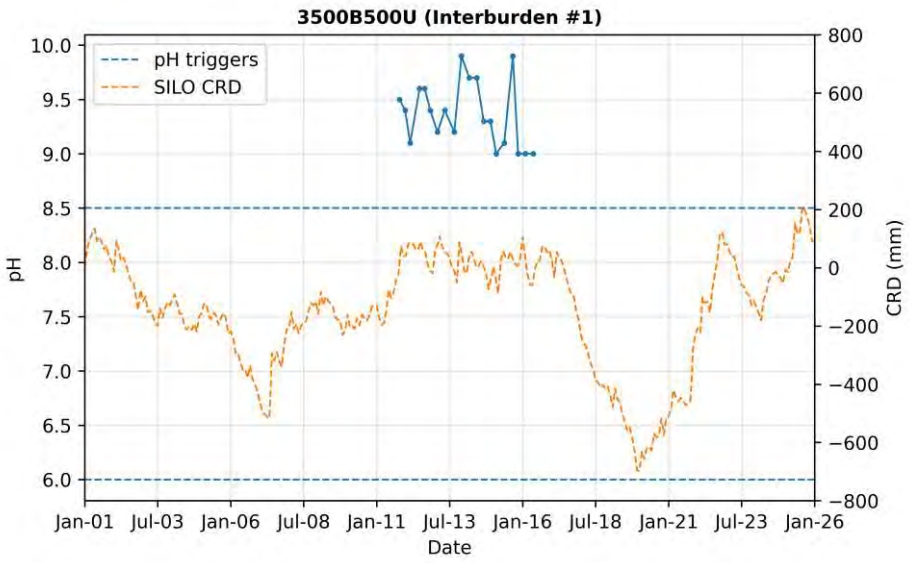

WRA5U (Alluvium/Regolith)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

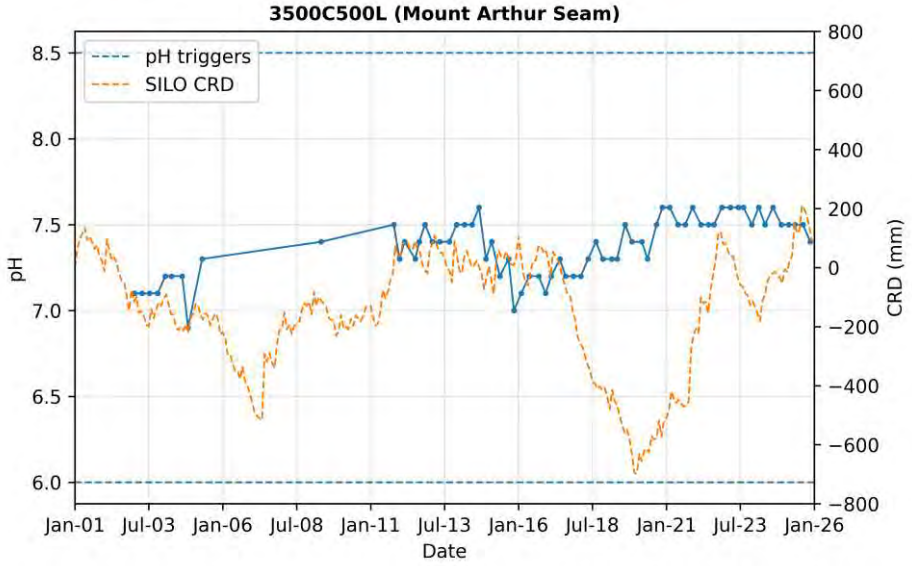

WRA6L (Warkworth/Permian)
EC trigger
SILO CRD
Electrical conductivity, EC (µS/cm)
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

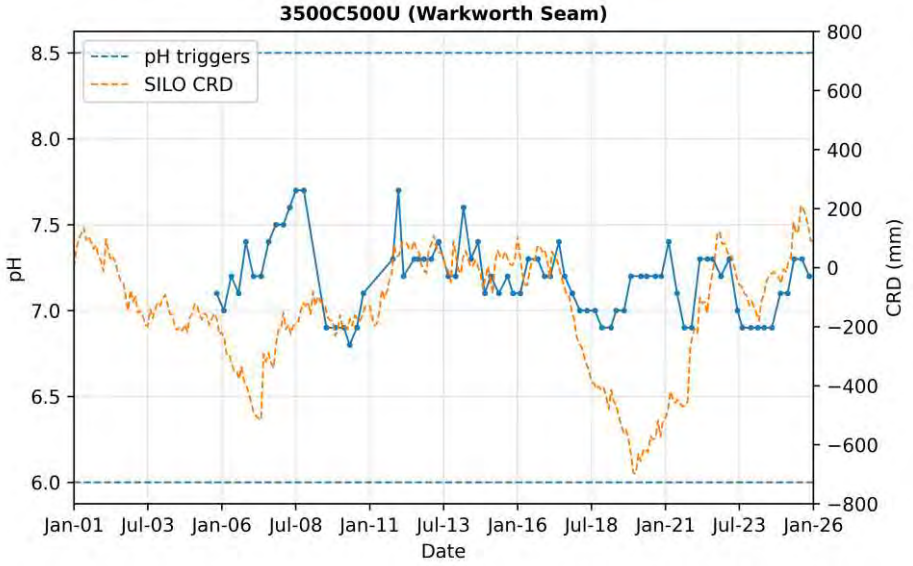
Appendix D

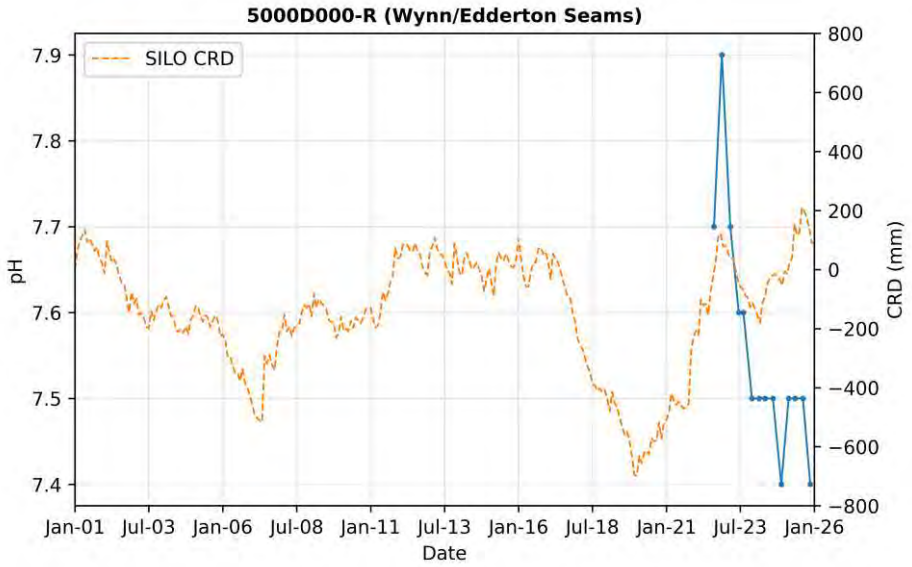
Field measured pH time series

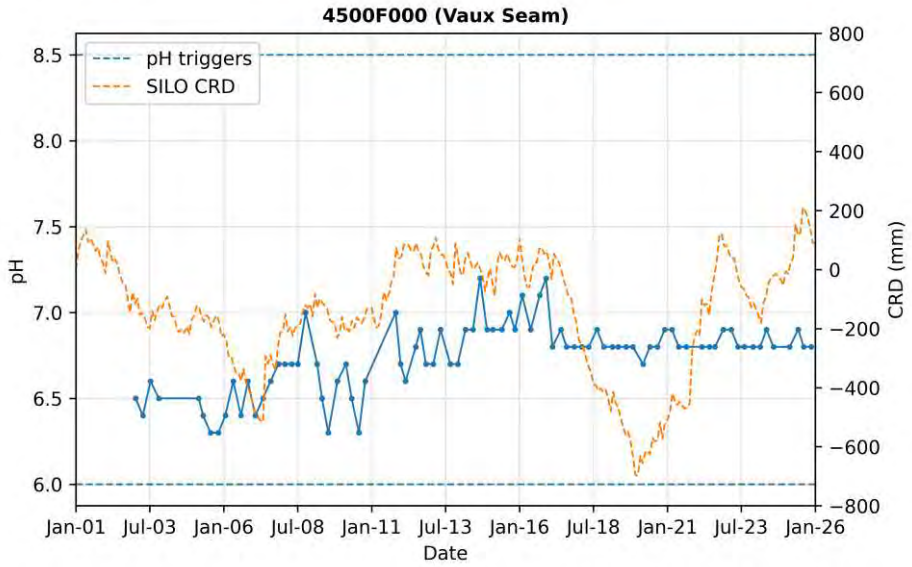

3500B500L (Bayswater Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

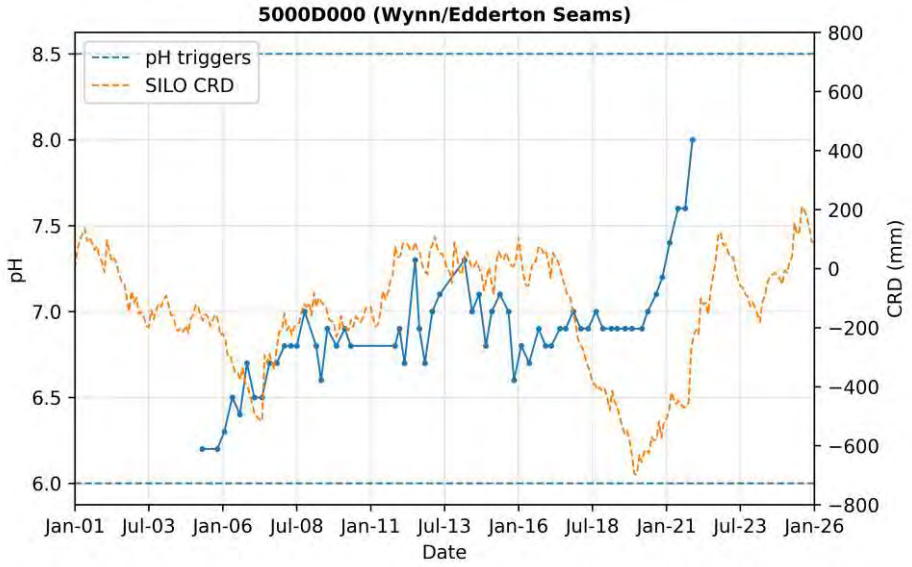

3500B500U (Interburden #1)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


3500C500L (Mount Arthur Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


3500C500U (Warkworth Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


5000D000-R (Wynn/Edderton Seams)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


4500F000 (Vaux Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


5000D000 (Wynn/Edderton Seams)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
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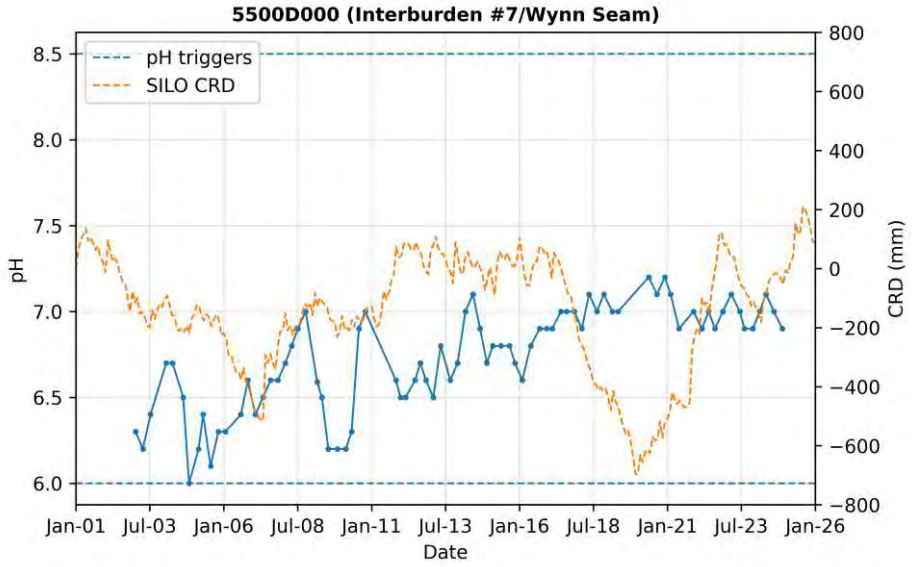
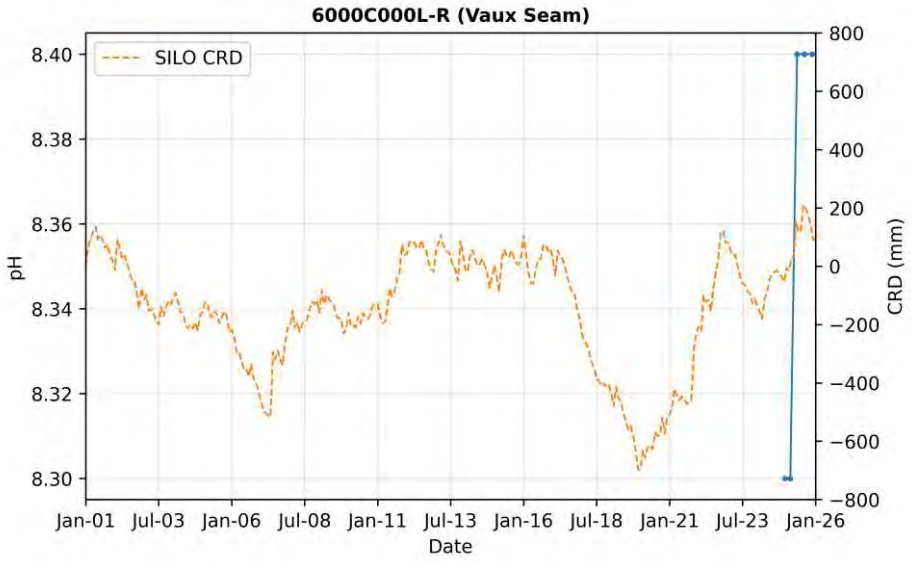
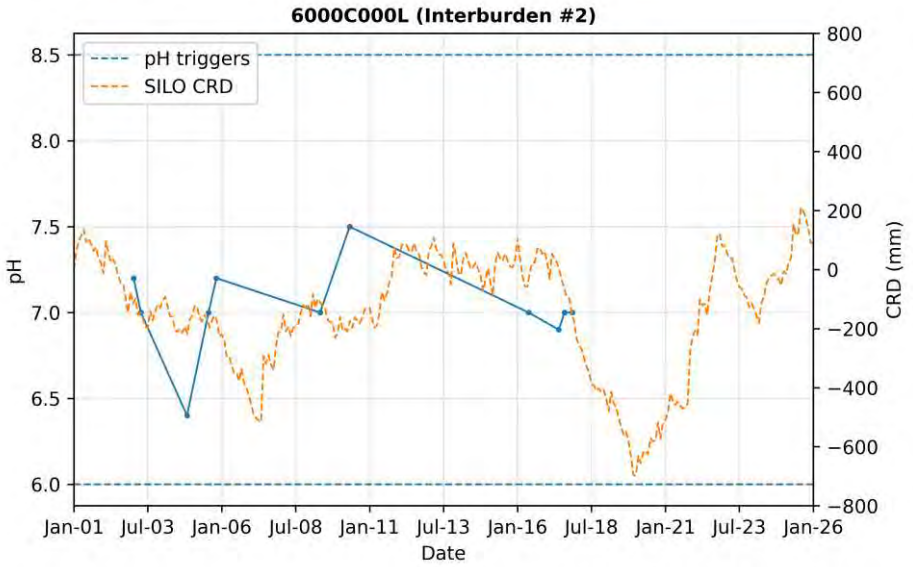
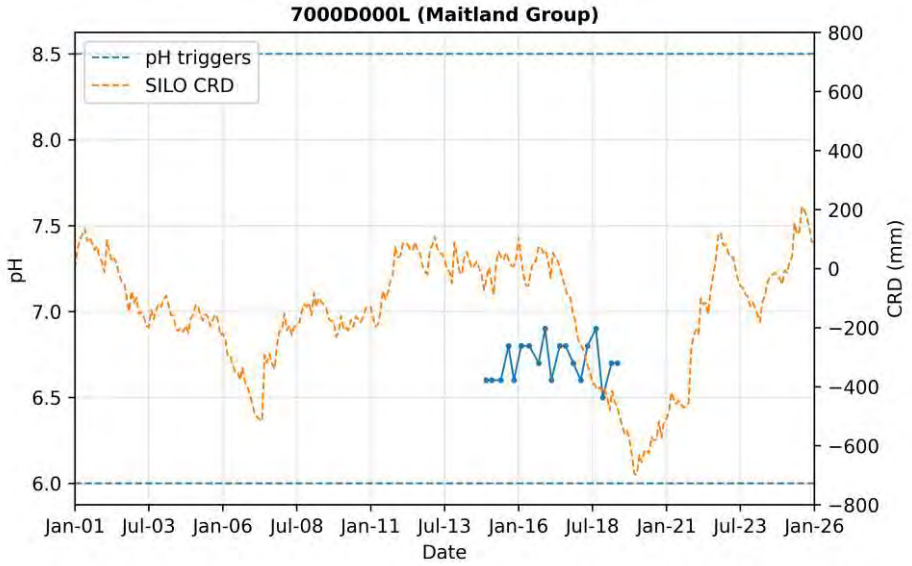
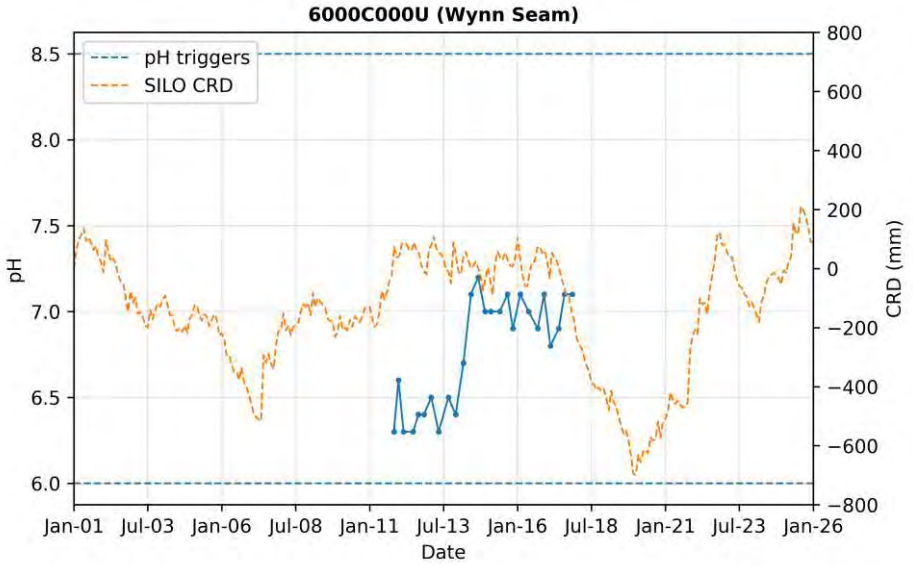
Jan-21
Jul-23
Jan-26

