

**LUDDENHAM OPERATIONS PTY LTD
LUDDENHAM QUARRY**

DA 315-7-2003 (MOD 5) ANNUAL REVIEW

23 SEPTEMBER 2025

Luddenham Operations Pty Ltd
Annual Review for the Luddenham Quarry
DA 315-7-2003 (MOD 5), Schedule 6, Condition 5

REVISIONS

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CONTENTS

1	INTRODUCTION	5
2	CONDITIONS OF CONSENT	5
3	ANNUAL REVIEW CONDITIONS REQUIREMENTS	7
3.1	Mining, exploration and geoscience reporting	7
3.2	Stakeholder consultation	8
3.3	Waste management	8
3.4	Traffic and material movement procedures	8
3.4.1	Amendments to statutory approvals	8
3.4.2	Total material haulage during the reporting period	8
3.4.3	Summary of heavy vehicle movements	9
3.4.4	Summary of complaints or incidents	9
3.4.5	Non-compliance and remedial actions	9
3.4.6	Discrepancies between predicted and actual impacts of operations and potential cause	9
3.4.7	Summary of management actions to be implemented	9
3.5	Development and rehabilitation	10
3.5.1	Geotechnical site inspection	10
3.6	Environmental monitoring	10
3.6.1	Water	10
3.6.2	Air quality	18
3.6.3	Noise	20
3.7	Complaints	20
3.8	Incidents	21
3.9	Proposed mitigation measures	21
3.10	Report and document availability	21
3.10.1	Compliance against Schedule 6, Condition 15 (a)	21
3.11	Compliance against Schedule 6, Condition 15 (b)	24
4	SUMMARY OF RESULTS	24

APPENDICES

APPENDIX A – NEW SOUTH WALES GOVERNMENT REVENUE

APPENDIX B – MATERIAL TRANSPORTATION REGISTER

APPENDIX C – DEVELOPMENT AND REHABILITATION

APPENDIX D – WATER MONITORING REPORTS

APPENDIX E – WATER BALANCE REPORT

APPENDIX F – AIR QUALITY MONITORING REPORTS

APPENDIX G – NOISE MONITORING REPORTS

LIST OF TABLES

Table 1-1: Condition of Consent and location within the Annual Review.....	5
Table 3-1: Lease details	7
Table 3-2: Royalty (1 July 2024 – 31 December 2024)	7
Table 3-3: Stakeholder consultation	8
Table 3-4: Surface water assessment criteria and trigger values.....	11
Table 3-5: Ground water assessment criteria and trigger values.....	12
Table 3-6: Overview of water completed monitoring.....	14
Table 3-7: Summary of water use September 2024 – August 2025	17
Table 3-8: Summary of dust monitoring results September 2024 – August 2025	18
Table 3-9: Sensitive receivers’ locations	20
Table 3-10: Schedule 3, Condition 2 requirements.....	21
Table 3-11: Statutory approvals	23
Table 3-12: Strategies, plans and programs	23
Table 3-13: Summary of monitoring results.....	23
Table 3-14: Complaints register.....	23
Table 3-15: Complaints register.....	24
Table 3-16: Other matters required by the Planning Secretary	24
Table 3-17: Independent Environmental Audit	24
Table 4-1: Summary of monitoring results September 2024 - August 2025	24

LIST OF FIGURES

Figure 3-1: A summary of the truckloads exporting material from the site.....	9
Figure 3-2: Dust Deposition Gauge Results	19

1 INTRODUCTION

Luddenham Operations Pty Ltd operates the shale/clay quarry (the site), which is approved to extract and transport up to 300,000 tonnes (t) per annum of clay and shale products in accordance with State Significant Development Consent DA 315-7-2003 (MOD 5). The site is located at 275 Adams Road, Luddenham, NSW and operates in accordance with the Environmental Protection Licence (EPL) 21562.

In accordance with Schedule 6, Condition 5 of DA 315-7-2003 (MOD 5), this Annual Review assesses the environmental performance of the site between the reporting period of 1 September 2024 to 31 August 2025.

Quarry extraction ceased in late December 2024, and site rehabilitation has been undertaken since January 2025 in accordance with the Site Rehabilitation Strategy outlined in the Site Rehabilitation Plan. Construction of a new recycling facility (SSD-10446) immediately north of the quarry commenced in May 2025.

As part of the rehabilitation works, the following key activities were carried out during the reporting period:

- Clayey soils stripped from the adjacent recycling facility site were stockpiled in the base of the quarry. This material will be used in the future to line the quarry base as part of rehabilitation activities.
- Previously stockpiled overburden materials were progressively removed from the eastern side of the quarry to make room for future rehabilitation activities.

2 CONDITIONS OF CONSENT

Table 2-1: Condition of Consent and location within the Annual Review

Schedule	Conditions	Description	Report Location
Schedule 3	8	The Applicant must provide annual production data to the [Regional NSW – Mining, Exploration and Geoscience] MEG, in the manner required, on the standard form supplied for that purpose. These data are also to be included in the Annual Review.	Section 3.1
Schedule 4	11	The Applicant must regularly consult with adjoining property owners to ensure property management issues including maintenance of common fences, weed control measures, and bushfire management are coordinated. Details of this consultation are to be reported in the Annual Review.	Section 3.2
Schedule 4	21B	The Applicant must report on water extracted from the site each year (direct and indirect) in the Annual Review, including water taken under any water licence.	Section 3.63.6.1 (vi)
Schedule 4	30(e)	Report on waste minimisation and management in the Annual Review.	Section 3.3
Schedule 4	42(b)	Procedures for monitoring of product transport, including keeping of accurate records of all laden truck movements to and from the site (including time of arrival and dispatch) and publishing a summary of these records in the Annual Review.	Section 3.4
Schedule 6	5(a)	By the end of September 2016 and each year following, or other timing as may be agreed by the Planning Secretary, the Applicant must review the environmental performance of the development to the satisfaction of the Planning Secretary. This review must: <ul style="list-style-type: none"> • describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year 	Section 3.5
Schedule 6	5(b)	<ul style="list-style-type: none"> • include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against: <ul style="list-style-type: none"> – the relevant statutory requirements, limits or performance 	Section 3.6

Schedule	Conditions	Description	Report Location
		<ul style="list-style-type: none"> - measures/criteria - the monitoring results of previous years - the relevant predictions in the document/s listed in condition 2 of Schedule 3 	
Schedule 6	5(c)	<ul style="list-style-type: none"> • identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance 	Section 3.7
Schedule 6	5(d)	<ul style="list-style-type: none"> • identify any trends in the monitoring data over the life of the development 	Section 3.6
Schedule 6	5(e)	<ul style="list-style-type: none"> • identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies 	Section 3.4.6 Section 3.6
Schedule 6	5(f)	<ul style="list-style-type: none"> • describe what measures will be implemented over the current calendar year to improve the environmental performance of the development. 	Section 3.4.7 Section 3.9
Schedule 6	6	Copies of the Annual Review must be made available to Council and any interested person upon request.	Section 3.10
Schedule 6	15(a)	<p>From 30 September 2016 and for the duration of the development, the Applicant must:</p> <ul style="list-style-type: none"> • make copies of the following publicly available on its website: <ul style="list-style-type: none"> - the document/s listed in condition 2 of Schedule 3 - current statutory approvals for the development - approved strategies, plans and programs required under the conditions of this consent - a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs - a complaints register, which is to be updated monthly - the Annual Reviews of the development (for the last 5 years) - any Independent Environmental Audit of the development, and the Applicant's response to the recommendations in any audit - any other matter required by the Planning Secretary 	Section 3.10.1
Schedule 6	15(b)	<ul style="list-style-type: none"> - keep this information up to date, to the satisfaction of the Planning Secretary. 	Section 3.11

3 ANNUAL REVIEW CONDITIONS REQUIREMENTS

3.1 Mining, exploration and geoscience reporting

Table 3-1: Lease details

Lease Details	Description
Lease name	Mining Lease (ML) 1816 (1992)
Return type	Non-coal Mineral Annually (01/07/2023 – 30/06/2024)
Mineral/extraction	CLAY SHALE/ STRUCTURAL CLAY
Royalty regime	Quantum Royalty
Royalty rate	\$0.35 per tonne

Table 3-2: Royalty (1 July 2024 – 31 December 2024)

Royalty	Tonnes	Australian Dollars (\$AUD)
Productions		
Ore produced		
Concentrates produced		
Export sales		
Local sales and other disposals	150,826	490,184.76
Purchases		
Net disposals	150,826	490,184.76
Closing stock		
Opening stock		
Minerals recovered	150,826	490,184.76
Deductions		
Gross invoice value of contained mineral		
Invoiced off-site concentrate treatment charges		
Minerals recovered		490,184.76
Direct on-site treatment expenses		
Realisation		
On-site administration		
Depreciation		
Total deductions		
Ex mine value		490,184.76
	Royalty Due	52,789.10

Refer to Appendix A for the report downloaded from the Royalty online services portal.

3.2 Stakeholder consultation

Continued consultation with surrounding sensitive receivers will be completed when required in accordance with Schedule 4, Condition 11 and the Environmental Management Strategy (EMS) (EMM 2021). Compliance against project requirements is shown in Table 3-3.

Table 3-3: Stakeholder consultation

Item	Requirement	Luddenham Operations Comments
1	Luddenham Operations will regularly consult with adjoining property owners to ensure property management issues including maintenance of common fences, weed control measures, and bushfire management are coordinated. Details of this consultation will be reported in the Annual Review.	No formal consultation undertaken this year – no issues raised by neighbours. Fences are all in good condition and no issues with weeds, noise and dust have been raised.
2	General enquiries from the local community will be recorded in a community engagement register, which will also include any copies of formal correspondence, and responded to by the site environmental representative or operations manager within 5 days of the enquiry.	No enquiries submitted from the public this year.
3	Luddenham Operations will consult with the wider local community on an 'as needs' basis. The need for this wider consultation will be determined based on queries or complaints made to the quarry.	As no queries and/or complaints were received within the reporting period, wider local community consultation was not considered necessary.

3.3 Waste management

Due to the nature of on-site activities undertaken during the reporting period, no waste was generated from the quarrying operations. Only quarry material extracted up to December 2024 was removed from site.

Minor amounts of general waste were produced by employees (i.e. kitchen scraps and paper etc.) which were disposed of in co-mingle waste bins and removed under general council practices.

3.4 Traffic and material movement procedures

In accordance with Schedule 4, Condition 42 (b) Luddenham Operations have developed a Road Transport Protocol (EMM 2021) which outlines procedures for monitoring of product transport, including keeping of accurate records of all laden truck movements to and from the site (including time of arrival and dispatch).

The transportation and recording of material, including incidents and reporting, must comply with the procedures outlined within the Luddenham Quarry Road Transport Protocol (EMM 2021). Sections 3.4.1 to 3.4.7 of the Protocol detail elements specific to traffic management.

The Road Transport Protocol (EMM 2021) is available at the project webpage:
<https://luddenhamquarry.com.au/>.

3.4.1 Amendments to statutory approvals

No amendments were made to statutory approvals during the Annual review period.

3.4.2 Total material haulage during the reporting period

A total of 150,826 tonnes of product and 152,679 tonnes of overburden materials, mined in previous years, were hauled from the site during the Annual Review period.

In accordance with condition 8A of schedule 3 (DA 315-7-2003 MOD 5), a maximum of 300,000 tonnes of quarry products may be transported from the site in any calendar year. While the total material removed during the reporting period amounted to 303,505 tonnes, the tonnage of quarry product transported within the 2024 calendar remained below the 300,000 tonnes limit.

3.4.3 Summary of heavy vehicle movements

Heavy vehicle movements, comprising a total of 6306 loads, generally complied with the Luddenham Quarry Road Transport Protocol (EMM 2021). All quarry trucks access the site from the north and travel north on leaving the site. The most northerly 280 metre (m) long section of Adams Road is the only section of road used by quarry trucks. Figure 3-1 shows a summary of the truckloads exporting material from the site. The site traffic monitoring records are provided in Appendix B of this report.

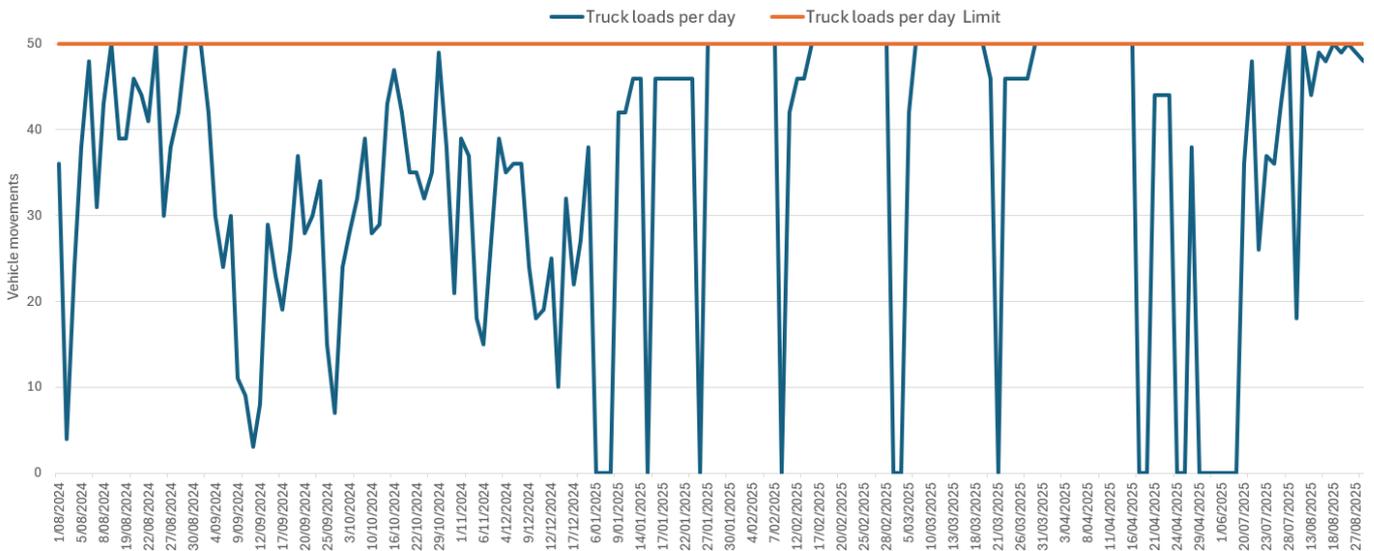


Figure 3-1: A summary of the truckloads exporting material from the site

During the 2024–2025 monitoring period, truck movements did not exceed the maximum daily truck movement limits specified in Condition 8B of Schedule 3 of Development Approval DA 315-7-2003 MOD 5.

3.4.4 Summary of complaints or incidents

No complaints or incidents associated with quarrying activities were recorded or reported during the reporting period.

3.4.5 Non-compliance and remedial actions

No non-compliance relating to truck loads per day was recorded during the reporting period and hence no actions required to ensure compliance.

3.4.6 Discrepancies between predicted and actual impacts of operations and potential cause

No discrepancies between the predicted and actual impacts of operations were identified.

3.4.7 Summary of management actions to be implemented

Over the next year, management will implement actions, including an internal review of the approved development consent conditions related to the environmental performance of the site, to ensure that monitoring and rehabilitation activities remain fully compliant. It is noted that a resource recovery facility has been approved on site directly north of the quarry under a separate development consent (SSD-10446), and traffic movements associated with the quarry will continue to be monitored independently from the resource recovery facility construction, in accordance with their respective consents.

3.5 Development and rehabilitation

Quarry rehabilitation commenced in January 2025, following the cessation of extraction activities on 20 December 2024.

Over the past 12 months, activities on site included:

- extraction of shale material (September – December 2024)
- stockpiling of extracted shale material
- dust mitigation measures
- rehabilitation works including weed control, repair and extension of fencing to riparian areas, removal of stockpiled material from the site, geotechnical assessment of quarry wall stability, and commencement of water dam reconstruction works involving silt removal and reshaping of the basin walls.

Over the next 12 months, activities on site will consist of:

- rehabilitation works including:
 - removal of shale stockpiles
 - implementing dust mitigation measures
 - weed management
 - re-vegetation and
 - completing the water dam reconstruction work.

Appendix C provides a progressive overview of the site in August 2023 when compared to February and May 2024.

3.5.1 Geotechnical site inspection

On 4 June 2025, JKGeotechnics conducted an inspection to assess the stability of the quarry cut faces.

The inspection did not identify any significant instability. However, extensive deep erosion rills were observed on all quarry faces, along with minor localized soil slumping near the crest. A larger slump of approximately 10 m³ was noted on the western face, with material deposited down the face and into the quarry base.

This slump is not considered indicative of large-scale or deep-seated instability. To mitigate risk, it is recommended that formal exclusion zones, including barriers and warning signs, be established 5 meters from both the crest and toe of the cut faces to prevent personnel access.

It is further recommended that inspections of the bedrock cut faces be conducted annually, or sooner following heavy rainfall or upon observation of signs of instability such as slumping or tension cracks. Any indications of instability between inspections should prompt immediate reassessment.

3.6 Environmental monitoring

The Environmental Monitoring section presents a summary of the monitoring results documented to support the Annual Review (AR) for the period of 1 September 2024 to 31 August 2025.

3.6.1 Water

This section outlines water quality monitoring undertaken by EMM Consulting (EMM) as part of the Annual Review. The EMM monitoring reports are provided in Appendix D.

i. Monitoring program

A water quality monitoring program was developed for the Soil and Water Management Plan (SWMP) (EMM 2021) for the site. The program commenced in March 2022 and during the annual review period involved quarterly groundwater and annual surface water monitoring.

a) Monitoring events

Three quarterly water monitoring events and one annual water monitoring event were undertaken for the Annual Review period. A summary of monitoring events, additional investigation measures and outcomes are provided in Table 3-6 below.

b) Laboratory analytes

Water samples were transported to a NATA-accredited laboratory (Australian Laboratory Services (ALS) in Sydney, NSW for analysis. All laboratory analytes that were not additionally measured in situ (i.e. pH, electrical conductivity (EC), dissolved oxygen and oxidation-reduction potential) were received by the laboratory within the maximum holding times.

c) Quality assurance/quality control

Surface and groundwater samples were collected in laboratory-provided sample containers with appropriate preservation. Samples were collected and sent to the laboratory under appropriate chain of custody protocols.

The field QA/QC procedures used to establish accurate, reliable, and precise results included:

- calibration of equipment by the supplier before use
- keeping samples chilled
- submitting laboratory samples within holding times
- wearing fresh disposable nitrile gloves during sampling at each sampling location
- collection of a field duplicate sample.

d) Groundwater monitoring network

A groundwater monitoring bore network was installed before quarrying to understand the hydrogeology at the site and to monitor for potential impacts. Three monitoring bores were drilled and installed to a depth of approximately 30 m into the Bringelly Shale with the overlying unconsolidated material cased off. The monitoring bores were sited with one bore up-hydraulic gradient (BSM1) as a background bore (to the quarry footprint) and two bores down-hydraulic gradient of the pit (BSM2 and BSM3). The two down-hydraulic gradient bores are located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oaky Creek.

During the 2021–2022 annual review, two sites (BSM1 and BSM2) were reported to be damaged and not producing representative results. It is noted that these sites were replaced with new bores, with the first sampling event from these locations being taken in August 2023.

e) Trigger exceedance criteria

The Soil and Water Management Plan (EMM 2021) outlines water quality trigger values for both surface and groundwater quality monitoring. The surface water quality trigger values are presented in Table 3-4 and groundwater quality trigger values are presented in Table 3-5.

Table 3-4: Surface water assessment criteria and trigger values

Parameter	Units	Trigger Value
General¹		
pH	-	6.5-8.5
Electrical Conductivity (EC) ³	µS/cm	125-2200
Turbidity	NTU	6-50
Oil and Grease	mg/L	Above detection
Nutrients¹		
Ammonia	µg N/L	20

Parameter	Units	Trigger Value
Oxidised nitrogen	µg N/L	40
Total nitrogen	µg N/L	500
Reactive phosphorus	µg P/L	20
Total phosphorus	µg P/L	50
Dissolved metals ²		
Aluminium	µg/L	55
Arsenic ⁴	µg/L	13
Boron	µg/L	370
Cadmium	µg/L	0.2
Chromium ⁵	µg/L	1.0
Copper	µg/L	1.4
Iron	µg/L	-
Manganese	µg/L	1900
Nickel	mg/L	11
Lead	mg/L	3.4
Zinc	mg/L	8.0

1. The trigger values for general parameters and nutrients refer to the DGVs for physical and chemical stressors in south-east Australia (lowland river) that are reported in Tables 3.3.2 and 3.3.3 of ANZECC (2000) as DGV is not yet defined by ANZG (2018).
2. Dissolved metal trigger values are for slightly to moderately disturbed ecosystems (ANZG 2018).
3. Table 3.3.3 of ANZECC (2000) specifies NSW coastal rivers typically have salinity values in the range of 200–300 µS/cm. The DGV for salinity in lowland rivers is 125–2200 µS/cm as a DGV is not yet defined by ANZG (2018).
4. For AS (V).
5. For Cr (VI).

Table 3-5: Ground water assessment criteria and trigger values

Parameter	Units	Trigger Value
General ¹		
pH	-	6.5-8.5
Electrical Conductivity (EC) ³	µS/cm	Comparison with upgradient bore ⁶
Turbidity	NTU	Comparison with upgradient bore ⁶
Oil and Grease	mg/L	Above detection
Nutrients ¹		
Ammonia	µg N/L	Comparison with upgradient bore ⁶
Oxidised nitrogen	µg N/L	Comparison with upgradient bore ⁶
Total nitrogen	µg N/L	Comparison with upgradient bore ⁶

Parameter	Units	Trigger Value
Reactive phosphorus	µg P/L	Comparison with upgradient bore ⁶
Total phosphorus	µg P/L	Comparison with upgradient bore ⁶
Dissolved metals ²		
Aluminium	µg/L	55
Arsenic ⁴	µg/L	13
Boron	µg/L	370
Cadmium	µg/L	0.2
Chromium ⁵	µg/L	1.0
Copper	µg/L	1.4
Iron	µg/L	-
Manganese	µg/L	1900
Nickel	µg/L	11
Lead	µg/L	3.4
Zinc	µg/L	8.0

1. The trigger values for general parameters and nutrients refer to the DGVs for physical and chemical stressors in south-east Australia (lowland river) that are reported in Tables 3.3.2 and 3.3.3 of ANZECC (2000) as DGV is not yet defined by ANZG (2018).
2. Dissolved metal trigger values are for slightly to moderately disturbed ecosystems (ANZG 2018).
3. Table 3.3.3 of ANZECC (2000) specifies NSW coastal rivers typically have salinity values in the range of 200–300 µS/cm. The DGV for salinity in lowland rivers is 125–2200 µS/cm as a DGV is not yet defined by ANZG (2018).
4. For AS (V).
5. For Cr (VI).
6. Parameter known to frequently exceed the DVG. Long term trend comparison to upgradient bore (BSM1) is most appropriate means of assessment.

Table 3-6: Overview of water completed monitoring

Monitoring Event Details	Additional Measures Undertaken	Summary of Outcomes
<p>Surface water and groundwater monitoring – 4 December 2024 (Quarter 1).</p> <p>Water levels were monitored using an interface probe at each of the three groundwater monitoring bores, prior to purging and sampling.</p>	<p>Additional analysis was undertaken of all groundwater monitoring locations for targeted hydrocarbon suites to determine potential sources of oil and grease identified in the previous monitoring rounds.</p> <p>Additional monitoring was conducted at the Oaky Creek upstream site to investigate the source of anomalous groundwater results identified in previous monitoring. However, the Quarry Pit location was not sampled as it contained no water.</p>	<p>The detectable concentrations of TRH/TPH and oil and grease reported in previous rounds were not present during this sampling round.</p> <p>No confirmed source has been identified for the sustained elevated nutrient concentrations in the monitoring wells. Although elevated nutrient levels were also present at the upstream surface water site, these were lower than those recorded in the monitoring bores, suggesting the nutrients may be naturally occurring or influenced by upstream activities.</p>
<p>Surface water and groundwater monitoring – 24 March 2025 (Quarter 2).</p> <p>Water levels were monitored using an interface probe at each of the three groundwater monitoring bores, prior to purging and sampling.</p>	<p>Additional analysis was undertaken of all surface water and groundwater monitoring locations for targeted hydrocarbon suites to determine potential sources of oil and grease identified in the previous monitoring rounds.</p> <p>Additional monitoring was completed at the Oaky Creek upstream site and of water stored within the quarry pit to investigate the source of anomalous groundwater results identified in previous monitoring.</p>	<p>March sampling detected TRH/TPH; however, oil and grease and TRH/TPH after silica gel cleanup were absent, indicating the hydrocarbons are likely from naturally occurring biogenic sources rather than site operations. Elevated nutrient concentrations persist in monitoring wells with no confirmed source; the upward trend since quarry closure suggests the cause is unrelated to former quarry activities. Extended hydrocarbon suite monitoring is recommended for future sampling rounds.</p> <p>No confirmed source has been identified for the sustained elevated nutrient concentrations in the monitoring wells. Low water levels and green to slightly green colouring observed in the quarry pit and upstream locations may indicate eutrophication caused by high nutrient loads.</p>
<p>Surface water and groundwater monitoring – 7 May 2025 (Quarter 3).</p> <p>Water levels were monitored using an interface probe at each of the three groundwater monitoring bores, prior to purging and sampling.</p>	<p>Surface water monitoring was relocated from the Water Management Dam to a midstream location in Oaky Creek due to construction access limitations. The unnamed dam in Oaky Creek was sampled via its southwestern access point.</p>	<p>No detectable concentrations of TRH/TPH were reported during the May 2025 sampling round.</p> <p>No confirmed source has been identified for the sustained elevated and increasing nutrient concentrations observed. The increasing trend was supported by Mann-Kendall analysis.</p>
<p>Surface water and groundwater monitoring – 17 July 2025 (Annual).</p> <p>Water levels were monitored using an interface probe at each of the three groundwater monitoring bores, prior to purging and sampling and four surface water sites were sampled.</p>	<p>The water within the Quarry pit was highly acidic (2.05). The quarry pit result is anomalous given historical pH ranges. Verification monitoring undertaken by the client on 5 August indicates the water within the Quarry Pit was slightly basic (~8.4), in line with historical pit monitoring, upstream and receiving environment.</p>	<p>No confirmed source has been identified for the sustained elevated nutrient concentrations in the monitoring wells.</p> <p>July sampling detected TRH/TPH; however, oil and grease and TRH/TPH after silica gel cleanup were absent, indicating the hydrocarbons are likely from naturally occurring biogenic sources rather than site operations.</p> <p>TRH analysis should continue at a frequency reduced from quarterly to annual at locations previously reported with detectable concentrations of TRH/TPH or oil and grease to assist with confirming the absence of TRH/TPH.</p>

ii. Surface water quality exceedances

The following receiving water downstream/impact site exceedances were noted:

- Ammonia exceeded the trigger value at the upstream, downstream/impact site, and the quarry pit. However, poorer water quality at the upstream/control site suggests that the quarry is not the source of the exceedance.
- Selenium concentrations were observed in the quarry pit but were not detected in the upstream environment, receiving waters, or monitoring bores.
- Zinc concentrations exceeded trigger levels in both upstream and downstream locations (Oak Creek), although these levels were approximately half of those detected in the quarry pit.
- Aluminium exceeded the trigger value only in the quarry pit and was not observed in the upstream environment, receiving waters, or monitoring bores.
- Copper trigger value exceedances were identified at the upstream site in December 2024, March 2025, and May 2025, and at the downstream (Oak Creek) site in July 2025. No exceedances were detected at the quarry monitoring location in July 2025. The occurrence of an exceedance of comparable magnitude at the upstream/control site suggests that natural background variability or catchment-scale influences, rather than quarry activities, are the likely source. Across all monitoring rounds, copper concentrations within Oak Creek remained at the lower end of the recorded baseline range, indicating minimal deviation from historical water quality conditions.

There were no downstream/impact site exceedances that are not consistent with the upstream/control site, indicating the quarry is not the source of surface water exceedances. Additionally, no discharge occurred from the site water management system during the AR period.

iii. Groundwater levels

Key observations of groundwater levels during the Annual Review period include:

- Groundwater levels in bores BSM1, BSM2, and BSM3 remained within the historical range observed since monitoring began in March 2022. Occasional exceedances of the 2 m standing water level (SWL) trigger, as defined in the Water Management Plan (EMM 2021), were recorded across all three bores. These exceedances are considered to reflect climatic variability rather than impacts from quarry activities, and therefore TARP provisions for drawdown effects are not applicable.
- A resurvey of the bores in April 2025 updated reference levels, and subsequent monitoring (including May and July 2025) confirmed that all bores remained within historical ranges. BSM1 was near its baseline average, while BSM2 and BSM3 remained slightly above the 2 m trigger.
- No further action is required, and groundwater levels will continue to be monitored as part of the ongoing program.

iv. Groundwater quality exceedances

a) Toxicants

Groundwater quality was monitored at three bores (BSM1, BSM2, BSM3) and assessed against baseline data, trigger values, and upgradient control conditions in accordance with the Soil and Water Management Plan (EMM, 2021).

The following exceedances relative to default guideline trigger values and background concentrations reported:

- Concentrations of iron exceeded the baseline criteria at BSM3 in May 2025, reaching a maximum of 1.18 mg/L, while the upgradient location BSM1 recorded concentrations below the laboratory limits of reporting (LORs). Iron is naturally present in groundwater near the site, with the baseline dataset indicating a median concentration of 8.5 mg/L.
- Copper concentrations were generally low across the monitoring period, with occasional exceedances of the trigger value. Exceedances were recorded at BSM1 (0.005 mg/L) and BSM2 (0.002 mg/L) in December 2024, and at BSM1 (0.002 mg/L) in May 2025, with results consistent with historical trends. In March 2025, copper exceeded the trigger value at BSM2 in both the primary (0.003 mg/L) and duplicate (0.006 mg/L) samples, with concentrations comparable to baseline values. In July 2025, copper was not detected above LOR at any monitoring location.

- Zinc concentrations exceeded the trigger values during all monitoring rounds. In December 2024, exceedances were recorded at BSM1 (0.010 mg/L) and BSM2 (0.021 mg/L). In March 2025, zinc exceeded the trigger value at BSM2 in both the primary and duplicate samples (0.093 mg/L). In May 2025, exceedances were again recorded at BSM2 in both the primary (0.020 mg/L) and duplicate (0.022 mg/L) samples. In July 2025, zinc exceeded the trigger values at all locations, ranging from 0.010 mg/L at BSM1 to 0.083 mg/L at BSM2. Elevated concentrations were most consistently associated with BSM2 and are generally consistent with historical results.
- Cadmium marginally exceeded the trigger value in the duplicate sample at BSM2 with concentrations of 0.0003 mg/L only in March 2025.
- Aluminium exceeded the trigger value at BSM2 with a concentration of 0.08 mg/L in December 2024.

Surface water (Oak Creek and the quarry pit) showed occasional metals exceedances; however, these were not consistent with groundwater trends. Trigger value exceedances over the default guideline values were sporadic, generally within historical ranges, and consistent with natural background variability, and are therefore unlikely to be related to the project.

b) Oil and grease

Additional analysis was undertaken to assess source of the oil and grease detections including surface water locations and additional analysis of hydrocarbon suites to assess the composition of the detected oil and grease concentrations.

The following exceedances relative to default guideline trigger values and background concentrations reported:

- TPH was detected at BSM1 in March 2025 in the C15–C28 fraction (680 µg/L), and again in July 2025 in the same fraction (340 µg/L).
- TRH was also reported above detection limits at BSM1 in March 2025, with concentrations of 560 µg/L (C10–C16) and 200 µg/L (C16–C34). In July 2025, TRH was detected at 260 µg/L (C10–C16) and 340 µg/L (C15–C28).
- Detectable TRH/TPH concentrations observed in March and July 2025 were not present during the December 2024 and May 2025 sampling rounds.
- While detectable concentrations of TRH/TPH were reported, oil and grease and TRH/TPH results following silica gel clean-up were below detection limits, indicating the hydrocarbons are of natural biogenic origin (e.g., lipids, plant oils) and unrelated to site operations.

c) Physico-chemical properties

A review of water quality results from the monitoring bore network (BSM1, BSM2 and BSM3) showed water quality for some analytes that are not consistent with baseline data trends, notably:

- Electrical Conductivity (EC) results across the monitoring locations show variability between upgradient and downgradient bores, generally reflecting historical trends. Upgradient bore BSM1 recorded EC ranging from 6,276–23,336 µS/cm, potentially indicating freshwater or surface water ingress. Downgradient bores BSM2 (shallow: 13,556 µS/cm; deep: 23,393 µS/cm) and BSM3 (22,730–22,866 µS/cm) reported EC values more typical of baseline trends. The observations support the premise that EC fluctuations at BSM1 may be influenced by surface water ingress, particularly during periods of low rainfall.
- Ammonia exceeded trigger values in all bores during every monitoring round, ranging from 3.9–6.6 mg/L at BSM2 and BSM3. Total Nitrogen was consistently elevated at BSM2 (peak 218 mg/L) and BSM3 (7.5 mg/L) compared to the upgradient bore BSM1 (4.7 mg/L). The highest Total Nitrogen concentrations were recorded at BSM2, indicating a possible shallow or external nutrient source, as elevated levels were not detected in the quarry pit or upgradient bore. Trend analysis confirmed a statistically significant increasing trend at BSM2. The source of the nitrate is unknown.
- Reactive phosphorus exceeded the trigger value at BSM3 in June 2025 with a concentration of 0.05 mg/L compared to <0.01 mg/L at the upgradient bore.

It is suspected that the monitoring well network may be influenced by:

- monitoring well installation processes (for reconstructed bores BSM1 and BSM2)

- surface water ingress or potentially alluvial inflow, or
- offsite activities such as hydro-mulching and use of fertilizers for mass-reestablishment of groundcover at the Western Sydney Airport.

v. Monitoring program recommendations

Considering the baseline data trends, physical and chemical results in the whole well network (both upgradient and downgradient) and results of additional investigative monitoring, it is unlikely that exceedances are related to operations at the quarry. The following recommendations are made for future monitoring rounds:

- Continue TRH analysis at a reduced annual frequency at locations previously reporting detectable TRH/TPH or oil and grease, with supplementary sampling following any detectable oil and grease results.
- Conduct follow-up pH monitoring of the quarry pit during the next monitoring round to confirm baseline conditions. Two field measurements are recommended (morning and afternoon) using a calibrated water quality monitor. If high acidity is detected, further sampling should investigate the nature and potential source of the acid.

vi. Water extraction, usage and discharge

- Luddenham Operations are required to report on water extracted or discharged from the site within the reporting period (Schedule 4 Condition 21 (b)).
- A summary of water use (confirmed by the water balance in Appendix E) is presented in Table 3-7.

Table 3-7: Summary of water use September 2024 – August 2025

Project Location	Volume	Comments	Water licensing
Water management dam	5.3 ML/year	Dust suppression water sourced from disturbed area runoff.	Exempt ¹
	3.2 ML/year	Treated discharge within the site boundary sourced from disturbed area runoff.	Exempt ¹
Quarry pit	0 ML/year	Dust suppression water sourced from disturbed area runoff.	Exempt ¹
	0 ML/year	Active water management of disturbed area runoff via evaporative misters.	Exempt ¹
	9.5 ML/year	Loss of stored water through natural evaporation from the quarry pit	N/A
	11.4 ML/year	Active water management of disturbed area runoff to the quarry pit.	N/A
	7.4 ML/year	Natural infill of the quarry pit through rainfall	N/A
	1.8 ML/year	Groundwater inflow to the quarry pit.	10MW119330 WAL34685 ²
Discharge to Oaky Creek	0 ML/year	No discharge events occurred for the Annual Review period.	N/A

Table notes:

1. Under the Schedule 1, Item 3 of the Water Management (General) Regulation 2018.

2. Trading in the water market is currently underway to satisfy licensing requirements associated with groundwater inflows

3.6.2 Air quality

The Air Quality Management Plan was updated during the previous Annual Review period. The updated version (revision 5) was issued to DPHI on 4 June 2024 with approval issued on 12 July 2024.

i. Deposited Dust

The air quality monitoring network consists of three dust deposition gauges (DDGs) installed, operated and analysed in accordance with AS 3580. 10. 1 2003. Static dust monitoring sites were chosen at locations adjacent to sensitive receivers in proximity to the works in accordance with the approved Air Quality Management Plan (AQMP). Table 3-8 outlines the results of the monitoring completed within the reporting period and further details are provided in Appendix F.

Table 3-8: Summary of dust monitoring results September 2024 – August 2025

Dust deposition gauge	Installation date	Removal date	Insoluble solids (g/m ² /month)	Annual average dust criteria (g/m ² /month)	Rolling average (g/m ² /month)
DG01	05/11/2024	03/12/2024	2.8	4	2.8
	03/12/2024	31/12/2024	3.4	4	3.1
	21/03/2025	23/04/2025	3.2	4	3.1
	23/04/2025	20/05/2025	0.7	4	2.5
	20/05/2025	24/06/2025	0.7	4	2.1
DG02	05/11/2024	03/12/2024	5.0	4	2.8
	03/12/2024	31/12/2024	2.7	4	3.9
	21/03/2025	23/04/2025	2.7	4	3.5
	23/04/2025	20/05/2025	2.2	4	3.2
	20/05/2025	24/06/2025	1.4	4	2.8
DG03	05/11/2024	03/12/2024	1.5	4	1.5
	03/12/2024	31/12/2024	2.6	4	2.1
	21/03/2025	23/04/2025	2.9	4	2.3
	23/04/2025	20/05/2025	0.9	4	2.0
	20/05/2025	24/06/2025	1.4	4	1.9

Figure 3-2 is a visual representation of the data presented in Table 3-8.

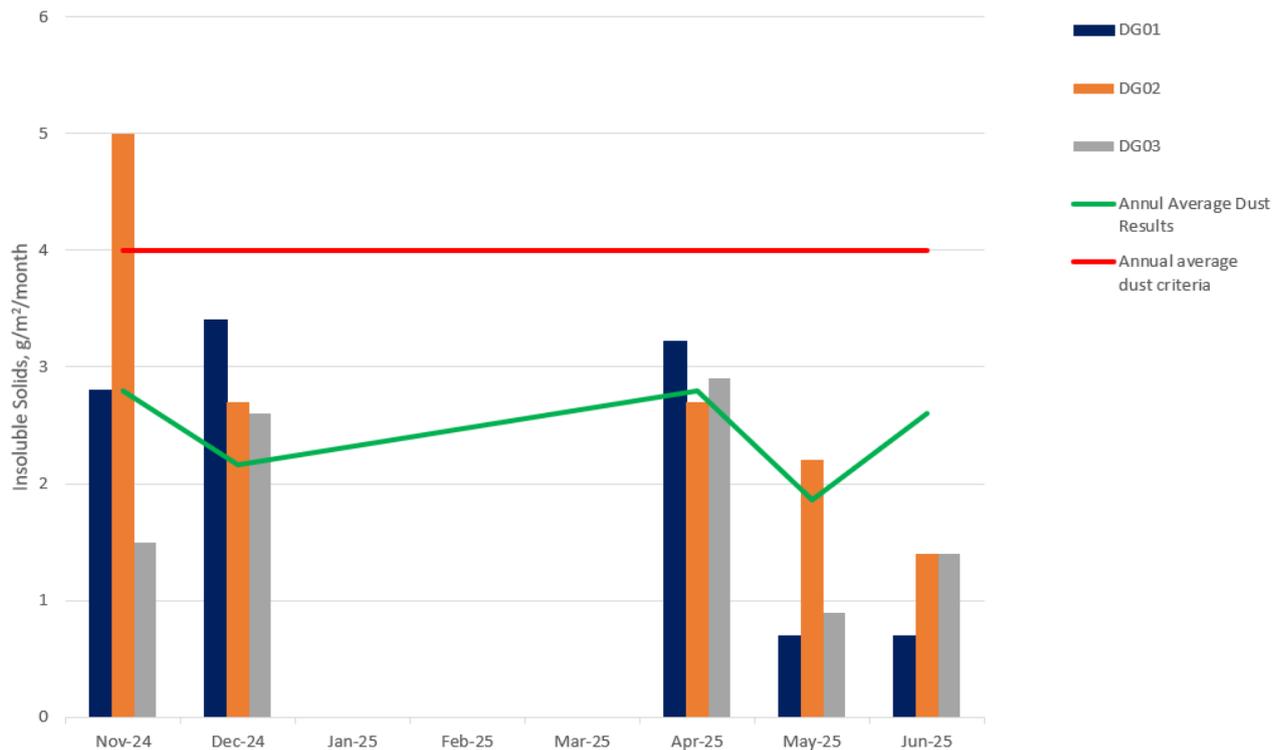


Figure 3-2: Dust Deposition Gauge Results

Following a minor exceedance at DG02 in November 2024, quarry operations reviewed dust controls and implemented measures including increased water cart use, wind and air quality monitoring, targeted mitigation in active areas, and temporary cessation of works during high winds. December 2024 monitoring confirmed these measures were effective. The annual average at DG02 and the rolling and annual averages at all monitoring locations remained below the dust deposition criterion of 4.0 g/m²/month. Although a minor exceedance was recorded at DG02 in November 2024, the annual average remained compliant with dust deposition criteria (4.0 g/m²/month).

Construction of the recycling facility did not impact the quarry’s dust monitoring results, as effective dust mitigation measures were implemented by the construction contractor.

ii. Real time monitoring

In accordance with section 5.2.2 of the approved air quality management plan (EMM, June 2024) the continuous real-time monitoring campaign must occur for a 14-day period, once per year during extractive/ haulage operations.

EMM has been commissioned to manage a short-term ambient air quality monitoring campaign at the Quarry site.

A two-week monitoring program was completed during October and November 2024 using two continuous PM monitoring units (AirMetER-DX monitoring system) to record concentrations of PM₁₀ and PM_{2.5}. Meteorological measurements for the monitoring period were sourced from the nearby BoM Badgerys Creek AWS. The onsite PM monitoring data was also compared with monitoring data for the same period from the DCCEEW Bringelly AQMS.

Siting of equipment was conducted in accordance with AS/NZS 3580.1.1:2007, as much as practicable, taking the constraints of site into consideration. The monitoring equipment was deployed at the north-east and south-west corners of the site, with a specific focus of the monitoring study to record upwind and downwind concentrations.

A summary of the monitoring results are as follows:

- No exceedances of the 24-hour PM₁₀ criterion of 50 µg/m³ were recorded at either of the onsite monitoring locations.
- No exceedances of the 24-hour PM_{2.5} criterion of 25 µg/m³ were recorded at either of the onsite monitoring locations.
- PM₁₀ and PM_{2.5} concentrations at AQM01 were notably lower than at AQM02 and DCCEEW Bringelly.

- The PM₁₀ concentrations at the quarry were generally comparable with the concurrent measurements at the DCCEEW Bringelly AQMS for the same period.
- The PM_{2.5} concentrations at the quarry were generally comparable with the concurrent measurements at the DCCEEW Bringelly AQMS for the same period.
- When upwind and downwind concentrations were considered, the contribution from the site did not result in an exceedance of the criteria.
- It is inferred that no exceedances of the annual TSP criterion of 90 µg/m³ would occur based on the recorded PM₁₀ concentrations.

A full real time air quality monitoring report (September 2024) is provided in Appendix F.

3.6.3 Noise

EPL 21562 required to conduct noise monitoring twice a year, at a minimum, two 15-minute measurements at each of the eight attended noise monitoring locations on two consecutive days during daytime operations (7:00 am to 6:00 pm, Monday to Friday). Monitoring on the second day allows for the investigation and correction of any anomalous results recorded on the first day. The noise monitoring purpose was to quantify the acoustic environment and compare site noise levels against specified EPL 21562 limits.

EMM was commissioned to conduct a bi-annual noise survey of site operations in accordance with the Noise Management Plan (EMM, 2021). Attended environmental noise monitoring was done during the day period(s) of 29th and 30th October 2024 at six monitoring locations.

Another bi-annual noise survey of site operations, in accordance with the Noise Management Plan (EMM, 2021), was conducted by the Environmental Manager of Coomber Property Group. The initial attended monitoring was undertaken during the daytime periods of April 15th and 16th 2025 at six monitoring locations. However, due to strong winds exceeding the limits recommended in the NSW EPA Noise Policy for Industry (NSW EPA, 20217), monitoring was ceased and subsequently rescheduled. The rescheduled monitoring was conducted during the daytime periods of July 7th and 8th 2025 at the same six representative monitoring locations.

Attended environmental noise monitoring was completed in general accordance with Australian Standard AS1055 Acoustics, Description and Measurement of Environmental Noise and relevant NSW requirements. Meteorological data was obtained from the Badgerys Creek automatic weather station (AWS) (station ID 067108) which allowed correlation of atmospheric parameters with measured site noise levels.

During noise monitoring conducted in July 2025, no noise from quarry operations was audible at any monitoring location during the attended measurements. Ambient noise levels were primarily influenced by local road traffic, bird activity, light aircraft movements, and construction works at the nearby recycling facility and surrounding areas.

The results for doth monitoring rounds in October 2024 and July 2025 are consistent with previous monitoring rounds and indicate no significant changes or deviations in the observed parameters.

Noise levels at all monitoring locations complied with the EPL limits, confirming that extraction works and rehabilitation activities at the quarry were conducted in accordance with regulatory noise requirements and are not causing adverse impacts to nearby sensitive receivers. Full real noise monitoring reports are provided in Appendix G.

3.7 Complaints

The nearest sensitive locations to the Quarry are listed in Table 3-9 below. The nearest occupied receiver is R6 (225 Adams Road) that is located approx. 160 m from Quarry. R3 (285 Adams Road), is a derelict and unoccupied building that is located 14 m from the site access road. The Hubertus Country Club is located immediately west of the site. No complaints have been received within the reporting period.

Table 3-9: Sensitive receivers' locations

ID	Address	Classification	Comments
R1	2161-2177 Elizabeth Drive, Luddenham	Residential	Occupied

ID	Address	Classification	Comments
R2	2111–2141 Elizabeth Drive, Luddenham	Residential	Unoccupied (building demolished)
R3	285 Adams Road, Luddenham	Residential	Unoccupied (used as commercial operation)
R4	5 Anton Road, Luddenham	Residential	Occupied
R5	185 Adams Road, Luddenham	Residential	Unoccupied
R6	225 Adams Road, Luddenham	Residential	Occupied
R7	161 Adams Road, Luddenham	Residential	Occupied
R8	2510–2550 Elizabeth Drive, Luddenham	Residential	Occupied
C1	Hubertus Club – restaurant including outdoor facilities	Commercial	Occupied
AR1	Hubertus Country Club – outdoor firing range	Active recreation	Occupied

3.8 Incidents

There have been no incidents during the reporting period, as defined by the Conditions of Consent: “An occurrence or set of circumstances that causes or threatens to cause material harm, and which may or may not be or cause non-compliance”.

3.9 Proposed mitigation measures

Over the next 12 months, activities on site will continue to be managed to meet all relevant statutory requirements, limits, and performance measures/criteria. Mitigations proposed as part of the sites ongoing compliance include the following:

- Ongoing management and rehabilitation of the site in accordance with the mitigation measures listed with relevant management plans.
- Monitoring is to be completed in accordance with relevant management plans.
- An internal review audit be completed to assess site compliance against relevant conditions and management plan requirements.
- Annual inspections of the bedrock cut faces to be undertaken, with additional inspections carried out following significant rainfall events or if signs of instability (e.g., slumping or tension cracks) are observed. Any indications of instability identified between scheduled inspections should trigger immediate reassessment.

3.10 Report and document availability

Copies of the Annual Review will be made available to Council and any interested person upon request.

As required by Schedule 6, Condition 15(a), copies of the following documentation are publicly available on Luddenham Operations’ website (<https://luddenhamquarry.com.au/>).

3.10.1 Compliance against Schedule 6, Condition 15 (a)

As conditioned by Schedule 6, Condition 15 (a), this section demonstrates the availability of reports on Luddenham Operations’ website:

- The document/s listed in condition 2 of Schedule 3.

Table 3-10: Schedule 3, Condition 2 requirements

Condition	Description	On website
a	In compliance with these conditions of consent.	-
b	In accordance with all written directions of the Planning Secretary	None received

Condition	Description	On website
c	In general accordance with EIS titled Proposed Clay/Shale Extraction Operation – Lot 3 – 275 Adams Road Luddenham, dated May 2003, and prepared by Douglas Nicolaisen & Associates.	Yes
d	In general accordance with correspondence from Douglas Nicolaisen & Associates to the Department dated 16 March 2004 relating to operating hours, location of environmental bunds and reduction in the proposed extraction area.	Yes
e	In general accordance with information accompanying modification application DA 315-7-2003-MOD 1 for the relocation of the access bridge across Oaky Creek, lodged 16 November 2005, and prepared by Stuart J Castle.	Yes (MOD5)
f	In general accordance with Modification Application DA 315-7-2003 MOD 2 and the accompanying SEE titled Section 96(1A) Modification Application, 275 Adams Road Luddenham produced by Planning Direction Pty Ltd and dated 3 November 2009 and Acoustic Report – Clay/Shale Quarry at 275 Adams Road Luddenham produced by Golders Associates Ltd and dated 15 December 2009.	Yes (MOD5)
g	In general accordance with Modification Application DA 315-7-2003 MOD 3 and the accompanying Environmental Assessment titled Environmental Assessment Report for Epic Mining Pty Ltd: 275 Adams Road, Luddenham, NSW, prepared by Benbow Environmental and dated November 2014 relating to temporary stockpiling, extraction sequencing and other activities.	Yes (MOD3)
h	In general accordance with Modification Application DA 315-7-2003 MOD 5 and the accompanying Modification Report titled Luddenham Quarry Modification Report DA 315-7-2003 MOD 5 Prepared for Coombs Property Group & KLF Holdings, prepared by EMM Consulting and dated August 2020; Submissions Report dated December 2020 and RFI Responses dated March 2021; as amended by the revised project description prepared by EMM Consulting and dated 16 April 2021.	Yes (MOD5)

- Current statutory approvals for the development.

Table 3-11: Statutory approvals

Item	Approval	On website
1	Development Consent DA No. 315-7-2003	Yes
2	Environmental Protection Licence – EPL 21562	Yes
3	Mining License – ML 1816	Yes

- Approved strategies, plans and programs required under the conditions of this consent.

Table 3-12: Strategies, plans and programs

Item	Strategies/plans/programs	On website
1	Air Quality Management Plan	Yes
2	Discharge Characterisation and Water Pollution Impact Assessment	Yes
3	Environmental Management Strategy	Yes
4	Final Land Use Plan	Yes
5	Irrigation Management Plan <i>As advised by Luddenham Operations, no irrigation is currently proposed.</i>	Yes
6	Noise Management Plan	Yes
7	Road Transport Protocol	Yes
8	Site Rehabilitation Plan (inclusive of Biodiversity Management Plan)	Yes
9	Soil and Water Management Plan (inclusive Site Water Balance, Erosion and Sediment Control Plan, Surface Water Management Plan and Groundwater Management Plan)	Yes
10	Traffic Management Plan <i>Matters addressed in the Road Transport Protocol plan.</i>	Yes

- A comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs.

Table 3-13: Summary of monitoring results

Item	Monitoring results	On website
1	Summary of monitoring results <i>This Annual Review provides a summary of monitoring results and will be uploaded to the website.</i>	Yes

- A complaints register, which is to be updated monthly.

Table 3-14: Complaints register

Year	Monitoring results	On website
2025	1 September 2021 to 31 August 2025 (0 Complaints)	Yes

- The Annual Reviews of the development (for the last 5 years).

Table 3-15: Complaints register

Year	Annual Review	On website
2022	2022 Annual Review	Yes
2023	2023 Annual Review	Yes
2024	2024 Annual Review	Yes

- Any other matter required by the Planning Secretary.

Table 3-16: Other matters required by the Planning Secretary

Item	Other matters	On website
1	RFI Responses	Yes
2	Submission Report	Yes

- Any Independent Environmental Audit of the development, and the Applicant’s response to the recommendations in any audit.

Table 3-17: Independent Environmental Audit

Item	Other matters	On website
1	Independent Environmental Audit (IEA) Report prepared by Annabelle Tungol (Artea Green Ventures Pty Ltd), dated 13/02/2025	Yes

3.11 Compliance against Schedule 6, Condition 15 (b)

All information has been checked during the preparation of this report and is maintained in an up-to-date manner.

4 SUMMARY OF RESULTS

Table 4-1 outlines a summary of the monitoring completed for the Annual Review period and results pertaining the relevant assessments.

Table 4-1: Summary of monitoring results September 2024 - August 2025

Annual review item	Monitoring completed	Exceedance/non-compliance (NC) identified	Comments
Development and rehabilitation	Site inspection	No NCs identified.	<p>Site rehabilitation activities commenced in mid-January 2025. JK Geotechnics undertook an inspection to assess the stability of the quarry cut faces, which did not identify any significant instability. The inspection recommended that the bedrock cut faces continue to be inspected annually, and more frequently following heavy rainfall events or if signs of instability (e.g. slumping or tension cracks) are observed.</p> <p>As part of the rehabilitation works, fencing to riparian areas were repaired and extended, and stockpiled materials were removed from the site. No extractive activities have been undertaken since 21 December 2024.</p>

Annual review item	Monitoring completed	Exceedance/non-compliance (NC) identified	Comments
Traffic management	Review of truck movements	No exceedances identified.	<p>It is noted that construction of the Advanced Resource Recovery Facility commenced on 1 May 2025. Construction traffic is being monitored in accordance with the Resource Recovery Facility Construction Traffic Management Plan and is reported separately to the Department of Planning in accordance with Development Consent SSD-10446.</p> <p>The quarry truck movements were compliant with the traffic management plan and road transport protocol.</p>
Surface water	Water sampling	Elevated levels of physical and chemical analytes were recorded within monitoring.	Elevated levels were noted at both upstream and downstream monitoring sites, indicating the quarry is not the source of surface water exceedances.
Groundwater	Water sampling	<p>Some exceedances of metals.</p> <p>Anomalous nutrient results in reconstructed wells.</p> <p>Oil and grease were identified as above detection limits.</p> <p>Physical parameters indicating potential alluvial or surface water inflow.</p>	<p>Groundwater monitoring schedule and scope compliant with water management plan.</p> <p>Additional monitoring completed throughout the Annual Review period to determine source of anomalies. No connection between anomalous results and onsite activities.</p> <p>Increased levels of contaminants may have been a result of offsite activities and/or previous monitoring well installation processes.</p>
Air quality	Dust deposition gauge	A minor exceedance was recorded at DG02 in November 2024.	The rolling annual average remained compliant with dust deposition criteria of 4.0 g/m ² /month at all monitoring locations during this reporting period.
Air quality	Realtime (PM _{2.5} and PM ₁₀)	No exceedances identified.	All monitoring completed was compliant against project criteria.
Noise	Noise monitoring	No exceedances identified.	No exceedances identified. All monitoring completed was compliant against project criteria.
Complaints	NIL	NIL	No complaints were received during the reporting period.
Incidents	Incident Investigation	NIL	No environmental incidents occurred that causes, or threatens to cause, material harm or breaches the limits or performances criteria during the reporting period.
Independent Environmental Audit	Audit	No non-compliant conditions were found during this audit.	<p>Independent Environmental Audit (IEA) was conducted by Annabelle Tungol (Artea Green Ventures Pty Ltd) on 18 December 2024, against the conditions of approval DA 315-7-2003 MOD5. This audit was the first independent environmental audit conducted for the Luddenham quarry since operations commenced in December 2021. The IEA assessed fifty-five (55) consent conditions and found them to be compliant. Twenty-three (23) consent conditions were identified as not triggered. No non-compliant conditions were found during this audit.</p> <p>Quarry operations and proposed rehabilitation planning activities were validated on the site and found to be in adherence with all conditions of consent DA 315-7-2003 MOD5.</p> <p>DPHI reviewed the IEA report and noted that the report is generally considered to satisfy the reporting requirements of the consent (NSW Planning ref: DA315-7-2003-PA-18). It is also noted that no response to the IEA recommendations has been included, as no non-</p>

Annual review item	Monitoring completed	Exceedance/non-compliance (NC) identified	Comments
			<p>compliances were identified. Please note that NSW Planning's acceptance of this IEA report does not constitute an endorsement of the project's compliance status.</p>

Appendix A – New South Wales Government Revenue

Royalty online services

Welcome Olivia Maretta

Logout

Lease details

Lease name:	ML 1816 (1992)
Return type:	Non-coal Mineral Quarterly (01/07/2024 - 30/09/2024)
Mineral / Extraction:	CLAY SHALE
Royalty regime:	Quantum Royalty
Royalty rate:	\$0.35 per tonne

Royalty

Production

Ore produced:	Tonnes		\$AUD	
Concentrates produced:	Tonnes		\$AUD	
Export sales:	Tonnes		\$AUD	
Local sales & other disposals:	Tonnes	96,434	\$AUD	313,411.05
Purchases:	Tonnes		\$AUD	
Net disposals:	Tonnes	96,434	\$AUD	313,411.05
Closing stock:	Tonnes		\$AUD	
Opening stock:	Tonnes		\$AUD	
Minerals recovered:	Tonnes	96,434	\$AUD	313,411.05

Deductions

Gross invoice value of contained mineral:	\$AUD	
Invoiced off-site concentrate treatment charges:	\$AUD	
Minerals recovered:	\$AUD	313,411.05
Direct on-site treatment expenses:	\$AUD	
Realisation:	\$AUD	
On-site administration:	\$AUD	
Depreciation:	\$AUD	
Total deductions:	\$AUD	
Ex Mine value:	\$AUD	313,411.05

Royalty due:

\$AUD 33,751.90

Cancel

Royalty online services

Welcome Olivia Marett

Logout

Lease details

Lease name:	ML 1816 (1992)
Return type:	Non-coal Mineral Quarterly (01/10/2024 - 31/12/2024)
Mineral / Extraction:	CLAY SHALE
Royalty regime:	Quantum Royalty
Royalty rate:	\$0.35 per tonne

Royalty

Production

Ore produced:	Tonnes		\$AUD	
Concentrates produced:	Tonnes		\$AUD	
Export sales:	Tonnes		\$AUD	
Local sales & other disposals:	Tonnes	54,392	\$AUD	176,773.71
Purchases:	Tonnes		\$AUD	
Net disposals:	Tonnes	54,392	\$AUD	176,773.71
Closing stock:	Tonnes		\$AUD	
Opening stock:	Tonnes		\$AUD	
Minerals recovered:	Tonnes	54,392	\$AUD	176,773.71

Deductions

Gross invoice value of contained mineral:	\$AUD	
Invoiced off-site concentrate treatment charges:	\$AUD	
Minerals recovered:	\$AUD	176,773.71
Direct on-site treatment expenses:	\$AUD	
Realisation:	\$AUD	
On-site administration:	\$AUD	
Depreciation:	\$AUD	
Total deductions:	\$AUD	
Ex Mine value:	\$AUD	176,773.71

Royalty due: \$AUD 19,037.20

Cancel

Appendix B – Material Transportation Register

SaleDate	Ticket	HQMT.Description	UM	MatUnits	No. of load
1/08/2024	306296	Coombes Apricot Shale	T	229.3	4
1/08/2024	306415	Coombes Apricot Shale	T	229	4
1/08/2024	307472	Coombes Apricot Shale	T	42	1
1/08/2024	302147	Coombes Apricot Shale	T	74.5	2
1/08/2024	306792	Coombes Apricot Shale	T	91.3	2
1/08/2024	306843	Coombes Apricot Shale	T	78.8	2
1/08/2024	305863	Coombes Apricot Shale	T	91	2
1/08/2024	307760	Coombes Apricot Shale	T	72.7	2
1/08/2024	306297	Coombes Apricot Shale	T	91.7	2
1/08/2024	306416	Coombes Apricot Shale	T	91.4	2
1/08/2024	306307	Coombes Apricot Shale	T	74.9	2
1/08/2024	306964	Coombes Apricot Shale	T	40.4	1
1/08/2024	302146	Coombes Brown Shale	T	149.1	3
1/08/2024	306791	Coombes Brown Shale	T	182.7	3
1/08/2024	306842	Coombes Brown Shale	T	157.5	3
1/08/2024	305862	Coombes Brown Shale	T	229.3	4
1/08/2024	307759	Coombes Brown Shale	T	145.6	3
1/08/2024	306306	Coombes Brown Shale	T	150.2	3
2/08/2024	306417	Coombes Apricot Shale	T	273.34	4
2/08/2024	307473	Coombes Apricot Shale	T	194.74	3
2/08/2024	302148	Coombes Apricot Shale	T	223.05	4
2/08/2024	306298	Coombes Apricot Shale	T	274.9	4
2/08/2024	306793	Coombes Apricot Shale	T	273.8	4
2/08/2024	306965	Coombes Apricot Shale	T	193.6	3
2/08/2024	305864	Coombes Apricot Shale	T	275	4
2/08/2024	306846	Coombes Apricot Shale	T	39.5	1
2/08/2024	307286	Coombes Apricot Shale	T	38.4	1
2/08/2024	306418	Coombes Apricot Shale	T	45.5	1
2/08/2024	304862	Coombes Apricot Shale	T	36.92	1
2/08/2024	307474	Coombes Apricot Shale	T	39	1
2/08/2024	302149	Coombes Apricot Shale	T	37.5	1
2/08/2024	306299	Coombes Apricot Shale	T	46	1
2/08/2024	306794	Coombes Apricot Shale	T	46	1
2/08/2024	306966	Coombes Apricot Shale	T	38.88	1
2/08/2024	276572	Coombes Apricot Shale	T	45.8	1
3/08/2024	306419	Coombes Apricot Shale	T	45.7	1
3/08/2024	306300	Coombes Apricot Shale	T	45.9	1
3/08/2024	302150	Coombes Apricot Shale	T	37.1	1
3/08/2024	307475	Coombes Apricot Shale	T	38.53	1
5/08/2024	305848	Coombes Apricot Shale	T	198.8	3
5/08/2024	305952	Coombes Apricot Shale	T	275.1	4
5/08/2024	307580	Coombes Apricot Shale	T	75.4	2
5/08/2024	306848	Coombes Apricot Shale	T	196.9	3

5/08/2024	306421	Coombes Apricot Shale	T	227.16	4
5/08/2024	306795	Coombes Apricot Shale	T	228.8	4
5/08/2024	305865	Coombes Apricot Shale	T	229.4	4
6/08/2024	307853	Coombes Apricot Shale	T	186.5	3
6/08/2024	306315	Coombes Apricot Shale	T	186.7	3
6/08/2024	306849	Coombes Apricot Shale	T	196.5	3
6/08/2024	306316	Coombes Apricot Shale	T	74.4	2
6/08/2024	307854	Coombes Apricot Shale	T	74.8	2
6/08/2024	307478	Coombes Apricot Shale	T	209.2	3
6/08/2024	305953	Coombes Apricot Shale	T	229.1	4
6/08/2024	307582	Coombes Apricot Shale	T	37.6	1
6/08/2024	306422	Coombes Apricot Shale	T	227.5	4
6/08/2024	306796	Coombes Apricot Shale	T	273.3	4
6/08/2024	305866	Coombes Apricot Shale	T	229.2	4
6/08/2024	306968	Coombes Apricot Shale	T	125.5	2
6/08/2024	305849	Coombes Apricot Shale	T	156.7	3
7/08/2024	305867	Coombes Apricot Shale	T	229.4	4
7/08/2024	305954	Coombes Apricot Shale	T	275.3	4
7/08/2024	306423	Coombes Apricot Shale	T	273.52	4
7/08/2024	307764	Coombes Apricot Shale	T	145.2	3
7/08/2024	305850	Coombes Apricot Shale	T	157.3	3
7/08/2024	306850	Coombes Apricot Shale	T	157.5	3
7/08/2024	305868	Coombes Apricot Shale	T	46	1
7/08/2024	307292	Coombes Apricot Shale	T	153	3
7/08/2024	307479	Coombes Apricot Shale	T	167.72	3
7/08/2024	306797	Coombes Apricot Shale	T	137.1	2
7/08/2024	307765	Cream Shale	T	73	2
7/08/2024	306424	Cream Shale	T	91.5	2
7/08/2024	305955	Cream Shale	T	137.9	2
7/08/2024	307301	Cream Shale	T	78.4	2
7/08/2024	308251	Cream Shale	T	78.7	2
7/08/2024	305869	Cream Shale	T	91.8	2
7/08/2024	306798	Cream Shale	T	91.7	2
7/08/2024	307293	Cream Shale	T	76.6	2
7/08/2024	307480	Cream Shale	T	84	2
8/08/2024	305957	Coombes Brown Shale	T	183.8	3
8/08/2024	308201	Coombes Brown Shale	T	182.9	3
8/08/2024	306975	Coombes Brown Shale	T	167.5	3
8/08/2024	307481	Coombes Brown Shale	T	209.26	3
8/08/2024	308253	Coombes Brown Shale	T	157.5	3
8/08/2024	307303	Coombes Brown Shale	T	157.6	3
8/08/2024	306426	Coombes Brown Shale	T	183.04	3
8/08/2024	305871	Coombes Brown Shale	T	183.7	3
8/08/2024	305956	Coombes Apricot Shale	T	45.7	1

8/08/2024	306799	Coombes Apricot Shale	T	45.5	1
8/08/2024	306974	Coombes Apricot Shale	T	39.12	1
8/08/2024	308252	Coombes Apricot Shale	T	39.5	1
8/08/2024	307302	Coombes Apricot Shale	T	39.5	1
8/08/2024	306425	Coombes Apricot Shale	T	45.4	1
8/08/2024	305870	Coombes Apricot Shale	T	45.8	1
9/08/2024	308257	Cream Shale	T	236.3	4
9/08/2024	306800	Cream Shale	T	183.2	3
9/08/2024	307298	Cream Shale	T	229.6	4
9/08/2024	307307	Cream Shale	T	196.2	3
9/08/2024	305961	Cream Shale	T	229.4	4
9/08/2024	305875	Cream Shale	T	229.4	4
9/08/2024	305906	Cream Shale	T	228.7	4
9/08/2024	308204	Coombes Brown Shale	T	45.9	1
9/08/2024	308256	Coombes Brown Shale	T	39.2	1
9/08/2024	307297	Coombes Brown Shale	T	38.3	1
9/08/2024	307306	Coombes Brown Shale	T	39.3	1
9/08/2024	305960	Coombes Brown Shale	T	45.8	1
9/08/2024	305874	Coombes Brown Shale	T	46	1
9/08/2024	305905	Coombes Brown Shale	T	45.5	1
9/08/2024	308203	Coombes Apricot Shale	T	45.8	1
9/08/2024	308255	Coombes Apricot Shale	T	39.5	1
9/08/2024	307296	Coombes Apricot Shale	T	76.1	2
9/08/2024	307305	Coombes Apricot Shale	T	39.5	1
9/08/2024	305959	Coombes Apricot Shale	T	91.8	2
9/08/2024	305904	Coombes Apricot Shale	T	45.3	1
9/08/2024	305873	Coombes Apricot Shale	T	91.8	2
12/08/2024	308259	Coombes Apricot Shale	T	78.9	2
12/08/2024	308206	Coombes Apricot Shale	T	90.8	2
12/08/2024	307309	Coombes Apricot Shale	T	78.9	1
12/08/2024	306322	Coombes Apricot Shale	T	74.9	1
12/08/2024	307861	Coombes Apricot Shale	T	74.6	1
12/08/2024	306428	Coombes Apricot Shale	T	91.2	1
12/08/2024	307300	Coombes Apricot Shale	T	76.6	1
12/08/2024	305877	Coombes Apricot Shale	T	91.8	1
12/08/2024	305963	Coombes Apricot Shale	T	91.9	2
12/08/2024	308260	Coombes Brown Shale	T	39.5	1
12/08/2024	308207	Coombes Brown Shale	T	46	1
12/08/2024	307486	Coombes Brown Shale	T	42	1
12/08/2024	306980	Coombes Brown Shale	T	42	1
12/08/2024	307310	Coombes Brown Shale	T	34	1
12/08/2024	306323	Coombes Brown Shale	T	37.6	1
12/08/2024	307862	Coombes Brown Shale	T	74.9	1
12/08/2024	306429	Coombes Brown Shale	T	91	1

12/08/2024	307601	Coombes Brown Shale	T	76.4	1
12/08/2024	305878	Coombes Brown Shale	T	91.9	1
12/08/2024	305964	Coombes Brown Shale	T	91.7	1
12/08/2024	297730	Cream Shale	T	150.2	2
12/08/2024	308261	Cream Shale	T	157.7	2
12/08/2024	308208	Cream Shale	T	182.9	2
12/08/2024	307487	Cream Shale	T	168	2
12/08/2024	306981	Cream Shale	T	167.4	3
12/08/2024	307311	Cream Shale	T	157.7	3
12/08/2024	306324	Cream Shale	T	150.3	3
12/08/2024	307863	Cream Shale	T	111.3	2
12/08/2024	306430	Cream Shale	T	136.9	2
12/08/2024	307602	Cream Shale	T	114.3	2
12/08/2024	305879	Cream Shale	T	137.7	2
12/08/2024	305965	Cream Shale	T	137.6	2
19/08/2024	308209	Coombes Brown Shale	T	45.6	1
19/08/2024	305967	Coombes Brown Shale	T	91.8	1
19/08/2024	306432	Coombes Brown Shale	T	45.7	1
19/08/2024	308262	Coombes Brown Shale	T	39.4	1
19/08/2024	307312	Coombes Brown Shale	T	39.5	1
19/08/2024	307774	Coombes Brown Shale	T	73	1
19/08/2024	307865	Coombes Brown Shale	T	37.1	1
19/08/2024	305966	Cream Shale	T	321.1	4
19/08/2024	308210	Cream Shale	T	320.3	4
19/08/2024	306431	Cream Shale	T	365.55	5
19/08/2024	308263	Cream Shale	T	315.3	4
19/08/2024	307313	Cream Shale	T	315.3	4
19/08/2024	307775	Cream Shale	T	217.9	3
19/08/2024	307866	Cream Shale	T	260.9	3
19/08/2024	304878	Cream Shale	T	367.2	5
20/08/2024	306329	Coombes Brown Shale	T	37.4	1
20/08/2024	306328	Coombes Apricot Shale	T	75.4	2
20/08/2024	306984	Coombes Apricot Shale	T	156.3	3
20/08/2024	307490	Coombes Apricot Shale	T	156	3
20/08/2024	308212	Coombes Apricot Shale	T	229.1	4
20/08/2024	306434	Coombes Apricot Shale	T	229.06	4
20/08/2024	305969	Coombes Apricot Shale	T	229.7	4
20/08/2024	305968	Cream Shale	T	183.7	3
20/08/2024	306983	Cream Shale	T	167.2	3
20/08/2024	307489	Cream Shale	T	168	3
20/08/2024	304879	Cream Shale	T	46	1
20/08/2024	308211	Cream Shale	T	183.2	3
20/08/2024	306433	Cream Shale	T	182.86	3
20/08/2024	306669	Cream Shale	T	36.3	1

20/08/2024	307777	Cream Shale	T	36.5	1
21/08/2024	306330	Coombes Apricot Shale	T	113	2
21/08/2024	304880	Coombes Apricot Shale	T	137.5	2
21/08/2024	307491	Coombes Apricot Shale	T	117	2
21/08/2024	306985	Coombes Apricot Shale	T	78	2
21/08/2024	308213	Coombes Apricot Shale	T	137.3	2
21/08/2024	306435	Coombes Apricot Shale	T	137.36	2
21/08/2024	305970	Coombes Apricot Shale	T	137.9	2
21/08/2024	306332	Cream Shale	T	150.4	3
21/08/2024	307493	Cream Shale	T	168	3
21/08/2024	306987	Cream Shale	T	167.5	3
21/08/2024	304882	Cream Shale	T	275.3	4
21/08/2024	308215	Cream Shale	T	183.3	3
21/08/2024	306437	Cream Shale	T	229	4
21/08/2024	305972	Cream Shale	T	229.7	4
21/08/2024	306331	Coombes Brown Shale	T	37.7	1
21/08/2024	306436	Coombes Brown Shale	T	45.7	1
21/08/2024	305971	Coombes Brown Shale	T	46	1
21/08/2024	304881	Coombes Brown Shale	T	45.98	1
21/08/2024	307492	Coombes Brown Shale	T	42	1
21/08/2024	306986	Coombes Brown Shale	T	83.6	2
21/08/2024	308214	Coombes Brown Shale	T	45.8	1
22/08/2024	306989	Coombes Apricot Shale	T	78.1	2
22/08/2024	308216	Coombes Apricot Shale	T	182.9	3
22/08/2024	306438	Coombes Apricot Shale	T	182.86	3
22/08/2024	307494	Coombes Apricot Shale	T	156	3
22/08/2024	305973	Coombes Apricot Shale	T	229.2	4
22/08/2024	304883	Coombes Apricot Shale	T	183.7	3
22/08/2024	306990	Cream Shale	T	209.5	3
22/08/2024	308217	Cream Shale	T	229.3	4
22/08/2024	306439	Cream Shale	T	228.64	4
22/08/2024	307495	Cream Shale	T	210	3
22/08/2024	306334	Cream Shale	T	150.2	3
22/08/2024	305974	Cream Shale	T	183.5	3
22/08/2024	307609	Cream Shale	T	153.1	3
22/08/2024	304884	Cream Shale	T	183.6	3
23/08/2024	306679	Cream Shale	T	36.3	1
23/08/2024	308270	Cream Shale	T	236	4
23/08/2024	308219	Cream Shale	T	228.4	4
23/08/2024	306678	Cream Shale	T	72.6	2
23/08/2024	305881	Cream Shale	T	275.2	4
23/08/2024	305976	Cream Shale	T	229.4	4
23/08/2024	306441	Cream Shale	T	228.56	4
23/08/2024	307497	Cream Shale	T	210	3

23/08/2024	306992	Cream Shale	T	209.3	3
23/08/2024	305880	Coombes Apricot Shale	T	91.5	2
23/08/2024	305975	Coombes Apricot Shale	T	137.7	2
23/08/2024	306440	Coombes Apricot Shale	T	137.3	2
23/08/2024	306991	Coombes Apricot Shale	T	78	2
23/08/2024	307496	Coombes Apricot Shale	T	78	2
23/08/2024	308218	Coombes Apricot Shale	T	136.9	2
26/08/2024	307323	Coombes Apricot Shale	T	118.4	2
26/08/2024	306444	Coombes Apricot Shale	T	183.06	3
26/08/2024	305979	Coombes Apricot Shale	T	183.2	2
26/08/2024	305884	Coombes Apricot Shale	T	137.5	2
26/08/2024	308272	Coombes Apricot Shale	T	118.1	2
26/08/2024	308220	Coombes Apricot Shale	T	136.9	2
26/08/2024	306995	Coombes Apricot Shale	T	117	2
26/08/2024	307499	Coombes Apricot Shale	T	117	2
26/08/2024	307324	Cream Shale	T	236.7	3
26/08/2024	306445	Cream Shale	T	228.2	3
26/08/2024	307876	Cream Shale	T	149	3
26/08/2024	305980	Cream Shale	T	229.6	3
26/08/2024	306338	Cream Shale	T	112.2	2
26/08/2024	305885	Cream Shale	T	229.5	4
26/08/2024	308273	Cream Shale	T	197.2	3
26/08/2024	308221	Cream Shale	T	229	4
26/08/2024	306684	Cream Shale	T	72.8	2
26/08/2024	307500	Cream Shale	T	210	3
26/08/2024	306996	Cream Shale	T	209.3	3
27/08/2024	305983	Cream Shale	T	46	1
27/08/2024	305888	Cream Shale	T	46	1
27/08/2024	308275	Cream Shale	T	118.3	2
27/08/2024	305982	Cream Shale	T	137.7	2
27/08/2024	305887	Cream Shale	T	137.7	2
27/08/2024	308223	Cream Shale	T	137.8	2
27/08/2024	306902	Cream Shale	T	126	2
27/08/2024	306447	Cream Shale	T	137.2	2
27/08/2024	308274	Coombes Apricot Shale	T	157.7	3
27/08/2024	305981	Coombes Apricot Shale	T	137.7	2
27/08/2024	305886	Coombes Apricot Shale	T	137.8	2
27/08/2024	308222	Coombes Apricot Shale	T	183.4	3
27/08/2024	306901	Coombes Apricot Shale	T	156	3
27/08/2024	306446	Coombes Apricot Shale	T	182.22	3
28/08/2024	305984	Coombes Apricot Shale	T	229.8	4
28/08/2024	306448	Coombes Apricot Shale	T	229.22	4
28/08/2024	308278	Coombes Apricot Shale	T	39.5	1
28/08/2024	308224	Coombes Apricot Shale	T	183.2	3

28/08/2024	307880	Coombes Apricot Shale	T	111.6	2
28/08/2024	305889	Coombes Apricot Shale	T	229.5	4
28/08/2024	305985	Cream Shale	T	183.5	3
28/08/2024	306449	Cream Shale	T	183.1	3
28/08/2024	308501	Cream Shale	T	41.8	1
28/08/2024	308279	Cream Shale	T	157.6	3
28/08/2024	307789	Cream Shale	T	36.5	1
28/08/2024	306905	Cream Shale	T	42	1
28/08/2024	308225	Cream Shale	T	183.7	3
28/08/2024	306688	Cream Shale	T	36.1	1
28/08/2024	307881	Cream Shale	T	74.9	2
28/08/2024	305890	Cream Shale	T	138.1	2
29/08/2024	306343	Coombes Apricot Shale	T	150.3	3
29/08/2024	307329	Coombes Apricot Shale	T	39.1	1
29/08/2024	309151	Coombes Apricot Shale	T	183.5	3
29/08/2024	305987	Coombes Apricot Shale	T	229.5	4
29/08/2024	305891	Coombes Apricot Shale	T	183.7	3
29/08/2024	308226	Coombes Apricot Shale	T	182.9	3
29/08/2024	307330	Cream Shale	T	118.2	2
29/08/2024	306450	Cream Shale	T	229.3	4
29/08/2024	306344	Cream Shale	T	149.45	3
29/08/2024	307883	Cream Shale	T	37.3	1
29/08/2024	308281	Cream Shale	T	39.5	1
29/08/2024	305986	Cream Shale	T	183.6	3
29/08/2024	308504	Cream Shale	T	83.7	2
29/08/2024	306908	Cream Shale	T	84	2
29/08/2024	306692	Cream Shale	T	36.5	1
29/08/2024	308227	Cream Shale	T	183.2	3
29/08/2024	305892	Cream Shale	T	183.7	3
30/08/2024	305989	Cream Shale	T	229.3	3
30/08/2024	308229	Cream Shale	T	229.4	4
30/08/2024	308284	Cream Shale	T	157.7	3
30/08/2024	307332	Cream Shale	T	118.2	2
30/08/2024	306911	Cream Shale	T	126	2
30/08/2024	307885	Cream Shale	T	111.9	2
30/08/2024	308507	Cream Shale	T	125	2
30/08/2024	306694	Cream Shale	T	217.9	4
30/08/2024	309153	Cream Shale	T	274	4
30/08/2024	305894	Cream Shale	T	229.8	4
30/08/2024	306347	Cream Shale	T	187.7	3
30/08/2024	309001	Cream Shale	T	188.2	3
30/08/2024	305988	Coombes Apricot Shale	T	138	2
30/08/2024	308228	Coombes Apricot Shale	T	137.3	2
30/08/2024	306693	Coombes Apricot Shale	T	72.3	2