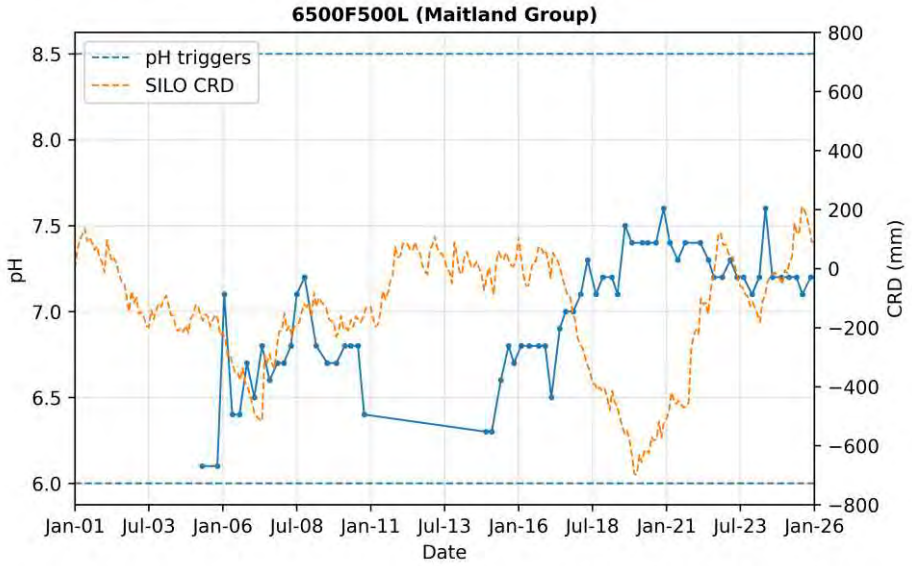

5500D000 (Interburden #7/Wynn Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

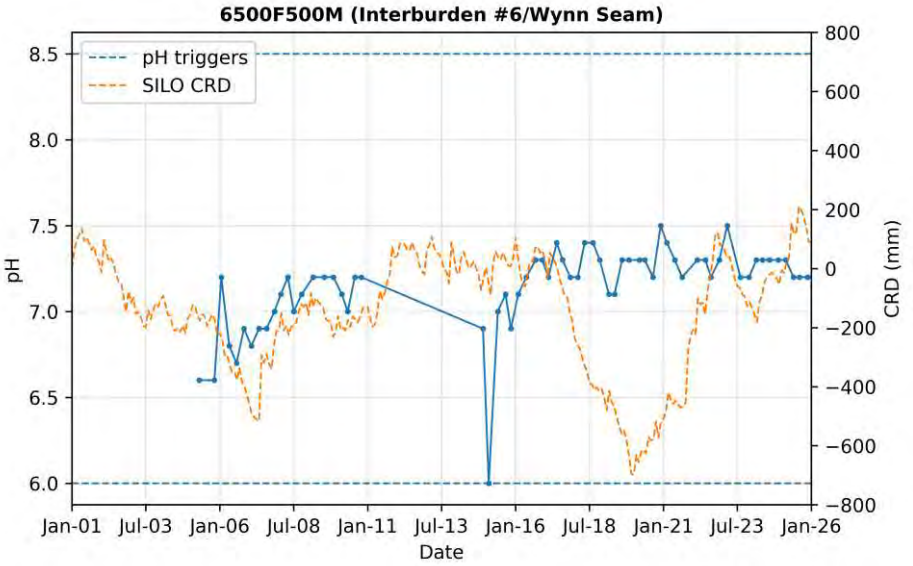

6000C000L-R (Vaux Seam)
SILO CRD
pH
CRD (mm)
Date

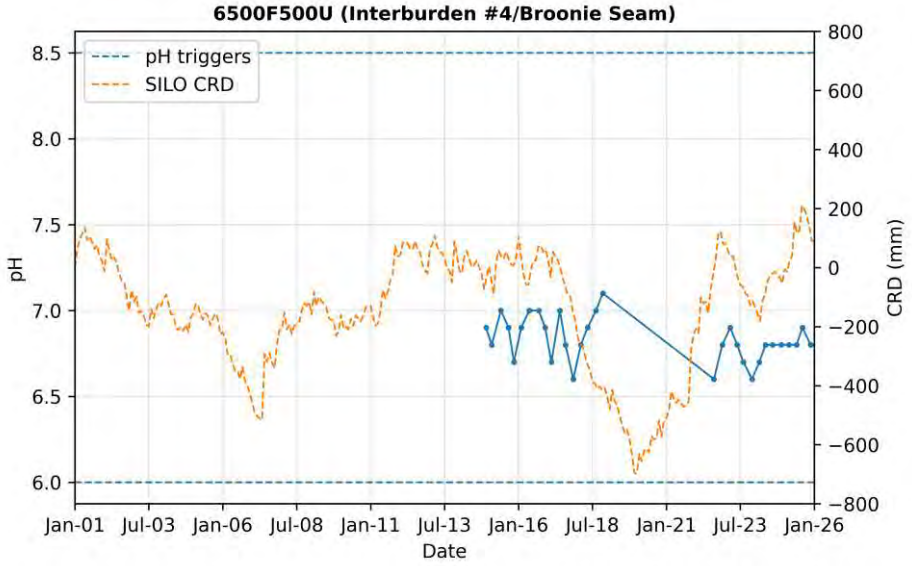

6000C000L (Interburden #2)
pH triggers
SILO CRD
pH
CRD (mm)
Date

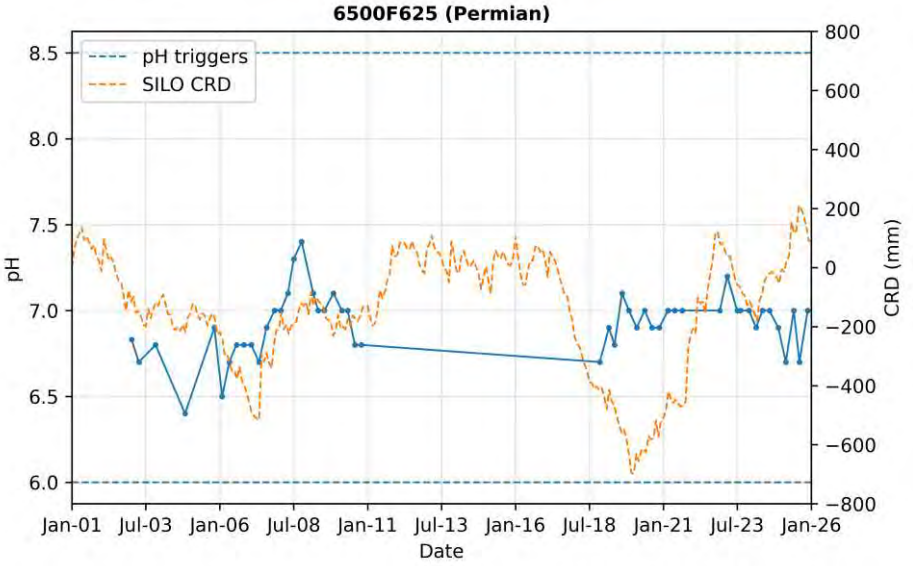

7000D000L (Maitland Group)
pH triggers
SILO CRD
pH
CRD (mm)
Date

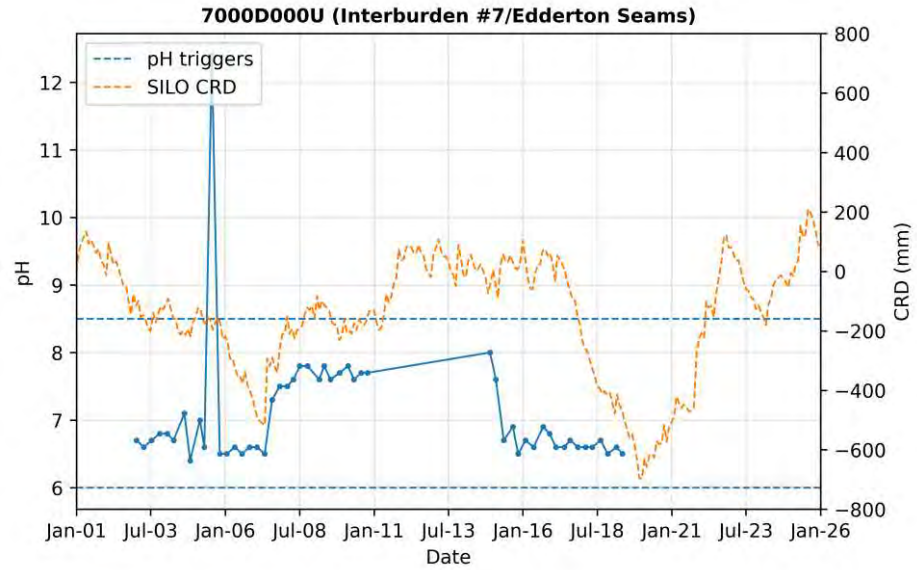

6000C000U (Wynn Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date

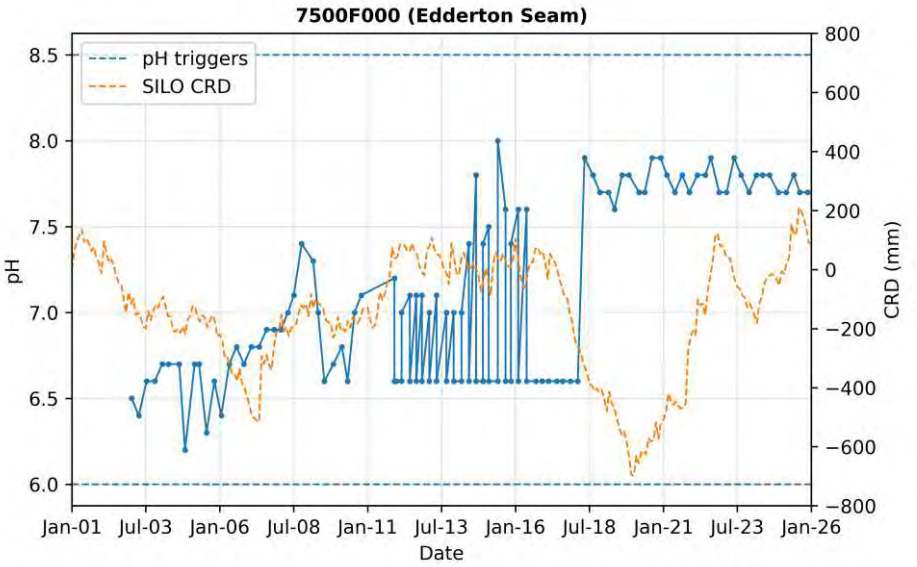

6500F500L (Maitland Group)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

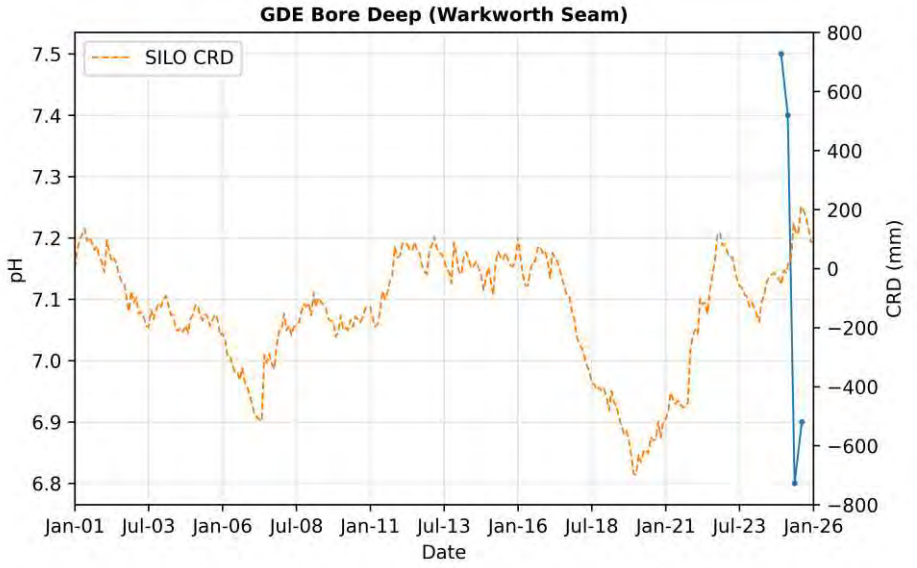

6500F500M (Interburden #6/Wynn Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

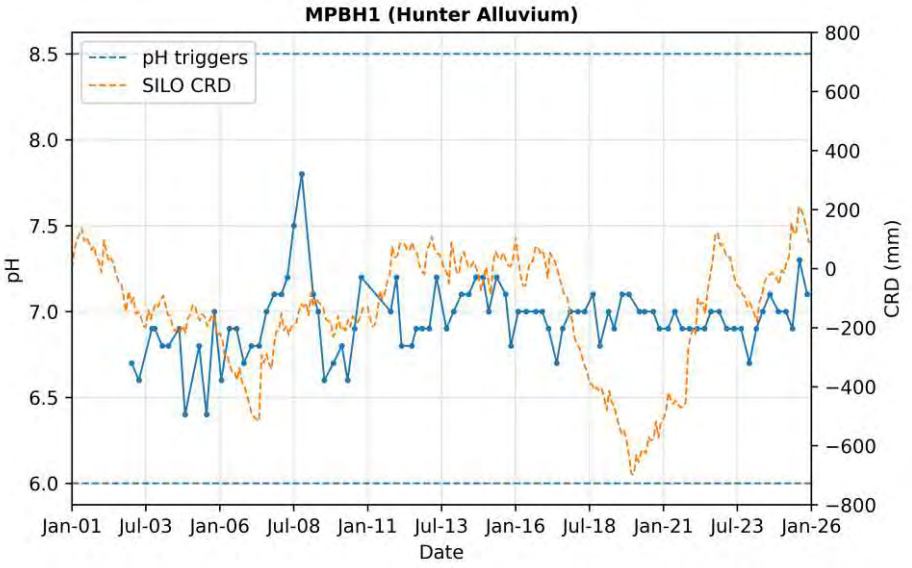

6500F500U (Interburden #4/Broonie Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

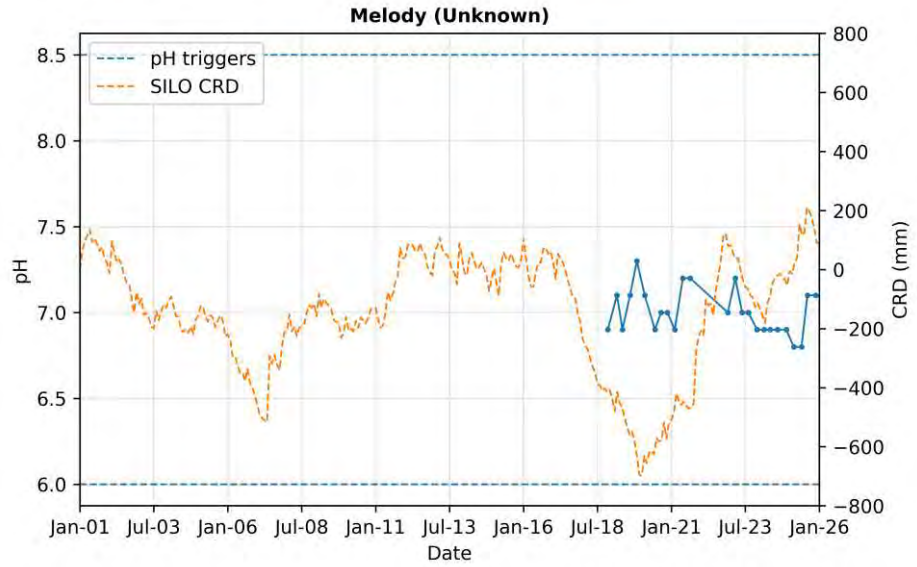

6500F625 (Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

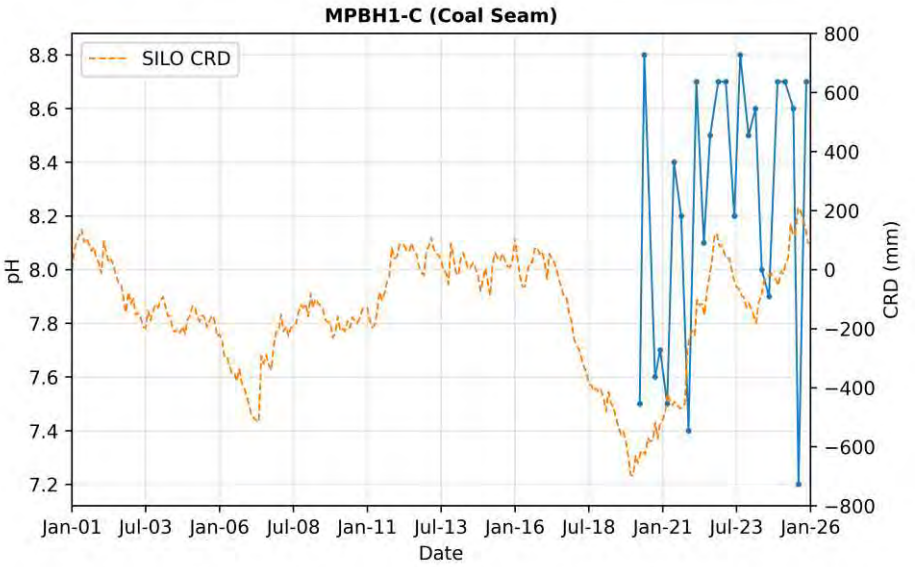

7000D000U (Interburden #7/Edderton Seams)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

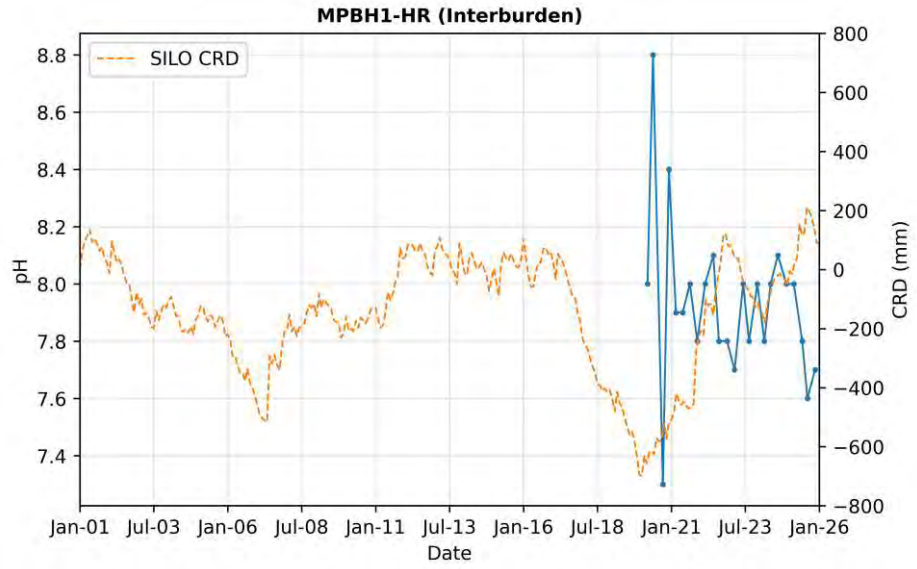

7500F000 (Edderton Seam)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

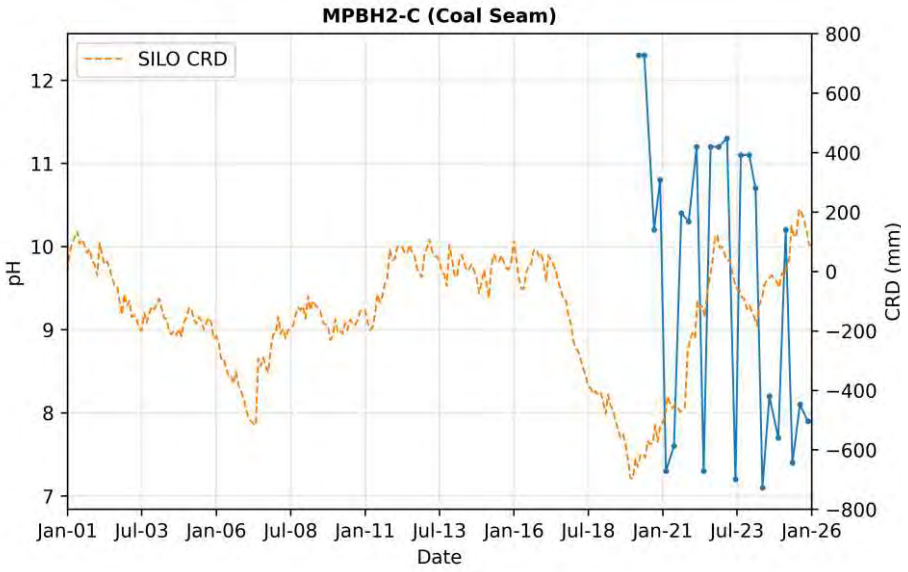

GDE Bore Deep (Warkworth Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

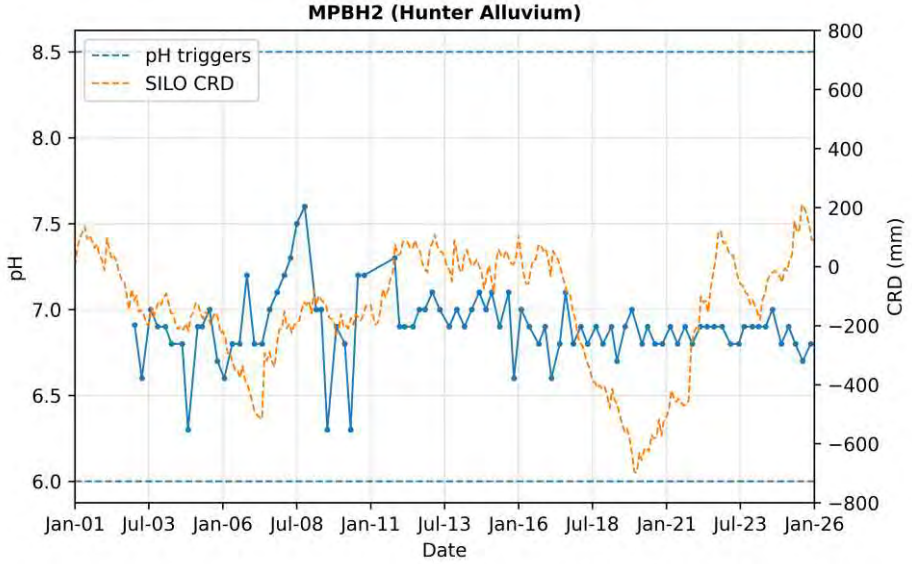

MPBH1 (Hunter Alluvium)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

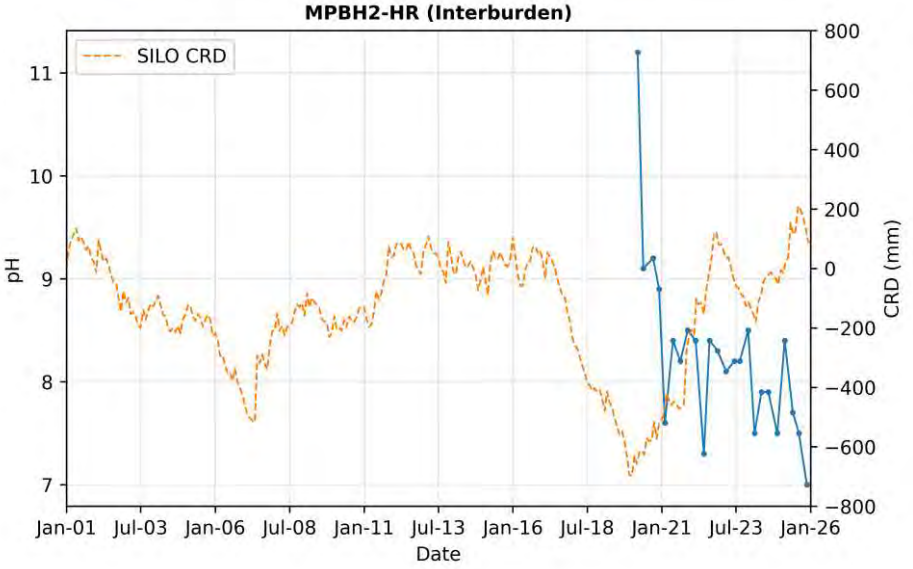

Melody (Unknown)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

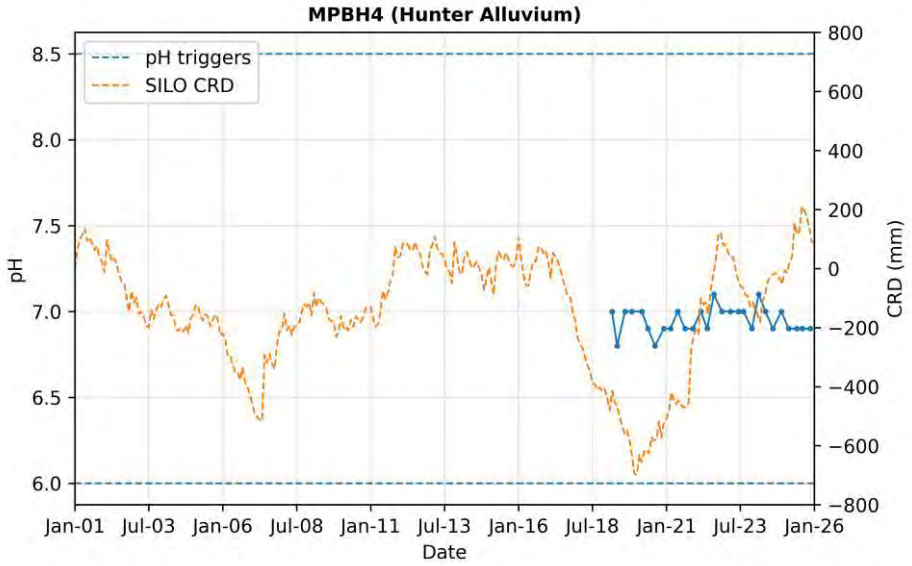

MPBH1-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

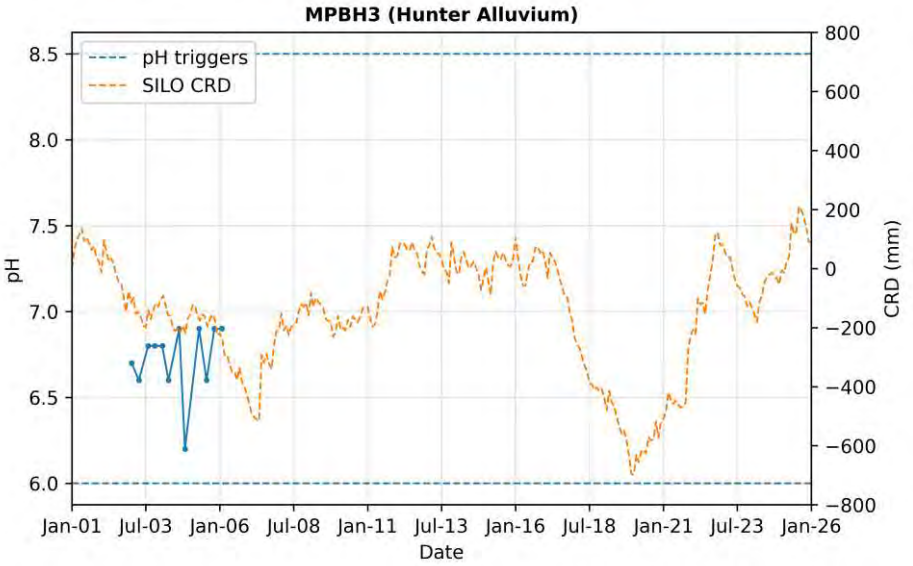

MPBH1-HR (Interburden)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

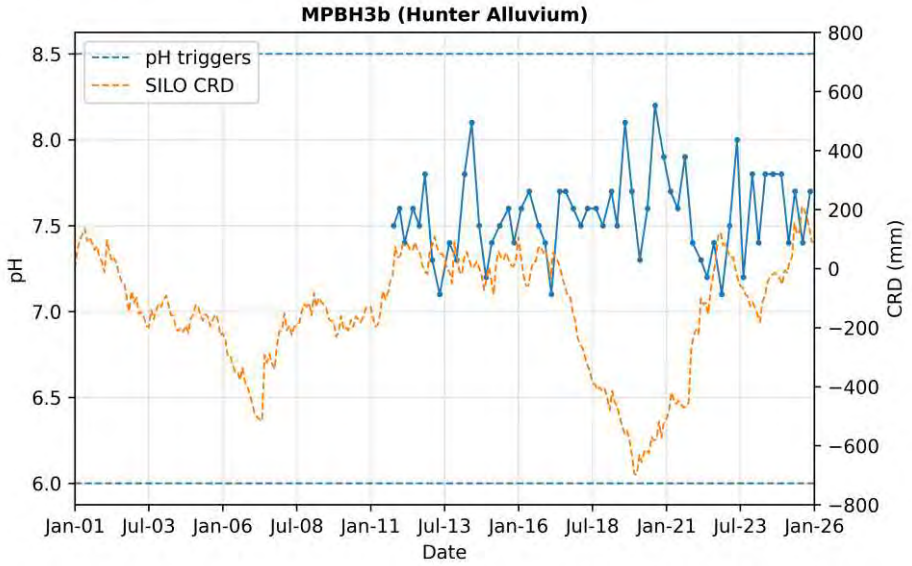

MPBH2-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

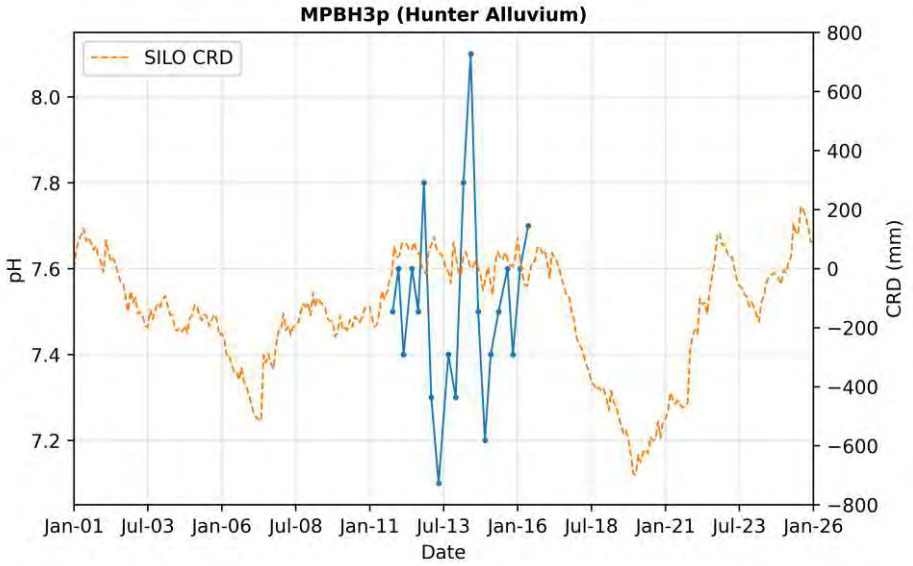

MPBH2 (Hunter Alluvium)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

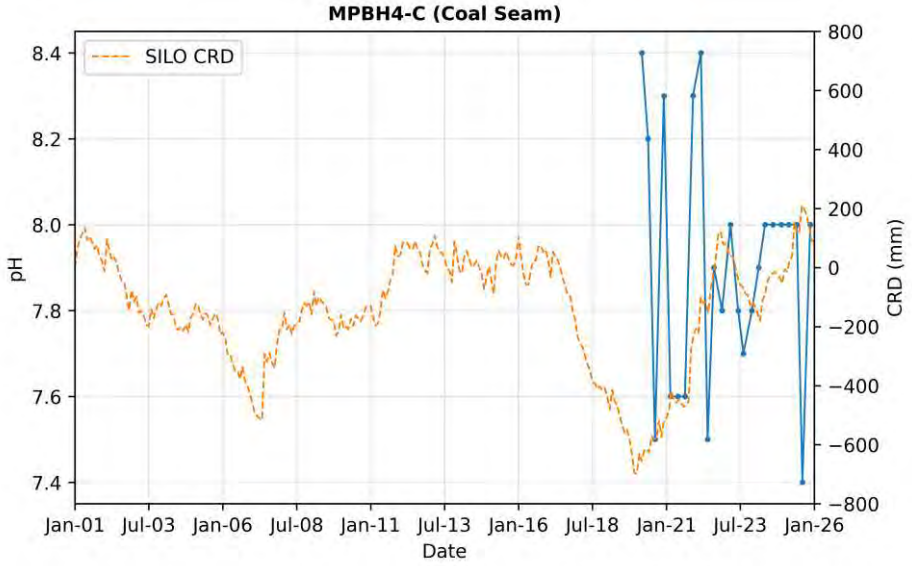

MPBH2-HR (Interburden)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

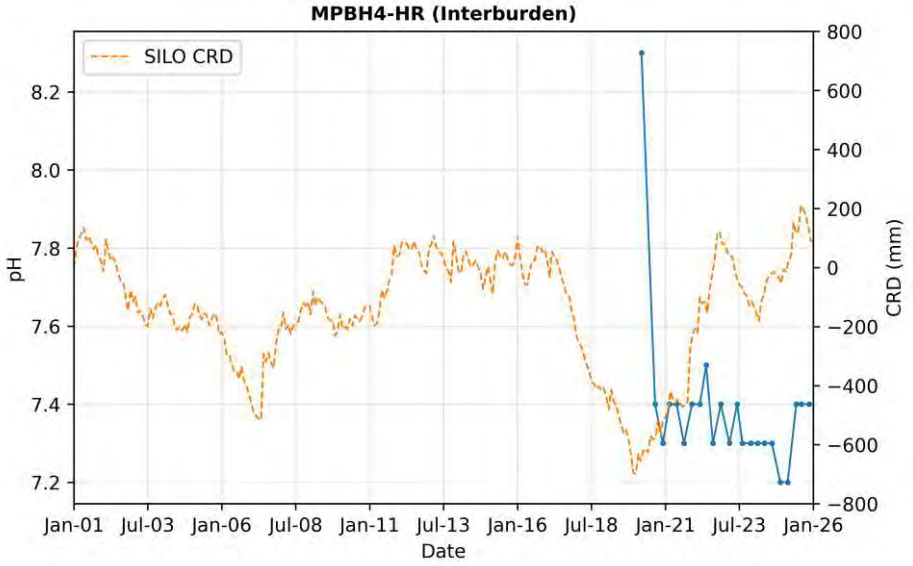

MPBH4 (Hunter Alluvium)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

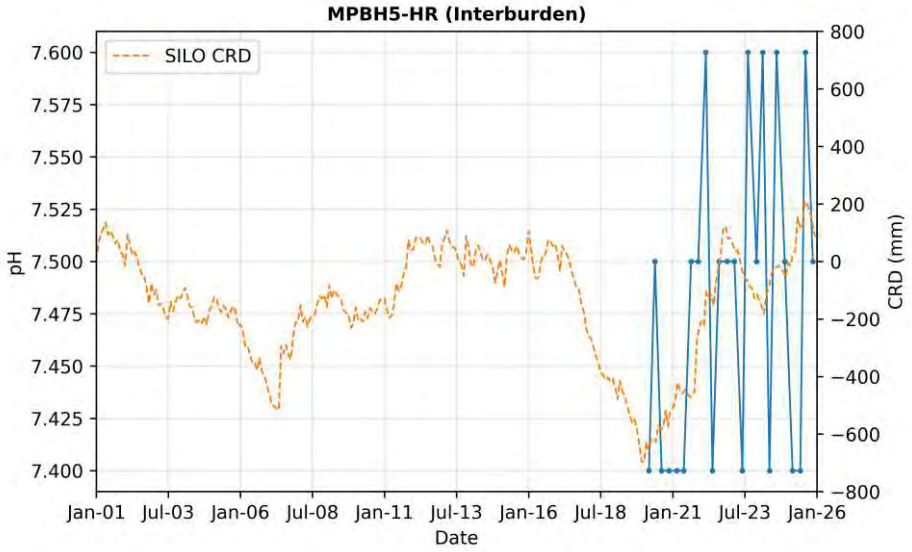

MPBH3 (Hunter Alluvium)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH3b (Hunter Alluvium)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH3p (Hunter Alluvium)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH4-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH4-HR (Interburden)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