30/08/2024	309152	Coombes Apricot Shale	T	91.4	2
30/08/2024	305893	Coombes Apricot Shale	T	137.7	2
30/08/2024	306346	Coombes Apricot Shale	T	112.9	2
30/08/2024	306460	Coombes Apricot Shale	T	113	2
2/09/2024	306914	Cream Shale	T	252	4
2/09/2024	308509	Cream Shale	T	250.9	4
2/09/2024	308232	Cream Shale	T	275.5	4
2/09/2024	307336	Cream Shale	T	167.1	3
2/09/2024	305992	Cream Shale	T	229.4	4
2/09/2024	305897	Cream Shale	T	229.9	4
2/09/2024	308287	Cream Shale	T	157.2	3
2/09/2024	309156	Cream Shale	T	183.2	3
2/09/2024	309002	Cream Shale	T	188	3
3/09/2024	307338	Cream Shale	T	236.7	4
3/09/2024	308234	Cream Shale	T	229.5	4
3/09/2024	307891	Cream Shale	T	186.1	3
3/09/2024	308289	Cream Shale	T	196.8	3
3/09/2024	309158	Cream Shale	T	274.46	4
3/09/2024	305994	Cream Shale	T	229.4	4
3/09/2024	305899	Cream Shale	T	275.8	4
3/09/2024	306916	Cream Shale	T	210	3
3/09/2024	308511	Cream Shale	T	209.2	3
2/09/2024	306913	Coombes Apricot Shale	T	78	2
2/09/2024	308508	Coombes Apricot Shale	T	78.1	2
2/09/2024	308231	Coombes Apricot Shale	T	91.9	2
2/09/2024	307335	Coombes Apricot Shale	T	118.2	2
2/09/2024	305991	Coombes Apricot Shale	T	137.9	2
2/09/2024	305896	Coombes Apricot Shale	T	137.7	2
2/09/2024	308286	Coombes Apricot Shale	T	78.8	2
2/09/2024	309155	Coombes Apricot Shale	T	137.6	2
2/09/2024	306462	Coombes Apricot Shale	T	75.1	2
3/09/2024	307337	Coombes Apricot Shale	T	78.9	2
3/09/2024	308233	Coombes Apricot Shale	T	91.9	2
3/09/2024	307890	Coombes Apricot Shale	T	112.1	2
3/09/2024	308288	Coombes Apricot Shale	T	78.9	2
3/09/2024	309157	Coombes Apricot Shale	T	91.2	2
3/09/2024	305993	Coombes Apricot Shale	T	137.6	2
3/09/2024	305898	Coombes Apricot Shale	T	91.9	2
3/09/2024	308510	Coombes Apricot Shale	T	78.1	2
3/09/2024	306915	Coombes Apricot Shale	T	78	2
4/09/2024	307894	Cream Shale	T	186.6	3
4/09/2024	308513	Cream Shale	T	84	2
4/09/2024	306918	Cream Shale	T	84	2
4/09/2024	306700	Cream Shale	T	36.2	1

4/09/2024	305996	Cream Shale	T	183.8	3
4/09/2024	308236	Cream Shale	T	183.2	3
4/09/2024	308291	Cream Shale	T	157.3	3
4/09/2024	309160	Cream Shale	T	183.1	3
4/09/2024	309102	Cream Shale	T	184.2	3
4/09/2024	307893	Coombes Apricot Shale	T	149	3
4/09/2024	305995	Coombes Apricot Shale	T	229.3	4
4/09/2024	308235	Coombes Apricot Shale	T	183.9	3
4/09/2024	308290	Coombes Apricot Shale	T	157.6	3
4/09/2024	309159	Coombes Apricot Shale	T	183.46	3
4/09/2024	309101	Coombes Apricot Shale	T	184	3
5/09/2024	308292	Coombes Apricot Shale	T	157.6	3
5/09/2024	305997	Coombes Apricot Shale	T	183.5	3
5/09/2024	309103	Coombes Apricot Shale	T	183.8	3
5/09/2024	309161	Coombes Apricot Shale	T	183.56	3
5/09/2024	308237	Coombes Apricot Shale	T	183	3
5/09/2024	308293	Cream Shale	T	157.3	3
5/09/2024	305998	Cream Shale	T	183.7	3
5/09/2024	309104	Cream Shale	T	184.2	3
5/09/2024	309162	Cream Shale	T	183.7	3
5/09/2024	308238	Cream Shale	T	183.7	3
6/09/2024	309106	Cream Shale	T	92.1	2
6/09/2024	309003	Cream Shale	T	112.9	2
6/09/2024	308240	Cream Shale	T	137.9	2
6/09/2024	309164	Cream Shale	T	183	3
6/09/2024	309105	Coombes Apricot Shale	T	229.8	4
6/09/2024	308239	Coombes Apricot Shale	T	229.4	4
6/09/2024	306466	Coombes Apricot Shale	T	188.3	3
6/09/2024	309163	Coombes Apricot Shale	T	228.9	4
9/09/2024	309252	Cream Shale	T	37.1	1
9/09/2024	308242	Cream Shale	T	137.7	2
9/09/2024	309166	Cream Shale	T	91.6	2
9/09/2024	306000	Cream Shale	T	92	2
9/09/2024	309605	Cream Shale	T	37.5	1
9/09/2024	306604	Cream Shale	T	73	2
9/09/2024	308307	Cream Shale	T	72.5	2
9/09/2024	309251	Coombes Apricot Shale	T	74.8	2
9/09/2024	308241	Coombes Apricot Shale	T	229.6	4
9/09/2024	309604	Coombes Apricot Shale	T	263.2	4
9/09/2024	306603	Coombes Apricot Shale	T	254.5	4
9/09/2024	308306	Coombes Apricot Shale	T	217.6	4
10/09/2024	309608	Coombes Apricot Shale	T	187	3
10/09/2024	297587	Coombes Apricot Shale	T	152.7	3
10/09/2024	306606	Coombes Apricot Shale	T	181.5	3

10/09/2024	307633	Coombes Apricot Shale	T	113.6	2
11/09/2024	309255	Coombes Apricot Shale	T	261	4
11/09/2024	307349	Coombes Apricot Shale	T	315.7	5
12/09/2024	309109	Coombes Apricot Shale	T	46	1
12/09/2024	309173	Coombes Apricot Shale	T	45.7	1
12/09/2024	308524	Coombes Apricot Shale	T	42	1
13/09/2024	308317	Coombes Apricot Shale	T	36.1	1
13/09/2024	305456	Coombes Apricot Shale	T	39.4	1
13/09/2024	308247	Coombes Apricot Shale	T	45.6	1
13/09/2024	309175	Coombes Apricot Shale	T	45.8	1
13/09/2024	309111	Coombes Apricot Shale	T	46	1
13/09/2024	308407	Coombes Apricot Shale	T	46	1
13/09/2024	306612	Coombes Apricot Shale	T	36.5	1
13/09/2024	306927	Coombes Apricot Shale	T	42	1
16/09/2024	298717	Coombes Apricot Shale	T	39.1	1
16/09/2024	308410	Coombes Apricot Shale	T	229.8	4
16/09/2024	308912	Coombes Apricot Shale	T	197.2	3
16/09/2024	306930	Coombes Apricot Shale	T	168	3
16/09/2024	309178	Coombes Apricot Shale	T	229	4
16/09/2024	306614	Coombes Apricot Shale	T	182.5	3
16/09/2024	308248	Coombes Apricot Shale	T	229.6	4
16/09/2024	309262	Coombes Apricot Shale	T	186.3	3
16/09/2024	309114	Coombes Apricot Shale	T	229.6	4
17/09/2024	306527	Coombes Apricot Shale	T	225.7	4
17/09/2024	308411	Coombes Apricot Shale	T	229.3	4
17/09/2024	309264	Coombes Apricot Shale	T	186.3	3
17/09/2024	308249	Coombes Apricot Shale	T	229.2	4
17/09/2024	309179	Coombes Apricot Shale	T	229	4
17/09/2024	309115	Coombes Apricot Shale	T	229.9	4
18/09/2024	309117	Cream Shale	T	45.8	1
18/09/2024	309116	Coombes Apricot Shale	T	183.8	3
18/09/2024	308535	Coombes Apricot Shale	T	125.4	2
18/09/2024	290433	Coombes Apricot Shale	T	167.74	3
18/09/2024	308250	Coombes Apricot Shale	T	181.3	3
18/09/2024	308412	Coombes Apricot Shale	T	229.2	4
18/09/2024	307645	Coombes Apricot Shale	T	151.5	3
19/09/2024	308414	Cream Shale	T	46	1
19/09/2024	305465	Coombes Apricot Shale	T	78.5	2
19/09/2024	307703	Coombes Apricot Shale	T	76.46	2
19/09/2024	306934	Coombes Apricot Shale	T	168	3
19/09/2024	308413	Coombes Apricot Shale	T	229.6	4
19/09/2024	309625	Coombes Apricot Shale	T	37.5	1
19/09/2024	308920	Coombes Apricot Shale	T	39.5	1
19/09/2024	309551	Coombes Apricot Shale	T	229.6	4

19/09/2024	309180	Coombes Apricot Shale	T	228.96	4
19/09/2024	309118	Coombes Apricot Shale	T	229.5	4
20/09/2024	305466	Coombes Apricot Shale	T	79	2
20/09/2024	308921	Coombes Apricot Shale	T	79	2
20/09/2024	309552	Coombes Apricot Shale	T	91.9	2
20/09/2024	308415	Coombes Apricot Shale	T	91.8	2
20/09/2024	309119	Coombes Apricot Shale	T	91.9	2
20/09/2024	309181	Coombes Apricot Shale	T	91.5	2
20/09/2024	308330	Coombes Apricot Shale	T	72.4	2
20/09/2024	308922	Cream Shale	T	157.4	3
20/09/2024	309553	Cream Shale	T	183.3	3
20/09/2024	305467	Cream Shale	T	157.6	3
20/09/2024	308416	Cream Shale	T	229.6	4
20/09/2024	309120	Cream Shale	T	183.7	3
20/09/2024	308331	Cream Shale	T	145.5	3
20/09/2024	309182	Cream Shale	T	183.7	3
20/09/2024	306616	Cream Shale	T	36.4	1
23/09/2024	305470	Coombes Apricot Shale	T	197.3	3
23/09/2024	309555	Coombes Apricot Shale	T	229.5	4
23/09/2024	308925	Coombes Apricot Shale	T	197.2	3
23/09/2024	308419	Coombes Apricot Shale	T	229.5	4
23/09/2024	309185	Coombes Apricot Shale	T	229.7	4
23/09/2024	309271	Coombes Apricot Shale	T	186.2	3
23/09/2024	308554	Coombes Apricot Shale	T	190.1	3
23/09/2024	309123	Coombes Apricot Shale	T	229.6	4
24/09/2024	308063	Cream Shale	T	37.5	1
24/09/2024	307711	Coombes Apricot Shale	T	76.3	2
24/09/2024	308544	Coombes Apricot Shale	T	209.4	3
24/09/2024	309186	Coombes Apricot Shale	T	229.06	4
24/09/2024	309557	Coombes Apricot Shale	T	229.2	4
24/09/2024	309273	Coombes Apricot Shale	T	74.3	2
24/09/2024	306533	Coombes Apricot Shale	T	37.7	1
24/09/2024	308556	Coombes Apricot Shale	T	38.4	1
24/09/2024	308062	Coombes Apricot Shale	T	37.2	1
24/09/2024	306942	Coombes Apricot Shale	T	210	3
24/09/2024	309124	Coombes Apricot Shale	T	229.6	4
24/09/2024	308421	Coombes Apricot Shale	T	229.4	4
25/09/2024	306535	Coombes Apricot Shale	T	225.3	4
25/09/2024	309558	Coombes Apricot Shale	T	275.1	4
25/09/2024	305473	Coombes Apricot Shale	T	121.2	2
25/09/2024	309274	Coombes Apricot Shale	T	186.6	3
25/09/2024	306619	Coombes Apricot Shale	T	181.7	3
25/09/2024	308557	Coombes Apricot Shale	T	190.8	3
25/09/2024	306943	Coombes Apricot Shale	T	210	3

25/09/2024	308928	Coombes Apricot Shale	T	197.1	3
25/09/2024	308338	Coombes Apricot Shale	T	181.8	3
25/09/2024	308423	Coombes Apricot Shale	T	209.3	3
25/09/2024	307713	Coombes Apricot Shale	T	190.9	3
1/10/2024	308545	Coombes Apricot Shale	T	167.2	3
1/10/2024	306944	Coombes Apricot Shale	T	168	3
1/10/2024	308558	Coombes Apricot Shale	T	151.9	3
1/10/2024	309632	Coombes Apricot Shale	T	149	3
1/10/2024	306536	Coombes Apricot Shale	T	186.9	3
2/10/2024	308546	Coombes Apricot Shale	T	41.7	1
2/10/2024	306480	Coombes Apricot Shale	T	37.4	1
2/10/2024	309633	Coombes Apricot Shale	T	37.4	1
2/10/2024	306945	Coombes Apricot Shale	T	42	1
2/10/2024	309560	Coombes Apricot Shale	T	45.5	1
2/10/2024	309276	Coombes Apricot Shale	T	37.4	1
2/10/2024	306537	Coombes Apricot Shale	T	37.5	1
3/10/2024	309634	Coombes Apricot Shale	T	150.4	3
3/10/2024	309127	Coombes Apricot Shale	T	228.3	4
3/10/2024	309191	Coombes Apricot Shale	T	229.36	4
3/10/2024	309561	Coombes Apricot Shale	T	228.7	4
3/10/2024	306539	Coombes Apricot Shale	T	188.2	3
3/10/2024	307716	Coombes Apricot Shale	T	152.2	3
3/10/2024	309277	Coombes Apricot Shale	T	149.4	3
4/10/2024	308549	Coombes Apricot Shale	T	125.5	2
4/10/2024	308427	Coombes Apricot Shale	T	183.7	3
4/10/2024	306948	Coombes Apricot Shale	T	126	2
4/10/2024	309129	Coombes Apricot Shale	T	137.1	2
4/10/2024	306541	Coombes Apricot Shale	T	75.3	2
4/10/2024	309279	Coombes Apricot Shale	T	74.8	2
4/10/2024	309562	Coombes Apricot Shale	T	182.7	3
4/10/2024	309192	Coombes Apricot Shale	T	183.5	3
4/10/2024	306482	Coombes Apricot Shale	T	150.4	3
4/10/2024	305476	Coombes Apricot Shale	T	39.3	1
4/10/2024	306623	Coombes Apricot Shale	T	146	3
4/10/2024	308342	Coombes Apricot Shale	T	108.9	2
9/10/2024	309131	Coombes Apricot Shale	T	137.9	2
9/10/2024	306546	Coombes Apricot Shale	T	37.7	1
9/10/2024	307718	Coombes Apricot Shale	T	152.7	3
9/10/2024	308563	Coombes Apricot Shale	T	152.7	3
9/10/2024	309194	Coombes Apricot Shale	T	182.8	3
9/10/2024	309635	Coombes Apricot Shale	T	149.6	3
9/10/2024	305479	Coombes Apricot Shale	T	159	3
9/10/2024	308345	Coombes Apricot Shale	T	108.4	2
9/10/2024	309565	Coombes Apricot Shale	T	183.1	3

9/10/2024	306625	Coombes Apricot Shale	T	146	3
9/10/2024	308071	Coombes Apricot Shale	T	148	3
9/10/2024	308429	Coombes Apricot Shale	T	183.1	3
10/10/2024	306628	Coombes Apricot Shale	T	145	3
10/10/2024	309568	Coombes Apricot Shale	T	183.2	3
10/10/2024	309452	Coombes Apricot Shale	T	167.2	3
10/10/2024	305482	Coombes Apricot Shale	T	157.6	3
10/10/2024	306950	Coombes Apricot Shale	T	168	3
10/10/2024	308432	Coombes Apricot Shale	T	183.7	3
10/10/2024	308348	Coombes Apricot Shale	T	108.5	2
10/10/2024	309283	Coombes Apricot Shale	T	149.2	3
10/10/2024	309638	Coombes Apricot Shale	T	150.1	3
10/10/2024	306549	Coombes Apricot Shale	T	150.2	3
10/10/2024	307721	Coombes Apricot Shale	T	151.7	3
10/10/2024	308934	Coombes Apricot Shale	T	118.4	2
10/10/2024	309133	Coombes Apricot Shale	T	183.7	3
10/10/2024	308566	Coombes Apricot Shale	T	114.5	2
11/10/2024	309302	Coombes Apricot Shale	T	113	2
11/10/2024	308935	Coombes Apricot Shale	T	157.5	3
11/10/2024	308434	Coombes Apricot Shale	T	183.8	3
11/10/2024	309198	Coombes Apricot Shale	T	183.3	3
11/10/2024	309569	Coombes Apricot Shale	T	183.4	3
11/10/2024	307003	Coombes Apricot Shale	T	126	2
11/10/2024	308074	Coombes Apricot Shale	T	150.3	3
11/10/2024	309453	Coombes Apricot Shale	T	167.2	3
11/10/2024	307723	Coombes Apricot Shale	T	114.5	2
11/10/2024	309641	Coombes Apricot Shale	T	112.6	2
11/10/2024	309136	Coombes Apricot Shale	T	137.9	2
14/10/2024	305487	Coombes Apricot Shale	T	39.6	1
14/10/2024	308940	Coombes Apricot Shale	T	39.5	1
14/10/2024	307007	Coombes Apricot Shale	T	165	3
14/10/2024	309573	Coombes Apricot Shale	T	137.6	2
14/10/2024	308438	Coombes Apricot Shale	T	183.7	3
14/10/2024	309457	Coombes Apricot Shale	T	164.4	3
14/10/2024	309752	Coombes Apricot Shale	T	183.4	3
14/10/2024	309138	Coombes Apricot Shale	T	183.7	3
14/10/2024	308439	Coombes Apricot Shale	T	91.8	2
14/10/2024	309139	Coombes Apricot Shale	T	92	2
14/10/2024	309458	Coombes Apricot Shale	T	39	1
14/10/2024	307008	Coombes Apricot Shale	T	39	1
14/10/2024	309574	Coombes Apricot Shale	T	91.9	2
14/10/2024	309753	Coombes Apricot Shale	T	91.2	2
16/10/2024	309140	Coombes Apricot Shale	T	321.4	5
16/10/2024	309007	Coombes Apricot Shale	T	262.4	4

16/10/2024	308440	Coombes Apricot Shale	T	321.7	5
16/10/2024	308941	Coombes Apricot Shale	T	275.8	4
16/10/2024	305488	Coombes Apricot Shale	T	276.18	4
16/10/2024	309575	Coombes Apricot Shale	T	320.8	5
16/10/2024	307011	Coombes Apricot Shale	T	336	5
16/10/2024	309460	Coombes Apricot Shale	T	334.9	5
16/10/2024	309754	Coombes Apricot Shale	T	365.4	6
17/10/2024	309141	Coombes Apricot Shale	T	275.6	4
17/10/2024	308458	Coombes Apricot Shale	T	36.1	1
17/10/2024	309755	Coombes Apricot Shale	T	274.5	4
17/10/2024	305489	Coombes Apricot Shale	T	236.2	4
17/10/2024	309576	Coombes Apricot Shale	T	320.9	5
17/10/2024	306635	Coombes Apricot Shale	T	36.5	1
17/10/2024	308942	Coombes Apricot Shale	T	276	4
17/10/2024	308441	Coombes Apricot Shale	T	275.5	4
17/10/2024	308573	Coombes Apricot Shale	T	228.2	4
17/10/2024	309290	Coombes Apricot Shale	T	74.8	2
17/10/2024	309645	Coombes Apricot Shale	T	74.7	2
17/10/2024	309142	Coombes Apricot Shale	T	91.9	2
17/10/2024	309756	Coombes Apricot Shale	T	91.6	2
17/10/2024	305490	Coombes Apricot Shale	T	79	2
17/10/2024	309577	Coombes Apricot Shale	T	45.8	1
17/10/2024	308943	Coombes Apricot Shale	T	39.5	1
17/10/2024	308442	Coombes Apricot Shale	T	91.9	2
17/10/2024	308574	Coombes Apricot Shale	T	76.5	2
21/10/2024	305491	Coombes Apricot Shale	T	39.6	1
21/10/2024	308444	Cream Shale	T	275.6	4
21/10/2024	309757	Cream Shale	T	273.6	4
21/10/2024	309579	Cream Shale	T	274.2	4
21/10/2024	309463	Cream Shale	T	251	4
21/10/2024	307014	Cream Shale	T	252	4
21/10/2024	309647	Cream Shale	T	229.5	4
21/10/2024	308461	Cream Shale	T	36.2	1
21/10/2024	308443	Coombes Apricot Shale	T	137.8	2
21/10/2024	309758	Coombes Apricot Shale	T	137.6	2
21/10/2024	305492	Coombes Apricot Shale	T	39.5	1
21/10/2024	309009	Coombes Apricot Shale	T	37.5	1
21/10/2024	309578	Coombes Apricot Shale	T	91.3	2
21/10/2024	308945	Coombes Apricot Shale	T	39.5	1
21/10/2024	309462	Coombes Apricot Shale	T	78.1	2
21/10/2024	307013	Coombes Apricot Shale	T	78.1	2
21/10/2024	309646	Coombes Apricot Shale	T	75.6	2
21/10/2024	309291	Coombes Apricot Shale	T	37.2	1
22/10/2024	307016	Coombes Apricot Shale	T	78	2

22/10/2024	308446	Coombes Apricot Shale	T	92	2
22/10/2024	309761	Coombes Apricot Shale	T	91.7	2
22/10/2024	309465	Coombes Apricot Shale	T	78	2
22/10/2024	306639	Coombes Apricot Shale	T	72.8	2
22/10/2024	309581	Coombes Apricot Shale	T	91.8	2
22/10/2024	309144	Coombes Apricot Shale	T	91.9	2
22/10/2024	307015	Coombes Apricot Shale	T	252	4
22/10/2024	308447	Coombes Apricot Shale	T	137.8	2
22/10/2024	309760	Coombes Apricot Shale	T	137.2	2
22/10/2024	309464	Coombes Apricot Shale	T	209.1	3
22/10/2024	306640	Coombes Apricot Shale	T	109.3	2
22/10/2024	309580	Coombes Apricot Shale	T	229.3	4
22/10/2024	309143	Coombes Apricot Shale	T	229.8	4
23/10/2024	308448	Coombes Apricot Shale	T	229.8	4
23/10/2024	309762	Coombes Apricot Shale	T	229.5	4
23/10/2024	309582	Coombes Apricot Shale	T	229.4	4
23/10/2024	309145	Coombes Apricot Shale	T	230	4
23/10/2024	309467	Coombes Apricot Shale	T	39.1	1
23/10/2024	310105	Coombes Apricot Shale	T	30	1
23/10/2024	309583	Coombes Apricot Shale	T	137.8	2
23/10/2024	308824	Coombes Apricot Shale	T	37.5	1
23/10/2024	309146	Coombes Apricot Shale	T	138	2
23/10/2024	308466	Coombes Apricot Shale	T	36.4	1
23/10/2024	310353	Coombes Apricot Shale	T	31.5	1
23/10/2024	307018	Coombes Apricot Shale	T	42	1
23/10/2024	309468	Coombes Apricot Shale	T	167.5	3
23/10/2024	308449	Coombes Apricot Shale	T	183.7	3
23/10/2024	309763	Coombes Apricot Shale	T	183.3	3
24/10/2024	309470	Coombes Apricot Shale	T	83.7	2
24/10/2024	309764	Coombes Apricot Shale	T	137.4	2
24/10/2024	308450	Coombes Apricot Shale	T	138	2
24/10/2024	307020	Coombes Apricot Shale	T	126	2
24/10/2024	306644	Coombes Apricot Shale	T	73	2
24/10/2024	309147	Coombes Apricot Shale	T	91.9	2
24/10/2024	309584	Coombes Apricot Shale	T	92	2
24/10/2024	308351	Coombes Apricot Shale	T	229.6	4
24/10/2024	309765	Coombes Apricot Shale	T	229.2	4
24/10/2024	307021	Coombes Apricot Shale	T	78	2
24/10/2024	309148	Coombes Apricot Shale	T	229.8	4
24/10/2024	309585	Coombes Apricot Shale	T	229.5	4
29/10/2024	308827	Coombes Apricot Shale	T	112.5	2
29/10/2024	309771	Coombes Apricot Shale	T	182.7	3
29/10/2024	309592	Coombes Apricot Shale	T	183.7	3
29/10/2024	308358	Coombes Apricot Shale	T	46	1

29/10/2024	310503	Coombes Apricot Shale	T	158.4	3
29/10/2024	306649	Coombes Apricot Shale	T	145.6	3
29/10/2024	310052	Coombes Apricot Shale	T	36.2	1
29/10/2024	309475	Coombes Apricot Shale	T	194.9	3
29/10/2024	310502	Coombes Apricot Shale	T	157.9	3
29/10/2024	306648	Coombes Apricot Shale	T	144.9	3
29/10/2024	310051	Coombes Apricot Shale	T	229.7	4
29/10/2024	309770	Coombes Apricot Shale	T	183.4	3
29/10/2024	309591	Coombes Apricot Shale	T	183.5	3
30/10/2024	308828	Coombes Apricot Shale	T	74.7	2
30/10/2024	309330	Coombes Apricot Shale	T	75.2	2
30/10/2024	307807	Coombes Apricot Shale	T	37.3	1
30/10/2024	308591	Coombes Apricot Shale	T	37.5	1
30/10/2024	309593	Coombes Apricot Shale	T	91.9	2
30/10/2024	309019	Coombes Apricot Shale	T	37.5	1
30/10/2024	306650	Coombes Apricot Shale	T	72.7	2
30/10/2024	308359	Coombes Apricot Shale	T	92	2
30/10/2024	307904	Coombes Apricot Shale	T	76.2	2
30/10/2024	309772	Coombes Apricot Shale	T	91.7	2
30/10/2024	308829	Coombes Apricot Shale	T	224.4	4
30/10/2024	305757	Coombes Apricot Shale	T	158.5	3
30/10/2024	310505	Coombes Apricot Shale	T	158.2	3
30/10/2024	307027	Coombes Apricot Shale	T	168	3
30/10/2024	307808	Coombes Apricot Shale	T	37.5	1
30/10/2024	308592	Coombes Apricot Shale	T	74.8	2
30/10/2024	309020	Coombes Apricot Shale	T	75	2
30/10/2024	309594	Coombes Apricot Shale	T	321.6	4
30/10/2024	308651	Coombes Apricot Shale	T	254.8	3
30/10/2024	310055	Coombes Apricot Shale	T	46	1
30/10/2024	308360	Coombes Apricot Shale	T	275.7	3
30/10/2024	309773	Coombes Apricot Shale	T	275	3
31/10/2024	308831	Coombes Apricot Shale	T	149.8	3
31/10/2024	309775	Coombes Apricot Shale	T	137.5	2
31/10/2024	308362	Coombes Apricot Shale	T	184	3
31/10/2024	305760	Coombes Apricot Shale	T	79.4	2
31/10/2024	308653	Coombes Apricot Shale	T	108.9	2
31/10/2024	307031	Coombes Apricot Shale	T	84	2
31/10/2024	310508	Coombes Apricot Shale	T	118.8	2
31/10/2024	310057	Coombes Apricot Shale	T	137.9	2
31/10/2024	308830	Coombes Apricot Shale	T	149.8	3
31/10/2024	309774	Coombes Apricot Shale	T	229.2	4
31/10/2024	309411	Coombes Apricot Shale	T	38.2	1
31/10/2024	308361	Coombes Apricot Shale	T	229.8	4
31/10/2024	308652	Coombes Apricot Shale	T	145.4	3

31/10/2024	310507	Coombes Apricot Shale	T	39.7	1
31/10/2024	310056	Coombes Apricot Shale	T	230.1	4
1/11/2024	310511	Coombes Apricot Shale	T	79.5	2
1/11/2024	309777	Coombes Apricot Shale	T	183.2	3
1/11/2024	307035	Coombes Apricot Shale	T	78	2
1/11/2024	308364	Coombes Apricot Shale	T	183.9	3
1/11/2024	310059	Coombes Apricot Shale	T	184	3
1/11/2024	308833	Coombes Apricot Shale	T	150.2	3
1/11/2024	305764	Coombes Apricot Shale	T	39.6	1
4/11/2024	309478	Coombes Apricot Shale	T	117	2
4/11/2024	309597	Coombes Apricot Shale	T	137.3	2
4/11/2024	307038	Coombes Apricot Shale	T	117	2
4/11/2024	308368	Coombes Apricot Shale	T	183.9	3
4/11/2024	309781	Coombes Apricot Shale	T	137.7	2
4/11/2024	310061	Coombes Apricot Shale	T	138	2
5/11/2024	308371	Coombes Apricot Shale	T	183.7	3
5/11/2024	307041	Coombes Apricot Shale	T	156	3
5/11/2024	309481	Coombes Apricot Shale	T	155.9	3
5/11/2024	309600	Coombes Apricot Shale	T	137.7	2
5/11/2024	310064	Coombes Apricot Shale	T	138	2
5/11/2024	310516	Coombes Apricot Shale	T	118.3	2
5/11/2024	309784	Coombes Apricot Shale	T	137.4	2
5/11/2024	308658	Coombes Apricot Shale	T	36.5	1
1/11/2024	308365	Cream Shale	T	46	1
1/11/2024	308834	Cream Shale	T	37.5	1
1/11/2024	307034	Cream Shale	T	42	1
1/11/2024	309778	Cream Shale	T	45.8	1
4/11/2024	308656	Cream Shale	T	73	2
4/11/2024	305769	Cream Shale	T	39.5	1
4/11/2024	309479	Cream Shale	T	167.5	3
4/11/2024	309598	Cream Shale	T	183.7	3
4/11/2024	307039	Cream Shale	T	168	3
4/11/2024	308369	Cream Shale	T	183.8	3
4/11/2024	309782	Cream Shale	T	183.4	3
4/11/2024	310514	Cream Shale	T	118.5	2
4/11/2024	310062	Cream Shale	T	183.8	3
4/11/2024	309414	Cream Shale	T	77.1	2
4/11/2024	307812	Cream Shale	T	37.4	1
5/11/2024	308372	Coombes Apricot Shale	T	137.8	2
5/11/2024	307042	Coombes Apricot Shale	T	84	2
5/11/2024	309482	Coombes Apricot Shale	T	83.9	2
5/11/2024	309351	Coombes Apricot Shale	T	137.3	2
5/11/2024	310065	Coombes Apricot Shale	T	138.2	2
5/11/2024	305771	Coombes Apricot Shale	T	39.4	1

5/11/2024	310517	Coombes Apricot Shale	T	79.1	2
5/11/2024	309785	Coombes Apricot Shale	T	137.7	2
5/11/2024	308659	Coombes Apricot Shale	T	109.4	2
5/11/2024	308485	Coombes Apricot Shale	T	72.7	2
6/11/2024	308376	Coombes Apricot Shale	T	46	1
6/11/2024	309355	Coombes Apricot Shale	T	46	1
6/11/2024	310069	Coombes Apricot Shale	T	46	1
6/11/2024	309789	Coombes Apricot Shale	T	45.8	1
6/11/2024	305773	Coombes Apricot Shale	T	197.8	3
6/11/2024	307045	Coombes Apricot Shale	T	78	2
6/11/2024	308374	Coombes Apricot Shale	T	91.8	2
6/11/2024	309354	Coombes Apricot Shale	T	45.8	1
6/11/2024	310068	Coombes Apricot Shale	T	92	2
6/11/2024	309788	Coombes Apricot Shale	T	45.9	1
6/11/2024	310519	Coombes Apricot Shale	T	158.5	3
7/11/2024	310072	Coombes Apricot Shale	T	45.6	1
7/11/2024	310521	Coombes Apricot Shale	T	118	2
7/11/2024	309791	Coombes Apricot Shale	T	136.4	2
7/11/2024	308378	Coombes Apricot Shale	T	183.4	3
7/11/2024	307048	Coombes Apricot Shale	T	78	2
7/11/2024	309357	Coombes Apricot Shale	T	45.7	1
7/11/2024	309488	Coombes Apricot Shale	T	77.6	2
7/11/2024	310071	Coombes Apricot Shale	T	91.1	2
3/12/2024	311005	Cream Shale	T	137.8	2
3/12/2024	309435	Cream Shale	T	150.2	3
3/12/2024	310176	Cream Shale	T	136.9	2
3/12/2024	308195	Cream Shale	T	187.9	3
3/12/2024	307082	Cream Shale	T	125.63	2
3/12/2024	307529	Cream Shale	T	82.94	2
3/12/2024	310088	Cream Shale	T	138	2
3/12/2024	309389	Cream Shale	T	90.5	2
3/12/2024	308196	Coombes Apricot Shale	T	150.7	3
3/12/2024	309436	Coombes Apricot Shale	T	150.8	3
3/12/2024	307081	Coombes Apricot Shale	T	38.68	1
3/12/2024	307528	Coombes Apricot Shale	T	75.12	2
4/12/2024	310809	Coombes Apricot Shale	T	39.7	1
4/12/2024	312202	Coombes Apricot Shale	T	39.5	1
4/12/2024	307823	Coombes Apricot Shale	T	37.3	1
4/12/2024	307825	Cream Shale	T	37.4	1
4/12/2024	307532	Cream Shale	T	166.9	3
4/12/2024	307085	Cream Shale	T	126	2
4/12/2024	309391	Cream Shale	T	91.7	2
4/12/2024	310090	Cream Shale	T	184.2	3
4/12/2024	311007	Cream Shale	T	183.8	3

4/12/2024	310811	Cream Shale	T	119.1	2
4/12/2024	309674	Cream Shale	T	36	1
4/12/2024	312204	Cream Shale	T	118.7	2
4/12/2024	310178	Cream Shale	T	136.4	2
4/12/2024	307530	Coombes Apricot Shale	T	38.28	1
4/12/2024	307083	Coombes Apricot Shale	T	38.32	1
4/12/2024	307531	Cream Shale	T	116.42	2
4/12/2024	307824	Cream Shale	T	111.6	2
4/12/2024	307084	Cream Shale	T	157	3
4/12/2024	310810	Cream Shale	T	118.8	2
4/12/2024	309673	Cream Shale	T	109.5	2
4/12/2024	312203	Cream Shale	T	118.5	2
5/12/2024	309438	Cream Shale	T	112.7	2
5/12/2024	307086	Cream Shale	T	78	2
5/12/2024	309392	Cream Shale	T	90.9	2
5/12/2024	307533	Cream Shale	T	76.7	2
5/12/2024	307827	Cream Shale	T	112.6	2
5/12/2024	310091	Cream Shale	T	138.2	2
5/12/2024	309439	Cream Shale	T	189.1	3
5/12/2024	307087	Cream Shale	T	84	2
5/12/2024	310408	Cream Shale	T	113.7	2
5/12/2024	309822	Cream Shale	T	37.5	1
5/12/2024	310180	Cream Shale	T	45.6	1
5/12/2024	311009	Cream Shale	T	45.9	1
5/12/2024	307534	Cream Shale	T	83.3	2
5/12/2024	307828	Cream Shale	T	187.7	3
5/12/2024	310092	Cream Shale	T	230	4
5/12/2024	309393	Cream Shale	T	273.4	4
6/12/2024	308199	Cream Shale	T	149.2	3
6/12/2024	310813	Cream Shale	T	158.1	3
6/12/2024	312206	Cream Shale	T	118.6	2
6/12/2024	310181	Cream Shale	T	183	3
6/12/2024	310410	Cream Shale	T	38.5	1
6/12/2024	309394	Cream Shale	T	136.8	2
6/12/2024	307830	Cream Shale	T	187	3
6/12/2024	308200	Cream Shale	T	186.6	3
6/12/2024	311011	Cream Shale	T	45.8	1
6/12/2024	310814	Cream Shale	T	197.3	3
6/12/2024	312207	Cream Shale	T	197.1	3
6/12/2024	310182	Cream Shale	T	182.1	3
6/12/2024	310411	Cream Shale	T	153.1	3
6/12/2024	309395	Cream Shale	T	182.1	3
9/12/2024	307091	Coombes Apricot Shale	T	84	2
9/12/2024	310816	Coombes Apricot Shale	T	118.6	2

LUDDENHAM OVERBURDEN REMOVAL - LOAD&GO

DATE	LOADS	PAYLOAD	TONNAGE
06-Jan-25	38	38	1444
10-Jan-25	42	38	1596
13-Jan-25	42	38	1596
14-Jan-25	46	38	1748
15-Jan-25	46	38	1748
17-Jan-25	46	38	1748
20-Jan-25	46	38	1748
21-Jan-25	46	38	1748
22-Jan-25	46	38	1748
23-Jan-25	46	38	1748
24-Jan-25	46	38	1748
27-Jan-25			
28-Jan-25	50	38	1900
29-Jan-25	50	38	1900
30-Jan-25	50	38	1900
31-Jan-25	50	38	1900
03-Feb-25	50	38	1900
04-Feb-25	50	38	1900
05-Feb-25	50	38	1900
06-Feb-25	50	38	1900
07-Feb-25	50	38	1900
10-Feb-25	50	38	1900
12-Feb-25	42	38	1596
13-Feb-25	46	38	1748
14-Feb-25	46	38	1748
17-Feb-25	50	38	1900
18-Feb-25	50	38	1900
19-Feb-25	50	38	1900
20-Feb-25	50	38	1900
21-Feb-25	50	38	1900
24-Feb-25	50	38	1900
25-Feb-25	50	38	1900
26-Feb-25	50	38	1900
27-Feb-25	50	38	1900
28-Feb-25	50	38	1900
03-Mar-25	50	38	1900
06-Mar-25	42	38	1596
07-Mar-25	50	38	1900
10-Mar-25	50	38	1900
11-Mar-25	50	38	1900
12-Mar-25	50	38	1900
13-Mar-25	50	38	1900
14-Mar-25	50	38	1900
17-Mar-25	50	38	1900
18-Mar-25	50	38	1900

19-Mar-25	50	38	1900
20-Mar-25	50	38	1900
21-Mar-25	46	38	1748
25-Mar-25	46	38	1748
26-Mar-25	46	38	1748
27-Mar-25	46	38	1748
28-Mar-25	46	38	1748
31-Mar-25	50	38	1900
01-Apr-25	50	38	1900
02-Apr-25	50	38	1900
03-Apr-25	50	38	1900
04-Apr-25	50	38	1900
07-Apr-25	50	38	1900
08-Apr-25	50	38	1900
09-Apr-25	50	38	1900
10-Apr-25	50	38	1900
11-Apr-25	50	38	1900
14-Apr-25	50	38	1900
15-Apr-25	50	38	1900
16-Apr-25	50	38	1900
17-Apr-25	50	38	1900
18-Apr-25			
21-Apr-25			
22-Apr-25	44	38	1672
23-Apr-25	44	38	1672
24-Apr-25	44	38	1672
25-Apr-25			
29-Apr-25	38	38	1444

Ticket	Date	Material	Unit	Tonnage
100177049	21/07/25	MS1005 / Shale	T	35.720
100177056	21/07/25	MS1005 / Shale	T	37.400
100177068	21/07/25	MS1005 / Shale	T	36.060
100177071	21/07/25	MS1005 / Shale	T	37.200
100177072	21/07/25	MS1005 / Shale	T	34.100
100177083	21/07/25	MS1005 / Shale	T	35.900
100177086	21/07/25	MS1005 / Shale	T	35.080
100177091	21/07/25	MS1005 / Shale	T	36.660
100177102	21/07/25	MS1005 / Shale	T	45.940
100177104	21/07/25	MS1005 / Shale	T	45.100
100177107	21/07/25	MS1005 / Shale	T	37.620
100177124	21/07/25	MS1005 / Shale	T	35.700
100177134	21/07/25	MS1005 / Shale	T	36.100
100177146	21/07/25	MS1005 / Shale	T	43.180
100177162	21/07/25	MS1005 / Shale	T	37.460
100177164	21/07/25	MS1005 / Shale	T	38.920
100177184	21/07/25	MS1005 / Shale	T	32.120
100177189	21/07/25	MS1005 / Shale	T	37.640
100177218	21/07/25	MS1005 / Shale	T	32.240
100177242	21/07/25	MS1005 / Shale	T	35.160
100177247	21/07/25	MS1005 / Shale	T	40.480
100177260	21/07/25	MS1005 / Shale	T	43.500
100177264	21/07/25	MS1005 / Shale	T	35.920
100177265	21/07/25	MS1005 / Shale	T	36.540
100177270	21/07/25	MS1005 / Shale	T	37.180
100177278	21/07/25	MS1005 / Shale	T	38.420
100177285	21/07/25	MS1005 / Shale	T	36.720
100177292	21/07/25	MS1005 / Shale	T	34.700
100177300	21/07/25	MS1005 / Shale	T	43.040
100177301	21/07/25	MS1005 / Shale	T	35.600
100177303	21/07/25	MS1005 / Shale	T	45.140
100177307	21/07/25	MS1005 / Shale	T	43.460
100177308	21/07/25	MS1005 / Shale	T	37.000
100177311	21/07/25	MS1005 / Shale	T	35.460
100177321	21/07/25	MS1005 / Shale	T	34.480
100177330	21/07/25	MS1005 / Shale	T	36.880
100177380	22/07/25	MS1005 / Shale	T	36.980
100177382	22/07/25	MS1005 / Shale	T	44.480
100177405	22/07/25	MS1005 / Shale	T	27.460
100177408	22/07/25	MS1005 / Shale	T	38.640
100177413	22/07/25	MS1005 / Shale	T	35.860
100177414	22/07/25	MS1005 / Shale	T	45.720
100177417	22/07/25	MS1005 / Shale	T	41.280
100177424	22/07/25	MS1005 / Shale	T	39.980
100177425	22/07/25	MS1005 / Shale	T	37.120
100177427	22/07/25	MS1005 / Shale	T	37.840
100177429	22/07/25	MS1005 / Shale	T	33.300
100177443	22/07/25	MS1005 / Shale	T	39.880
100177451	22/07/25	MS1005 / Shale	T	39.200
100177477	22/07/25	MS1005 / Shale	T	36.820
100177518	22/07/25	MS1005 / Shale	T	37.900
100177522	22/07/25	MS1005 / Shale	T	37.860
100177526	22/07/25	MS1005 / Shale	T	38.100
100177529	22/07/25	MS1005 / Shale	T	38.940
100177536	22/07/25	MS1005 / Shale	T	31.440
100177539	22/07/25	MS1005 / Shale	T	40.300
100177554	22/07/25	MS1005 / Shale	T	41.440
100177564	22/07/25	MS1005 / Shale	T	39.600

100177572	22/07/25	MS1005 / Shale	T	36.680
100177630	22/07/25	MS1005 / Shale	T	46.080
100177633	22/07/25	MS1005 / Shale	T	43.200
100177637	22/07/25	MS1005 / Shale	T	38.400
100177638	22/07/25	MS1005 / Shale	T	35.820
100177641	22/07/25	MS1005 / Shale	T	35.860
100177648	22/07/25	MS1005 / Shale	T	37.680
100177652	22/07/25	MS1005 / Shale	T	34.180
100177657	22/07/25	MS1005 / Shale	T	35.640
100177664	22/07/25	MS1005 / Shale	T	38.260
100177668	22/07/25	MS1005 / Shale	T	39.680
100177672	22/07/25	MS1005 / Shale	T	47.440
100177673	22/07/25	MS1005 / Shale	T	33.740
100177675	22/07/25	MS1005 / Shale	T	36.680
100177679	22/07/25	MS1005 / Shale	T	35.400
100177681	22/07/25	MS1005 / Shale	T	41.880
100177683	22/07/25	MS1005 / Shale	T	40.480
100177684	22/07/25	MS1005 / Shale	T	35.720
100177697	22/07/25	MS1005 / Shale	T	44.960
100177700	22/07/25	MS1005 / Shale	T	42.560
100177701	22/07/25	MS1005 / Shale	T	38.840
100177703	22/07/25	MS1005 / Shale	T	36.600
100177706	22/07/25	MS1005 / Shale	T	38.440
100177707	22/07/25	MS1005 / Shale	T	38.120
100177709	22/07/25	MS1005 / Shale	T	34.880
100177711	22/07/25	MS1005 / Shale	T	35.040
100177762	23/07/25	MS1005 / Shale	T	41.700
100177837	23/07/25	MS1005 / Shale	T	36.200
100177841	23/07/25	MS1005 / Shale	T	41.860
100177842	23/07/25	MS1005 / Shale	T	36.520
100177887	23/07/25	MS1005 / Shale	T	38.820
100177899	23/07/25	MS1005 / Shale	T	37.340
100177901	23/07/25	MS1005 / Shale	T	41.660
100177940	23/07/25	MS1005 / Shale	T	35.860
100177947	23/07/25	MS1005 / Shale	T	42.420
100177964	23/07/25	MS1005 / Shale	T	38.060
100177966	23/07/25	MS1005 / Shale	T	35.840
100177977	23/07/25	MS1005 / Shale	T	42.120
100177986	23/07/25	MS1005 / Shale	T	43.940
100177991	23/07/25	MS1005 / Shale	T	36.200
100177996	23/07/25	MS1005 / Shale	T	38.880
100178001	23/07/25	MS1005 / Shale	T	41.340
100178005	23/07/25	MS1005 / Shale	T	35.300
100178015	23/07/25	MS1005 / Shale	T	36.360
100178024	23/07/25	MS1005 / Shale	T	43.360
100178045	23/07/25	MS1005 / Shale	T	34.920
100178049	23/07/25	MS1005 / Shale	T	44.720
100178051	23/07/25	MS1005 / Shale	T	37.920
100178052	23/07/25	MS1005 / Shale	T	41.940
100178054	23/07/25	MS1005 / Shale	T	36.760
100178066	23/07/25	MS1005 / Shale	T	37.400
100178070	23/07/25	MS1005 / Shale	T	43.980
100178137	24/07/25	MS1005 / Shale	T	36.160
100178140	24/07/25	MS1005 / Shale	T	46.180
100178143	24/07/25	MS1005 / Shale	T	39.460
100178144	24/07/25	MS1005 / Shale	T	43.080
100178168	24/07/25	MS1005 / Shale	T	42.780
100178171	24/07/25	MS1005 / Shale	T	37.900
100178175	24/07/25	MS1005 / Shale	T	40.660
100178176	24/07/25	MS1005 / Shale	T	38.420
100178184	24/07/25	MS1005 / Shale	T	36.060

100178221	24/07/25	MS1005 / Shale	T	40.900
100178240	24/07/25	MS1005 / Shale	T	40.480
100178258	24/07/25	MS1005 / Shale	T	35.760
100178273	24/07/25	MS1005 / Shale	T	38.560
100178279	24/07/25	MS1005 / Shale	T	35.200
100178289	24/07/25	MS1005 / Shale	T	41.840
100178290	24/07/25	MS1005 / Shale	T	39.560
100178301	24/07/25	MS1005 / Shale	T	38.780
100178310	24/07/25	MS1005 / Shale	T	37.000
100178315	24/07/25	MS1005 / Shale	T	39.580
100178327	24/07/25	MS1005 / Shale	T	41.920
100178356	24/07/25	MS1005 / Shale	T	39.600
100178382	24/07/25	MS1005 / Shale	T	36.060
100178385	24/07/25	MS1005 / Shale	T	40.860
100178394	24/07/25	MS1005 / Shale	T	39.940
100178398	24/07/25	MS1005 / Shale	T	39.520
100178400	24/07/25	MS1005 / Shale	T	40.800
100178411	24/07/25	MS1005 / Shale	T	36.080
100178412	24/07/25	MS1005 / Shale	T	38.460
100178416	24/07/25	MS1005 / Shale	T	41.920
100178432	24/07/25	MS1005 / Shale	T	36.420
100178450	24/07/25	MS1005 / Shale	T	39.400
100178468	24/07/25	MS1005 / Shale	T	35.680
100178469	24/07/25	MS1005 / Shale	T	42.620
100178474	24/07/25	MS1005 / Shale	T	39.820
100178478	24/07/25	MS1005 / Shale	T	40.000
100178479	24/07/25	MS1005 / Shale	T	38.160
100178488	24/07/25	MS1005 / Shale	T	35.900
100178537	25/07/25	MS1005 / Shale	T	37.760
100178538	25/07/25	MS1005 / Shale	T	35.300
100178551	25/07/25	MS1005 / Shale	T	37.440
100178592	25/07/25	MS1005 / Shale	T	38.700
100178597	25/07/25	MS1005 / Shale	T	38.900
100178600	25/07/25	MS1005 / Shale	T	40.880
100178602	25/07/25	MS1005 / Shale	T	36.940
100178607	25/07/25	MS1005 / Shale	T	39.700
100178631	25/07/25	MS1005 / Shale	T	36.920
100178632	25/07/25	MS1005 / Shale	T	36.900
100178637	25/07/25	MS1005 / Shale	T	42.040
100178640	25/07/25	MS1005 / Shale	T	39.620
100178645	25/07/25	MS1005 / Shale	T	38.340
100178651	25/07/25	MS1005 / Shale	T	37.120
100178714	25/07/25	MS1005 / Shale	T	42.640
100178718	25/07/25	MS1005 / Shale	T	38.140
100178722	25/07/25	MS1005 / Shale	T	40.680
100178723	25/07/25	MS1005 / Shale	T	38.880
100178725	25/07/25	MS1005 / Shale	T	40.420
100178739	25/07/25	MS1005 / Shale	T	37.280
100178752	25/07/25	MS1005 / Shale	T	37.620
100178762	25/07/25	MS1005 / Shale	T	42.520
100178764	25/07/25	MS1005 / Shale	T	35.800
100178769	25/07/25	MS1005 / Shale	T	38.740
100178778	25/07/25	MS1005 / Shale	T	43.740
100178823	25/07/25	MS1005 / Shale	T	40.220
100178845	25/07/25	MS1005 / Shale	T	35.980
100178855	25/07/25	MS1005 / Shale	T	40.060
100178859	25/07/25	MS1005 / Shale	T	40.460
100178868	25/07/25	MS1005 / Shale	T	40.760
100178874	25/07/25	MS1005 / Shale	T	38.680
100178884	25/07/25	MS1005 / Shale	T	42.460
100178887	25/07/25	MS1005 / Shale	T	37.480

100178889	25/07/25	MS1005 / Shale	T	36.440
100178893	25/07/25	MS1005 / Shale	T	36.440
100178894	25/07/25	MS1005 / Shale	T	36.620
100179259	28/07/25	MS1005 / Shale	T	35.920
100179265	28/07/25	MS1005 / Shale	T	36.680
100179299	28/07/25	MS1005 / Shale	T	37.400
100179301	28/07/25	MS1005 / Shale	T	36.200
100179312	28/07/25	MS1005 / Shale	T	42.980
100179315	28/07/25	MS1005 / Shale	T	29.280
100179322	28/07/25	MS1005 / Shale	T	43.740
100179329	28/07/25	MS1005 / Shale	T	41.480
100179333	28/07/25	MS1005 / Shale	T	37.720
100179336	28/07/25	MS1005 / Shale	T	35.520
100179356	28/07/25	MS1005 / Shale	T	36.420
100179362	28/07/25	MS1005 / Shale	T	37.780
100179365	28/07/25	MS1005 / Shale	T	37.520
100179381	28/07/25	MS1005 / Shale	T	37.280
100179384	28/07/25	MS1005 / Shale	T	38.880
100179414	28/07/25	MS1005 / Shale	T	37.040
100179421	28/07/25	MS1005 / Shale	T	44.760
100179424	28/07/25	MS1005 / Shale	T	32.300
100179430	28/07/25	MS1005 / Shale	T	44.320
100179439	28/07/25	MS1005 / Shale	T	41.220
100179441	28/07/25	MS1005 / Shale	T	37.480
100179446	28/07/25	MS1005 / Shale	T	36.480
100179470	28/07/25	MS1005 / Shale	T	36.640
100179472	28/07/25	MS1005 / Shale	T	37.200
100179512	28/07/25	MS1005 / Shale	T	39.180
100179519	28/07/25	MS1005 / Shale	T	38.140
100179528	28/07/25	MS1005 / Shale	T	37.020
100179555	28/07/25	MS1005 / Shale	T	34.540
100179558	28/07/25	MS1005 / Shale	T	37.380
100179576	28/07/25	MS1005 / Shale	T	44.300
100179578	28/07/25	MS1005 / Shale	T	44.380
100179579	28/07/25	MS1005 / Shale	T	36.440
100179593	28/07/25	MS1005 / Shale	T	39.980
100179594	28/07/25	MS1005 / Shale	T	41.180
100179599	28/07/25	MS1005 / Shale	T	36.340
100179609	28/07/25	MS1005 / Shale	T	36.620
100179611	28/07/25	MS1005 / Shale	T	39.960
100179617	28/07/25	MS1005 / Shale	T	37.080
100179619	28/07/25	MS1005 / Shale	T	39.440
100179631	28/07/25	MS1005 / Shale	T	34.680
100179633	28/07/25	MS1005 / Shale	T	36.520
100179643	28/07/25	MS1005 / Shale	T	45.800
100179647	28/07/25	MS1005 / Shale	T	46.280
100179699	29/07/25	MS1005 / Shale	T	36.480
100179700	29/07/25	MS1005 / Shale	T	37.800
100179701	29/07/25	MS1005 / Shale	T	37.340
100179731	29/07/25	MS1005 / Shale	T	37.960
100179736	29/07/25	MS1005 / Shale	T	35.520
100179742	29/07/25	MS1005 / Shale	T	33.920
100179744	29/07/25	MS1005 / Shale	T	44.360
100179753	29/07/25	MS1005 / Shale	T	43.180
100179757	29/07/25	MS1005 / Shale	T	38.900
100179767	29/07/25	MS1005 / Shale	T	35.920
100179775	29/07/25	MS1005 / Shale	T	41.120
100179776	29/07/25	MS1005 / Shale	T	38.080
100179781	29/07/25	MS1005 / Shale	T	32.840
100179785	29/07/25	MS1005 / Shale	T	35.440
100179791	29/07/25	MS1005 / Shale	T	44.880

Ticket	Date	Material	Unit	Loads	Tonnage
100184712	13/08/25	MS1005 / Shale	T	1	36.200
100184717	13/08/25	MS1005 / Shale	T	1	42.600
100184721	13/08/25	MS1005 / Shale	T	1	29.400
100184731	13/08/25	MS1005 / Shale	T	1	36.480
100184734	13/08/25	MS1005 / Shale	T	1	42.880
100184745	13/08/25	MS1005 / Shale	T	1	28.520
100184755	13/08/25	MS1005 / Shale	T	1	28.820
100184760	13/08/25	MS1005 / Shale	T	1	36.560
100184824	13/08/25	MS1005 / Shale	T	1	29.260
100184856	13/08/25	MS1005 / Shale	T	1	27.660
100184863	13/08/25	MS1005 / Shale	T	1	36.840
100184867	13/08/25	MS1005 / Shale	T	1	38.640
100184885	13/08/25	MS1005 / Shale	T	1	28.920
100184896	13/08/25	MS1005 / Shale	T	1	35.900
100184901	13/08/25	MS1005 / Shale	T	1	29.420
100184914	13/08/25	MS1005 / Shale	T	1	43.560
100184918	13/08/25	MS1005 / Shale	T	1	43.180
100184927	13/08/25	MS1005 / Shale	T	1	30.420
100184959	15/08/25	MS1005 / Shale	T	1	29.560
100184969	15/08/25	MS1005 / Shale	T	1	44.100
100184973	15/08/25	MS1005 / Shale	T	1	29.500
100184975	15/08/25	MS1005 / Shale	T	1	28.460
100184983	15/08/25	MS1005 / Shale	T	1	42.340
100185037	14/08/25	MS1005 / Shale	T	1	35.260
100185038	14/08/25	MS1005 / Shale	T	1	45.020
100185039	14/08/25	MS1005 / Shale	T	1	44.400
100185040	14/08/25	MS1005 / Shale	T	1	30.200
100185042	14/08/25	MS1005 / Shale	T	1	36.480
100185046	14/08/25	MS1005 / Shale	T	1	37.160
100185047	14/08/25	MS1005 / Shale	T	1	29.420
100185049	14/08/25	MS1005 / Shale	T	1	36.280
100185065	14/08/25	MS1005 / Shale	T	1	36.740
100185075	14/08/25	MS1005 / Shale	T	1	43.060
100185079	14/08/25	MS1005 / Shale	T	1	45.060
100185080	14/08/25	MS1005 / Shale	T	1	29.480
100185093	14/08/25	MS1005 / Shale	T	1	37.080
100185129	14/08/25	MS1005 / Shale	T	1	35.600
100185131	14/08/25	MS1005 / Shale	T	1	28.940
100185136	14/08/25	MS1005 / Shale	T	1	29.240
100185137	14/08/25	MS1005 / Shale	T	1	37.880
100185140	14/08/25	MS1005 / Shale	T	1	36.940
100185144	14/08/25	MS1005 / Shale	T	1	30.320
100185151	14/08/25	MS1005 / Shale	T	1	37.100
100185156	14/08/25	MS1005 / Shale	T	1	37.240
100185167	14/08/25	MS1005 / Shale	T	1	28.460
100185185	14/08/25	MS1005 / Shale	T	1	34.060
100185263	14/08/25	MS1005 / Shale	T	1	27.620
100185264	14/08/25	MS1005 / Shale	T	1	28.320
100185276	14/08/25	MS1005 / Shale	T	1	34.000
100185277	14/08/25	MS1005 / Shale	T	1	36.980
100185280	14/08/25	MS1005 / Shale	T	1	36.740
100185286	14/08/25	MS1005 / Shale	T	1	44.460
100185295	14/08/25	MS1005 / Shale	T	1	44.860
100185297	14/08/25	MS1005 / Shale	T	1	35.840
100185299	14/08/25	MS1005 / Shale	T	1	29.300
100185306	14/08/25	MS1005 / Shale	T	1	37.080
100185310	14/08/25	MS1005 / Shale	T	1	28.660
100185313	14/08/25	MS1005 / Shale	T	1	44.980
100185319	14/08/25	MS1005 / Shale	T	1	45.160

100186043	18/08/25	MS1005 / Shale	T	1	37.820
100186044	18/08/25	MS1005 / Shale	T	1	42.140
100186045	18/08/25	MS1005 / Shale	T	1	45.140
100186046	18/08/25	MS1005 / Shale	T	1	44.840
100186048	18/08/25	MS1005 / Shale	T	1	38.420
100186049	18/08/25	MS1005 / Shale	T	1	29.600
100186050	18/08/25	MS1005 / Shale	T	1	29.340
100186051	18/08/25	MS1005 / Shale	T	1	44.580
100186104	18/08/25	MS1005 / Shale	T	1	37.300
100186108	18/08/25	MS1005 / Shale	T	1	36.800
100186116	18/08/25	MS1005 / Shale	T	1	36.980
100186123	18/08/25	MS1005 / Shale	T	1	30.880
100186124	18/08/25	MS1005 / Shale	T	1	33.740
100186126	18/08/25	MS1005 / Shale	T	1	36.800
100186132	18/08/25	MS1005 / Shale	T	1	30.140
100186142	18/08/25	MS1005 / Shale	T	1	30.320
100186193	18/08/25	MS1005 / Shale	T	1	36.660
100186200	18/08/25	MS1005 / Shale	T	1	37.500
100186201	18/08/25	MS1005 / Shale	T	1	29.940
100186213	18/08/25	MS1005 / Shale	T	1	30.880
100186216	18/08/25	MS1005 / Shale	T	1	31.900
100186224	18/08/25	MS1005 / Shale	T	1	37.500
100186233	18/08/25	MS1005 / Shale	T	1	29.940
100186244	18/08/25	MS1005 / Shale	T	1	29.760
100186284	18/08/25	MS1005 / Shale	T	1	44.940
100186291	18/08/25	MS1005 / Shale	T	1	29.360
100186293	18/08/25	MS1005 / Shale	T	1	37.440
100186297	18/08/25	MS1005 / Shale	T	1	45.520
100186303	18/08/25	MS1005 / Shale	T	1	45.380
100186307	18/08/25	MS1005 / Shale	T	1	38.700
100186313	18/08/25	MS1005 / Shale	T	1	37.180
100186318	18/08/25	MS1005 / Shale	T	1	44.400
100186322	18/08/25	MS1005 / Shale	T	1	37.680
100186326	18/08/25	MS1005 / Shale	T	1	29.660
100186330	18/08/25	MS1005 / Shale	T	1	35.700
100186332	18/08/25	MS1005 / Shale	T	1	34.140
100186335	18/08/25	MS1005 / Shale	T	1	37.540
100186343	18/08/25	MS1005 / Shale	T	1	36.480
100186351	18/08/25	MS1005 / Shale	T	1	28.780
100186353	18/08/25	MS1005 / Shale	T	1	28.760
100187952	25/08/25	MS1005 / Shale	T	1	36.340
100187955	25/08/25	MS1005 / Shale	T	1	34.760
100187958	25/08/25	MS1005 / Shale	T	1	37.740
100187960	25/08/25	MS1005 / Shale	T	1	46.340
100187961	25/08/25	MS1005 / Shale	T	1	35.780
100187971	25/08/25	MS1005 / Shale	T	1	45.840
100187974	25/08/25	MS1005 / Shale	T	1	37.160
100187984	25/08/25	MS1005 / Shale	T	1	35.040
100187986	25/08/25	MS1005 / Shale	T	1	37.400
100187989	25/08/25	MS1005 / Shale	T	1	41.800
100187993	25/08/25	MS1005 / Shale	T	1	37.200
100187996	25/08/25	MS1005 / Shale	T	1	36.840
100188000	25/08/25	MS1005 / Shale	T	1	44.480
100188002	25/08/25	MS1005 / Shale	T	1	35.900
100188004	25/08/25	MS1005 / Shale	T	1	34.660
100188028	25/08/25	MS1005 / Shale	T	1	36.600
100188034	25/08/25	MS1005 / Shale	T	1	36.960
100188043	25/08/25	MS1005 / Shale	T	1	35.900
100188044	25/08/25	MS1005 / Shale	T	1	36.600
100188054	25/08/25	MS1005 / Shale	T	1	46.140

100188058	25/08/25	MS1005 / Shale	T	1	35.560
100188060	25/08/25	MS1005 / Shale	T	1	34.460
100188063	25/08/25	MS1005 / Shale	T	1	45.460
100188068	25/08/25	MS1005 / Shale	T	1	37.860
100188079	25/08/25	MS1005 / Shale	T	1	34.040
100188084	25/08/25	MS1005 / Shale	T	1	37.400
100188088	25/08/25	MS1005 / Shale	T	1	45.720
100188097	25/08/25	MS1005 / Shale	T	1	37.260
100188098	25/08/25	MS1005 / Shale	T	1	37.580
100188112	25/08/25	MS1005 / Shale	T	1	44.100
100188114	25/08/25	MS1005 / Shale	T	1	38.180
100188115	25/08/25	MS1005 / Shale	T	1	34.360
100188137	25/08/25	MS1005 / Shale	T	1	38.040
100188144	25/08/25	MS1005 / Shale	T	1	36.700
100188155	25/08/25	MS1005 / Shale	T	1	34.800
100188156	25/08/25	MS1005 / Shale	T	1	37.680
100188159	25/08/25	MS1005 / Shale	T	1	35.500
100188160	25/08/25	MS1005 / Shale	T	1	35.440
100188168	25/08/25	MS1005 / Shale	T	1	45.520
100188171	25/08/25	MS1005 / Shale	T	1	43.960
100188174	25/08/25	MS1005 / Shale	T	1	38.260
100188178	25/08/25	MS1005 / Shale	T	1	37.380
100188180	25/08/25	MS1005 / Shale	T	1	42.260
100188184	25/08/25	MS1005 / Shale	T	1	36.280
100188186	25/08/25	MS1005 / Shale	T	1	29.080
100188191	25/08/25	MS1005 / Shale	T	1	35.800
100188192	25/08/25	MS1005 / Shale	T	1	38.480
100188198	25/08/25	MS1005 / Shale	T	1	37.340
100188206	25/08/25	MS1005 / Shale	T	1	44.760
100188208	25/08/25	MS1005 / Shale	T	1	35.960
100188210	15/08/25	MS1005 / Shale	T	1	37.900
100188256	15/08/25	MS1005 / Shale	T	1	35.600
100188257	15/08/25	MS1005 / Shale	T	1	45.520
100188258	15/08/25	MS1005 / Shale	T	1	44.560
100188260	15/08/25	MS1005 / Shale	T	1	45.100
100188261	15/08/25	MS1005 / Shale	T	1	35.680
100188262	15/08/25	MS1005 / Shale	T	1	38.560
100188263	15/08/25	MS1005 / Shale	T	1	35.920
100188264	15/08/25	MS1005 / Shale	T	1	36.640
100188265	15/08/25	MS1005 / Shale	T	1	38.520
100188267	15/08/25	MS1005 / Shale	T	1	38.240
100188268	15/08/25	MS1005 / Shale	T	1	35.360
100188270	15/08/25	MS1005 / Shale	T	1	34.780
100188271	15/08/25	MS1005 / Shale	T	1	38.380
100188302	15/08/25	MS1005 / Shale	T	1	36.180
100188311	15/08/25	MS1005 / Shale	T	1	42.040
100188357	15/08/25	MS1005 / Shale	T	1	36.440
100188372	15/08/25	MS1005 / Shale	T	1	36.800
100188376	15/08/25	MS1005 / Shale	T	1	39.520
100188378	15/08/25	MS1005 / Shale	T	1	36.760
100188379	15/08/25	MS1005 / Shale	T	1	37.040
100188380	15/08/25	MS1005 / Shale	T	1	36.140
100188381	26/08/25	MS1005 / Shale	T	1	35.500
100188402	26/08/25	MS1005 / Shale	T	1	36.760
100188409	26/08/25	MS1005 / Shale	T	1	37.320
100188445	26/08/25	MS1005 / Shale	T	1	36.140
100188484	26/08/25	MS1005 / Shale	T	1	37.400
100188486	26/08/25	MS1005 / Shale	T	1	38.360
100188488	26/08/25	MS1005 / Shale	T	1	35.480
100188499	26/08/25	MS1005 / Shale	T	1	34.580

100188504	26/08/25	MS1005 / Shale	T	1	35.580
100188506	26/08/25	MS1005 / Shale	T	1	35.000
100188519	26/08/25	MS1005 / Shale	T	1	45.280
100188525	26/08/25	MS1005 / Shale	T	1	45.380
100188529	26/08/25	MS1005 / Shale	T	1	43.660
100188541	26/08/25	MS1005 / Shale	T	1	37.780
100188547	26/08/25	MS1005 / Shale	T	1	34.700
100188555	26/08/25	MS1005 / Shale	T	1	34.500
100188561	26/08/25	MS1005 / Shale	T	1	44.080
100188566	26/08/25	MS1005 / Shale	T	1	35.360
100188567	26/08/25	MS1005 / Shale	T	1	37.480
100188569	26/08/25	MS1005 / Shale	T	1	37.040
100188576	26/08/25	MS1005 / Shale	T	1	36.460
100188578	26/08/25	MS1005 / Shale	T	1	35.980
100188579	26/08/25	MS1005 / Shale	T	1	35.200
100188649	28/08/25	MS1005 / Shale	T	1	35.140
100188651	28/08/25	MS1005 / Shale	T	1	37.380
100188653	28/08/25	MS1005 / Shale	T	1	44.980
100188657	28/08/25	MS1005 / Shale	T	1	45.960
100188658	28/08/25	MS1005 / Shale	T	1	44.660
100188673	28/08/25	MS1005 / Shale	T	1	37.720
100188674	27/08/25	MS1005 / Shale	T	1	45.460
100188681	27/08/25	MS1005 / Shale	T	1	37.300
100188690	29/08/25	MS1005 / Shale	T	1	35.500
100188699	29/08/25	MS1005 / Shale	T	1	35.140
100188720	29/08/25	MS1005 / Shale	T	1	35.960
100188726	27/08/25	MS1005 / Shale	T	1	28.700
100188727	27/08/25	MS1005 / Shale	T	1	35.500
100188728	27/08/25	MS1005 / Shale	T	1	38.220
100188732	27/08/25	MS1005 / Shale	T	1	37.800
100188755	27/08/25	MS1005 / Shale	T	1	35.240
100188760	27/08/25	MS1005 / Shale	T	1	37.360
100188780	27/08/25	MS1005 / Shale	T	1	36.220
100188783	27/08/25	MS1005 / Shale	T	1	36.460
100188799	27/08/25	MS1005 / Shale	T	1	37.240
100188804	27/08/25	MS1005 / Shale	T	1	33.260
100188808	27/08/25	MS1005 / Shale	T	1	36.880
100188813	27/08/25	MS1005 / Shale	T	1	30.000
100188821	27/08/25	MS1005 / Shale	T	1	35.740
100188826	27/08/25	MS1005 / Shale	T	1	28.180
100188839	27/08/25	MS1005 / Shale	T	1	37.860
100188877	27/08/25	MS1005 / Shale	T	1	36.040
100188879	27/08/25	MS1005 / Shale	T	1	36.800
100188897	27/08/25	MS1005 / Shale	T	1	38.460
100188907	27/08/25	MS1005 / Shale	T	1	37.400
100188923	27/08/25	MS1005 / Shale	T	1	45.860
100188925	27/08/25	MS1005 / Shale	T	1	45.220
100188930	27/08/25	MS1005 / Shale	T	1	42.780
100188939	27/08/25	MS1005 / Shale	T	1	46.580
100188941	27/08/25	MS1005 / Shale	T	1	28.800
100188956	27/08/25	MS1005 / Shale	T	1	36.320
100188970	27/08/25	MS1005 / Shale	T	1	35.020
100188973	27/08/25	MS1005 / Shale	T	1	37.100
100188979	27/08/25	MS1005 / Shale	T	1	36.420
100188984	27/08/25	MS1005 / Shale	T	1	37.540
306720-1	15/08/25	MS1005 / Shale	T	1	44.080
306728-1	28/08/25	MS1005 / Shale	T	1	45.160
306728-2	28/08/25	MS1005 / Shale	T	1	42.880
306730-1	29/08/25	MS1005 / Shale	T	1	45.520
306730-2	29/08/25	MS1005 / Shale	T	1	46.220

310002-1	15/08/25	MS1005 / Shale	T	1	42.980
310010-1	28/08/25	MS1005 / Shale	T	1	43.440
310010-2	28/08/25	MS1005 / Shale	T	1	43.240
310012-1	29/08/25	MS1005 / Shale	T	1	43.420
310012-2	29/08/25	MS1005 / Shale	T	1	43.740
310390-1	15/08/25	MS1005 / Shale	T	1	43.320
310398-1	28/08/25	MS1005 / Shale	T	1	44.960
310398-2	28/08/25	MS1005 / Shale	T	1	45.640
310400-1	29/08/25	MS1005 / Shale	T	1	43.580
310400-2	29/08/25	MS1005 / Shale	T	1	44.020
310995-1	28/08/25	MS1005 / Shale	T	1	36.940
310995-2	28/08/25	MS1005 / Shale	T	1	37.660
310995-3	28/08/25	MS1005 / Shale	T	1	37.080
310996-1	29/08/25	MS1005 / Shale	T	1	37.180
312569-1	15/08/25	MS1005 / Shale	T	1	29.700
312569-2	15/08/25	MS1005 / Shale	T	1	29.020
314203-1	15/08/25	MS1005 / Shale	T	1	38.960
314203-2	15/08/25	MS1005 / Shale	T	1	37.660
317809-1	15/08/25	MS1005 / Shale	T	1	36.520
317821-1	28/08/25	MS1005 / Shale	T	1	37.900
317821-2	28/08/25	MS1005 / Shale	T	1	37.500
317821-3	28/08/25	MS1005 / Shale	T	1	37.300
317821-4	28/08/25	MS1005 / Shale	T	1	38.220
317822-1	29/08/25	MS1005 / Shale	T	1	38.140
317822-2	29/08/25	MS1005 / Shale	T	1	38.080
317822-3	29/08/25	MS1005 / Shale	T	1	37.340
317822-4	29/08/25	MS1005 / Shale	T	1	38.400
317931-1	28/08/25	MS1005 / Shale	T	1	37.380
317931-2	28/08/25	MS1005 / Shale	T	1	37.160
317931-3	28/08/25	MS1005 / Shale	T	1	36.740
317934-1	29/08/25	MS1005 / Shale	T	1	36.540
318027-1	15/08/25	MS1005 / Shale	T	1	29.400
318027-2	15/08/25	MS1005 / Shale	T	1	29.540
318033-1	29/08/25	MS1005 / Shale	T	1	34.940
318033-2	29/08/25	MS1005 / Shale	T	1	29.160
318033-3	29/08/25	MS1005 / Shale	T	1	29.820
318033-4	29/08/25	MS1005 / Shale	T	1	29.860
318095-1	28/08/25	MS1005 / Shale	T	1	37.040
318096-1	29/08/25	MS1005 / Shale	T	1	37.860
318096-2	29/08/25	MS1005 / Shale	T	1	36.780
318096-3	29/08/25	MS1005 / Shale	T	1	36.980
318096-4	29/08/25	MS1005 / Shale	T	1	38.260
318186-1	28/08/25	MS1005 / Shale	T	1	35.520
318186-2	28/08/25	MS1005 / Shale	T	1	36.680
318186-3	28/08/25	MS1005 / Shale	T	1	37.140
318187-1	29/08/25	MS1005 / Shale	T	1	36.720
318187-2	29/08/25	MS1005 / Shale	T	1	36.940
318187-3	29/08/25	MS1005 / Shale	T	1	37.600
322806-1	15/08/25	MS1005 / Shale	T	1	36.120
322806-2	15/08/25	MS1005 / Shale	T	1	35.960
322821-1	28/08/25	MS1005 / Shale	T	1	37.380
322821-2	28/08/25	MS1005 / Shale	T	1	37.360
322821-3	28/08/25	MS1005 / Shale	T	1	37.420
322821-4	28/08/25	MS1005 / Shale	T	1	36.760
322930-1	15/08/25	MS1005 / Shale	T	1	44.340
322938-1	28/08/25	MS1005 / Shale	T	1	44.880
322938-2	28/08/25	MS1005 / Shale	T	1	45.480
322940-1	29/08/25	MS1005 / Shale	T	1	45.348
322940-2	29/08/25	MS1005 / Shale	T	1	45.700
322940-3	29/08/25	MS1005 / Shale	T	1	44.300

323076-1	15/08/25	MS1005 / Shale	T	1	28.740
323076-2	15/08/25	MS1005 / Shale	T	1	28.040
323082-1	28/08/25	MS1005 / Shale	T	1	29.960
323082-2	28/08/25	MS1005 / Shale	T	1	29.660
323082-3	28/08/25	MS1005 / Shale	T	1	29.380
323082-4	28/08/25	MS1005 / Shale	T	1	30.540
323083-1	29/08/25	MS1005 / Shale	T	1	29.740
323083-2	29/08/25	MS1005 / Shale	T	1	29.380
323083-3	29/08/25	MS1005 / Shale	T	1	28.840
323083-4	29/08/25	MS1005 / Shale	T	1	29.640
323173-1	15/08/25	MS1005 / Shale	T	1	28.040
323173-2	15/08/25	MS1005 / Shale	T	1	28.560
323179-1	28/08/25	MS1005 / Shale	T	1	29.180
323179-2	28/08/25	MS1005 / Shale	T	1	29.440
323179-3	28/08/25	MS1005 / Shale	T	1	27.760
323180-1	29/08/25	MS1005 / Shale	T	1	29.940
323180-2	29/08/25	MS1005 / Shale	T	1	29.040
323180-3	29/08/25	MS1005 / Shale	T	1	29.460
323180-4	29/08/25	MS1005 / Shale	T	1	28.340
323554-1	28/08/25	MS1005 / Shale	T	1	35.520
323554-2	28/08/25	MS1005 / Shale	T	1	37.220
323554-3	28/08/25	MS1005 / Shale	T	1	34.580
323555-1	29/08/25	MS1005 / Shale	T	1	34.440
323555-2	29/08/25	MS1005 / Shale	T	1	34.760
323555-3	29/08/25	MS1005 / Shale	T	1	36.320
323659-1	15/08/25	MS1005 / Shale	T	1	37.860
323659-2	15/08/25	MS1005 / Shale	T	1	36.060
323666-1	28/08/25	MS1005 / Shale	T	1	36.820
323666-2	28/08/25	MS1005 / Shale	T	1	37.500
323666-3	28/08/25	MS1005 / Shale	T	1	37.540
323667-1	29/08/25	MS1005 / Shale	T	1	37.360
323667-2	29/08/25	MS1005 / Shale	T	1	37.340
323670-1	29/08/25	MS1005 / Shale	T	1	37.780
323670-2	29/08/25	MS1005 / Shale	T	1	37.760
324056-1	28/08/25	MS1005 / Shale	T	1	39.360
324056-2	28/08/25	MS1005 / Shale	T	1	38.500
324056-3	28/08/25	MS1005 / Shale	T	1	38.820
324056-4	28/08/25	MS1005 / Shale	T	1	38.900
324057-1	29/08/25	MS1005 / Shale	T	1	37.880
324057-2	29/08/25	MS1005 / Shale	T	1	38.460
324057-3	29/08/25	MS1005 / Shale	T	1	36.780
324057-4	29/08/25	MS1005 / Shale	T	1	38.800
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130258744	14/08/25	MS1005 / Shale	T	1	29.320
130258677	14/08/25	MS1005 / Shale	T	1	29.440
130258698	14/08/25	MS1005 / Shale	T	1	29.960
130258696	14/08/25	MS1005 / Shale	T	1	35.600
130258706	14/08/25	MS1005 / Shale	T	1	36.900
130258710	14/08/25	MS1005 / Shale	T	1	37.360
130258689	14/08/25	MS1005 / Shale	T	1	37.560
130260821	26/08/25	MS1005 / Shale	T	1	32.880
130260911	26/08/25	MS1005 / Shale	T	1	33.720
130260886	26/08/25	MS1005 / Shale	T	1	34.300
130260817	26/08/25	MS1005 / Shale	T	1	34.360
130260958	26/08/25	MS1005 / Shale	T	1	34.360
130261109	26/08/25	MS1005 / Shale	T	1	34.360
130260859	26/08/25	MS1005 / Shale	T	1	34.480
130261130	26/08/25	MS1005 / Shale	T	1	34.940
130260938	26/08/25	MS1005 / Shale	T	1	35.080
130261035	26/08/25	MS1005 / Shale	T	1	35.780

130260997	26/08/25	MS1005 / Shale	T	1	35.940
130260991	26/08/25	MS1005 / Shale	T	1	35.960
130260874	26/08/25	MS1005 / Shale	T	1	35.980
130260881	26/08/25	MS1005 / Shale	T	1	36.180
130261133	26/08/25	MS1005 / Shale	T	1	36.260
130261080	26/08/25	MS1005 / Shale	T	1	36.720
130260924	26/08/25	MS1005 / Shale	T	1	36.760
130261059	26/08/25	MS1005 / Shale	T	1	37.000
130260895	26/08/25	MS1005 / Shale	T	1	37.100
130260902	26/08/25	MS1005 / Shale	T	1	37.180
130261074	26/08/25	MS1005 / Shale	T	1	37.220
130261041	26/08/25	MS1005 / Shale	T	1	37.260
130261114	26/08/25	MS1005 / Shale	T	1	37.380
130260852	26/08/25	MS1005 / Shale	T	1	37.440
130261021	26/08/25	MS1005 / Shale	T	1	37.640
130261091	26/08/25	MS1005 / Shale	T	1	38.420
130261377	27/08/25	MS1005 / Shale	T	1	33.720
130261439	27/08/25	MS1005 / Shale	T	1	34.180
130261371	27/08/25	MS1005 / Shale	T	1	34.660
130261402	27/08/25	MS1005 / Shale	T	1	34.820
130261340	27/08/25	MS1005 / Shale	T	1	35.280
130261364	27/08/25	MS1005 / Shale	T	1	35.700
130261435	27/08/25	MS1005 / Shale	T	1	35.840
130261388	27/08/25	MS1005 / Shale	T	1	35.860
130261380	27/08/25	MS1005 / Shale	T	1	35.920
130261414	27/08/25	MS1005 / Shale	T	1	36.060
130261452	27/08/25	MS1005 / Shale	T	1	36.080
130261405	27/08/25	MS1005 / Shale	T	1	36.300
130261440	27/08/25	MS1005 / Shale	T	1	36.740
130261431	27/08/25	MS1005 / Shale	T	1	36.760
130261352	27/08/25	MS1005 / Shale	T	1	36.780
130261396	27/08/25	MS1005 / Shale	T	1	36.860
130261422	27/08/25	MS1005 / Shale	T	1	36.900
130261450	27/08/25	MS1005 / Shale	T	1	37.000
130261413	27/08/25	MS1005 / Shale	T	1	37.560
130258255	13/08/25	MS1005 / Shale	T	1	35.760
130258259	13/08/25	MS1005 / Shale	T	1	28.460
130258265	13/08/25	MS1005 / Shale	T	1	27.160
130258280	13/08/25	MS1005 / Shale	T	1	38.520
130258286	13/08/25	MS1005 / Shale	T	1	38.300
130258287	13/08/25	MS1005 / Shale	T	1	27.760
130258292	13/08/25	MS1005 / Shale	T	1	28.580
130258298	13/08/25	MS1005 / Shale	T	1	36.820
130258308	13/08/25	MS1005 / Shale	T	1	29.880
130258309	13/08/25	MS1005 / Shale	T	1	37.600
130258315	13/08/25	MS1005 / Shale	T	1	38.860
130258316	13/08/25	MS1005 / Shale	T	1	29.260
130258328	13/08/25	MS1005 / Shale	T	1	28.020
130258334	13/08/25	MS1005 / Shale	T	1	37.760
130258338	13/08/25	MS1005 / Shale	T	1	37.820
130258342	13/08/25	MS1005 / Shale	T	1	29.660
130259301	18/08/25	MS1005 / Shale	T	1	36.580
130259309	18/08/25	MS1005 / Shale	T	1	41.800
130259336	18/08/25	MS1005 / Shale	T	1	37.540
130259338	18/08/25	MS1005 / Shale	T	1	37.820
130259369	18/08/25	MS1005 / Shale	T	1	37.080
130259371	18/08/25	MS1005 / Shale	T	1	38.320
130259405	18/08/25	MS1005 / Shale	T	1	37.220
130259412	18/08/25	MS1005 / Shale	T	1	39.550

Appendix C – Development and Rehabilitation

C.1 Quarry overview (23 November 2024) – NearMap



C.2 Quarry overview (23 February 2025) – NearMap



C.3 Quarry overview (30 March 2025) – NearMap



Appendix D – Water Monitoring Reports

Memorandum

29 January 2025

To: Pascal Bobillier
General Manager - Development
Coombes Property Group

From: Patrick Carolan

Subject: Luddenham Quarry SWMP monitoring results (Q1 - 2024/2025)

Dear Pascal,

1 Background

This memorandum outlines groundwater water quality and level monitoring undertaken by EMM Consulting Pty Ltd (EMM) for Luddenham Quarry (the site), as required by the water monitoring program that was developed for the Soil and Water Management Plan (SWMP) (EMM 2021).