MPBH5-HR (Interburden)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
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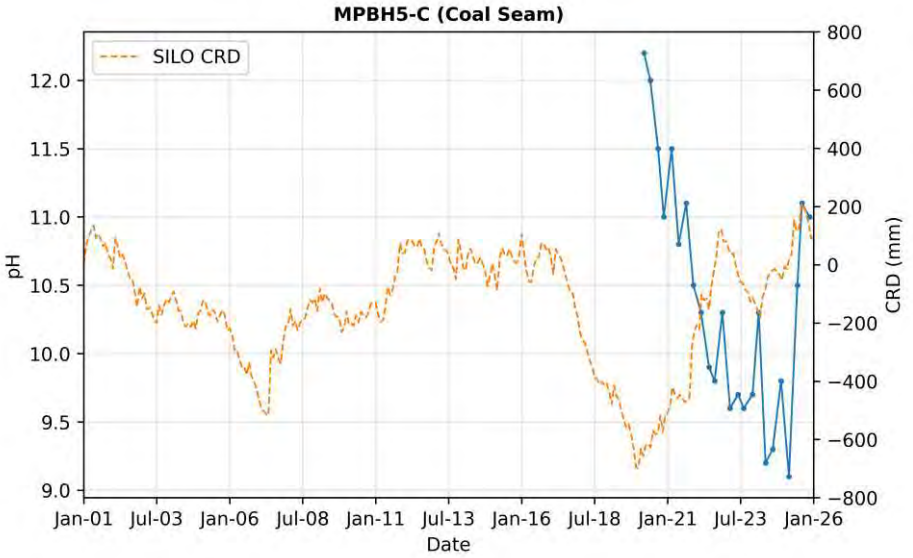
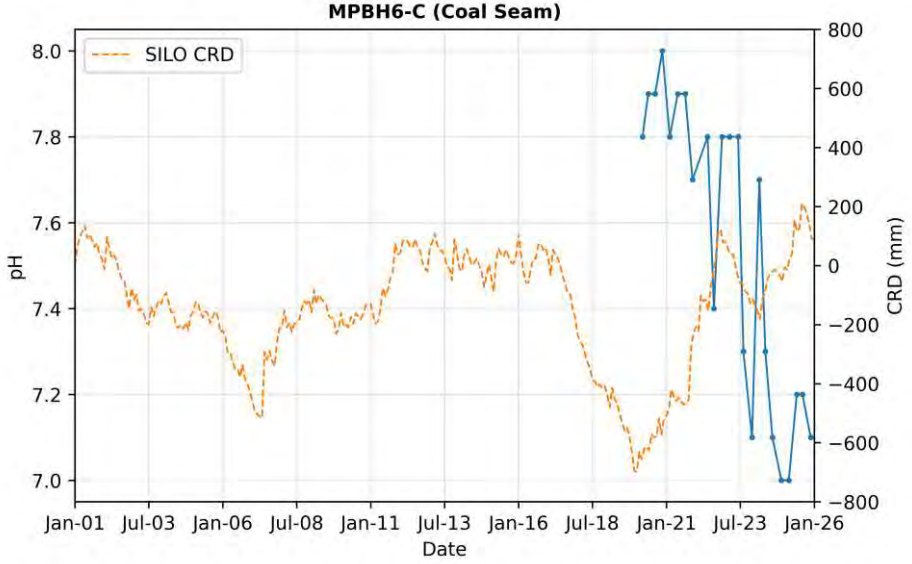
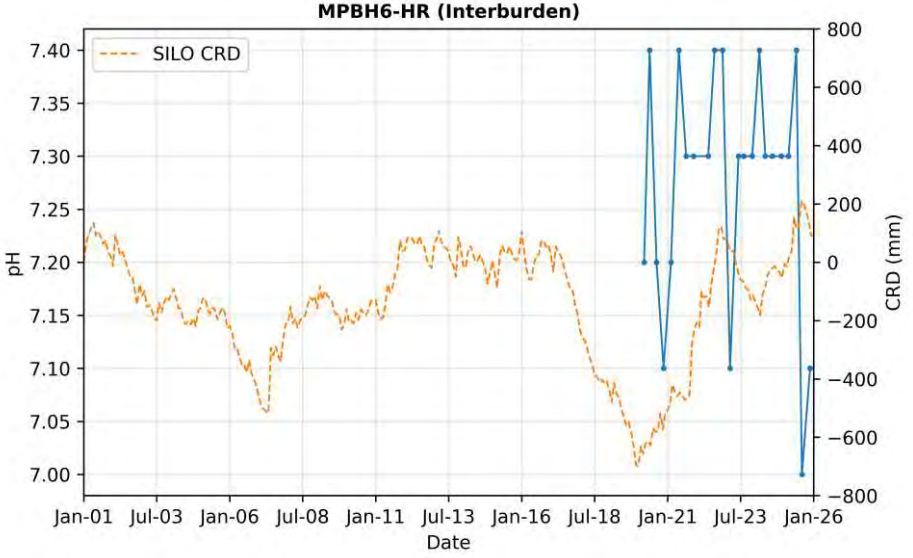
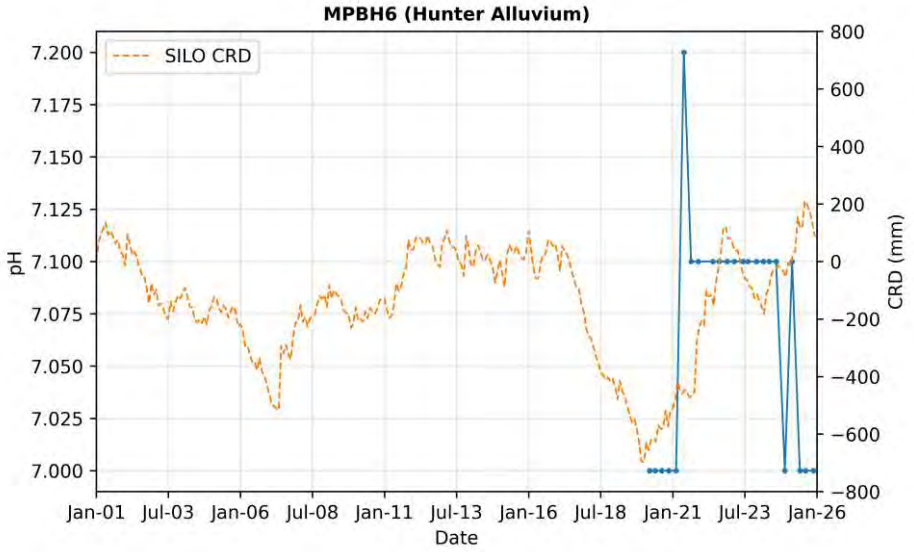
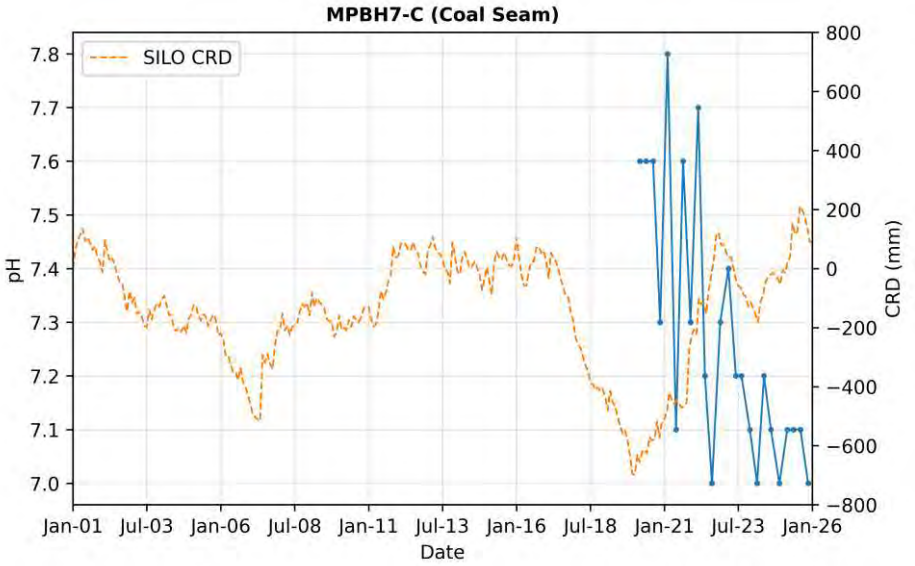
Jan-21
Jul-23
Jan-26

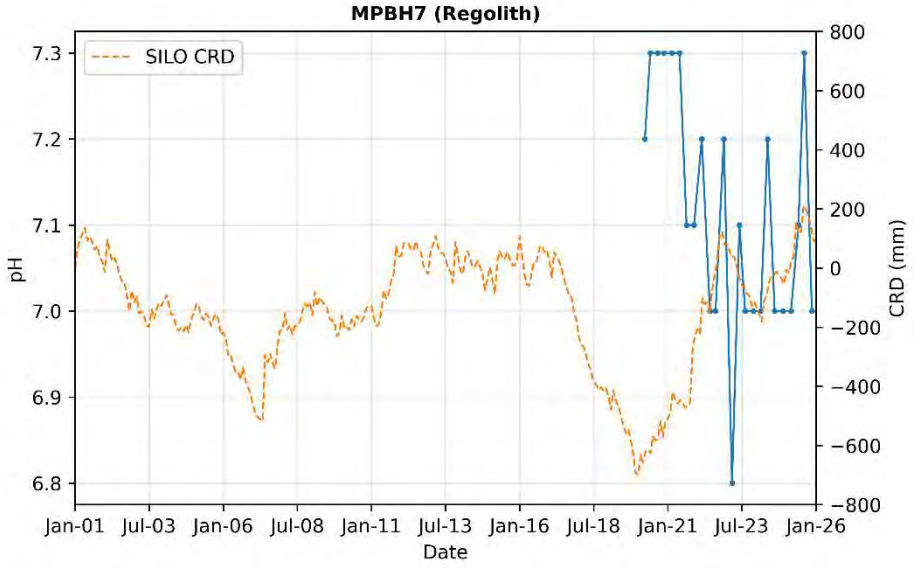

MPBH5-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


MPBH6-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

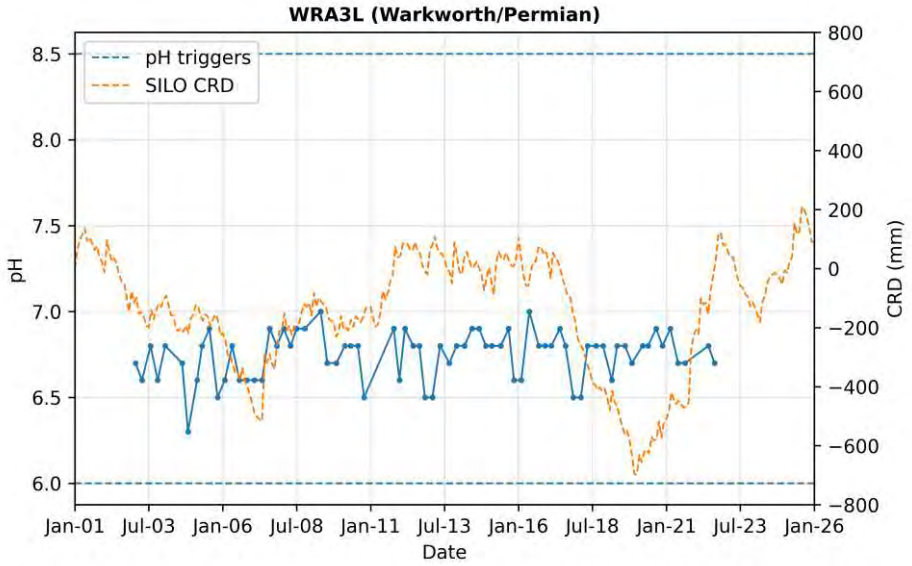

MPBH6-HR (Interburden)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

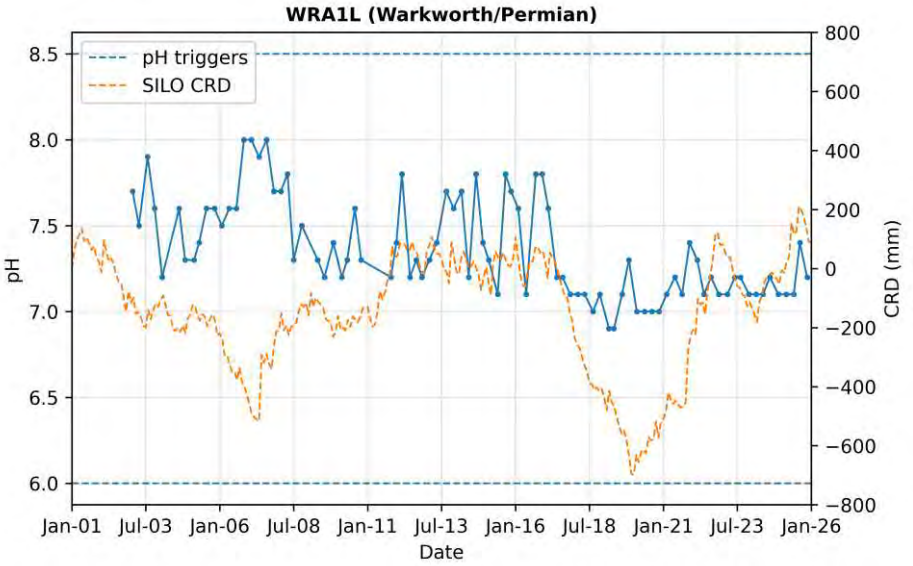

MPBH6 (Hunter Alluvium)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
7.200 7.175 7.150 7.125 7.100 7.075 7.050 7.025 7.000
800 600 400 200 0 −200 −400 −600 −800


MPBH7-C (Coal Seam)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
7.8 7.7 7.6 7.5 7.4 7.3 7.2 7.1 7.0
800 600 400 200 0 −200 −400 −600 −800

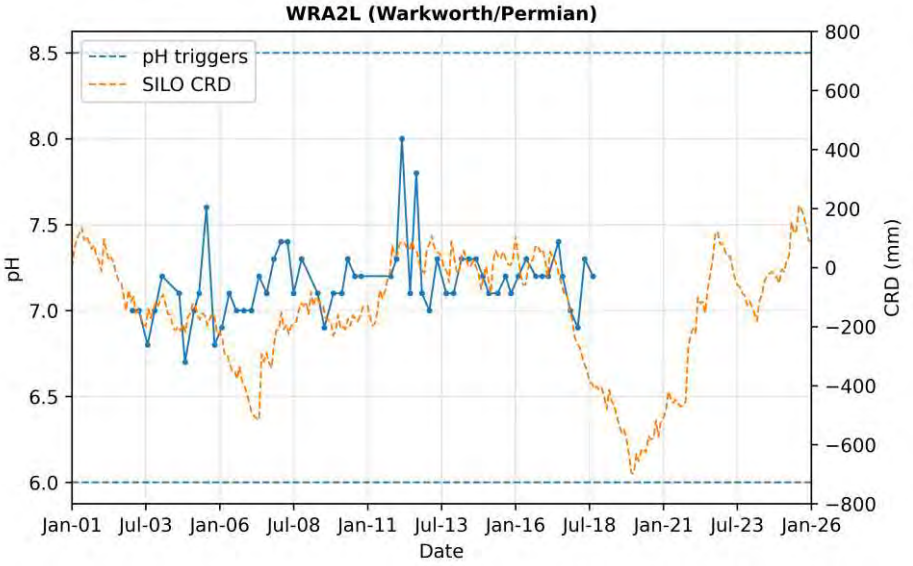

MPBH7 (Regolith)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
7.3 7.2 7.1 7.0 6.9 6.8
800 600 400 200 0 −200 −400 −600 −800