The program commenced in March 2022 and involves quarterly groundwater and annual surface water monitoring (refer Appendix A for monitoring locations).

Monitoring outlined in this report was completed on 4 December 2024 for the period of October to December 2024 (Q1 of the 2024–2025 annual review period).

2 Water monitoring

2.1 Program overview

2.1.1 Monitoring locations

i Groundwater monitoring network

Three monitoring bores exist at the site, installed to a depth of approximately 30 metres (m) into the Bringelly Shale. The monitoring bores are sited with one bore up-hydraulic gradient (BSM1) as a background bore (to the quarry footprint) and two bores down-hydraulic gradient of the pit (BSM2 and BSM3). The two down-hydraulic gradient bores are located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oak Creek.

Sites BSM1 and BSM2 were replaced with new bores in 2023, with subsequent monitoring producing anomalous results. Redevelopment of the bores was attempted ahead of the December 2023 Q1 monitoring round (refer Q1 23–24 monitoring report, EMM 2024).

ii Surface water monitoring locations

Additional monitoring of some surface water locations has been undertaken in response to previous monitoring results to assess the source of anomalous groundwater results. Additional monitoring was attempted at the Oaky Creek upstream site and of water stored within the quarry pit for this monitoring round.

2.1.2 Water quality analytes

The analytical suite for the monitoring program is presented in Table 2.1. Physical and chemical stressors (except for total suspended solids) are monitored in the field with a calibrated hand-held water quality meter. All other parameters are analysed at a laboratory accredited by the National Association of Testing Authorities (NATA).

Detailed hydrocarbon analysis was added to the analytical suite as recommended in the 23/24 Q2 groundwater monitoring report, to assist in determining the likely source of oil and grease found in previous monitoring (i.e. lubricants used as part of the drilling process, oils or greases used as part of quarry operations, diesel etc).

In 23/24 Q4, silica gel cleanup was a step added to the analytical process of testing for hydrocarbons. Silica is a polar material that is used to adsorb (remove) non-hydrocarbon polar organics during the sample extraction process.

Table 2.1 Water quality analytes

Category	Parameters	Analysis method
Physical and chemical stressors	Dissolved oxygen, electrical conductivity, pH, total dissolved solids, turbidity.	In the field with a calibrated hand-held water quality meter.
	Total suspended solids.	Analysis undertaken at NATA accredited laboratory.
Nutrients	Ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, reactive phosphorus, total phosphorus.	Analysis undertaken at NATA accredited laboratory.
Dissolved metals	Aluminium, arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc.	Analysis undertaken at NATA accredited laboratory.
Other	Total hardness, oil and grease.	Analysis undertaken at NATA accredited laboratory.
Hydrocarbons ¹	BTEXN (benzene, toluene, ethylbenzene, xylene and naphthalene), TRH/TPH (total petroleum hydrocarbon) and PAH (polycyclic aromatic hydrocarbons). Including analysis/results for Chromatogram. TRH/TPH (total petroleum hydrocarbon) with Silica Gel Cleanup.	Analysis undertaken at NATA accredited laboratory.

Table notes:

1. Hydrocarbon analysis undertaken for exceedance investigations from previous monitoring rounds.

2.1.3 Water level monitoring

Water levels are monitored using an interface probe at each monitoring bore during sampling. A deviation of 2 m from the long-term median groundwater level in the quarry monitoring bores is considered a trigger for further action. 2 m as the deviation value aligns with the minimal impact considerations of the aquifer interference activities stated in the NSW Aquifer Interference Policy (DPI 2012).

2.2 Completed monitoring

The following sections describe the completed monitoring and field observations. Key results are discussed in Section 2.3 and detailed results are provided in the following appendices:

- Appendix B: Groundwater levels.
- Appendix C: Water quality monitoring results.
- Appendix D: Water quality timeseries charts.

2.2.1 Rainfall context

The Bureau of Meteorology operates a rain gauge at Badgerys Creek (approximately 3 kilometres (km) from the site – Station number: 067108). 46 mm of rain was recorded at the station in the five days preceding the monitoring event.

2.2.2 Groundwater

Field observations for completed groundwater monitoring is presented in Table 2.2.

Table 2.2 Field observations (groundwater monitoring)

Time of sample	Monitoring point	Site description	Field comments/context
Groundwater sampling locations			
04/09/2024 – 12:10 am	BSM1	Upgradient bore to measure background contamination levels.	Bore water initially appeared clear but transitioned to brown and highly turbid during purging and when the sample was taken. No odour noted.
04/09/2024 – 9:54 am	BSM2	Bore which is down hydraulically gradient to the quarry pit and BSM1.	Bore water maintained consistent clear colour. A field duplicate was taken as a quality assurance (QA) sample at this bore.
04/09/2024 – 11:00 am	BSM3	Bore which is down hydraulically gradient to the quarry pit and BSM1.	Bore water maintained consistent clear colour with a sulphurous odour. Foam noted during purging.

2.2.3 Surface water

Field observations for completed surface water monitoring is presented in Table 2.3

Table 2.3 **Field observations (surface water monitoring)**

Time of sample	Monitoring point	Site description	Field comments/context	Site photos
Surface water sampling locations				
04/09/2024	QUARRY PIT	Sample of the pit quarry water in the NE corner of the pit.	No sample taken as Quarry Pit was dry.	
04/09/2024 – 12:44 PM	UPSTREAM	Upstream sample point of Oaky Creek.	Creek flow stagnant with clear water.	

2.2.4 Laboratory analysis

Water samples were transported to a NATA-accredited laboratory (Australian Laboratory Services (ALS) in Smithfield, NSW for analysis. All laboratory analytes that were not measured during purging (i.e. pH, electrical conductivity (EC), dissolved oxygen and oxidation-reduction potential) were received by the laboratory within the maximum holding times.

2.2.5 Quality assurance/quality control (QA/QC)

Samples were collected in laboratory-provided sample containers with appropriate preservation. Samples were collected and sent to the laboratory under appropriate chain of custody protocols.

The field QA/QC procedures used to establish accurate, reliable, and precise results included:

- calibration of equipment by the supplier before use
- keeping samples chilled
- submitting laboratory samples within holding times
- wearing disposable nitrile gloves during sampling at each sampling location
- using dedicated sampling equipment
- collection of a field duplicate sample.

Quality assurance/control was assessed by calculating relative percentage difference (RPD) of the field duplicate ($S_{duplicate}$) sample to the parent sample (S_{parent}) as per the following equation.

$$Relative \% difference = \frac{|S_{parent} - S_{Duplicate}|}{\frac{S_{parent} + S_{Duplicate}}{2}} \times 100$$

Results were considered to confirm acceptable degree of data quality where RPDs were below 30%.

Most results for the monitoring round were within RPD limits (refer Appendix C), indicating adequate QA/QC. Zinc concentrations at BSM2 marginally exceeded RPD limits, however the elevated RPD is attributed to low detected concentrations.

2.3 Monitoring results - general observations

2.3.1 Groundwater levels

Water levels in BSM1 and BSM2 were within the historical range since the program commenced in March 2022. BSM3 was reported with a standing water level lower than reported since the program commenced in March 2022, but was within historical ranges including baseline data and was not reflected in the adjacent downgradient bore BSM2. No further action is required with respect to groundwater levels however continued review of the standing water levels will be undertaken as part of the groundwater monitoring program.

2.3.2 Groundwater quality

Key observations of groundwater quality for the monitoring period include the following:

- pH was circumneutral in all bores.
- Salinity, as indicated by electrical conductivity (EC), was significantly lower in BSM1 than noted in BSM2 and BSM3. Results at these downgradient bores are more typical of baseline trends, indicating that the upgradient/BSM1 results may be impacted by surface water ingress.
- Nutrients remain significantly elevated above baseline in all bores, particularly nitrate in BSM2. Given the pit no longer contains water, the elevated nutrients appear contained to the groundwater system, attributable to an external source or localised within the wells.

- Elevated metals were noted in some bores (discussed in Section 2.4).

2.3.3 Surface water quality

Key observations of the surface water quality are summarised below:

- The Quarry Pit location did not contain water and hence was not sampled.
- pH was neutral in the receiving environment.
- EC was within the baseline data range for the upstream location.

2.4 Review of exceedances

Water quality results were reviewed for trigger exceedances, via comparison of default guideline values or comparison of other chemical properties to the upgradient bore (BSM1).

An assessment of exceedances including actions taken and recommendations for the groundwater monitoring is presented in Table 2.4.

Table 2.4 Review of exceedances (groundwater)

Exceedance description	Assessment, actions taken and recommendations
Field parameters	
Electrical conductivity at the upgradient bore was significantly lower than the 2x downgradient bores.	<p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> • Results of the two downgradient bores (BSM2 and BSM3) are relatively consistent with historical data. • Whilst concentrations at BSM1 are lower than the historical data, electrical conductivity did increase from the previous monitoring round. <p>Bore construction information was sourced from the original well installation and reviewed. The following observations are noted from the bore construction information for each of the new wells:</p> <ul style="list-style-type: none"> • Wells were drilled to approximately 30 m. • A six-metre screen was installed at the base of the wells, with a 25 m gravel pack backfilled (from 5 m to 30 m below ground level (mbgl)). • A 5 m bentonite seal was installed at the top portion of the bore. • No lithology information from the drilling was available for review. <p>It is understood that a layer of clay/alluvium is situated close to the surface level atop the Bringelly Shale hydrogeological unit. Based on the above bore construction information, it is possible that the shallow alluvial aquifer and the Bringelly Shale aquifer are both contributing to the monitoring bores and producing inconsistencies in the monitoring results.</p>

Table 2.4 Review of exceedances (groundwater)

Exceedance description	Assessment, actions taken and recommendations
Nutrients	
Ammonia exceeded the trigger value (0.02 mg/L) at all locations.	Baseline data results were reviewed, where the following was noted: <ul style="list-style-type: none"> No historical records of ammonia or total nitrogen were available. Oxidised nitrogen was noted to be significantly above historical records (with respect to nitrite and nitrate results typically less than 0.01 mg/L).
TKN concentrations exceeded the upgradient bore concentration (6.8 mg/L) at BSM2 and BSM3 with concentrations of 7.6 mg/L and 7 mg/L, respectively.	Surface water monitoring at the upstream Oaky Creek site was undertaken and reviewed. Nutrients at the upstream site were also elevated above surface water trigger values, however, were of lower concentration than noted in the bores. This suggests high nutrients may be naturally occurring or present from activities upstream of the site.
Oxidised nitrogen significantly exceeded the upgradient bore concentration (0.04mg/L) at BSM2 with a concentration of 67.3 mg/L.	Timeseries charts of nutrients exceedances were prepared (refer Appendix D).
Total nitrogen exceeded the upgradient bore concentration (6.8 mg/L) at BSM2 and BSM3 with concentrations of 74.9 mg/L and 7.0 mg/L, respectively.	The following observations are made from charts in Appendix D.1: <ul style="list-style-type: none"> Groundwater exceedances for nutrients generally appear to occur following the bore installation in July 2023. Previous trends of a reduction in nutrient concentrations over time, no longer appear to be consistent. <p>The previous results of silica gel cleanup from hydrocarbon analysis indicated the presence of biogenic organic compounds in the groundwater samples from a source unrelated to site operations. The source of the biogenic organic compounds may also relate to the high nutrient levels recorded by the monitoring program.</p>
Metals	
Copper exceeded the trigger value at BSM1 and BSM2 with concentrations of 0.005 mg/L and 0.002 mg/L, respectively.	Baseline data results were reviewed, where the following was noted: <ul style="list-style-type: none"> Copper, Iron and Zinc have been noted in the bores historically at similar concentrations. No historical records of aluminium or manganese are available. Manganese was also elevated in the previous monitoring round.
Aluminium exceeded the trigger value at BSM2 with a concentration of 0.08 mg/L.	Surface water results were also reviewed. Monitoring of the quarry pit showed some exceedances in metals however, these were not consistent with the analytes or magnitude of concentrations recorded in the groundwater results.
Manganese exceeded the trigger value at BSM2 with a concentration of 1.99 mg/L.	Timeseries charts of metals exceedances were prepared (refer Appendix D). The following observations are made from charts in Appendix D.2:
Nickel marginally exceeded the trigger value at BSM2 with a concentration of 0.012 mg/L.	<ul style="list-style-type: none"> No obvious trends are discernible from the timeseries charts and exceedances of similar magnitude are generally known to occur for some metals in the historical baseline dataset.
Zinc exceeded the trigger values at BSM1 and BSM2 with concentrations of 0.010 mg/L and 0.021 mg/L respectively.	

3 Summary and recommendations

The following provides a summary of additional investigations:

- The detectable concentrations of TRH/TPH and oil and grease reported in previous rounds were not present during the December sampling round.
- No confirmed source has been identified for the sustained elevated nutrient concentrations observed within the monitoring wells. Significant re-establishment of ground cover vegetation upstream of the site for the Western Sydney Airport (WSA) has been noted since 2021 and it is possible that widespread use of fertilisers may have contributed to the reported increase in nutrients observed at monitoring wells at the site. Detailed surface water and groundwater monitoring associated with the WSA construction was not available for review to verify this potential source.
- The construction details of monitoring wells BSM1 and BSM2 were reviewed, which noted that the wells have an extended gravel pack from 5–30 mbgl. It is possible that this construction method is capturing multiple sources of groundwater inflow, if the gravel pack extends across both a shallow alluvial aquifer and the Bringelly Shale. No lithology information was provided with the bore construction details, and it is therefore not possible to confirm the source of groundwater inflows to the wells. If detailed bore logs with lithology cannot be provided for the new wells, additional drilling and installation of monitoring wells with screens and gravel packs separately targeting observed aquifers may be beneficial to confirm the impacted aquifer(s) and inform source investigations or eliminate if the wells were contaminated as a result of the installation process.

The following recommendations are made for future monitoring:

- It is recommended that the total recoverable hydrocarbon analysis and silica gel cleanup process is continued on future samples to assist with confirming the absence of TRH/TPH and oil and grease or determining the source of any future oil and grease concentrations.
- Continue to monitor groundwater quality results over the next AR period and investigate regional sources of anomalous results. Consider additional investigative drilling to confirm lithology and/or consider replacement of monitoring wells with appropriate design to enable control impact monitoring, if water quality results do not normalise by the end of the next AR period.

Please contact the undersigned with any questions or clarifications.

Yours sincerely



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Appendix A

Water quality monitoring locations



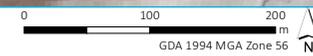
- KEY**
- Study area
 - Cadastral boundary
 - Watercourse
 - Water quality monitoring location
 - ⊕ Groundwater monitoring bore

Water quality monitoring locations

Luddenham Quarry
Water Management Plan
Figure 4.1



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)



Appendix B

Groundwater levels

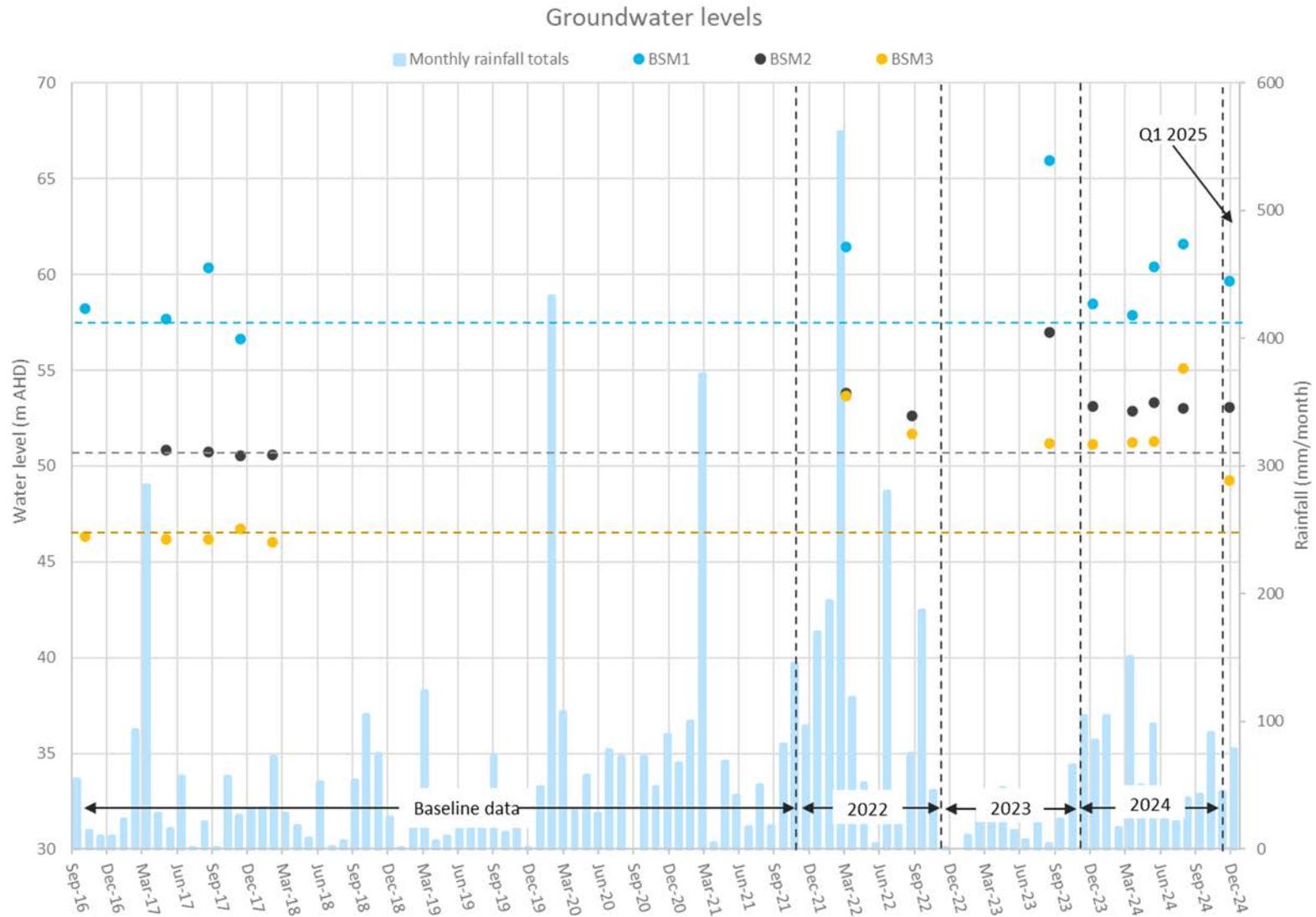


Figure B.1 Ground water levels

Appendix C

Water quality monitoring results

Analytical Results Tables - Groundwater

	Unit	EQL	ANZECC (2000)	Trigger value (groundwater)	Location Code			
					Field ID		Date	
					BSM1	BSM2	BSM3	BSM3
					04 Dec 2024	04 Dec 2024	04 Dec 2024	04 Dec 2024
Field Parameters								
Temperature	°C	-	-	-	21.5	21.4	-	21.7
Electrical conductivity	µS/cm	-	-	BSM1	11008	25067	-	23623
pH	-	-	6.5-8.5	6.5-8.5	6.8	6.79	-	7.21
Dissolved oxygen	mg/L	-	-	-	5.34	5.06	-	5.11
Redox potential	mg/L	-	-	-	-21.2	64	-	-208
Total dissolved solids	mg/L	-	-	BSM1	-	-	-	-
Nutrients								
Ammonia as N	mg/L	0.01	0.02	BSM1	5.36	2.63	3.06	4.68
Kjeldahl Nitrogen Total	mg/L	0.1	-	BSM1	6.8	7.6	7.3	7.0
Nitrite (as N)	mg/L	0.01	-	BSM1	0.03	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.01	-	BSM1	0.01	67.3	63.9	0.02
Nitrite + Nitrate as N	mg/L	0.01	0.04	BSM1	0.04	67.3	63.9	0.02
Nitrogen (Total)	mg/L	0.1	0.5	BSM1	6.8	74.9	71.2	7.0
Reactive Phosphorus as P	mg/L	0.01	-	BSM1	<0.01	<0.01	<0.01	<0.01
Phosphate total (as P)	MG/L	0.01	0.05	BSM1	0.24	0.05	0.04	0.08
Hardness as CaCO ₃ (filtered)	mg/L	1	-	-	3,550	3,690	3,680	3,380
Analytical results – general								
TSS	mg/L	5	-	BSM1	1,090	36	41	14
Metals								
Arsenic (filtered)	mg/L	0.001	0.013	0.013	0.001	<0.001	0.001	<0.001
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001	0.001
Mercury (filtered)	mg/L	0.0001	0.0006	0.0006	<0.0001	<0.0001	<0.0001	<0.0001
Copper (filtered)	mg/L	0.001	0.0014	0.0014	0.005	0.002	0.002	<0.001
Iron (filtered)	mg/L	0.05	-	-	2.48	0.06	0.05	0.51
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	0.06	0.08	<0.01
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	<0.001	<0.001	<0.001
Boron (filtered)	mg/L	0.05	0.37	0.37	0.07	<0.05	<0.05	<0.05
Manganese (filtered)	mg/L	0.001	1.9	1.9	1.16	1.96	1.99	0.247
Selenium (filtered)	mg/L	0.01	0.011	0.011	<0.01	<0.01	<0.01	<0.01
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.002	0.012	0.012	<0.001
Zinc (filtered)	mg/L	0.005	0.008	0.008	0.010	0.015	0.021	<0.005
BTEX								
Benzene	µg/L	1	950	LOR	<1	<1	<1	<1
Toluene	µg/L	2	180	LOR	<2	<2	<2	<2
Ethylbenzene	µg/L	2	80	LOR	<2	<2	<2	<2
Xylene (m & p)	µg/L	2	-	LOR	<2	<2	<2	<2
Xylene (o)	µg/L	2	350	LOR	<2	<2	<2	<2
Xylene Total	µg/L	2	-	LOR	<2	<2	<2	<2
Total BTEX	µg/L	1	-	LOR	<1	<1	<1	<1
Naphthalene (VOC)	mg/L	0.005	-	LOR	<0.005	<0.005	<0.005	<0.005
TRH								
C6-C10	µg/L	20	-	LOR	<20	<20	<20	<20
C6 - C10 less BTEX (F1)	µg/L	20	-	LOR	<20	<20	<20	<20
>C10-C16	µg/L	100	-	LOR	<100	<100	<100	<100
>C10-C16 less Naphthalene (F2)	µg/L	100	-	LOR	<100	<100	<100	<100
>C16-C34	µg/L	100	-	LOR	<100	<100	<100	<100
>C34-C40	µg/L	100	-	LOR	<100	<100	<100	<100
>C10-C40 (Total)	µg/L	100	-	LOR	<100	<100	<100	<100
TRH - (Post Silica Gel Cleanup)								
TRH >C10 - C16 less Naphthalene (F2)	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TRH >C10-C16	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TRH >C16-C34	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TRH >C34-C40	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TRH >C10 - C40 Fraction (Total)	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TPH								
Oil and Grease	mg/L	5	-	LOR	<5	<5	<5	<5
C6-C9	µg/L	20	-	LOR	<20	<20	<20	<20
C10-C14	µg/L	50	-	LOR	<50	<50	<50	<50
C15-C28	µg/L	100	-	LOR	<100	<100	<100	<100
C29-C36	µg/L	50	-	LOR	<50	<50	<50	<50
C10-C36 (Total)	µg/L	50	600	LOR	<50	<50	<50	<50
TPH - (Silica Gel Cleanup)								
TPH C10-C14	mg/L	0.05	-	LOR	<0.05	<0.05	<0.05	<0.05
TPH C15-C28	mg/L	0.1	-	LOR	<0.1	<0.1	<0.1	<0.1
TPH C29-C36	mg/L	0.05	-	LOR	<0.05	<0.05	<0.05	<0.05
TPH C10-C36 (Total)	mg/L	0.05	600	LOR	<0.05	<0.05	<0.05	<0.05

Analytical Results Tables – Surface water

					Location Code
					Field ID
					Date
			ANZECC (2000)	Trigger value (groundwater)	UPSTREAM
	Unit	EQL			UPSTREAM
					04 Dec 2024
Field Parameters					
Temperature	°C	-	-	-	25.8
Electrical conductivity	µS/cm	-	125-2,200	125-2,200	1402
pH	-	-	6.5-8.5	6.5-8.5	7.22
Dissolved oxygen	mg/L	-	-	-	4.37
Redox potential	mg/L	-	-	-	21.5
Total dissolved solids	mg/L	-	-	-	-
Turbidity	NTU	-	50	50	14.52
Nutrients					
Ammonia as N	mg/L	0.01	0.02	0.02	0.18
Kjeldahl Nitrogen Total	mg/L	0.1	-	-	1.4
Nitrite (as N)	mg/L	0.01	-	-	<0.01
Nitrate (as N)	mg/L	0.01	-	-	0.03
Nitrite + Nitrate as N	mg/L	0.01	0.04	0.04	0.03
Nitrogen (Total)	mg/L	0.1	0.5	0.5	1.4
Reactive Phosphorus as P	mg/L	0.01	-	0.02	<0.01
Phosphate total (as P)	MG/L	0.01	0.05	0.05	0.06
Hardness as CaCO ₃ (filtered)	mg/L	1	-	-	268
Analytical results – general					
TSS	mg/L	5	-	-	<5
Metals					
Arsenic (filtered)	mg/L	0.001	0.013	0.013	0.001
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001
Mercury (filtered)	mg/L	0.0001	0.0006	0.0006	<0.0001
Copper (filtered)	mg/L	0.001	0.0014	0.0014	0.002
Iron (filtered)	mg/L	0.05	-	-	0.11
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001
Boron (filtered)	mg/L	0.05	0.37	0.37	<0.05
Manganese (filtered)	mg/L	0.001	1.9	1.9	0.903
Selenium (filtered)	mg/L	0.01	0.011	0.011	<0.01
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.002
Zinc (filtered)	mg/L	0.005	0.008	0.008	<0.005
BTEX					
Benzene	µg/L	1	950	LOR	<1
Toluene	µg/L	2	180	LOR	<2
Ethylbenzene	µg/L	2	80	LOR	<2
Xylene (m & p)	µg/L	2	-	LOR	<2
Xylene (o)	µg/L	2	350	LOR	<2
Xylene Total	µg/L	2	-	LOR	<2
Total BTEX	µg/L	1	-	LOR	<1
Naphthalene (VOC)	mg/L	0.005	-	LOR	<0.005
TRH					
C6-C10	µg/L	20	-	LOR	<20
C6 - C10 less BTEX (F1)	µg/L	20	-	LOR	<20
>C10-C16	µg/L	100	-	LOR	<100
>C10-C16 less Naphthalene (F2)	µg/L	100	-	LOR	<100
>C16-C34	µg/L	100	-	LOR	<100
>C34-C40	µg/L	100	-	LOR	<100
>C10-C40 (Total)	µg/L	100	-	LOR	<100
TRH - (Post Silica Gel Cleanup)					
TRH >C10 - C16 less Naphthalene (F2)	mg/L	0.1	-	LOR	<0.1
TRH >C10-C16	mg/L	0.1	-	LOR	<0.1
TRH >C16-C34	mg/L	0.1	-	LOR	<0.1
TRH >C34-C40	mg/L	0.1	-	LOR	<0.1
TRH >C10 - C40 Fraction(Total)	mg/L	0.1	-	LOR	<0.1
TPH					
Oil and Grease	mg/L	5	-	LOR	<5
C6-C9	µg/L	20	-	LOR	<20
C10-C14	µg/L	50	-	LOR	<50
C15-C28	µg/L	100	-	LOR	<100
C29-C36	µg/L	50	-	LOR	<50
C10-C36 (Total)	µg/L	50	600	LOR	<50
TPH - (Silica Gel Cleanup)					
TPH C10-C14	mg/L	0.05	-	LOR	<0.05
TPH C15-C28	mg/L	0.1	-	LOR	<0.1
TPH C29-C36	mg/L	0.05	-	LOR	<0.05
TPH C10-C36 (Total)	mg/L	0.05	0.6	LOR	<0.05

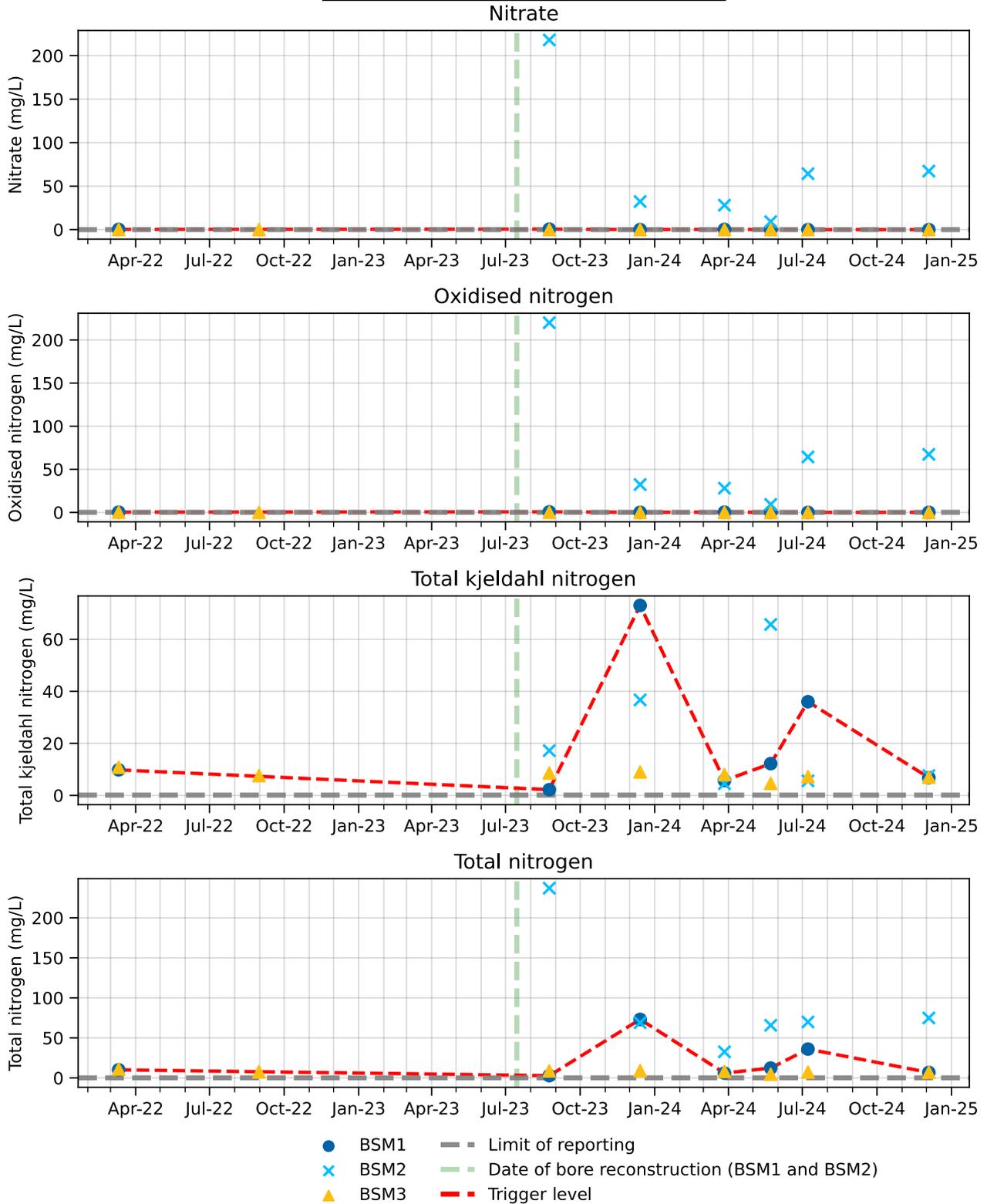
	Unit	EQL	Field ID	BSM2	QA BSM2	RPD
			Lab Report Number	ES2439522	ES2439522	
			Date	04 Dec 2024	04 Dec 2024	
			Matrix Type	Water	Water	
Nutrients						
Ammonia as N	mg/L	0.01	2.63	3.06	15	
Kjeldahl Nitrogen Total	mg/L	0.1	7.6	7.3	4	
Nitrite (as N)	mg/L	0.01	<0.01	<0.01	0	
Nitrate (as N)	mg/L	0.01	67.3	63.9	5	
Nitrite + Nitrate as N	mg/L	0.01	67.3	63.9	5	
Nitrogen (Total)	mg/L	0.1	74.9	71.2	5	
Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	0	
Phosphate total (as P)	MG/L	0.01	0.05	0.04	22	
Hardness as CaCO ₃ (filtered)	mg/L	1	3,690	3,680	0	
Analytical results – general						
TSS	mg/L	5	36	41	13	
Metals						
Arsenic (filtered)	mg/L	0.001	<0.001	0.001	0	
Cadmium (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0	
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0	
Copper (filtered)	mg/L	0.001	0.002	0.002	0	
Iron (filtered)	mg/L	0.05	0.06	0.05	18	
Aluminium (filtered)	mg/L	0.01	0.06	0.08	29	
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0	
Boron (filtered)	mg/L	0.05	<0.05	<0.05	0	
Manganese (filtered)	mg/L	0.001	1.96	1.99	2	
Selenium (filtered)	mg/L	0.01	<0.01	<0.01	0	
Nickel (filtered)	mg/L	0.001	0.012	0.012	0	
Zinc (filtered)	mg/L	0.005	0.015	0.021	33	
BTEX						
Benzene	µg/L	1	<1	<1	0	
Toluene	µg/L	2	<2	<2	0	
Ethylbenzene	µg/L	2	<2	<2	0	
Xylene (m & p)	µg/L	2	<2	<2	0	
Xylene (o)	µg/L	2	<2	<2	0	
Xylene Total	µg/L	2	<2	<2	0	
Total BTEX	µg/L	1	<1	<1	0	
Naphthalene (VOC)	mg/L	0.005	<0.005	<0.005	0	
TRH						
C6-C10	µg/L	20	<20	<20	0	
C6 - C10 less BTEX (F1)	µg/L	20	<20	<20	0	
>C10-C16	µg/L	100	<100	<100	0	
>C10-C16 less Naphthalene (F2)	µg/L	100	<100	<100	0	
>C16-C34	µg/L	100	<100	<100	0	
>C34-C40	µg/L	100	<100	<100	0	
>C10-C40 (Total)	µg/L	100	<100	<100	0	
TRH - (Post Silica Gel Cleanup)						
TRH >C10 - C16 less Naphthalene (F2)	mg/L	0.1	<0.1	<0.1	0	
TRH >C10-C16	mg/L	0.1	<0.1	<0.1	0	
TRH >C16-C34	mg/L	0.1	<0.1	<0.1	0	
TRH >C34-C40	mg/L	0.1	<0.1	<0.1	0	
TRH >C10 - C40 Fraction (Total)	mg/L	0.1	<0.1	<0.1	0	
TPH						
Oil and Grease	mg/L	5	<5	<5	0	
C6-C9	µg/L	20	<20	<20	0	
C10-C14	µg/L	50	<50	<50	0	
C15-C28	µg/L	100	<100	<100	0	
C29-C36	µg/L	50	<50	<50	0	
C10-C36 (Total)	µg/L	50	<50	<50	0	
TPH - (Silica Gel Cleanup)						
TPH C10-C14	mg/L	0.05	<0.05	<0.05	0	
TPH C15-C28	mg/L	0.1	<0.1	<0.1	0	
TPH C29-C36	mg/L	0.05	<0.05	<0.05	0	
TPH C10-C36 (Total)	mg/L	0.05	<0.05	<0.05	0	

Appendix D

Water quality timeseries charts

D.1 Timeseries water quality charts – nutrients

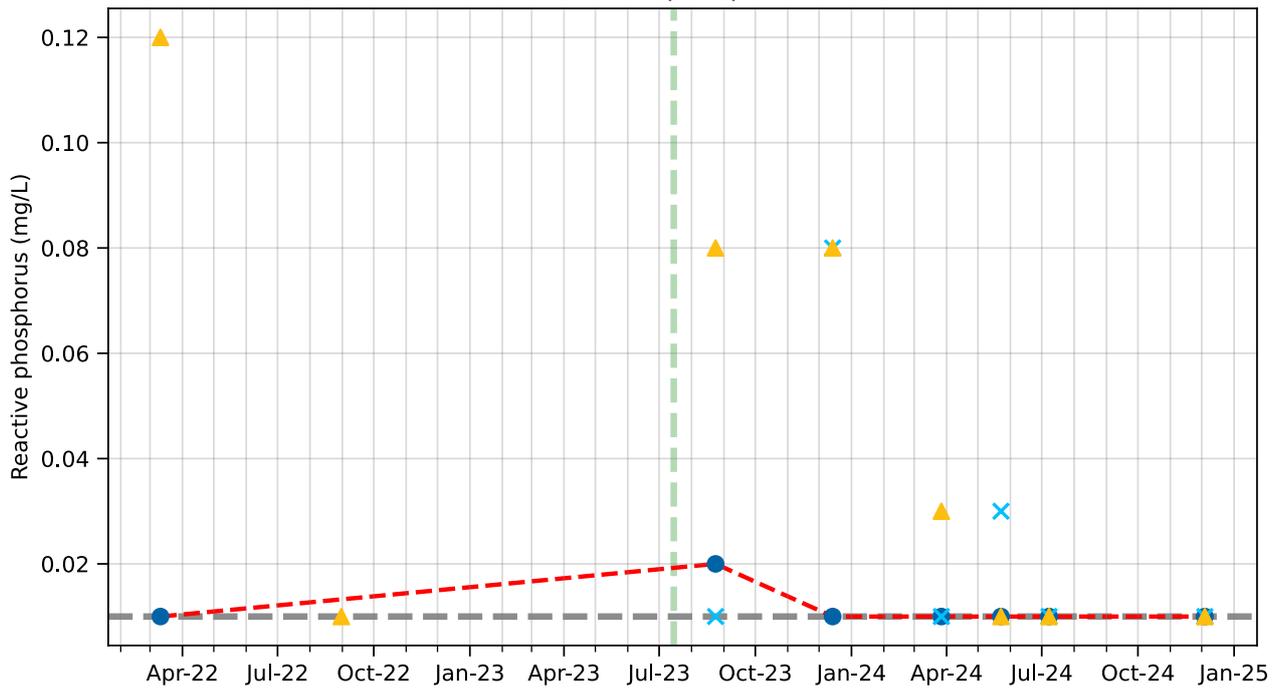
Water quality analysis - nutrients



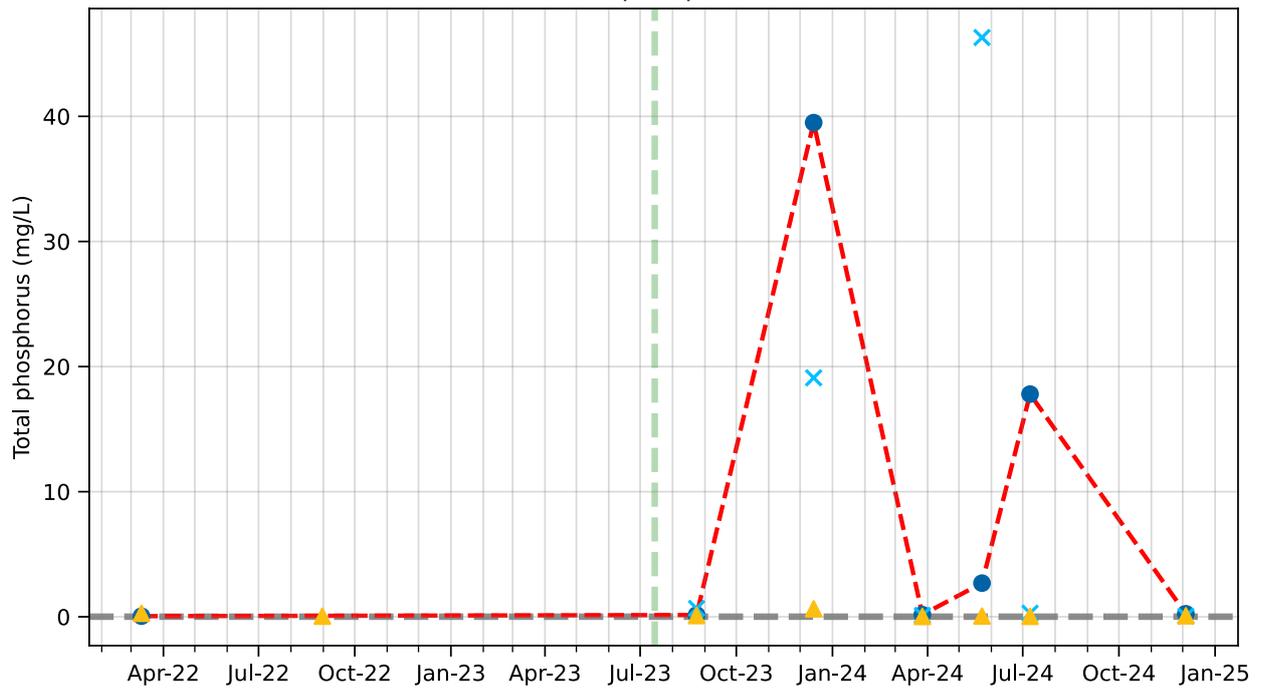
*Trigger values based on upgradient bore (BSM1).

Water quality analysis - nutrients

Reactive phosphorus



Total phosphorus

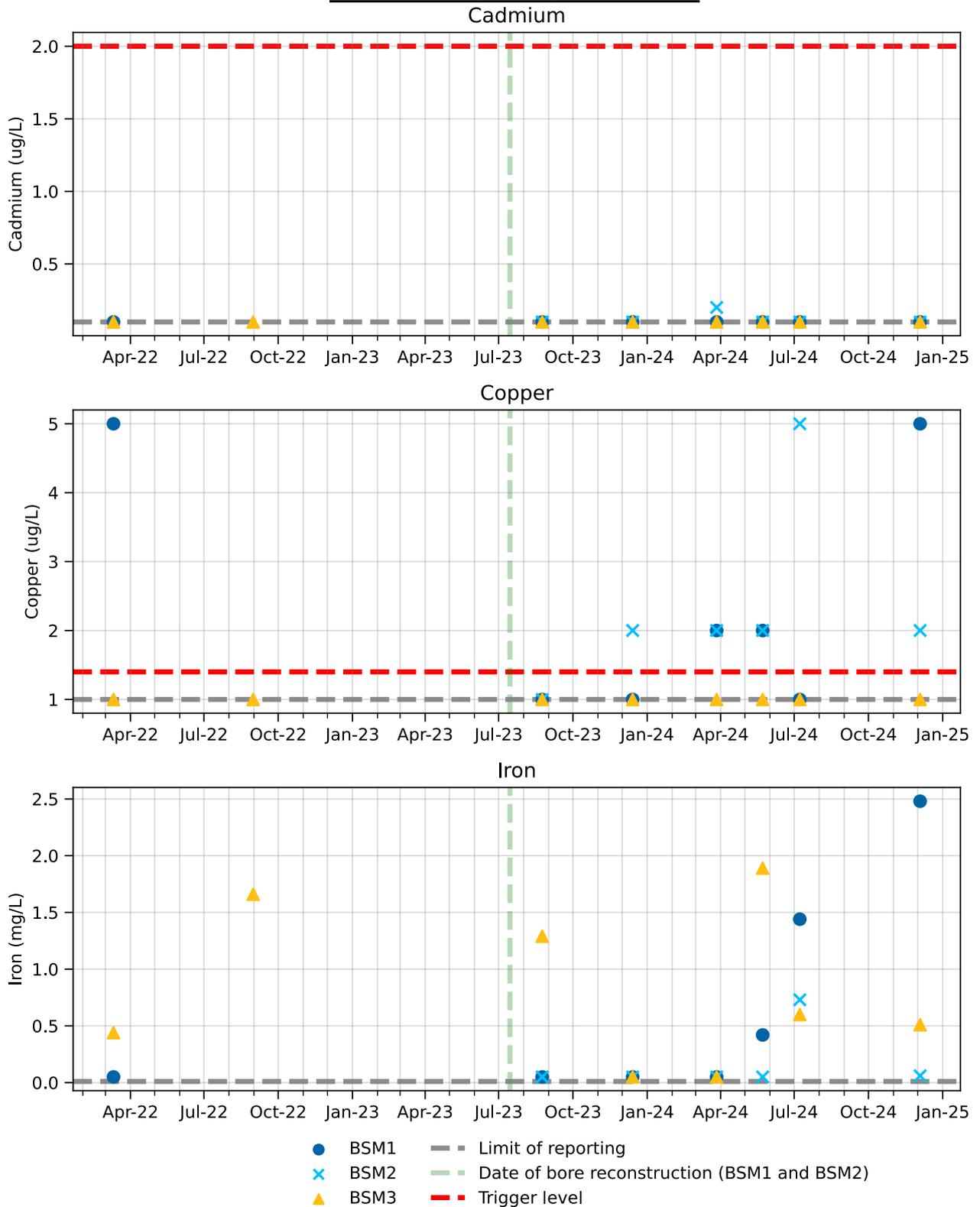


- BSM1
- × BSM2
- ▲ BSM3
- Limit of reporting
- Date of bore reconstruction (BSM1 and BSM2)
- - - Trigger level

*Trigger values based on upgradient bore (BSM1).

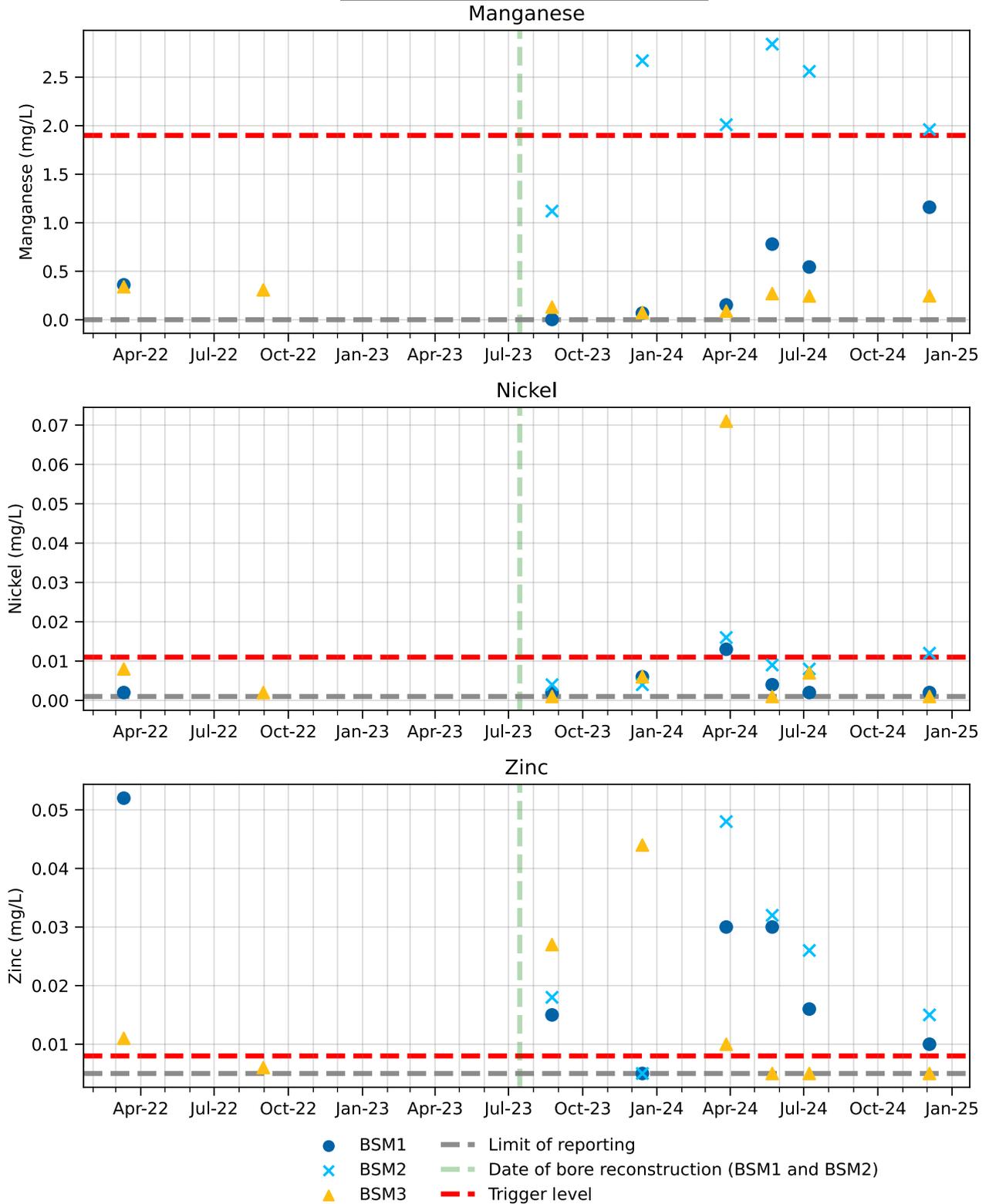
D.2 Timeseries water quality charts – metals

Water quality analysis - metals



*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Water quality analysis - metals



*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Memorandum

25 March 2025

To: Pascal Bobillier
General Manager - Development
Coombes Property Group

From: Tasman Coupe

Subject: Luddenham Quarry SWMP monitoring results (Q2 - 2024/2025)

Dear Pascal,

1 Background

This memorandum outlines groundwater water quality and level monitoring undertaken by EMM Consulting Pty Ltd (EMM) for Luddenham Quarry (the site), as required by the water monitoring program that was developed as part of the Soil and Water Management Plan (SWMP) (EMM 2021).

The program commenced in March 2022 and involves quarterly groundwater and annual surface water monitoring (refer Appendix A for monitoring locations). Previous monitoring events have occurred:

- 11 March 2022
- 31 August 2022
- 24 August 2023
- 14 December 2023
- 27 March 2024
- 23 May 2024
- 7 August 2024
- 4 December 2024

Sites BSM1 and BSM2 were replaced with new bores in 2023, with subsequent monitoring producing anomalous results. Redevelopment of the bores was attempted ahead of the December 2023 Q1 monitoring round (refer Q1 23–24 monitoring report, EMM 2024).

Additional monitoring of some surface water locations has been undertaken in response to previous monitoring results to assess the source of anomalous groundwater results. Additional monitoring was completed at the Oaky Creek upstream site and of water stored within the quarry pit for this monitoring round.

Monitoring outlined in this report was completed by Jonathon Schacht, a water resources engineer on 4 March 2025 for the period of January to March 2025 (Q2 of the 2024–2025 annual review period).

2 Water monitoring

2.1 Program overview

2.1.1 Water quality analytes

The analytical suite for the monitoring program is presented in Table 2.1. Physical and chemical stressors (except for total suspended solids) are monitored in the field with a calibrated hand-held water quality meter. All other parameters are analysed at a laboratory accredited by the National Association of Testing Authorities (NATA).

Detailed hydrocarbon analysis was added to the analytical suite as recommended in the 23/24 Q2 groundwater monitoring report, to assist in determining the likely source of oil and grease found in previous monitoring (i.e. lubricants used as part of the drilling process, oils or greases used as part of quarry operations, diesel, etc).

In 23/24 Q4, silica gel cleanup was a step added to the analytical process of testing for hydrocarbons. Silica is a polar material that is used to adsorb (remove) non-hydrocarbon polar organics during the sample extraction process.

Table 2.1 Water quality analytes

Category	Parameters	Analysis method
Physical and chemical stressors	Dissolved oxygen, electrical conductivity, pH, total dissolved solids, turbidity.	In the field with a calibrated hand-held water quality meter.
	Total suspended solids.	Analysis undertaken at NATA accredited laboratory.
Nutrients	Ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, reactive phosphorus, total phosphorus.	Analysis undertaken at NATA accredited laboratory.
Dissolved metals	Aluminium, arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc.	Analysis undertaken at NATA accredited laboratory.
Other	Total hardness, oil and grease.	Analysis undertaken at NATA accredited laboratory.
Hydrocarbons ¹	BTEXN (benzene, toluene, ethylbenzene, xylene and naphthalene), TRH/TPH (total petroleum hydrocarbon) and PAH (polycyclic aromatic hydrocarbons). Including analysis/results for Chromatogram. TRH/TPH (total petroleum hydrocarbon) with Silica Gel Cleanup.	Analysis undertaken at NATA accredited laboratory.

Notes:

1. Hydrocarbon analysis undertaken for exceedance investigations from previous monitoring rounds.

Laboratory certificates are presented in Appendix E. Calibration certificates are provided in Appendix G.

2.1.2 Water level monitoring

Water levels are monitored using an interface probe at each monitoring bore during sampling. A deviation of two meters from the long-term median groundwater level in the quarry monitoring bores is considered a trigger for further action. Two meters as the deviation value aligns with the minimal impact considerations of the aquifer interference activities stated in the NSW Aquifer Interference Policy (DPI 2012).

2.2 Monitoring completed – March 2025

The following sections describe the monitoring completed including field observations. Key results are discussed in Section 2.3 and detailed results are provided in the following appendices:

- Appendix B: Groundwater levels.
- Appendix C: Water quality monitoring results.
- Appendix D: Water quality timeseries charts.

2.2.1 Rainfall context

The Bureau of Meteorology operates a rain gauge at Badgerys Creek (approximately 3 kilometres (km) from the site – Station number: 067108). No rain was recorded at the station in the five days preceding the monitoring event with 3.8 millimetres (mm) of rain recorded on the day sampling was undertaken.

2.2.2 Groundwater

Field observations for completed groundwater monitoring is presented in Table 2.2. Data collected in the field is presented in Appendix F.

Table 2.2 Field observations (groundwater monitoring)

Time of sample	Monitoring point	Site description	Field comments/context
Groundwater sampling locations			
04/03/2025 – 1:15 pm	BSM1	Upgradient bore to measure background contamination levels. Located near the western site boundary in the southern portion of the site, to the west of the site access/haul road.	Bore water initially appeared clear but transitioned to pale grey/brown and slightly turbid during purging and when the sample was taken. No odour noted.
04/03/2025 – 11:40 am	BSM2	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 metres (m) vegetated riparian zone associated with the western banks of Oaky Creek.	Bore water was clear and colourless during purging and sampling. A field duplicate was taken as a quality assurance (QA) sample at this bore.
04/03/2025 – 11:00 am	BSM3	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oaky Creek	Bore water initially appeared clear and colourless but transitioned to pale grey/brown and slightly turbid during purging and when the sample was taken. Bore water observed with a strong sulphurous odour. Foam noted during purging.

2.2.3 Surface water

Field observations for completed surface water monitoring is presented in Table 2.3.

Table 2.3 Field observations (surface water monitoring)

Time of sample	Monitoring point	Site description	Field comments/context	Site photos
Surface water sampling locations				
04/03/2025 – 12:20 PM	QUARRY PIT	Sample of the pit quarry water in the NE corner of the pit.	Pit water was green and slightly turbid. Quarry pit water level was low compared to historical monitoring.	
04/03/2025 – 10:05 AM	UPSTREAM	Upstream sample point of Oaky Creek.	Creek primarily dry with only small pools observed. Ponded water was clear to slightly turbid with a slight green/brown colour.	

2.2.4 Laboratory analysis

Water samples were transported to a NATA-accredited laboratory (Australian Laboratory Services (ALS) in Smithfield, NSW for analysis. All analytes not measured during purging (i.e. pH, electrical conductivity (EC), dissolved oxygen and oxidation-reduction potential) were received by the laboratory within the maximum holding times.

2.2.5 Quality assurance/quality control (QA/QC)

Samples were collected in laboratory-provided sample containers with appropriate preservation. Samples were collected and sent to the laboratory under appropriate chain of custody protocols.

The field QA/QC procedures used to establish accurate, reliable, and precise results included:

- calibration of equipment by the supplier before use
- keeping samples chilled
- submitting laboratory samples within holding times
- wearing disposable nitrile gloves during sampling at each sampling location
- using dedicated sampling equipment
- collection of a field duplicate sample.

Quality assurance/control was assessed by calculating relative percentage difference (RPD) of the field duplicate ($S_{duplicate}$) sample to the parent sample (S_{parent}) as per the following equation.

$$Relative \% difference = \frac{|S_{parent} - S_{Duplicate}|}{\frac{S_{parent} + S_{Duplicate}}{2}} \times 100$$

Results were considered to confirm acceptable degree of data quality where RPDs were below 30%.

Most results for the monitoring round were within RPD limits (refer Appendix C), indicating adequate quality assurance/quality control (QA/QC). Cadmium and copper concentrations at BSM2 exceeded RPD limits, however the elevated RPD is attributed to low detected concentrations. TSS exceeded RPD limits, however the elevated RPD is attributed heterogeneous distribution of suspended solids with the water sample and the variation in particulate has not affected reported contaminant concentrations.

2.3 Monitoring results - general observations

2.3.1 Groundwater levels

Water levels are presented in Appendix B and all bores were within the historical range since the program commenced in March 2022. BSM1 was reported with a standing water level at its second highest since the program commenced in March 2022. This increase was not reflected in the downgradient bores BSM2 and BSM3, although all three monitoring wells were reported near or above the 2 m trigger as prescribed by the WMP (EMM, 2021). Although this represents an increase and thus part of the TARP triggers relating to distance drawdown effects is not applicable, EMM will continue to monitor and assess water level data, to establish trends and correlate with quarry activities (currently inactive) and climatic data.

2.3.2 Groundwater quality

Key observations of groundwater quality for the monitoring period include the following:

- pH was circumneutral (6.52–6.73) in all bores.
- Salinity, as indicated by EC, was similar in upgradient BSM1 (23,336 microsiemens per centimetre ($\mu\text{S}/\text{cm}$)) to downgradient wells BSM2 (20,803 $\mu\text{S}/\text{cm}$) and BSM3 (22,866 $\mu\text{S}/\text{cm}$). Results are typical of baseline trends (22,560 $\mu\text{S}/\text{cm}$ at BSM1). Given the lack of rainfall prior to the sampling event, compared to the December round, the increased electrical conductivity record supports the premise proposed in the December report that the upgradient/BSM1 results may be impacted by surface water ingress.
- Nutrients remain present in all bores and significantly elevated above baseline for nitrate in BSM2 (208 milligrams per litre (mg/L)). The concentrations on nitrate in BSM2 have increased over the past year to the level reported in the round following reinstallation (August 2021). It is noted that the concentration of nitrate in BSM2 (22.38 mg/L) in historical groundwater quality monitoring results were elevated compared to BSM1 (0.17 mg/L) and BSM3 (0.022 mg/L, however the current result exceeds the baseline by an order of magnitude. The quarry pit and upstream locations were observed with low levels of water and were observed to be green or slightly green, which may indicate eutrophication as a result of high nutrient load. Both locations reported nutrient levels more than an order of magnitude below BSM2. The source of the nitrate remains inconclusive, with nearby sources comprising fertilization of agricultural land, country club and revegetation of the adjacent airport. Based on the sustained increasing trend following the cessation of quarry operations, the change appears unrelated to quarry activities.
- Elevated metals were noted in some bores (discussed in Section 2.4).
- Detectable concentrations of TRH (C₁₀-C₁₆ of 560 micrograms per litre ($\mu\text{g}/\text{L}$) and C₁₆-C₃₄ of 200 $\mu\text{g}/\text{L}$) and TPH (C₁₅-C₂₈ of 680 $\mu\text{g}/\text{L}$) were again observed in BSM1 with no hydrocarbons reported above detection limits following silica gel clean-up.

2.3.3 Surface water quality

Key observations of the surface water quality are summarised below:

- The Upstream and Quarry Pit locations contained less water than was observed during the monitoring program to date. Oaky Creek at the location of the upstream location was primarily dry with only small pools observed.
- pH was slightly basic in the Quarry pit (7.31) and receiving environment (8.14).
- EC was within the baseline data range (5,940–45,900 $\mu\text{S}/\text{cm}$) for the Quarry Pit location (13,333 $\mu\text{S}/\text{cm}$) with upstream location (2,069 $\mu\text{S}/\text{cm}$) below the baseline concentration (11,000 $\mu\text{S}/\text{cm}$).

2.4 Review of exceedances

Water quality results were reviewed for trigger exceedances, via comparison of default guideline values or comparison of other chemical properties to the upgradient bore (BSM1).

An assessment of exceedances including actions taken and recommendations for the groundwater monitoring is presented in Table 2.4.

Table 2.4 Review of exceedances (groundwater)

Exceedance description	Assessment, actions taken and recommendations
Nutrients	
<p>Ammonia exceeded the upgradient bore concentration (4.17 mg/L) at BSM3 (6.6 mg/L).</p>	<p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> No historical records of ammonia or total nitrogen were available.
<p>TKN concentrations exceeded the upgradient bore concentration (4.7 mg/L) at BSM2 and BSM3 with concentrations of 9.5 mg/L and 7.5 mg/L, respectively.</p>	<ul style="list-style-type: none"> As a result of the nitrate concentration at BSM2, oxidised nitrogen was noted to be significantly above the trigger value (upgradient bore comparison). The median baseline concentration at BSM2 of 21 mg/L, is significantly greater than the median baseline for the upgradient bore of 0.137 mg/L. Regardless the reported concentration of 208 mg/L is an order of magnitude greater than the median baseline for nitrate with the upgradient bore reporting nitrate below detectable limits.
<p>Oxidised nitrogen significantly exceeded the upgradient bore concentration (<0.01 mg/L) at BSM2 with a concentration of 208 mg/L. This exceedance is attributable to the nitrate concentration at BSM2.</p>	<p>Surface water monitoring at the upstream Oaky Creek site and within the quarry pit was undertaken and reviewed. Nutrients at the upstream site and within the quarry pit were also elevated above surface water trigger values, however, were of lower concentration than noted in BSM2. This suggests high nutrients may be naturally occurring or present from activities upgradient of the site.</p>
<p>Total nitrogen exceeded the upgradient bore concentration (4.7 mg/L) at BSM2 and BSM3 with concentrations of 218 mg/L and 7.5 mg/L, respectively.</p>	<p>Timeseries charts of nutrients exceedances were prepared (refer Appendix D).</p> <p>The following observations are made from charts in Appendix D.1:</p> <ul style="list-style-type: none"> Groundwater exceedances for nutrients generally appear to occur following the bore reinstallation in July 2023. Previous trends of a reduction in nutrient concentrations over time, no longer appear to be consistent.
Metals	
<p>Cadmium marginally exceeded the trigger value in the duplicate sample at BSM2 with concentrations of 0.0003 mg/L.</p>	<p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> Cadmium, and zinc were reported above baseline concentrations, at the highest concentration on record in BSM2.
<p>Copper exceeded the trigger value at BSM2 (primary and duplicate) with a concentration of 0.003 mg/L and 0.006 mg/L, respectively.</p>	<ul style="list-style-type: none"> Copper reported concentrations similar to baseline values. No historical records of manganese are available. An increasing trend in manganese has been observed in both the upgradient and downgradient bores.
<p>Manganese exceeded the trigger value at BSM2 (primary and duplicate) with a concentration of 3.48 mg/L and 3.54 mg/L, respectively</p>	<p>Surface water results were also reviewed. Monitoring of the quarry pit and upstream location in Oaky Creek, indicated increased concentrations of manganese were more likely form offsite sources, with the upstream location reporting a concentration lower than BSM2 but higher than the remaining monitoring well and quarry pit sampling locations. The Quarry Pit showed some exceedances similar metals including copper and nickel.</p>
<p>Nickel exceeded the trigger value at BSM2 (primary and duplicate) with a concentration of 0.02 mg/L and 0.021 mg/L, respectively</p>	<p>Timeseries charts of metals exceedances were prepared (refer Appendix D).</p>
<p>Zinc exceeded the trigger values at BSM2 (primary and duplicate) with a concentration of 0.093 mg/L at both locations</p>	<p>The following observations are made from charts in Appendix D.2:</p> <ul style="list-style-type: none"> No obvious trends are discernible from the timeseries charts and exceedances of similar magnitude are generally known to occur for some metals in the historical baseline dataset. Based on sufficient baseline and environmental monitoring program data, it is recommended as part of future monitoring that Mann-Kendall trend analysis be undertaken on analytes at sample locations exceeding the trigger value to establish any statistically significant time series trends.

Exceedance description	Assessment, actions taken and recommendations
Hydrocarbons	
TRH was reported above detectable limits at BSM1 in C ₁₀ -C ₁₆ fractions (560 µg/L) and C ₁₆ -C ₃₄ fractions (200 µg/L).	Groundwater sampling reported concentrations of hydrocarbons above detection limits. This was limited to upgradient bore BSM1. The concentration represents the highest reported since TRH and TPH monitoring commenced in May 2024. This was not reflected in the results for TRH and TPH analysis following silica gel cleanup, where all samples reported concentrations below detection limits. This indicates the reported hydrocarbons are from a naturally occurring biogenic source (lipids, plant oils, etc.) and unrelated to site operations. Detectable concentrations of Oil and grease were not reported as part of the March 2025 groundwater sampling round.
TPH was reported above detectable limits at BSM1 in C ₁₅ -C ₂₈ fractions (680 µg/L).	

3 Summary and recommendations

The following provides a summary of additional investigations:

- Water levels in all were within the historical range since the program commenced in March 2022. BSM1 was reported with its second highest standing water level on record. This significant increase was not reflected in the downgradient bores BSM2 and BSM3, although all three monitoring wells were reported near or above the 2-m trigger as prescribed by the WMP (EMM, 2021). The monitoring well network should be resurveyed to determine if anomalies are attributable to groundwater conditions or elevation changes to the monitoring well network.
- Detectable concentrations of TRH/TPH were report however oil and grease and TRH/TPH following silica gel clean up were not present at detectable concentrations during the March sampling round. This indicates the reported hydrocarbons are from a naturally occurring biogenic source (lipids, plant oils, etc.) and unrelated to site operations.
- No confirmed source has been identified for the sustained elevated nutrient concentrations observed within the monitoring wells. The quarry pit and upstream locations were observed with low levels of water and were observed to be green or slightly green, which may indicate eutrophication as a result of high nutrient load. The site is surrounded by agricultural land, a country club and the Western Sydney Airport (WSA) which has been undertaking significant re-establishment of ground cover vegetation upstream of the site since 2021 and it is possible that widespread use of fertilisers around the site may have contributed to the reported increase in nutrients observed at monitoring wells at the site. Detailed surface water and groundwater monitoring associated with the WSA construction was not available for review to verify this potential source. Based on the sustained increasing trend following the cessation of quarry operations, the change appears unrelated to quarry activities.
- Elevated metals were observed at BSM2 as part of the March 2025 monitoring round. Elevated metals were also reported in the additional surface water sampling indicating that the upstream and/or quarry pit may be subject to the conditions leading to increased heavy metals concentrations, however these were neither elevated to the levels reported at BSM2 nor consistent with relation to the combination of analytes observed above trigger values. Based on the increasing concentrations following the cessation of quarry operations, the change appears unrelated to quarry activities.

The following recommendations are made for future monitoring:

- It is recommended the monitoring well network be resurveyed to determine if anomalous reported groundwater levels are attributable to groundwater conditions or elevation changes to the monitoring well network.
- It is recommended the following monitoring round covering the April to June 2025 (Q3 of the 2024–2025 annual review period) be undertaken as the annual surface water and groundwater monitoring program to determine whether increases in nutrients and metals concentrations observed during this monitoring round are reflected in the surface water and receiving water locations (water management dam and downstream).
- Based on sufficient baseline and environmental monitoring program data, it is recommended as part of future monitoring that Mann-Kendall trend analysis be undertaken on analytes at sample locations exceeding the trigger value to establish any statistically significant time series trends.
- It is recommended that the total recoverable hydrocarbon analysis and silica gel cleanup process is continued to assist with confirming the absence of TRH/TPH and oil and grease or determining the source of any future oil and grease concentrations.
- Continue to monitor groundwater quality results over the remainder of the AR period (1 September 2024 to 30 August 2025) and investigate regional sources of anomalous results. Consider additional investigative drilling to confirm lithology and/or consider replacement of monitoring wells with appropriate design to enable control impact monitoring, if water quality results do not normalise by the end of the next AR period.

Please contact the undersigned with any questions or clarifications.