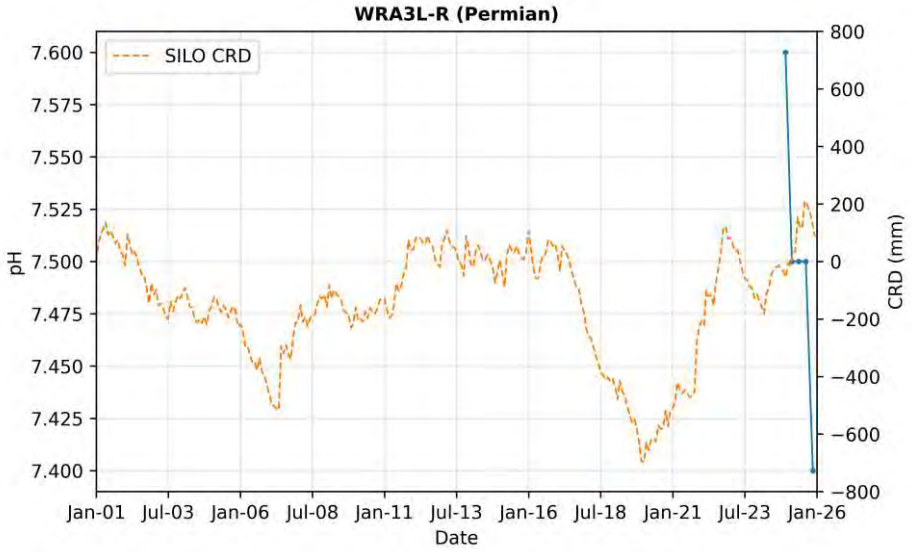

WRA2U (Alluvium/Regolith)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

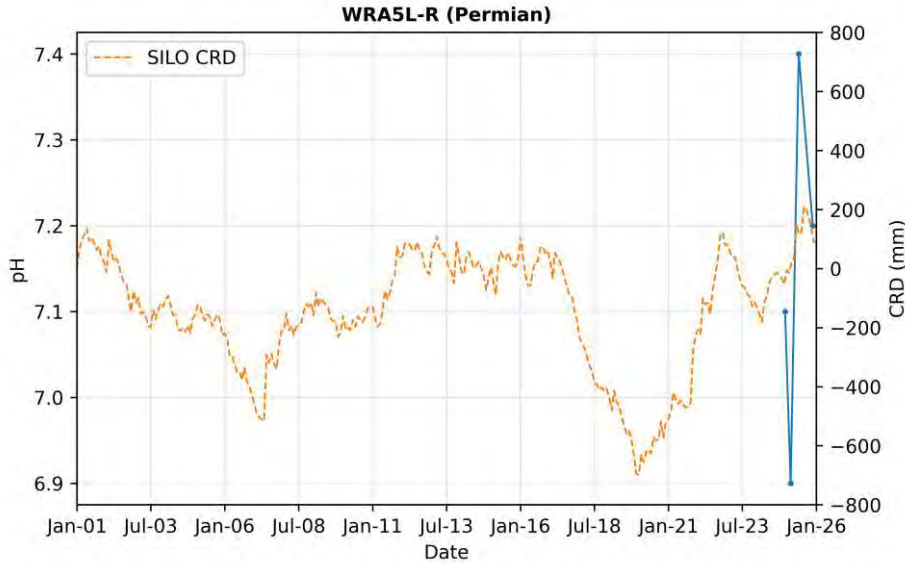

WRA3L (Warkworth/Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

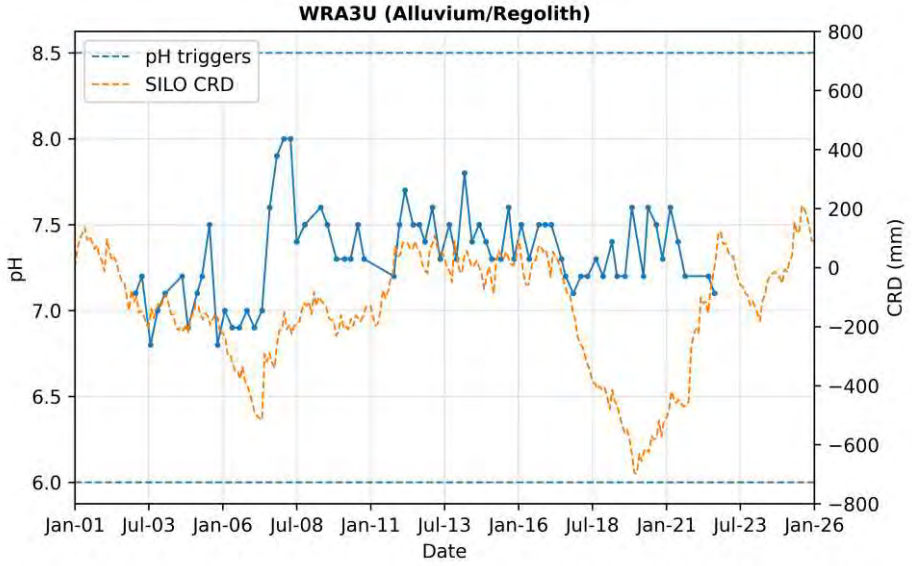

WRA1L (Warkworth/Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

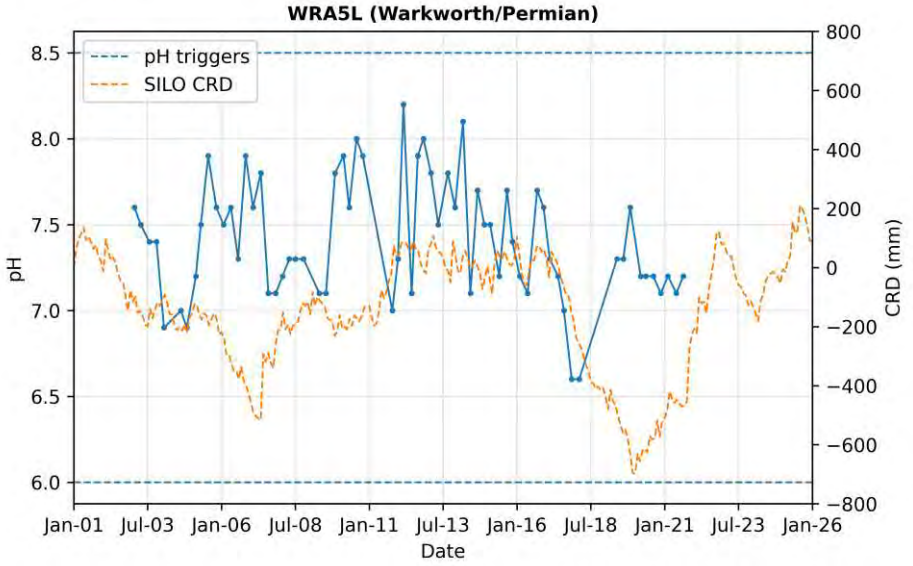

WRA1U (Alluvium/Regolith)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

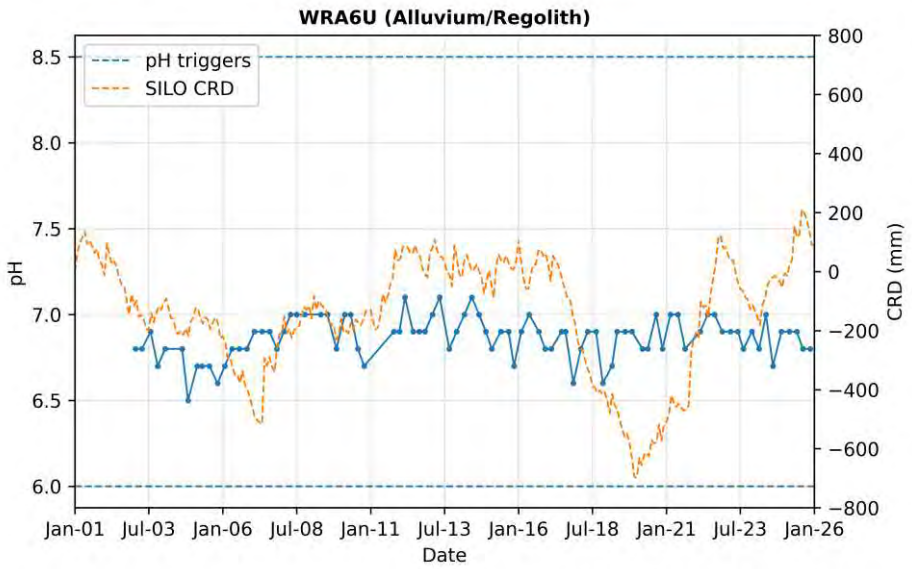

WRA2L (Warkworth/Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26
8.5 8.0 7.5 7.0 6.5 6.0
800 600 400 200 0 −200 −400 −600 −800

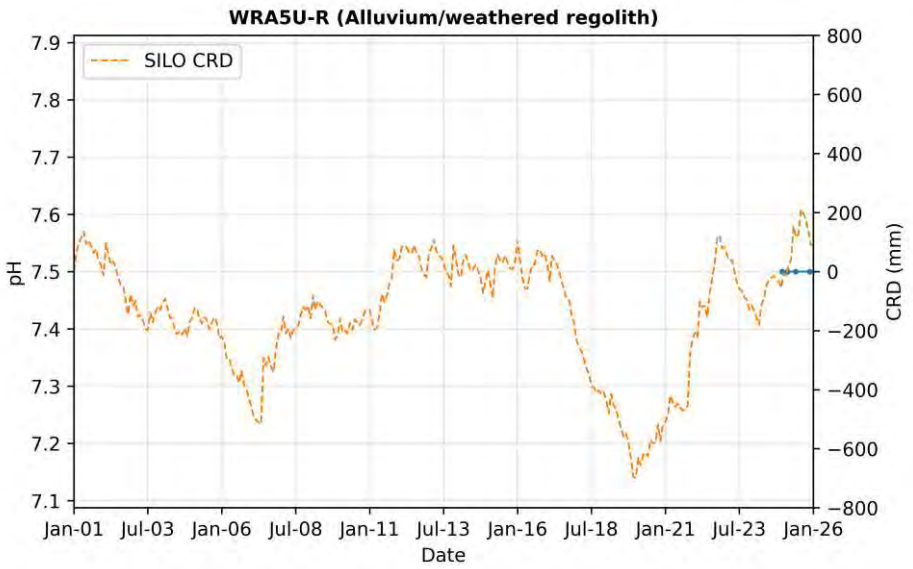

WRA3L-R (Permian)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

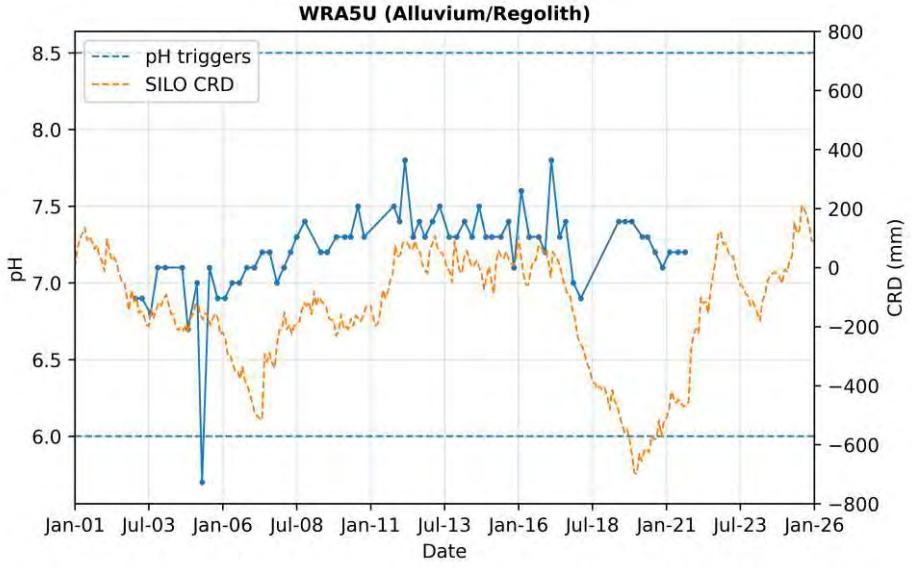

WRA5L-R (Permian)
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26

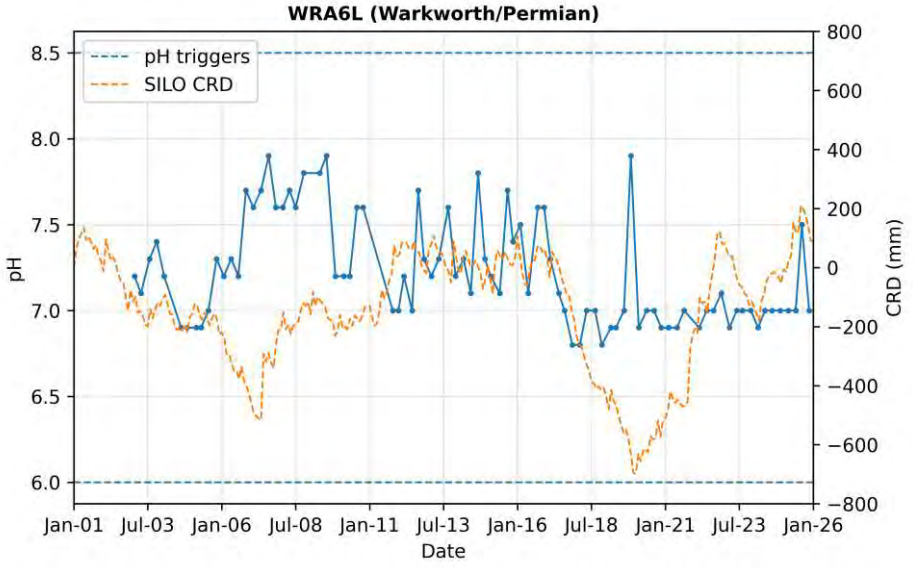

WRA3U (Alluvium/Regolith)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


WRA5L (Warkworth/Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01
Jul-03
Jan-06
Jul-08
Jan-11
Jul-13
Jan-16
Jul-18
Jan-21
Jul-23
Jan-26


WRA6U (Alluvium/Regolith)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


WRA5U-R (Alluvium/weathered regolith)
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


WRA5U (Alluvium/Regolith)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26


WRA6L (Warkworth/Permian)
pH triggers
SILO CRD
pH
CRD (mm)
Date
Jan-01 Jul-03 Jan-06 Jul-08 Jan-11 Jul-13 Jan-16 Jul-18 Jan-21 Jul-23 Jan-26

Appendix E

Water quality laboratory results

Bore ID	pH Field				EC Field (µS/cm)				Total Dissolved Solids (mg/L)				Dissolved Iron (mg/L)				Sulfate as SO4 (mg/L)				Chloride (mg/L)			
	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean
3500C500L	7.5	6.9	7.6	7.4	3820	3290	7260	4323	2200	1960	2710	2361	0.75	0.05	0.75	0.22	33	6.7	823	99	570	21	876	573
3500C500U	7.3	6.8	7.7	7.2	5610	726	12160	4796	3200	1220	7600	3086	0.05	0.05	1.52	0.41	110	15.6	389	123	1300	8	3400	959
4500F000	6.9	6.3	7.2	6.7	8540	1300	9650	5112	5100	5070	6380	5519	0.07	0.05	0.29	0.17	370	22.8	1070	398	2300	30	3058	2039
5000D000-R	7.5	7.4	7.9	7.6	4500	4240	5210	4490	2900	2780	3100	2927	0.37	0.09	0.37	0.19	730	680	730	698	690	470	690	558
6000C000L-R	8.4	8.3	8.4	8.4	4760	4530	4790	4682	2800	2800	2800	2800	0.05	0.05	0.05	0.05	37	37	37	37	770	770	770	770
6500F500L	7.2	6.1	7.6	6.9	2570	1170	3990	2060	1400	705	2250	1565	0.05	0.05	0.18	0.08	110	1	110	37	360	135	967	529
6500F500M	7.2	6	7.5	7.1	2670	1126	3390	2351	1400	1090	1970	1584	0.05	0.05	0.13	0.06	41	26	45	40	350	210	710	480
6500F500U	6.8	6.6	7.1	6.8	5080	4750	6180	5457	2700	2700	3290	3146	1	0.07	1	0.45	130	130	260	189	1100	1100	1458	1353
6500F625	7	6.4	7.4	6.9	4190	987	6810	4890	2200	1740	2540	1995	0.05	0.05	0.13	0.07	36	36	142	92	890	636	1030	767
7500F000	7.8	6.2	8	7.1	6290	955	6500	3954	4000	2450	5690	3838	0.05	0.05	0.87	0.23	4.1	1	519	50	790	1	1020	710
GDE Bore Deep	6.8	6.8	7.5	7.2	12850	10710	12920	11930	7700	7700	7700	7700	0.8	0.8	0.8	0.80	350	350	350	350	3700	3700	3700	3700
Melody	6.8	6.8	7.3	7.0	6280	802	6280	2950	3400	444	3500	1491	0.05	0.05	0.3	0.08	160	19	160	60	1600	17	1600	501
MPBH1	6.9	6.4	7.8	7.0	604	451	970	561	330	255	392	319	0.05	0.05	0.05	0.05	26	14	42	22	48	19	63	34
MPBH1-C	8.6	7.2	8.8	8.2	1426	532	1596	1151	830	314	1740	644	0.05	0.05	0.15	0.06	58	12	113	48	130	32	130	60
MPBH1-HR	7.8	7.3	8.8	7.9	1713	531	2020	1549	1200	320	2170	1061	0.07	0.05	0.07	0.05	100	20	344	141	78	28	101	69
MPBH2	6.8	6.3	7.6	6.9	1222	740	1291	892	730	438	820	555	0.05	0.05	0.05	0.05	69	32	69	45	83	36	98	57
MPBH2-C	7.4	7.1	12.3	9.6	1363	861	4220	1629	830	544	1440	837	0.05	0.05	0.12	0.06	78	58	102	70	100	68	320	159
MPBH2-HR	7.7	7	11.2	8.2	1113	833	1886	1366	660	402	1290	721	0.05	0.05	0.05	0.05	72	20	73	56	100	65	178	116
MPBH3b	7.7	7.1	8.2	7.6	5280	2510	7260	4394	3100	1700	3960	2407	0.05	0.05	0.05	0.05	200	23	1040	186	1400	62	1630	813
MPBH4	6.9	6.8	7.1	7.0	5290	5030	6410	5700	3700	2800	4370	3605	0.05	0.05	0.79	0.43	330	216	356	311	1600	1110	1600	1378
MPBH4-C	8	7.4	8.4	7.9	4820	3440	5090	4300	2700	1880	2900	2226	0.05	0.05	1.05	0.32	110	32	110	69	1200	735	1200	894
MPBH4-HR	7.4	7.2	8.3	7.4	5450	3390	6210	5599	3900	3900	3930	3915	0.05	0.05	0.05	0.05	70	63	70	67	350	350	409	380
MPBH5-C	10.5	9.1	12.2	10.4	834	598	3090	944	420	420	906	550	0.05	0.05	0.05	0.05	76	26	76	56	97	90	220	134
MPBH5-HR	7.4	7.4	7.6	7.5	813	772	1149	866	440	432	528	463	0.14	0.13	0.2	0.15	34	22	34	25	67	42	67	49
MPBH6	7	7	7.2	7.1	1274	873	1310	1145	770	552	896	705	0.05	0.05	0.05	0.05	52	41	55	48	210	114	210	157
MPBH6-C	7.2	7	8	7.5	3770	2500	7450	5161	2200	1900	4700	3908	0.05	0.05	0.18	0.12	20	1	52	17	420	290	846	667
MPBH6-HR	7.4	7	7.4	7.3	6150	1341	6410	4250	4000	719	4070	2967	0.05	0.05	1.81	0.31	40	1	40	25	700	184	745	527
MPBH7	7.1	6.8	7.3	7.1	7630	6690	14450	11263	4600	4600	8640	6798	0.05	0.05	0.5	0.13	150	150	311	236	2300	2300	3710	3143
MPBH7-C	7.1	7	7.8	7.3	10220	9910	12060	10678	6100	6050	8330	7092	0.9	0.05	0.9	0.16	190	1	230	113	2800	925	2970	1998
WRA1L	7.1	6.9	8	7.4	3120	2650	4770	3576	1800	1600	2420	1993	0.05	0.05	0.05	0.05	63	61	796	140	520	21	843	569
WRA3L-R	7.5	7.4	7.6	7.5	7500	6120	8110	7362	5000	5000	5000	5000	0.05	0.05	0.05	0.05	1300	1300	1300	1300	1200	1200	1200	1200
WRA5L-R	7.4	6.9	7.4	7.2	5070	4800	5320	5120	3300	3300	3300	3300	0.05	0.05	0.05	0.05	170	170	170	170	890	890	890	890
WRA5U-R	7.5	7.5	7.5	7.5	5980	5980	6230	6118	3800	3800	3800	3800	0.05	0.05	0.05	0.05	440	440	440	440	1500	1500	1500	1500
WRA6L	7	6.8	7.9	7.3	6670	4510	7290	5827	4000	2700	4070	3534	0.05	0.05	0.05	0.05	320	170	1030	274	1600	23	1810	1333
WRA6U	6.9	6.5	7.1	6.9	8430	1080	13290	10207	5000	4060	7230	5950	0.05	0.05	2.5	0.37	260	220	2940	487	2200	24	3280	2531

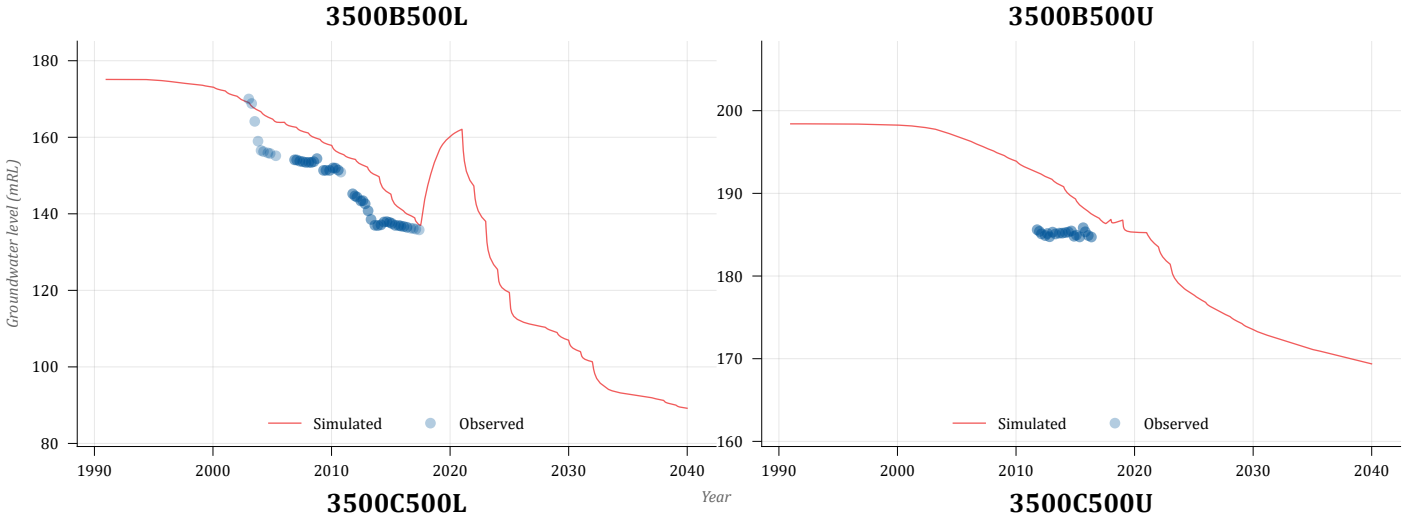
Note: min, max, and mean represent the minimum, maximum, and average values of the parameter across all available data.

Bore ID	Calcium (mg/L)				Magnesium (mg/L)				Potassium (mg/L)				Sodium (mg/L)				Carbonate Alkalinity as CaCO3 (mg/L)				Bicarbonate Alkalinity as CaCO3 (mg/L)			
	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean	25-Q2	min	max	mean
3500C500L	5.1	5.1	712	75	5.4	4	908	96	3.6	0.05	866	78	870	8	966	739	20	0	74	10	1300	774	1300	1164
3500C500U	32	10	626	87	87	21	536	116	9.1	0.74	682	66	1200	6	2200	862	20	0	24	4	1400	546	1600	1036
4500F000	57	51	2440	367	270	170	1100	368	10	0.08	1430	131	1200	9	1630	1201	20	0	20	2.3	1300	940	1360	1241
5000D000-R	28	19	28	23	50	18	50	31	10	8	12	10	1000	907	1000	946	20	1	20	13.7	1000	783	1000	884
6000C000L-R	6.4	6.4	6.4	6	4.3	4.3	4.3	4	3.9	3.9	3.9	4	1100	1100	1100	1100	110	110	110	110.0	1300	1300	1300	1300
6500F500L	31	30	44	36	51	26	54	40	5.9	5.9	26	12	480	100	789	499	10	0	20	2.4	810	261	966	677
6500F500M	32	32	65	42	54	29	130	56	6	6	25	11	470	180	628	477	10	0	20	2.4	890	545	890	756
6500F500U	120	110	130	117	220	200	260	235	11	10	15	13	640	540	750	673	10	0	20	3.4	790	790	866	832
6500F625	91	69	102	84	180	136	180	154	12	7	12	9	540	416	540	471	20	1	20	4.8	930	670	930	803
7500F000	4.2	4.2	878	105	3.1	2	257	59	3.4	0.05	512	48	1600	11	1690	1172	20	0	62	6.2	2600	301	2700	1869
GDE Bore Deep	140	140	140	140	340	340	340	340	24	24	24	24	2200	2200	2200	2200	10	10	10	10.0	1300	1300	1300	1300
Melody	150	46	150	82	300	49	300	120	10	4	10	7	730	62	730	271	10	1	20	3.8	1000	409	1000	614
MPBH1	54	24	72	44	27	20	45	26	1.6	0.05	22	3	30	2	32	25	10	0	20	1.9	220	185	260	209
MPBH1-C	8.2	2	54	27	4.2	1	24	13	0.9	0.9	4	2	320	31	320	161	42	1	42	10.6	560	232	560	363
MPBH1-HR	7.5	7.5	43	18	3	3	20	8	1	1	2	2	400	34	400	275	20	1	20	6.2	750	208	750	460
MPBH2	110	43	110	73	64	32	72	46	0.8	0.05	28	3	58	1	68	36	10	0	20	1.9	370	262	460	316
MPBH2-C	38	2	97	39	25	1	59	21	2.1	0.9	2.1	1	260	74	518	245	10	1	573	141.6	580	1	580	256
MPBH2-HR	76	2	85	38	54	1	54	21	2.1	1	4	2	99	48	339	166	20	1	79	26.3	390	9	566	328
MPBH3b	93	39	707	105	140	49	887	126	3.6	0.05	687	41	960	3	1060	672	20	0	56	7.3	950	615	1010	807
MPBH4	260	225	350	270	200	179	229	206	4.8	4.8	7	6	670	488	713	665	20	1	20	4.8	660	660	831	750
MPBH4-C	13	6	146	63	8.5	5	101	39	2.4	2	5	3	1100	381	1100	714	20	1	20	7.1	790	467	800	643
MPBH4-HR	13	13	19	16	9.6	8	9.6	9	3.2	3	3.2	3	1300	1220	1300	1260	20	1	20	10.5	1600	1520	1600	1560
MPBH5-C	7.2	4	70	18	1.4	1	21	3	1.9	1.9	8	4	160	142	260	181	150	41	222	105.3	20	1	160	49
MPBH5-HR	53	48	64	52	30	28	31	29	1.7	1	2	2	86	81	96	88	20	1	20	5.2	350	346	381	360
MPBH6	89	66	89	80	59	43	59	52	0.8	0.8	1	1	95	76	102	92	20	1	20	5.2	330	322	444	378
MPBH6-C	31	9	31	16	19	5	19	10	6.4	4	7	5	860	700	1860	1508	20	1	39	9.4	1600	1200	3280	2481
MPBH6-HR	19	19	74	38	14	12	55	26	7.9	3	9	7	1500	140	1700	1083	20	1	63	12.1	2600	485	3000	2015
MPBH7	11	11	35	23	320	320	589	496	28	28	38	33	1200	1200	2000	1705	20	1	20	7.3	910	910	1690	1385
MPBH7-C	15	15	21	18	280	24	321	159	26	20	27	23	2000	1700	2990	2361	20	1	20	5.2	1400	1220	4520	2789
WRA1L	20	16	161	32	130	103	664	181	11	0.05	14	11	500	14	687	500	20	0	20	2.3	930	768	1110	936
WRA3L-R	41	41	41	41	31	31	31	31	12	12	12	12	1700	1700	1700	1700	10	10	10	10.0	1300	1300	1300	1300
WRA5L-R	45	45	45	45	160	160	160	160	13	13	13	13	980	980	980	980	20	20	20	20.0	1700	1700	1700	1700
WRA5U-R	11	11	11	11	270	270	270	270	18	18	18	18	990	990	990	990	20	20	20	20.0	740	740	740	740
WRA6L	31	22	196	42	310	180	1050	314	17	0.14	19	16	1000	16	1100	882	20	0	20	2.3	1000	871	1750	1116
WRA6U	16	16	533	64	450	409	1480	608	28	0.08	51	33	1200	33	1640	1321	20	0	20	2.2	1600	1220	1770	1528

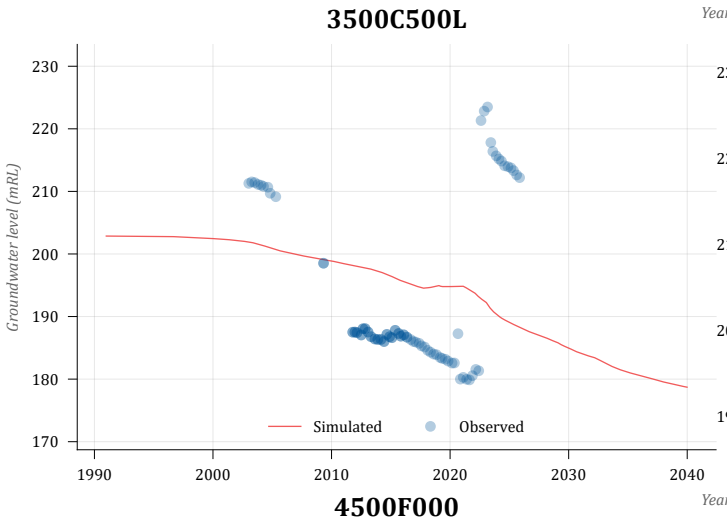
Note: min, max, and mean represent the minimum, maximum, and average values of the parameter across all available data.