Yours sincerely



Tasman Coupe
Senior Environmental Engineer
tcoupe@emmconsulting.com.au

Appendix A

Water quality monitoring locations

\\lemm.local\drive\2023\E231131 - Luddenham Quarry - Environmental Monitoring\GIS\02_Maps\130749\SWM003_WQMMonitoringLocations_20240927_03.mxd 27/09/2024



- KEY**
- Study area
 - Cadastral boundary
 - Watercourse
 - Water quality monitoring location
 - ⊕ Groundwater monitoring bore

Water quality monitoring locations

Luddenham Quarry
Water Management Plan
Figure 1



Source: EMM (2024); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)



Appendix B

Groundwater levels

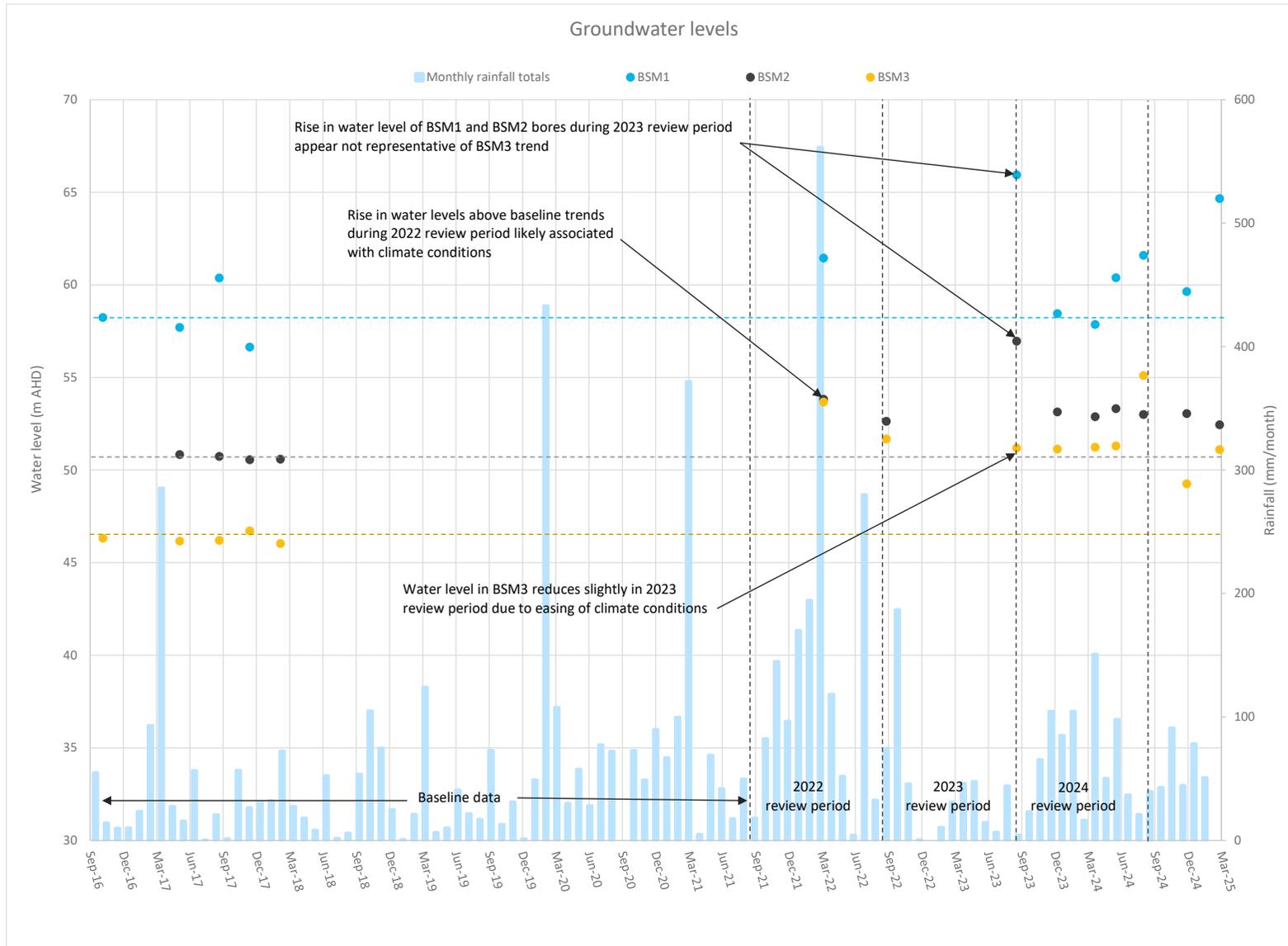


Figure B.1 Ground water levels

Appendix C

Water quality monitoring results

Analytical Results summary- Groundwater

	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (groundwater)	Date			
					Location Code			
					Field ID			
					b Report Number			
					04 Mar 2025	04 Mar 2025	04 Mar 2025	04 Mar 2025
					BSM1	BSM2	BSM2	BSM3
					BSM1	BSM2	QA	BSM3
					ES2506120	ES2506120	ES2506120	ES2506120
Field								
Temp (Field)	°C	0.1		-	20.5	20.7	-	21.2
pH (Field)	-	0.01		6.5-8.5	6.62	6.52	-	6.73
EC (field)	µS/cm	1		BSM1	23,336	20,803	-	22,866
DO % Saturation (Field)	%Sat	0.1		-	48.1	28.4	-	22
Redox Potential (Field)	mV	0.1		-	-34	-51.2	-	-260
TSS	mg/L	5		BSM1	82	51	31	10
Inorganics								
Hardness as CaCO ₃ (filtered)	mg/L	1		-	4,980	2,660	2,700	3,430
Ammonia as N	mg/L	0.01	0.9	BSM1	4.17	<0.10	<0.10	6.60
Nitrite (as N)	mg/L	0.01		BSM1	<0.01	0.06	0.07	<0.01
Nitrate (as N)	mg/L	0.01		BSM1	<0.01	208	204	<0.01
Nitrite + Nitrate as N	mg/L	0.01		BSM1	<0.01	208	204	<0.01
Total Kjeldahl Nitrogen	mg/L	0.1		BSM1	4.7	9.5	9.0	7.5
Nitrogen (Total)	mg/L	0.1		BSM1	4.7	218	213	7.5
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		BSM1	<0.01	<0.01	<0.01	0.01
Total Phosphate (as P)	mg/L	0.01		BSM1	0.21	0.18	0.20	0.18
Metals								
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	<0.01	<0.01	<0.01
Arsenic (filtered)	mg/L	0.001	0.013	0.013	0.002	0.001	0.001	<0.001
Boron (filtered)	mg/L	0.05	0.94	0.37	0.07	<0.05	<0.05	<0.05
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	0.0002	0.0003	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001		0.001	<0.001	<0.001	<0.001	<0.001
Copper (filtered)	mg/L	0.001	0.0014	0.0014	<0.001	0.003	0.006	<0.001
Iron (filtered)	mg/L	0.05		-	1.78	<0.05	<0.05	0.07
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	<0.001	<0.001	<0.001
Manganese (filtered)	mg/L	0.001	1.9	1.9	1.21	3.48	3.54	0.218
Mercury (filtered)	mg/L	0.0001	0.0006	0.0006	<0.0001	<0.0001	<0.0001	<0.0001
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.004	0.020	0.021	<0.001
Selenium (filtered)	mg/L	0.01	0.011	0.011	<0.01	<0.01	<0.01	<0.01
Zinc (filtered)	mg/L	0.005	0.008	0.008	<0.005	0.093	0.093	<0.005
BTEX								
Benzene	µg/L	1	950	LOR	<1	<1	<1	<1
Toluene	µg/L	2	180	LOR	<2	<2	<2	<2
Ethylbenzene	µg/L	2	80	LOR	<2	<2	<2	<2
Xylene (m & p)	µg/L	2		LOR	<2	<2	<2	<2
Xylene (o)	µg/L	2	350	LOR	<2	<2	<2	<2
Xylene Total	µg/L	2		LOR	<2	<2	<2	<2
Total BTEX	µg/L	1		LOR	<1	<1	<1	<1
Naphthalene (VOC)	mg/L	0.005	0.016	LOR	<0.005	<0.005	<0.005	<0.005
TRH								
Oil and Grease	mg/L	5		LOR	<5	<5	<5	<5
C6-C10	µg/L	20		LOR	<20	<20	<20	<20
C6 - C10 less BTEX (F1)	µg/L	20		LOR	<20	<20	<20	<20
>C10-C16	µg/L	100		LOR	560	<100	<100	<100
>C10-C16 less Naphthalene (F2)	µg/L	100		LOR	560	<100	<100	<100
>C16-C34	µg/L	100		LOR	200	<100	<100	<100
>C34-C40	µg/L	100		LOR	<100	<100	<100	<100
>C10-C40 (Sum of total)	µg/L	100		LOR	760	<100	<100	<100
TRH - (Silica Gel Cleanup)								
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TRH >C10 - C16 Fraction minus Naphthalene (F2) (SG)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TPH								
C6-C9	µg/L	20		LOR	<20	<20	<20	<20
C10-C14	µg/L	50		LOR	<50	<50	<50	<50
C15-C28	µg/L	100		LOR	680	<100	<100	<100
C29-C36	µg/L	50		LOR	<50	<50	<50	<50
C10-C36 (Sum of total)	µg/L	50		LOR	680	<50	<50	<50
TPH - (Silica Gel Cleanup)								
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (surface water)	Date	04 Mar 2025	04 Mar 2025
					Location Code	QUARRY PIT	UPSTREAM
					Field ID	QUARRY PIT	UPSTREAM
					Report Number	ES2506120	ES2506120
Field							
Temp (Field)	°C	0.1		-		24.6	20.7
pH (Field)	-	0.01		6.5-8.5		8.14	7.31
EC (field)	µS/cm	1		125-2200		13,333	2,069
DO (Field)	mg/L	0.1				108.8	-
DO % Saturation (Field)	%Sat	0.1				-	54.5
Redox Potential (Field)	mV	0.1				-13.4	73.4
Inorganics							
Ammonia as N	mg/L	0.01	0.9	0.02		0.54	4.95
Nitrite (as N)	mg/L	0.01				0.39	0.03
Nitrate (as N)	mg/L	0.01				5.39	0.34
Nitrite + Nitrate as N	mg/L	0.01		0.04		5.78	0.37
Total Kjeldahl Nitrogen	mg/L	0.1				1.1	6.9
Nitrogen (Total)	mg/L	0.1		0.5		6.9	7.3
TSS	mg/L	5				<5	592
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		0.02		<0.01	<0.01
Total Phosphate (as P)	MG/L	0.01		0.05		0.11	0.16
Hardness as CaCO ₃ (filtered)	mg/L	1				1,540	878
Metals							
Arsenic (filtered)	mg/L	0.001		0.013		0.003	0.002
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002		<0.0001	<0.0001
Chromium (III+VI) (filtered)	mg/L	0.001		0.001		<0.001	<0.001
Mercury (filtered)	mg/L	0.0001	0.0006			<0.0001	<0.0001
Copper (filtered)	mg/L	0.001	0.0014	0.0014		0.002	0.002
Iron (filtered)	mg/L	0.05				<0.05	0.17
Aluminium (filtered)	mg/L	0.01	0.055	0.055		<0.01	0.03
Lead (filtered)	mg/L	0.001	0.0034	0.0034		<0.001	<0.001
Boron (filtered)	mg/L	0.05	0.94	0.37		<0.05	<0.05
Manganese (filtered)	mg/L	0.001	1.9	1.9		0.039	1.82
Selenium (filtered)	mg/L	0.01	0.011			0.03	<0.01
Nickel (filtered)	mg/L	0.001	0.011	0.011		0.013	0.003
Zinc (filtered)	mg/L	0.005	0.008	0.008		<0.005	<0.005
BTEX							
Benzene	µg/L	1	950	LOR		<1	<1
Toluene	µg/L	2	180	LOR		<2	<2
Ethylbenzene	µg/L	2	80	LOR		<2	<2
Xylene (m & p)	µg/L	2		LOR		<2	<2
Xylene (o)	µg/L	2	350	LOR		<2	<2
Xylene Total	µg/L	2		LOR		<2	<2
Total BTEX	µg/L	1		LOR		<1	<1
Naphthalene (VOC)	mg/L	0.005	0.016	LOR		<0.005	<0.005
TRH							
Oil and Grease	mg/L	5		LOR		<5	<5
C6-C10	µg/L	20		LOR		<20	<20
C6 - C10 less BTEX (F1)	µg/L	20		LOR		<20	<20
>C10-C16	µg/L	100		LOR		<100	<100
>C10-C16 less Naphthalene (F2)	µg/L	100		LOR		<100	<100
>C16-C34	µg/L	100		LOR		<100	<100
>C34-C40	µg/L	100		LOR		<100	<100
>C10-C40 (Sum of total)	µg/L	100		LOR		<100	<100
TRH - (Silica Gel Cleanup)							
TRH >C10 - C16 Fraction minus Naphthalene (F2) (SG)	mg/L	0.1		LOR		<0.1	<0.1
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		LOR		<0.1	<0.1
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		LOR		<0.1	<0.1
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		LOR		<0.1	<0.1
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		LOR		<0.1	<0.1
TPH							
C6-C9	µg/L	20		LOR		<20	<20
C10-C14	µg/L	50		LOR		<50	<50
C15-C28	µg/L	100		LOR		<100	<100
C29-C36	µg/L	50		LOR		<50	<50
C10-C36 (Sum of total)	µg/L	50		LOR		<50	<50
TPH - (Silica Gel Cleanup)							
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		LOR		<0.05	<0.05
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		LOR		<0.1	<0.1
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		LOR		<0.05	<0.05
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		LOR		<0.05	<0.05

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

	Unit	EQL	04 Mar 2025	04 Mar 2025	RPD
			BSM2	QA	
			ES2506120	ES2506120	
			Water	Water	
Inorganics					
Ammonia as N	mg/L	0.01	<0.10	<0.10	0
Nitrite (as N)	mg/L	0.01	0.06	0.07	15
Nitrate (as N)	mg/L	0.01	208	204	2
Nitrite + Nitrate as N	mg/L	0.01	208	204	2
Total Kjeldahl Nitrogen	mg/L	0.1	9.5	9.0	5
Nitrogen (Total)	mg/L	0.1	218	213	2
TSS	mg/L	5	51	31	49
Reactive Phosphorus (as P) (filtered)	mg/L	0.01	<0.01	<0.01	0
Total Phosphate (as P)	MG/L	0.01	0.18	0.20	11
Hardness as CaCO ₃ (filtered)	mg/L	1	2,660	2,700	1
Metals					
Arsenic (filtered)	mg/L	0.001	0.001	0.001	0
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0003	40
Chromium (III+VI) (filtered)	mg/L	0.001	<0.001	<0.001	0
Mercury (filtered)	mg/L	0.0001	<0.0001	<0.0001	0
Copper (filtered)	mg/L	0.001	0.003	0.006	67
Iron (filtered)	mg/L	0.05	<0.05	<0.05	0
Aluminium (filtered)	mg/L	0.01	<0.01	<0.01	0
Lead (filtered)	mg/L	0.001	<0.001	<0.001	0
Boron (filtered)	mg/L	0.05	<0.05	<0.05	0
Manganese (filtered)	mg/L	0.001	3.48	3.54	2
Selenium (filtered)	mg/L	0.01	<0.01	<0.01	0
Nickel (filtered)	mg/L	0.001	0.020	0.021	5
Zinc (filtered)	mg/L	0.005	0.093	0.093	0
BTEX					
Benzene	µg/L	1	<1	<1	0
Toluene	µg/L	2	<2	<2	0
Ethylbenzene	µg/L	2	<2	<2	0
Xylene (m & p)	µg/L	2	<2	<2	0
Xylene (o)	µg/L	2	<2	<2	0
Xylene Total	µg/L	2	<2	<2	0
Total BTEX	µg/L	1	<1	<1	0
Naphthalene (VOC)	mg/L	0.005	<0.005	<0.005	0
TRH					
Oil and Grease	mg/L	5	<5	<5	0
C6-C10	µg/L	20	<20	<20	0
C6 - C10 less BTEX (F1)	µg/L	20	<20	<20	0
>C10-C16	µg/L	100	<100	<100	0
>C10-C16 less Naphthalene (F2)	µg/L	100	<100	<100	0
>C16-C34	µg/L	100	<100	<100	0
>C34-C40	µg/L	100	<100	<100	0
>C10-C40 (Sum of total)	µg/L	100	<100	<100	0
TRH - (Silica Gel Cleanup)					
TRH >C10 - C16 Fraction minus Naphthalene (F2) (SG)	mg/L	0.1	<0.1	<0.1	0
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1	<0.1	<0.1	0
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1	<0.1	<0.1	0
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1	<0.1	<0.1	0
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1	<0.1	<0.1	0
TPH					
C6-C9	µg/L	20	<20	<20	0
C10-C14	µg/L	50	<50	<50	0
C15-C28	µg/L	100	<100	<100	0
C29-C36	µg/L	50	<50	<50	0
C10-C36 (Sum of total)	µg/L	50	<50	<50	0
TPH - (Silica Gel Cleanup)					
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05	<0.05	<0.05	0
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1	<0.1	<0.1	0
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05	<0.05	<0.05	0
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05	<0.05	<0.05	0

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 50 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

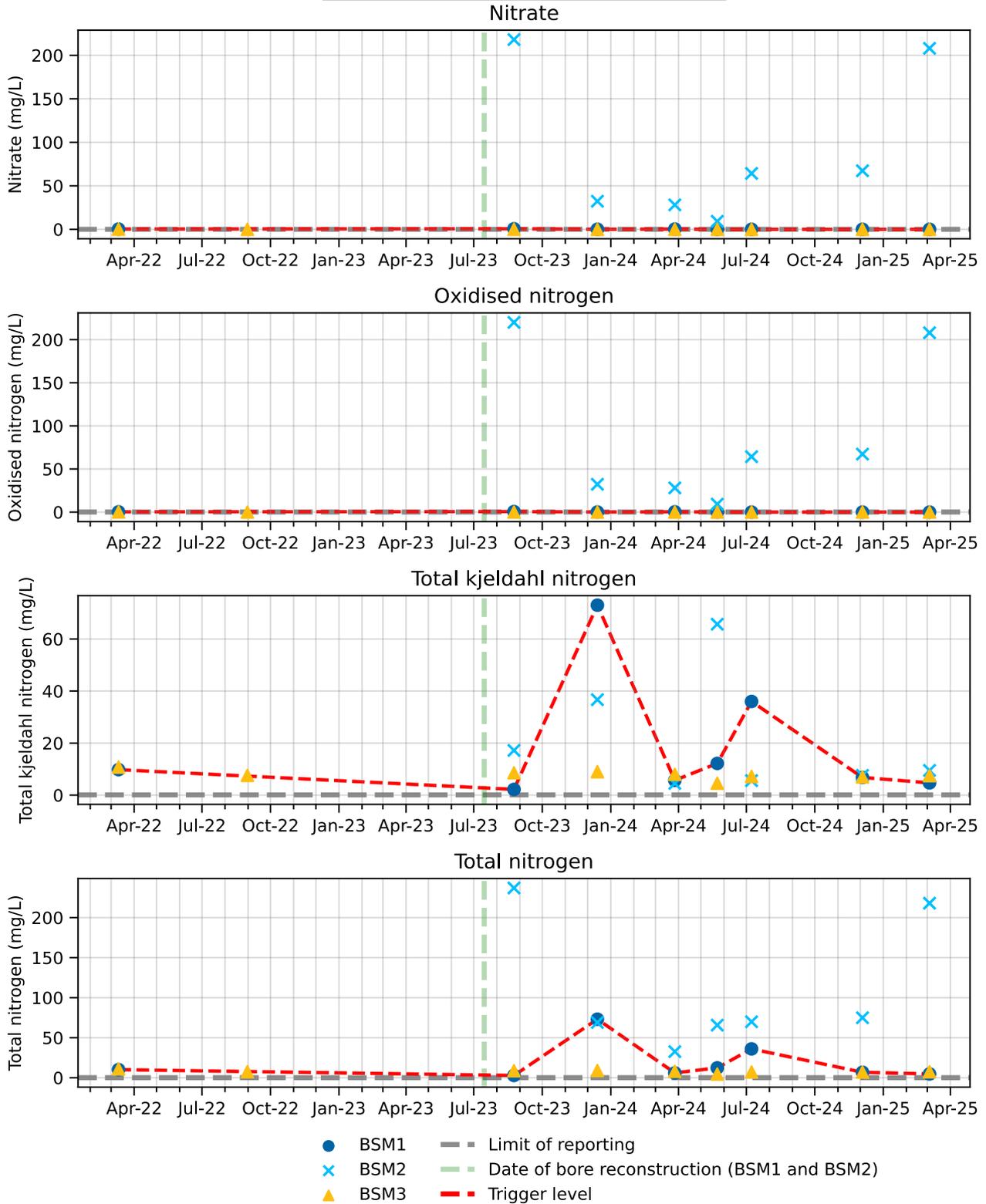
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix D

Water quality timeseries charts

D.1 Timeseries water quality charts – nutrients

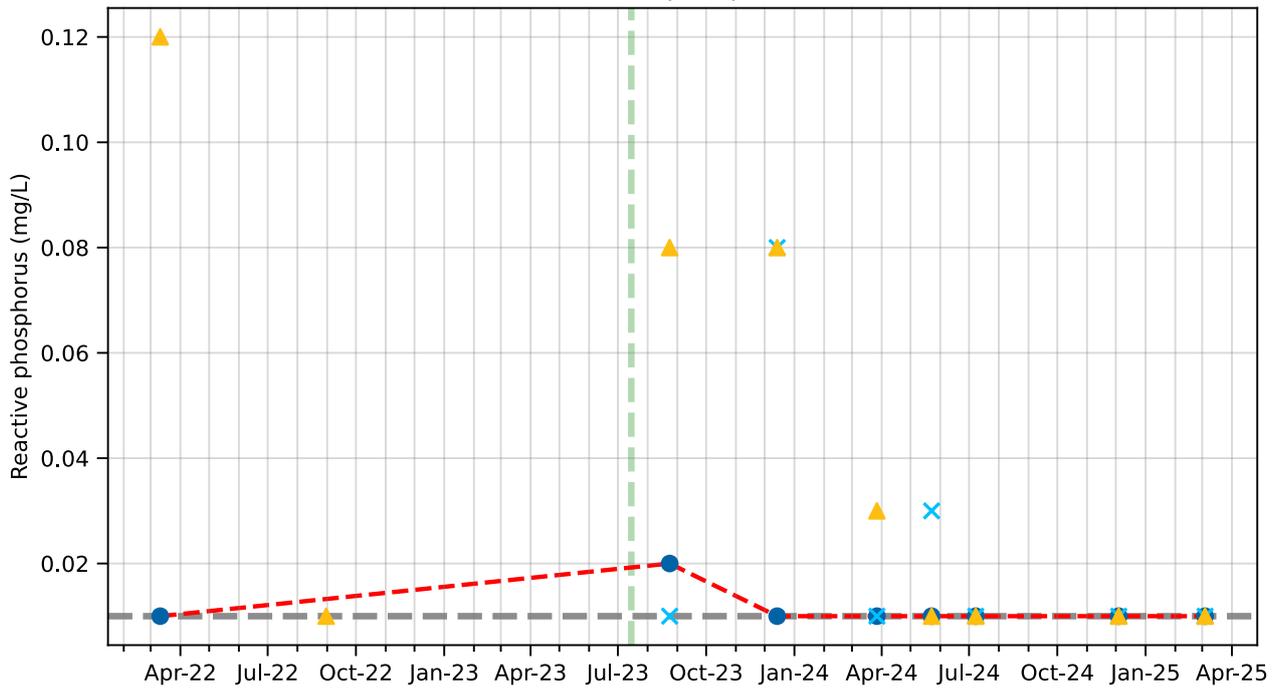
Water quality analysis - nutrients



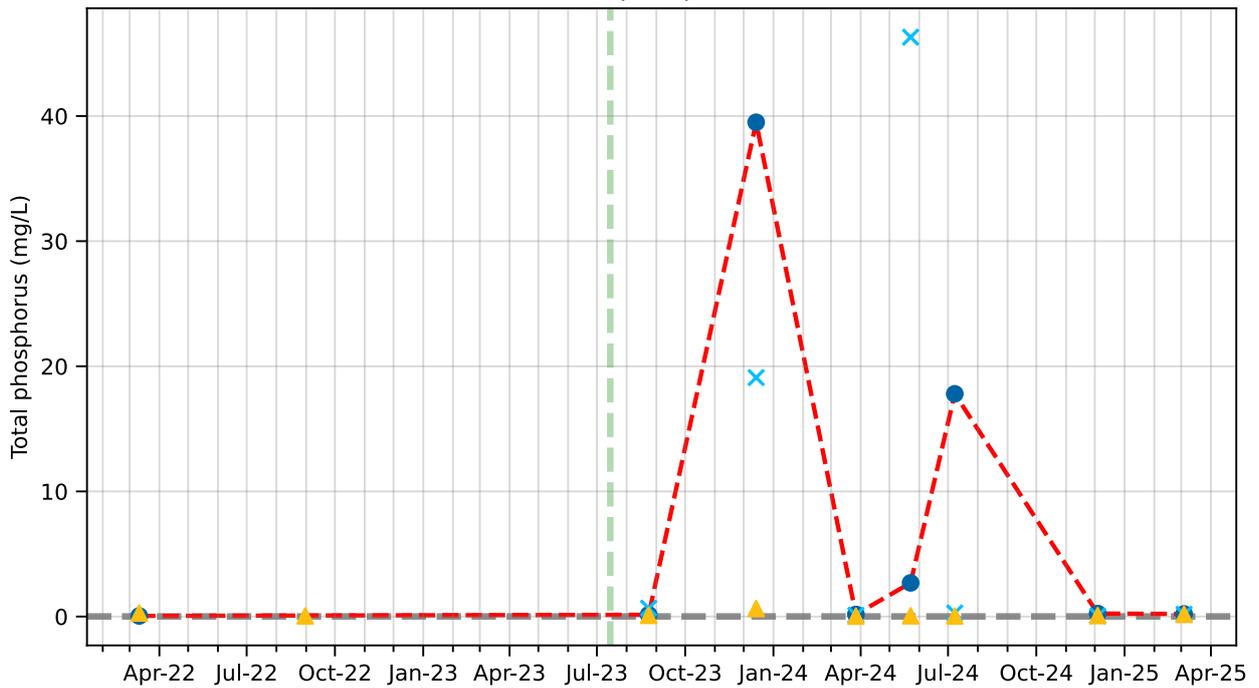
*Trigger values based on upgradient bore (BSM1).

Water quality analysis - nutrients

Reactive phosphorus



Total phosphorus

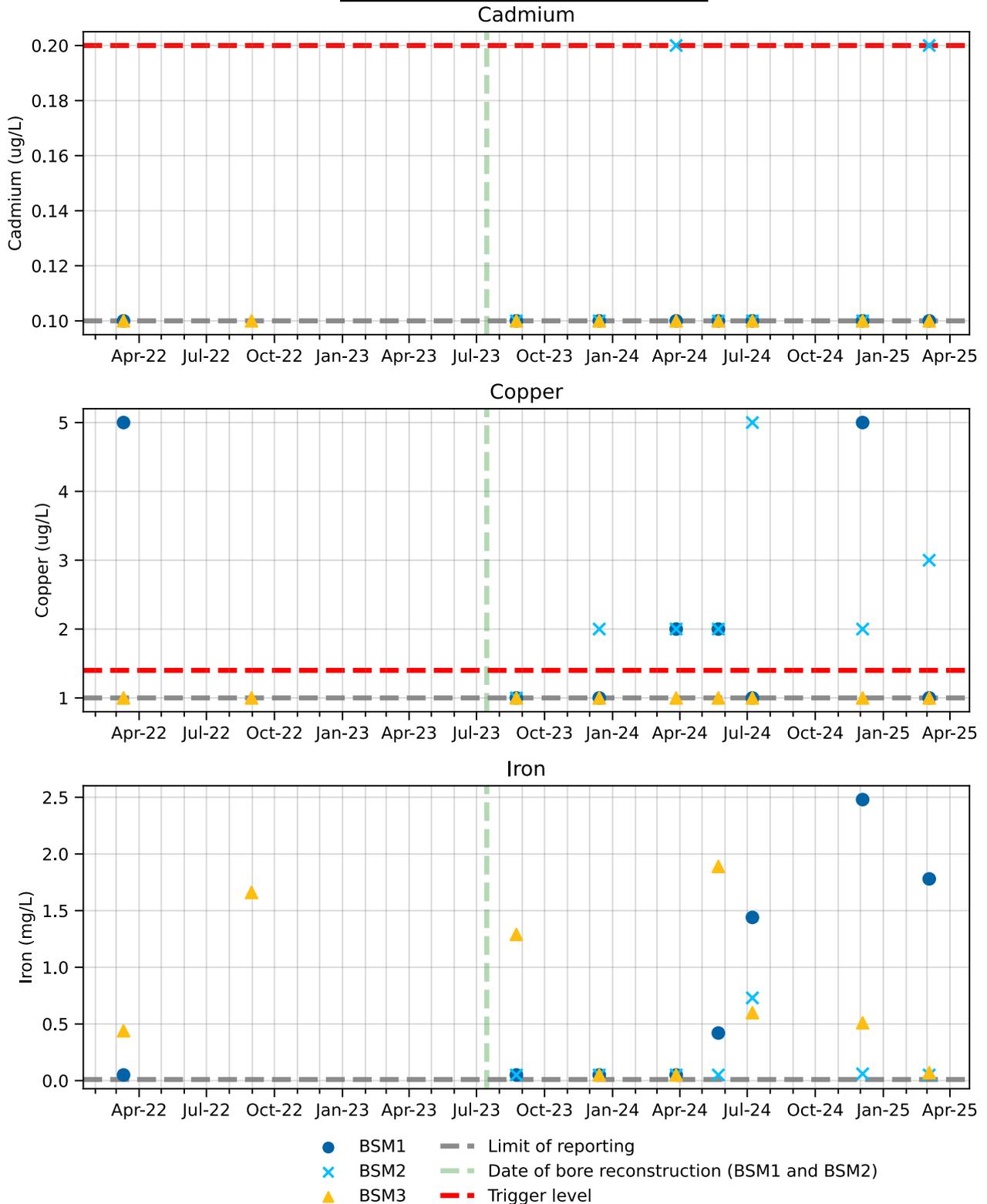


- BSM1 - - - Limit of reporting
- × BSM2 - - - Date of bore reconstruction (BSM1 and BSM2)
- ▲ BSM3 - - - Trigger level

*Trigger values based on upgradient bore (BSM1).

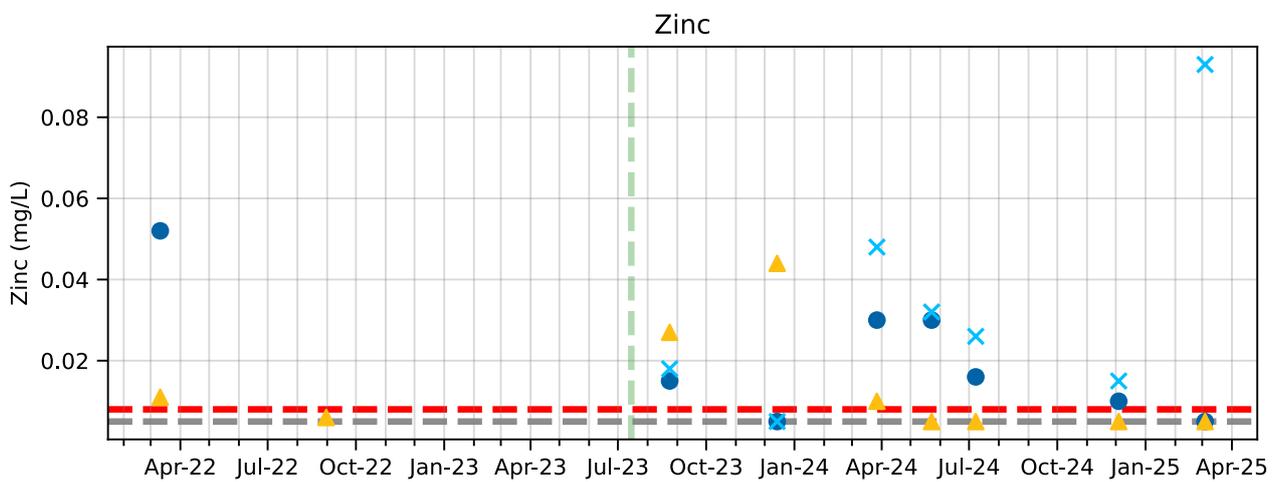
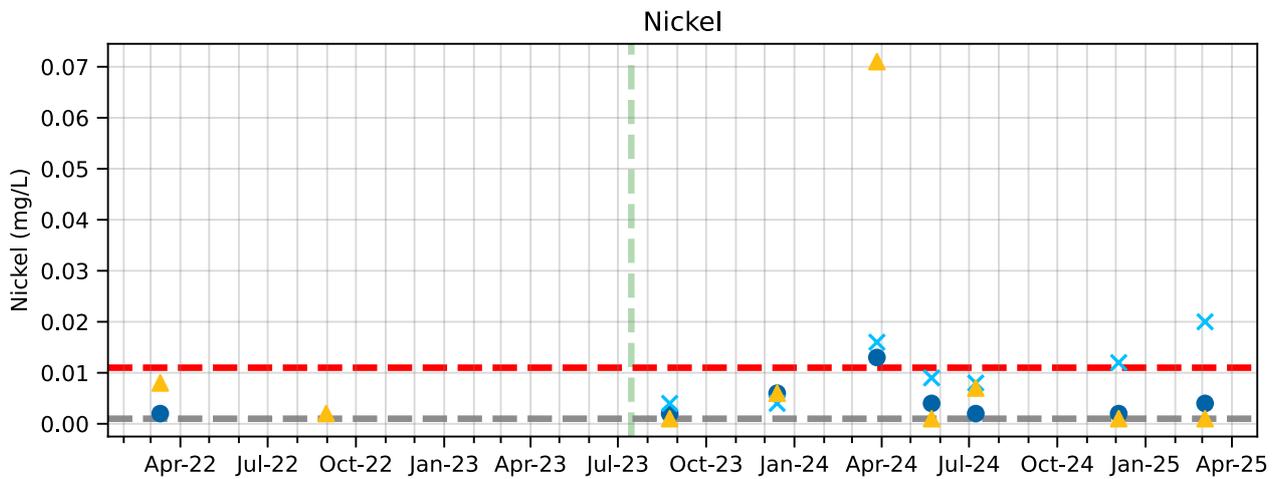
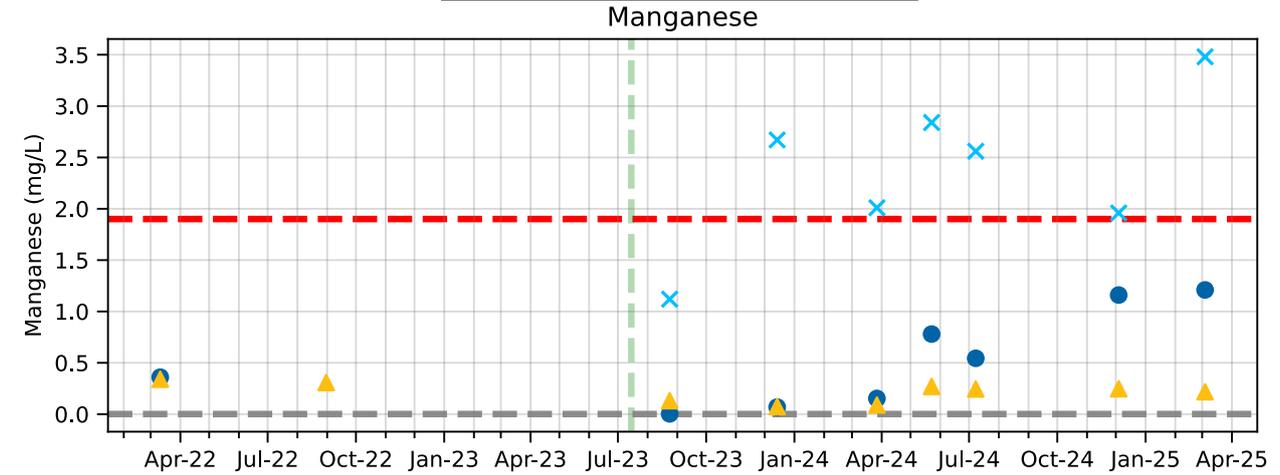
D.2 Timeseries water quality charts – metals

Water quality analysis - metals



*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Water quality analysis - metals



- BSM1 - - - Limit of reporting
- × BSM2 - - - Date of bore reconstruction (BSM1 and BSM2)
- ▲ BSM3 - - - Trigger level

*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Appendix E

Laboratory certificates



CHAIN OF CUSTODY

ALS Laboratory please tick →

CLIENT: EMM Consulting Pty Ltd		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):				FOR LABORATORY USE ONLY (Circle)			
OFFICE: Sydney		(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):				Custody Seal Intact? Yes No			
PROJECT: Luddenham Quarry		PROJECT NO E240981		ALS QUOTE NO.: EN/11/23		Free ice / frozen ice bricks present upon receipt? Yes No			
ORDER NUMBER:		PURCHASE ORDER NO.:		COUNTRY OF ORIGIN: Australia		Random Sample Temperature on Receipt: C			
PROJECT MANAGER: Tasman Coupe		CONTACT PH: 0439 694 514		RELINQUISHED BY: Jonathon Schacht		RECEIVED BY: <i>[Signature]</i>			
SAMPLER: Jonathon Schacht (JS)		SAMPLER MOBILE: 0497 154 233		DATE/TIME: 04/0/2025, 3pm		RECEIVED BY: DATE/TIME: <i>5/3/25 10:15</i>			
COC Emailed to ALS? Yes		EDD FORMAT (or default):				RECEIVED BY: DATE/TIME:			
Email Reports to: tcoupe@emmconsulting.com.au, jschacht@emmconsulting.com.au						RECEIVED BY: DATE/TIME:			
Email Invoice to: tcoupe@emmconsulting.com.au, jschacht@emmconsulting.com.au						RECEIVED BY: DATE/TIME:			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: All metals dissolved. Add Chromatograms to analysis report.

ALS USE ONLY	SAMPLE DETAILS			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB Suite Codes must be listed to attract suite price)						Additional Information	
	MATRIX: Solid(S) Water(W)					Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required)							
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Total Suspended Solids (EA025F)	Nutrients (NT-9A)	Dissolved metals (W-36) Plus Boron and Manganese	Oil and grease (EP020)	TRH/BTEXN Silica Gel (W-4 and W-4SG)	Total hardness		Comments on likely contaminant to dilutants or samples requiring spot analysis etc
1	BSM1	4/03/2025 13:15	w		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
2	BSM2	4/03/2025 11:40	w		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
3	BSM3	4/03/2025 11:00	w		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
4	QA	4/03/2025 11:40	w		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
5	QUARRY PIT	4/03/2025 12:20	W		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
6	UPSTREAM	4/03/2025 10:05	W		8	x	x	x	x	x	x		All metals dissolved. Add Chromatograms to analysis
					TOTAL	48							

#6 Received as US

HT

Environmental Division
Sydney
Work Order Reference
ES2506120



Telephone + 61-2-8784 8555

ES2506120

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Od Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserve; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugels Iodine Preserved Bottles; SFT = Sterile Sodium Thiosulfate Preserved Bottles.

SAMPLES RECEIVED WITHOUT COC

Environmental Division
 Sydney
 Work Order Reference
ES2506120



Telephone - 61-2-8784 9555

CLIENT: <i>EMM Consulting</i>	CARRIER: <i>Client Drop-off</i>
PROJECT / QUOTE:	CONNOTE #:
CONTACT NAME: <i>Jonathan Schuchert</i>	AWB #:
CONTACT NUMBER: <i>0497 154 233</i>	# OF ESKIES: SECURITY SEAL: Y N N/A
SAMPLER NAME: <i>As above</i>	TYPE OF ESKIES: <i>HARD ESKY</i>
SAMPLER NUMBER: <i>As above</i>	ESKY NUMBERS: <i>1 cooling method (ice)</i>
SAMPLES RECEIVED BY: <i>Bulent (CROWS NEST)</i>	# OF SAMPLES:
DATE/TIME RECEIVED: <i>4/13/25 3:00pm</i>	TEMPERATURE: <i>10.9°C, 11.6°C, 13.1°C</i>
CLIENT SERVICES NOTIFIED BY: <i>email</i>	

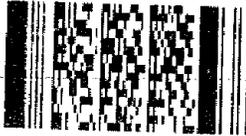
LAB ID	SAMPLE DETAILS				NUMBER OF CONTAINERS	ADDITIONAL INFORMATION / COMMENTS:
	SAMPLE ID	DATE	MATRIX			OTHER INFORMATION:
1					<input type="checkbox"/> MICRO <input type="checkbox"/> BIOSECURITY <input type="checkbox"/> BROKEN CONTAINERS <input checked="" type="checkbox"/> COC EMAILED (<i>COC to be emailed</i>) <input type="checkbox"/> ALS COMPASS	
2						
3						
4						
5						
TOTAL						

CORRESPONDENCE (DATE, INITIALS - DETAILS OF CORRESPONDENCE):

Re: [Signature]
4/13/25
1920.

SAMPLES RECEIVED WITHOUT COC

Environmental Division
 Sydney
 Work Order Reference
ES2506120



Telephone - 61-2-8784 9555

CLIENT: <i>Emm Consulting</i>	CARRIER: <i>Client Drop-off</i>
PROJECT / QUOTE:	CONNOTE #:
CONTACT NAME: <i>Jonathan Schacht</i>	AWB #:
CONTACT NUMBER: <i>0497 154 233</i>	# OF ESKIES: SECURITY SEAL: Y N <u>N/A</u>
SAMPLER NAME: <i>As above</i>	TYPE OF ESKIES: <i>HARD ESKY</i>
SAMPLER NUMBER: <i>As above</i>	ESKY NUMBERS: <i>X 1 cooling method (ice)</i>
SAMPLES RECEIVED BY: <i>Bulent (CRONS NEST)</i>	# OF SAMPLES:
DATE/TIME RECEIVED: <i>4/3/25 3:00pm</i>	TEMPERATURE: <i>10.9°C, 11.6°C, 13.1°C</i>
CLIENT SERVICES NOTIFIED BY: <i>email</i>	

LAB ID	SAMPLE DETAILS				NUMBER OF CONTAINERS	ADDITIONAL INFORMATION / COMMENTS:
	SAMPLE ID	DATE	MATRIX			OTHER INFORMATION:
1					<input type="checkbox"/> MICRO <input type="checkbox"/> BIOSECURITY <input type="checkbox"/> BROKEN CONTAINERS <input checked="" type="checkbox"/> COC EMAILED (<i>COC to be emailed</i>) <input type="checkbox"/> ALS COMPASS	
2						
3						
4						
5						
TOTAL						

CORRESPONDENCE (DATE, INITIALS - DETAILS OF CORRESPONDENCE):

Recd
4/3/25
1920.



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2506120	Page	: 1 of 8
Amendment	: 2		
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAN COUPE	Telephone	: +61-2-8784 8555
Project	: E240981 Luddenham Quarry	Date Samples Received	: 05-Mar-2025
Site	: ----	Issue Date	: 25-Mar-2025
Sampler	: JONATHON SCHACHT	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, where applicable to the methodology, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Frequency of Quality Control Samples

Matrix: WATER

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	6	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
TRH - Semivolatile Fraction	EP071	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: WATER

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	07-Mar-2025	11-Mar-2025	✓
ED093F: SAR and Hardness Calculations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	10-Mar-2025	01-Apr-2025	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	10-Mar-2025	31-Aug-2025	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	10-Mar-2025	01-Apr-2025	✓



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	10-Mar-2025	01-Apr-2025	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	06-Mar-2025	06-Mar-2025	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) BSM1, BSM3	04-Mar-2025	----	----	----	07-Mar-2025	01-Apr-2025	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) BSM2, QUARRY PIT, QA, UPSTREAM	04-Mar-2025	----	----	----	10-Mar-2025	01-Apr-2025	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	07-Mar-2025	01-Apr-2025	✓	07-Mar-2025	01-Apr-2025	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	07-Mar-2025	01-Apr-2025	✓	07-Mar-2025	01-Apr-2025	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	06-Mar-2025	06-Mar-2025	✓
EP020: Oil and Grease (O&G)							
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	----	----	----	07-Mar-2025	01-Apr-2025	✓
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup							
Amber Glass Bottle - Unpreserved (EP071SG) BSM1, BSM3, QUARRY PIT, BSM2, QA, UPSTREAM	04-Mar-2025	10-Mar-2025	11-Mar-2025	✓	11-Mar-2025	19-Apr-2025	✓



Matrix: **WATER** Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071SG) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	10-Mar-2025	11-Mar-2025	✔	11-Mar-2025	19-Apr-2025	✔
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	10-Mar-2025	11-Mar-2025	✔	25-Mar-2025	19-Apr-2025	✔
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	06-Mar-2025	18-Mar-2025	✔	07-Mar-2025	18-Mar-2025	✔
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	10-Mar-2025	11-Mar-2025	✔	25-Mar-2025	19-Apr-2025	✔
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	06-Mar-2025	18-Mar-2025	✔	07-Mar-2025	18-Mar-2025	✔
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT,	BSM2, QA, UPSTREAM	04-Mar-2025	06-Mar-2025	18-Mar-2025	✔	07-Mar-2025	18-Mar-2025	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	3	28	10.71	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	39	10.26	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	35	11.43	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	0	6	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	6	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	4	46	8.70	8.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	6	39	15.38	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	35	11.43	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	3	46	6.52	6.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Analytical Methods							
Method Blanks (MB) - Continued							
Suspended Solids (High Level)	EA025H	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	39	5.13	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	5.71	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	6	16.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	39	5.13	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	5.71	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	6	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	6	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH ₃ G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO ₂ - B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO ₃ -. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	WATER	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM Schedule B(3).
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.



QUALITY CONTROL REPORT

Work Order : **ES2506120**

Page : 1 of 10

Amendment : **2**

Client : **EMM CONSULTING PTY LTD**
Contact : **TASMAN COUPE**
Address : **The Forum Level 10 201 Pacific Highway
St Leonards NSW NSW 2065**

Laboratory : **Environmental Division Sydney**
Contact : **Samiksha Sathish**
Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**

Telephone : ----
Project : **E240981 Luddenham Quarry**
Order number : ----
C-O-C number : ----
Sampler : **JONATHON SCHACHT**
Site : ----
Quote number : **EN/111**
No. of samples received : **6**
No. of samples analysed : **6**

Telephone : **+61-2-8784 8555**
Date Samples Received : **05-Mar-2025**
Date Analysis Commenced : **05-Mar-2025**
Issue Date : **25-Mar-2025**



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC
 * = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 6424041)									
EN2503720-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EN2503809-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	20	16	19.4	No Limit
ES2506104-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	10	10	0.0	No Limit
ES2506122-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6424715)									
ES2506114-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.038	0.039	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020A-F: Iron	7439-89-6	0.05	mg/L	0.14	0.15	0.0	No Limit		
ES2506114-009	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6424715) - continued									
ES2506114-009	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6424718)									
ES2506178-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.010	0.010	0.0	0% - 50%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.005	23.3	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2506350-002	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.005	0.006	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.063	0.062	2.2	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.005	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.016	0.016	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 6424714)									
EN2503721-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2506114-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 6424719)									



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG035F: Dissolved Mercury by FIMS (QC Lot: 6424719) - continued									
ES2506240-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6424260)									
ES2505666-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.08	0.07	0.0	No Limit
ES2506120-001	BSM1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	4.17	4.45	6.5	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 6419332)									
ES2506120-001	BSM1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 6424259)									
ES2505666-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2506120-001	BSM1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 6424264)									
EN2503756-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.2)*	mg/L	7.8	8.0	2.8	0% - 20%
ES2506051-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (10.0)*	mg/L	694	665	4.2	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 6424266)									
ES2506120-005	QUARRY PIT	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.2)*	mg/L	1.1	1.2	15.6	No Limit
ES2506193-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.2)*	mg/L	2.7	2.8	6.4	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 6424263)									
EN2503756-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01 (0.02)*	mg/L	1.08	1.09	1.2	0% - 20%
ES2506051-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01 (1.00)*	mg/L	11.1	13.5	19.1	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 6424265)									
ES2506120-005	QUARRY PIT	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.11	0.16	37.0	0% - 50%
ES2506193-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	1.51	1.27	17.0	0% - 20%
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 6419331)									
ES2506120-001	BSM1	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 6421865)									
EN2503747-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2506271-005	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 6421865)									
EN2503747-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
ES2506271-005	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 6421865)									
EN2503747-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	106-42-3	2	µg/L	<2	<2	0.0	No Limit
			95-47-6	2	µg/L	<2	<2	0.0	No Limit

Page : 5 of 10
 Work Order : ES2506120 Amendment 2
 Client : EMM CONSULTING PTY LTD
 Project : E240981 Luddenham Quarry



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 6421865) - continued									
EN2503747-001	Anonymous	EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2506271-005	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 6424041)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	96.2	82.0	110
				<5	842 mg/L	100	83.0	118
EG020F: Dissolved Metals by ICP-MS (QCLot: 6424715)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	104	80.0	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	101	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	103	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	99.3	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	99.4	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	99.9	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	97.4	85.0	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	104	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	109	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 6424718)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	104	80.0	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	104	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	102	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	102	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	100	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	102	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	100	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	89.0	85.0	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	99.0	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	102	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	101	82.0	112
EG035F: Dissolved Mercury by FIMS (QCLot: 6424714)								



Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
					LCS	Low	High	
EG035F: Dissolved Mercury by FIMS (QCLot: 6424714) - continued								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	99.0	83.0	105
EG035F: Dissolved Mercury by FIMS (QCLot: 6424719)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	102	83.0	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6424260)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	104	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6419332)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6424259)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	104	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6424264)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	105	69.0	123
				<0.1	2.5 mg/L	102	70.0	123
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6424266)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	115	69.0	123
				<0.1	2.5 mg/L	114	70.0	123
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6424263)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	109	71.3	126
				<0.01	0.5 mg/L	120	71.3	126
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6424265)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	104	71.3	126
				<0.01	0.5 mg/L	106	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6419331)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	100	85.0	117
EP020: Oil and Grease (O&G) (QCLot: 6422424)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	95.0	81.0	121
				<5	4000 mg/L	95.8	70.0	110
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 6418774)								
EP071SG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	61.8	55.8	112
EP071SG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	79.6	71.6	113
EP071SG: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	65.6	56.0	121
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 6418774)								
EP071SG: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	63.0	57.9	119
EP071SG: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	75.4	62.5	110
EP071SG: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	71.5	61.5	121



Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6421865)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	76.2	75.0	127
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6461970)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	84.4	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	105	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	104	58.3	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6421865)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	77.8	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6461970)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	87.4	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	104	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	100	50.5	115
EP080: BTEXN (QCLot: 6421865)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	104	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	97.4	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	94.4	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	91.8	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	94.8	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	101	75.5	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
				MS	Low	High	
EG020F: Dissolved Metals by ICP-MS (QCLot: 6424715)							
EN2503721-002	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	95.6	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	102	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	102	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	97.6	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	99.0	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	102	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	103	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	99.6	70.0	130



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	Spike Recovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 6424718)							
ES2506120-004	QA	EG020A-F: Arsenic	7440-38-2	1 mg/L	115	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	102	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	96.0	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	104	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	97.6	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	89.2	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	106	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	107	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 6424714)							
EN2503721-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	92.8	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 6424719)							
ES2506120-006	UPSTREAM	EG035F: Mercury	7439-97-6	0.01 mg/L	92.1	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6424260)							
ES2505666-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	96.3	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6419332)							
ES2506120-001	BSM1	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	104	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6424259)							
ES2505666-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	111	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6424264)							
EN2503756-007	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	98.2	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6424266)							
ES2506120-006	UPSTREAM	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	120	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6424263)							
EN2503756-007	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	114	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6424265)							
ES2506120-006	UPSTREAM	EK067G: Total Phosphorus as P	----	1 mg/L	110	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6419331)							
ES2506120-001	BSM1	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	93.0	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6421865)							
EN2503721-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	114	70.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6421865)							
EN2503721-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	112	70.0	130
EP080: BTEXN (QCLot: 6421865)							
EN2503721-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	99.9	70.0	130



Sub-Matrix: **WATER**

				<i>Matrix Spike (MS) Report</i>			
				<i>Spike</i>	<i>SpikeRecovery(%)</i>	<i>Acceptable Limits (%)</i>	
<i>Laboratory sample ID</i>	<i>Sample ID</i>	<i>Method: Compound</i>	<i>CAS Number</i>	<i>Concentration</i>	<i>MS</i>	<i>Low</i>	<i>High</i>
EP080: BTEXN (QCLot: 6421865) - continued							
EN2503721-001	Anonymous	EP080: Toluene	108-88-3	25 µg/L	111	70.0	130
		EP080: Ethylbenzene	100-41-4	25 µg/L	117	70.0	130
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	118	70.0	130
			106-42-3				
		EP080: ortho-Xylene	95-47-6	25 µg/L	112	70.0	130
		EP080: Naphthalene	91-20-3	25 µg/L	118	70.0	130



CERTIFICATE OF ANALYSIS

Work Order	: ES2506120	Page	: 1 of 9
Amendment	: 2		
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAL COUPE	Contact	: Samiksha Sathish
Address	: The Forum Level 10 201 Pacific Highway St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: E240981 Luddenham Quarry	Date Samples Received	: 05-Mar-2025 10:15
Order number	: ----	Date Analysis Commenced	: 05-Mar-2025
C-O-C number	: ----	Issue Date	: 25-Mar-2025 11:47
Sampler	: JONATHON SCHACHT		
Site	: ----		
Quote number	: EN/111		
No. of samples received	: 6		
No. of samples analysed	: 6		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK055G: LOR raised for Ammonia on sample 2 & 4 due to sample matrix.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- Amendment (21/03/2025): This report has been amended following the addition of EP071-SV (TRH Semivolatile Fractions) on all samples
- Amendment (25/03/2025): This report has been amended following the addition of EP071 TRH F2 Fraction on all samples
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT
Sampling date / time				04-Mar-2025 00:00					
Compound	CAS Number	LOR	Unit	ES2506120-001	ES2506120-002	ES2506120-003	ES2506120-004	ES2506120-005	
				Result	Result	Result	Result	Result	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	82	51	10	31	<5	
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	4980	2660	3430	2700	1540	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Arsenic	7440-38-2	0.001	mg/L	0.002	0.001	<0.001	0.001	0.003	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.0002	<0.0001	0.0003	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	0.003	<0.001	0.006	0.002	
Nickel	7440-02-0	0.001	mg/L	0.004	0.020	<0.001	0.021	0.013	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.03	
Zinc	7440-66-6	0.005	mg/L	<0.005	0.093	<0.005	0.093	<0.005	
Manganese	7439-96-5	0.001	mg/L	1.21	3.48	0.218	3.54	0.039	
Boron	7440-42-8	0.05	mg/L	0.07	<0.05	<0.05	<0.05	<0.05	
Iron	7439-89-6	0.05	mg/L	1.78	<0.05	0.07	<0.05	<0.05	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	4.17	<0.10	6.60	<0.10	0.54	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.06	<0.01	0.07	0.39	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	208	<0.01	204	5.39	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	208	<0.01	204	5.78	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT
Sampling date / time				04-Mar-2025 00:00					
Compound	CAS Number	LOR	Unit	ES2506120-001	ES2506120-002	ES2506120-003	ES2506120-004	ES2506120-005	
				Result	Result	Result	Result	Result	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	4.7	9.5	7.5	9.0	1.1	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	4.7	218	7.5	213	6.9	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.21	0.18	0.18	0.20	0.11	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.01	<0.01	<0.01	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup									
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100	
>C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20	
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	µg/L	680	<100	<100	<100	<100	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
^ C10 - C36 Fraction (sum)	----	50	µg/L	680	<50	<50	<50	<50	
^ C6 - C36 Fraction (sum)	----	20	µg/L	680	<20	<20	<20	<20	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT
Sampling date / time				04-Mar-2025 00:00					
Compound	CAS Number	LOR	Unit	ES2506120-001	ES2506120-002	ES2506120-003	ES2506120-004	ES2506120-005	
				Result	Result	Result	Result	Result	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20	
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20	
>C10 - C16 Fraction	----	100	µg/L	560	<100	<100	<100	<100	
>C16 - C34 Fraction	----	100	µg/L	200	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	760	<100	<100	<100	<100	
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	560	<100	<100	<100	<100	
[^] C6 - C40 Fraction (sum)	----	50	µg/L	760	<50	<50	<50	<50	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2	
[^] Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2	
[^] Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	105	104	102	103	101	
Toluene-D8	2037-26-5	2	%	106	103	99.4	100	99.7	
4-Bromofluorobenzene	460-00-4	2	%	96.2	95.2	93.0	91.9	92.6	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM	----	----	----	----
Sampling date / time				04-Mar-2025 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2506120-006	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	592	----	----	----	----	----
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	878	----	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	0.03	----	----	----	----	----
Arsenic	7440-38-2	0.001	mg/L	0.002	----	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----	----
Copper	7440-50-8	0.001	mg/L	0.002	----	----	----	----	----
Nickel	7440-02-0	0.001	mg/L	0.003	----	----	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	----	----	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----	----
Manganese	7439-96-5	0.001	mg/L	1.82	----	----	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	0.17	----	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	4.95	----	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.03	----	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.34	----	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.37	----	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM	----	----	----	----
Sampling date / time				04-Mar-2025 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2506120-006	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	6.9	----	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L	7.3	----	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.16	----	----	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	----	----	----	----	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	----	----	----	----	----
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup									
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----	----
[^] C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	----
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	----
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----	----
>C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----	----
[^] C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	----
[^] C6 - C36 Fraction (sum)	----	20	µg/L	<20	----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM	----	----	----	----
Sampling date / time				04-Mar-2025 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2506120-006	-----	-----	-----	-----	-----
				Result	---	---	---	---	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----	----
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----	----
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----	----
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	----	----	----	----
[^] C6 - C40 Fraction (sum)	----	50	µg/L	<50	----	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	----	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----	----
[^] Total Xylenes	----	2	µg/L	<2	----	----	----	----	----
[^] Sum of BTEX	----	1	µg/L	<1	----	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	100	----	----	----	----	----
Toluene-D8	2037-26-5	2	%	102	----	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	91.4	----	----	----	----	----



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137

Appendix F

Field data

ObjectID	7566	7567	7568
GlobalID	6517bb8d-632d-4c56-b533-41e465fa6ca6	6d43a3e9-0346-4546-a1e1-c56711f1e4f4	8e2ac33f-e321-46dc-a953-c578141ce3eb
Job number	E240981	E240981	E240981
Bore ID	BSM3	BSM2	BSM1
Date	3/03/2025 23:18	3/04/2025 0:31	3/04/2025 1:45
realtime	4/03/2025 10:18	4/03/2025 11:31	4/03/2025 12:45
Depth to groundwater (mb TOC)	12.35	10.61	9.4
Well depth from TOC (PVC) (m)	30	29.88	30.09
Purging method	bailer	bailer	bailer
Logger download	no	no	no
One bore volume (L)	30.8	37.8	40
Three bore volumes (L)	92.4	113.5	120
Start time	1020	1120	1248
Finish time		1200	
Esdat comment:			
Collector comment:	Lightly raining	Lightly raining	Lightly raining
CreationDate	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33
Creator	EMMGISApps	EMMGISApps	EMMGISApps
EditDate	3/09/2025 21:33	3/09/2025 21:33	3/11/2025 2:44
Editor	EMMGISApps	EMMGISApps	EMMGISApps
x	150.7207902	150.720848	150.7167771
y	-33.87480465	-33.87548626	-33.87550008

ObjectID	6023	6024	6021	6022	6019	6020
GlobalID	98743ca1-6533-4304-9a5f-def525d1e134	07227cee-2fce-48db-b07f-c0dde3ba81e4	c86b8808-cfb2-4cfd-afbb-0e5b6dfd332d	28611190-adaf-4929-8dc9-ca18dfe0b1be	9d6506c8-1873-4d26-8a85-87569979963e	1a7f28a7-c205-4ecb-b76d-1a60f73beee9
Sample time	1248	1310	1120	1200	1020	1100
Bore ID	BSM1	BSM1	BSM2	BSM2	BSM3	BSM3
Volume (L)		14.707	36.8	28		20
Sample taken?	no	yes		yes	no	yes
Temp (degC)	21.5	20.5	20.6	20.7	20.6	21.2
DO (%)	23.6	48.1	34.5	28.4	18.3	22
DO (mg/L)						
EC (uS/cm)	10497	23336	185114	20803	22594	22866
TDS (mg/L)						
pH	6.97	6.62	6.84	6.52	6.64	6.73
Redox (mV)	-6.1	-34	-134.6	-51.2	-184.5	-260
Colour/odour/comments	17.2ntu, no smell clear	65ntu, frothy water similar to bsm3	28.9ntu, clear	32.78ntu not much change slightly cloudy	58.94ntu, clear with sulphate smell	44.1ntu, stronger sulphate smell
ParentGlobalID	8e2ac33f-e321-46dc-a953-c578141ce3eb	8e2ac33f-e321-46dc-a953-c578141ce3eb	6d43a3e9-0346-4546-a1e1-c56711f1e4f4	6d43a3e9-0346-4546-a1e1-c56711f1e4f4	6517bb8d-632d-4c56-b533-41e465fa6ca6	6517bb8d-632d-4c56-b533-41e465fa6ca6
CreationDate	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33
Creator	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps
EditDate	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33	3/09/2025 21:33
Editor	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps	EMMGISApps

Appendix G

Calibration certificates

Multi Parameter Water Meter

Instrument **YSI Pro DSS**
Serial No. **21K104034**



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00 (pH)		pH 7.00	NIST	433551	7.02
2. pH 4.00 (pH)		pH 4.00	NIST	429462	4.03
3. ORP (mV)		225.42	NIST	A426086/B435258	226.1
4. EC ($\mu\text{S}/\text{cm}$)		2760	NIST	436693	2754
5. D.O		0.0%	NIST	412773	0.1%
6. Temp ($^{\circ}\text{C}$)		23.9	NIST	MultiTherm	23.8
8. Turbidity (NTU)		100	NIST	436042	102.00

Calibrated by: _____ **Miriam Poyitt**

Calibration date: **24/02/2025**

Next calibration due: **26/03/2025**

Memorandum

11 June 2025

To: Pascal Bobillier
General Manager - Development
Coombes Property Group

From: Tasman Coupe

Subject: Luddenham Quarry SWMP monitoring results (Q3 - 2024/2025)

Dear Pascal,

1 Background

This memorandum outlines groundwater and surface water quality and level monitoring undertaken by EMM Consulting Pty Ltd (EMM) for Luddenham Quarry (the site), as required by the water monitoring program that was developed as part of the Soil and Water Management Plan (SWMP) (EMM 2021).

The program commenced in March 2022 and involves quarterly groundwater and annual surface water monitoring at seven locations: groundwater locations BSM1, BSM2 and BSM3 and surface water locations downstream, upstream, quarry pit and water management dam). Refer to Appendix A for monitoring locations. Previous monitoring events have occurred on the following dates: 11 March 2022, 31 August 2022, 24 August 2023, 14 December 2023, 27 March 2024, 23 May 2024, 7 August 2024, 4 December 2024 and 4 March 2025.

Following bore replacement at BSM1 and BSM2 in 2023, and subsequent monitoring producing anomalous results, redevelopment of the bores was undertaken in late 2023 with an augmented analytical suite routinely completed to inform root cause analysis.

Monitoring outlined in this report was completed by Jonathon Schacht, a water resources engineer on 7 May 2025 for the period of April to June 2025 (Q3 of the 2024–2025 annual review period).

2 Water monitoring

2.1 Program overview

2.1.1 Water quality analytes

The analytical suite for the monitoring program is presented in Table 2.1. Physical and chemical stressors (except for total suspended solids) are monitored in the field with a calibrated hand-held water quality meter. All other parameters are analysed at a laboratory accredited by the National Association of Testing Authorities (NATA).

Detailed hydrocarbon analysis was added to the analytical suite as recommended in the 23/24 Q2 groundwater monitoring report, to assist in determining the likely source of oil and grease found in previous monitoring (i.e. lubricants used as part of the drilling process, oils or greases used as part of quarry operations, diesel, etc).

In 23/24 Q4, silica gel cleanup was a step added to the analytical process of testing for hydrocarbons. Silica is a polar material that is used to adsorb (remove) non-hydrocarbon polar organics during the sample extraction process.

Table 2.1 Water quality analytes

Category	Parameters	Analysis method
Physical and chemical stressors	Dissolved oxygen (DO), electrical conductivity (EC), pH, total dissolved solids (TDS), turbidity.	In the field with a calibrated hand-held water quality meter.
	Total suspended solids.	Analysis undertaken at NATA accredited laboratory.
Nutrients	Ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, reactive phosphorus, total phosphorus.	
Dissolved metals	Aluminium, arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc.	
Other	Total hardness, oil and grease.	
Hydrocarbons ¹	Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), total petroleum hydrocarbon (TRH/TPH) and polycyclic aromatic hydrocarbons (PAH). Including analysis/results for Chromatogram. TRH/TPH (total petroleum hydrocarbon) with Silica Gel Cleanup.	

Notes: 1. Hydrocarbon analysis undertaken for exceedance investigations from previous monitoring rounds.

Laboratory certificates are presented in Appendix E. Calibration certificates are provided in Appendix G.

2.1.2 Water level monitoring

Water levels are monitored using an interface probe at each monitoring bore during sampling. A deviation of two meters from the long-term median groundwater level in the quarry monitoring bores is considered a trigger for further action. Two meters is used as the trigger as the deviation value aligns with the minimal impact considerations of the aquifer interference activities stated in the NSW Aquifer Interference Policy (DPI 2012).

2.2 Monitoring completed – May 2025

Key results are discussed in Section 2.3 and detailed results are provided in the following appendices:

- Appendix B: Groundwater levels.
- Appendix C: Water quality monitoring results.
- Appendix D: Water quality timeseries charts.

2.2.1 Rainfall context

The Bureau of Meteorology operates a rain gauge at Badgerys Creek (approximately 3 kilometres (km) from the site – Station number: 067108); 0.2 millimetres (mm) of rain was recorded at the station in the five days preceding the monitoring event with no rain recorded on the day sampling was undertaken.

2.2.2 Groundwater

Field observations for completed groundwater monitoring are presented in Table 2.2. Data collected in the field is presented in Appendix F.

Table 2.2 Field observations (groundwater monitoring)

Time of sample	Monitoring point	Site description	Field comments/context
Groundwater sampling locations			
07/05/2025 09:44 am	BSM1	Upgradient bore to measure background contamination levels. Located near the western site boundary in the southern portion of the site, to the west of the site access/haul road.	Strong sulphur smell and bubbles observed during initial purging. Bore water initially appeared clear but transitioned to pale grey/brown and slightly turbid during purging and when the sample was taken. Purged dry at 48 litres (L). Left to recharge and then sampled. No odour noted during sampling.
07/05/2025 1:08 pm	BSM2	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 metres (m) vegetated riparian zone associated with the western banks of Oaky Creek.	Bore water was clear and colourless, with no odour or sheen observed during purging and sampling. A field duplicate was taken as a quality assurance (QA) sample at this bore.
07/05/2025 2:50 pm	BSM3	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oaky Creek	Bore water was clear and colourless during purging and sampling. Bore water observed with a strong sulphurous odour and bubbles/foam.

2.2.3 Surface water

Field observations for completed surface water monitoring are presented in Table 2.3.

Table 2.3 Field observations (surface water monitoring)

Time of sample	Monitoring point	Site description	Field comments/context	Site photos
Surface water sampling locations				
07/05/2025 – 12:07 PM	QUARRY PIT	Sample of the pit quarry water in the NE corner of the pit.	Pit water was green and slightly turbid. Quarry pit water level was low compared to historical monitoring however higher than the previous monitoring round.	
07/05/2025 4:18 PM	UPSTREAM	Upstream sample point of Oaky Creek.	Creek stagnant with water approximately 0.2 m deep. Water in creek was clear with a slight brown colour likely because of organic material from the surrounding vegetation. No odour or sheen noted.	
07/05/2025 No sample	WATER MANAGEMENT DAM	Water management dam in the northern portion of the site collecting water from the catchment north of the Quarry.	No access or sampling authorised due to construction. Dam impacted by construction works associated with the ARRF.	
07/05/2025 4:38 PM	MIDSTREAM	Replacement sampling location in water body in line with Oaky Creek adjacent to the WMD.	Waterbody was stagnant. Water was brown, turbid with no odour or sheen noted.	

07/05/2025 DOWNSTREAM
4:59 PM

Downstream sample
point of Oaky Creek.

Creek stagnant with water
approximately 0.5m deep.
Water in creek was brown
and turbid with no odour or
sheen noted.



2.2.4 Laboratory analysis

Water samples were transported to a NATA-accredited laboratory (Australian Laboratory Services (ALS) in Smithfield, NSW for analysis. All analytes not measured during purging (i.e. pH, EC, DO and oxidation-reduction potential) were received by the laboratory within the maximum holding times.

2.2.5 Quality assurance/quality control

Samples were collected in laboratory-provided sample containers with appropriate preservation. Samples were collected and sent to the laboratory under appropriate chain of custody protocols.

The field quality assurance/quality control (QA/QC) procedures used to establish accurate, reliable, and precise results included:

- calibration of equipment by the supplier before use
- keeping samples chilled
- submitting laboratory samples within holding times
- wearing disposable nitrile gloves during sampling at each sampling location
- using dedicated sampling equipment
- collection of a field duplicate sample.

QA/QC was assessed by calculating relative percentage difference (RPD) of the field duplicate ($S_{\text{duplicate}}$) sample to the parent sample (S_{parent}) as per the following equation.

$$\text{Relative \% difference} = \frac{|S_{\text{parent}} - S_{\text{Duplicate}}|}{\frac{S_{\text{parent}} + S_{\text{Duplicate}}}{2}} \times 100$$

Results were considered to confirm acceptable degree of data quality where RPDs were below 30%.

Most results for the monitoring round were within RPD limits (refer Appendix C), indicating adequate QA/QC. TSS reported RPD at the data quality limit, however the elevated RPD is attributed heterogeneous distribution of suspended solids within the water sample and the variation in particulate has not affected reported contaminant concentrations.

2.3 Monitoring results - general observations

2.3.1 Groundwater levels

Following recommendations in the March groundwater monitoring memorandum (EMM 2025), a resurvey of the groundwater wells was undertaken by Total Surveying Solutions on 14 April 2025, as provided by the Client. Water levels for the May monitoring period are calculated based on the resurveyed well data. Water levels and survey data are presented in Appendix B. For context, the average baseline and subsequent upper and lower trigger values are presented in Table 2.4.

Table 2.4 Water level trigger values

Well ID	Average Baseline (mAHD)	Upper SWL Trigger (mAHD)	Lower SWL Trigger (mAHD)
BSM1	58.13	60.13	56.13
BSM2	50.68	52.68	48.68
BSM3	46.29	48.29	44.29

Bores BSM1 and BSM2 were within the historical range since the program commenced in March 2022. BSM1 was reported with a standing water level (SWL) at its lowest since the program commenced in March 2022. It is noted that a larger depth to water was reported for BSM1 in March 2024, however reference datum discrepancies indicate the water level in BSM1 to be at its lowest since the program commenced in March 2022.

BSM1 was within 2 m of the baseline average whilst both BSM2 and BSM3 were observed above the 2 m trigger as prescribed by the WMP (EMM 2021). Based on the survey data, it appears the wells have consistently exceeded the 2 m trigger across the 10 monitoring events at BSM1 (4 occasions), BSM2 (8 occasions) and BSM3 (10 occasions). This represents an increase and thus part of the TARP triggers relating to distance drawdown effects is not applicable.

Upon consultation with CPG, it is understood no quantitative historical monitoring of the water level within the quarry pit has been undertaken. Anecdotal evidence indicates the base of the quarry pit to be approximately 30 metres below ground level (m bgl) which would indicate the pit is not the source of the sustained increased water level. Determination of any relationship between observed groundwater levels and quarry operations would require quarry pit water level monitoring.

2.3.2 Groundwater quality

Key observations of groundwater quality for the monitoring period include the following:

- pH was circumneutral (6.47–7.16) in all bores.
- Salinity, as indicated by EC, was similar in upgradient BSM1 (18,812 microsiemens per centimetre ($\mu\text{S}/\text{cm}$)) to downgradient wells BSM2 (17,755 $\mu\text{S}/\text{cm}$) with BSM3 (23,256 $\mu\text{S}/\text{cm}$) exceeding both, but reporting within historical ranges. Results are typical of baseline trends (22,560 $\mu\text{S}/\text{cm}$ at BSM1).
- Nutrients remain present in all bores and significantly elevated above baseline for nitrate in BSM2 (395 milligrams per litre (mg/L)). This represents the highest concentrations on record for nitrate with the previous highest (218 mg/L) level reported in the round following reinstallation (August 2021). The quarry pit and midstream and downstream locations were observed to be green or slightly green, which may indicate eutrophication as a result of high nutrient load. All surface water locations reported nutrient levels more than an order of magnitude below BSM2. The source of the nitrate remains inconclusive, with nearby sources comprising fertilization of agricultural land, country club and revegetation of the adjacent airport.

- Elevated metals were noted in some bores (discussed in Section 2.4).
- No detectable concentrations of TRH were observed at any groundwater monitoring locations.

2.3.3 Surface water quality

Key observations of the surface water quality are summarised below:

- A surface water monitoring location (Midstream) within Oaky Creek, adjacent to the Water Management Dam, was sampled in place of the Water Management Dam as a result of access restrictions associated with the construction works onsite. Surface water sampling of the unnamed dam in Oaky Creek was accessed from the southwestern side.
- The Upstream and Quarry Pit locations contained more water than was observed during the previous monitoring round. Oaky Creek at the location of the upstream location was estimated to contain water to a depth of approximately 0.2 m.
- pH was neutral upstream (6.98), slightly basic in the Quarry pit (8.71) and receiving environment (8.53 at midstream and 7.31 at downstream).
- EC was below the baseline concentration (11,000 $\mu\text{S}/\text{cm}$) at all locations. The upstream location (1,805 $\mu\text{S}/\text{cm}$) was below the surface water trigger value but exceeded by the Quarry Pit location (6,606 $\mu\text{S}/\text{cm}$) and receiving environment (4,465 $\mu\text{S}/\text{cm}$ at midstream and 2770 $\mu\text{S}/\text{cm}$ at downstream).

2.4 Review of exceedances

Water quality results were reviewed for trigger exceedances, via comparison of default guideline values or comparison of other chemical properties to the upgradient bore (BSM1).

An assessment of exceedances including actions taken and recommendations for the groundwater monitoring is presented in Table 2.5.

Table 2.5 Review of exceedances (groundwater)

Exceedance description	Assessment, actions taken and recommendations
Nutrients	
Ammonia exceeded the upgradient bore concentration (4.53 mg/L) at BSM3 (6.07 mg/L). All locations exceeded the ANZECC 95% protection level for freshwater (0.9 mg/L).	<p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> • No historical records of ammonia or total nitrogen were available. • As a result of the nitrate concentration at BSM2, total and oxidised nitrogen was noted to be significantly above the trigger value (upgradient bore comparison). The median baseline concentration at BSM2 of 21 mg/L, is significantly greater than the median baseline for the upgradient bore of 0.137 mg/L. Regardless the reported concentration of 395 mg/L is more than order of magnitude greater than the median baseline for nitrate with the upgradient bore reporting nitrate below detectable limits. <p>Timeseries charts of nutrients exceedances were prepared (refer Appendix D).</p> <p>The following observations are made from charts in Appendix D.1 and Mann-Kendall trend analysis in Appendix H:</p> <ul style="list-style-type: none"> • Groundwater exceedances for nutrients generally appear to occur following the bore reinstallation in July 2023. • A statistically significant increasing trend has been identified at BSM2 for Total Nitrogen. This trend was not observed in the upgradient bore BSM1. The predominant form of nitrogen in BSM2 is nitrate.
Total and oxidised nitrogen significantly exceeded the upgradient bore concentration (9.5 mg/L and 0.02 mg/L, respectively) at BSM2 with a concentration of 395 mg/L. This exceedance is attributable to the nitrate concentration at BSM2.	
Reactive phosphorus exceeded the upgradient bore concentration (0.01 mg/L) at BSM3 with concentrations of 0.05 mg/L.	

Exceedance description	Assessment, actions taken and recommendations
Metals	
Copper exceeded the trigger value at BSM1 with a concentration of 0.002 mg/L.	<p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> • Copper reported concentrations similar to baseline values for BSM1. • Zinc was reported below baseline concentrations for BSM2. • No historical records of manganese are available. A statistically significant increasing trend in manganese has been observed the upgradient bore. This trend was not observed in the downgradient bores. <p>Timeseries charts of metals exceedances were prepared (refer Appendix D). The following observations are made from charts in Appendix D.2:</p> <ul style="list-style-type: none"> • No obvious trends are discernible from the timeseries charts or in the Mann-Kendall trend analysis (with the exception of the upgradient manganese trend identified above) and exceedances of similar magnitude are generally known to occur for some metals in the historical baseline dataset.
Manganese exceeded the trigger value at BSM2 (primary and duplicate) with a concentration of 2.15 mg/L.	
Zinc exceeded the trigger values at BSM2 (primary and duplicate) with a concentration of 0.020 mg/L and 0.022 mg/L, respectively.	

An assessment of exceedances including actions taken and recommendations for the surface water monitoring program is presented Table 2.6.

Table 2.6 Review of exceedances (surface water)

Exceedance description	Assessment, actions taken and recommendations
Nutrients	
Ammonia exceeded the trigger value (0.02 mg/L) at the Oaky Creek upstream and downstream site with a concentration of 0.26 mg/L and 0.19 mg/L, respectively.	<p>Nutrients at the upstream site, within the quarry pit and receiving environment were elevated above surface water trigger values. Nutrients were of lower concentration than noted in groundwater bores. This suggests high nutrients may be naturally occurring or present from activities upgradient of the site.</p> <p>Results of surface water monitoring were reviewed, including:</p> <ul style="list-style-type: none"> • The Quarry Pit site, recorded its highest concentration of oxidised and total nitrogen at 8.36 mg/L. • The quarry pit exceeded the trigger value for ammonia; however, the concentration was less than the upstream Oaky Creek value.
Oxidised nitrogen exceeded trigger value (0.02 mg/L) in the Quarry Pit and downstream in Oaky Creek with concentrations of 8.36 mg/L and 0.05 mg/L, respectively.	
Total nitrogen exceeded the trigger value (0.5 mg/L) at all locations.	
Total phosphorus exceeded trigger value (0.05 mg/L) in the Quarry Pit with a concentration of 0.08 mg/L.	
Metals	
Copper exceeded the trigger value at the Oaky Creek upstream site with a concentration of 0.002 mg/L.	<p>Monitoring of the quarry pit and upstream location in Oaky Creek, indicated increased concentrations of manganese were more likely form offsite sources, with the upstream location reporting a concentration lower than BSM2 but higher than the remaining monitoring well and quarry pit sampling locations. Selenium concentrations observed in the Quarry Pit were not observed in the upstream, receiving environment or monitoring bores.</p>
Selenium exceeded the ANZECC 95% protection level for freshwater (0.011 mg/L) in the quarry pit with a concentration of 0.04 mg/L.	

3 Summary and recommendations

The following provides a summary of additional investigations:

- The monitoring well network was resurveyed based on recommendations in previous monitoring rounds to determine if anomalies are attributable to groundwater conditions or elevation changes to the monitoring well network. Down gradient bores BSM2 and BSM3 were reported above the standing water level trigger value as part of the May 2025 monitoring event. All water levels were within the historical ranges with BSM1 reporting its lowest level since baseline monitoring in 2017. Sustained elevated water levels are not likely to be attributable to the site as the monitored water level is substantially greater than the reported base of the quarry pit.
- No detectable concentrations of TRH/TPH were reported during the May 2025 sampling round.
- No confirmed source has been identified for the sustained elevated and increasing nutrient concentrations observed within monitoring well BSM2. The increasing trend in BSM2 was supported by Mann-Kendall analysis. The surface water locations were observed with low levels of water and were observed to be green or slightly green/brown, which may indicate eutrophication as a result of high nutrient load. The site is surrounded by agricultural land, a country club and the Western Sydney Airport (WSA) which has been undertaking significant re-establishment of ground cover vegetation upstream of the site since 2021 and it is possible that widespread use of fertilisers around the site may have contributed to the reported increase in nutrients observed at monitoring wells at the site. Detailed surface water and groundwater monitoring associated with the WSA construction was not available for review to verify this potential source. Based on the sustained increasing trend following the cessation of quarry operations, the change appears unrelated to quarry activities.
- Concentrations of metals at BSM2 reduced from levels observed as part of the March 2025 monitoring round. Based on the variable concentrations following the cessation of quarry operations, the change appears unrelated to quarry activities. Mann-Kendall analysis identified only one statistically significant increasing trend in manganese in the upgradient bore BSM1.

The following recommendations are made for future monitoring:

- Continue to monitor additional surface water locations in response to previous monitoring results to assess the source of anomalous groundwater results. Additional monitoring is proposed at the Oaky Creek upstream and downstream sites and of water stored within the quarry pit for the next monitoring round.
- To better align the monitoring program with the National Environment Protection (Assessment of Site Contamination) Measure (NEPM ASC 2013) and to refine understanding of the anomalous nutrient source hydrasleeve monitoring is recommended. In addition, to assess nutrient concentrations within varying depths of the water column at BSM2, EMM recommends the installation of hydrasleeves within the screened water column at depths of approximately 1.5 m below SWL and at the base of the well.
- Based on sufficient baseline and environmental monitoring program data, it is recommended as part of future monitoring that Mann-Kendall trend analysis be undertaken on an annual basis for analytes at sample locations exceeding the trigger value to establish any statistically significant time series trends.

- It is recommended that the total recoverable hydrocarbon analysis is continued at locations previously reported with detectable concentrations of TRH/TPH (BSM1 and BSM2) to assist with confirming the absence of TRH/TPH. Should TRH/TPH be identified, analysis of TRH/TPH using the silica gel cleanup process should be undertaken to confirm the nature of the detectable hydrocarbons. If the TRH and TPH concentrations in the Q4 24/25 monitoring period are reported below detection limits, EMM recommends the cessation of the additional hydrocarbon analysis with any future analysis dependent on detectable oil and grease.
- Continue to monitor groundwater quality results over the remainder of the AR period (1 September 2024 to 30 August 2025) and investigate regional sources of anomalous results. Consider additional investigative drilling to confirm lithology and/or consider replacement of monitoring wells with appropriate design to enable control impact monitoring, if water quality results do not normalise by the end of the next AR period.

Please contact the undersigned with any questions or clarifications.

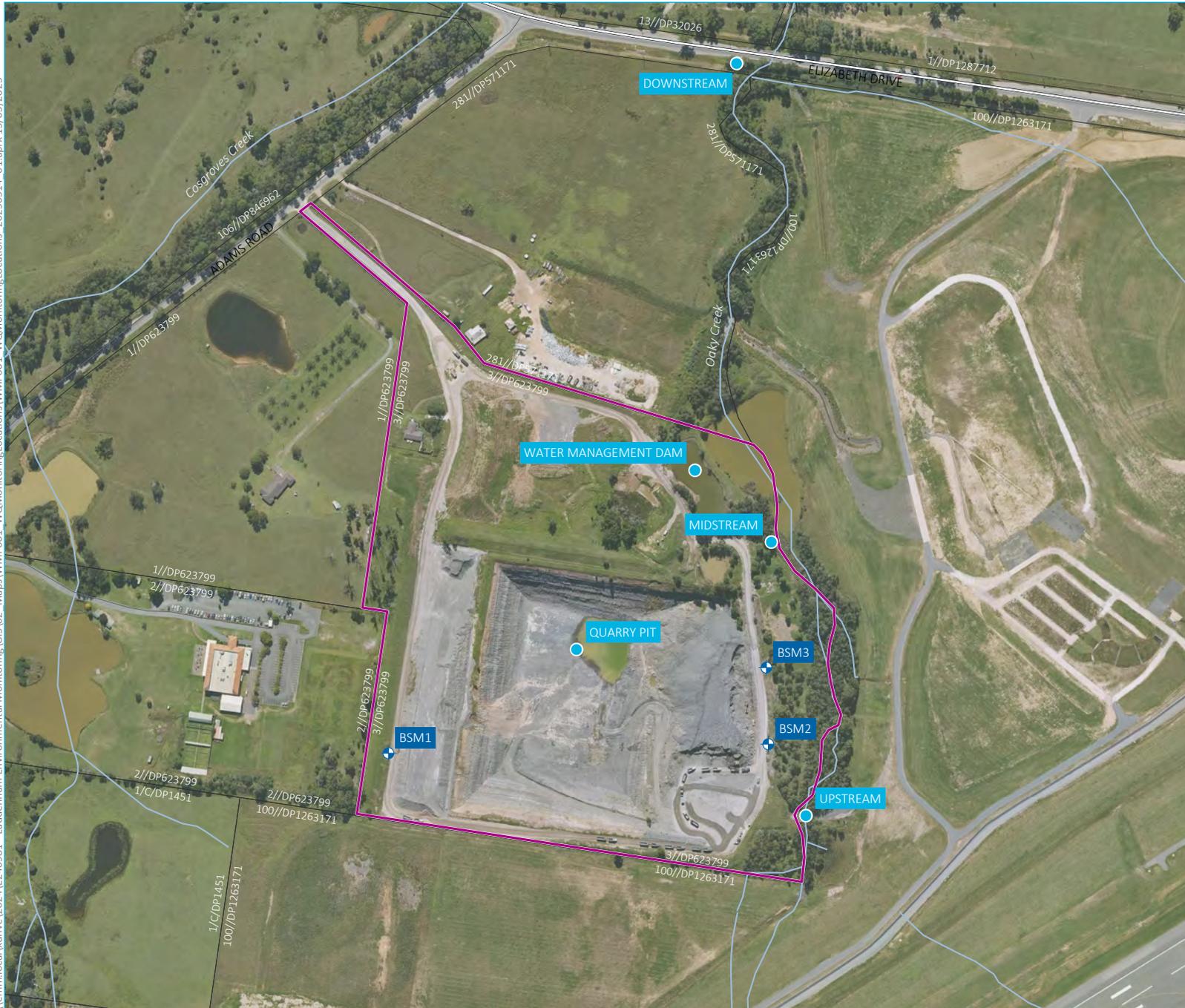
Yours sincerely

A handwritten signature in blue ink that reads "T. Coupe". The signature is written in a cursive style with a large initial 'T'.

Tasman Coupe
Senior Environmental Engineer
tcoupe@emmconsulting.com.au

Appendix A

Water quality monitoring locations



- KEY**
- Study area
 - + Groundwater monitoring bore
 - Water quality monitoring location
- Existing environment
- Major road
 - Minor road
 - Watercourse/drainage line
 - Cadastral boundary

Water quality monitoring locations

Luddenham Quarry
Water Management Plan
Figure 1



Appendix B

Groundwater levels

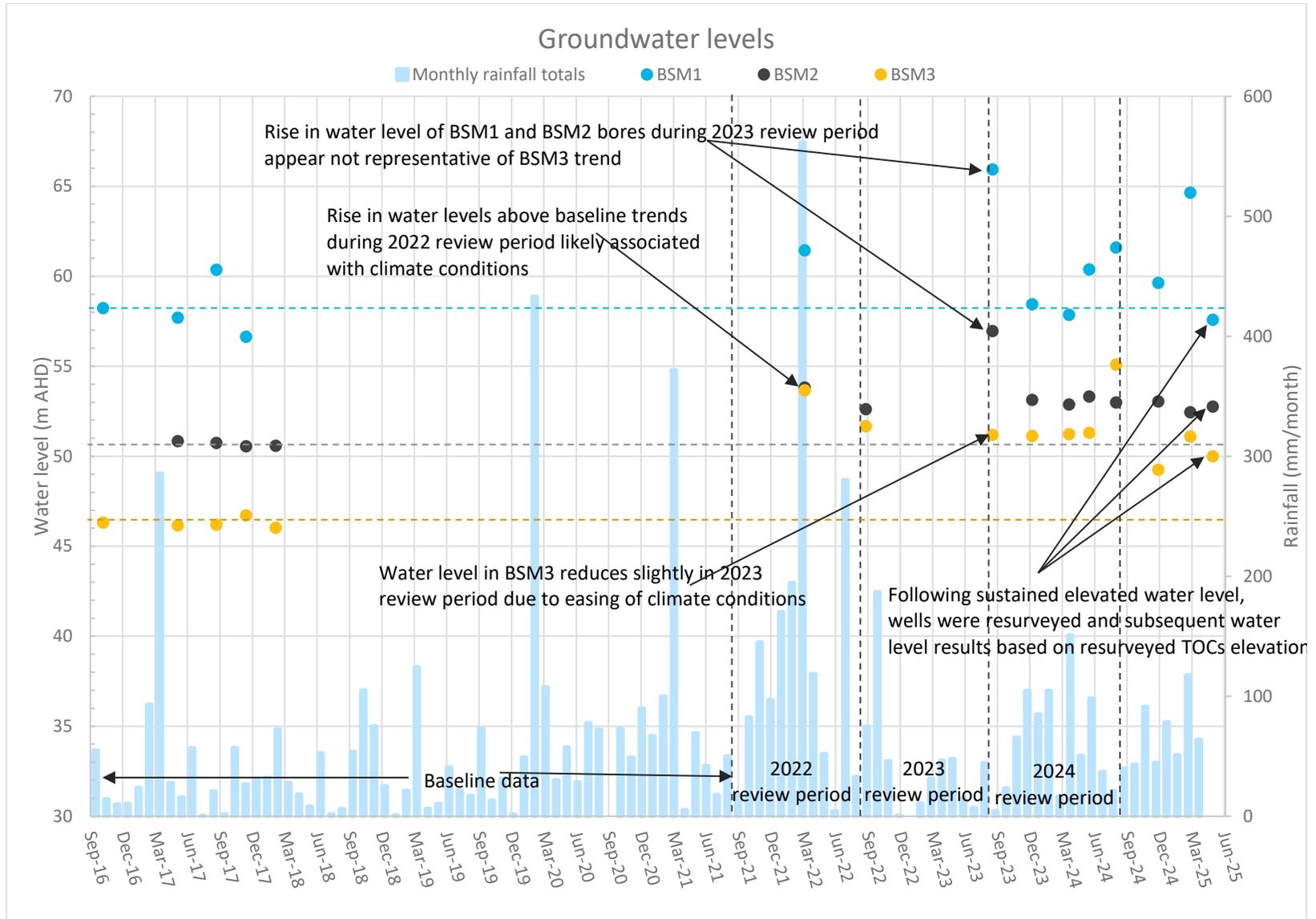


Figure B.1 Ground water levels

Appendix C

Water quality monitoring results

	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (surface water)	Location Code	BSM1	BSM2	BSM2	BSM3
					Field ID	BSM1	BSM2	QA	BSM3
					Lab Report Number	ES2513348	ES2513348	ES2513348	ES2513348
					Date	07 May 2025	07 May 2025	07 May 2025	07 May 2025
Field									
Temp (Field)	°C	0.1		-	21.1	19.6	-	19.4	
pH (Field)	-	0.01		6.5-8.5	7.16	6.47	-	6.64	
EC (field)	µS/cm	1		BSM1	18,812	17,755	-	23,256	
DO % Saturation (Field)	%Sat	0.1		-	97	20	-	16.6	
Redox Potential (Field)	mV	0.1		-	102	132	-	-241	
TSS	mg/L	5		BSM1	9,190	109	148	37	
Inorganics									
Hardness as CaCO ₃ (filtered)	mg/L	1		-	3,400	2,100	2,120	3,550	
Ammonia as N	mg/L	0.01	0.9	BSM1	4.53	0.98	0.97	6.07	
Nitrite (as N)	mg/L	0.01			<0.01	0.04	0.04	<0.01	
Nitrate (as N)	mg/L	0.01			0.02	395	377	0.01	
Nitrite + Nitrate as N	mg/L	0.01		BSM1	0.02	395	377	0.01	
Total Kjeldahl Nitrogen	mg/L	0.1			9.5	<2.0 ^{#1}	<2.0 ^{#1}	6.5	
Nitrogen (Total)	mg/L	0.1		BSM1	9.5	395	377	6.5	
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		BSM1	0.01	<0.01	<0.01	0.05	
Total Phosphate (as P)	MG/L	0.01		BSM1	3.98	<0.20 ^{#1}	<0.20 ^{#1}	0.14	
Metals									
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	<0.01	<0.01	<0.01	
Arsenic (filtered)	mg/L	0.001	0.013	0.013	0.002	<0.001	<0.001	<0.001	
Boron (filtered)	mg/L	0.05	0.94	0.37	0.08	<0.05	<0.05	<0.05	
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	
Copper (filtered)	mg/L	0.001	0.0014	0.0014	0.002	0.001	<0.001	<0.001	
Iron (filtered)	mg/L	0.05			<0.05	<0.05	<0.05	1.18	
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	<0.001	<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	1.9	1.9	0.576	2.15	2.15	0.247	
Mercury (filtered)	mg/L	0.0001	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.006	0.009	0.011	0.001	
Selenium (filtered)	mg/L	0.01	0.005		<0.01	<0.01	<0.01	<0.01	
Zinc (filtered)	mg/L	0.005	0.008	0.008	0.007	0.020	0.022	<0.005	
BTEX									
Benzene	µg/L	1	950	LOR	<1	<1	<1	<1	
Toluene	µg/L	2		LOR	<2	<2	<2	<2	
Ethylbenzene	µg/L	2	80	LOR	<2	<2	<2	<2	
Xylene (m & p)	µg/L	2		LOR	<2	<2	<2	<2	
Xylene (o)	µg/L	2	350	LOR	<2	<2	<2	<2	
Xylene Total	µg/L	2		LOR	<2	<2	<2	<2	
Total BTEX	µg/L	1		LOR	<1	<1	<1	<1	
Naphthalene (VOC)	mg/L	0.005	0.016	LOR	<0.005	<0.005	<0.005	<0.005	
TRH									
C6-C10	µg/L	20		LOR	<20	<20	<20	<20	
C6 - C10 less BTEX (F1)	µg/L	20		LOR	<20	<20	<20	<20	
>C10-C16	µg/L	100		LOR	<100	<100	<100	<100	
>C10 - C16 less Naphthalene (F2)	µg/L	100		LOR	<100	<100	<100	<100	
>C16-C34	µg/L	100		LOR	<100	<100	<100	<100	
>C34-C40	µg/L	100		LOR	<100	<100	<100	<100	
>C10-C40 (Sum of total)	µg/L	100		LOR	<100	<100	<100	<100	
Oil and Grease	mg/L	5		LOR	<5	<5	<5	<5	
TRH - (Silica Gel Cleanup)									
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TPH									
C6-C9	µg/L	20		LOR	<20	<20	<20	<20	
C10-C14	µg/L	50		LOR	<50	<50	<50	<50	
C15-C28	µg/L	100		LOR	<100	<100	<100	<100	
C29-C36	µg/L	50		LOR	<50	<50	<50	<50	
C10-C36 (Sum of total)	µg/L	50		LOR	<50	<50	<50	<50	
TPH - (Silica Gel Cleanup)									
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (surface water)	Location Code	UPSTREAM	QUARRY PIT	MIDSTREAM	DOWNSTREAM
					Field ID	UPSTREAM (US)	QUARRY PIT (QP)	MIDSTREAM	DOWNSTREAM (DS)
					Lab Report Number	ES2513348	ES2513348	ES2513348	ES2513348
					Date	07 May 2025	07 May 2025	07 May 2025	07 May 2025
Field									
Temp (Field)	°C	0.1		-	18.9	22.5	20.4	17	
pH (Field)	-	0.01		6.5-8.5	6.98	8.71	8.53	7.31	
EC (field)	µS/cm	1		125-2200	1,805	6,606	4,465	2,770	
DO % Saturation (Field)	%Sat	0.1			33.6	139.5	114.5	53.8	
Redox Potential (Field)	mV	0.1			-11.6	74.8	30.3	20.6	
TSS	mg/L	5			8	20	26	15	
Inorganics									
Hardness as CaCO ₃ (filtered)	mg/L	1			344	750	554	446	
Ammonia as N	mg/L	0.01	0.9	0.02	0.26	0.02	<0.01	0.19	
Nitrite (as N)	mg/L	0.01			<0.01	0.14	<0.01	<0.01	
Nitrate (as N)	mg/L	0.01			0.03	8.22	<0.01	0.05	
Nitrite + Nitrate as N	mg/L	0.01		0.04	0.03	8.36	<0.01	0.05	
Total Kjeldahl Nitrogen	mg/L	0.1			1.5	1.0	0.7	0.6	
Nitrogen (Total)	mg/L	0.1		0.5	1.5	9.4	0.7	0.6	
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		0.02	<0.01	<0.01	<0.01	<0.01	
Total Phosphate (as P)	MG/L	0.01		0.05	0.11	0.08	0.05	0.03	
Metals									
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	0.01	0.02	<0.01	
Arsenic (filtered)	mg/L	0.001	0.013	0.013	0.001	0.002	0.001	<0.001	
Boron (filtered)	mg/L	0.05	0.94	0.37	<0.05	<0.05	<0.05	<0.05	
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	
Copper (filtered)	mg/L	0.001	0.0014	0.0014	0.002	<0.001	<0.001	0.001	
Iron (filtered)	mg/L	0.05			0.20	<0.05	<0.05	0.07	
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	<0.001	<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	1.9	1.9	0.818	0.007	0.062	0.567	
Mercury (filtered)	mg/L	0.0001	0.00006		<0.0001	<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.005	0.006	0.003	0.004	
Selenium (filtered)	mg/L	0.01	0.011		<0.01	0.04	<0.01	<0.01	
Zinc (filtered)	mg/L	0.005	0.008	0.008	<0.005	<0.005	<0.005	<0.005	
BTEX									
Benzene	µg/L	1	950	LOR	<1	<1	<1	<1	
Toluene	µg/L	2		LOR	<2	<2	<2	<2	
Ethylbenzene	µg/L	2	80	LOR	<2	<2	<2	<2	
Xylene (m & p)	µg/L	2		LOR	<2	<2	<2	<2	
Xylene (o)	µg/L	2	350	LOR	<2	<2	<2	<2	
Xylene Total	µg/L	2		LOR	<2	<2	<2	<2	
Total BTEX	µg/L	1		LOR	<1	<1	<1	<1	
Naphthalene (VOC)	mg/L	0.005	0.016	LOR	<0.005	<0.005	<0.005	<0.005	
TRH									
C6-C10	µg/L	20		LOR	<20	<20	<20	<20	
C6 - C10 less BTEX (F1)	µg/L	20		LOR	<20	<20	<20	<20	
>C10-C16	µg/L	100		LOR	<100	<100	<100	<100	
>C10 - C16 less Naphthalene (F2)	µg/L	100		LOR	<100	<100	<100	<100	
>C16-C34	µg/L	100		LOR	<100	<100	<100	<100	
>C34-C40	µg/L	100		LOR	<100	<100	<100	<100	
>C10-C40 (Sum of total)	µg/L	100		LOR	<100	<100	<100	<100	
Oil and Grease	mg/L	5		LOR	<5	<5	<5	<5	
TRH - (Silica Gel Cleanup)									
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TPH									
C6-C9	µg/L	20		LOR	<20	<20	<20	<20	
C10-C14	µg/L	50		LOR	<50	<50	<50	<50	
C15-C28	µg/L	100		LOR	<100	<100	<100	<100	
C29-C36	µg/L	50		LOR	<50	<50	<50	<50	
C10-C36 (Sum of total)	µg/L	50		LOR	<50	<50	<50	<50	
TPH - (Silica Gel Cleanup)									
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		LOR	<0.1	<0.1	<0.1	<0.1	
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		LOR	<0.05	<0.05	<0.05	<0.05	

Environmental Standards
ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

			Location Code	BSM2	BSM2	
			Field ID	BSM2	QA	
			Lab Report Number	ES2513348	ES2513348	
			Date	07 May 2025	07 May 2025	
			Matrix Type	Water	Water	RPD
	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs			
Field						
TSS	mg/L	5		109	148	30
Inorganics						
Hardness as CaCO ₃ (filtered)	mg/L	1		2,100	2,120	1
Ammonia as N	mg/L	0.01	0.9	0.98	0.97	1
Nitrite (as N)	mg/L	0.01		0.04	0.04	0
Nitrate (as N)	mg/L	0.01		395	377	5
Nitrite + Nitrate as N	mg/L	0.01		395	377	5
Total Kjeldahl Nitrogen	mg/L	0.1		<2.0 ^{#1}	<2.0 ^{#1}	0
Nitrogen (Total)	mg/L	0.1		395	377	5
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		<0.01	<0.01	0
Total Phosphate (as P)	MG/L	0.01		<0.20 ^{#1}	<0.20 ^{#1}	0
Metals						
Aluminium (filtered)	mg/L	0.01	0.055	<0.01	<0.01	0
Arsenic (filtered)	mg/L	0.001	0.013	<0.001	<0.001	0
Boron (filtered)	mg/L	0.05	0.94	<0.05	<0.05	0
Cadmium (filtered)	mg/L	0.0001	0.0002	<0.0001	<0.0001	0
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	<0.001	<0.001	0
Copper (filtered)	mg/L	0.001	0.0014	0.001	<0.001	0
Iron (filtered)	mg/L	0.05		<0.05	<0.05	0
Lead (filtered)	mg/L	0.001	0.0034	<0.001	<0.001	0
Manganese (filtered)	mg/L	0.001	1.9	2.15	2.15	0
Mercury (filtered)	mg/L	0.0001	0.00006	<0.0001	<0.0001	0
Nickel (filtered)	mg/L	0.001	0.011	0.009	0.011	20
Selenium (filtered)	mg/L	0.01	0.005	<0.01	<0.01	0
Zinc (filtered)	mg/L	0.005	0.008	0.020	0.022	10
BTEX						
Benzene	µg/L	1	950	<1	<1	0
Toluene	µg/L	2		<2	<2	0
Ethylbenzene	µg/L	2	80	<2	<2	0
Xylene (m & p)	µg/L	2		<2	<2	0
Xylene (o)	µg/L	2	350	<2	<2	0
Xylene Total	µg/L	2		<2	<2	0
Total BTEX	µg/L	1		<1	<1	0
Naphthalene (VOC)	mg/L	0.005	0.016	<0.005	<0.005	0
TRH						
C6-C10	µg/L	20		<20	<20	0
C6 - C10 less BTEX (F1)	µg/L	20		<20	<20	0
>C10-C16	µg/L	100		<100	<100	0
>C10 - C16 less Naphthalene (F2)	µg/L	100		<100	<100	0
>C16-C34	µg/L	100		<100	<100	0
>C34-C40	µg/L	100		<100	<100	0
>C10-C40 (Sum of total)	µg/L	100		<100	<100	0
Oil and Grease	mg/L	5		<5	<5	0
TRH - (Silica Gel Cleanup)						
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		<0.1	<0.1	0
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		<0.1	<0.1	0
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		<0.1	<0.1	0
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		<0.1	<0.1	0
TPH						
C6-C9	µg/L	20		<20	<20	0
C10-C14	µg/L	50		<50	<50	0
C15-C28	µg/L	100		<100	<100	0
C29-C36	µg/L	50		<50	<50	0
C10-C36 (Sum of total)	µg/L	50		<50	<50	0
TPH - (Silica Gel Cleanup)						
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		<0.05	<0.05	0
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		<0.1	<0.1	0
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		<0.05	<0.05	0
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		<0.05	<0.05	0

Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 50 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

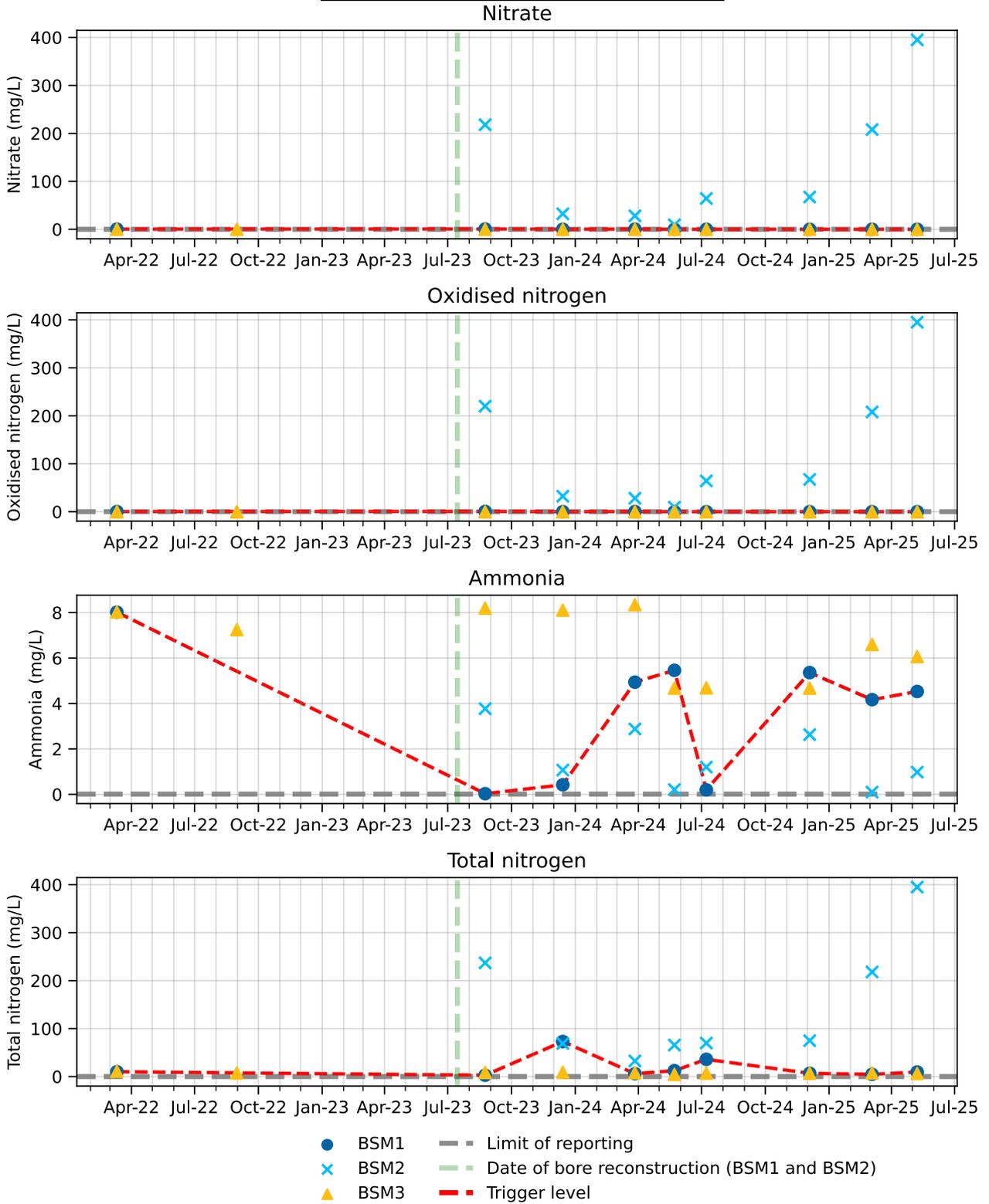
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix D

Water quality timeseries charts

D.1 Timeseries water quality charts – nutrients

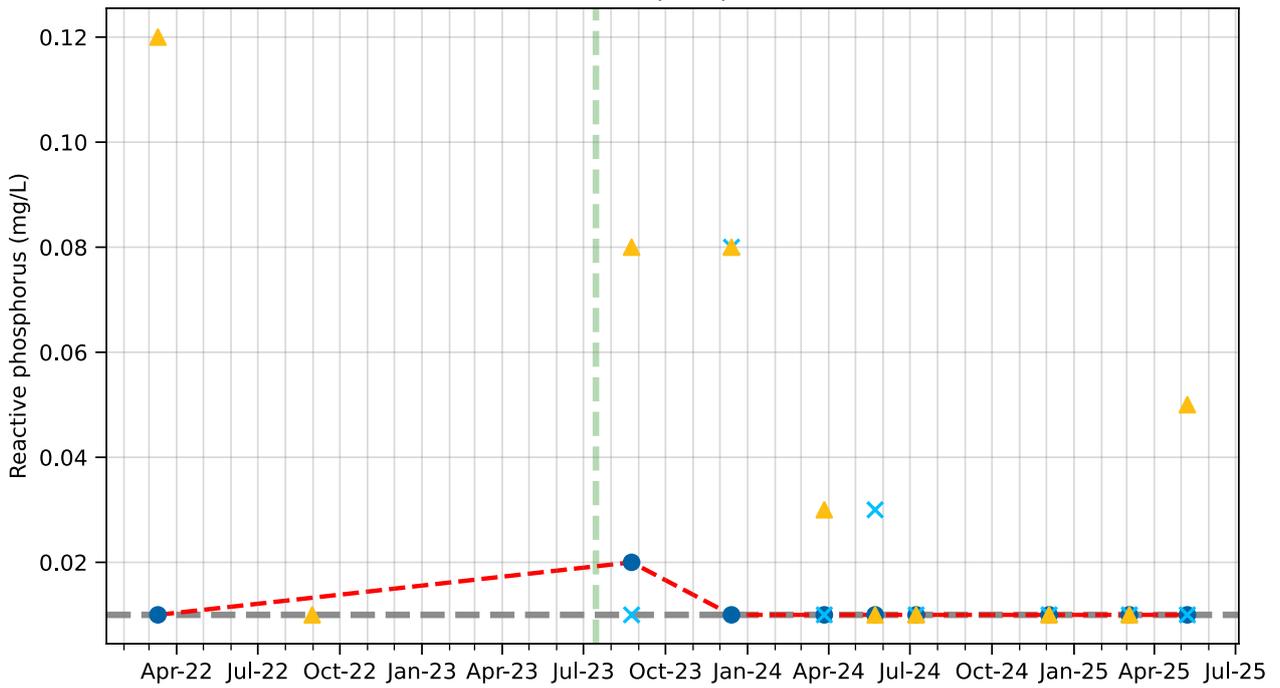
Water quality analysis - nutrients



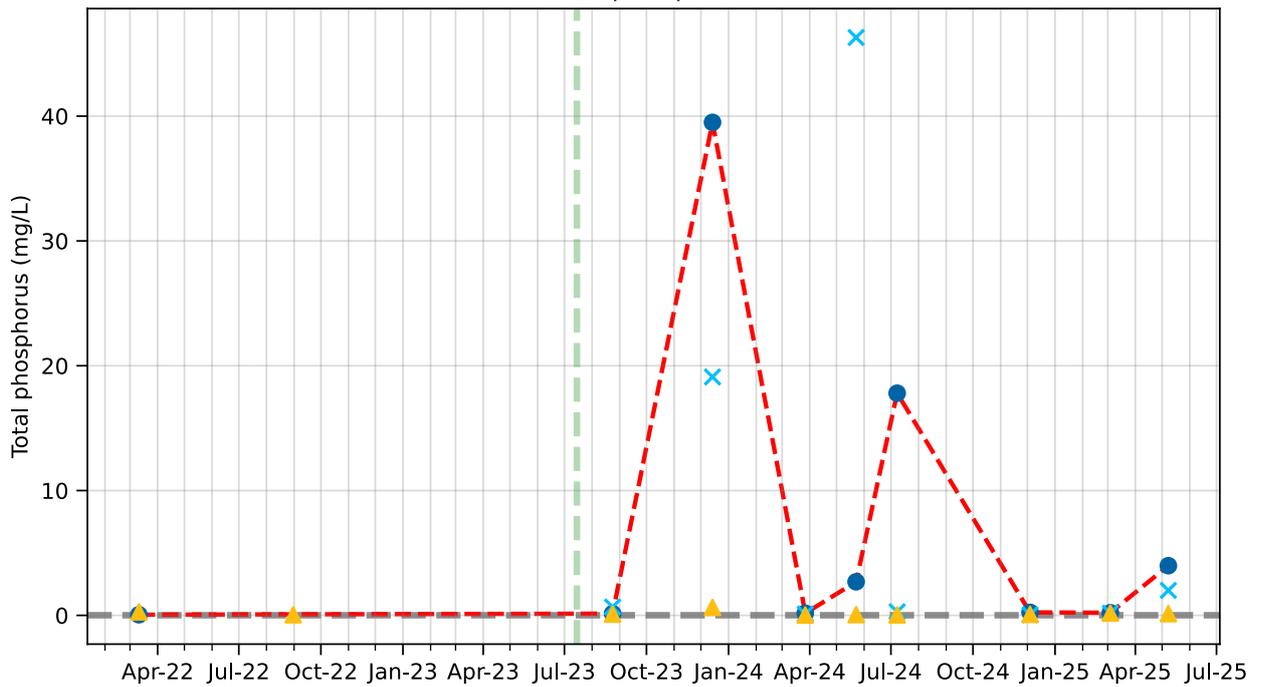
*Trigger values based on upgradient bore (BSM1).

Water quality analysis - nutrients

Reactive phosphorus



Total phosphorus

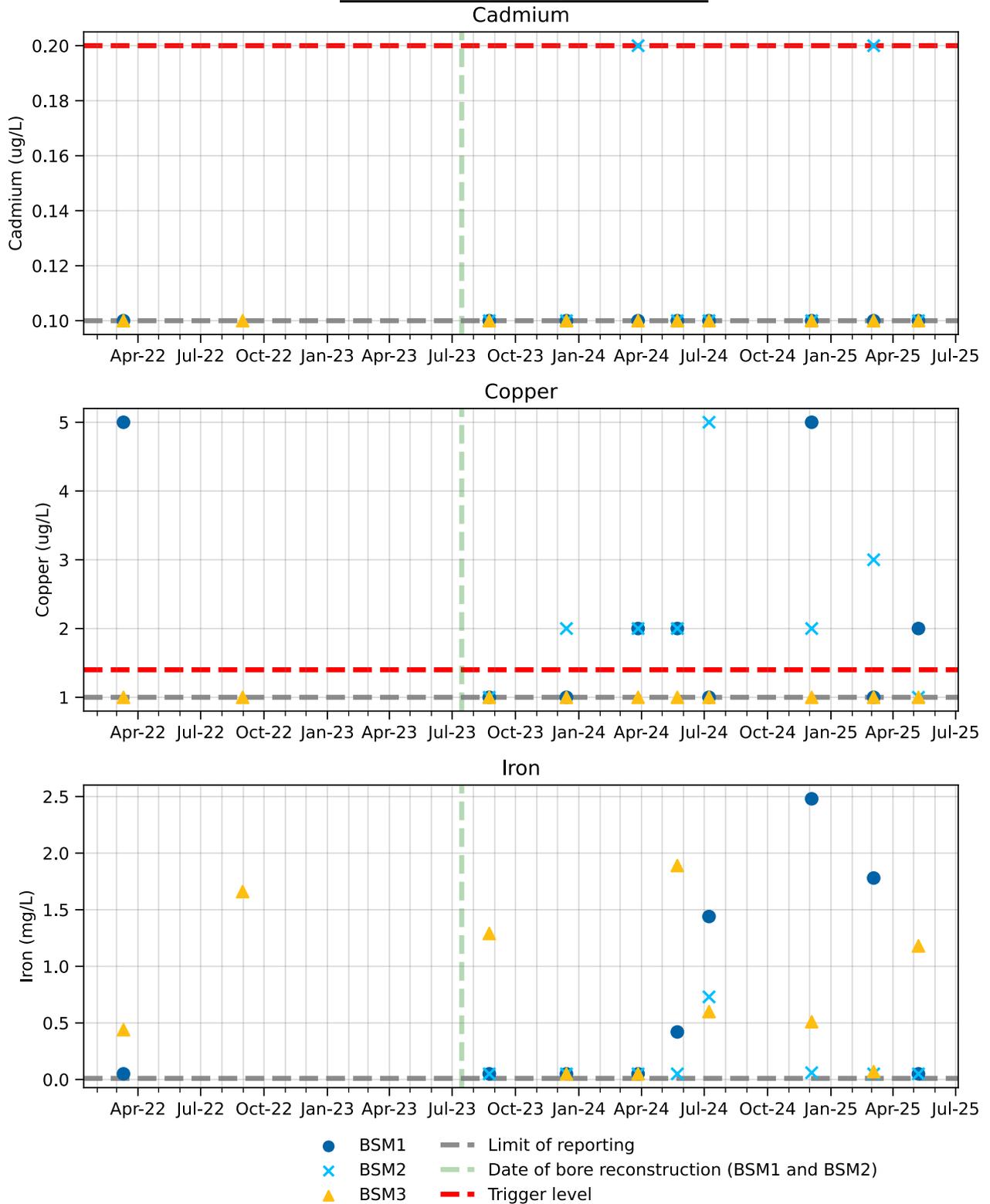


- BSM1
- × BSM2
- ▲ BSM3
- Limit of reporting
- Date of bore reconstruction (BSM1 and BSM2)
- - - Trigger level

*Trigger values based on upgradient bore (BSM1).

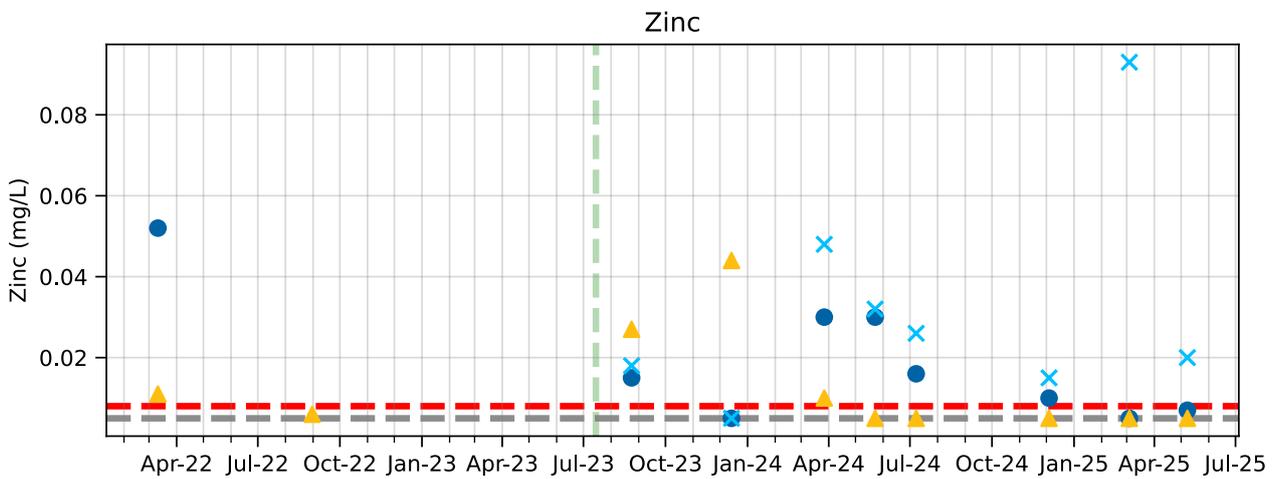
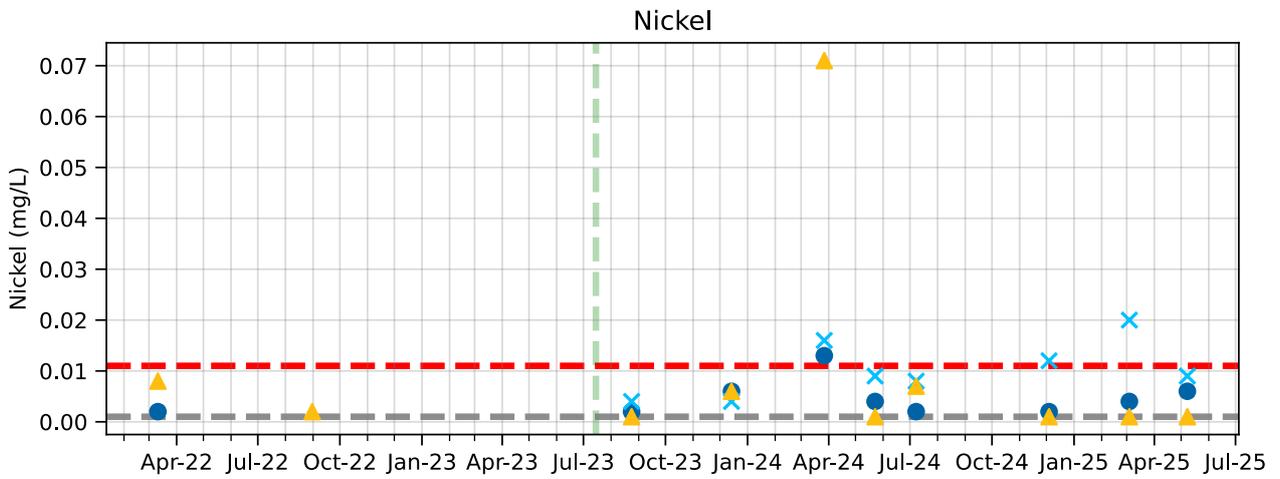
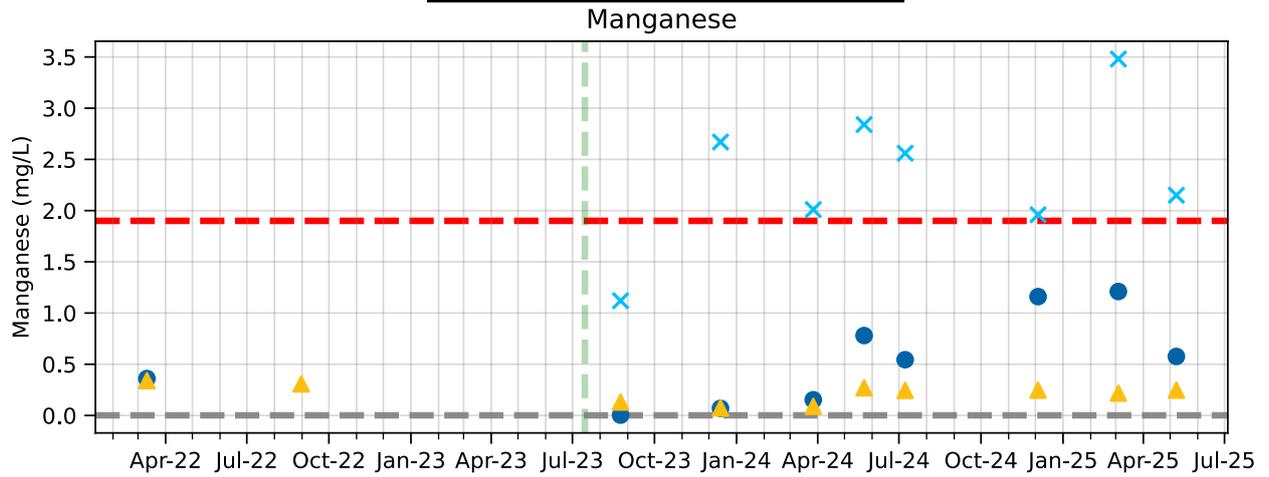
D.2 Timeseries water quality charts – metals

Water quality analysis - metals



*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Water quality analysis - metals



- BSM1
- × BSM2
- ▲ BSM3
- Limit of reporting
- Date of bore reconstruction (BSM1 and BSM2)
- Trigger level

*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Appendix E

Laboratory certificates



CERTIFICATE OF ANALYSIS

Work Order : **ES2513348**
Client : **EMM CONSULTING PTY LTD**
Contact : **TASMAN COUPE**
Address : **The Forum Level 10 201 Pacific Highway
St Leonards NSW NSW 2065**
Telephone : ----
Project : **E240981**
Order number : ----
C-O-C number : ----
Sampler : **JONATHON SCHACHT (JS)**
Site : ----
Quote number : **EN/111**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 9
Laboratory : Environmental Division Sydney
Contact : Samiksha Sathish
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 08-May-2025 14:00
Date Analysis Commenced : 09-May-2025
Issue Date : 16-May-2025 09:35



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
∅ = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EK061G: LOR raised for TKN due to sample matrix.
- EK067G: LOR raised for TP due to sample matrix.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT (QP)
Sampling date / time				07-May-2025 12:45	07-May-2025 14:25	07-May-2025 15:50	07-May-2025 14:25	07-May-2025 12:15	
Compound	CAS Number	LOR	Unit	ES2513348-001	ES2513348-002	ES2513348-003	ES2513348-004	ES2513348-005	
				Result	Result	Result	Result	Result	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	9190	109	37	148	20	
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	3400	2100	3550	2120	750	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	
Arsenic	7440-38-2	0.001	mg/L	0.002	<0.001	<0.001	<0.001	0.002	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	0.002	0.001	<0.001	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.006	0.009	0.001	0.011	0.006	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	0.04	
Zinc	7440-66-6	0.005	mg/L	0.007	0.020	<0.005	0.022	<0.005	
Manganese	7439-96-5	0.001	mg/L	0.576	2.15	0.247	2.15	0.007	
Boron	7440-42-8	0.05	mg/L	0.08	<0.05	<0.05	<0.05	<0.05	
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	1.18	<0.05	<0.05	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	4.53	0.98	6.07	0.97	0.02	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.04	<0.01	0.04	0.14	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.02	395	0.01	377	8.22	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.02	395	0.01	377	8.36	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT (QP)
Sampling date / time				07-May-2025 12:45	07-May-2025 14:25	07-May-2025 15:50	07-May-2025 14:25	07-May-2025 12:15	
Compound	CAS Number	LOR	Unit	ES2513348-001	ES2513348-002	ES2513348-003	ES2513348-004	ES2513348-005	
				Result	Result	Result	Result	Result	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	9.5	<2.0	6.5	<2.0	1.0	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	9.5	395	6.5	377	9.4	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	3.98	<0.20	0.14	<0.20	0.08	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	0.01	<0.01	0.05	<0.01	<0.01	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5	
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup									
C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50	
EP071 SG: Total Petroleum Hydrocarbons - SV Silica gel cleanup									
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100	
EP071 SG: Total Recoverable Hydrocarbons - SV NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20	
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM3	QA	QUARRY PIT (QP)
Sampling date / time				07-May-2025 12:45	07-May-2025 14:25	07-May-2025 15:50	07-May-2025 14:25	07-May-2025 12:15	
Compound	CAS Number	LOR	Unit	ES2513348-001	ES2513348-002	ES2513348-003	ES2513348-004	ES2513348-005	
				Result	Result	Result	Result	Result	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20	
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20	
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100	
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100	
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1	
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2	
[^] Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2	
[^] Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	85.0	87.8	94.6	89.4	86.6	
Toluene-D8	2037-26-5	2	%	102	101	107	103	101	
4-Bromofluorobenzene	460-00-4	2	%	115	115	119	114	112	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM (US)	DOWNSTREAM (DS)	MIDSTREAM	----	----
Sampling date / time				07-May-2025 16:20	07-May-2025 17:00	07-May-2025 16:40	----	----	
Compound	CAS Number	LOR	Unit	ES2513348-006	ES2513348-007	ES2513348-008	-----	-----	
				Result	Result	Result	----	----	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	8	15	26	----	----	
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	344	446	554	----	----	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.02	----	----	
Arsenic	7440-38-2	0.001	mg/L	0.001	<0.001	0.001	----	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----	
Copper	7440-50-8	0.001	mg/L	0.002	0.001	<0.001	----	----	
Nickel	7440-02-0	0.001	mg/L	0.005	0.004	0.003	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----	
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----	
Manganese	7439-96-5	0.001	mg/L	0.818	0.567	0.062	----	----	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----	
Iron	7439-89-6	0.05	mg/L	0.20	0.07	<0.05	----	----	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.26	0.19	<0.01	----	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.03	0.05	<0.01	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.05	<0.01	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM (US)	DOWNSTREAM (DS)	MIDSTREAM	----	----
Sampling date / time				07-May-2025 16:20	07-May-2025 17:00	07-May-2025 16:40	----	----	
Compound	CAS Number	LOR	Unit	ES2513348-006	ES2513348-007	ES2513348-008	-----	-----	
				Result	Result	Result	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.5	0.6	0.7	----	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L	1.5	0.6	0.7	----	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.11	0.03	0.05	----	----	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	----	----	
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup									
C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----	
EP071 SG: Total Petroleum Hydrocarbons - SV Silica gel cleanup									
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----	
EP071 SG: Total Recoverable Hydrocarbons - SV NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----	
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	UPSTREAM (US)	DOWNSTREAM (DS)	MIDSTREAM	----	----
Sampling date / time				07-May-2025 16:20	07-May-2025 17:00	07-May-2025 16:40	----	----	
Compound	CAS Number	LOR	Unit	ES2513348-006	ES2513348-007	ES2513348-008	-----	-----	
				Result	Result	Result	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----	
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----	
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----	
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----	
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----	
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----	
[^] Total Xylenes	----	2	µg/L	<2	<2	<2	----	----	
[^] Sum of BTEX	----	1	µg/L	<1	<1	<1	----	----	
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	85.9	72.6	86.5	----	----	
Toluene-D8	2037-26-5	2	%	102	84.2	98.1	----	----	
4-Bromofluorobenzene	460-00-4	2	%	114	92.8	106	----	----	



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order	: ES2513348	Page	: 1 of 10
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAN COUPE	Contact	: Samiksha Sathish
Address	: The Forum Level 10 201 Pacific Highway St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: E240981	Date Samples Received	: 08-May-2025
Order number	: ----	Date Analysis Commenced	: 09-May-2025
C-O-C number	: ----	Issue Date	: 16-May-2025
Sampler	: JONATHON SCHACHT (JS)		
Site	: ----		
Quote number	: EN/111		
No. of samples received	: 8		
No. of samples analysed	: 8		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC
 * = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 6570994)									
ES2513222-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1770	1930	8.7	0% - 20%
ES2513348-005	QUARRY PIT (QP)	EA025H: Suspended Solids (SS)	----	5	mg/L	20	15	28.6	No Limit
ES2513480-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2513480-021	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6572263)									
ES2513348-006	UPSTREAM (US)	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.818	0.824	0.7	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.005	0.004	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020A-F: Iron	7439-89-6	0.05	mg/L	0.20	0.20	0.0	No Limit		
ES2513149-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6572263) - continued									
ES2513149-001	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.706	0.720	2.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.070	0.077	9.7	0% - 50%
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.07	0.17	81.4	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.28	0.20	37.3	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6572267)									
ES2513348-008	MIDSTREAM	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.062	0.061	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EW2502437-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.001	0.002	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.002	0.003	47.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	0.02	0.02	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.09	0.09	0.0	No Limit
		EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 6572266)									
ED2500732-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2513269-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6569671)									



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6569671) - continued									
ES2512795-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.05	0.03	44.1	No Limit
ES2513199-006	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.32	0.31	0.0	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6569674)									
ME2500680-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2513348-005	QUARRY PIT (QP)	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 6564717)									
EN2507526-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.16	0.16	0.0	0% - 50%
ES2513204-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 6564722)									
EW2502401-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2513348-007	DOWNSTREAM (DS)	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 6569672)									
ES2512795-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.06	<0.01	144	No Limit
ES2513199-006	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	11.8	11.7	0.5	0% - 20%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 6569673)									
ES2513417-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.10	0.12	11.9	0% - 50%
ES2513348-005	QUARRY PIT (QP)	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	8.36	8.67	3.6	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 6569668)									
ES2513199-007	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.2)*	mg/L	5.2	5.4	3.2	0% - 20%
ES2512795-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.6	0.5	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 6569669)									
ES2513348-003	BSM3	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.5)*	mg/L	6.5	6.4	0.0	0% - 50%
ME2500680-004	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.5	0.5	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 6569667)									
ES2512795-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	0.04	0.05	20.2	No Limit
ES2513348-003	BSM3	EK067G: Total Phosphorus as P	----	0.01 (0.05)*	mg/L	0.14	0.17	20.3	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 6564720)									
ES2513348-007	DOWNSTREAM (DS)	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2513204-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	8.88	8.90	0.2	0% - 20%
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 6563146)									
ES2513314-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2513348-004	QA	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 6563146)									
ES2513314-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	30	30	0.0	No Limit
ES2513348-004	QA	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 6563146)									

Page : 5 of 10
 Work Order : ES2513348
 Client : EMM CONSULTING PTY LTD
 Project : E240981



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080: BTEXN (QC Lot: 6563146) - continued									
ES2513314-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	2	2	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2513348-004	QA	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound	CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
EP071 SG: Total Petroleum Hydrocarbons - SV Silica gel cleanup (QCLot: 6562701)								
EP071-SVSG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	58.1	55.8	112
EP071-SVSG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	83.3	71.6	113
EP071-SVSG: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	85.4	56.0	121
EP071 SG: Total Recoverable Hydrocarbons - SV NEPM 2013 Fractions - Silica gel cleanup (QCLot: 6562701)								
EP071-SVSG: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	58.0	56.0	119
EP071-SVSG: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	73.7	62.5	110
EP071-SVSG: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	99.4	61.5	121
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 6570994)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	83.0	129
				<5	1000 mg/L	97.4	82.0	110
				<5	842 mg/L	94.8	83.0	118
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572263)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	103	80.0	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	105	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	104	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	104	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	103	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	99.5	85.0	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	103	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	99.4	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	104	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572267)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	105	80.0	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	109	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	108	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	101	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	108	81.0	111



Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
				Result	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
					LCS	Low	High	
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572267) - continued								
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	105	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	102	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	107	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	103	85.0	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	108	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	96.0	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	102	82.0	112
EG035F: Dissolved Mercury by FIMS (QCLot: 6572266)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	95.3	83.0	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6569671)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	102	90.0	114
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6569674)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	110	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6564717)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	96.4	82.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6564722)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	97.7	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6569672)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6569673)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	102	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6569668)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	94.9	69.0	123
				<0.1	2.5 mg/L	95.9	70.0	123
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6569669)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	99.0	69.0	123
				<0.1	2.5 mg/L	90.4	70.0	123
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6569667)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	94.9	71.3	126
				<0.01	0.5 mg/L	101	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6564720)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	98.4	85.0	117
EP020: Oil and Grease (O&G) (QCLot: 6572124)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	94.9	81.0	121



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)		Acceptable Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 6562701)								
EP071-SVSG: C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	----	----	----
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 6562701)								
EP071-SVSG: >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6562700)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	76.6	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	85.0	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	60.1	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6563146)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	81.7	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6562700)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	54.5	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	59.9	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	60.2	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6563146)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	85.9	75.0	127
EP080: BTEXN (QCLot: 6563146)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	99.2	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	95.3	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	106	73.8	122
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	10 µg/L	112	73.0	122
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	108	76.4	123
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	105	75.5	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572263)							
ES2512891-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	117	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	92.1	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	95.2	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	78.8	70.0	130



Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572263) - continued							
ES2512891-001	Anonymous	EG020A-F: Lead	7439-92-1	1 mg/L	98.1	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	88.0	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	90.0	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	93.9	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 6572267)							
ES2513381-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	106	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	110	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	101	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	109	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	104	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	107	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	111	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	110	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 6572266)							
ED2500732-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	77.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6569671)							
ES2512795-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.5 mg/L	98.0	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6569674)							
ES2513348-005	QUARRY PIT (QP)	EK055G: Ammonia as N	7664-41-7	0.5 mg/L	111	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6564717)							
EN2507526-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	100	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6564722)							
ES2513348-007	DOWNSTREAM (DS)	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	106	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6569672)							
ES2512795-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	98.8	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6569673)							
ES2513348-005	QUARRY PIT (QP)	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6569668)							
ES2512795-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	95.5	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6569669)							
ES2513348-004	QA	EK061G: Total Kjeldahl Nitrogen as N	----	100 mg/L	71.8	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6569667)							
ES2512795-002	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	91.1	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6564720)							



Sub-Matrix: WATER				Matrix Spike (MS) Report				
				Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%)		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6564720) - continued								
ES2513204-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	# Not Determined	70.0	130	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6563146)								
ES2513314-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	99.4	70.0	130	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6563146)								
ES2513314-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	104	70.0	130	
EP080: BTEXN (QCLot: 6563146)								
ES2513314-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	100	70.0	130	
		EP080: Toluene	108-88-3	25 µg/L	98.0	70.0	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	108	70.0	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	111	70.0	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	113	70.0	130	
	EP080: Naphthalene	91-20-3	25 µg/L	107	70.0	130		



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2513348	Page	: 1 of 10
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAL COUPE	Telephone	: +61-2-8784 8555
Project	: E240981	Date Samples Received	: 08-May-2025
Site	: ----	Issue Date	: 16-May-2025
Sampler	: JONATHON SCHACHT (JS)	No. of samples received	: 8
Order number	: ----	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, where applicable to the methodology, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	ES2513348--005	QUARRY PIT (QP)	Nitrite + Nitrate as N	----	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EK071G: Reactive Phosphorus as P by discrete analyse	ES2513204--001	Anonymous	Reactive Phosphorus as P	14265-44-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis			
	Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural BSM1, QA, UPSTREAM (US), MIDSTREAM	BSM2, QUARRY PIT (QP), DOWNSTREAM (DS),	----	----	----	10-May-2025	09-May-2025	1
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	----	----	----	10-May-2025	09-May-2025	1

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Method	Count		Rate (%)		Quality Control Specification
		QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)						
Oil and Grease	EP020	2	38	5.26	8.00	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)						
Oil and Grease	EP020	2	38	5.26	6.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
TRH - Semivolatile Fraction	EP071	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Quality Control Sample Type	Method	Count		Rate (%)		Quality Control Specification
		QC	Regular	Actual	Expected	
Matrix Spikes (MS) - Continued						
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	13-May-2025	14-May-2025	✓
ED093F: SAR and Hardness Calculations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)								
BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	14-May-2025	04-Jun-2025	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)								
BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	14-May-2025	03-Nov-2025	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)								
BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	15-May-2025	04-Jun-2025	✓



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) MIDSTREAM	07-May-2025	----	----	----	13-May-2025	04-Jun-2025	✓
Clear Plastic Bottle - Sulfuric Acid (EK055G) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS) BSM2, QA, UPSTREAM (US),	07-May-2025	----	----	----	14-May-2025	04-Jun-2025	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) BSM1, BSM2	07-May-2025	----	----	----	10-May-2025	09-May-2025	*
Clear Plastic Bottle - Natural (EK057G) BSM3	07-May-2025	----	----	----	09-May-2025	09-May-2025	✓
Clear Plastic Bottle - Natural (EK057G) QA, UPSTREAM (US), MIDSTREAM QUARRY PIT (QP), DOWNSTREAM (DS),	07-May-2025	----	----	----	10-May-2025	09-May-2025	*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) MIDSTREAM	07-May-2025	----	----	----	13-May-2025	04-Jun-2025	✓
Clear Plastic Bottle - Sulfuric Acid (EK059G) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS) BSM2, QA, UPSTREAM (US),	07-May-2025	----	----	----	14-May-2025	04-Jun-2025	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	13-May-2025	04-Jun-2025	✓	13-May-2025	04-Jun-2025	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	13-May-2025	04-Jun-2025	✓	13-May-2025	04-Jun-2025	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	10-May-2025	09-May-2025	*



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP020: Oil and Grease (O&G)								
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	----	----	----	14-May-2025	04-Jun-2025	✓	
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071-SVSG) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓	
EP071 SG: Total Petroleum Hydrocarbons - SV Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071-SVSG) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071-SVSG) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓	
EP071 SG: Total Recoverable Hydrocarbons - SV NEPM 2013 Fractions - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071-SVSG) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS), BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓	



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) BSM3, UPSTREAM (US), MIDSTREAM	QUARRY PIT (QP), DOWNSTREAM (DS),	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓
Amber Glass Bottle - Unpreserved (EP071) BSM1, QA	BSM2,	07-May-2025	09-May-2025	14-May-2025	✓	15-May-2025	18-Jun-2025	✓
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	13-May-2025	21-May-2025	✓	13-May-2025	21-May-2025	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) BSM3, UPSTREAM (US), MIDSTREAM	QUARRY PIT (QP), DOWNSTREAM (DS),	07-May-2025	09-May-2025	14-May-2025	✓	13-May-2025	18-Jun-2025	✓
Amber Glass Bottle - Unpreserved (EP071) BSM1, QA	BSM2,	07-May-2025	09-May-2025	14-May-2025	✓	15-May-2025	18-Jun-2025	✓
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	13-May-2025	21-May-2025	✓	13-May-2025	21-May-2025	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) BSM1, BSM3, QUARRY PIT (QP), DOWNSTREAM (DS),	BSM2, QA, UPSTREAM (US), MIDSTREAM	07-May-2025	13-May-2025	21-May-2025	✓	13-May-2025	21-May-2025	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✘ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reaular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	4	30	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	34	11.76	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	38	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	33	12.12	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	4	30	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	8	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	0	8	0.00	10.00	✘	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	33	6.06	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	2	38	5.26	8.00	✘	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	6	30	20.00	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	33	6.06	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	2	38	5.26	6.00	✘	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Analytical Methods							
Method Blanks (MB) - Continued							
Suspended Solids (High Level)	EA025H	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	34	5.88	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	38	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	33	6.06	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	8	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	0	8	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH ₃ G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO ₂ - B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO ₃ -. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH - Semivolatile Fractions Only (after Silica Gel Cleanup)	EP071-SVSG	WATER	In house: Referenced to USEPA SW 846 - 8015 Sample extracts cleaned up using silica gel and are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.



CHAIN OF CUSTODY

ALS Laboratory, please tick →

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SYDNEY 277-289 Cockatoo Road, Smithfield NSW 2168
Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

CLIENT: EMM Consulting Pty Ltd	TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	<input type="checkbox"/> Non Standard or urgent TAT (List due date):	FOR L Custody
OFFICE: Sydney	ALS QUOTE NO.: EN/111/24	COC SEQUENCE NUMBER (Circle)	Free ice receipt?
PROJECT: E240981 PROJECT NO E240981	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	Random
ORDER NUMBER: PURCHASE ORDER NO.:	CONTACT PH: 0439 694 514	OF: 1 2 3 4 5 6 7	Other c
PROJECT MANAGER: Tasman Coupe	SAMPLER MOBILE: 0497 154 233	RELINQUISHED BY: Jonathon Schacht	RECEIVED BY: <i>[Signature]</i>
SAMPLER: Jonathon Schacht (JS)	EDD FORMAT (or default):	DATE/TIME: 8:45 am 8/5/25	DATE/TIME: 8/5/25 1400
COC Emailed to ALS? Yes	Email Reports to: tcoupe@emmconsulting.com.au, jschacht@emmconsulting.com.au, emmconsulting@esdat.net		
Email Invoice to: tcoupe@emmconsulting.com.au, jschacht@emmconsulting.com.au			

Environmental Division
Sydney
Work Order Reference
ES2513348



Telephone - 81-2-8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: All metals dissolved. Add Chromatograms to analysis report.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Total Suspended Solids (EA025H)	Nutrients (NT-8A)	Dissolved metals (W-30) Plus Boron and Manganese	Oil and grease (EP020)	BTEXN and TRH Silica Gel (Pre and Post) (W-4 and W-4SG)	Total hardness	
1	BSM1	7/5/25 12:45	w		7	x	x	x	x	x	x	All metals dissolved. Add Chromatograms to analysis report.
2	BSM2	14:25	w		7	x	x	x	x	x	x	All metals dissolved. Add Chromatograms to analysis report.
3	BSM3	15:50	w		7	x	x	x	x	x	x	All metals dissolved. Add Chromatograms to analysis report.
4	QA	14:25	w		7	x	x	x	x	x	x	All metals dissolved. Add Chromatograms to analysis report.
5	QUARRY PIT (QP)	12:15	w		7	x	x	x	x	x	x	Bottles labelled as QP. All metals dissolved. Add Chromatograms to analysis report.
6	UPSTREAM (US)	16:20	w		7	x	x	x	x	x	x	Bottles labelled as US. All metals dissolved. Add Chromatograms to analysis report.
7	DOWNSTREAM (DS)	17:00	w		7	x	x	x	x	x	x	Bottles labelled as DS. All metals dissolved. Add Chromatograms to analysis report.
8	WATER MANAGEMENT DAM (WMD)	16:40	w		7	x	x	x	x	x	x	Bottles labelled as WMD. All metals dissolved. Add Chromatograms to analysis report.
TOTAL					64							

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugol's Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Appendix F

Field data

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM1	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	Jono Schacht	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	07/05/2025 09:44	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	15.85
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	30.3
Well diameter (mm)	50		
Comments			

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input checked="" type="checkbox"/> Bailer	Disposable?	yes
		Volume (L)	1
	<input type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	
		Volume (L)	
		New hydrasleeve installed following sampling?	
<input type="checkbox"/> Other	Comments		

Water quality meter model

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM2	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	Jono Schacht	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	07/05/2025 13:08	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	10.03
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	29.64
Well diameter (mm)	50		
Comments			

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input checked="" type="checkbox"/> Bailer	Disposable?	yes
		Volume (L)	1
	<input type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	
		Volume (L)	
		New hydrasleeve installed following sampling?	
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI DSI Pro
----------------------------------	-------------



Photo 1

Location: /

Direction: ° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM3	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	Jono Schacht	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	07/05/2025 14:50	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	12.6
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	31.6
Well diameter (mm)	50		
Comments	Well monument lid and difficult to open. Logger present unknown who owns it.		

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input checked="" type="checkbox"/> Bailer	Disposable?	yes
		Volume (L)	1
	<input type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	
		Volume (L)	
		New hydrasleeve installed following sampling?	
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI DSI Pro
----------------------------------	-------------

Surface water sampling field sheet

Job number	E240981	Location ID	Downstream
Project	Luddenham Quarry	Field staff	JS
Client	CPG	Date	07/05/2025 16:59

Site

Latitude	0	Longitude	0
Weather	Clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Stagnant, water is approximately 0.5 m deep, vegetated		

Sampling equipment

Sampling method	Sampling pole
Water quality meter model	Pro DSS

Field parameters

PID (ppm)		Redox (mV)	20.6
pH	7.31	Dissolved oxygen (mg/L)	53.8
Electrical conductivity (uS/cm)	2770	Temperature (degC)	17
Comments	7.31		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	DS
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: ° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Downstream



Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	MIDSTREAM (replacement location adjacent to WMD)
Project	Luddenham Quarry	Field staff	JS
Client	CPG	Date	07/05/2025 16:38

Site

Latitude	0	Longitude	0
Weather	clear		

 Dry weather event
 Wet weather event (rain in previous 24 hrs)

Site description	Water management dam that is sampled as existing WMD location is currently impacted by construction works associated with the ARRF. Replacement sampling location "MIDSTREAM" is adjacent to WMD sampling location within Oaky Creek.
-------------------------	---

Sampling equipment

Sampling method	By hand
Water quality meter model	YSI DSI PRO

Field parameters

PID (ppm)	NA	Redox (mV)	30.3
pH	8.53	Dissolved oxygen (mg/L)	114.5
Electrical conductivity (uS/cm)	4465	Temperature (degC)	20.4
Comments	8.53		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	WMD
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: ° clockwise from north



Photo 2

Location: /

Direction: ° clockwise from north

Downstream



Photo 3

Location: /

Direction: ° clockwise from north



Photo 4

Location: /

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	Quarry Pit (QP)
Project	Luddenham Quarry	Field staff	JS
Client	CPG	Date	07/05/2025 12:07

Site

Latitude	0	Longitude	0
Weather	clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Water level increased from last visit. Green in colour. No odour.		

Sampling equipment

Sampling method	Sampling pole
Water quality meter model	YSI Pro DSS

Field parameters

PID (ppm)		Redox (mV)	74.8
pH	8.71	Dissolved oxygen (mg/L)	139.5
Electrical conductivity (uS/cm)	6606	Temperature (degC)	22.5
Comments	8.71		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	QP
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: ° clockwise from north



Photo 2

Location: /

Direction: ° clockwise from north

Downstream

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	Upstream
Project	Luddenham Quarry	Field staff	JS
Client	CPG	Date	07/05/2025 16:18

Site

Latitude	0	Longitude	0
Weather	clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Stagnant, depth: 0.2m, bank conditions: vegetated and some signs of sheer stress.		

Sampling equipment

Sampling method	By hand.
Water quality meter model	YSI PRO DSS

Field parameters

PID (ppm)		Redox (mV)	-11.6
pH	6.98	Dissolved oxygen (mg/L)	33.6
Electrical conductivity (uS/cm)	1805	Temperature (degC)	18.9
Comments	6.98		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	US
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: ° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Downstream



Photo 3

Location: /

Direction: ° clockwise from north



Photo 4

Location: /

Direction: ° clockwise from north

Appendix G

Calibration certificates



Instrument **YSI ProDSS**
 Serial No. **15J100067**

Air-Met Scientific Pty Ltd
 1800 000 744

Item	Test	Pass	Comments	
Battery	Charge Condition	✓		
	Fuses	✓		
	Capacity	✓		
Switch/keypad	Operation	✓		
	Display	Intensity	✓	
		Operation (segments)	✓	
Grill Filter	Condition	✓		
	Seal	✓		
PCB	Condition	✓		
Connectors	Condition	✓		
Sensor	1. pH	✓		
	2. mV	✓		
	3. EC	✓		
	4. D.O	✓		
	5. Temp	✓		
Alarms	Beeper			
	Settings			
Software	Version			
Data logger	Operation			
Download	Operation			
Other tests:				

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0ppm		432901	0ppm
2. Conductivity		2760µS		436693	2760µS
3. pH7		pH 7		433551	pH 7
4. pH4		pH 4		438363	pH 4
5. Temp °C		21.4°C		MultTherm	21.4°C
6. ORP mV		230.92mV		439985/435258	230.92mV
7. Turbidity		0 NTU		Distilled Water	0 NTU
8. Turbidity		100 NTU		440963	100 NTU

Calibrated by: Chris Nicdao

Calibration date: 5-May-25

Next calibration due: 1-Nov-25

Appendix H

Mann-Kendall Trend Analysis



Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options

Date/Time of Computation ProUCL 5.2 29/05/2025 3:01:44 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

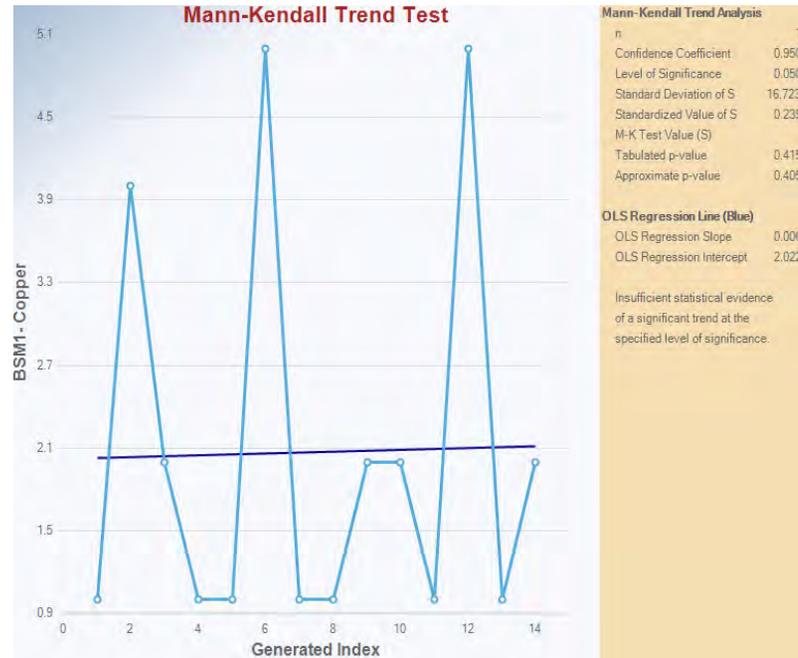
BSM1- Copper

General Statistics

Number or Reported Events Not Used 0
 Number of Generated Events 14
 Number Values Reported (n) 14
 Minimum 1
 Maximum 5
 Mean 2.071
 Geometric Mean 1.694
 Median 1.5
 Standard Deviation 1.492
 Coefficient of Variation 0.72

Mann-Kendall Test

M-K Test Value (S) 5
 Tabulated p-value 0.415
 Standard Deviation of S 16.72
 Standardized Value of S 0.239
 Approximate p-value 0.405



Insufficient evidence to identify a significant trend at the specified level of significance.

User Selected Options

Date/Time of Computation ProUCL 5.2 29/05/2025 3:03:56 PM
From File WorkSheet.xls
Full Precision OFF
Confidence Coefficient 0.95
Level of Significance 0.05

BSM1- Manganese

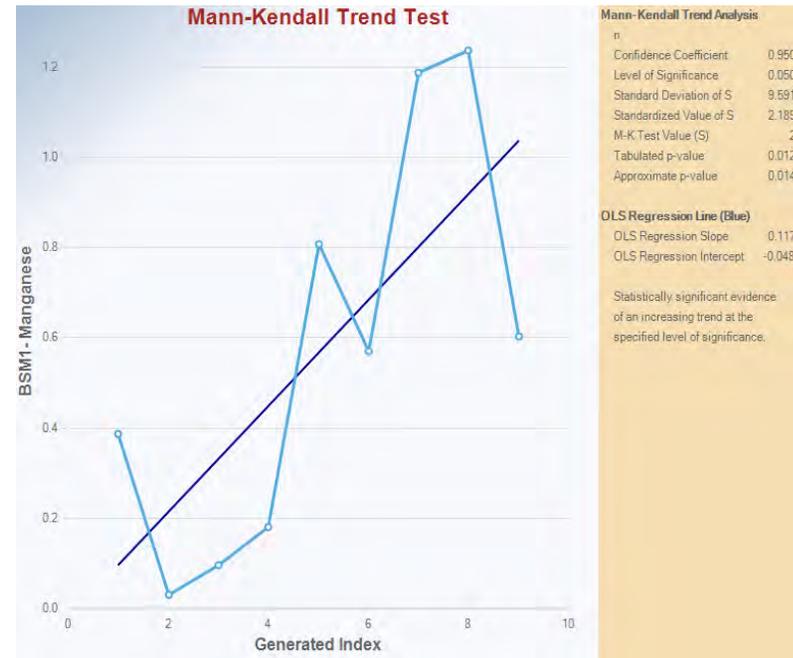
General Statistics

Number or Reported Events Not Used 0
Number of Generated Events 9
Number Values Reported (n) 9
Minimum 0.003
Maximum 1.21
Mean 0.539
Geometric Mean 0.251
Median 0.544
Standard Deviation 0.445
Coefficient of Variation 0.825

Mann-Kendall Test

M-K Test Value (S) 22
Tabulated p-value 0.012
Standard Deviation of S 9.592
Standardized Value of S 2.189
Approximate p-value 0.0143

Statistically significant evidence of an increasing trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

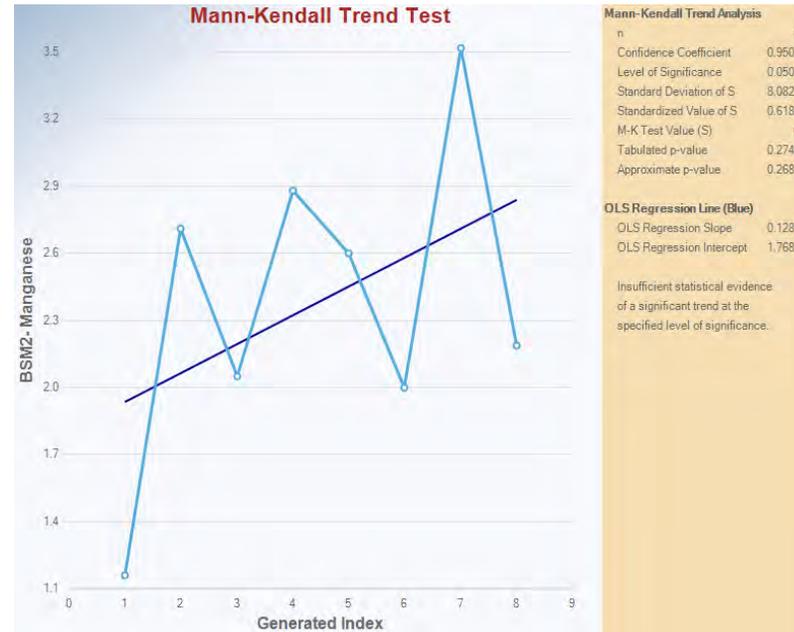
User Selected Options
Date/Time of Computation ProUCL 5.2 29/05/2025 3:05:05 PM
From File WorkSheet.xls
Full Precision OFF
Confidence Coefficient 0.95
Level of Significance 0.05

BSM2- Manganese

General Statistics
Number of Reported Events Not Used 0
Number of Generated Events 8
Number Values Reported (n) 8
Minimum 1.12
Maximum 3.48
Mean 2.349
Geometric Mean 2.243
Median 2.355
Standard Deviation 0.705
Coefficient of Variation 0.3

Mann-Kendall Test
M-K Test Value (S) 6
Tabulated p-value 0.274
Standard Deviation of S 8.083
Standardized Value of S 0.619
Approximate p-value 0.268

Insufficient evidence to identify a significant trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options
 Date/Time of Computation ProUCL 5.2 29/05/2025 3:07:46 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM3- Manganese

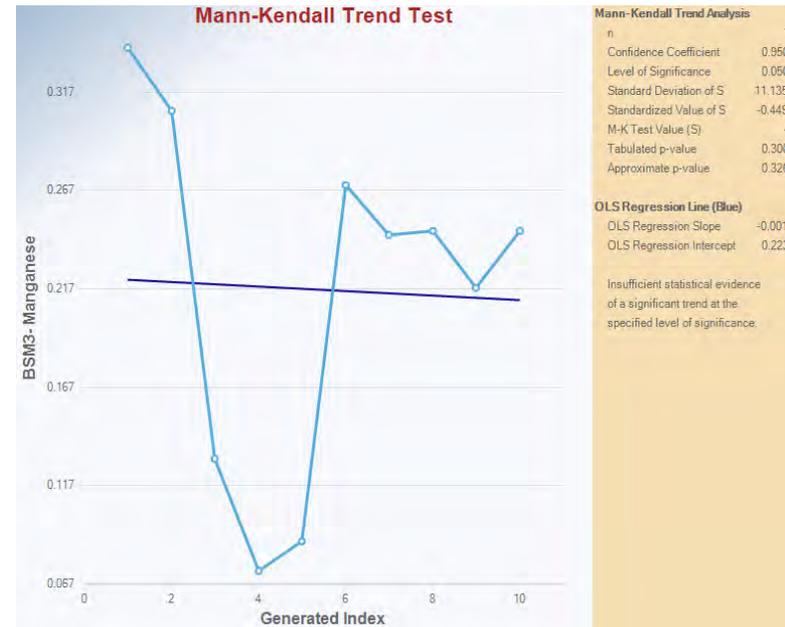
General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	10
Number Values Reported (n)	10
Minimum	0.074
Maximum	0.34
Mean	0.217
Geometric Mean	0.195
Median	0.246
Standard Deviation	0.0901
Coefficient of Variation	0.415

Mann-Kendall Test

M-K Test Value (S)	-6
Tabulated p-value	0.3
Standard Deviation of S	11.14
Standardized Value of S	-0.449
Approximate p-value	0.327

Insufficient evidence to identify a significant trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options
 Date/Time of Computation ProUCL 5.2 29/05/2025 3:18:59 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM1- Ammonia

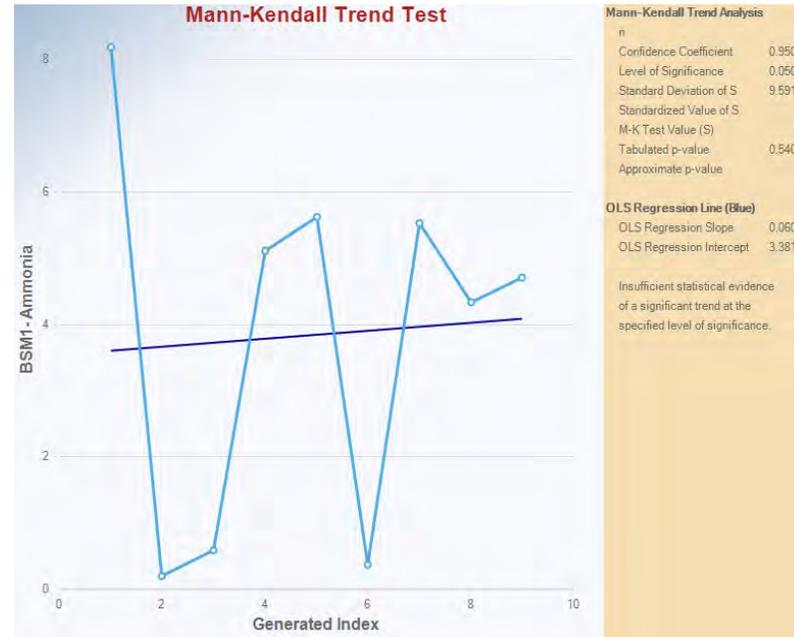
General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	9
Number Values Reported (n)	9
Minimum	0.03
Maximum	8.02
Mean	3.681
Geometric Mean	1.562
Median	4.53
Standard Deviation	2.816
Coefficient of Variation	0.765

Mann-Kendall Test

M-K Test Value (S)	0
Tabulated p-value	0.54
Standard Deviation of S	9.592
Standardized Value of S	N/A
Approximate p-value	N/A

Insufficient evidence to identify a significant trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options

Date/Time of Computation ProUCL 5.2 29/05/2025 3:08:58 PM
From File WorkSheet.xls
Full Precision OFF
Confidence Coefficient 0.95
Level of Significance 0.05

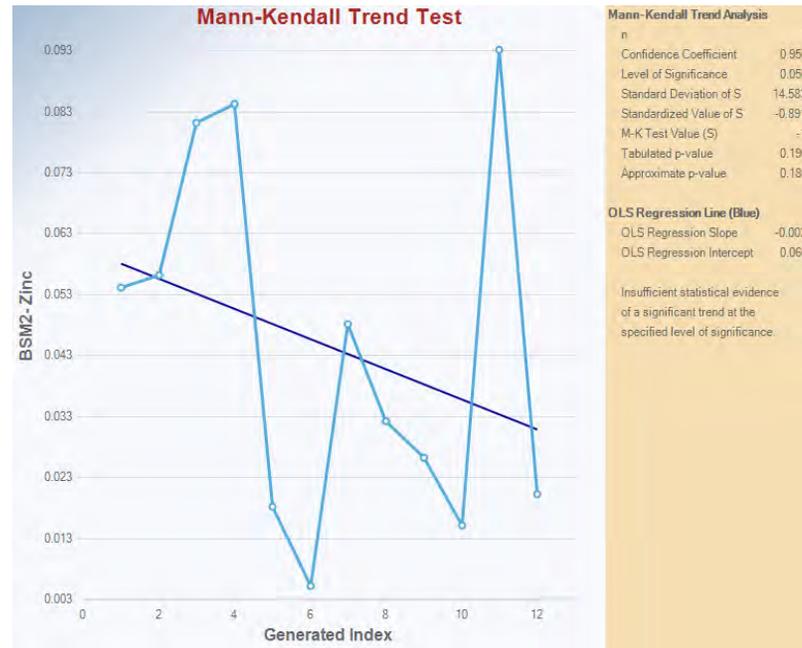
BSM2- Zinc

General Statistics

Number of Reported Events Not Used 0
Number of Generated Events 12
Number Values Reported (n) 12
Minimum 0.005
Maximum 0.093
Mean 0.0443
Geometric Mean 0.0336
Median 0.04
Standard Deviation 0.0297
Coefficient of Variation 0.67

Mann-Kendall Test

M-K Test Value (S) -14
Tabulated p-value 0.19
Standard Deviation of S 14.58
Standardized Value of S -0.891
Approximate p-value 0.186



Insufficient evidence to identify a significant trend at the specified level of significance.



Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

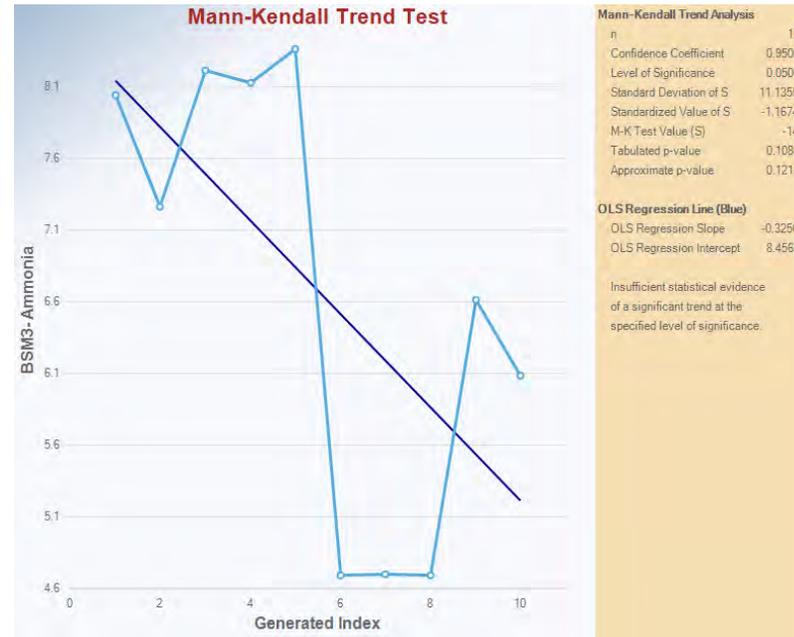
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 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM3- Ammonia

General Statistics
 Number or Reported Events Not Used 0
 Number of Generated Events 10
 Number Values Reported (n) 10
 Minimum 4.68
 Maximum 8.35
 Mean 6.666
 Geometric Mean 6.492
 Median 6.925
 Standard Deviation 1.55
 Coefficient of Variation 0.233

Mann-Kendall Test
 M-K Test Value (S) -14
 Tabulated p-value 0.108
 Standard Deviation of S 11.14
 Standardized Value of S -1.167
 Approximate p-value 0.122

Insufficient evidence to identify a significant trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

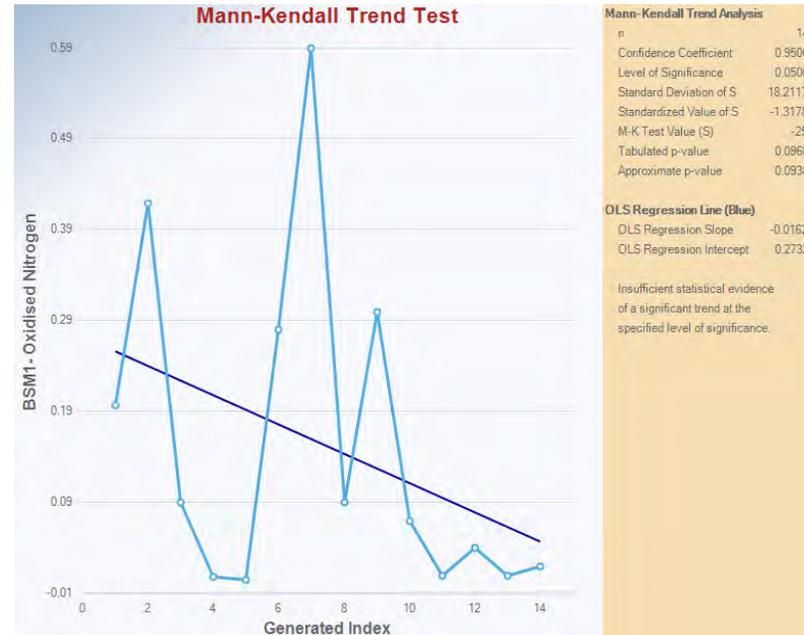
Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options
 Date/Time of Computation ProUCL 5.2 29/05/2025 3:22:05 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM1- Oxidised Nitrogen

General Statistics
 Number or Reported Events Not Used 0
 Number of Generated Events 14
 Number Values Reported (n) 14
 Minimum 0.005
 Maximum 0.59
 Mean 0.152
 Geometric Mean 0.0598
 Median 0.08
 Standard Deviation 0.182
 Coefficient of Variation 1.197

Mann-Kendall Test
 M-K Test Value (S) -25
 Tabulated p-value 0.096
 Standard Deviation of S 18.21
 Standardized Value of S -1.318
 Approximate p-value 0.0938



Insufficient evidence to identify a significant trend at the specified level of significance.

User Selected Options

Date/Time of Computation ProUCL 5.2 29/05/2025 3:23:15 PM
From File WorkSheet.xls
Full Precision OFF
Confidence Coefficient 0.95
Level of Significance 0.05

BSM2- Oxidised Nitrogen

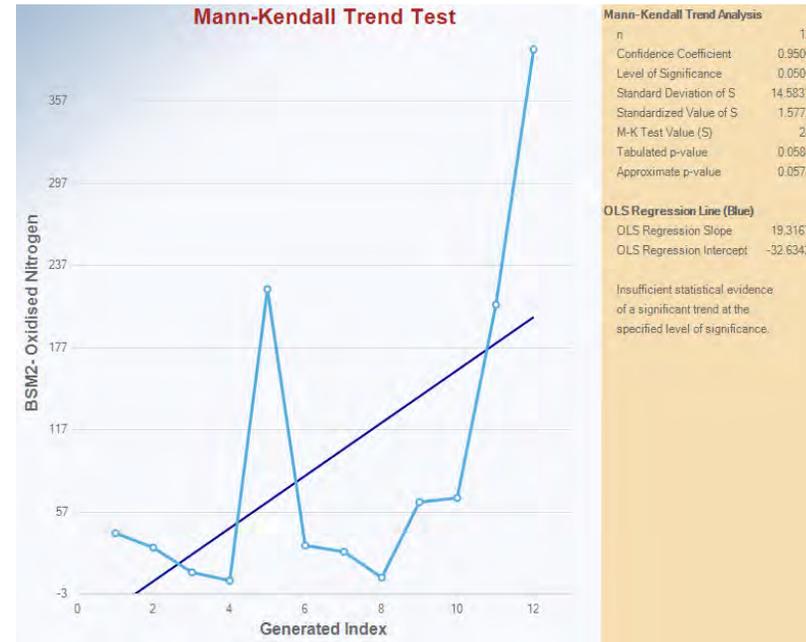
General Statistics

Number or Reported Events Not Used 0
Number of Generated Events 12
Number Values Reported (n) 12
Minimum 6.62
Maximum 395
Mean 92.92
Geometric Mean 44.95
Median 36.74
Standard Deviation 119.7
Coefficient of Variation 1.288

Mann-Kendall Test

M-K Test Value (S) 24
Tabulated p-value 0.058
Standard Deviation of S 14.58
Standardized Value of S 1.577
Approximate p-value 0.0574

Insufficient evidence to identify a significant trend at the specified level of significance.





Appendix H
Mann-Kendall Trend Test Analysis

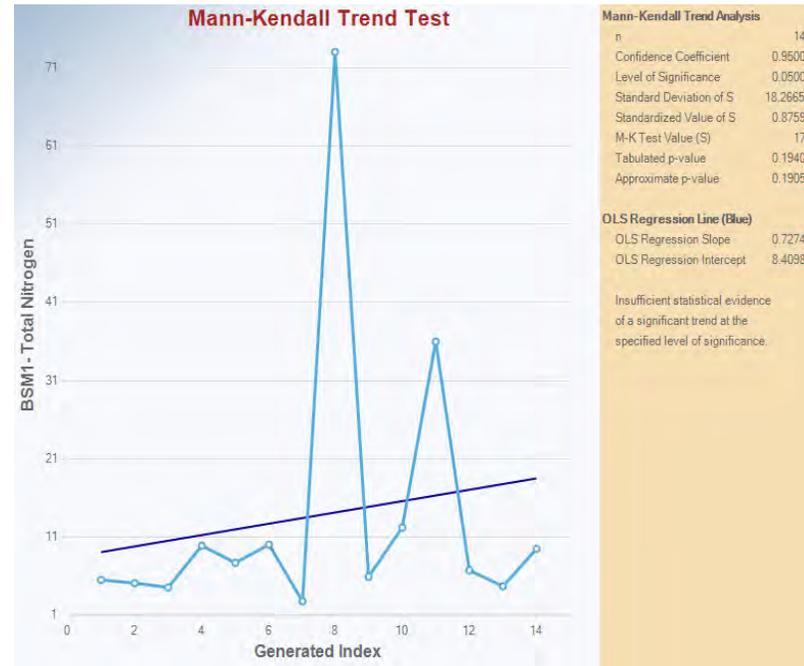
Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options
 Date/Time of Computation ProUCL 5.2 29/05/2025 3:24:41 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM1- Total Nitrogen

General Statistics
 Number or Reported Events Not Used 0
 Number of Generated Events 14
 Number Values Reported (n) 14
 Minimum 2.8
 Maximum 73.1
 Mean 13.87
 Geometric Mean 8.79
 Median 7.25
 Standard Deviation 18.89
 Coefficient of Variation 1.362

Mann-Kendall Test
 M-K Test Value (S) 17
 Tabulated p-value 0.194
 Standard Deviation of S 18.27
 Standardized Value of S 0.876
 Approximate p-value 0.191



Insufficient evidence to identify a significant trend at the specified level of significance.



Appendix H
Mann-Kendall Trend Test Analysis

Luddenham Quarry
May 2025 monitoring
E240981

User Selected Options
 Date/Time of Computation ProUCL 5.2 29/05/2025 3:26:11 PM
 From File WorkSheet.xls
 Full Precision OFF
 Confidence Coefficient 0.95
 Level of Significance 0.05

BSM2- Total Nitrogen

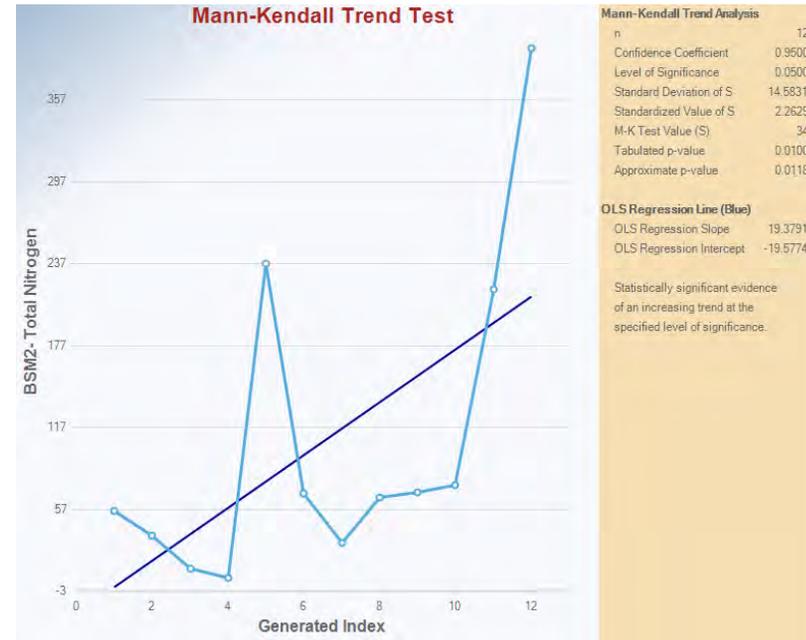
General Statistics

Number or Reported Events Not Used	0
Number of Generated Events	12
Number Values Reported (n)	12
Minimum	6.82
Maximum	395
Mean	106.4
Geometric Mean	61.91
Median	67.35
Standard Deviation	116.5
Coefficient of Variation	1.095

Mann-Kendall Test

M-K Test Value (S)	34
Tabulated p-value	0.01
Standard Deviation of S	14.58
Standardized Value of S	2.263
Approximate p-value	0.0118

Statistically significant evidence of an increasing trend at the specified level of significance.



Memorandum

13 August 2025

To: Elena Ivanova
Environmental & Planning Manager
Coombes Property Group

From: Tasman Coupe

Subject: Luddenham Quarry SWMP monitoring results (Q4 - 2024/2025)

Dear Elena,

1 Background

This memorandum outlines groundwater and surface water quality and level monitoring undertaken by EMM Consulting Pty Ltd (EMM) on behalf of Coombes Property Group (CPG) at Luddenham Quarry (the site), as required by the water monitoring program that was developed as part of the Soil and Water Management Plan (SWMP) (EMM 2021).

The program commenced in March 2022 and involves quarterly groundwater and annual surface water monitoring at seven locations: groundwater locations BSM1, BSM2 and BSM3 and surface water locations downstream, upstream, quarry pit and water management dam). Refer to Appendix A for monitoring locations. Previous monitoring events have occurred on the following dates: 11 March 2022, 31 August 2022, 24 August 2023, 14 December 2023, 27 March 2024, 23 May 2024, 7 August 2024, 4 December 2024. 4 March 2025 and 7 May 2025.

Following bore replacement at BSM1 and BSM2 in 2023, and subsequent monitoring producing anomalous results, redevelopment of the bores was undertaken in late 2023 with an augmented analytical suite routinely completed to inform root cause analysis.

2 Program overview

Monitoring outlined in this report was completed by Jude Lewis, an environmental scientist on 17 July 2025 for the period of June to August 2025 (Q4 of the 2024–2025 annual review period).

2.1 Rainfall context

The Bureau of Meteorology operates a rain gauge at Badgerys Creek (approximately 3 kilometres (km) from the site – Station number: 067108); no rain was recorded at the station in the five days preceding the monitoring event or on the day sampling was undertaken.

2.2 Water quality analytes

The analytical suite for the monitoring program is presented in Table 2.1. Physical and chemical stressors (except for total suspended solids) are monitored in the field with a calibrated hand-held water quality meter. All other parameters are analysed at a laboratory accredited by the National Association of Testing Authorities (NATA).

Detailed hydrocarbon analysis was added to the analytical suite as recommended in the 2023/2024 Q2 groundwater monitoring report, to assist in determining the likely source of oil and grease found in previous monitoring (i.e. lubricants used as part of the drilling process, oils or greases used as part of quarry operations, diesel, etc).

In 2023/2024 Q4, silica gel cleanup was added to the analytical process of testing for hydrocarbons. Silica is a polar material that is used to adsorb (remove) non-hydrocarbon polar organics during the sample extraction process. As subsequent testing identified limited locations with detectable concentrations of hydrocarbons, the hydrocarbon analysis program was reduced these locations (BSM1 and BSM2).

Table 2.1 Water quality analytes

Category	Parameters	Analysis method
Physical and chemical stressors	Dissolved oxygen (DO), electrical conductivity (EC), pH, total dissolved solids (TDS), turbidity.	In the field with a calibrated hand-held water quality meter.
	Total suspended solids.	Analysis undertaken at NATA accredited laboratory.
Nutrients	Ammonia, nitrate, nitrite, total Kjeldahl nitrogen, total nitrogen, reactive phosphorus, total phosphorus.	
Dissolved metals	Aluminium, arsenic, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc.	
Other	Total hardness, oil and grease.	
Hydrocarbons ¹	Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), total petroleum hydrocarbon (TRH/TPH) pre- and post-Silica Gel Cleanup.	

Notes: 1. Hydrocarbon analysis undertaken for exceedance investigations from previous monitoring rounds.

Laboratory certificates are presented in Appendix E. Calibration certificates are provided in Appendix G.

2.3 Laboratory analysis

Water samples were transported to a NATA-accredited laboratory (Australian Laboratory Services (ALS) in Smithfield, NSW for analysis. All analytes not measured during purging (i.e. pH, EC, DO and oxidation-reduction potential) were received by the laboratory within the recommended holding times.

2.4 Quality assurance/quality control

Samples were collected in laboratory-provided sample containers with appropriate preservation. Samples were collected and sent to the laboratory under appropriate chain of custody protocols.

The field quality assurance/quality control (QA/QC) procedures used to establish accurate, reliable, and precise results included:

- calibration of equipment by the supplier before use
- keeping samples chilled
- submitting laboratory samples within holding times
- wearing disposable nitrile gloves during sampling at each sampling location
- using dedicated sampling equipment
- collection of a field duplicate sample.

QA/QC was assessed by calculating relative percentage difference (RPD) of the field duplicate ($S_{\text{duplicate}}$) sample to the parent sample (S_{parent}) as per the following equation.

$$\text{Relative \% difference} = \frac{|S_{\text{parent}} - S_{\text{Duplicate}}|}{\frac{S_{\text{parent}} + S_{\text{Duplicate}}}{2}} \times 100$$

Results were considered to confirm acceptable degree of data quality where RPDs were below 30%.

Most results for the monitoring round were within RPD limits (refer Appendix C), indicating adequate QA/QC. Zinc reported RPD above the data quality limit. Both primary and duplicate results were within the historical range reported for zinc concentrations and exceeded the site assessment criteria and ANZG freshwater guideline values. Hence, this conformance outlier is not considered likely to impact the conclusions or overall data quality of this investigations.

3 Monitoring results

Key results are discussed in Section 3 and detailed results are provided in the following appendices:

- Appendix B: Groundwater levels.
- Appendix C: Water quality monitoring results.
- Appendix D: Water quality timeseries charts.

3.1 Groundwater levels

Water levels are monitored using an interface probe at each monitoring bore during sampling. Based on the Soil and water management plan (EMM, 2021)¹, a deviation of two meters from the long-term median groundwater level in the quarry monitoring bores is considered a trigger for further action as per the groundwater trigger action response plan (Table B.2, EMM 2021). Two meters (m) has been used as the trigger as the deviation value aligns with the minimal impact considerations of the aquifer interference activities stated in the NSW Aquifer Interference Policy (DPI 2012).

¹ EMM, 2021. *Luddenham Quarry Soil and Water Management Plan*. Doc Ref: J190749 RP49. 22 September 2021

Following recommendations in the March 2025 groundwater monitoring memorandum (EMM 2025), a resurvey of the groundwater wells was undertaken by Total Surveying Solutions on 14 April 2025, as provided by the Client. Water levels since the May 2025 monitoring period are calculated based on the resurveyed well data. Water levels and survey data are presented in Appendix B. For context, the average baseline and subsequent upper and lower trigger values are presented in Table 3.1.

Table 3.1 Water level trigger values

Well ID	Average Baseline (mAHD)	Upper SWL Trigger (mAHD)	Lower SWL Trigger (mAHD)	July 2025 SWL (mAHD)
BSM1	58.13	60.13	56.13	58.01
BSM2	50.68	52.68	48.68	52.81
BSM3	46.29	48.29	44.29	50.15

All three groundwater bores were within the historical range since the program commenced in March 2022.

BSM1 was within 2 m of the baseline average whilst both BSM2 and BSM3 were observed above the 2 m trigger as prescribed by the WMP (EMM 2021). Based on the survey data, it appears the wells have consistently exceeded the 2 m trigger across the 12 monitoring events at BSM1 (4 occasions), BSM2 (10 occasions) and BSM3 (12 occasions). This represents an increase and thus part of the TARP triggers relating to distance drawdown effects is not applicable.

Upon consultation with CPG, it is understood no quantitative historical monitoring of the water level within the quarry pit has been undertaken. Anecdotal evidence indicates the base of the quarry pit to be approximately 30 metres below ground level (m bgl) which would indicate the pit is not the source of the sustained increased water level.

3.2 Groundwater quality

Field observations for completed groundwater monitoring are presented in Table 3.2. Data collected in the field is presented in Appendix F.

Table 3.2 Field observations (groundwater monitoring)

Time of sample	Monitoring point	Site description	Field comments/context
Groundwater sampling locations			
17/07/2025 13:13 pm	BSM1	Upgradient bore to measure background contamination levels. Located near the western site boundary in the southern portion of the site, to the west of the site access/haul road.	Clear, colourless, strong sulphur smell, no sheen observed.
17/07/2025 10:13 am and 10:50 am	BSM2	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oaky Creek. Two samples were taken from this bore during the July monitoring round; one from ~1 m below the standing water level (labelled BSM2_shallow) and one from the middle of the screened water column.	Bore water was clear and colourless, with no odour or sheen observed during sampling. A field duplicate was taken as a quality assurance (QA) sample at this bore.

Time of sample	Monitoring point	Site description	Field comments/context
Groundwater sampling locations			
17/07/2025 11:55 am	BSM3	Bore which is down hydraulically gradient to the quarry pit and BSM1. Located along the eastern downslope perimeter of the quarry, outside the 40 m vegetated riparian zone associated with the western banks of Oaky Creek.	Clear and colourless, slight sulphurous odour, no sheen.

Groundwater quality results are presented in Appendix C. Key observations of groundwater quality for the monitoring period include the following:

- pH was slightly acidic to circumneutral (6.29–6.7) in all bores.
- Salinity, as indicated by EC, was lower in upgradient BSM1 (6,276 microsiemens per centimetre ($\mu\text{S}/\text{cm}$)) compared to downgradient wells BSM2 (13,556 $\mu\text{S}/\text{cm}$ (shallow) 23,393 $\mu\text{S}/\text{cm}$ (deep)) and BSM3 (22,730 $\mu\text{S}/\text{cm}$), all reporting within historical ranges. BSM1 results are low, compared to baseline trends (22,560 $\mu\text{S}/\text{cm}$ at BSM1) potentially indicating freshwater ingress.
- Nutrients remain present in all bores and significantly elevated above baseline for nitrate in BSM2 (684 milligrams per litre (mg/L)). This represents the highest concentrations on record for nitrate with the previous two highest concentrations (395mg/L and 218 mg/L) reported in May 2025 and the round following reinstallation (August 2021), respectively. All surface water locations reported nutrient levels more than an order of magnitude below BSM2. The source of the nitrate is unknown, with nearby potential sources comprising fertilization of agricultural land, country club and revegetation of the adjacent airport.
- Following sustained elevated and increasing nitrogen results in BSM2, concentration profiling using hydrasleeve discrete sampling was undertaken to determine if the source of the nitrogen could be informed by sample depth within the screened water column. Concentrations of nitrogen, in its most common form (nitrate) were highest in the shallow sample taken at BSM2. The reported concentration in the shallow sample from BSM2 for nitrate, and subsequently total and oxidised nitrogen, is the highest on record.
- Elevated metals were noted in some bores (discussed in Section 3.4).
- Detectable concentrations of TRH ($\text{C}_{10}\text{-C}_{16}$ of 260 micrograms per litre ($\mu\text{g}/\text{L}$)) and TPH ($\text{C}_{15}\text{-C}_{28}$ of 340 $\mu\text{g}/\text{L}$) were again observed in BSM1 with no hydrocarbons reported above detection limits following silica gel clean-up.

3.3 Surface water quality

Field observations for completed surface water monitoring are presented in Table 3.3.

Table 3.3 Field observations (surface water monitoring)

Time of sample	Monitoring point	Site description	Field comments	Site photos
Surface water sampling locations				
17/07/2025 9:44 AM	QUARRY PIT	Sample of the pit quarry water in the northern portion of the pit.	Pit water was light brown and slightly turbid. Quarry pit water level was higher than the previous monitoring rounds this year.	
17/07/2025 12:48 PM	UPSTREAM	Upstream sample point of Oaky Creek.	Creek stagnant with water approximately 0.3 m deep. Water in creek was light brown, turbid with no odour or sheen noted.	
17/07/2025 2:01 PM	DOWNSTREAM	Downstream sample point of Oaky Creek.	Creek stagnant. Water in creek was light brown and slightly turbid with no odour or sheen noted.	

Key observations of the surface water quality are summarised below:

- pH was recorded as highly acidic in the Quarry pit (2.05) and slightly basic upstream and receiving environment (7.72 and 7.49, respectively). The quarry pit result is anomalous given historical pH ranges. Verification monitoring undertaken by the client on 5 August indicates the water within the Quarry Pit was slightly basic (~8.4), in line with historical monitoring.
- The Upstream and Quarry Pit locations contained more water than was observed during the previous monitoring round. Oaky Creek at the location of the upstream location was estimated to contain water to a depth of approximately 0.3 m.
- EC was below the baseline concentration (11,000 µS/cm) at all locations. The upstream location (1,890 µS/cm) was below the surface water trigger value but exceeded by the Quarry Pit location (6,592 µS/cm) and receiving environment (2,360 µS/cm at downstream).

3.4 Review of exceedances

Water quality results were reviewed for trigger exceedances, via comparison of default guideline values or comparison of other chemical properties to the upgradient bore (BSM1).

An assessment of exceedances including actions taken and recommendations for the groundwater monitoring is presented in Table 3.4.

Table 3.4 Review of exceedances (groundwater)

Exceedance description	Assessment and actions taken
Nutrients	
<p>Total and oxidised nitrogen significantly exceeded the upgradient bore concentrations (1.3 mg/L and 0.02 mg/L, respectively) at BSM2, with the highest concentration of total nitrogen at 694 mg/L in the top of the screened water column. This exceedance is attributable to the nitrate concentration at BSM2. BSM3 also exceeded the upgradient bore with a concentrations at (5.1 mg/L (total) and 0.1 mg/L oxidised).</p>	<p>Following sustained elevated and increasing nitrogen results in BSM2, profiling was undertaken to determine if the source of the nitrogen could be informed by sample depth within the screened water column. Concentrations of nitrogen, in its most common form (nitrate) were highest in the shallow sample taken at BSM2. This sample was collected from the top 1 m of the screened water column. The total nitrogen concentration within the shallow sample was approximately seven times higher than that of the sample taken from the middle of the screened water column in the same well. The reported concentration in the shallow sample from BSM2 for nitrate, and subsequently total and oxidised nitrogen, is the highest on record. This may indicate the source of the nitrogen is at or above the standing water interface.</p>
<p>Ammonia exceeded the upgradient bore concentration (0.98 mg/L) at BSM2 and BSM3 (3.87 and 4.88 mg/L, respectively). All locations exceeded the ANZECC 95% protection level for freshwater (0.9 mg/L).</p>	<p>The nitrate concentration at the middle of the screened water column was within historical ranges for nitrate, and subsequently total and oxidised nitrogen.</p> <p>The elevated nutrients concentrations were not observed in the background upgradient, quarry pit or receiving surface water samples.</p> <p>Baseline data results were reviewed, where the following was noted:</p> <ul style="list-style-type: none"> As a result of the nitrate concentration at BSM2, total and oxidised nitrogen was noted to be significantly above the trigger value (upgradient bore comparison). The median baseline concentration at BSM2 of 21 mg/L, is significantly greater than the median baseline for the upgradient bore of 0.137 mg/L. Regardless the reported concentration of 102 mg/L is significantly greater than the median baseline for nitrate with the upgradient bore reporting nitrate slightly above detectable limits. No historical records of ammonia or total nitrogen were available. <p>Timeseries charts of nutrients exceedances were prepared (refer Appendix D).</p>
<p>Laboratory limits of reporting (LORs) were raised above trigger values for Total Phosphorus in BSM2 as a result of reported high levels of chloride. Raised LORs were also reported in the May 2025 monitoring as a result of matrix interference.</p>	<p>Chloride concentrations have not been assessed in the groundwater well network since 2018, notably since the BSM1 and BSM2 were replaced. Elevated chloride concentrations were previously reported in BSM1 and BSM3.</p>
Metals	
<p>Zinc exceeded the trigger values all locations with a concentrations from 0.010 mg/L (BSM1) to 0.083 mg/L (BSM2).</p>	<p>Zinc was reported above baseline concentrations for BSM2. The reported concentration for zinc in BSM2 was the second highest concentration on record with the highest reported in March this year.</p>

Exceedance description	Assessment and actions taken
Hydrocarbons	
TRH was reported above detectable limits at BSM1 in C10-C16 fractions (260 µg/L).	Groundwater sampling reported concentrations of hydrocarbons above detection limits. This was limited to upgradient bore BSM1. This was not reflected in the results for TRH and TPH analysis following silica gel cleanup, where all samples reported concentrations below detection limits. This indicates the reported hydrocarbons are from a naturally occurring biogenic source (lipids, plant oils, etc.) and unrelated to site operations. Detectable concentrations of Oil and grease were not reported as part of the July 2025 groundwater sampling round.
TPH was reported above detectable limits at BSM1 in C15-C28 fractions (340 µg/L).	

4 Summary and recommendations

The following provides a summary of additional investigations:

- Down gradient bores BSM2 and BSM3 were reported above the standing water level trigger value as part of the May 2025 monitoring event. All water levels were within the historical ranges. Sustained elevated water levels are not likely to be attributable to the site as the monitored water level is substantially greater than the reported base of the quarry pit.
- The water within the Quarry pit was highly acidic (2.05). The quarry pit result is anomalous given historical pH ranges. Verification monitoring undertaken by the client on 5 August indicates the water within the Quarry Pit was slightly basic (~8.4), in line with historical pit monitoring, upstream and receiving environment.
- Detectable concentrations of TRH/TPH were report however oil and grease and TRH/TPH following silica gel clean up were not present at detectable concentrations during the March sampling round. This indicates the reported hydrocarbons are from a naturally occurring biogenic source (lipids, plant oils, etc.) and unrelated to site operations.
- No confirmed source has been identified for the sustained elevated and increasing nutrient concentrations observed within monitoring well BSM2. To address this trend, profiling was undertaken to determine if the source of the nitrogen could be informed by sample depth within the screened water column. The total nitrogen concentration within the shallow sample was approximately seven times higher than that of the sample taken from the middle of the screened water column in the same well. The reported concentration in the shallow sample from BSM2 for nitrate, and subsequently total and oxidised nitrogen, is the highest on record. This may indicate the source of the nitrogen is at or above the standing water interface. The site is surrounded by agricultural land, a country club and the Western Sydney Airport (WSA) which has been undertaking significant re-establishment of ground cover vegetation upstream of the site since 2021. The elevated standing water table, increased chloride (as identified by the laboratory as the source of matrix interference) in BSM2 support the possibility that widespread use of fertilisers around the site may have contributed to the reported increase in nutrients observed at monitoring wells at the site. Detailed surface water and groundwater monitoring associated with the WSA construction was not available for review to verify this potential source. Based on the sustained increasing trend following the cessation of quarry operations, the change appears unrelated to quarry activities.
- Concentrations of metals at BSM2 reduced from levels observed as part of the March 2025 monitoring round.

The following recommendations are made for future monitoring:

- TRH analysis should continue at a frequency reduced from quarterly to annual at locations previously reported with detectable concentrations of TRH/TPH or oil and grease to assist with confirming the absence of TRH/TPH. Supplementary TRH/TPH sampling should also be undertaken following detectable oil and grease results.
- Follow-up monitoring of the pH of water within the Quarry pit should be undertaken during the next monitoring round to confirm conditions have returned to baseline. It is recommended two field measurements be taken, morning and afternoon, with a water quality monitor calibrated on site to verify field measurements. Should field measurements indicate the Quarry pit is highly acidic, sampling will be undertaken to investigate the nature and potential source of the acid.

Please contact the undersigned with any questions or clarifications.

Yours sincerely,



Tasman Coupe

Senior Environmental Engineer

tcoupe@emmconsulting.com.au

Appendix A

Water quality monitoring locations



- KEY**
- Study area
 - + Groundwater monitoring bore
 - Water quality monitoring location
- Existing environment
- Major road
 - Minor road
 - Watercourse/drainage line
 - Cadastral boundary

Water quality monitoring locations

Luddenham Quarry
Water Management Plan
Figure 1



Appendix B

Groundwater levels

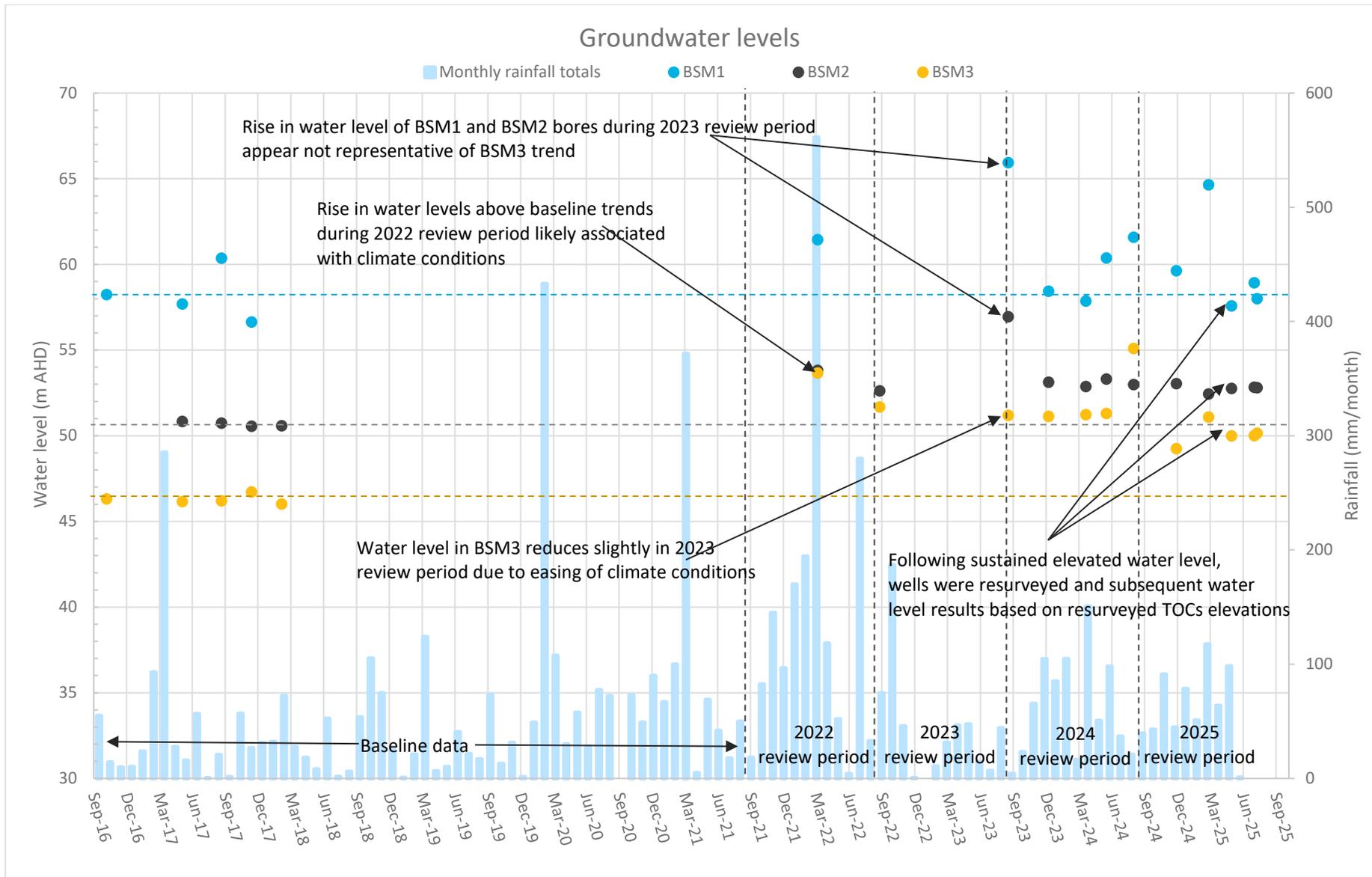


Figure B.1 Ground water levels

Appendix C

Water quality monitoring results

	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (surface water)	Location Code					
					Field ID	BSM1	BSM2	BSM2	BSM3	
					Lab Report Number	BSM1	BSM2_Shallow	BSM2	QA	BSM3
					Date	ES2521875	ES2521875	ES2521875	ES2521875	ES2521875
					17 Jul 2025	17 Jul 2025	17 Jul 2025	17 Jul 2025	17 Jul 2025	
Field										
Temp (Field)	°C	0.1		-	19.1	18	19	-	19.5	
pH (Field)	-	0.01		6.5-8.5	6.55	6.29	6.49	-	6.7	
EC (field)	µS/cm	1		BSM1	6,276	13,556	23,393	-	22,730	
DO (Field)	mg/L	0.1			1.74	3.25	1.5	-	1.76	
Redox Potential (Field)	mV	0.1			-178.8	221	177.4	-	-222.5	
TSS	mg/L	5		BSM1	37	-	30	36	48	
Inorganics										
Hardness as CaCO ₃ (filtered)	mg/L	1			940	-	3,390	3,420	3,420	
Ammonia as N	mg/L	0.01	0.9	BSM1	0.98	0.18	3.87	3.56	4.88	
Nitrite (as N)	mg/L	0.01			<0.01	7.79	3.60	3.66	<0.01	
Nitrate (as N)	mg/L	0.01			0.02	684	102	112	0.10	
Nitrite + Nitrate as N	mg/L	0.01		BSM1	0.02	692	106	116	0.10	
Total Kjeldahl Nitrogen	mg/L	0.1			1.3	2.1	5.1	5.2	5.0	
Nitrogen (Total)	mg/L	0.1		BSM1	1.3	694	111	121	5.1	
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		BSM1	<0.01	<0.01	<0.01	<0.01	<0.01	
Total Phosphate (as P)	mg/L	0.01		BSM1	<0.01	<0.10 ^{#1}	<0.10 ^{#1}	<0.10 ^{#1}	<0.02 ^{#1}	
Metals										
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	-	<0.01	<0.01	<0.01	
Arsenic (filtered)	mg/L	0.001	0.013	0.013	<0.001	-	<0.001	<0.001	<0.001	
Boron (filtered)	mg/L	0.05	0.94	0.37	0.09	-	0.05	<0.05	0.06	
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	-	<0.0001	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001	-	<0.001	<0.001	<0.001	
Copper (filtered)	mg/L	0.001	0.0014	0.0014	<0.001	-	<0.001	<0.001	<0.001	
Iron (filtered)	mg/L	0.05			0.56	-	<0.05	<0.05	<0.05	
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	-	<0.001	<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	1.9	1.9	0.399	-	1.18	1.18	0.245	
Mercury (filtered)	mg/L	0.0001	0.00006		<0.0001	-	<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.002	-	0.011	0.010	0.002	
Selenium (filtered)	mg/L	0.01	0.005		<0.01	-	<0.01	<0.01	<0.01	
Zinc (filtered)	mg/L	0.005	0.008	0.008	0.010	-	0.083	0.018	0.011	
BTEX										
Benzene	µg/L	1	950	LOR	<1	<1	-	-	-	
Toluene	µg/L	2		LOR	<2	<2	-	-	-	
Ethylbenzene	µg/L	2	80	LOR	<2	<2	-	-	-	
Xylene (m & p)	µg/L	2		LOR	<2	<2	-	-	-	
Xylene (o)	µg/L	2	350	LOR	<2	<2	-	-	-	
Xylene Total	µg/L	2		LOR	<2	<2	-	-	-	
Total BTEX	µg/L	1		LOR	<1	<1	-	-	-	
Naphthalene (VOC)	mg/L	0.005	0.016	LOR	<0.005	<0.005	-	-	-	
TRH										
C6-C10	µg/L	20		LOR	<20	<20	-	-	-	
C6 - C10 less BTEX (F1)	µg/L	20		LOR	<20	<20	-	-	-	
>C10-C16	µg/L	100		LOR	260	<100	-	-	-	
>C10 - C16 less Naphthalene (F2)	µg/L	100		LOR	260	<100	-	-	-	
>C16-C34	µg/L	100		LOR	<100	<100	-	-	-	
>C34-C40	µg/L	100		LOR	<100	<100	-	-	-	
>C10-C40 (Sum of total)	µg/L	100		LOR	260	<100	-	-	-	
Oil and Grease	mg/L	5		LOR	<5	<5	-	-	<5	
TRH - (Silica Gel Cleanup)										
TRH >C10 - C16 Fraction minus Naphthalene (F2) (SG)	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TRH >C10-C16 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TRH >C16-C34 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TRH >C34-C40 (after silica gel clean-up)	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TRH >C10 - C40 Fraction (sum) (SG)	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TPH										
C6-C9	µg/L	20		LOR	<20	<20	-	-	-	
C10-C14	µg/L	50		LOR	<50	<50	-	-	-	
C15-C28	µg/L	100		LOR	340	<100	-	-	-	
C29-C36	µg/L	50		LOR	<50	<50	-	-	-	
C10-C36 (Sum of total)	µg/L	50		LOR	340	<50	-	-	-	
TPH - (Silica Gel Cleanup)										
TPH C10-C14 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	-	-	-	
TPH C15-C28 Fraction after Silica Cleanup	mg/L	0.1		LOR	<0.1	<0.1	-	-	-	
TPH C29-C36 Fraction after Silica Cleanup	mg/L	0.05		LOR	<0.05	<0.05	-	-	-	
TPH C10-C36 (Total) (after silica gel clean-up)	mg/L	0.05		LOR	<0.05	<0.05	-	-	-	

Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

					Location Code	DOWNSTREAM	QUARRY PIT	UPSTREAM
					Field ID	DOWNSTREAM	QUARRY PIT	UPSTREAM
					Lab Report Number	ES2521875	ES2521875	ES2521875
					Date	17 Jul 2025	17 Jul 2025	17 Jul 2025
	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs	Trigger value (surface water)				
Field								
Temp (Field)	°C	0.1		-	9.3	13.3	9.9	
pH (Field)	-	0.01		6.5-8.5	7.72	2.05	7.49	
EC (field)	µS/cm	1		125-2200	1,890	6,592	2,360	
DO (Field)	mg/L	0.1			10.12	11.52	7.21	
Redox Potential (Field)	mV	0.1			14.9	499.2	24	
TSS	mg/L	5			5	192	14	
Inorganics								
Hardness as CaCO ₃ (filtered)	mg/L	1			432	523	390	
Ammonia as N	mg/L	0.01	0.9	0.02	0.03	0.11	0.06	
Nitrite (as N)	mg/L	0.01			<0.01	0.10	<0.01	
Nitrate (as N)	mg/L	0.01			0.02	7.25	0.05	
Nitrite + Nitrate as N	mg/L	0.01		0.04	0.02	7.35	0.05	
Total Kjeldahl Nitrogen	mg/L	0.1			0.4	1.1	1.0	
Nitrogen (Total)	mg/L	0.1		0.5	0.4	8.4	1.0	
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		0.02	<0.01	<0.01	<0.01	
Total Phosphate (as P)	mg/L	0.01		0.05	<0.01	0.13	0.02	
Metals								
Aluminium (filtered)	mg/L	0.01	0.055	0.055	<0.01	0.16	<0.01	
Arsenic (filtered)	mg/L	0.001	0.013	0.013	<0.001	<0.001	<0.001	
Boron (filtered)	mg/L	0.05	0.94	0.37	<0.05	<0.05	<0.05	
Cadmium (filtered)	mg/L	0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001	
Copper (filtered)	mg/L	0.001	0.0014	0.0014	0.002	0.001	0.001	
Iron (filtered)	mg/L	0.05			0.06	<0.05	0.18	
Lead (filtered)	mg/L	0.001	0.0034	0.0034	<0.001	<0.001	<0.001	
Manganese (filtered)	mg/L	0.001	1.9	1.9	0.172	0.014	0.143	
Mercury (filtered)	mg/L	0.0001	0.00006		<0.0001	<0.0001	<0.0001	
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.001	0.004	0.002	
Selenium (filtered)	mg/L	0.01	0.005		<0.01	0.03	<0.01	
Zinc (filtered)	mg/L	0.005	0.008	0.008	0.048	0.019	0.050	
TRH								
Oil and Grease	mg/L	5		LOR	<5	<5	<5	

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

				Location Code	BSM2	BSM2	RPD
				Field ID	BSM2	QA	
				Lab Report Number	ES2521875	ES2521875	
				Date	17 Jul 2025	17 Jul 2025	
				Matrix Type	Water	Water	
Field	Unit	EQL	ANZG (2018) Freshwater 95% toxicant DGVs				
TSS	mg/L	5		30	36	18	
Inorganics							
Hardness as CaCO ₃ (filtered)	mg/L	1		3,390	3,420	1	
Ammonia as N	mg/L	0.01	0.9	3.87	3.56	8	
Nitrite (as N)	mg/L	0.01		3.60	3.66	2	
Nitrate (as N)	mg/L	0.01		102	112	9	
Nitrite + Nitrate as N	mg/L	0.01		106	116	9	
Total Kjeldahl Nitrogen	mg/L	0.1		5.1	5.2	2	
Nitrogen (Total)	mg/L	0.1		111	121	9	
Reactive Phosphorus (as P) (filtered)	mg/L	0.01		<0.01	<0.01	0	
Total Phosphate (as P)	MG/L	0.01		<0.10 ^{#1}	<0.10 ^{#1}	0	
Metals							
Aluminium (filtered)	mg/L	0.01	0.055	<0.01	<0.01	0	
Arsenic (filtered)	mg/L	0.001	0.013	<0.001	<0.001	0	
Boron (filtered)	mg/L	0.05	0.94	0.05	<0.05	0	
Cadmium (filtered)	mg/L	0.0001	0.0002	<0.0001	<0.0001	0	
Chromium (III+VI) (filtered)	mg/L	0.001	0.001	<0.001	<0.001	0	
Copper (filtered)	mg/L	0.001	0.0014	<0.001	<0.001	0	
Iron (filtered)	mg/L	0.05		<0.05	<0.05	0	
Lead (filtered)	mg/L	0.001	0.0034	<0.001	<0.001	0	
Manganese (filtered)	mg/L	0.001	1.9	1.18	1.18	0	
Mercury (filtered)	mg/L	0.0001	0.00006	<0.0001	<0.0001	0	
Nickel (filtered)	mg/L	0.001	0.011	0.011	0.010	10	
Selenium (filtered)	mg/L	0.01	0.005	<0.01	<0.01	0	
Zinc (filtered)	mg/L	0.005	0.008	0.083	0.018	129	

Comments

#1 Reported Analyte LOR is higher than Requested Analyte LOR

Environmental Standards

ANZG, 2018, ANZG (2018) Freshwater 95% toxicant DGVs

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 50 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 (> 30 x EQL))

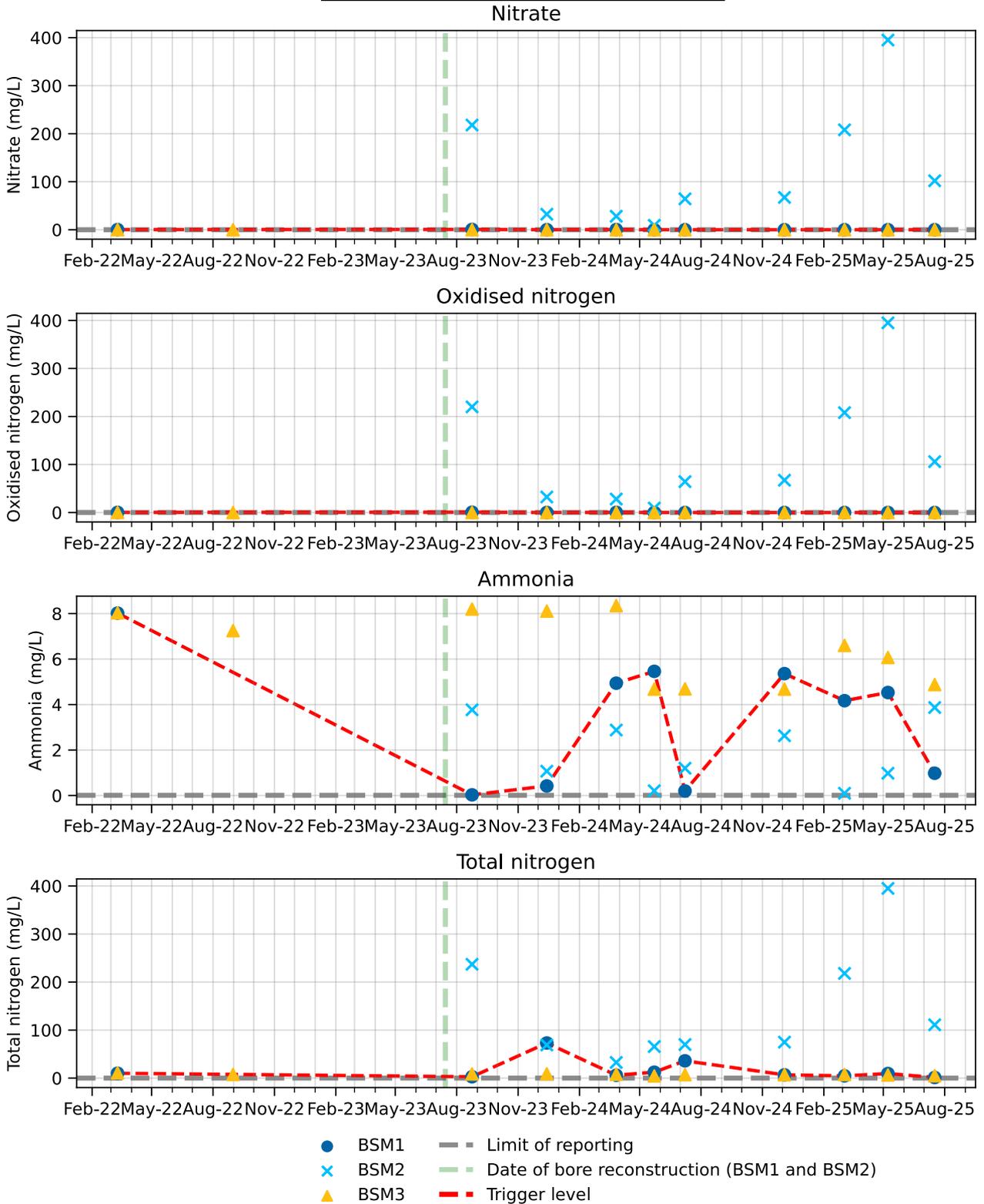
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix D

Water quality timeseries charts

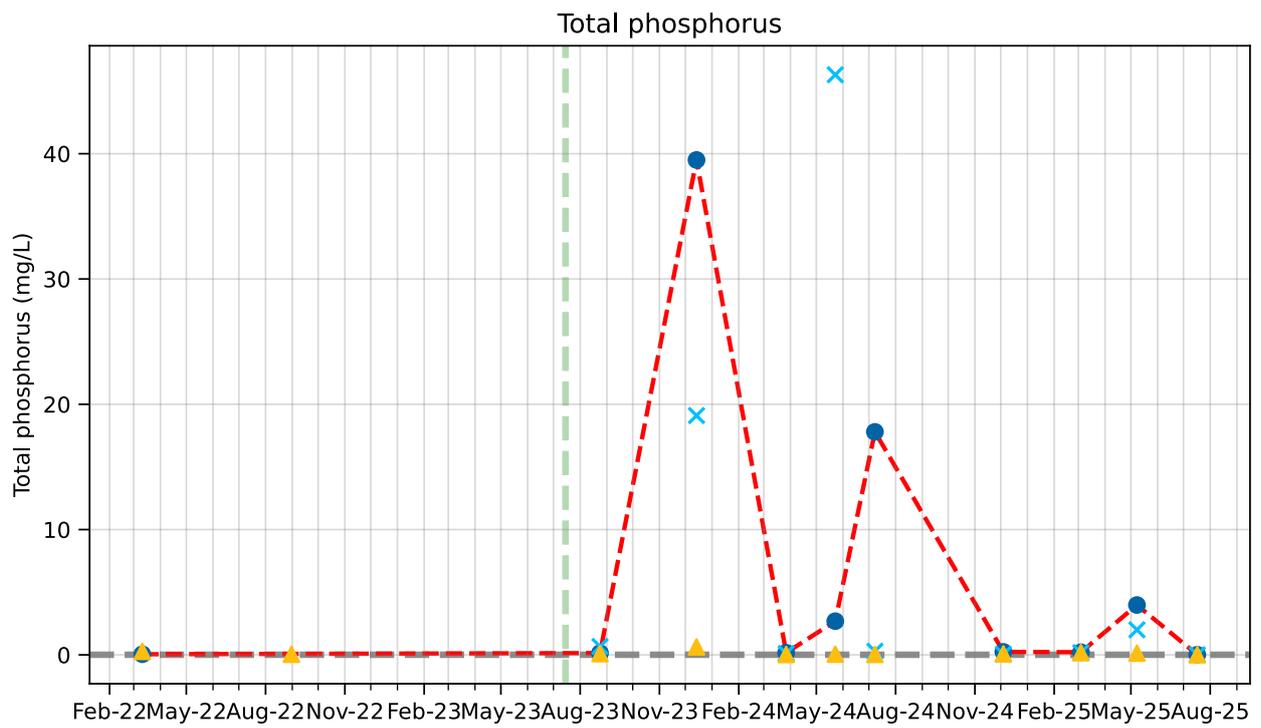
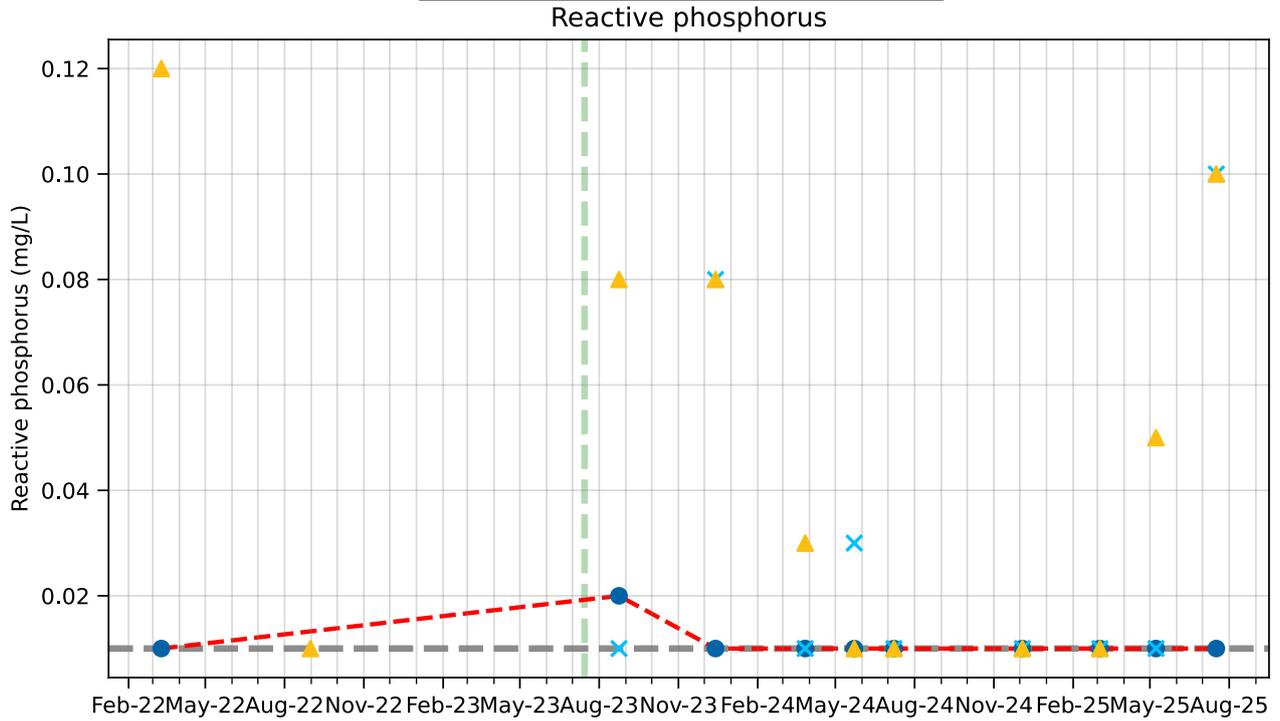
D.1 Timeseries water quality charts – nutrients

Water quality analysis - nutrients



*Trigger values based on upgradient bore (BSM1).

Water quality analysis - nutrients

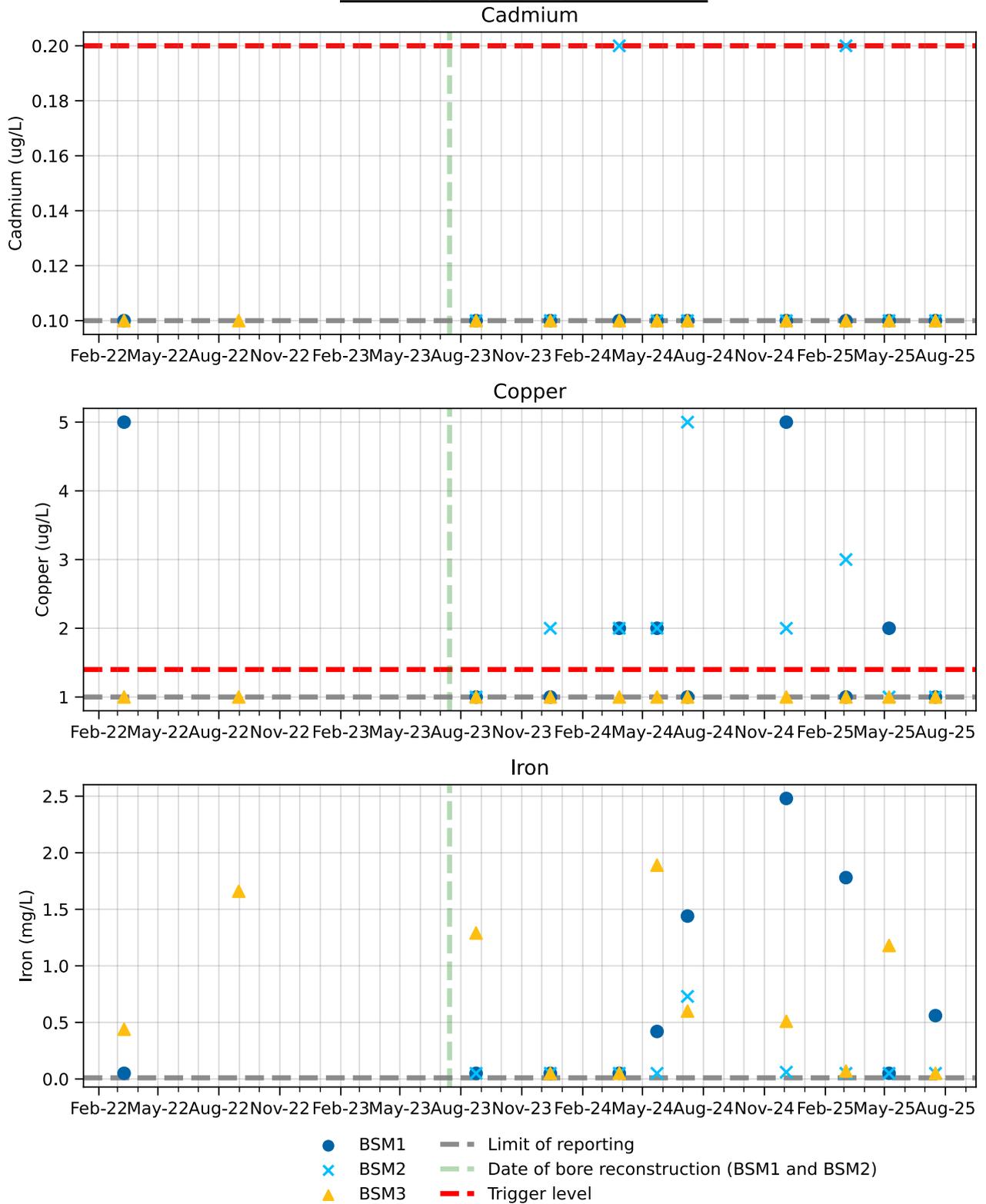


- BSM1
- × BSM2
- ▲ BSM3
- Limit of reporting
- Date of bore reconstruction (BSM1 and BSM2)
- - - Trigger level

*Trigger values based on upgradient bore (BSM1).

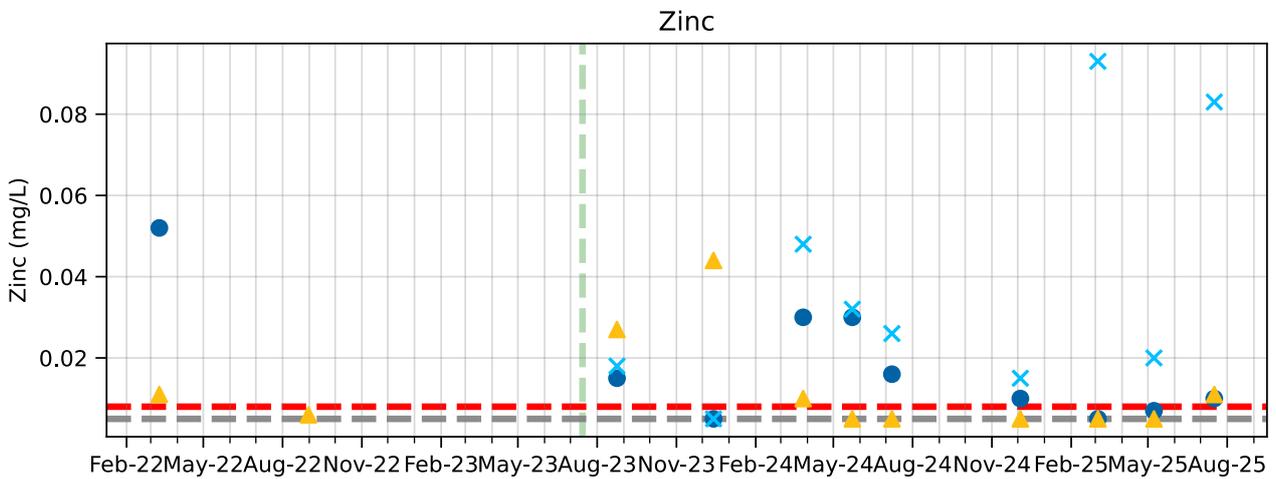
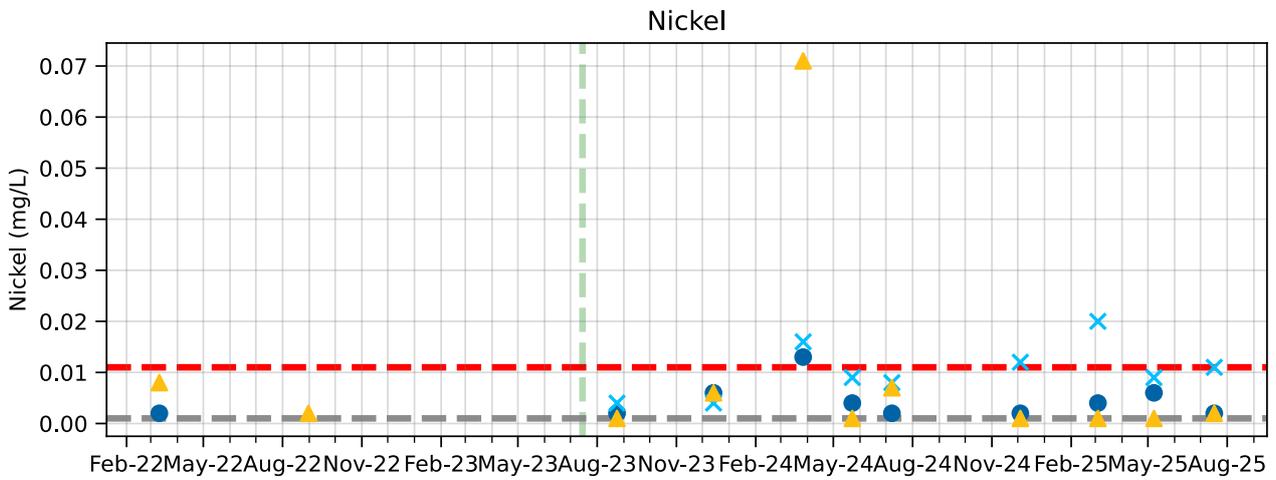
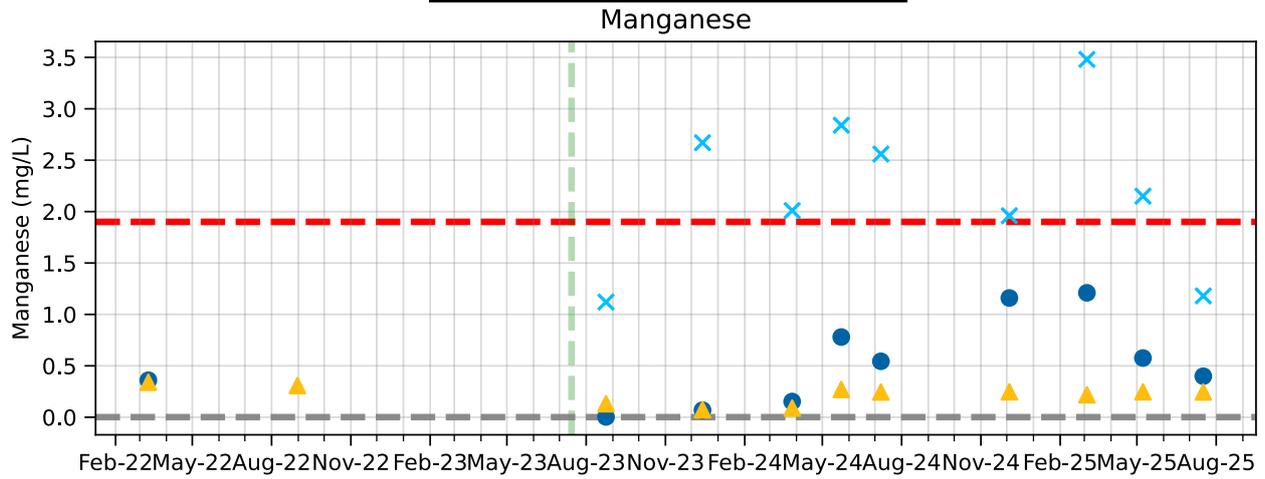
D.2 Timeseries water quality charts – metals

Water quality analysis - metals



*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Water quality analysis - metals



- BSM1
- × BSM2
- ▲ BSM3
- — Limit of reporting
- — Date of bore reconstruction (BSM1 and BSM2)
- — Trigger level

*Trigger values based on slightly-moderately disturbed riverine ecosystems (ANZG 2018).

Appendix E

Laboratory certificates



CERTIFICATE OF ANALYSIS

Work Order : **ES2521875**
Client : **EMM CONSULTING PTY LTD**
Contact : **TASMAN COUPE**
Address : **The Forum Level 10 201 Pacific Highway
St Leonards NSW NSW 2065**
Telephone : ----
Project : **E240981**
Order number : ----
C-O-C number : ----
Sampler : **JUDE LEWIS**
Site : ----
Quote number : **EN/111**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 8
Laboratory : Environmental Division Sydney
Contact : Lianna Taing
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 17-Jul-2025 16:00
Date Analysis Commenced : 18-Jul-2025
Issue Date : 25-Jul-2025 19:17



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK067: LOR raised for TP for various samples due to sample matrix.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020: Filtered Zinc results for samples ES2521875-#002 and #005 have been confirmed by reanalysis.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM2_Shallow	BSM3	QA
Sampling date / time				17-Jul-2025 13:15	17-Jul-2025 10:50	17-Jul-2025 10:15	17-Jul-2025 12:00	17-Jul-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2521875-001	ES2521875-002	ES2521875-003	ES2521875-004	ES2521875-005	
				Result	Result	Result	Result	Result	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	37	30	----	48	36	
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	940	3390	----	3420	3420	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	----	<0.01	<0.01	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	<0.0001	<0.0001	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001	
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001	
Nickel	7440-02-0	0.001	mg/L	0.002	0.011	----	0.002	0.010	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	<0.001	<0.001	
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	<0.01	<0.01	
Zinc	7440-66-6	0.005	mg/L	0.010	0.083	----	0.011	0.018	
Manganese	7439-96-5	0.001	mg/L	0.399	1.18	----	0.245	1.18	
Boron	7440-42-8	0.05	mg/L	0.09	0.05	----	0.06	<0.05	
Iron	7439-89-6	0.05	mg/L	0.56	<0.05	----	<0.05	<0.05	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	<0.0001	<0.0001	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.98	3.87	0.18	4.88	3.56	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	3.60	7.79	<0.01	3.66	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	0.02	102	684	0.10	112	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	0.02	106	692	0.10	116	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM2_Shallow	BSM3	QA
Sampling date / time				17-Jul-2025 13:15	17-Jul-2025 10:50	17-Jul-2025 10:15	17-Jul-2025 12:00	17-Jul-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2521875-001	ES2521875-002	ES2521875-003	ES2521875-004	ES2521875-005	
				Result	Result	Result	Result	Result	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.3	5.1	2.1	5.0	5.2	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L	1.3	111	694	5.1	121	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.10	<0.10	<0.02	<0.10	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	----	<5	<5	----	
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup									
C10 - C14 Fraction	----	50	µg/L	<50	----	<50	----	----	
C15 - C28 Fraction	----	100	µg/L	<100	----	<100	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	----	<50	----	----	
[^] C10 - C36 Fraction (sum)	----	50	µg/L	<50	----	<50	----	----	
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup									
>C10 - C16 Fraction	----	100	µg/L	<100	----	<100	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	----	<100	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	<100	----	----	
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	<100	----	<100	----	----	
>C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	----	<100	----	----	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L	<20	----	<20	----	----	
C10 - C14 Fraction	----	50	µg/L	<50	----	<50	----	----	
C15 - C28 Fraction	----	100	µg/L	340	----	<100	----	----	
C29 - C36 Fraction	----	50	µg/L	<50	----	<50	----	----	
[^] C10 - C36 Fraction (sum)	----	50	µg/L	340	----	<50	----	----	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BSM1	BSM2	BSM2_Shallow	BSM3	QA
Sampling date / time				17-Jul-2025 13:15	17-Jul-2025 10:50	17-Jul-2025 10:15	17-Jul-2025 12:00	17-Jul-2025 00:00	
Compound	CAS Number	LOR	Unit	ES2521875-001	ES2521875-002	ES2521875-003	ES2521875-004	ES2521875-005	
				Result	Result	Result	Result	Result	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	<20	----	----	
[^] C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	----	<20	----	----	
>C10 - C16 Fraction	----	100	µg/L	260	----	<100	----	----	
>C16 - C34 Fraction	----	100	µg/L	<100	----	<100	----	----	
>C34 - C40 Fraction	----	100	µg/L	<100	----	<100	----	----	
[^] >C10 - C40 Fraction (sum)	----	100	µg/L	260	----	<100	----	----	
[^] >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	260	----	<100	----	----	
EP080: BTEXN									
Benzene	71-43-2	1	µg/L	<1	----	<1	----	----	
Toluene	108-88-3	2	µg/L	<2	----	<2	----	----	
Ethylbenzene	100-41-4	2	µg/L	<2	----	<2	----	----	
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	<2	----	----	
ortho-Xylene	95-47-6	2	µg/L	<2	----	<2	----	----	
[^] Total Xylenes	----	2	µg/L	<2	----	<2	----	----	
[^] Sum of BTEX	----	1	µg/L	<1	----	<1	----	----	
Naphthalene	91-20-3	5	µg/L	<5	----	<5	----	----	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%	76.7	----	88.6	----	----	
Toluene-D8	2037-26-5	2	%	96.7	----	85.5	----	----	
4-Bromofluorobenzene	460-00-4	2	%	106	----	94.3	----	----	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QUARRY PIT	UPSTREAM	DOWNSTREAM	----	----
Sampling date / time				17-Jul-2025 09:45	17-Jul-2025 12:50	17-Jul-2025 14:10	----	----	
Compound	CAS Number	LOR	Unit	ES2521875-006	ES2521875-007	ES2521875-008	-----	-----	
				Result	Result	Result	----	----	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	192	14	5	----	----	
ED093F: SAR and Hardness Calculations									
Total Hardness as CaCO3	----	1	mg/L	523	390	432	----	----	
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L	0.16	<0.01	<0.01	----	----	
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----	
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----	
Copper	7440-50-8	0.001	mg/L	0.001	0.001	0.002	----	----	
Nickel	7440-02-0	0.001	mg/L	0.004	0.002	0.001	----	----	
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----	
Selenium	7782-49-2	0.01	mg/L	0.03	<0.01	<0.01	----	----	
Zinc	7440-66-6	0.005	mg/L	0.019	0.050	0.048	----	----	
Manganese	7439-96-5	0.001	mg/L	0.014	0.143	0.172	----	----	
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----	
Iron	7439-89-6	0.05	mg/L	<0.05	0.18	0.06	----	----	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----	
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L	0.11	0.06	0.03	----	----	
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L	0.10	<0.01	<0.01	----	----	
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L	7.25	0.05	0.02	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L	7.35	0.05	0.02	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	QUARRY PIT	UPSTREAM	DOWNSTREAM	----	----
Sampling date / time				17-Jul-2025 09:45	17-Jul-2025 12:50	17-Jul-2025 14:10	----	----	
Compound	CAS Number	LOR	Unit	ES2521875-006	ES2521875-007	ES2521875-008	-----	-----	
				Result	Result	Result	----	----	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	1.1	1.0	0.4	----	----	
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
[^] Total Nitrogen as N	----	0.1	mg/L	8.4	1.0	0.4	----	----	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L	0.13	0.02	<0.01	----	----	
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----	
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L	<5	<5	<5	----	----	



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	72	143
Toluene-D8	2037-26-5	75	131
4-Bromofluorobenzene	460-00-4	73	137



QUALITY CONTROL REPORT

Work Order	: ES2521875	Page	: 1 of 8
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAN COUPE	Contact	: Lianna Taing
Address	: The Forum Level 10 201 Pacific Highway St Leonards NSW NSW 2065	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: E240981	Date Samples Received	: 17-Jul-2025
Order number	: ----	Date Analysis Commenced	: 18-Jul-2025
C-O-C number	: ----	Issue Date	: 25-Jul-2025
Sampler	: JUDE LEWIS		
Site	: ----		
Quote number	: EN/111		
No. of samples received	: 8		
No. of samples analysed	: 8		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC
 * = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 6737460)									
ES2521820-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	490	523	6.6	0% - 20%
ES2521875-007	UPSTREAM	EA025H: Suspended Solids (SS)	----	5	mg/L	14	17	19.0	No Limit
ES2521996-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	122	130	6.3	0% - 20%
ES2521804-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	2150	2320	7.6	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6737067)									
ES2521875-004	BSM3	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.245	0.250	1.9	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.002	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.011	0.012	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.06	0.06	0.0	No Limit
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit		
ES2521960-004	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 6737067) - continued									
ES2521960-004	Anonymous	EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit		
EG035F: Dissolved Mercury by FIMS (QC Lot: 6737066)									
ES2521875-002	BSM2	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2521960-003	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6733248)									
EN2512001-006	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.81	0.81	0.0	0% - 20%
EN2511884-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	21.8	22.0	1.1	0% - 20%
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 6733250)									
ES2521875-002	BSM2	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	3.87	3.87	0.0	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 6729480)									
ES2521875-001	BSM1	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2521861-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 6733249)									
EN2512001-012	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
ES2521875-006	QUARRY PIT	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	7.35	7.38	0.4	0% - 20%
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 6733236)									
EN2512001-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.2	0.2	0.0	No Limit
ES2521875-005	QA	EK061G: Total Kjeldahl Nitrogen as N	----	0.1 (0.5)*	mg/L	5.2	5.3	3.3	0% - 50%
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 6733237)									
EN2512001-011	Anonymous	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	0.08	155	No Limit
ES2521875-005	QA	EK067G: Total Phosphorus as P	----	0.01 (0.10)*	mg/L	<0.10	0.52	135	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 6729481)									
ES2521875-001	BSM1	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2503713-008	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 6729875)									
ES2521815-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
ES2521875-003	BSM2_Shallow	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 6729875)									
ES2521815-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 6729875) - continued									
ES2521875-003	BSM2_Shallow	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 6729875)									
ES2521815-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
ES2521875-003	BSM2_Shallow	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit			LCS	Low	High
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 6737460)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	107	83.0	129
				<5	1000 mg/L	92.3	82.0	110
				<5	816 mg/L	92.3	83.0	118
EG020F: Dissolved Metals by ICP-MS (QCLot: 6737067)								
EG020A-F: Aluminium	7429-90-5	0.01	mg/L	<0.01	0.5 mg/L	95.9	80.0	116
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	95.2	85.0	114
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	96.8	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.2	85.0	111
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.2	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.9	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	92.6	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.0	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	92.7	85.0	115
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	94.8	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	92.0	85.0	115
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	93.8	82.0	112
EG035F: Dissolved Mercury by FIMS (QCLot: 6737066)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.0	83.0	105
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6733248)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	99.1	90.0	114
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6733250)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.5 mg/L	99.6	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6729480)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	95.3	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6733249)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	103	91.0	113
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6733236)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	5 mg/L	83.6	69.0	123
				<0.1	2.5 mg/L	88.6	70.0	123
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6733237)								



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)		Acceptable Limits (%)
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6733237) - continued								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	2.21 mg/L	84.6	71.3	126
				<0.01	0.5 mg/L	77.8	71.3	126
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6729481)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	101	85.0	117
EP020: Oil and Grease (O&G) (QCLot: 6736882)								
EP020: Oil & Grease	----	5	mg/L	<5	5000 mg/L	97.4	81.0	121
				<5	4000 mg/L	85.8	70.0	110
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup (QCLot: 6727961)								
EP071SG: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	85.5	55.8	112
EP071SG: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	81.5	71.6	113
EP071SG: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	83.1	56.0	121
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup (QCLot: 6727961)								
EP071SG: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	71.7	57.9	119
EP071SG: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	82.6	62.5	110
EP071SG: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	71.3	61.5	121
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6727960)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	64.0	53.7	97.0
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	76.6	63.3	107
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	82.4	58.3	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6729875)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	260 µg/L	98.1	75.0	127
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6727960)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	60.5	53.9	95.5
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	69.8	57.8	110
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	70.2	50.5	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6729875)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	310 µg/L	101	75.0	127
EP080: BTEXN (QCLot: 6729875)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	93.3	68.3	119
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	107	73.5	120
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	108	73.8	122
EP080: meta- & para-Xylene	108-38-3	2	µg/L	<2	10 µg/L	114	73.0	122
	106-42-3							
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	104	76.4	123



Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
EP080: BTEXN (QCLot: 6729875) - continued								
EP080: Naphthalene	91-20-3	5	µg/L	<5	10 µg/L	107	75.5	124

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Acceptable Limits (%)	
						Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 6737067)							
ES2521875-005	QA	EG020A-F: Arsenic	7440-38-2	1 mg/L	109	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	101	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	96.8	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	98.6	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	109	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	94.4	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	101	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	93.4	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 6737066)							
ES2521875-001	BSM1	EG035F: Mercury	7439-97-6	0.01 mg/L	80.0	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6733248)							
EN2511884-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.5 mg/L	# Not Determined	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 6733250)							
ES2521875-002	BSM2	EK055G: Ammonia as N	7664-41-7	1 mg/L	98.7	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 6729480)							
ES2521861-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	99.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 6733249)							
EN2512001-012	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	113	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 6733236)							
EN2512001-012	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	75.7	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 6733237)							
EN2512001-012	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	77.2	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 6729481)							
ES2521875-001	BSM1	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	97.6	70.0	130



Sub-Matrix: WATER				Matrix Spike (MS) Report				
				Spike	SpikeRecovery(%)	Acceptable Limits (%)		
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High	
EP080/071: Total Petroleum Hydrocarbons (QCLot: 6729875)								
ES2521815-001	Anonymous	EP080: C6 - C9 Fraction	----	325 µg/L	94.7	70.0	130	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 6729875)								
ES2521815-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	375 µg/L	103	70.0	130	
EP080: BTEXN (QCLot: 6729875)								
ES2521815-001	Anonymous	EP080: Benzene	71-43-2	25 µg/L	109	70.0	130	
		EP080: Toluene	108-88-3	25 µg/L	109	70.0	130	
		EP080: Ethylbenzene	100-41-4	25 µg/L	99.8	70.0	130	
		EP080: meta- & para-Xylene	108-38-3	25 µg/L	102	70.0	130	
			106-42-3					
		EP080: ortho-Xylene	95-47-6	25 µg/L	91.0	70.0	130	
	EP080: Naphthalene	91-20-3	25 µg/L	99.7	70.0	130		



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES2521875	Page	: 1 of 8
Client	: EMM CONSULTING PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: TASMAN COUPE	Telephone	: +61-2-8784 8555
Project	: E240981	Date Samples Received	: 17-Jul-2025
Site	: ----	Issue Date	: 25-Jul-2025
Sampler	: JUDE LEWIS	No. of samples received	: 8
Order number	: ----	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, where applicable to the methodology, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK055G: Ammonia as N by Discrete Analyser	EN2511884--001	Anonymous	Ammonia as N	7664-41-7	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Method	Count		Rate (%)		Quality Control Specification
		QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	0	2	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	2	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
TRH - Semivolatile Fraction	EP071	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	2	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
BSM1, BSM3, QUARRY PIT, DOWNSTREAM	BSM2, QA, UPSTREAM,	17-Jul-2025	----	----	----	23-Jul-2025	24-Jul-2025	✓



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: SAR and Hardness Calculations								
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F) BSM1, BSM3, QUARRY PIT, DOWNSTREAM	BSM2, QA, UPSTREAM,	17-Jul-2025	----	----	----	23-Jul-2025	14-Aug-2025	✓
EG020F: Dissolved Metals by ICP-MS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F) BSM1, BSM3, QUARRY PIT, DOWNSTREAM	BSM2, QA, UPSTREAM,	17-Jul-2025	----	----	----	23-Jul-2025	13-Jan-2026	✓
EG035F: Dissolved Mercury by FIMS								
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F) BSM1, BSM3, QUARRY PIT, DOWNSTREAM	BSM2, QA, UPSTREAM,	17-Jul-2025	----	----	----	24-Jul-2025	14-Aug-2025	✓
EK055G: Ammonia as N by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK055G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	----	----	----	22-Jul-2025	14-Aug-2025	✓
EK057G: Nitrite as N by Discrete Analyser								
Clear Plastic Bottle - Natural (EK057G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	----	----	----	19-Jul-2025	19-Jul-2025	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK059G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	----	----	----	22-Jul-2025	14-Aug-2025	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK061G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	21-Jul-2025	14-Aug-2025	✓	22-Jul-2025	14-Aug-2025	✓



Matrix: **WATER** Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EK067G: Total Phosphorus as P by Discrete Analyser								
Clear Plastic Bottle - Sulfuric Acid (EK067G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	21-Jul-2025	14-Aug-2025	✓	22-Jul-2025	14-Aug-2025	✓
EK071G: Reactive Phosphorus as P by discrete analyser								
Clear Plastic Bottle - Natural (EK071G) BSM1, BSM2_Shallow, QA, UPSTREAM,	BSM2, BSM3, QUARRY PIT, DOWNSTREAM	17-Jul-2025	----	----	----	19-Jul-2025	19-Jul-2025	✓
EP020: Oil and Grease (O&G)								
Amber Jar - Sulfuric Acid or Sodium Bisulfate (EP020) BSM1, BSM3, UPSTREAM,	BSM2_Shallow, QUARRY PIT, DOWNSTREAM	17-Jul-2025	----	----	----	23-Jul-2025	14-Aug-2025	✓
EP071 SG: Total Petroleum Hydrocarbons - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071SG) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	24-Jul-2025	✓	24-Jul-2025	27-Aug-2025	✓
EP071 SG: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Silica gel cleanup								
Amber Glass Bottle - Unpreserved (EP071SG) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	24-Jul-2025	✓	24-Jul-2025	27-Aug-2025	✓
EP080/071: Total Petroleum Hydrocarbons								
Amber Glass Bottle - Unpreserved (EP071) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	24-Jul-2025	✓	23-Jul-2025	27-Aug-2025	✓
Amber VOC Vial - Sulfuric Acid (EP080) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	31-Jul-2025	✓	19-Jul-2025	31-Jul-2025	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Amber Glass Bottle - Unpreserved (EP071) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	24-Jul-2025	✓	23-Jul-2025	27-Aug-2025	✓
Amber VOC Vial - Sulfuric Acid (EP080) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	31-Jul-2025	✓	19-Jul-2025	31-Jul-2025	✓
EP080: BTEXN								
Amber VOC Vial - Sulfuric Acid (EP080) BSM1,	BSM2_Shallow	17-Jul-2025	18-Jul-2025	31-Jul-2025	✓	19-Jul-2025	31-Jul-2025	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Reular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	3	28	10.71	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	0	2	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	2	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	16	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	4	41	9.76	8.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	40	12.50	12.50	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	20	15.00	15.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatle Fraction	EP071	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Oil and Grease	EP020	3	41	7.32	6.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
		QC	Regular	Actual	Expected	Evaluation	
Analytical Methods							
Method Blanks (MB) - Continued							
Suspended Solids (High Level)	EA025H	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	28	7.14	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	2	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	0	2	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl ₂)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH ₃ G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO ₂ - B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NO _x) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO ₃ - F. Combined oxidised Nitrogen (NO ₂ +NO ₃) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO ₃ -. This method is compliant with NEPM Schedule B(3)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Oil and Grease	EP020	WATER	In house: Referenced to APHA 5520 B. Oil & grease is a gravimetric procedure to determine the amount of dissolved or emulsified oil & grease residue in an aqueous sample. The sample is serially extracted three times n-hexane. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH - Total Recoverable Hydrocarbons - Silica Gel Cleanup	EP071SG	WATER	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM Schedule B(3).
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.