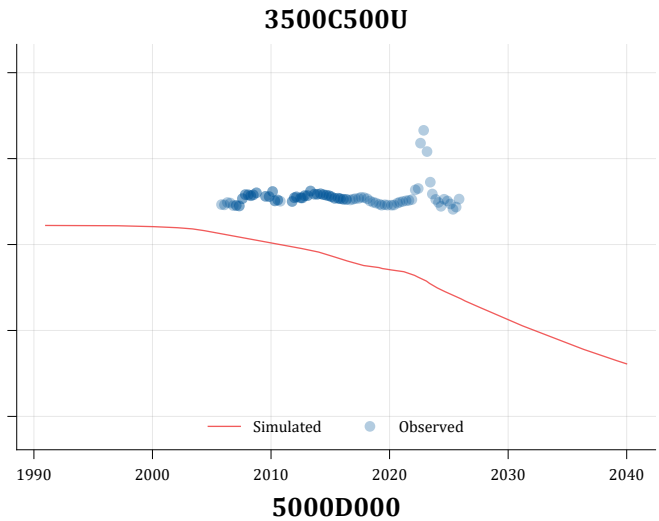
Appendix F

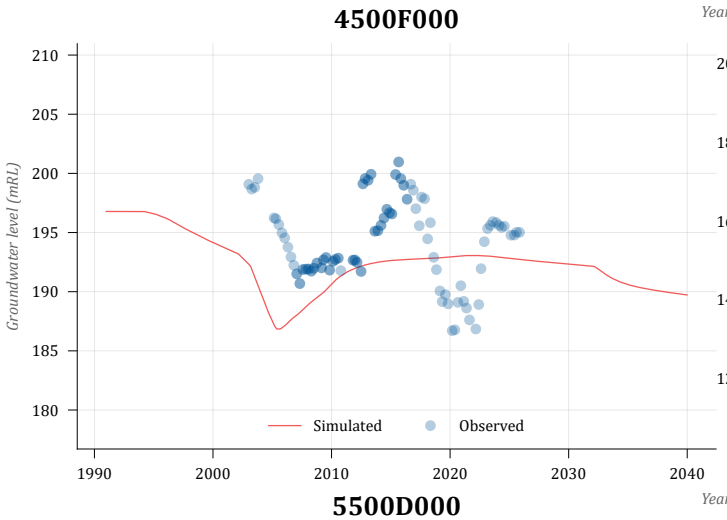
Model-data comparison hydrographs

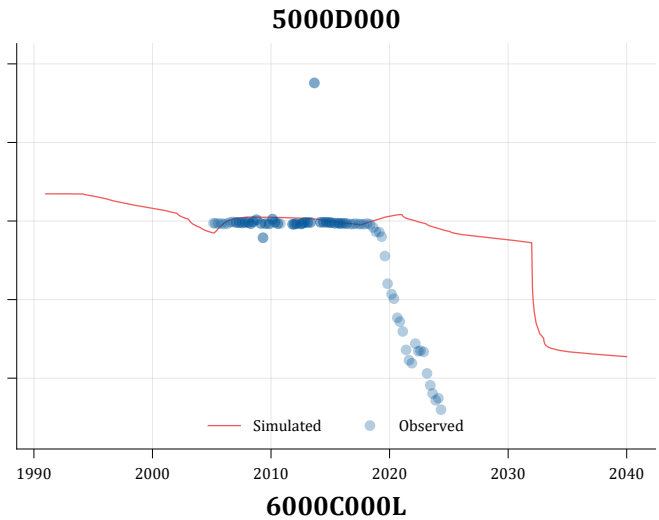

3500B500L
Groundwater level (mRL)
Simulated
Observed
Year

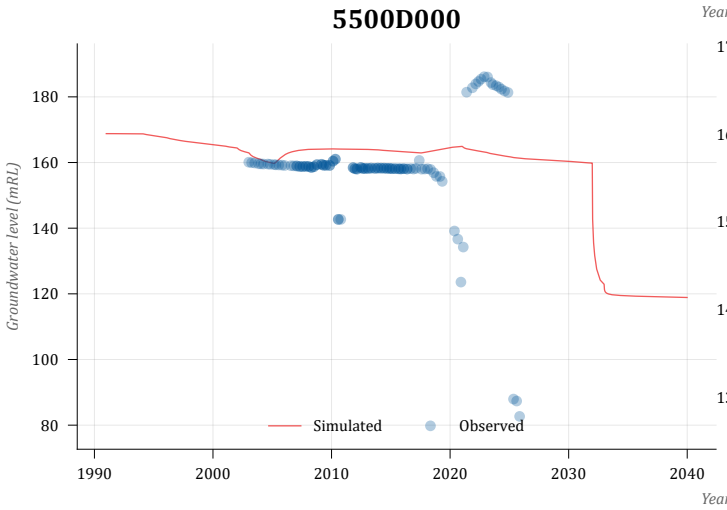
3500B500U
Simulated
Observed

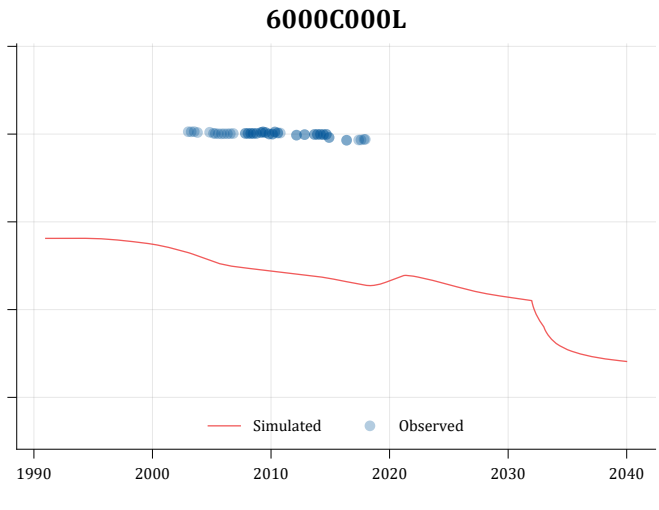

3500C500L
Groundwater level (mRL)
Simulated
Observed
Year

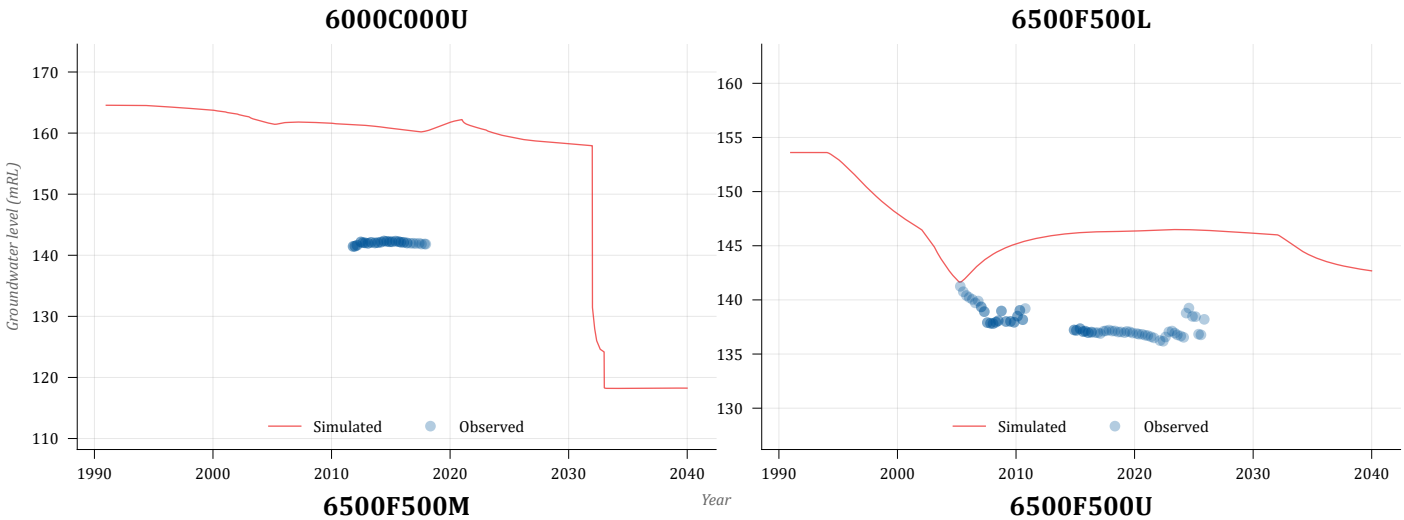

3500C500U
Simulated
Observed


4500F000
Groundwater level (mRL)
Simulated
Observed
Year

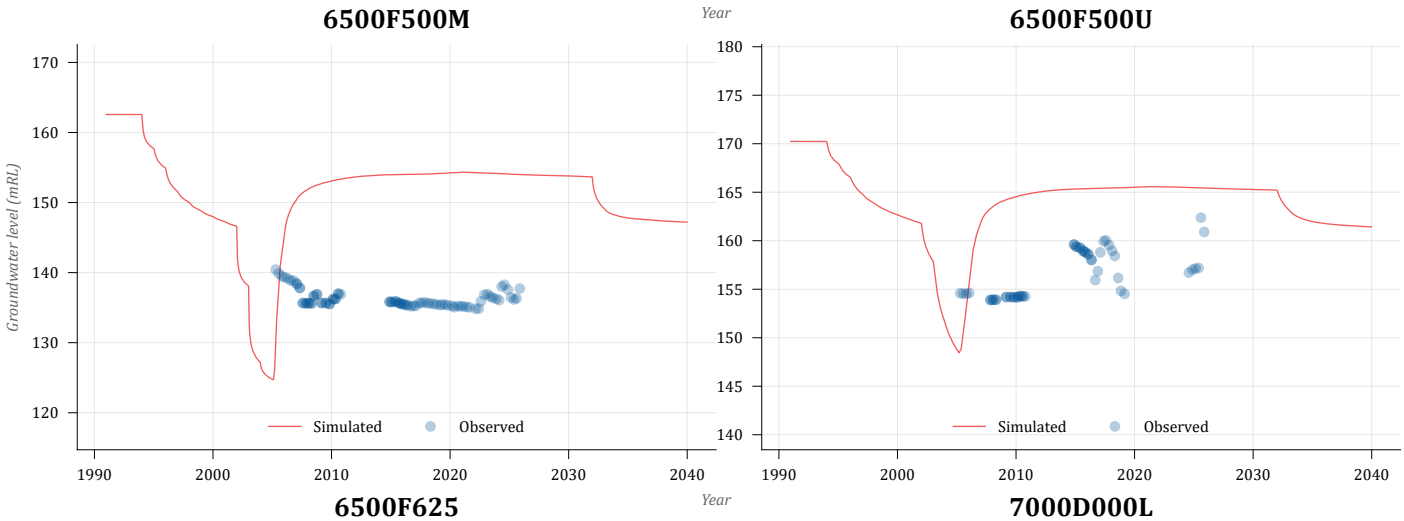

5000D000
Simulated
Observed


5500D000
Groundwater level (mRL)
Simulated
Observed
Year

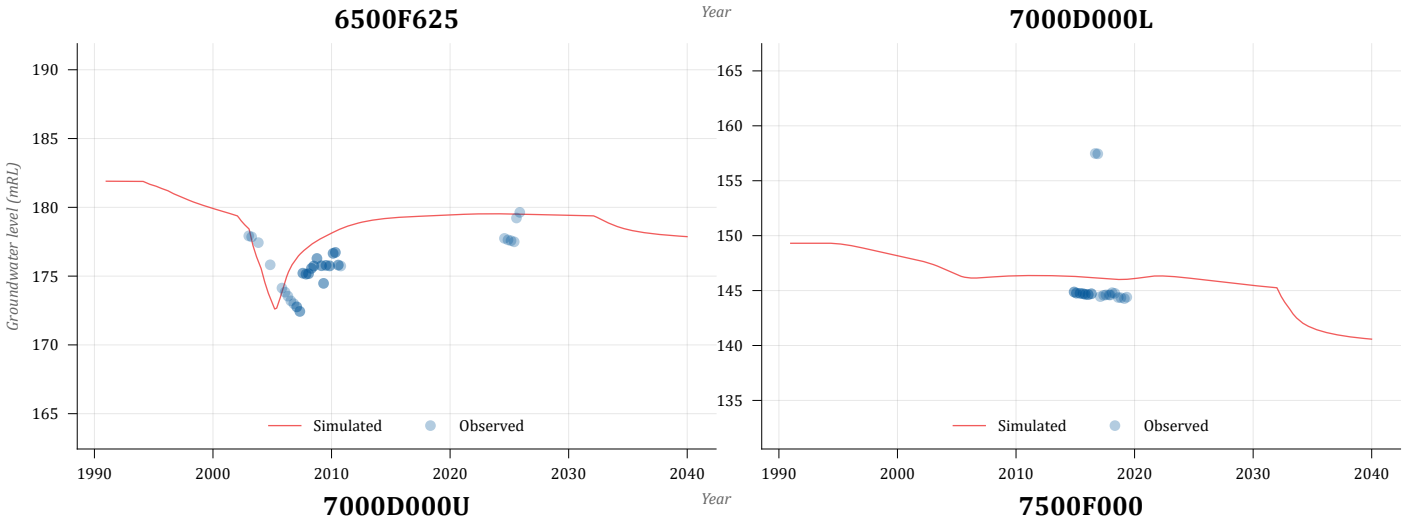

6000C000L
Simulated
Observed


6000C000U
Groundwater level (mRL)
Simulated
Observed
Year

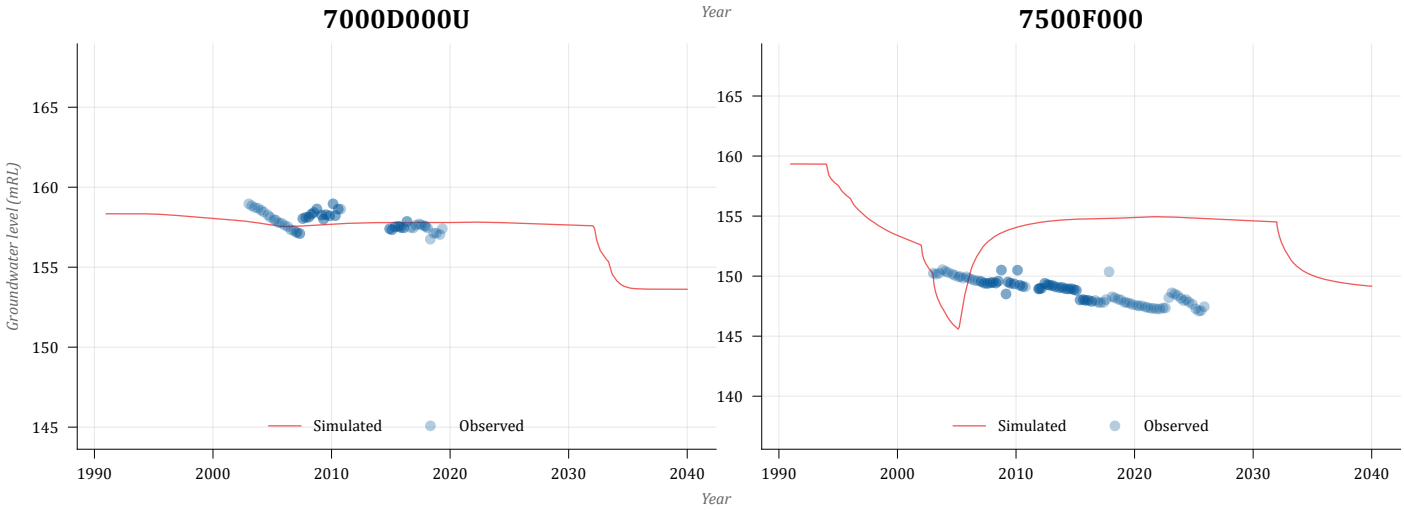
6500F500L
Groundwater level (mRL)
Simulated
Observed
Year


6500F500M
Groundwater level (mRL)
Simulated
Observed
Year

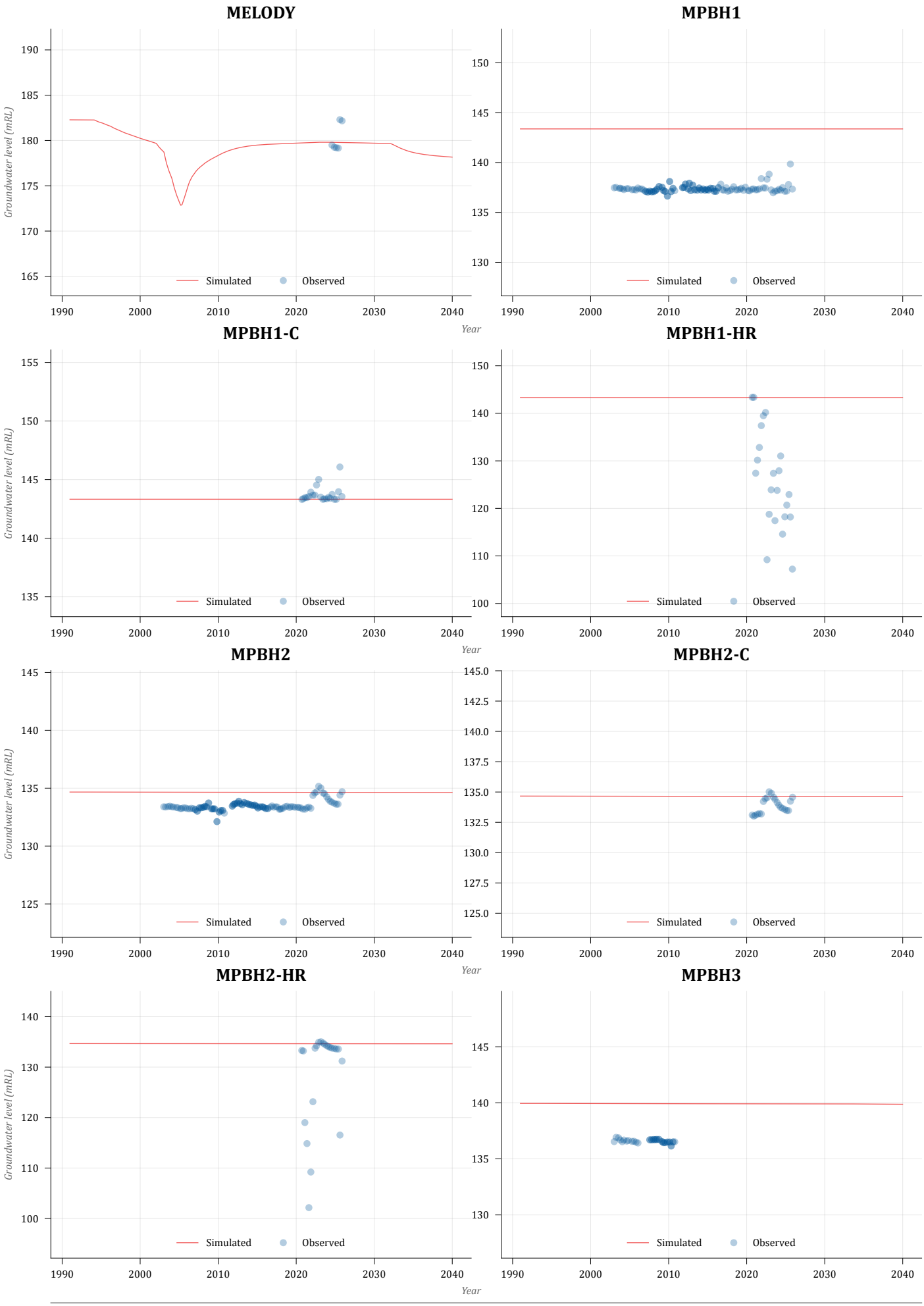
6500F500U
Groundwater level (mRL)
Simulated
Observed
Year

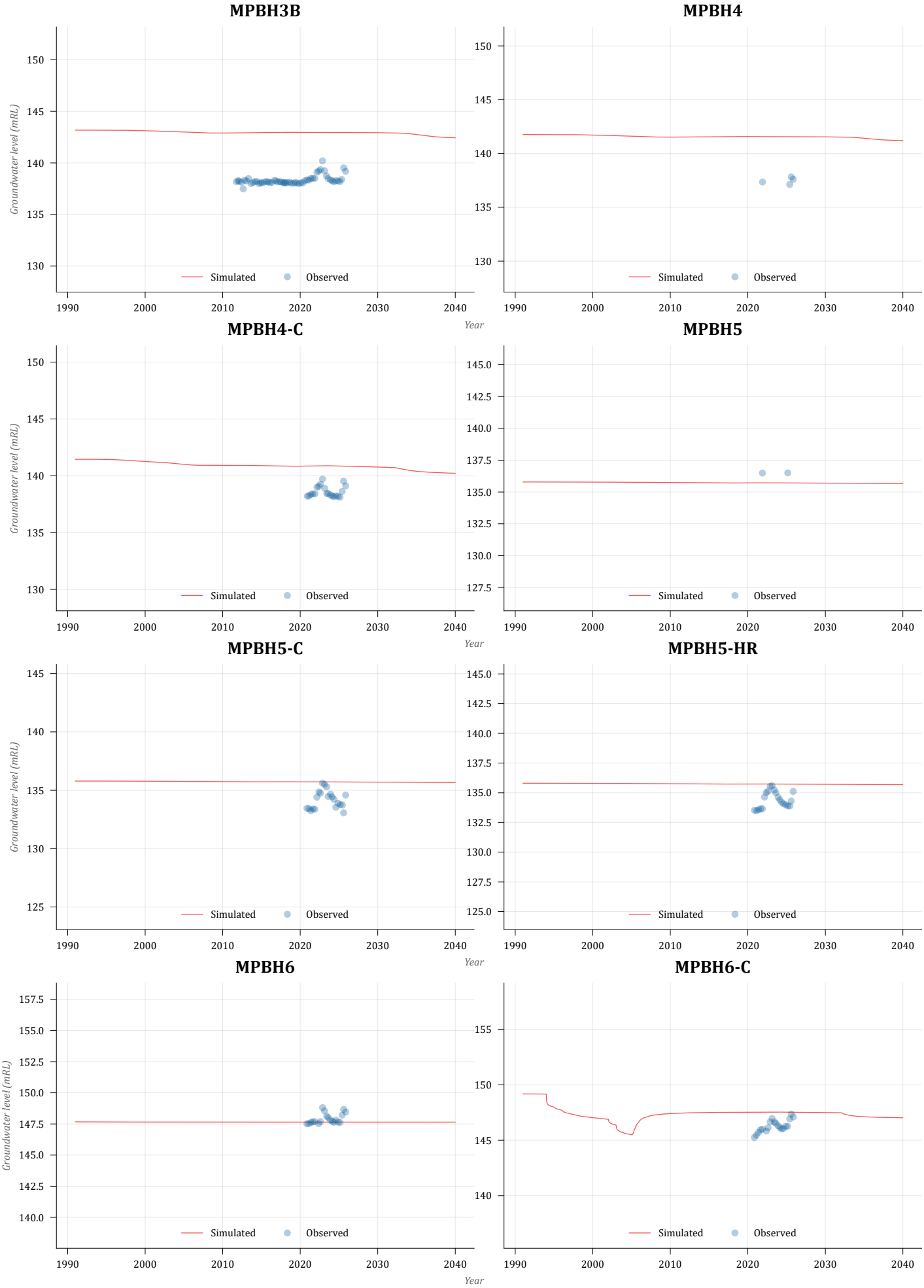

6500F625
Groundwater level (mRL)
Simulated
Observed
Year

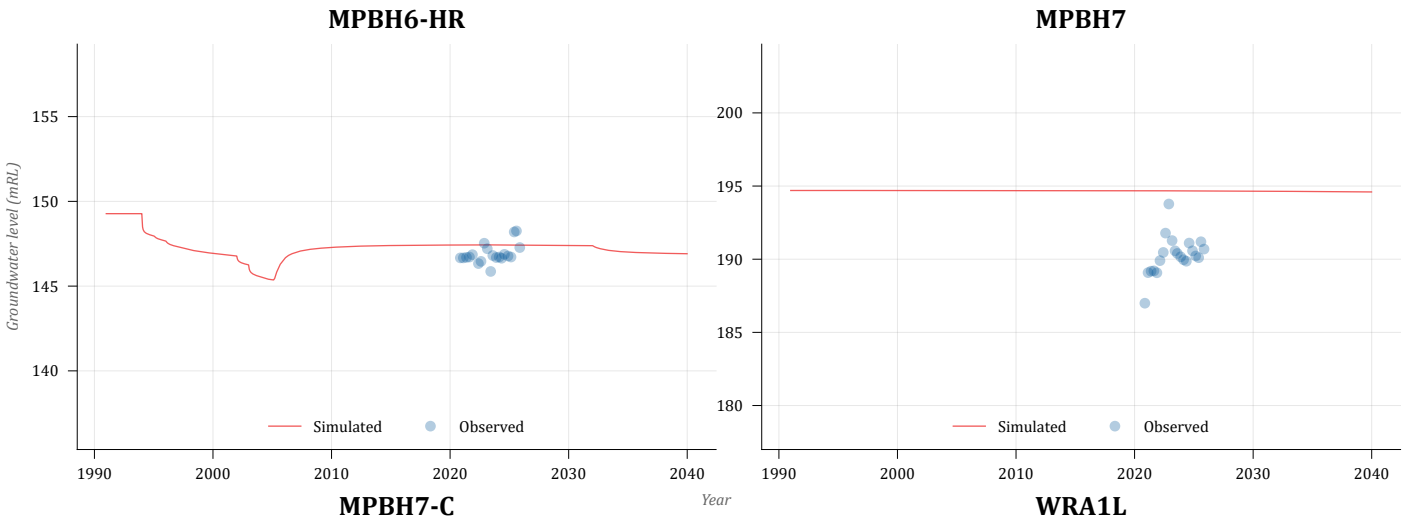
7000D000L
Groundwater level (mRL)
Simulated
Observed
Year