CHAIN OF CUSTODY
ALS Laboratory: please tick →

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Ph: 08 8359 6940 E: adelaide@alsglobal.com
BRISBANE 25th Street Stafford QLD 4053
Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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Ph: 07 7471 5600 E: gladstone@alsglobal.com

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DUNEDIN 1150 Main Road
Ph: 03 4786 0600
WOLLONGONG 86 Kenny Street Wollongong NSW 2500
Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: EMM Consulting Pty Ltd

OFFICE: Sydney

PROJECT: E240981

ORDER NUMBER: 1

PURCHASE ORDER NO.:

PROJECT MANAGER: Tasman Coupe

SAMPLER: Jude Lewis (JL)

COC Emailed to ALS? Yes

Email Reports to: tcoupe@emmconsulting.com.au, esedat@emmwater@esdatlabsync.net

Email Invoice to: tcoupe@emmconsulting.com.au, payments@emmconsulting.com.au

TURNAROUND REQUIREMENTS:

(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)

ALS QUOTE NO.: EN/111/24

COUNTRY OF ORIGIN: Australia

CONTACT PH: 0439 694 514

SAMPLER MOBILE: 0466 312 176

EDD FORMAT (or default):

Standard TAT (List due date):

Standard TAT (List due date):

Non Standard or urgent TAT (List due date):

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

RECEIVED BY: Jude Lewis

DATE/TIME: 17/7/25 16:00

RECEIVED BY: Jude Lewis

DATE/TIME: 17/7/25 4:00pm

RECEIVED BY: Jude Lewis

DATE/TIME: 17/7/25 19:00

FOR LABORATORY USE ONLY (Circle) Client Drop-off

Custody Seal Intact? Yes No

Free ice frozen ice bricks present upon receipt? Yes No

Random Sample Temperature on Receipt: 19.86°C 10.3°C

Other comment: 11800 ESKY

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: All metals dissolved. Add Chromatograms to analysis report.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)	CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).	Additional Information									
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Total Suspended Solids (EA25H)	Nutrients (NT-8A)	Dissolved metals (W-30) Plus	Boron and Manganese	Oil and grease (EP20)	TRH Silica Gel (Pre and Post) (W-4 and W-4SG)	Total hardness	Comments on likely contaminant levels, dilutions, or samples requiring specific OC analysis etc.
1	BSM1	17/7/25 13:15	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
2	BSM2	17/7/25 10:50	W		6	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
3	BSM2_Shallow	17/7/25 10:15	W		6	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
4	BSM3	17/7/25 12:00	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
5	QA	17/7/25	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
6	QUARRY PIT	17/7/25 09:45	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
7	UPSTREAM	17/7/25 12:50	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
8	DOWNSTREAM	17/7/25 14:10	W		7	X	X	X	X	X	X	X	All metals dissolved. Add Chromatograms to analysis report.
TOTAL					56								

Environmental Division
Sydney
Work Order Reference
ES2521875

Telephone : +61-2-8704-8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved; Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Appendix F

Field data

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM2_Shallow	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	JL	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	17/07/2025 10:13	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	9.995
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	29.68
Well diameter (mm)	50		
Comments	Hydrasleeve reinstalled at 20m		

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input type="checkbox"/> Bailer	Disposable?	
		Volume (L)	
	<input checked="" type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	no
		Volume (L)	
		New hydrasleeve installed following sampling?	yes
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI
----------------------------------	-----



Photo 1

Location: 150.719558525 / -33.87427816666667

Direction: 342.62° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM2	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	JL	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	17/07/2025 10:50	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	9.995
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	29.68
Well diameter (mm)	50		
Comments	Hydrasleeve reinstalled at 20m		

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input type="checkbox"/> Bailer	Disposable?	
		Volume (L)	
	<input checked="" type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	no
		Volume (L)	
		New hydrasleeve installed following sampling?	yes
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI
----------------------------------	-----

Purging

Time	Cumulative volume removed (L)	Standing water level (mBTOC)	pH	Electrical conductivity (uS/cm)	Redox (mV)	Dissolved oxygen (mg/L)	Temperature (degC)
10.54		9.995	6.49	23393	177.4	1.5	19
Comments	Clear, no odour or sheen						

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	BSM2
QC Sample ID (if applicable)	QA
Number of bottles collected	12



Photo 1

Location: 150.71941146666666 / -33.87379696388889

Direction: 287.36° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM3	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	JL	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	17/07/2025 11:55	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	12.449
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	31.55
Well diameter (mm)	50		
Comments	Hydrasleeve reinstalled at 20m		

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input type="checkbox"/> Bailer	Disposable?	
		Volume (L)	
	<input checked="" type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	no
		Volume (L)	
		New hydrasleeve installed following sampling?	yes
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI
----------------------------------	-----

Purging

Time	Cumulative volume removed (L)	Standing water level (mBTOC)	pH	Electrical conductivity (uS/cm)	Redox (mV)	Dissolved oxygen (mg/L)	Temperature (degC)
12:20		12.449	6.7	22730	-222.5	1.76	19.5
Comments	Clear, slightly turbid, slight eggy odour, no sheen						

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	BSM3
QC Sample ID (if applicable)	
Number of bottles collected	7



Photo 1

Location: 150.71919637222223 / -33.87341438888889

Direction: 229.45° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Groundwater sampling field sheet

Job number	E240981	Well ID	BSM1	<input type="checkbox"/> Well development
Project	Luddenham Quarry	Field staff	JL	<input checked="" type="checkbox"/> Gauging
Client	CPG	Date	17/07/2025 13:13	<input checked="" type="checkbox"/> Sampling

Gauging

PID (ppm)	Not collected	LEL (%)	Not collected
Depth to LNAPL (mBTOC)	Not observed	Depth to groundwater (mBTOC)	15.434
Depth to DNAPL (mBTOC)	Not observed	Well depth (mBTOC)	30.04
Well diameter (mm)	50		
Comments	Hydrasleeve reinstalled at 22m		

Sampling equipment

Pumps	<input type="checkbox"/> Submerged pump	Pump model	
		Depth of pump (mBTOC)	
		Depth to water after pump placement (mBTOC)	
		Controller info	
	<input type="checkbox"/> Peristaltic pump	Pump model	
		Length of tubing (m)	
	<input type="checkbox"/> Inertial pump	Pump model	
	Depth of pump (mBTOC)		
	Depth to water after pump placement (mBTOC)		
	Flow rate (L/min)		
Grab sampling	<input type="checkbox"/> Bailer	Disposable?	
		Volume (L)	
	<input checked="" type="checkbox"/> Hydrasleeve	Hydrasleeve installation only?	no
		Volume (L)	
		New hydrasleeve installed following sampling?	yes
<input type="checkbox"/> Other	Comments		

Water quality meter model	YSI
----------------------------------	-----

Purging

Time	Cumulative volume removed (L)	Standing water level (mBTOC)	pH	Electrical conductivity (uS/cm)	Redox (mV)	Dissolved oxygen (mg/L)	Temperature (degC)
13:36		15.434	6.55	6276	-178.8	1.74	19.1
Comments	Clear, eggy odour, no sheen						

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	BSM1
QC Sample ID (if applicable)	
Number of bottles collected	7



Photo 1

Location: 150.71878964444446 / -33.873907611111115

Direction: 287.55° clockwise from north

Photo 2

Location: /

Direction: ° clockwise from north

Photo 3

Location: /

Direction: ° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	QUARRY PIT
Project	Luddenham Quarry	Field staff	JL
Client	CPG	Date	17/07/2025 09:44

Site

Latitude	-33.87388533	Longitude	150.71904456
Weather	Clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Still		

Sampling equipment

Sampling method	By hand
Water quality meter model	YSI

Field parameters

PID (ppm)		Redox (mV)	499.2
pH	2.05	Dissolved oxygen (mg/L)	11.52
Electrical conductivity (uS/cm)	6592	Temperature (degC)	13.3
Comments	Light brown, slightly turbid, no odour or sheen		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	QUARRY PIT
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: 150.718957175 / -33.873320166666666

Direction: 256.9° clockwise from north



Photo 2

Location: 150.718957175 / -33.873320166666666

Direction: 303.72° clockwise from north

Downstream



Photo 3

Location: 150.719053775 / -33.873945736111111

Direction: 5.85° clockwise from north



Photo 4

Location: 150.71929235277779 / -33.8754895

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	UPSTREAM
Project	Luddenham Quarry	Field staff	JL
Client	CPG	Date	17/07/2025 12:48

Site

Latitude	-33.87268174	Longitude	150.7185479
Weather	Clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Still, ~30cm depth		

Sampling equipment

Sampling method	Sampling pole
Water quality meter model	YSI

Field parameters

PID (ppm)		Redox (mV)	24
pH	7.49	Dissolved oxygen (mg/L)	7.21
Electrical conductivity (uS/cm)	2360	Temperature (degC)	9.9
Comments	Light brown, turbid, leaves and twigs, no odour or sheen		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	UPSTREAM
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: 320.18° clockwise from north



Photo 2

Location: /

Direction: 232.39° clockwise from north

Downstream



Photo 3

Location: /

Direction: 176.75° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Surface water sampling field sheet

Job number	E240981	Location ID	DOWNSTREAM
Project	Luddenham Quarry	Field staff	JL
Client	CPG	Date	17/07/2025 14:01

Site

Latitude		Longitude	
Weather	Clear		
	<input checked="" type="checkbox"/> Dry weather event		<input type="checkbox"/> Wet weather event (rain in previous 24 hrs)
Site description	Still, steep banks, cannot see bottom of stream		

Sampling equipment

Sampling method	Sampling pole
Water quality meter model	YSI

Field parameters

PID (ppm)		Redox (mV)	14.9
pH	7.72	Dissolved oxygen (mg/L)	10.12
Electrical conductivity (uS/cm)	1890	Temperature (degC)	9.3
Comments	Light brown, slightly turbid, no odour or sheen		

Sample collection

Sampled?	yes
Field filtered for metals?	yes
Sample ID	DOWNSTREAM
QC Sample ID (if applicable)	
Number of bottles collected	7

Upstream



Photo 1

Location: /

Direction: 188.85° clockwise from north



Photo 2

Location: /

Direction: 139.97° clockwise from north

Downstream



Photo 3

Location: /

Direction: 84.65° clockwise from north

Photo 4

Location: /

Direction: ° clockwise from north

Appendix G

Calibration certificates

Multi Parameter Water Meter

Instrument YSI Pro DSS
Serial No. 21K101474



Air-Met Scientific Pty Ltd
 1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
	Recharge OK?	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH/ORP	✓	
	2. Turbidity	✓	
	3. Conductivity	✓	
	4. D.O	✓	
	5. Temp	✓	
	6. Depth	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH7		441789	6.98
2. pH 4.00		pH4		443801	3.97
3. ORP (mV)		235.32		A:434482/B:447912	236.4
4. SPC (uS/cm)		2760		442541	2756
5. D.O		0.0%		432901	0.1%
6. Temp (°C)		19.4		MultiTherm	19.5
7. Turbidity (NTU)		100		4360422	99.14

Calibrated by:

Nyla Simons

Calibration date: 15/07/2025

Next calibration due: 14/08/2025

Appendix E – Water Balance Report

Memorandum

15 September 2025

To: Luddenham Operations Pty Ltd

From: Hallam Brichacek

Subject: Annual water balance review 2024-2025

Luddenham Quarry is located at 275 Adams Road, Luddenham NSW (Lot 3 in DP 623799, 'the site') within the Liverpool City Council municipality. The existing shale/clay quarry is approved by State significant development (SSD) consent DA 315-7-2003, issued by the Minister for Planning under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The site is owned by CFT No 13 Pty Ltd, a member of the Coombes Property Group (CPG).

Luddenham Operations Pty Ltd (Luddenham Operations) is operating the quarry in accordance with Modification 5 (MOD 5) of DA 315-7-2003 which was granted on 24 May 2021.

This memorandum outlines water balance modelling undertaken by EMM Consulting Pty Ltd (EMM) to support the annual review for Luddenham Quarry, for the period of 1 September 2024 to 31 August 2025.

1 Background

During the annual review period, quarrying activities included the ongoing removal of existing stockpiled materials and extraction of new material from the quarry footprint. Quarrying activities ceased on 31 December 2024 and quarry rehabilitation activities were undertaken in 2025.

The construction of the Luddenham Advanced Resource Recovery Facility (ARRC), approved under SSD-10446, commenced on 1 May 2025 to the north of the quarry void. The water management dam was used as a sediment dam for the initial stages of the ARRC construction in May and June 2025.

2 Methodology and data

The site water balance model that was developed for the Luddenham Quarry MOD5 approval (EMM 2020) was updated to assess the water management system during the annual review period. The following sections outline the model updates.

2.1 GoldSim representation

The water balance model was developed in GoldSim version 14. The model was created by representing the water cycle as a series of elements, each containing pre-set rules and data, that were linked together to simulate the interaction of these elements over the annual review period from 1 September 2024 to 31 August 2025.

To undertake the modelling the following simplifications and assumptions were made:

- No pumped water transfers between the water management dam and the quarry pit were applied to the model, as advised by Luddenham Operations.

- A simulation reporting timeframe was set as the same as the annual review period with the initial water level in the water management dam and quarry pit assumed to be 6.5 megalitres (ML) and 1 ML respectively, at the beginning of the simulation, consistent with site observations/photographs of storages.
- A ‘warm-up’ period of climate data was applied to the rainfall-runoff model ahead of the simulation reporting timeframe to ensure the hydrological model stores were representative of antecedent conditions.
- A dust suppression timeseries was applied to the model based on information provided by Luddenham Operations. A total of 5.3 ML was applied from the water management dam from 1 September 2024 until 31 December 2024. Potable water was used for remaining dust suppression volume of 9.6 ML in 2025.
- Operation of the Minetek evaporator ceased in early August 2024 and therefore was removed from the model.
- Construction of the ARRC commenced on 1 May 2025. The water management dam was used as a sediment basin for the initial stages of the construction during May and June 2025. This captured all runoff from the catchment (2.83 ha) that previously was diverted to Oaky Creek.
- In July 2025, following a rainfall event, approximately 3.15 ML of stormwater from the ARRC site was collected within the water management dam, treated, tested and released within the site boundary.
- A dedicated sediment basin for the ARRC site was constructed in July 2025, and since that time no water from the construction site has drained to the water management dam.

2.2 Data

2.2.1 Climatic data

Daily rainfall and evaporation data from Bureau of Meteorology’s Badgerys Creek AWS weather station (station number 67108) was adopted for the water balance model simulation period.

2.2.2 Rainfall-runoff model

Surface runoff was estimated using the Australian Water Balance Model (AWBM). The AWBM was developed by Boughton (2004) and is widely used across Australia to estimate runoff. The hydrological model calculates runoff and baseflow components from rainfall after allowing for relevant losses and storage. The AWBM was incorporated into the GoldSim water balance model for the site.

For each surface type present on site, the AWBM was parameterised to achieve long-term average volumetric runoff coefficients (Cv) based on typical values. The assumed catchment breakdown and Cv applied to each surface type are provided in Table 2.1.

Table 2.1 Catchment runoff parameters

Surface type	Management areas	Area (ha)	Cv
Impervious – high runoff potential	Roofs, weighbridge, sealed roads	0.8	0.9
Disturbed – moderate runoff potential	Unsealed roads, stockpiles	9.7	0.6
Pasture – low runoff potential	Grassed catchments, vegetated bunds	2.8	0.4

2.2.3 Groundwater inflows

The predicted quantity of groundwater to be intercepted by the quarry pit was assumed to be a constant 5 m³/day, based on the original groundwater assessment undertaken for the quarry (Douglas Nicolaisen and Associates 2003).

3 Water balance results

The water management system for Luddenham Quarry was modelled from 1 September 2024 to 31 August 2025. The estimated values for each of the inputs and outputs of the water management system for the annual review period are provided in Figure 3.1. A summary of the estimated annual inputs and outputs of the water management systems is presented in Table 3.1. Total results have been rounded to 0.1 megalitres per year (ML/year).

As shown in Table 3.1, there was a predicted a net increase of water stored within the quarry pit and decrease in water stored in the water management dam over the annual review period, which is consistent with anecdotal information and site observations made at the beginning and end of the period. There were no uncontrolled discharges modelled from the water management dam into Oaky Creek during the annual review period, which is consistent with site observations.

Table 3.1 Summary of site water balance

Water management element	Volume (ML/year)
Inputs	
Groundwater inflows	1.8
Rainfall	7.4
Catchment runoff	11.4
Total inputs	20.7
Outputs	
Dust suppression	5.3
Evaporation	9.5
Treated discharge	3.2
Total outputs	18.1
Change in storage	
Quarry pit	9.0
Water management dam	-6.3
Total change in storage	2.6
Balance	0.0

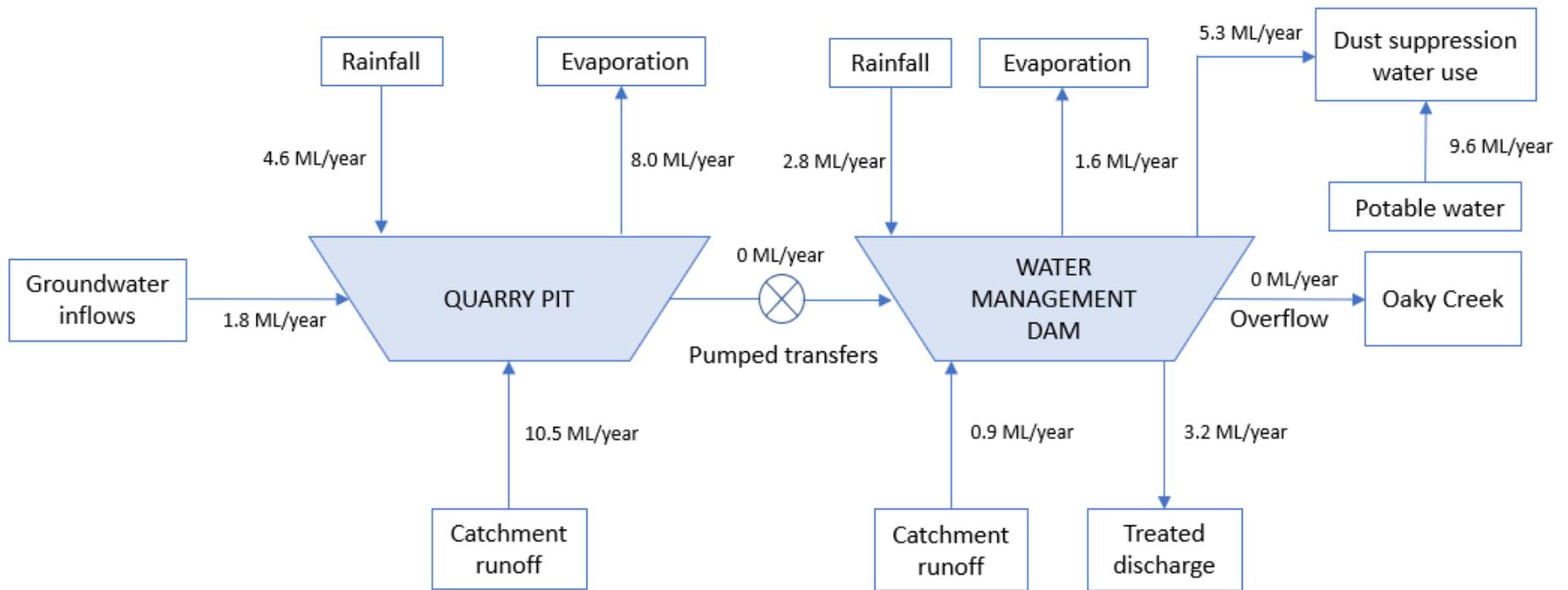


Figure 3.1 Water balance schematic with results

Yours sincerely

Hallam Brichacek

Hallam Brichacek

Water Resources Engineer

hbrichacek@emmconsulting.com

References

EMM 2020, *Luddenham Quarry – Modification 5: Surface Water Assessment*, prepared by EMM Consulting Pty Limited for Coombes Property Group and KLF Holdings Pty Ltd.

Appendix F – Air Quality Monitoring Reports

Luddenham Quarry

Real-time air quality monitoring campaign - November 2024

Prepared for Luddenham Operations Pty Ltd

December 2024

Luddenham Quarry

Real-time air quality monitoring campaign - November 2024

Luddenham Operations Pty Ltd

E240981 RP2

December 2024

Version	Date	Prepared by	Reviewed by	Comments
V1	27 November 2024	A Gilbert	S Fishwick	Draft
V2	12 December 2024	A Gilbert	S Fishwick	Final

Approved by



Scott Fishwick

National Technical Lead – Air Quality and Climate

12 December 2024

Ground floor 20 Chandos Street

St Leonards NSW 2065

ABN: 28 141 736 558

This report has been prepared in accordance with the brief provided by Luddenham Operations Pty Ltd and, in its preparation, EMM has relied upon the information collected at the times and under the conditions specified in this report. All findings, conclusions or recommendations contained in this report are based on those aforementioned circumstances. The contents of this report are private and confidential. This report is only for Luddenham Operations Pty Ltd's use in accordance with its agreement with EMM and is not to be relied on by or made available to any other party without EMM's prior written consent. Except as permitted by the Copyright Act 1968 (Cth) and only to the extent incapable of exclusion, any other use (including use or reproduction of this report for resale or other commercial purposes) is prohibited without EMM's prior written consent. Except where expressly agreed to by EMM in writing, and to the extent permitted by law, EMM will have no liability (and assumes no duty of care) to any person in relation to this document, other than to Luddenham Operations Pty Ltd (and subject to the terms of EMM's agreement with Luddenham Operations Pty Ltd).

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ABN: 28 141 736 558

TABLE OF CONTENTS

1	Introduction	1
1.1	Overview	1
1.2	Air quality management plan and monitoring program	1
1.3	Continuous particulate matter monitoring	1
2	Applicable criteria	3
3	Monitoring network and methodology	4
3.1	Monitoring network	4
3.2	Monitoring methodology	4
4	Meteorological data	8
4.1	Overview of meteorological data	8
4.2	Meteorological data	9
5	Air quality data	10
5.1	Overview of air quality data	10
5.2	PM ₁₀ concentrations	11
5.3	PM _{2.5} concentrations	15
5.4	Upwind and downwind concentrations	19
5.5	TSP concentrations	20
6	Conclusion	21

Appendices

Appendix A	Summary of 24-hour average concentrations recorded on site	A.1
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Tables

Table 2.1	Long-term air quality criteria for particulate matter	3
Table 2.2	Short-term air quality criteria for particulate matter	3
Table 3.1	Summary of monitoring network adopted in monitoring campaign at Luddenham quarry	4
Table 4.1	Summary of meteorological data – assessment period 2024 – BoM Badgerys Creek AWS	9
Table 5.1	Statistics for PM ₁₀ 24 hour average concentration	11
Table 5.2	Statistics for PM _{2.5} 24 hour average concentrations	15
Table 5.3	PM ₁₀ and PM _{2.5} concentrations upwind and downwind of the quarry	19
Table 5.4	PM contributions from the quarry	19
Table A.1	Daily average PM ₁₀ and PM _{2.5} concentration (µg/m ³)	A.1

Figures

Figure 3.1	Luddenham quarry monitoring network	7
Figure 4.1	Meteorological data summary – BoM Badgerys Creek AWS	8
Figure 4.2	Wind rose for the assessment period – BoM Badgerys Creek AWS	9
Figure 5.1	Air quality monitoring data – DCCEEW Bringelly and onsite monitors – assessment period	10
Figure 5.2	Daily mean PM ₁₀ concentration	11
Figure 5.3	Assessment period bivariate polar plot for PM ₁₀ at AQM01	13
Figure 5.4	Assessment period bivariate polar plot for PM ₁₀ at AQM02	13
Figure 5.5	Assessment period bivariate polar plot for PM ₁₀ at DCCEEW Bringelly	13
Figure 5.6	Polar annulus plot for PM ₁₀ at AQM01	14
Figure 5.7	Polar annulus plot for PM ₁₀ at AQM02	14
Figure 5.8	Polar annulus plot for PM ₁₀ at DCCEEW Bringelly	14
Figure 5.9	Daily mean PM _{2.5} concentration	15
Figure 5.10	Assessment period bivariate polar plot for PM _{2.5} at AQM01	17
Figure 5.11	Assessment period bivariate polar plot for PM _{2.5} at AQM02	17
Figure 5.12	Assessment period bivariate polar plot for PM _{2.5} at DCCEEW Bringelly	17
Figure 5.13	Polar annulus plot for PM _{2.5} at AQM01	18
Figure 5.14	Polar annulus plot for PM _{2.5} at AQM02	18
Figure 5.15	Polar annulus plot for PM _{2.5} at DCCEEW Bringelly	18

Photographs

Photograph 3.1	AQM01 monitoring location	5
Photograph 3.2	AQM02 monitoring location	6

1 Introduction

1.1 Overview

Luddenham Quarry is located at 275 Adams Road, Luddenham NSW (Lot 3 in DP 623799, 'the site') within the Liverpool City Council municipality. The existing shale/clay quarry is approved by state significant development (SSD) consent DA 315-7-2003, issued by the NSW Minister for Planning under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The site is owned by CFT No 13 Pty Ltd, a member of the Coombes Property Group (CPG).

Luddenham Operations Pty Ltd has reactivated and is operating at the quarry in accordance with Modification 5 (MOD 5) of DA 315-7-2003, which was granted by the NSW Department of Planning, Housing and Infrastructure (DPHI then DPIE) on 24 May 2021.

This report provides a summary of the two-week real-time particulate matter (PM) monitoring campaign conducted at the site during October and November 2024 (the assessment period), to satisfy the requirements of the development consent (as modified).

1.2 Air quality management plan and monitoring program

Condition 4 (Schedule 4) of the development consent (as modified) requires the preparation of an air quality management plan (AQMP). The AQMP was completed in September 2021 and most recently updated in June 2024.

As identified in Chapter 5 of the AQMP, the requirements for ambient air quality monitoring at the site are outlined in Condition 3 (Schedule 4) as follows:

carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions in this consent.

The specific AQMP requirements outlined in Condition 4 (Schedule 4) requires a monitoring program that:

- (i) is capable of evaluating the performance of the development against the air quality criteria;
- (ii) adequately supports the air quality management system; and
- (iii) includes a protocol for identifying any air quality-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.

1.3 Continuous particulate matter monitoring

Section 5.2.2 of the AQMP relates to continuous particulate matter (PM) monitoring and is reproduced in this section.

To evaluate compliance with the air quality criteria for TSP, PM₁₀ and PM_{2.5} (see Chapter 2), two continuous PM monitoring instructions will be deployed on a campaign basis¹.

¹ If all three size fractions cannot be measured simultaneously by the selected instrument, preference will be given to PM₁₀ and PM_{2.5} and TSP will be derived from PM₁₀ concentrations based on the assumption that PM₁₀ is 40% of TSP.

The instruments will be solar powered and relocatable and will be positioned upwind and downwind of the main dust generation activities occurring during the monitoring campaign. The upwind and downwind monitoring will enable compliance assessment against the short-term air quality criteria, which are evaluated against the increment increase from the development alone, as follows:

- PM contribution from quarry = downwind concentration minus upwind concentration.

Seasonal wind roses for the Bureau of Meteorology (BoM) Badgerys Creek automatic weather station (AWS) are presented in Figure A.1 (of the AQMP), which can be used to determine which locations are upwind and downwind for each monitoring campaign. Compliance assessment will use the meteorological monitoring data collected for the period of each monitoring campaign to determine upwind and downwind conditions on a daily basis.

The continuous monitoring campaign will occur for a 14-day period, once per year during extractive/ haulage operations.

A compliance assessment against the long-term air quality criteria will be based on monitoring data collected at both locations across each monitoring campaign. The fortnightly average concentrations will be used as a proxy for compliance assessment against the annual average concentrations. Any identified extraordinary events during each monitoring campaign will be excluded from the calculation of the fortnightly average.

2 Applicable criteria

Condition 1 of Schedule 4 lists the relevant air quality criteria for the development (replicated below in Table 2.1 and Table 2.2).

The long-term criteria in Table 2.1 are assessed against the total cumulative impact (the development contribution plus all other sources), whereas the short-term criteria in Table 2.2 apply to the incremental impact (development contribution alone).

Table 2.1 Long-term air quality criteria for particulate matter

Pollutant	Averaging period	Criterion	Basis
Total suspended particulate matter (TSP)	Annual	90 µg/m ³	Total impact (incremental increase from development plus all other sources) but excluding extraordinary events such as bushfires, prescribed burning, dust storms.
Particulate matter <10 µm (PM ₁₀)	Annual	25 µg/m ³	
Particulate matter <2.5 µm (PM _{2.5})	Annual	8 µg/m ³	

Table 2.2 Short-term air quality criteria for particulate matter

Pollutant	Averaging period	Criterion	Basis
Particulate matter <10 µm (PM ₁₀)	24 hour	50 µg/m ³	Incremental impact (increase in concentrations from the development alone).
Particulate matter <2.5 µm (PM _{2.5})	24 hour	25 µg/m ³	

As the monitoring campaign is two weeks in duration, the short-term 24-hour average criteria will be the focus of this monitoring report. Discussion regarding compliance with the annual average criteria will be derived from the period averaging concentrations recorded.

3 Monitoring network and methodology

3.1 Monitoring network

In accordance with Section 5.2.2 of the AQMP, the continuous PM monitoring network installed at the site for the two-week campaign consists of two continuous PM monitoring units.

In the absence of site-specific meteorological measurements, historical wind conditions recorded by the BoM Badgerys Creek AWS (located 2.3 km to the south-east of the site) for the assessment period were reviewed. The data analysis identified a dominance of winds from the north-east, south-east and south-west. Consequently, to record upwind and downwind PM concentrations at the site, the two continuous PM monitoring units were sited at the north-east and south-west corners of the site.

For the November 2024 monitoring campaign period, concurrent meteorological monitoring data from the BoM Badgerys Creek AWS was collated. Further, to provide an understanding of potential regional-scale air quality events, concurrent measurements from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) Bringelly air quality monitoring station (AQMS), located 5.9 km to the south-east of the site, have been collated.

The monitoring resources adopted in this campaign are summarised in Table 3.1, and the monitoring locations are shown in Figure 3.1.

Table 3.1 Summary of monitoring network adopted in monitoring campaign at Luddenham quarry

	Location ID	Description	Coordinates (MGA 56)	
			Easting (m)	Northing (m)
Onsite air quality	AQM01	Site boundary in south-west corner	288812	6249239
	AQM02	Site boundary in north-east corner	289187	6249481
Reference air quality	DCCEEW AQMS	Bringelly AQMS	293102	6244719
Meteorology	BoM AWS	Badgerys Creek AWS	289920	6246951

3.2 Monitoring methodology

The BoM Badgerys Creek AWS continuously measures mean wind speed, mean wind direction, the standard deviation of wind direction (referred to as ‘sigma-theta’), mean temperature, mean relative humidity, pressure and accumulated rainfall. The measurements are recorded as 1-hour averages from 1 minute data.

The real-time particulate matter monitoring was completed using two AirMetER-DX continuous particulate matter monitoring units installed at the site. The monitoring was conducted at ground level, with the inlet positioned at approximately 1.5 m. During the monitoring period the PM₁₀ and PM_{2.5} measurements were taken continuously and recorded as both 1 minute and 1 hour mean values in micrograms per cubic metre (µg/m³). Daily average concentrations were also calculated. The PM monitoring installations are shown in Photograph 3.1 and Photograph 3.2.



Photograph 3.1 **AQM01 monitoring location**



Photograph 3.2 **AQM02 monitoring location**

\\emm.local\ydrive\2023\E231131 - Luddenham Quarry - Environmental Monitoring\GIS\02_Maps\AQ0010 QuarryMonitoring_20220923_01.mxd 20/09/2024



KEY

- Study area
- On site air quality monitor
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Cadastral boundary

INSET KEY

- Study area
- Major road
- Named watercourse
- + BoM AWS
- + DPE AQMS
- On site air quality monitor

Luddenham quarry
monitoring network

Luddenham Quarry
Air quality monitoring report
Figure 3.1



Source: EMM (2024); ABS (2021); DFSI (2020, 2021); ESRI (2024); GA (2011)



4 Meteorological data

4.1 Overview of meteorological data

This section of the report presents a summary and analysis of the meteorological data that were collected by the BoM Badgerys Creek AWS during the reporting period.

An overview of the continuous data from the BoM Badgerys Creek AWS is provided in Figure 4.1. The panel on the left shows the time series of 1-hour values for each parameter, with the grey bars indicating the presence of data and any red bars indicating missing data. Some summary statistics for the reporting period are also given, including the mean, median, 95th percentile, minimum, maximum and number of missing points. The panel on the right shows the frequency distribution of the values for each parameter.

The key descriptive statistics and time series plots for the meteorological parameters collected at the BoM Badgerys Creek AWS during the reporting period are provided in the following sections.

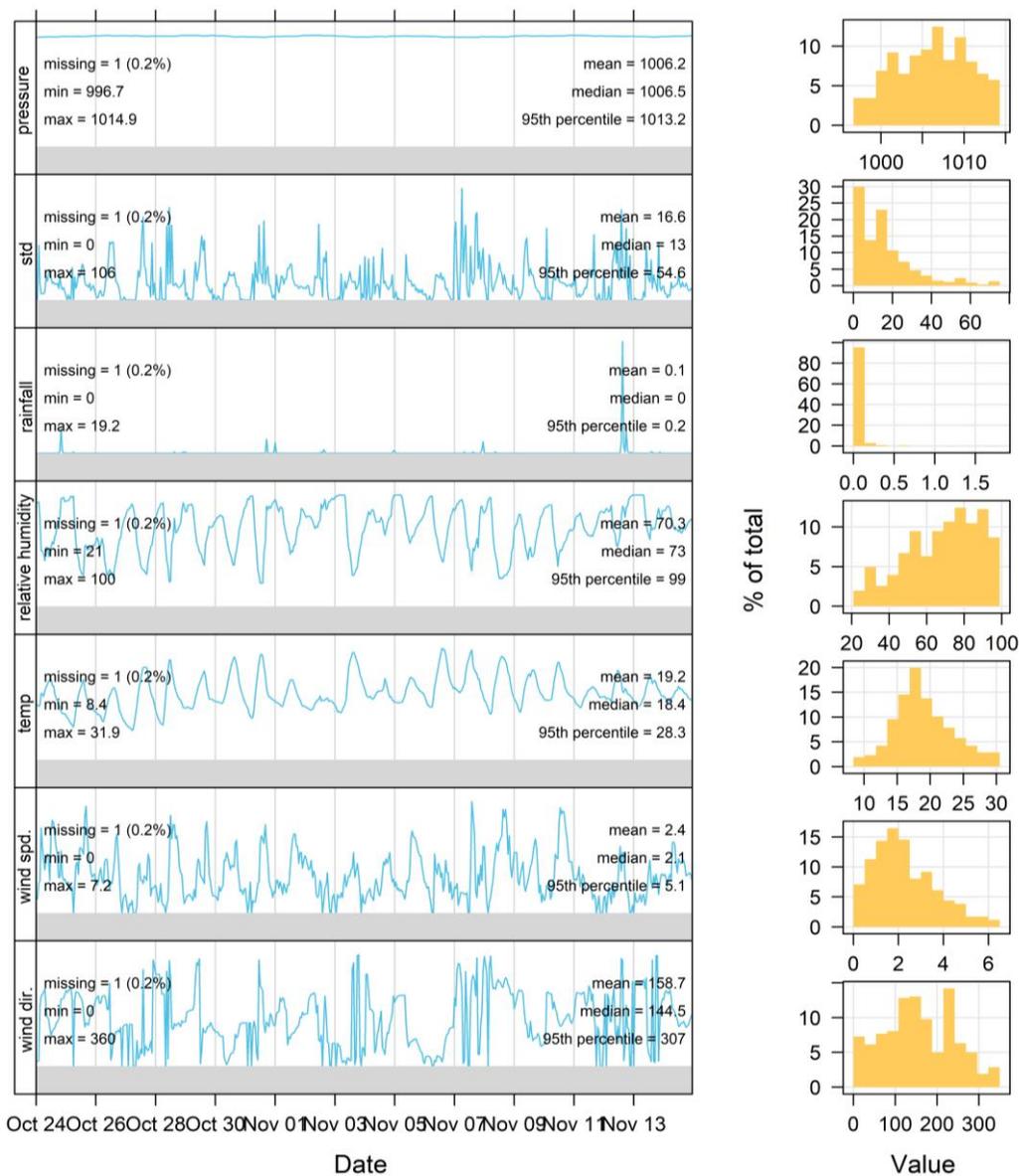


Figure 4.1 Meteorological data summary – BoM Badgerys Creek AWS

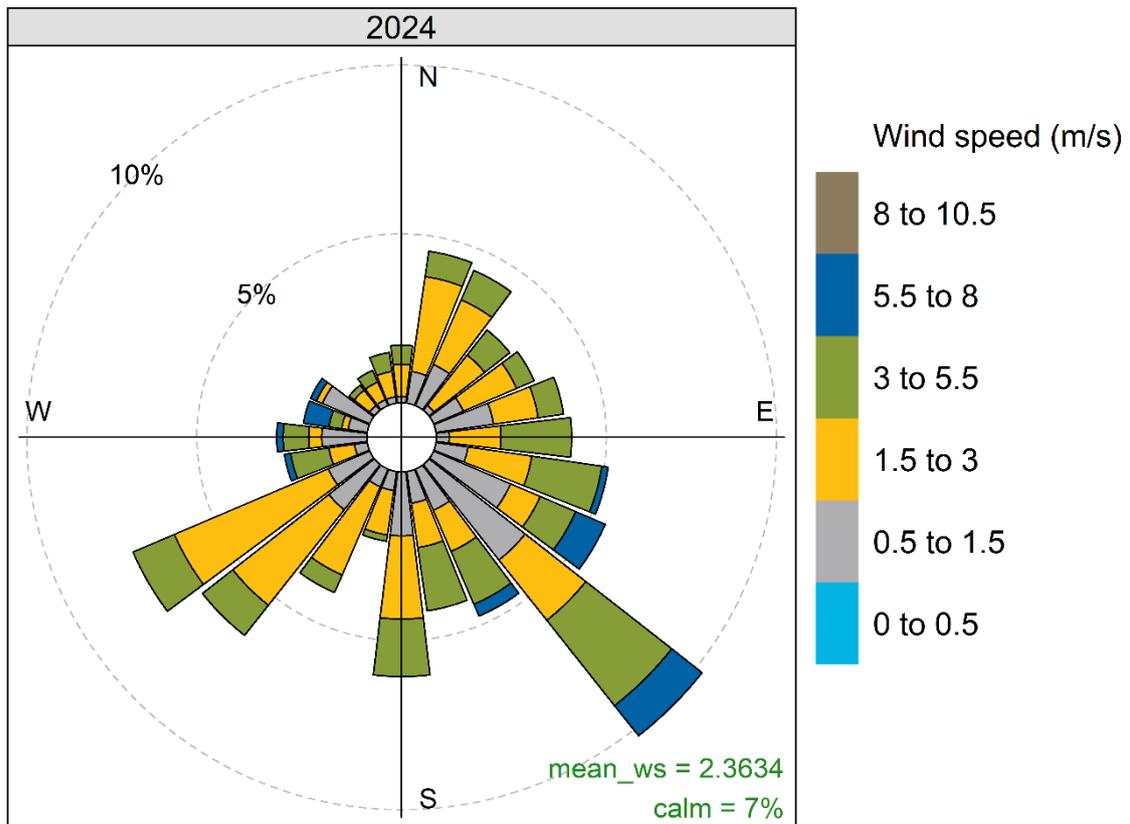
4.2 Meteorological data

Key descriptive statistics for the meteorological data collected at the BoM Badgerys Creek AWS during the reporting period are provided in Table 4.1. The statistics are calculated from the 1-hour values and are shown for the assessment period.

Table 4.1 Summary of meteorological data – assessment period 2024 – BoM Badgerys Creek AWS

Parameter	Minimum	Maximum	Median	Average	Standard deviation
Temperature (°C)	8.4	31.9	18.4	19.2	4.6
Wind speed (m/s)	0.0	7.2	2.1	2.4	1.5
Rainfall (mm)	0.0	19.2	0.0	0.1	0.9
Relative Humidity (%)	21.0	100.0	73.0	70.3	20.3

The wind rose for the November 2024 monitoring campaign from the BoM Badgerys Creek AWS is presented in Figure 4.2. The wind rose shows that winds during the assessment period were predominately from the south-east and south-west. In general the wind patterns indicate that the two continuous PM monitoring units installed at the site were appropriately located to record upwind and downwind particulate matter concentrations, however, it is noted that winds from the north-east were not as prevalent as those from the south-east, meaning that the upwind and downwind conditions at the monitoring locations may not be as pronounced.



Frequency of counts by wind direction (%)

Figure 4.2 Wind rose for the assessment period – BoM Badgerys Creek AWS

5 Air quality data

5.1 Overview of air quality data

This section of the report presents a summary and analysis of the air quality (PM₁₀ and PM_{2.5}) data that were collected from the onsite monitors during the reporting period. The data from the DCCEEW Bringelly AQMS are included for comparison.

An overview of the continuous (hourly) data from the two PM₁₀/PM_{2.5} monitors located at the site is provided in Figure 5.1. Measurements were collected starting from 3:00 pm on 24 October 2024 to 10:00 am on 14 November 2024.

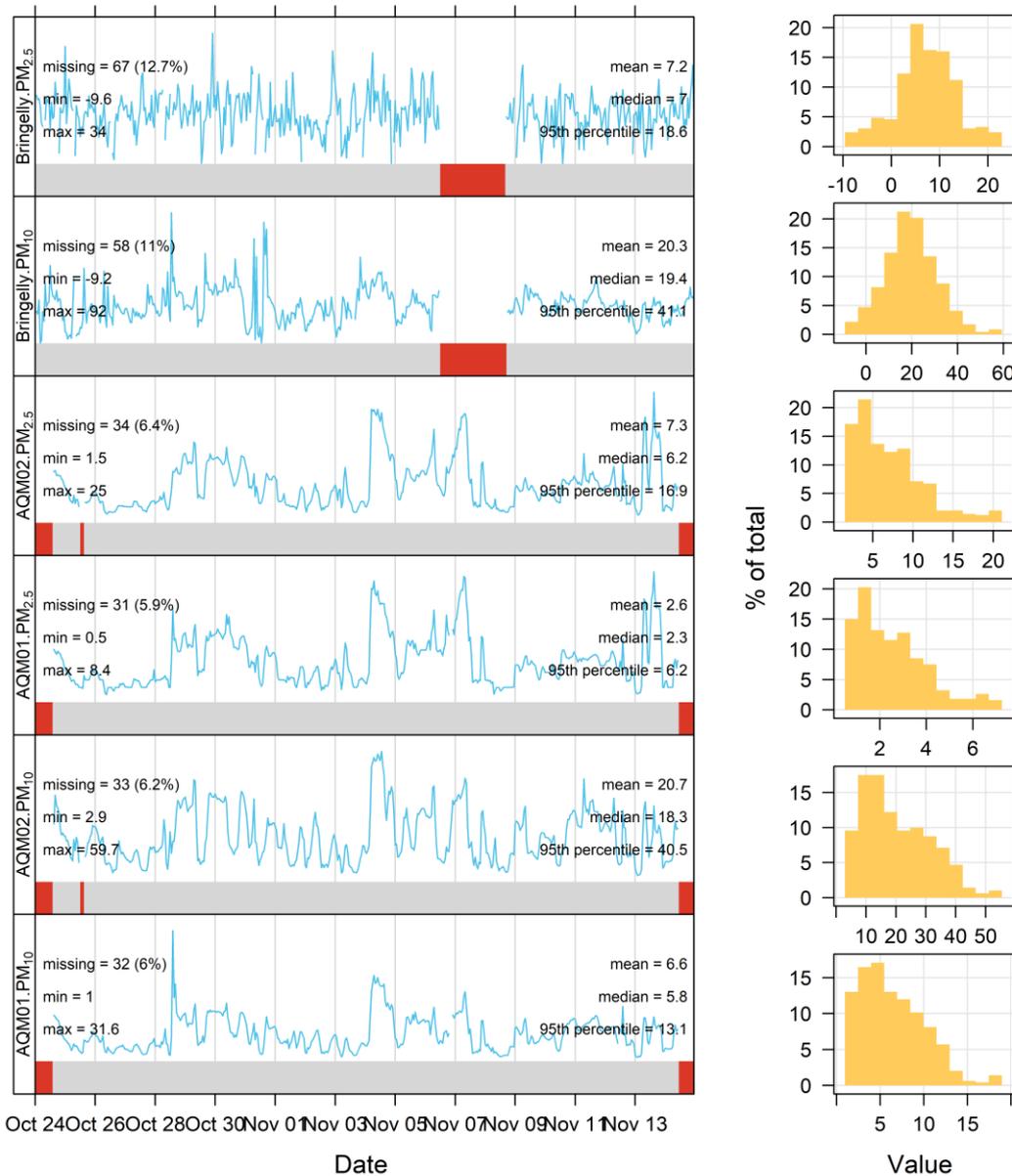


Figure 5.1 Air quality monitoring data – DCCEEW Bringelly and onsite monitors – assessment period

5.2 PM₁₀ concentrations

PM₁₀ concentrations are reported here as 24 hour mean values (midnight to midnight). A statistical summary of the 24-hour PM₁₀ concentrations recorded (AQM01 – south-west corner) and (AQM02 – north-east corner) at the site during the reporting period is provided in Table 5.1. The corresponding values from the DCCEEW Bringelly AQMS are included for comparison.

The period mean PM₁₀ concentrations for AQM02 and the DCCEEW Bringelly AQMS were generally similar, with average concentrations at the AQM02 slightly higher than at the DCCEEW Bringelly AQMS. While period mean PM₁₀ concentrations for AQM01 were lower than the other two locations.

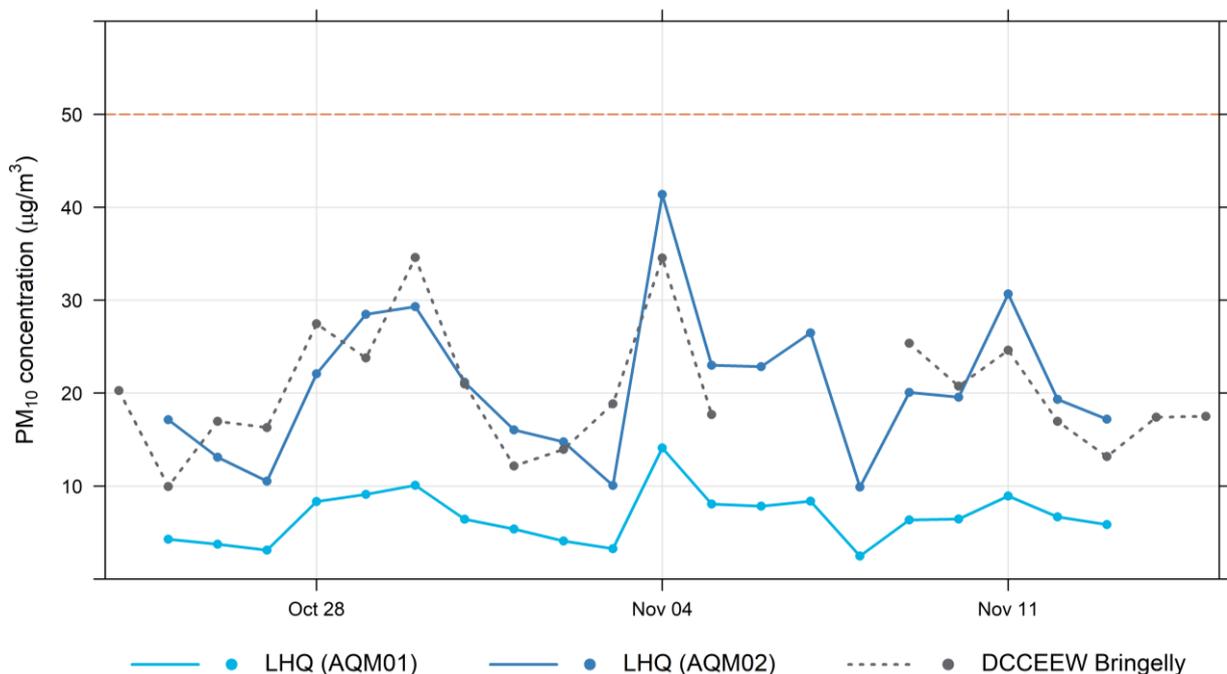
No exceedances of the 24-hour PM₁₀ criterion of 50 µg/m³ were recorded at any location during the campaign.

Table 5.1 Statistics for PM₁₀ 24 hour average concentration

Monitoring location	Mean (µg/m ³)	Median (µg/m ³)	Maximum (µg/m ³)	Standard deviation	Days above 50 µg/m ³
AQM01	6.6	6.4	14.2	2.8	0
AQM02	20.6	19.9	41.5	7.9	0
DCCEEW Bringelly AQMS	20.3	19.4	33.4	6.5	0

The time series of 24-hour PM₁₀ concentrations recorded at the site and DCCEEW Bringelly AQMS are plotted in Figure 5.2. The concentrations at all three sites generally followed a similar pattern, with concentrations at AQM01 lower than the other two locations.

It is noted that PM₁₀ concentrations at AQM01 are lower compared to the other two monitoring locations over the monitoring period. The cause of this difference is unclear, but may be a function of factors such as instrumentation sensitivity or the location of the monitoring equipment.



Note: red broken line marks 24-hour average PM₁₀ criterion of 50 µg/m³

Figure 5.2 Daily mean PM₁₀ concentration

The measured PM₁₀ concentrations from the two onsite monitors at the site and recorded by the DCCEEW Bringelly AQMS are also presented below using bivariate polar plots and polar annulus plots.

The bivariate plots (Figure 5.3 to Figure 5.5) show how PM₁₀ concentrations vary by wind speed and wind direction over the reporting period. The plots provide a graphical impression of potential sources influencing PM₁₀ concentrations at the monitoring locations.

The following points are noted from the bivariate polar plots (Figure 5.3 to Figure 5.5):

- The bivariate polar plot for AQM01 (Figure 5.3) shows low concentrations with a slight signal to the north-east, which is likely to be associated with emissions from the site as well as neighbouring activities, including emissions from the Western Sydney Airport.
- The bivariate polar plot for AQM02 (Figure 5.4) shows a signal to the north-east and south-east, which is likely to be associated with emissions from neighbouring activities, including emissions from the Western Sydney Airport.
- The bivariate polar plot for the DCCEEW Bringelly AQMS (Figure 5.5) shows a signal from the south-east, which is likely to be associated with emissions from regional influences and road traffic.

The polar annulus plots (Figure 5.6 to Figure 5.8) show the temporal variation in the PM₁₀ concentration by wind direction during the whole reporting period. In this case, the temporal variation is by hour of the day (0 to 23).

- The polar annulus plots for AQM01 and AQM02 (Figure 5.6 and Figure 5.7, respectively) show that the highest concentrations occur between 8:00 pm and 12:00 am, and are unlikely to be associated with operations at the site.
- The polar annulus plots for the DCCEEW Bringelly AQMS (Figure 5.8) shows that the highest concentrations occur in the morning (approximately around 8:00 am) and in the late afternoon to night (4:00 pm to 8:00 pm), supporting the earlier conclusion that recorded concentrations are likely to be associated with emissions morning and afternoon road traffic.

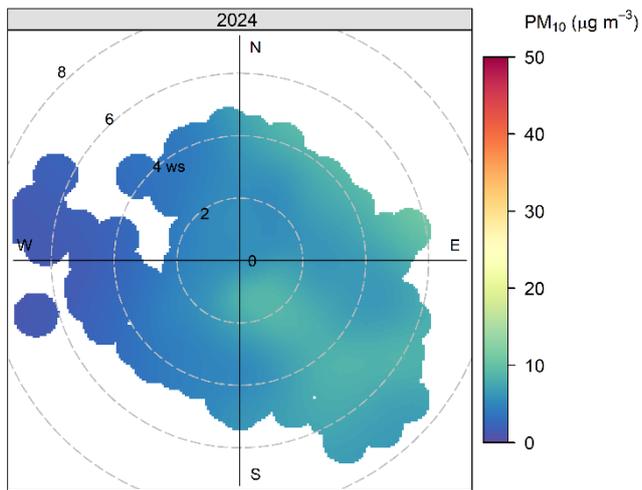


Figure 5.3 Assessment period bivariate polar plot for PM₁₀ at AQM01

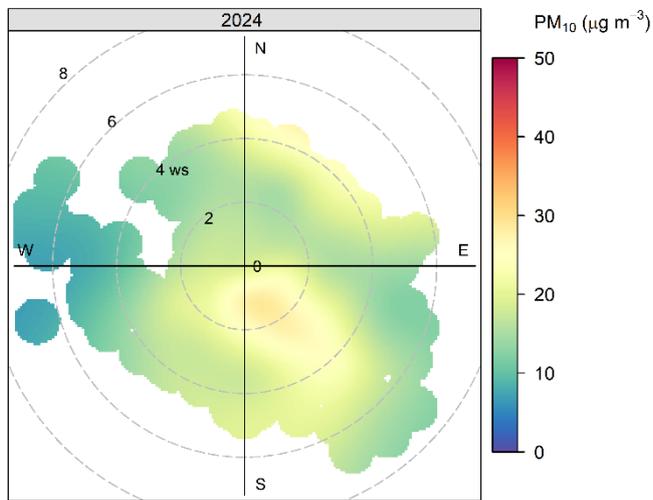


Figure 5.4 Assessment period bivariate polar plot for PM₁₀ at AQM02

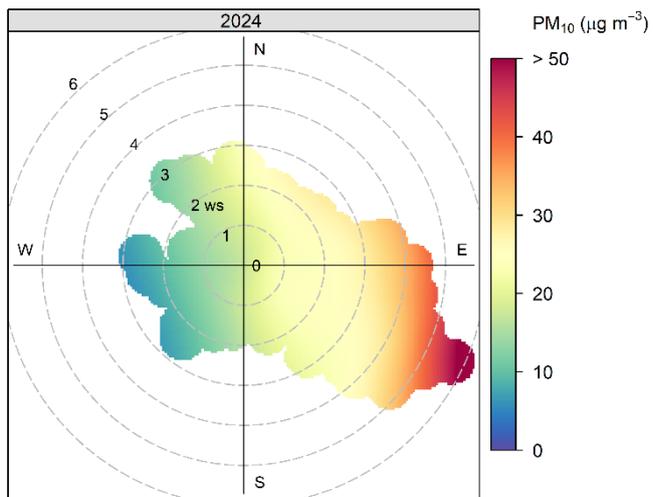


Figure 5.5 Assessment period bivariate polar plot for PM₁₀ at DCCEW Bringelly

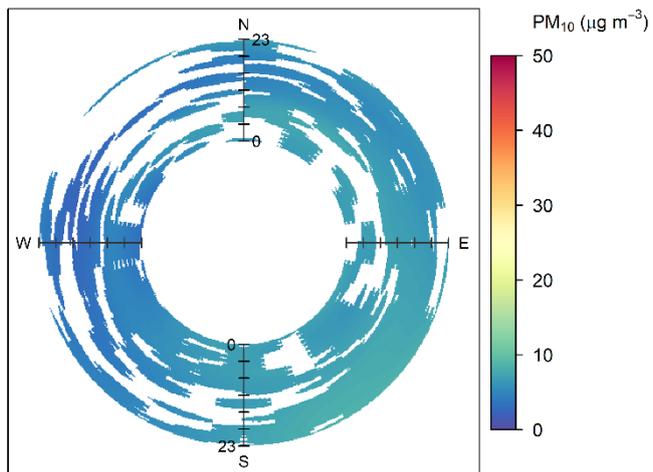


Figure 5.6 Polar annulus plot for PM₁₀ at AQM01

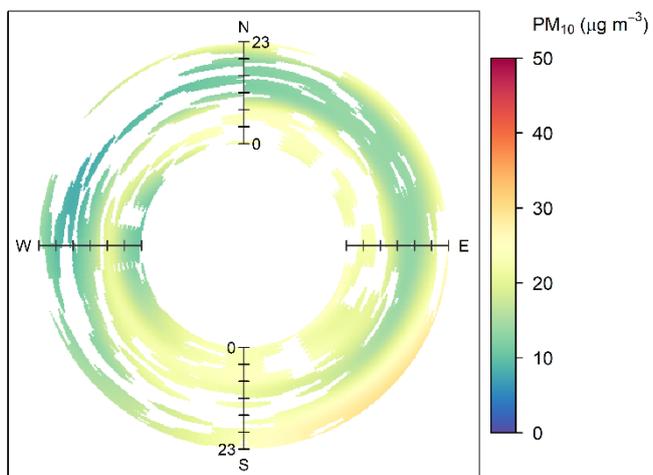


Figure 5.7 Polar annulus plot for PM₁₀ at AQM02

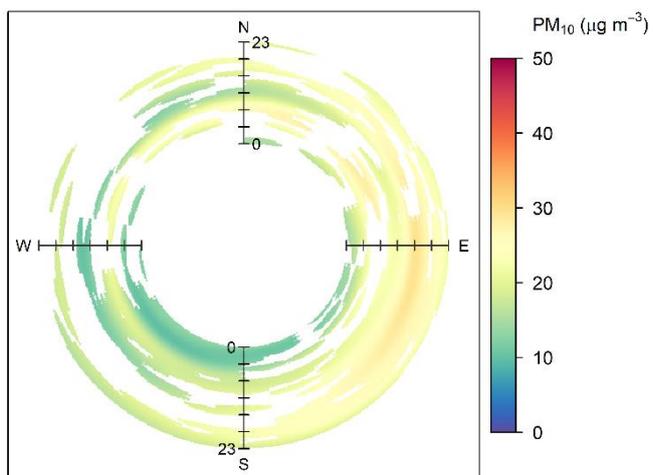


Figure 5.8 Polar annulus plot for PM₁₀ at DCCEW Bringelly

5.3 PM_{2.5} concentrations

The presentation of the PM_{2.5} data follows the same format as that for PM₁₀.

A statistical summary of the 24-hour PM_{2.5} concentrations at the site during the reporting period is provided in Table 5.2. The corresponding values from the DCCEEW Bringelly AQMS are included for comparison.

For the monitoring campaign period, the PM_{2.5} concentrations were generally similar between AQM02 and at the DCCEEW Bringelly AQMS. Concentrations were generally lower at AQM01

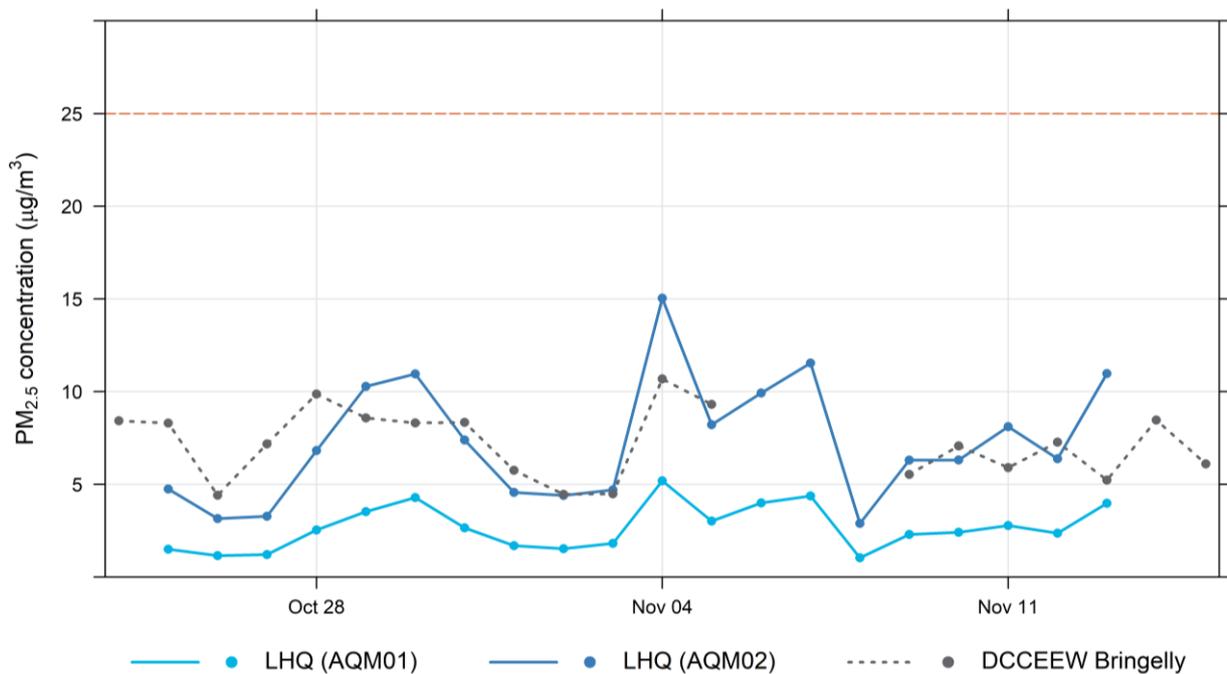
No exceedances of the 24-hour average PM_{2.5} criterion (25µg/m³) were recorded at any of the monitoring locations.

Table 5.2 Statistics for PM_{2.5} 24 hour average concentrations

Monitoring location	Mean (µg/m ³)	Median (µg/m ³)	Maximum (µg/m ³)	Standard deviation	Days above 25 µg/m ³
AQM01	2.7	2.5	5.3	1.2	0
AQM02	7.3	6.8	15.3	3.3	0
DCCEEW Bringelly AQMS	7.2	7.4	10.8	1.9	0

The time series of 24-hour PM_{2.5} concentrations recorded at the site and Bringelly are presented in Figure 5.9. Concentrations at all three sites generally followed a similar pattern, with concentrations at AQM01 lower than the other two locations.

Similar to PM₁₀ concentrations, it is noted that PM_{2.5} concentrations at AQM01 are lower compared to the other two monitoring locations over the monitoring period.



Note: read broken line marks 24-hour average PM_{2.5} criterion of 25 µg/m³

Figure 5.9 Daily mean PM_{2.5} concentration

The bivariate polar plots for PM_{2.5} are shown in Figure 5.10 to Figure 5.12, and the polar annulus plots are shown in Figure 5.13 to Figure 5.15.

The following points are noted from the bivariate polar plots (Figure 5.10 to Figure 5.12):

- The bivariate polar plots for AQM01 and AQM02 (Figure 5.10 and Figure 5.11, respectively) show generally low concentrations in all directions; however, there are slightly higher concentrations recorded when winds are from the north-east and south-east. This is most notable for AQM02.
- The bivariate polar plot for the DCCEEW Bringelly AQMS (Figure 5.12) show generally low concentrations in all directions; however, slight signals are noted from the east, which is likely to be associated with emissions from road traffic.

The polar annulus plots (Figure 5.13 to Figure 5.15) show the temporal variation in the PM_{2.5} concentration by wind direction during the whole reporting period. In this case the temporal variation is by hour of the day (0 to 23):

- The polar annulus plots for AQM01 and AQM02 (Figure 5.13 and Figure 5.14 , respectively) show that the highest concentrations occur between 4:00 am and 8:00 am, and are likely to be associated with emissions from the site.
- The polar annulus plots for the DCCEEW Bringelly AQMS (Figure 5.15) shows that the highest concentrations occur between in the daytime (approximately 12:00 pm to 4:00 pm) and in the evening (8:00 pm to 12.00 am), and are likely to be associated with emissions from road traffic.

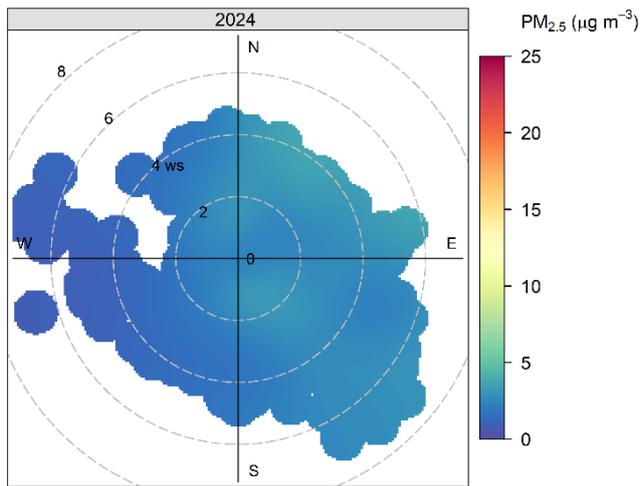


Figure 5.10 Assessment period bivariate polar plot for PM_{2.5} at AQM01

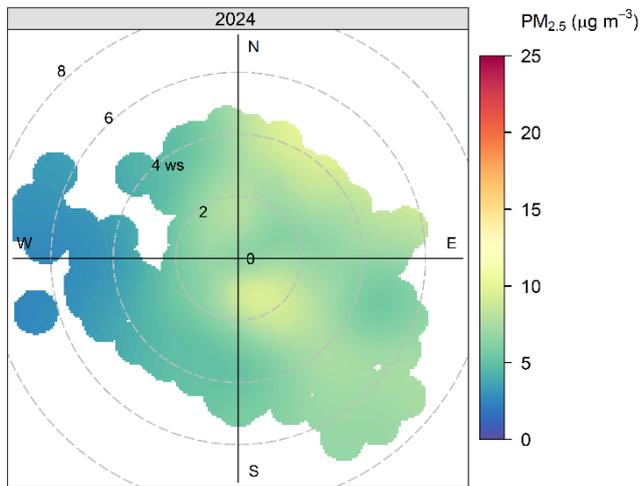


Figure 5.11 Assessment period bivariate polar plot for PM_{2.5} at AQM02

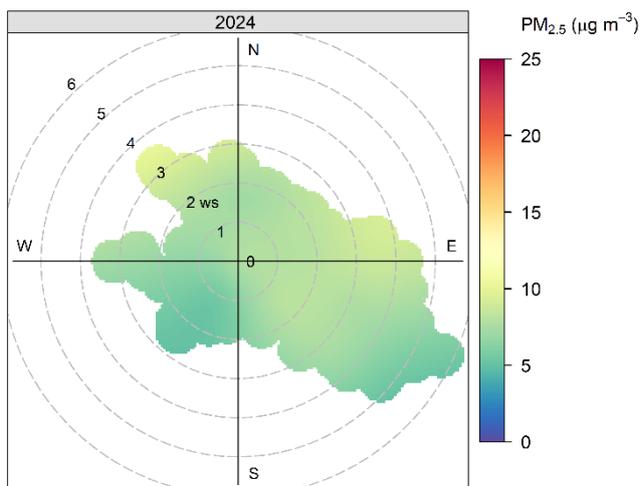


Figure 5.12 Assessment period bivariate polar plot for PM_{2.5} at DCCEW Bringelly

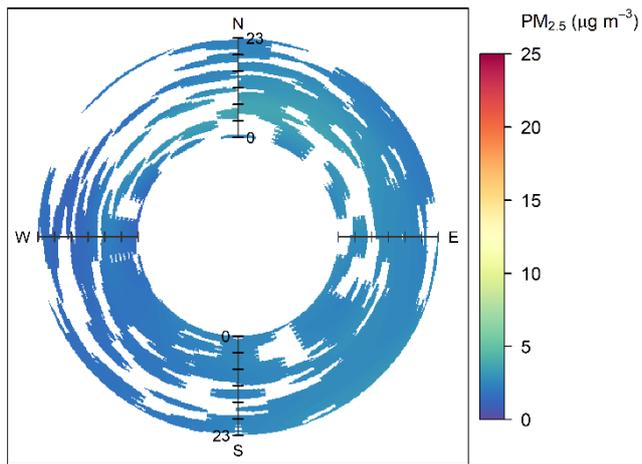


Figure 5.13 Polar annulus plot for PM_{2.5} at AQM01

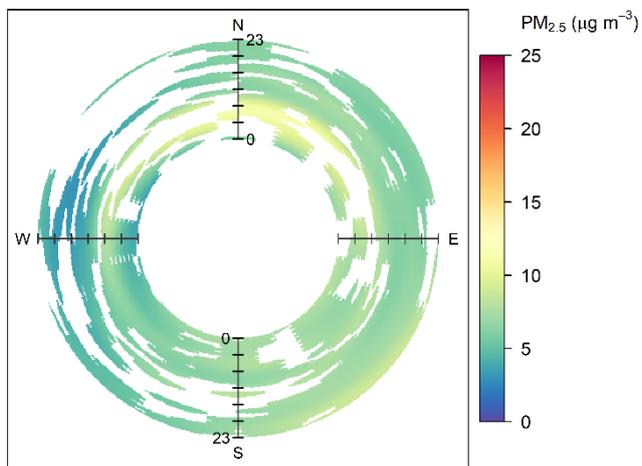


Figure 5.14 Polar annulus plot for PM_{2.5} at AQM02

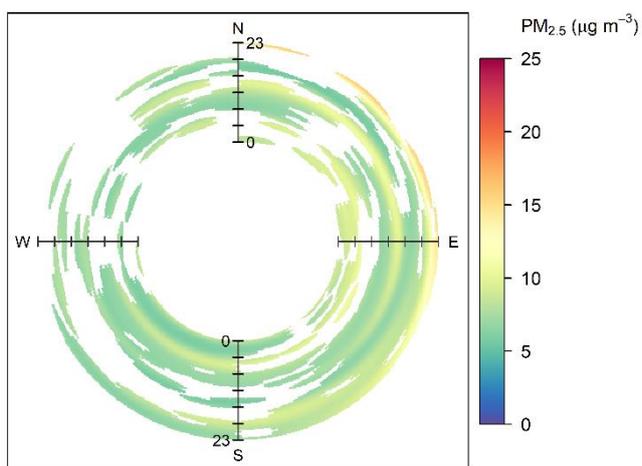


Figure 5.15 Polar annulus plot for PM_{2.5} at DCCEW Bringelly

5.4 Upwind and downwind concentrations

As stated in Section 1.2, the upwind and downwind monitoring will enable compliance assessment against the short-term air quality criteria, which are evaluated against the increment increase from the development alone, as follows:

- PM contribution from quarry = downwind concentration minus upwind concentration.

To determine the potential contribution from the site to recorded concentrations, the assessment period for the 2024 monitoring campaign where the wind direction aligned with the two onsite PM monitoring locations were examined. For the purpose of this analysis, downwind conditions were considered to occur when winds were between 10° and 99° for AQM01, and 180° and 320° for AQM02. Upwind conditions were considered between 100° and 360° for AQM01, and 0° and 179° for AQM02.

The mean PM₁₀ and PM_{2.5} concentration and wind speeds when the site was upwind or downwind of each monitor are given in Table 5.3. The number of hours for each condition is also provided.

For AQM01 and AQM02, PM₁₀ and PM_{2.5} concentrations were generally higher during upwind conditions than downwind conditions.

Table 5.3 PM₁₀ and PM_{2.5} concentrations upwind and downwind of the quarry

Parameter		AQM upwind of quarry			AQM downwind of quarry		
		Mean (µg/m ³)	Mean wind speed (m/s)	Hours upwind	Mean (µg/m ³)	Mean wind speed (m/s)	Hours downwind
PM ₁₀	AQM01	6.6	2.4	389	6.5	2.3	130
	AQM02	21.5	2.4	319	19.6	2.3	188
PM _{2.5}	AQM01	2.5	2.4	389	2.9	2.3	130
	AQM02	7.9	2.4	319	6.2	2.3	188

The potential contribution of recorded PM₁₀ and PM_{2.5} concentrations from onsite emission sources (e.g. quarrying, haulage of material, wind erosion) have been calculated by reviewing the differences in mean measurements at the two locations under upwind and downwind conditions (i.e. AQM01 downwind and AQM02 upwind). The average difference at each site is presented in Table 5.4. For the monitoring period, the average difference (or quarry contribution) was negligible for PM₁₀, and up to 0.4 µg/m³ for PM_{2.5}.

Table 5.4 PM contributions from the quarry

Parameters		Average contribution (µg/m ³)
PM ₁₀	AQM01	negligible
	AQM02	negligible
PM _{2.5}	AQM01	0.4
	AQM02	negligible

5.5 TSP concentrations

Measurements of TSP were not collected at the site during the October to November 2024 monitoring campaign. As stated in Section 1.3, TSP concentrations would be derived from PM₁₀ concentrations based on the assumption that PM₁₀ is 40% of TSP.

For the average PM₁₀ concentrations recorded by the two onsite monitors, the derived average TSP concentrations are 16.6 µg/m³ and 51.6 µg/m³ for AQM01 and AQM02 respectively. Both concentrations are well below the applicable assessment criteria of 90 µg/m³ (Table 2.1); however, it is noted that the TSP assessment criteria applies to annual average concentrations.

6 Conclusion

EMM has been commissioned to manage a short-term ambient air quality monitoring campaign at the site.

A two-week monitoring program was completed during October and November 2024 using two continuous PM monitoring units (AirMetER-DX monitoring system) to record concentrations of PM₁₀ and PM_{2.5}. Meteorological measurements for the monitoring period were sourced from the nearby BoM Badgerys Creek AWS. The onsite PM monitoring data was also compared with monitoring data for the same period from the DCCEEW Bringelly AQMS.

The monitoring equipment was deployed at the north-east and south-west corners of the site, with a specific focus of the monitoring study to record upwind and downwind concentrations.

A summary of the monitoring results are as follows:

- No exceedances of the 24-hour PM₁₀ criterion of 50 µg/m³ were recorded at either of the onsite monitoring locations.
- No exceedances of the 24-hour PM_{2.5} criterion of 25 µg/m³ were recorded at either of the onsite monitoring locations.
- PM₁₀ and PM_{2.5} concentrations at AQM01 were notably lower than at AQM02 and DCCEEW Bringelly.
- The PM₁₀ concentrations at the quarry were generally comparable with the concurrent measurements at the DCCEEW Bringelly AQMS for the same period.
- The PM_{2.5} concentrations at the quarry were generally comparable with the concurrent measurements at the DCCEEW Bringelly AQMS for the same period.
- When upwind and downwind concentrations were considered, the contribution from the site did not result in an exceedance of the criteria specified in Chapter 2.
- It is inferred that no exceedances of the annual TSP criterion of 90 µg/m³ would occur based on the recorded PM₁₀ concentrations.