7000D000U
Groundwater level (mRL)
Simulated
Observed
Year

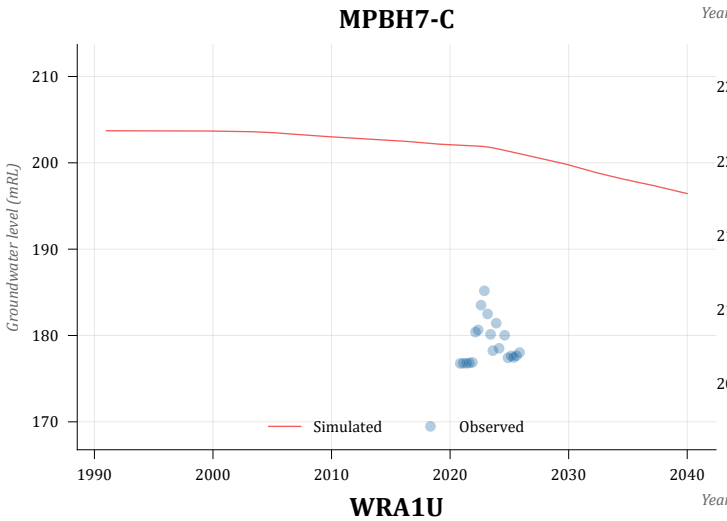
7500F000
Groundwater level (mRL)
Simulated
Observed
Year

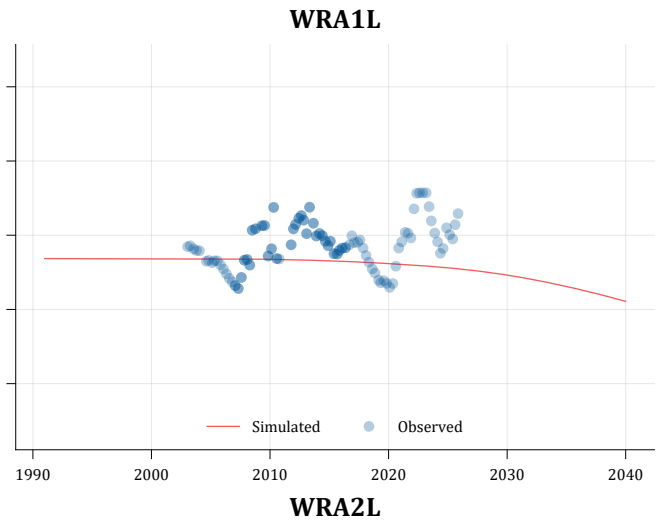

MELODY
MPBH1
MPBH1-C
MPBH1-HR
MPBH2
MPBH2-C
MPBH2-HR
MPBH3
Groundwater level (mRL)
Year
Simulated
Observed

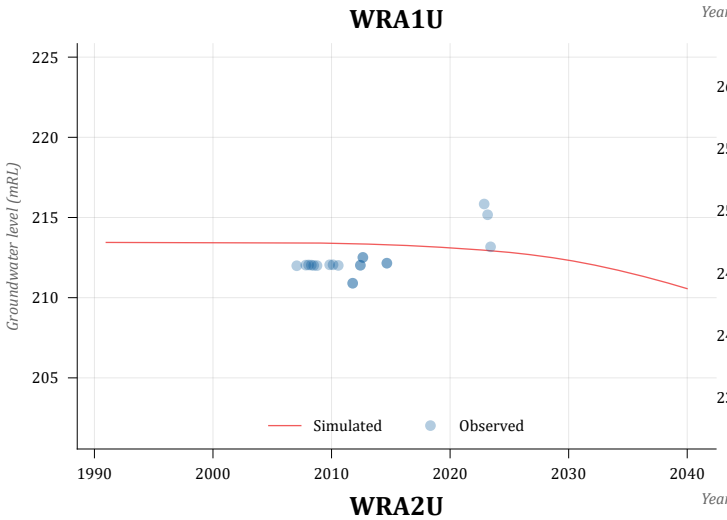

MPBH3B
MPBH4
MPBH4-C
MPBH5
MPBH5-C
MPBH5-HR
MPBH6
MPBH6-C
Groundwater level (mRL)
Year
Simulated
Observed

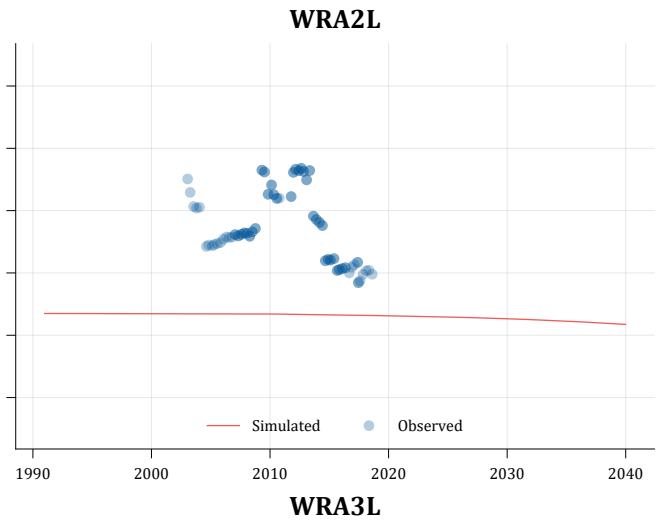

MPBH6-HR
Groundwater level (mRL)
155
150
145
140
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

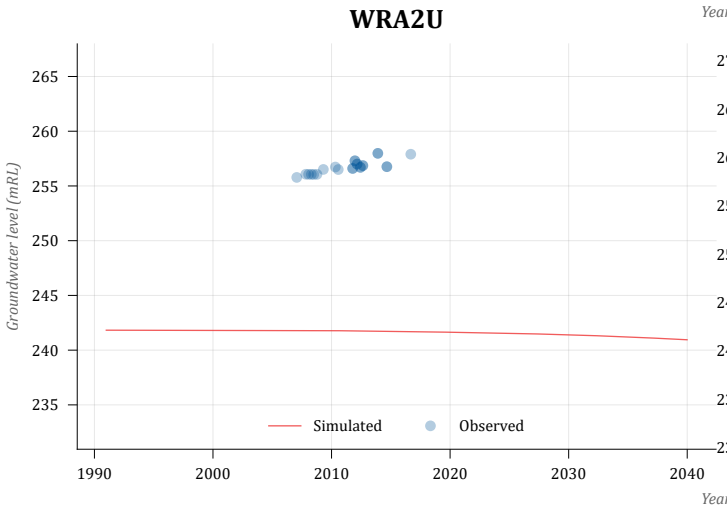
MPBH7
200
195
190
185
180
Simulated
Observed
1990
2000
2010
2020
2030
2040

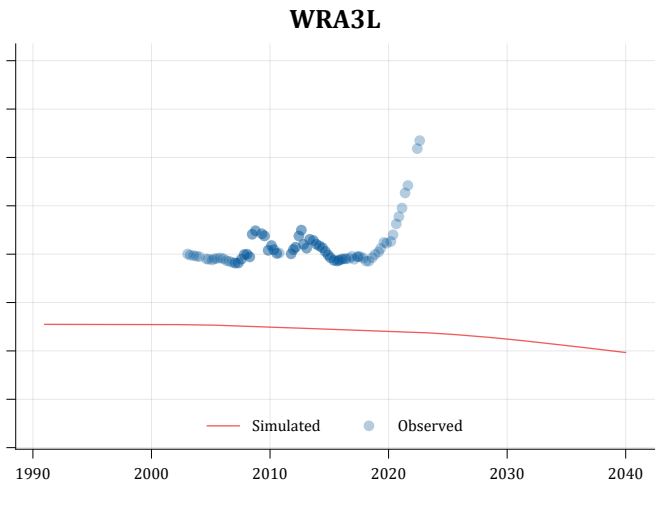

MPBH7-C
Groundwater level (mRL)
210
200
190
180
170
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

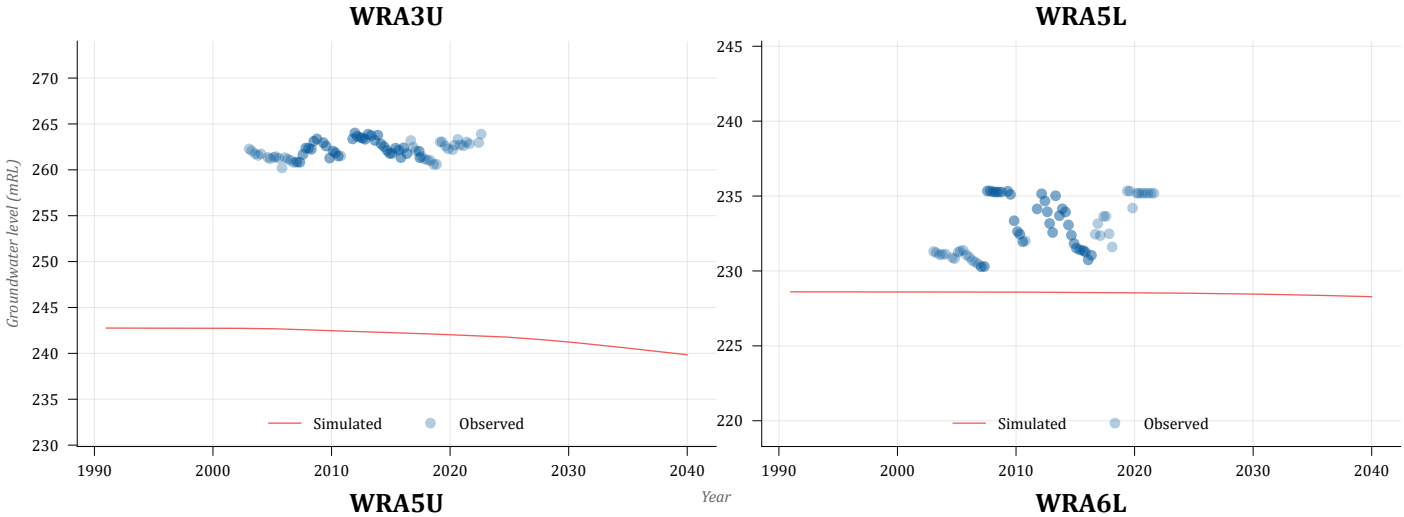

WRA1L
225
220
215
210
205
Simulated
Observed
1990
2000
2010
2020
2030
2040


WRA1U
Groundwater level (mRL)
225
220
215
210
205
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

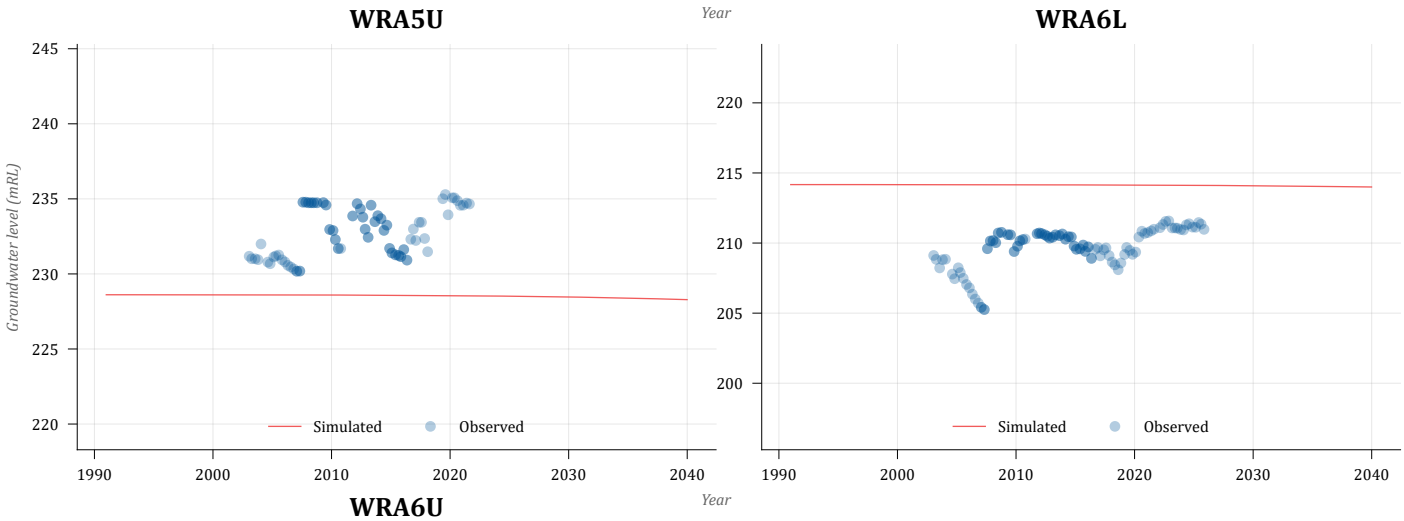

WRA2L
260
255
250
245
240
235
Simulated
Observed
1990
2000
2010
2020
2030
2040


WRA2U
Groundwater level (mRL)
265
260
255
250
245
240
235
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

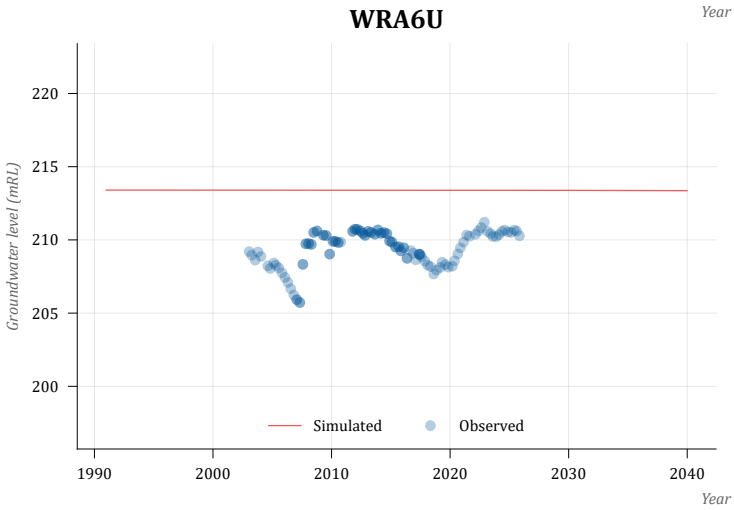

WRA3L
270
265
260
255
250
245
240
235
230
Simulated
Observed
1990
2000
2010
2020
2030
2040


WRA3U
Groundwater level (mRL)
270
265
260
255
250
245
240
235
230
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

WRA5L
245
240
235
230
225
220
Simulated
Observed
1990
2000
2010
2020
2030
2040


WRA5U
Groundwater level (mRL)
245
240
235
230
225
220
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

WRA6L
220
215
210
205
200
Simulated
Observed
1990
2000
2010
2020
2030
2040


WRA6U
Groundwater level (mRL)
220
215
210
205
200
Simulated
Observed
1990
2000
2010
2020
2030
2040
Year

MOUNT PLEASANT OPERATION

MOUNT PLEASANT OPTIMISATION PROJECT

EPBC APPROVAL 2020/8735

2025/2026 ANNUAL COMPLIANCE REPORT

Attachment 2

Schedule of Plans

Mount Pleasant Operation - EPBC Approval (2020/8735) EMP Register
21/11/2026

Plan	EPBC Condition Number	State Development Consent[1] Condition Number	Version Number (Latest Approved)	Latest Submission Date	Latest Approval Date	Due Date for Next Review
Biodiversity Management Plan	5	B63	2	11 August 2025	5 November 2024	11 August 2027
Rehabilitation Management Plan	5	B92	4	4 June 2026	-	11 August 2027
Rehabilitation Strategy	5	B89	4	18 July 2025	23 July 2025	-
Water Management Plan	8, 9, 19	B52	3	11 August 2025	7 February 2025	11 August 2027
Impact Response Plan	14	-	Not yet triggered[2]	-	-	As required

Notes

1 SSD-10418 issued under the NSW *Environmental Planning and Assessment Act 1979*.

2 MACH Energy Australia Pty Ltd (MACH) has not yet predicted or detected a reaching of a performance measure as defined under the conditions of EPBC 2020/8735. On this basis, the need to prepare an Impact Response Plan has not yet been triggered.