Appendix A

Summary of 24-hour average concentrations recorded on site

A.1 Daily average PM₁₀ and PM_{2.5} data

Table A.1 Daily average PM₁₀ and PM_{2.5} concentration (µg/m³)

Date	PM ₁₀ concentration (µg/m ³)		PM _{2.5} concentration (µg/m ³)	
	AQM01	AQM02	AQM01	AQM02
25/10/2024	Less than 24-hours of data			
26/10/2024	4.4	17.4	1.5	4.7
27/10/2024	3.6	12.5	1.1	3.0
28/10/2024	3.1	10.6	1.2	3.3
29/10/2024	8.7	23.1	2.7	7.2
30/10/2024	9.1	28.5	3.5	10.2
31/10/2024	10.0	29.1	4.3	10.9
1/11/2024	6.4	20.8	2.6	7.3
2/11/2024	5.1	15.3	1.6	4.3
3/11/2024	4.3	15.2	1.6	4.6
4/11/2024	3.1	9.9	1.8	4.5
5/11/2024	14.2	41.5	5.3	15.3
6/11/2024	8.2	23.6	3.0	8.3
7/11/2024	7.9	23.1	4.1	10.1
8/11/2024	8.1	25.8	4.2	11.1
9/11/2024	2.6	10.1	1.1	3.0
10/11/2024	6.3	19.8	2.3	6.2
11/11/2024	6.6	20.0	2.5	6.5
12/11/2024	8.8	30.5	2.7	8.1
13/11/2024	6.4	18.5	2.3	6.2
14/11/2024	5.9	17.3	4.0	11.0
15/11/2024	Less than 24-hours of data			

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Luddenham Quarry Dust Deposition Monitoring

December 2024 Monitoring Period

Prepared for Luddenham Operations Pty Ltd

December 2024

Luddenham Quarry Dust Deposition Monitoring

December 2024 Monitoring Period

Luddenham Operations Pty Ltd

E240891 RP02

December 2024

Version	Date	Prepared by	Reviewed by	Comments
V1	29 January 2025	Tasman Coupe	David Bone	Final

Approved by



David Bone

Associate Director

29 January 2025

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Newcastle NSW 2300

ABN: 28 141 736 558

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ABN: 28 141 736 558

TABLE OF CONTENTS

1	Introduction	1
2	Methodology	3
3	Results	4
4	Conclusion	6
5	Discussion and recommendations	7

Appendices

Appendix A	Certificate of analysis	A.1
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Tables

Table 3.1	December 2024 dust results	4
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Figures

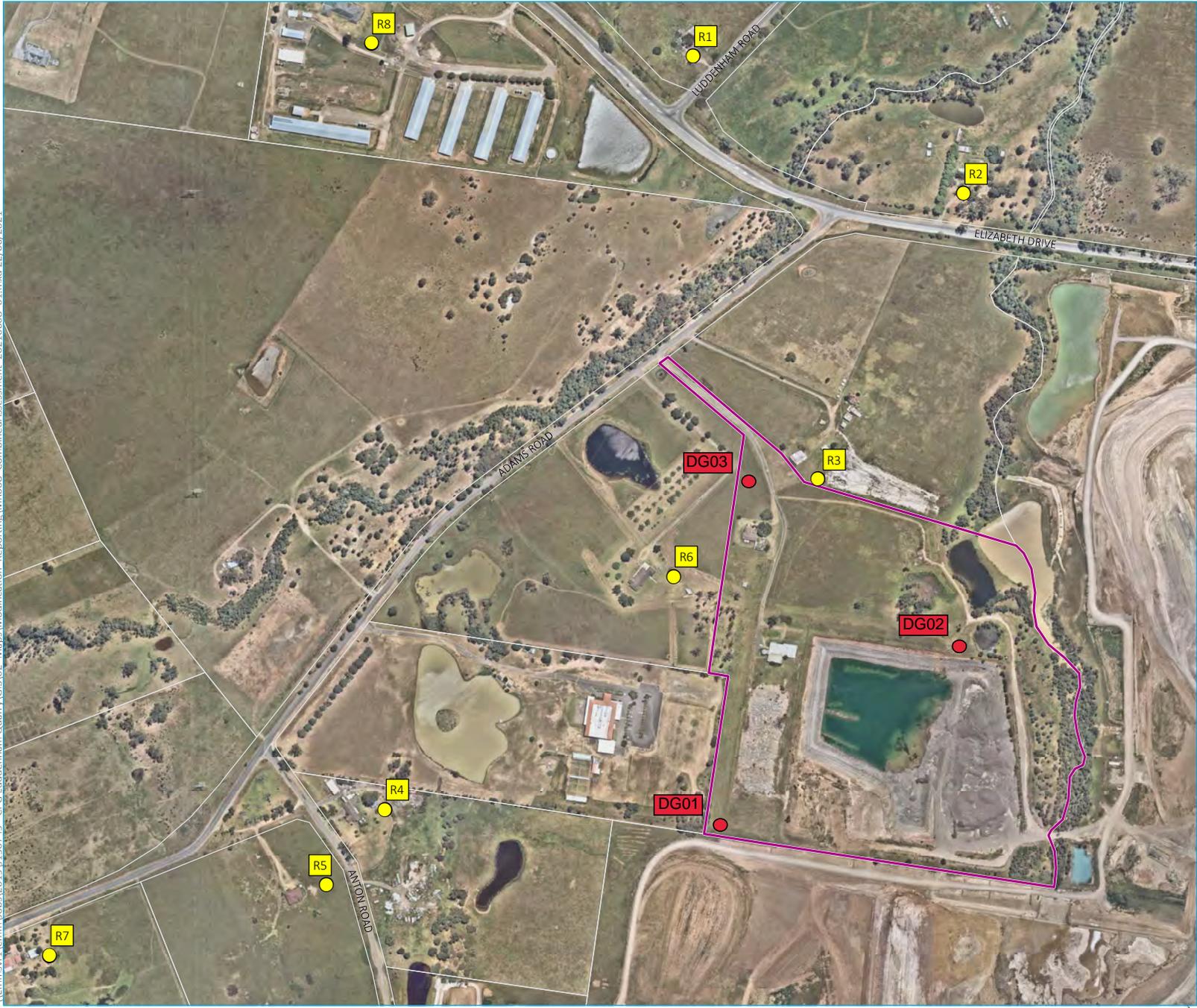
Figure 1.1	Indicative air quality monitoring locations	2
Figure 3.1	September 2023 – December 2024 Dust deposition results	5

1 Introduction

EMM Consulting Pty Limited (EMM) has been contracted by Luddenham Operations Pty Ltd to undertake environmental air quality monitoring activities for operation of the Luddenham Quarry Project off Adams Road Luddenham.

The air quality monitoring network consists of three dust deposition gauges installed, operated and analysed in accordance with AS 3580. 10. 1 2003. Static dust monitoring sites were chosen at locations adjacent to sensitive receivers in close proximity to the works, in accordance with the approved Air Quality Management Plan (AQMP). The indicative air quality monitoring locations are shown in Figure 1.1.

\\Emmsvr1\emms\jobs\2019\190749 - CPG Luddenham Quarry\GIS\02 - Maps\Modification - Reporting\WR008 - Combined\Assessment - 20210608 - 01.mxd 22/06/2021



- KEY**
- Study area
 - Cadastral boundary
 - Indicative air quality monitoring location
 - Air quality assessment location

Indicative air quality monitoring locations

Luddenham Quarry
Dust Deposition Monitoring
Figure 1.1

Source: EMM (2021); DFSI (2017); GA (2011); Nearmap (2020)



2 Methodology

Dust gauges have been installed in accordance with the requirements *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA 2022) and AS 3580. 10. 1 2016.

Samples will continue to be taken on a monthly basis (30 days \pm 2 days) until project completion.

In accordance with EPA (2022) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, the project specific criterion for dust deposition is:

Annual average dust deposition of no greater than 4 g/m²/month (assessed as total insoluble solids), and no more than a 2 g/m²/month increase on background (assessed as insoluble solids).

Samples are analysed in accordance with the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA 2022) guidelines by a NATA Accredited laboratory. Analysis reports are included in Appendix A of each monthly dust monitoring report.

3 Results

Results for the December 2024 dust monitoring period are compiled in Table 3.1 below.

Table 3.1 December 2024 dust results

Site	Date on	Date off	No. days active	Insoluble solids (g/m ² /mth)	Comments
DG01	03/12/24	31/12/24	28	3.4	Quarry operational during monitoring.
DG02	03/12/24	31/12/24	28	2.7	Quarry operational during monitoring.
DG03	03/12/24	31/12/24	28	2.6	Quarry operational during monitoring.

A copy of the laboratory Certificate of Analysis is attached in Appendix A.

Figure 3.1 below shows the monthly dust deposition results.

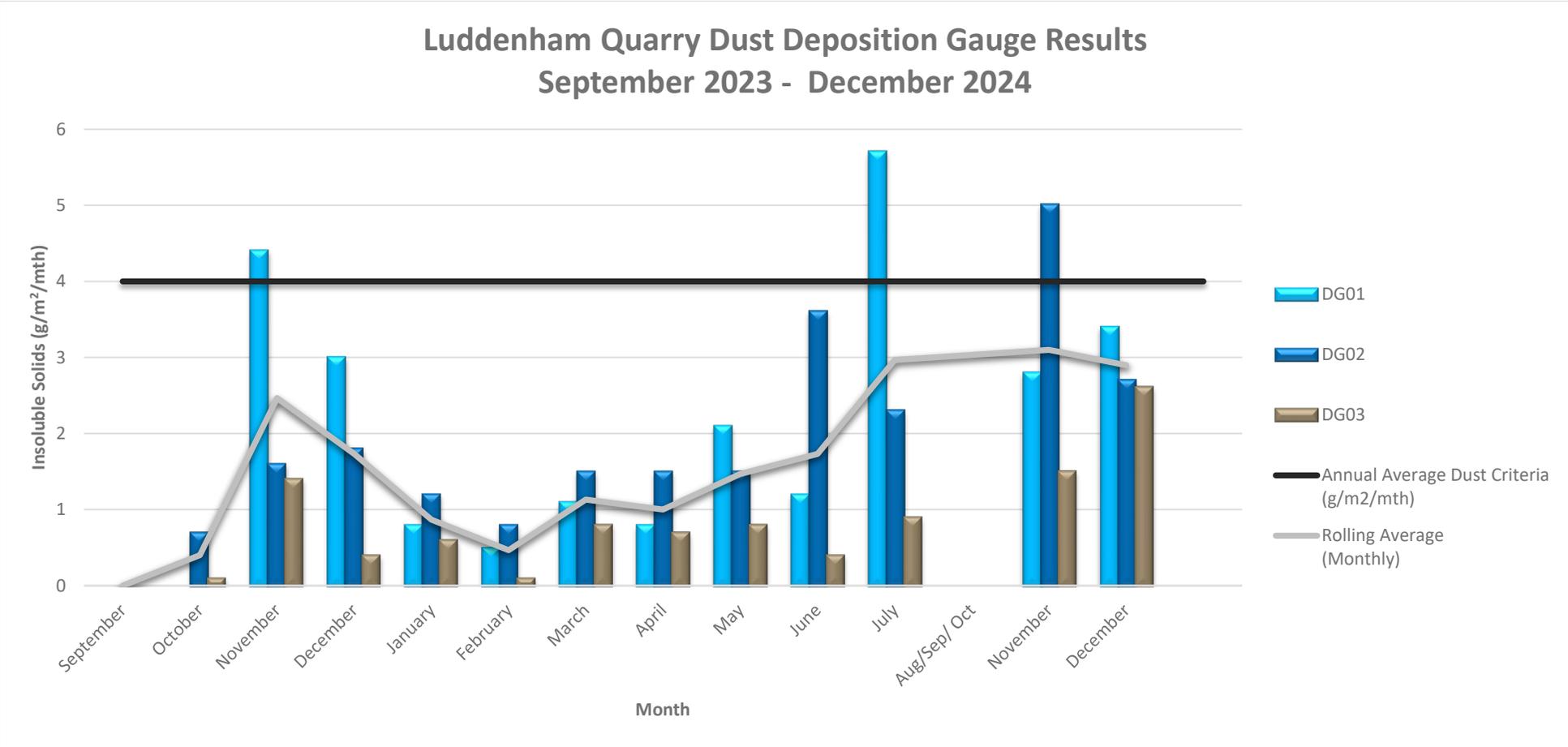


Figure 3.1 September 2023 – December 2024 Dust deposition results

4 Conclusion

Insoluble solids is the criterion by which dust deposition is measured by the NSW EPA, and is considered to be the most representative measure of dust components such as soil and weathered rock disturbed during earthworks and construction activities. Other matter collected may include bird droppings, insects, organic matter (such as pollen and seeds), and vegetative matter.

DG01 yielded a total insoluble solids value of 3.4 g/m²/month. DG01 is currently compliant with the 4.0 g/m²/month rolling annual average dust deposition criteria.

DG02 yielded a total insoluble solids value of 2.7 g/m²/month. DG02 is currently compliant with the 4.0 g/m²/month rolling annual average dust deposition criteria.

DG03 yielded a total insoluble solids value of 2.6 g/m²/month. DG03 is currently compliant with the 4.0 g/m²/month rolling annual average dust deposition criteria.

The annual rolling average across the site is 3.0 g/m²/month which is below the Annual Average criteria of 4.0 g/m²/month.

5 Discussion and recommendations

From the results reviewed this month, the following comments and recommendations are made:

- Gauge DG01, DG02 and DG03 analysed during this monitoring period recorded dust deposition results under annual average criteria of 4.0 g/m²/month.
- Gauge DG01, DG02 and DG03 are compliant with the 4.0 g/m²/month rolling annual average dust deposition criteria.
- It is recommended that site personnel exercise caution when the site is operating and when operating machinery, ensure exposed surfaces are sealed or revegetated in accordance with approved measures and continued regular use of dust control measures, such as the use of water carts and street sweepers, when the site is active.

Appendix A

Certificate of analysis

Report Number: 17270

Date Issued: 9/01/2025

Revision Number: 00

Site/Job: Luddenham Dusts

Client: EMM Consulting Pty Ltd
Address: Level 1, 87 Wickham Terrace
Spring Hill QLD 4000
Contact: Tasman Coupe

The following Dust Deposition sample(s) were received on 31/12/2024

Client Sample Reference	Date On	Date Off	Lab ID	Matrix	Comments or Non-Compliances
DG01	3/12/2024 13:41	31/12/2024	17270/1	Dust	
DG02	3/12/2024 13:23	31/12/2024 10:57	17270/2	Dust	
DG03	3/12/2024 13:13	31/12/2024 10:49	17270/3	Dust	

The sample(s) have been tested as received and results relate specifically to the samples tested.
The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)



Anthony Crane
Laboratory Manager

Authorised by:

Results have been approved and report finalised on 9/01/2025.

Test Report Number: 17270

Date Issued: 9/01/2025

Revision No: 00

Results

Deposited Matter	Method	Lab ID Sample Date Sample ID Units	17270/1 31/12/2024 DG01	17270/2 31/12/2024 DG02	17270/3 31/12/2024 DG03
<i>Date Tested</i>	AS 3580.10.1	--	8/01/2025	8/01/2025	8/01/2025
Number of Days	AS 3580.10.1	days	28	28	28
Insoluble Solids	AS 3580.10.1	g/m2/mth	3.4	2.7	2.6
Ash	AS 3580.10.1	g/m2/mth	2.9	2.3	1.9
Combustible Matter	AS 3580.10.1	g/m2/mth	0.5	0.4	0.7
Calculated Rain	AS 3580.10.1	mm	28	26	28



Report Comments:

Where present, indicates NATA accreditation does not cover the performance of this service.

Where applicable, results in **bold** indicate an exceedance of the relevant guideline.

When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.

<https://www.vgt.com.au/measurement-uncertainty>

[NT]: Not tested

Location Analysed : 4/30 Glenwood Dr Thornton NSW 2322.

Sampling Report Number: 17270

Date Issued: 9/01/2025

Revision No: 00

Sampling Conditions: Cloudy, 27 °C

Lab ID	Client Sample Reference	Licence/Reference	Sampler	Date Sampled	Method of Sampling	Pre-treatment / Preservation
17270/1	DG01		T & D.Walker	31/12/2024	AS3580.10.1	CuSO4
17270/2	DG02		T & D.Walker	31/12/2024 10:57	AS3580.10.1	CuSO4
17270/3	DG03		T & D.Walker	31/12/2024 10:49	AS3580.10.1	CuSO4

Lab ID	Client Sample Reference	GPS-Easting	GPS-Northing	Sampling Observations
17270/1	DG01	288811	6249243	Minor dust, 2 beetles
17270/2	DG02	289102	6249474	Minor dust
17270/3	DG03	288833	6249702	Minor glass, beetle

Sampling procedures have been approved and report finalised on 9/01/2025.

Where method is "unknown" sampling procedures are not endorsed

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Appendix G – Noise Monitoring Reports

CPG Luddenham Quarry

Noise Compliance Report - October 2024

Prepared for Luddenham Operations Pty Ltd

November 2024

CPG Luddenham Quarry

Noise Compliance Report - October 2024

Luddenham Operations Pty Ltd

E240981 RP1

November 2024

Version	Date	Prepared by	Reviewed by	Comments
V1	27/11/2024	Ingrid Smith	Carl Fokkema	Final

Approved by

Carl Fokkema

Associate - Acoustics

27 November 2024

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St Leonards NSW 2065

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TABLE OF CONTENTS

1	Introduction	1
1.1	Background	1
1.2	Attended monitoring locations	1
1.3	Terminology and abbreviations	3
2	Noise limits	4
2.1	Environment protection licence	4
2.2	Noise limits	4
2.3	Meteorological conditions	4
2.4	Additional requirements	5
3	Methodology	6
3.1	Overview	6
3.2	Attended noise monitoring	6
3.3	Modifying factors	6
3.4	Instrumentation	7
4	Results	8
4.1	Total measured noise levels and atmospheric conditions	8
4.2	Site only noise levels	10
5	Summary	13

Appendices

Appendix A	Noise perception and examples	A.1
Appendix B	Regulator document	B.1
Appendix C	Calibration certificates	C.1

Tables

Table 1.1	Attended noise monitoring locations	1
Table 1.2	Terminology and abbreviations	3
Table 2.1	Noise impact limits, dB	4
Table 2.2	Applicable meteorological conditions	4
Table 3.1	Measurement equipment	7
Table 4.1	Total measured noise levels, dB – October 2024 ¹	8
Table 4.2	Measured atmospheric conditions – October 2024	9

Table 4.3	Site noise levels and limits – October 2024	11
Table A.1	Perceived change in noise	A.2
Figures		
Figure 1.1	Attended noise monitoring locations	2
Figure A.1	Common noise levels	A.2

1 Introduction

1.1 Background

EMM Consulting Pty Limited (EMM) was engaged by Luddenham Operations Pty Ltd to conduct a bi-annual noise survey of operations at Luddenham Quarry (the site) located at Luddenham, NSW. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified limits.

Attended environmental noise monitoring described in this report was done during the day periods of 29 and 30 October 2024 at six monitoring locations.

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1.1 and shown on Figure 1.1. It should be noted that Figure 1.1 shows actual monitoring positions and residences.

Table 1.1 Attended noise monitoring locations

Location descriptor	Description	Address	Coordinates (MGA56)	
			Easting	Northing
R1	Approximately 880 m northwest of the site	2161–2177 Elizabeth Drive, Luddenham	288807	6250432
R2	Approximately 680 m northwest of the site	2111–2141 Elizabeth Drive, Luddenham	289142	6250089
A1	Approximately 260 m north of site	Northern site boundary utilised to calculate for R3 – 285 Adams Road, Luddenham	288937	6249498
A2	Approximately 635 m southwest	5 Anton Road, Luddenham – southwest utilised to represent for R4 – 5 Anton Road, Luddenham, R5 – 185 Adams Road, Luddenham and R7 – 161 Adams Road, Luddenham	288345	6249200
A3	Approximately 260 m west of the site	Western site boundary utilised to calculate for R6 – 225 Adams Road, Luddenham	288912	6249491
A4	Approximately 1020 m northwest of the site	196–214 Adams Road, Luddenham utilised to calculate for R8 – 2510–2550 Elizabeth Drive, Luddenham	288632	6249769

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- KEY**
- Study area
 - Cadastral boundary
 - Assessment location**
 - Active recreation
 - Commercial
 - Noise assessment location
 - Noise monitoring location

Attended noise monitoring locations

Source: EMM (2024); DCSSS (2024); MetroMap (2024)



GDA 1994 MGA Zone 56

CPG Luddenham Quarry
Noise Compliance Report
Figure 1.1



1.3 Terminology and abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2 Terminology and abbreviations

Term/descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to approximate how humans hear noise.
L_{Amax}	The maximum root mean squared A-weighted noise level over a time period.
L_{A1}	The A-weighted noise level which is exceeded for 1% of the time.
$L_{A1,1minute}$	The A-weighted noise level which is exceeded for 1% of the specified time period of 1 minute.
L_{A10}	The A-weighted noise level which is exceeded for 10% of the time.
L_{Aeq}	The energy average A-weighted noise level.
L_{A50}	The A-weighted noise level which is exceeded for 50% of the time, also the median noise level during a measurement period.
L_{A90}	The A-weighted noise level exceeded for 90% of the time, also referred to as the “background” noise level and commonly used to derive noise limits.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The energy average C-weighted noise energy during a measurement period. The “C” weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
IA	Inaudible. When site noise is noted as IA then there was no audible site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	Monday – Saturday: 7 am to 6 pm, on Sundays and Public Holidays: 8 am to 6 pm.
Evening	Monday – Saturday: 6 pm to 10 pm, on Sundays and Public Holidays: 6 pm to 10 pm.
Night	Monday – Saturday: 10 pm to 7 am, on Sundays and Public Holidays: 10 pm to 8 am.

Appendix A provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2 Noise limits

2.1 Environment protection licence

Noise assessment criteria for the operations are provided in the site's EPL which is included as Appendix B. These are specified at locations which are representative of residences potentially impacted by quarry noise.

2.2 Noise limits

Noise impact limits based on EPL 21562 are provided in Table 2.1.

Table 2.1 Noise impact limits, dB

Location	Location description	Day $L_{Aeq,15\text{minute}}$
R1	2161–2177 Elizabeth Drive, Luddenham	41
R2	2111–2141 Elizabeth Drive, Luddenham	43
R3	285 Adams Road, Luddenham	53
R4	5 Anton Road, Luddenham	46
R5	185 Adams Road, Luddenham	45
R6	225 Adams Road, Luddenham	52
R7	161 Adams Road, Luddenham	41
R8	2510–2550 Elizabeth Drive, Luddenham	41

2.3 Meteorological conditions

Condition L3.3 of the EPL states the meteorological conditions which the noise limits apply under:

- L3.2 Noise-enhancing meteorological conditions:
- a) The noise limits set out in condition L3.1 apply under the meteorological conditions listed in the table below.
 - b) For those meteorological conditions not referred to in condition L3.3(a) table, the noise limits that apply are the noise limits in conditions L3.1 table plus 5 dB.

Table 2.2 Applicable meteorological conditions

Assessment period	Meteorological conditions
Day	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level.
Evening	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level.
Night	Stability Categories A, B, C and D with wind speeds up to and including 3 m/s at 10 m above ground level; or Stability category E and F with wind speeds up to and including 2 m/s at 10 m above ground level.

Condition L3.4 specifies the source of meteorological data to be used and method for determining stability categories:

- L3.4 For the purpose of condition L3.3:
 - a) The meteorological conditions are to be determined from meteorological data obtained from the meteorological weather station identified as Bureau of Meteorology AWS at Badgerys Creek, NSW (Station no 067108).
 - b) Stability category shall be determined using the following method from Fact Sheet D of the Noise Policy for Industry (NSW EPA, 2017):
 - i. Use of sigma-theta data (section D1.4).

It is noted that the site only operates during the day period.

2.4 Additional requirements

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 Methodology

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW requirements.

Meteorological data was obtained from the Badgerys Creek automatic weather station (AWS) (station ID 067108) which allowed correlation of atmospheric parameters with measured site noise levels.

3.2 Attended noise monitoring

During this survey, attended noise monitoring was conducted during the day period at each location. The duration of each measurement was 15 minutes. Where access to a property was not granted or measurement at assessment location was not practical due to localised construction activities, monitoring was completed at alternative representative locations and results were calculated back for the actual assessment location. This approach is consistent with the approved NMP for the site and the NPfl. The attended monitoring was completed during the day period in accordance with section M4.1 of the EPL. The assessment locations are listed in Table 1.1 and shown on Figure 1.1. Atmospheric conditions were measured at each monitoring location.

Measured sound levels from various sources were noted during each measurement and particular attention was paid to the extent of site's contribution (if any) to measured levels. At each monitoring location, the site-only $L_{Aeq,15\text{minute}}$ and L_{Amax} were measured directly or determined by other methods detailed in Section 7.1 of the NPfl.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may be used in this report. When site noise is noted as IA, it was inaudible at the monitoring location. When site noise is noted as NM, this means it was audible but could not be quantified. All results noted as IA or NM in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (L_{A90}), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as breeze in foliage or continuous road traffic noise) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate of may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

3.3 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfl. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only L_{Aeq} .

Low-frequency modifying factor penalties have only been applied to site-only L_{Aeq} levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfl.

3.4 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix C.

Table 3.1 Measurement equipment

Item	Serial number	Calibration due date	Relevant standard
Brüel & Kjær Type 2250 sound level meter	3008201	12 July 2025	IEC 61672-1:2002
Svantek SV36 calibrator	154613	05 June 2025	IEC 60942:2003

4 Results

4.1 Total measured noise levels and atmospheric conditions

Total noise levels measured during each 15-minute attended measurement are provided in Table 4.1.

Table 4.1 Total measured noise levels, dB – October 2024 ¹

Location	Start date and time	L _{Amax}	L _{A1}	L _{A10}	L _{Aeq}	L _{A50}	L _{A90}	L _{Amin}
A1 (R3)	29/10/2024 07:52	77	68	54	55	49	45	42
A1 (R3)	29/10/2024 08:09	74	71	55	56	48	45	40
A3 (R6)	29/10/2024 08:29	67	58	50	48	45	42	41
A3 (R6)	29/10/2024 08:45	68	61	50	50	45	43	41
A2 (R4/R5/R7)	29/10/2024 09:14	72	67	62	57	52	45	40
A2 (R4/R5/R7)	29/10/2024 09:39	74	66	54	53	47	42	38
A4 (R8)	29/10/2024 10:05	89	76	61	64	50	47	43
A4 (R8)	29/10/2024 10:20	84	76	62	63	48	43	38
A5 (R1)	29/10/2024 10:43	89	79	69	67	55	45	39
A5 (R1)	29/10/2024 10:58	86	77	68	65	54	43	39
A6 (R2)	29/10/2024 11:19	92	83	75	72	62	53	49
A6 (R2)	29/10/2024 11:35	89	82	73	70	57	52	49
A5 (R1)	30/10/2024 07:20	89	85	80	75	68	56	47
A5 (R1)	30/10/2024 07:35	89	84	79	74	67	54	43
A6 (R2)	30/10/2024 07:53	89	81	73	69	59	48	42
A6 (R2)	30/10/2024 08:08	86	82	74	70	60	48	41
A1 (R3)	30/10/2024 08:30	77	71	57	57	50	47	44
A1 (R3)	30/10/2024 08:46	77	69	55	56	48	46	43
A3 (R6)	30/10/2024 09:04	71	65	58	55	50	46	43
A3 (R6)	30/10/2024 09:19	71	61	51	50	49	46	44
A2 (R4/R5/R7)	30/10/2024 09:39	80	73	61	60	47	44	44
A2 (R4/R5/R7)	30/10/2024 09:54	81	73	60	59	50	48	45
A4 (R8)	30/10/2024 10:32	79	74	61	61	49	45	41
A4 (R8)	30/10/2024 10:47	81	75	63	62	49	45	42

Notes: 1. Levels in this table are not necessarily the result of activity at site.

Atmospheric condition data measured by the operator during each measurement using a hand-held weather meter is shown in Table 4.2. The wind speed, direction and temperature were measured at approximately 1.5 m above ground. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.2 Measured atmospheric conditions – October 2024

Location	Start date and time	Temperature °C	Wind speed m/s	Wind direction ° magnetic north ¹	Cloud cover 1/8s
A1 (R3)	29/10/2024 07:52	26	0.5	280	1
A1 (R3)	29/10/2024 08:09	23	<0.5	-	2
A3 (R6)	29/10/2024 08:29	22	<0.5	-	3
A3 (R6)	29/10/2024 08:45	26	0.6	280	3
A2 (R4/R5/R7)	29/10/2024 09:14	24	0.9	20	2
A2 (R4/R5/R7)	29/10/2024 09:39	20	0.5	16	3
A4 (R8)	29/10/2024 10:05	27	0.6	310	3
A4 (R8)	29/10/2024 10:20	26	0.7	295	6
A5 (R1)	29/10/2024 10:43	22	1.8	287	3
A5 (R1)	29/10/2024 10:58	26	1.7	281	1
A6 (R2)	29/10/2024 11:19	24	0.7	282	2
A6 (R2)	29/10/2024 11:35	31	<0.5	-	1
A5 (R1)	30/10/2024 07:20	22	1.3	343	7
A5 (R1)	30/10/2024 07:35	19	2	11	7
A6 (R2)	30/10/2024 07:53	21	1	350	6
A6 (R2)	30/10/2024 08:08	22	0.6	350	7
A1 (R3)	30/10/2024 08:30	22	1	289	6
A1 (R3)	30/10/2024 08:46	26	1	327	6
A3 (R6)	30/10/2024 09:04	21	0.8	340	6
A3 (R6)	30/10/2024 09:19	22	1.8	354	3
A2 (R4/R5/R7)	30/10/2024 09:39	22	1.5	38	1
A2 (R4/R5/R7)	30/10/2024 09:54	23	0.9	38	0
A4 (R8)	30/10/2024 10:32	25	0.7	56	0
A4 (R8)	30/10/2024 10:47	24	<0.5	80	0

Notes: 1. “-” indicates calm conditions at monitoring location.

4.2 Site only noise levels

4.2.1 Modifying factors

There were no modifying factors, as defined in the NPfI, applicable during the survey.

4.2.2 Monitoring results

Table 4.3 provides site noise levels in the absence of other sources, where possible, and includes weather data from Badgerys Creek automatic weather station (AWS) (station ID 067108). Noise limits are applicable under all weather conditions but are adjusted during very noise-enhancing weather conditions as defined by the NPfI.

Table 4.3 Site noise levels and limits – October 2024

Location	Start date and time	Wind		Stability class	Very enhancing ¹	Limits, dB		Site levels, dB		Exceedances, dB ¹	
		Speed m/s	Direction ²			L _{Aeq,15minute}	L _{Amax}	L _{Aeq,15minute} ³	L _{Amax}	L _{Aeq,15minute}	L _{Amax}
A1 (R3)	29/10/2024 07:52:00	0.70	252	C	N	53	N/A	45	-	Nil	N/A
A1 (R3)	29/10/2024 08:09:00	1.30	309	A	N	53	N/A	44	-	Nil	N/A
A3 (R6)	29/10/2024 08:29:00	2.30	338	A	N	52	N/A	42	-	Nil	N/A
A3 (R6)	29/10/2024 08:45:00	2.30	338	A	N	52	N/A	43	-	Nil	N/A
A2 (R4)	29/10/2024 09:14:00	3.20	332	B	Y	51 ¹	N/A	<30 ⁵	-	Nil	N/A
A2 (R4)	29/10/2024 09:39:00	3.40	337	B	Y	51 ¹	N/A	<30 ⁵	-	Nil	N/A
A2 (R5)	29/10/2024 09:14:00	3.20	332	B	Y	50 ¹	N/A	<30 ⁵	-	Nil	N/A
A2 (R5)	29/10/2024 09:39:00	3.40	337	B	Y	50 ¹	N/A	<30 ⁵	-	Nil	N/A
A2 (R7) ⁴	29/10/2024 09:14:00	3.20	332	B	Y	46 ¹	N/A	<30 ⁵	-	Nil	N/A
A2 (R7) ⁴	29/10/2024 09:39:00	3.40	337	B	Y	46 ¹	N/A	<30 ⁵	-	Nil	N/A
A4 (R8) ⁴	29/10/2024 10:05:00	3.60	315	B	Y	46 ¹	N/A	<33 ⁵	-	Nil	N/A
A4 (R8) ⁴	29/10/2024 10:20:00	3.60	315	B	Y	46 ¹	N/A	<30 ⁵	-	Nil	N/A
A5 (R1)	29/10/2024 10:43:00	3.80	337	B	Y	46 ¹	N/A	<30 ⁵	-	Nil	N/A
A5 (R1)	29/10/2024 10:58:00	3.80	337	B	Y	46 ¹	N/A	<30 ⁵	-	Nil	N/A
A6 (R2)	29/10/2024 11:19:00	2.90	357	A	N	43	N/A	<39 ⁵	-	Nil	N/A
A6 (R2)	29/10/2024 11:35:00	2.50	5	A	N	43	N/A	<39 ⁵	-	Nil	N/A
A5 (R1)	30/10/2024 07:20:00	3.50	24	D	Y	46 ¹	N/A	<37 ⁵	-	Nil	N/A
A5 (R1)	30/10/2024 07:35:00	3.20	18	D	Y	46 ¹	N/A	<35 ⁵	-	Nil	N/A

Location	Start date and time	Wind		Stability class	Very enhancing ¹	Limits, dB		Site levels, dB		Exceedances, dB ¹	
		Speed m/s	Direction ²			L _{Aeq,15minute}	L _{Amax}	L _{Aeq,15minute} ³	L _{Amax}	L _{Aeq,15minute}	L _{Amax}
A6 (R2)	30/10/2024 07:53:00	3.20	18	D	Y	48 ¹	N/A	<32 ⁵	-	Nil	N/A
A6 (R2)	30/10/2024 08:08:00	3.60	16	C	Y	48 ¹	N/A	<31 ⁵	-	Nil	N/A
A1 (R3)	30/10/2024 08:30:00	4.30	6	C	Y	58 ¹	N/A	47	-	Nil	N/A
A1 (R3)	30/10/2024 08:46:00	4.30	6	C	Y	58 ¹	N/A	46	-	Nil	N/A
A3 (R6)	30/10/2024 09:04:00	3.50	3	B	Y	57 ¹	N/A	46	-	Nil	N/A
A3 (R6)	30/10/2024 09:19:00	3.50	3	B	Y	57 ¹	N/A	46	-	Nil	N/A
A2 (R4)	30/10/2024 09:39:00	3.70	9	B	Y	51 ¹	N/A	34	-	Nil	N/A
A2 (R4)	30/10/2024 09:54:00	3.70	9	B	Y	51 ¹	N/A	34	-	Nil	N/A
A2 (R5)	30/10/2024 09:39:00	3.70	9	B	Y	50 ¹	N/A	34	-	Nil	N/A
A2 (R5)	30/10/2024 09:54:00	3.70	9	B	Y	50 ¹	N/A	34	-	Nil	N/A
A2 (R7) ⁴	30/10/2024 09:39:00	3.70	9	B	Y	46 ¹	N/A	30	-	Nil	N/A
A2 (R7) ⁴	30/10/2024 09:54:00	3.70	9	B	Y	46 ¹	N/A	34	-	Nil	N/A
A4 (R8) ⁴	30/10/2024 10:32:00	3.30	21	A	Y	46 ¹	N/A	<31 ⁵	-	Nil	N/A
A4 (R8) ⁴	30/10/2024 10:47:00	3.30	21	A	Y	46 ¹	N/A	<32 ⁵	-	Nil	N/A

Notes: 1. Noise limits are adjusted by +5 dB during 'very noise-enhancing meteorological conditions' in accordance with the NPfl.

2. Degrees magnetic north, "-" indicates calm conditions.

3. Site-only L_{Aeq,15minute}, includes modifying factor penalties if applicable.

4. Access to this property was not granted or measurement at assessment location was not practical due to localised construction activities, hence attended noise monitoring was completed at an alternative representative locations (refer to Figure 1.1) and site contribution calculated back to the assessment location in accordance with the approved NMP for the site.

5. Values estimated based on L_{Amin} minus 10dB where site was noted as inaudible from monitoring location.

5 Summary

EMM was engaged by Luddenham Operations Pty Ltd to conduct a bi-annual noise survey of operations at the site. The survey purpose was to quantify the acoustic environment and compare site noise levels against specified EPL limits.

Attended environmental noise monitoring described in this report was done during the day period(s) of 29 and 30 October 2024 at six monitoring locations.

Noise levels from site complied with relevant limits at all monitoring locations during the October 2024 survey.

Appendix A

Noise perception and examples

A.1 Noise levels

Table A.1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A.1.

Table A.1 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
Up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

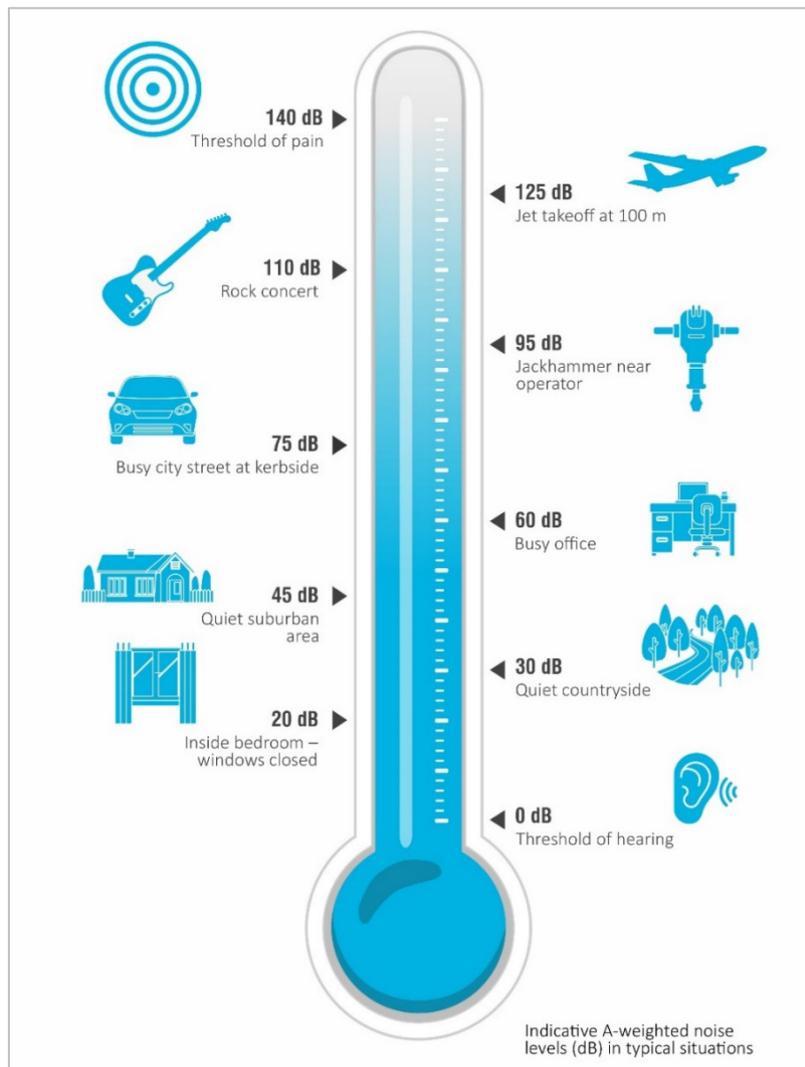


Figure A.1 Common noise levels

Appendix B

Regulator document

Environment Protection Licence

Licence - 21562

POINT 9

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				4300
Oil and Grease	Visible				Not visible
pH	pH				6.5-8.8
Turbidity	nephelometric turbidity units				50

POINT 10

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				2100
pH	pH				6.5-8.5

POINT 12

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				4300
pH	pH				6.5-8.8
Turbidity	nephelometric turbidity units				50

L2.5 Discharges from Discharge Point 12 must not occur until a rainfall of event of at least 15 millimetres in a day has occurred.

L2.6 Discharges from Discharge Point 12 must immediately cease when conductivity at Monitoring Point 10 reaches 2,100 micro-siemens per centimetre.

L3 Noise limits

L3.1 Noise generated at the premises that is measured at each noise monitoring point established under this

Environment Protection Licence

Licence - 21562

licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 1

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	41

POINT 2

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	43

POINT 3

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	53

POINT 4

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	46

POINT 5

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	45

POINT 6

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	52

Environment Protection Licence

Licence - 21562

POINT 7

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	41

POINT 8

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	41

Note: EPA Identification No. 4 and 7 are entitled to negotiated agreement under the *Voluntary Land Acquisition and Mitigation Policy*. Where negotiated agreements are in place noise limits will not apply.

L3.2 For the purposes of Condition L3.1:

a) Day means the period from 7am to 6pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays.

L3.3 Noise-enhancing meteorological conditions

a) The noise limits set out in Condition L3.1 apply under the meteorological conditions in the table below.
 b) For those meteorological conditions not referred to in the table below, the noise limits that apply are the noise limits in Condition L3.1 plus 5dB.

Assessment Period	Meteorological Conditions
Day	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.
Evening	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.
Night	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level; or Stability category E and F with wind speeds up to and including 2m/s at 10m above ground level.

L3.4 For the purposes of Condition L3.3:

a) The meteorological conditions are to be determined from the meteorological weather station identified as BoM monitoring point at Badgerys Creek.
 b) Stability category shall be determined using the following method from Fact Sheet D of the Noise Policy for Industry (NSW EPA, 2017):
 i. Use of sigma-theta data (section D1.4).

L3.5 To assess compliance:

Environment Protection Licence

Licence - 21562

a) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, the noise measurement equipment must be located:

- (i) approximately on the property boundary, where any residence is situated 30 metres or less from the property boundary closest to premises; or where applicable,
- (ii) in an area within 30 metres of a residence façade, but not closer than 3 metres where any residence on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable,
- (iii) in an area within 50 metres of the boundary of a National Park or Nature Reserve,
- (iv) at any other location identified in Condition L3.1.

b) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, the noise measurement equipment must be located:

- (i) at the reasonably most affected point at a location where there is no residence at the location; or,
- (ii) at the reasonably most affected point within an area at a location prescribed by Condition L3.5 (a).

c) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, where it can be demonstrated that direct measurement of noise from a relevant monitoring point is impractical, the EPA may accept alternative means of determining compliance as per Chapter 7 of the NSW Noise Policy for Industry.

L3.6 A non-compliance of Conditions L3.1 and L3.3 will still occur where noise generated from the premises is measured in excess of the noise limit at a point other than the reasonably most affected point at the locations referred to in Condition L3.5 (a) or L3.5 (b).

Note: The reasonably most affected point is a point at a location or within an area at a location experiencing or expected to experience the highest sound pressure level from the premises.

L3.7 For the purpose of determining the noise generated from the premises, the modifying factor corrections in Table C1 in Fact Sheet C of the Noise Policy for Industry (NSW EPA, 2017) may be applied, if appropriate, to the noise measurements by the noise monitoring equipment.

L3.8 Noise measurements must not be undertaken where rain or wind speed at microphone level will affect the acquisition of valid measurements.

L3.9 The following definitions apply to this licence:

a) Noise Policy for Industry - the document entitled "Noise Policy for Industry" published by the NSW Environment Protection Authority in October 2017.

b) Noise – 'sound pressure levels' for the purposes of Conditions L3.1 to L3.8.

- LAeq (15 minute) - the value of the A-weighted sound pressure level of a continuous steady sound that, over a 15 minute time interval, has the same mean square sound pressure level as a sound under consideration with a level that varies with time (Australian Standard AS 1055:2018 Acoustics: description and measurement of environmental noise).
- LAFmax – the maximum sound pressure level of an event measured with a sound level meter satisfying Australian Standard AS IEC 61672.1-2013 Electroacoustics - Sound level meters - Part 1: Specifications set to 'A' frequency weighting and fast time weighting.

Appendix C

Calibration certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE No: **C50057**

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Svantek

Type No: SV36

Serial No: 154613

Class: 1

Owner: EMM Consulting

Level 4, 20 Chandos Street

St Leonards NSW 2065

Tests Performed: Measured Output Pressure level, Frequency & Distortion

Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure 1004 hPa ± 1 hPa

Temperature 23 °C $\pm 1^\circ$ C

Relative Humidity 44 % $\pm 5\%$

Date of Receipt : 05/06/2024

Date of Calibration : 05/06/2024

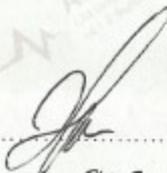
Date of Issue : 05/06/2024

Acu-Vib Test AVP02 (Calibrators)

Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY:

**AUTHORISED
SIGNATURE:**



Heia See

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.


Acu-Vib Electronics
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WORLD RECOGNISED
ACCREDITATION
Accredited Laboratory
No. 9262
Acoustic and Vibration
Measurements



**Sound Level Meter
IEC 61672-3:2013**

Calibration Certificate

Calibration Number C23471

Client Details	EMM Consulting Ground Floor Suite 01, 20 Chandos Street
-----------------------	---

Equipment Tested/ Model Number :	Type 2250
Instrument Serial Number :	3008201
Microphone Serial Number :	2888134
Pre-amplifier Serial Number :	16037
Firmware Version :	N/A

Pre-Test Atmospheric Conditions	Post-Test Atmospheric Conditions
Ambient Temperature : 23.1 °C	Ambient Temperature : 24.3 °C
Relative Humidity : 44 %	Relative Humidity : 44.1 %
Barometric Pressure : 101.6 kPa	Barometric Pressure : 101.3 kPa

Calibration Technician : Max Moore	Secondary Check: Rhys Gravelle
Calibration Date : 12 Jul 2023	Report Issue Date : 17 Jul 2023

Approved Signatory :  Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	N/A
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Uncertainties of Measurement -			
Acoustic Tests		Environmental Conditions	
125Hz	±0.13 dB	Temperature	±0.1 °C
1kHz	±0.13 dB	Relative Humidity	±1.9 %
8kHz	±0.14 dB	Barometric Pressure	±0.014 kPa
Electrical Tests	±0.13 dB		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.



This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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LUDDENHAM QUARRY

NOISE COMPLIANCE REPORT - JULY 2025

16 JULY 2025

Luddenham Quarry

Noise Compliance Report - July 2025

Luddenham Operations Pty Ltd

REVISIONS

Revision	Date	Prepared by	Reviewed by	Revision Comments
1	16 July 2025	Elena Ivanova	Pascal Bobillier	Final

CONTENTS

1	INTRODUCTION	4
1.1	Overview.....	4
1.2	Attended monitoring locations.....	4
1.3	Monitoring Period.....	5
2	NOISE LIMITS	7
2.1	Environmental Protection Licence	7
2.2	Noise limits	7
2.3	Meteorological conditions.....	7
2.4	Other considerations	8
3	METHODOLOGY	9
3.1	Overview.....	9
3.2	Attended noise monitoring.....	9
3.3	Modifying factors.....	9
3.4	Instrumentation	9
4	RESULTS	10
4.1	Total measured noise levels.....	10
4.2	Atmospheric conditions	11
4.3	Compliance Assessment.....	11
4.3.1	Monitoring results.....	11
4.3.2	Monitoring results discussion.....	14

APPENDICES

APPENDIX A – NOISE PERCEPTION AND EXAMPLES SITE

APPENDIX B – EXTRACT OF EPL 21562

APPENDIX C – CALIBRATION CERTIFICATES

LIST OF TABLES

Table 1-1: Attended noise monitoring locations.....	4
Table 2-1: Noise Limits	7
Table 2-2: Applicable meteorological conditions	7
Table 3-1: Measurement equipment	9
Table 4-1: Total measured noise levels.....	10
Table 4-2: Meteorological conditions (Station ID 067108).....	11
Table 4-3: Site monitoring results and limits.....	12

LIST OF FIGURES

Figure 1-1: Site and noise monitoring location.....	6
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1 INTRODUCTION

1.1 Overview

Luddenham Operations Pty Ltd operates the shale/clay quarry (the site) under the Environmental Protection Licence (EPL) 21562. The site is located at 275 Adams Road, Luddenham, NSW.

Quarry extraction activities ceased in December 2024, and no mining activities have been undertaken at the quarry site since then. The site is currently being rehabilitated in accordance with the approved Site Rehabilitation Plan, which includes the relocation and removing of overburden stockpiles.

The noise monitoring purpose was to quantify the acoustic environment and compare site noise levels against limits specified in condition L3 of EPL 21562.

Attended environmental noise monitoring, as outlined in this report, was conducted in general accordance with Condition L3 of the EPL. The initial monitoring was undertaken during the daytime periods of April 15 and 16 at six monitoring locations. However, due to strong winds exceeding the limits recommended in the NSW EPA Noise Policy for Industry, monitoring was ceased and subsequently rescheduled. The rescheduled monitoring was conducted during the daytime periods of July 7th and 8th at the same six representative monitoring locations. Monitoring results are presented in Section 4 of this report.

Immediately to the north of the quarry is a construction site occupying approximately 3 hectares of the total site area (Lot 3, DP 623799). Construction activities are being carried out under SSD10446. Development consent was granted to Coombes Property Group (CPG), in partnership with KLF Holdings (now known as Renier Group), to construct and operate a resource recovery facility. Once fully operational, this facility will be permitted to receive and process up to 600,000 tonnes per annum (TPA) of construction and demolition waste, as well as commercial and industrial waste (general solid waste (non-putrescible)).

1.2 Attended monitoring locations

Site monitoring locations are detailed in Table 1-1 and shown on Figure 1-1. It should be noted that Figure 1-1 shows actual monitoring positions, not necessarily the location of residences.

Table 1-1: Attended noise monitoring locations

Monitoring Location	Sensitive Receiver ID	Location Description	Address	GDA94/MGA56	
				Easting	Northing
A5	R1	Approximately 880m northwest of the site	2161-2177 Elizabeth Drive, Luddenham	288807	6250432
A6	R2	Approximately 680m northwest of the site	2111-2141 Elizabeth Drive, Luddenham	289142	6250089
A1	R3	Approximately 260m north of site	285 Adams Road, Luddenham – Northern site boundary	288937	6249498
A2	R4 R5 R7	Approximately 635m southwest	5 Anton Road, Luddenham – southwest utilised to represent for R4 – 5 Anton Road, Luddenham, R5 – 185 Adams Road, Luddenham and R7 – 161 Adams Road, Luddenham	288345	6249200
A3	R6	Approximately 260 m west of the site	Western site boundary utilised to calculate for R6 – 225 Adams Road, Luddenham	288912	6249491

Monitoring Location	Sensitive Receiver ID	Location Description	Address	GDA94/MGA56	
				Easting	Northing
A4	R8	Approximately 1020 m northwest of the site	196–214 Adams Road, Luddenham utilised for R8 – 2510–2550 Elizabeth Drive, Luddenham	288632	6249769

1.3 Monitoring Period

Condition L 3.1 of EPL 21562 requires noise monitoring to be undertaken during the day period.

For the purposes of Condition L3.1:

- a) Day means the period from 7am to 6pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays.



Figure 1-1: Site and noise monitoring location

2 NOISE LIMITS

2.1 Environmental Protection Licence

The bi-annual monitoring is a requirement as detailed in EPL 21562 dated 30 July 2021. Noise assessment criteria for the site are provided in EPL 21562, condition L3.1. These are specified for the day period at locations which are representative of residences potentially most impacted by site noise. Pages from the site's EPL pertaining to noise are shown in Appendix A. Appendix B provides further information that gives an indication as to how an average person perceives changes in noise level, and examples of common noise levels.

2.2 Noise limits

Noise impact limits from condition L3.1 of EPL 21562 are provided in Table 2-1.

Table 2-1: Noise Limits

Monitoring Location Description	Monitoring Location	Sensitive Receiver ID	Monitoring Frequency	Day
				L _{Aeq,15minute}
2161–2177 Elizabeth Drive, Luddenham	A5	R1	Two times a year	41
2111–2141 Elizabeth Drive, Luddenham	A6	R2	Two times a year	43
285 Adams Road, Luddenham	A1	R3	Two times a year	53
5 Anton Road, Luddenham	A2	R4	Two times a year	46
185 Adams Road, Luddenham	A2	R5	Two times a year	45
161 Adams Road, Luddenham	A2	R7	Two times a year	41
225 Adams Road, Luddenham	A3	R6	Two times a year	52
2510–2550 Elizabeth Drive, Luddenham	A4	R8	Two times a year	41

2.3 Meteorological conditions

Condition L3.3 of the EPL states the noise-enhancing meteorological conditions which the noise limits apply under:

- a) The noise limits set out in condition L3.1 apply under the meteorological conditions listed in table below.
- b) For those meteorological conditions not referred to in the table below, the noise limits that apply are the noise limits in condition L3.1 table plus 5dB.

The table from Condition L3.3 is reproduced in Table 2-2 below.

Table 2-2: Applicable meteorological conditions

Assessment period	Measurement Parameter
Day	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level

Condition L3.4 specifies the source of meteorological data to be used and method for determining stability categories:

L3.4 For the purpose of condition L3.3:

- a) The meteorological conditions are to be determined from meteorological data obtained from the meteorological weather station identified as BoM monitoring point at Badgerys Creek.
- b) Stability category shall be determined using the following method from Fact Sheet D of the Noise Policy for Industry (NSW EPA, 2017):
 - i. Use of sigma-theta data (section D1.4).

2.4 Other considerations

Monitoring and reporting have been done in accordance with the NSW EPA 'Noise Policy for Industry' (NPfI) issued in October 2017 and the 'Approved methods for the measurement and analysis of environmental noise in NSW' (Approved Methods) issued in January 2022.

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was done in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise' and relevant NSW requirements. Meteorological data was obtained from the Badgerys Creek automatic weather station (AWS) (station ID 067108) which allowed correlation of atmospheric parameters during measured noise levels. Extracted sections of the weather data are reproduced in Table 4-2.

3.2 Attended noise monitoring

Attended noise monitoring was conducted during the day period at each location specified in Table 1-1 of this report. The attended monitoring was completed during the day period in accordance with section M7 of the EPL.

Measured sound levels from various sources were noted during each measurement and particular attention was paid to the extent of site's contribution (if any) to measured levels. This approach is consistent with the approved NMP for the site and the NPfI.

All monitoring results noted in this report were due to one or more of the following:

- Site noise levels were very low, typically more than 10 dB below the measured background (LA90), and unlikely to be noticed.
- Site noise levels were masked by more dominant sources that are characteristic of the environment (such as birdsongs, light aircraft noise, continuous road traffic noise or construction activities at the adjusted construction site) that cannot be eliminated by monitoring at an alternate or intermediate location.
- It was not feasible or reasonable to employ methods, such as to move closer and back calculate. Cases may include rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation conditions may not be representative.

If exact noise levels from site could not be established due to masking by other noise sources in a similar frequency range but were determined to be at least 5 dB lower than relevant limits, then a maximum estimate of site may be provided. This is expressed as a 'less than' quantity, such as <20 dB or <30 dB.

3.3 Modifying factors

All measurements were evaluated for potential modifying factors in accordance with the NPfI. Assessment of modifying factors is undertaken at the time of measurement if the site was audible and directly quantifiable. If applicable, modifying factor penalties have been reported and added to measured site-only LAeq.

Low-frequency modifying factor penalties have only been applied to site-only LAeq levels if the site was the only contributing low-frequency noise source. Specific methodology for assessment of each modifying factor is outlined in Fact Sheet C of the NPfI.

3.4 Instrumentation

Equipment used to measure environmental noise levels is detailed in Table 3-1. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dB. Calibration certificates are provided in Appendix C.

Table 3-1: Measurement equipment

Item	Serial Number	Date of Calibration
Acoustic Calibrator Svantek, SV 33B	109960	30/07/2024

Item	Serial Number	Date of Calibration
Sound Level Meter Svantek, SVAN 971A	124743	23/02/2024

4 RESULTS

4.1 Total measured noise levels

Total noise levels measured during each 15-minute attended measurement are provided in Table 4-1. Levels in this table are not necessarily the result of activity at site.

During the monitoring period, site operations were not audible during all attended measurements.

Additional sounds included local traffic acceleration, birdsong, light aircraft noise, distant and constant traffic.

Table 4-1: Total measured noise levels

Monitoring Location	Start time and Date	L _{Amax} , dB	L _{A10} , dB	L _{Aeq} , dB	L _{Amin} , dB	L _{A90} , dB	Notes
A5	07/07/2025 07:16	91.8	72.8	70.0	54.1	56.8	The site was not audible. Noise measurements were influenced by local traffic.
A5	07/07/2025 07:32	90.5	72.9	69.2	52.9	56.9	The site was not audible. Noise measurements were influenced by local traffic.
A6	07/07/2025 07:55	84.0	70.1	67.3	50.2	54.2	The site was not audible. Noise measurements were influenced by local traffic and birds.
A6	07/07/2025 08:10	82.0	71.7	68.0	51.1	55.2	The site was not audible. Noise measurements were influenced by local traffic and birds.
A3	07/07/2025 08:36	66.2	54.3	52.5	46.4	48.3	The site was not audible. Noise measurements were influenced by light aircraft and construction site.
A3	07/07/2025 08:53	69.3	45.9	50.9	45.9	48.5	The site was not audible. Noise measurements were influenced by light aircraft and construction site.
A1	07/07/2025 09:16	79.0	64.2	62.7	45.2	47.3	The site was not audible. Noise measurements were influenced by construction site and birds.
A1	07/07/2025 09:32	79.3	59.7	61.2	45.3	48.4	The site was not audible. Noise measurements were influenced by construction site and birds.
A2	07/07/2025 10:23	76.9	53.2	54.4	36.1	39.5	The site was not audible. Noise measurements were influenced by local traffic and birds.
A2	07/07/2025 10:39	81.9	59.0	58.9	35.1	38.8	The site was not audible. Noise measurements were influenced by local traffic and birds.
A4	07/07/2025 11:02	83.8	65.0	63.8	38.0	42.0	The site was not audible. Noise measurements were influenced by light aircraft and local traffic.
A4	07/07/2025 11:18	83.5	55.4	64.6	37.0	40.2	The site was not audible. Noise measurements were influenced by light aircraft and local traffic.
A5	08/07/2025 07:17	86.0	72.6	68.5	51.9	56.5	The site was not audible. Noise measurements were influenced by local traffic.
A5	08/07/2025 07:34	85.6	72.5	68.4	54.2	56.7	The site was not audible. Noise measurements were influenced by local traffic.
A6	08/07/2025 07:55	84.1	69.9	66.7	50.5	53.4	The site was not audible. Noise measurements were influenced by local traffic.
A6	08/07/2025 08:16	94.0	70.8	69.0	48.8	52.4	The site was not audible. Noise measurements were influenced by local traffic.
A3	08/07/2025 08:40	61.2	51.7	50.1	45.9	47.8	The site was not audible. Noise measurements were influenced by light aircraft and construction site.
A3	08/07/2025 08:55	66.5	44.1	53.0	55.7	47.0	The site was not audible. Noise measurements were influenced by light aircraft and construction site.
A1	08/07/2025 09:17	79.7	65.5	62.0	46.5	49.6	The site was not audible. Noise measurements were influenced by construction site.
A1	08/07/2025 09:34	76.8	62.4	59.1	44.5	47.4	The site was not audible. Noise measurements were influenced by construction site.
A2	08/07/2025 12:11	80.4	51.4	55.9	41.1	43.5	The site was not audible. Noise measurements were influenced by light aircraft and local traffic.
A2	08/07/2025 12:26	85.0	54.0	59.6	42.8	44.5	The site was not audible. Noise measurements were influenced by light aircraft and local traffic.
A4	08/07/2025 12:45	82.6	59.5	61.6	42.3	44.5	The site was not audible. Noise measurements were influenced by local traffic and birds.
A4	08/07/2025 13:01	82.8	65.9	64.8	41.7	45.4	The site was not audible. Noise measurements were influenced by local traffic and birds.

4.2 Atmospheric conditions

As required by condition L3.4 of the EPL, meteorological data was obtained from the Badgerys Creek AWS (station ID 067108) which allowed correlation of atmospheric parameters with measured site noise levels. Attended noise monitoring is not done during rain, hail, or wind speeds above 5 m/s at microphone height. Meteorological conditions recorded by Badgerys Creek AWS on 07/07/2025 and 08/07/2025 are provided in Table 4-2 below.

Table 4-2: Meteorological conditions (Station ID 067108)

Monitoring Location	Time and Date	Temperature, °C	Wind Speed, km/h	Wind Speed, m/s ¹	Wind Direction
A5	07/07/2025, 07:00	6.3	0	0	CALM
A5	07/07/2025, 07:30	5.7	2	0.6	WSW
A6	07/07/2025, 08:00	7.5	2	0.6	WSW
A1	07/07/2025, 08:30	8.8	4	1.1	WSW
A3	07/07/2025, 09:00	11.3	6	1.7	WSW
A3	07/07/2025, 09:30	12.1	9	2.5	NE
A2	07/07/2025, 10:00	13.5	9	2.5	NNE
A2	07/07/2025, 10:30	14.4	9	2.5	N
A4	07/07/2025, 11:00	15.6	7	1.9	N
A4	07/07/2025, 11:30	16.4	11	3.1	WNW
A5	08/07/2025, 07:00	3.6	0	0	CALM
A5	08/07/2025, 07:30	3.7	4	1.1	W
A6	08/07/2025, 08:00	4.2	2	0.6	W
A3	08/07/2025, 08:30	5.8	0	0	CALM
A3	08/07/2025, 09:00	7.7	0	0	CALM
A1	08/07/2025, 09:30	8.1	4	1.1	WNW
A2	08/07/2025, 12:00	9.6	4	1.1	NNE
A4	08/07/2025, 12:30	10.3	7	1.9	NNE
A4	08/07/2025, 13:00	10.8	6	1.7	NE

Note: 1. Wind speed of 0.5 m/s and 0 m/s indicated calm conditions at monitoring location.

4.3 Compliance Assessment

4.3.1 Monitoring results

Table 4-3 provides site noise levels in the absence of other sources, where possible, and includes weather data from the Badgerys Creek AWS. Noise enhancing limits are applicable if weather conditions were within specified parameters during each measurement, otherwise the NPf's 'very noise enhancing' limits apply (ie noise enhancing plus 5dB).

In accordance with the EPL, the applicable noise limits during these periods were those specified in Condition L3.1, with an additional 5 dB(A) allowance. The average wind speed and stability category recorded at the Badgerys Creek automatic weather station (AWS) (Station ID 067108) for each 15-minute attended measurement are summarised in Table 4-3 below.

Table 4-3: Site monitoring results and limits

Monitoring Location	Start time and Date	Wind Speed, m/s ²	Stability Category	Noise enhancing limits apply	EPL Limits, dB	Site Noise levels, dB ⁵	Exceedances, dB ³
					L _{Aeq} , 15 minutes	L _{Aeq} , 15 minutes	L _{Aeq} , 15 minutes
A5 (R1)	07/07/2025 07:16	0	F	N	41	<35 ⁶	Nil
A5 (R1)	07/07/2025 07:32	0.6	F	N	41	<35 ⁶	Nil
A6 (R2)	07/07/2025 07:55	0.6	F	N	43	<40	Nil
A6 (R2)	07/07/2025 08:10	0.6	E	N	43	<41	Nil
A3 (R6)	07/07/2025 08:36	1.1	E	Y	57 ¹	<36	Nil
A3 (R6)	07/07/2025 08:53	1.1	E	Y	57 ¹	<36	Nil
A1 (R3)	07/07/2025 09:16	1.7	D	N	53	<35	Nil
A1 (R3)	07/07/2025 09:32	2.5	D	N	53	<35	Nil
A2 (R4)	07/07/2025 10:23	2.5	D	N	46	<26	Nil
A2 (R4)	07/07/2025 10:39	2.5	D	N	46	<25	Nil
A2 (R5)	07/07/2025 10:23	2.5	D	N	45	<26	Nil
A2 (R5)	07/07/2025 10:39	2.5	D	N	45	<25	Nil
A2 (R7) ⁴	07/07/2025 10:23	2.5	D	N	41	<26	Nil
A2 (R7) ⁴	07/07/2025 10:39	2.5	D	N	41	<25	Nil
A4 (R8) ⁴	07/07/2025 11:02	1.9	D	N	41	<28	Nil
A4 (R8) ⁴	07/07/2025 11:18	1.9	D	N	41	<27	Nil
A5 (R1)	08/07/2025 07:17	0	F	N	41	<42	Nil
A5 (R1)	08/07/2025 07:34	1.1	E	Y	46 ¹	<44	Nil
A6 (R2)	08/07/2025 07:55	0.6	E	N	43	<41	Nil
A6 (R2)	08/07/2025 08:16	0.6	E	N	43	<39	Nil
A3 (R6)	08/07/2025 08:40	0	F	N	52	<36	Nil
A3 (R6)	08/07/2025 08:55	0	F	N	52	<46	Nil
A1 (R3)	08/07/2025 09:17	0	F	N	53	<37	Nil
A1 (R3)	08/07/2025 09:34	1.1	E	Y	58 ¹	<35	Nil

Monitoring Location	Start time and Date	Wind Speed, m/s ²	Stability Category	Noise enhancing limits apply	EPL Limits, dB	Site Noise levels, dB ⁵	Exceedances, dB ³
					L _{Aeq, 15 minutes}	L _{Aeq, 15 minutes}	L _{Aeq, 15 minutes}
A2 (R4)	08/07/2025 12:11	1.1	D	N	46	<31	Nil
A2 (R4)	08/07/2025 12:26	1.9	D	N	46	<33	Nil
A2 (R5)	08/07/2025 12:11	1.1	D	N	45	<31	Nil
A2 (R5)	08/07/2025 12:26	1.9	D	N	45	<33	Nil
A2 (R7) ⁴	08/07/2025 12:11	1.1	D	N	41	<31	Nil
A2 (R7) ⁴	08/07/2025 12:26	1.9	D	N	41	<33	Nil
A4 (R8) ⁴	08/07/2025 12:45	1.9	D	N	41	<32	Nil
A4 (R8) ⁴	08/07/2025 13:01	1.7	D	N	41	<32	Nil

Notes:

1. In accordance with Condition L3.2, where meteorological conditions exceed those specified in Condition L3.1, the EPL limits for these periods are those listed in Condition L3.1 plus 5 dB (A).
2. Wind speed 0 m/s or 0,5 m/s indicates calm conditions.
3. A 1 to 2 dB exceedance is considered by the EPA as negligible in accordance with Section 4.2 of the NPfI (EPA 2017).
4. Site-only L_{Aeq,15minute}, includes modifying factor penalties (NPfI, EPA 2017) if applicable.
5. Values estimated based on L_{Amin} minus 10dB where site was noted as inaudible from monitoring location.
6. 35 dB is often used as a conservative default for inaudible cases.

4.3.2 Monitoring results discussion

Attended noise monitoring and observations were conducted on Monday 7th and Tuesday 8th July 2025 at six monitoring locations surrounding the quarry site. The monitoring purpose was to assess noise levels and verify compliance with the EPL limits.

Meteorological conditions during the monitoring period were generally calm, with light winds (0–2.5 m/s). Atmospheric stability ranged from F (stable) in the early morning to D (neutral) later in the day. Where applicable, EPL noise limits were adjusted to account for noise-enhancing weather conditions.

No noise from quarry operations was audible at any monitoring location during the attended measurements. Ambient noise levels were primarily influenced by local road traffic, bird activity, light aircraft movements, and construction works at the nearby Resource Recovery Facility (RRF) and surrounding areas.

The results are consistent with previous monitoring rounds and indicate no significant changes or deviations in the observed parameters.

Noise levels at all monitoring locations complied with the EPL limits, confirming that current rehabilitation and maintenance activities at the quarry are being conducted in accordance with regulatory noise requirements and are not causing adverse impacts to nearby sensitive receivers.

Appendix A – Noise Perception and Examples Site

NOISE LEVELS

Table A-1 gives an indication as to how an average person perceives changes in noise level. Examples of common noise levels are provided in Figure A-1.

Table A-1: Perceived change in noise

Change in sound pressure level, dB(A)	Perceived change in noise
Up to 2	Not perceptible
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud

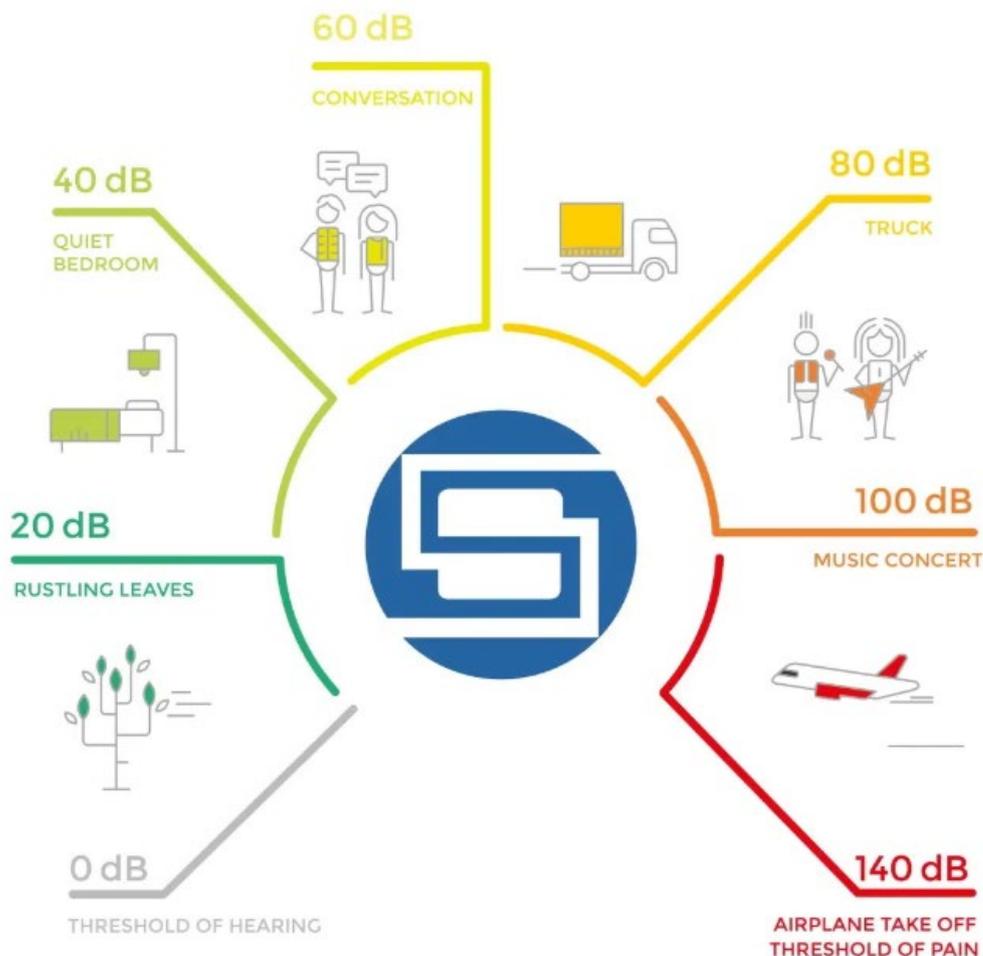


Figure A.1: Common noise levels

Appendix B – Extract of EPL 21562

Environment Protection Licence

Licence - 21562

POINT 9

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				4300
Oil and Grease	Visible				Not visible
pH	pH				6.5-8.8
Turbidity	nephelometric turbidity units				50

POINT 10

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				2100
pH	pH				6.5-8.5

POINT 12

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Conductivity	microsiemens per centimetre				4300
pH	pH				6.5-8.8
Turbidity	nephelometric turbidity units				50

L2.5 Discharges from Discharge Point 12 must not occur until a rainfall of event of at least 15 millimetres in a day has occurred.

L2.6 Discharges from Discharge Point 12 must immediately cease when conductivity at Monitoring Point 10 reaches 2,100 micro-siemens per centimetre.

L3 Noise limits

L3.1 Noise generated at the premises that is measured at each noise monitoring point established under this

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Licence - 21562

licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 1

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	41

POINT 2

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	43

POINT 3

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	53

POINT 4

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	46

POINT 5

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	45

POINT 6

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	LAeq (15 minute)	2 times a year	52

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POINT 7

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	41

POINT 8

Time period	Measurement parameter	Measurement frequency	Noise level dB(A)
Day	L _{Aeq} (15 minute)	2 times a year	41

Note: EPA Identification No. 4 and 7 are entitled to negotiated agreement under the *Voluntary Land Acquisition and Mitigation Policy*. Where negotiated agreements are in place noise limits will not apply.

L3.2 For the purposes of Condition L3.1:

a) Day means the period from 7am to 6pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays.

L3.3 Noise-enhancing meteorological conditions

a) The noise limits set out in Condition L3.1 apply under the meteorological conditions in the table below.
 b) For those meteorological conditions not referred to in the table below, the noise limits that apply are the noise limits in Condition L3.1 plus 5dB.

Assessment Period	Meteorological Conditions
Day	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.
Evening	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level.
Night	Stability Categories A, B, C and D with wind speeds up to and including 3m/s at 10m above ground level; or Stability category E and F with wind speeds up to and including 2m/s at 10m above ground level.

L3.4 For the purposes of Condition L3.3:

a) The meteorological conditions are to be determined from the meteorological weather station identified as BoM monitoring point at Badgerys Creek.
 b) Stability category shall be determined using the following method from Fact Sheet D of the Noise Policy for Industry (NSW EPA, 2017):
 i. Use of sigma-theta data (section D1.4).

L3.5 To assess compliance:

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Licence - 21562

a) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, the noise measurement equipment must be located:

- (i) approximately on the property boundary, where any residence is situated 30 metres or less from the property boundary closest to premises; or where applicable,
- (ii) in an area within 30 metres of a residence façade, but not closer than 3 metres where any residence on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable,
- (iii) in an area within 50 metres of the boundary of a National Park or Nature Reserve,
- (iv) at any other location identified in Condition L3.1.

b) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, the noise measurement equipment must be located:

- (i) at the reasonably most affected point at a location where there is no residence at the location; or,
- (ii) at the reasonably most affected point within an area at a location prescribed by Condition L3.5 (a).

c) with the LAeq(15 minutes) noise limits in Condition L3.1 and L3.3, where it can be demonstrated that direct measurement of noise from a relevant monitoring point is impractical, the EPA may accept alternative means of determining compliance as per Chapter 7 of the NSW Noise Policy for Industry.

L3.6 A non-compliance of Conditions L3.1 and L3.3 will still occur where noise generated from the premises is measured in excess of the noise limit at a point other than the reasonably most affected point at the locations referred to in Condition L3.5 (a) or L3.5 (b).

Note: The reasonably most affected point is a point at a location or within an area at a location experiencing or expected to experience the highest sound pressure level from the premises.

L3.7 For the purpose of determining the noise generated from the premises, the modifying factor corrections in Table C1 in Fact Sheet C of the Noise Policy for Industry (NSW EPA, 2017) may be applied, if appropriate, to the noise measurements by the noise monitoring equipment.

L3.8 Noise measurements must not be undertaken where rain or wind speed at microphone level will affect the acquisition of valid measurements.

L3.9 The following definitions apply to this licence:

a) Noise Policy for Industry - the document entitled "Noise Policy for Industry" published by the NSW Environment Protection Authority in October 2017.

b) Noise – 'sound pressure levels' for the purposes of Conditions L3.1 to L3.8.

- LAeq (15 minute) - the value of the A-weighted sound pressure level of a continuous steady sound that, over a 15 minute time interval, has the same mean square sound pressure level as a sound under consideration with a level that varies with time (Australian Standard AS 1055:2018 Acoustics: description and measurement of environmental noise).
- LAFmax – the maximum sound pressure level of an event measured with a sound level meter satisfying Australian Standard AS IEC 61672.1-2013 Electroacoustics - Sound level meters - Part 1: Specifications set to 'A' frequency weighting and fast time weighting.

Appendix C – Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **SLM38865**

EQUIPMENT TESTED: Sound Level Meter

Manufacturer: Svantek
Type No: SVAN 971A **Serial No:** 124743
Mic. Type: ACO 7152 **Serial No:** 85494
Pre-Amp. Type: SV18A **Serial No:** 129967
Filter Type: 1/3 Octave **Test No:** F038867
Owner: Acu-Vib Electronics
Unit 14/22 Hudson Ave
Castle Hill NSW 2154

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	994 hPa ± 1 hPa	Date of Receipt :	23/02/2024
Temperature	24 °C $\pm 1^\circ$ C	Date of Calibration :	23/02/2024
Relative Humidity	46 % $\pm 5\%$	Date of Issue :	26/02/2024

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: 

AUTHORISED SIGNATURE:


Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.


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Acoustic and Vibration
Measurements

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	Clause	Result
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Pass
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	Clause	Result
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	Pass
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: **C50711**

EQUIPMENT TESTED : Acoustic Calibrator

Manufacturer: Svantek

Type No: SV 33B

Serial No: 109960

Class: 1

Owner: Acu-Vib Electronics

Unit 14/22 Hudson Ave

Castle Hill NSW 2154

Tests Performed: Measured Output Pressure level, Frequency & Distortion

Comments: See Details and Class Tolerance overleaf.

CONDITION OF TEST:

Ambient Pressure 1018 hPa ± 1 hPa

Temperature 23 $^{\circ}\text{C} \pm 1^{\circ}\text{C}$

Relative Humidity 34 % $\pm 5\%$

Date of Receipt : 30/07/2024

Date of Calibration : 30/07/2024

Date of Issue : 14/08/2024

Acu-Vib Test AVP02 (Calibrators)

Procedure: Test Method: AS IEC 60942 - 2017

CHECKED BY: 

AUTHORISED
SIGNATURE: 

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

This report applies only to the item identified in the report and may not be reproduced in part.

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Measurements

The Calibrator described in this report has been tested to the requirements of the standard IEC 60942-[Ed 4]:2017-11.

The tests described in Annex B of the standard (Periodic tests) were carried out under the environmental conditions listed above to the following clauses:

Clause	Test description
B4.6	Sound Pressure Level (By comparison with a reference calibrator).
B4.7	Frequency (By measurement with a calibrated frequency meter).
B4.8	Total distortion and noise. (By measurement with a calibrated Noise and Distortion meter).

Notes:

1. The calibrator was calibrated with the main axis vertical and facing down.
2. No corrections have been made for atmospheric pressure,

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 μ Pa)	Frequency (Hz)	THD&N (%)
Level:	NA	N	114.03 dB	1000.01 Hz	0.35 %
Uncertainty			± 0.11 dB	$\pm 0.05\%$	± 0.20 %
Uncertainty (at 95% c.l.) k=2					

Parameter	Class 1		Class 2	
Nominal Frequency	250 Hz	1 kHz	250 Hz	1 kHz
Output dB SPL	0.25 dB	0.25 dB	0.40 dB	0.40 dB
Frequency Hz	0.7 % (1.75 Hz)	0.7 % (7 Hz)	1.7 % (4.25 Hz)	1.7 % (17 Hz)
THD&N	2.5 %	2.5 %	3.0 %	3.0 %

Tolerance limits from AS/IEC60942 (edition 4)

Results of the tests, calibration and/or measurements included in this document are traceable to SI units through reference equipment that has been calibrated by the Australian National Measurement Institute or other NATA accredited laboratories demonstrating traceability.

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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