Intended for
Transport for New South Wales

Document type
Report

Date
13 February 2023

Tarago Air Quality Monitoring Report

November 2022

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Project name	**Tarago Air Quality Monitoring Report**
Project no.	**318001376-004**
Recipient	**Transport for New South Wales**
Document type	**Report**
Version	**2**
Date	**13 February 2023**
Prepared by	**Nathalie Tomson**
Checked by	**Greer Laing**
Approved by	**Greer Laing**
Description	**Data collected during 18 October to 17 November 2022 for the air quality monitoring program at Tarago, NSW**

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Confidential

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Contents

1. Overview

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Transport for New South Wales (TfNSW) to recommence an air quality monitoring (AQM) program to inform air quality impacts resulting from retained lead-containing ore within the Goulburn – Bombala rail corridor in the Tarago Area.

Ramboll has provided assessment and management advice for contamination at and originating from the Tarago Rail Siding which was historically used to load-out ore concentrates. The Tarago Lead Management Action Plan (Ramboll, 2022) was developed to address risks related to exposure to lead from the site.

The Action Plan prescribed:

- Controls including application of a polymer sealant over exposed contaminated soils and application of stabilised sand over a stockpile of spoil generated during rail works; and
- Routine monitoring of contaminant concentrations in surface water and air surrounding the site as lines of evidence for assessing the effectiveness of controls described in the Action Plan.

Ramboll implemented and maintained an AQM program from April 2020 to August 2021 for a previous client and has now been commissioned to recommence the program. The focus of this AQM program is lead in particulate form, both for ambient airborne fractions and deposited dust. This program was commissioned during late October 2022, and this report presents results from the data collected during the first month of monitoring (Oct/Nov 2022).

A map of the monitoring locations is shown in Figure 1-1.

Figure 1-1: Map of air quality monitoring locations around Tarago, AQM

2. Methodology

2.1 Approach

The AQM program consists of two dust monitoring techniques interpreted in conjunction with meteorological data collected by the Department of Planning, Industry and Environment (DPIE) in Goulburn, approximately 38 km to the north-north-east. These techniques are:

- Deposited dust and lead measured continuously throughout each month (Section 2.1.1); and
- Total suspended particulates (TSP) including lead contained within the TSP measured for a 24-hour period completed every one day in six days (Section 2.1.2).

Siting of all equipment was completed, as far as practicable, in accordance with the recommendations of *AS/NZS 3580.1.1:2016 Methods for sampling and analysis of ambient air Guide to siting air monitoring equipment* (Standards Australia and Standards New Zealand, 2016a). Locations of all equipment are shown in Figure 1-1 and images of the monitoring equipment in-situ are shown in Appendix 1. Siting was weighed against technical and practical considerations and the fence is considered a minor obstruction to the contaminated site, where one of the instrument sampling inlets is below the fence-line.

Sampling location DDG4 during the 2020 to 2021 monitoring campaign was located at 96 Mulwaree St, Tarago. The resident declined to have the equipment reinstated, so access was sought and granted for monitoring at 72 Mulwaree St, Tarago. The new monitoring locations, now referred to as DDG4-B, is approximately 200m to the south-south-west of the DDG4. Both monitoring locations are considered to be representative of potential impacts to the west of the rail siding.

2.1.1 Deposited dust and lead

Deposited dust is particulate matter that settles out of the air onto the ground or surfaces. It generally consists of larger, heavier particles from a local source and is considered a nuisance impact rather than a health concern. These particles contain a variety of components such as nitrates, sulphates, organic chemicals, metals, soil or dust particles and allergens.

For this study, sampling and analysis was conducted in accordance with the recommendations of *AS/NZS 3580.10.1:2016 Methods for sampling and analysis of ambient air Determination of particulate matter – Deposited matter – Gravimetric method* (Standards Australia and Standards New Zealand, 2016b). Each gauge is installed to collect deposited matter in a glass bottle together with rainwater through a funnel over a period of 30 days +/- 2 days at a mounted height of approximately 2 m above ground surface. The samples are analysed for insoluble solids (including ash and combustible matter) and lead by inductively coupled plasma mass spectrometry (ICP-MS).

Four dust deposition gauges were placed to assess deposited dust and lead in residential areas east, west, and south-east of the source area and at 106 Goulburn Street (the nearest sensitive receptor).

2.1.2 TSP and lead

TSP are solid particles and water droplets less than approximately 50 to 100 µm in aerodynamic diameter. This parameter is dominated by larger entrained particles which are generally considered a nuisance dust compared to finer particles such as PM_{10} and $PM_{2.5}$ which are known to be hazardous to human health. The Australian Standard to measure lead in particulates—*AS/NZS 3580.9.15:2014 Methods for sampling and analysis of ambient air Method 9.15: Determination of*

suspended particulate matter — Particulate metals high or low volume sampler gravimetric collection — Inductively coupled plasma (ICP) spectrometric method (Standards Australia and Standards New Zealand, 2014)—requires measurement of the TSP fraction to analyse for lead content.

Sampling and analysis for this program has been conducted in accordance with the Australian Standard. Calibration has been completed by Ramboll, consistent with the Australian Standard and manufacturers recommendations. The program utilises a high-volume air sampler (Hi-Vol 3000) with a TSP head, that has a reported cut-point for particles of 50 µm diameter or less. The sampler draws a known volume of air across a pre-weighed filter for 24-hours. The filters are weighed following sampling to determine the weight of the particulate matter captured and further analysed for lead concentration using ICP-MS. To compare particulate lead to the air quality annual standard, lead sampling must be carried out for a period of 24 hours at least every sixth day, the approach applied for this program.

TSP including lead contained within the TSP were measured at 106 Goulburn Street identified as the nearest sensitive receptor to the source area.

2.1.3 PM_{10} and $PM_{2.5}$

The previous monitoring program during 2020 to 2021 included collection of continuous particulate matter at less than 10 microns in aerodynamic diameter (i.e. PM_{10}) and less than 2.5 microns (i.e. $PM_{2.5}$). This measurement was also included in the Tarago Lead Management Action Plan (Ramboll, 2022), but not included in the scope of works to reinstate the monitoring program on the basis of low correlation with lead values measured previously.

Continuous particle monitoring may be reinstated at a later date to inform proactive response to potential emissions during remediation.

2.2 Regional meteorological monitoring

The Department of Planning, Industry and Environment (DPIE) maintains a state-wide network of air quality monitoring stations, including one commissioned in late 2019 in Goulburn, NSW. The station measures meteorological parameters, of which wind speed, wind direction, temperature, humidity, and rainfall are of interest to this program. One-hourly averaged data have been analysed to determine prevailing conditions. DPIE do not monitor lead routinely as part of their state-wide air quality monitoring program.

A limitation of using meteorological data from the Goulburn station is its different location, terrain, and consequent micro-conditions to the studied site. Comparison with CSIRO's The Air Pollution Model (TAPM) predicted meteorological data centred on Tarago was done in the previous AQM program (Ramboll, 2021). Both datasets showed prevailing westerly winds, with a secondary easterly component, while the TAPM data predicted higher wind speeds in Tarago than measured in Goulburn. It is noted there are limitations to both datasets, where the Goulburn data is collected at distance and influenced by different terrain influences, whereas the modelled data has inherent uncertainty and assumptions, and the technique is limited in its prediction of calm conditions. Therefore, for this assessment the DPIE Goulburn station data was used and is deemed appropriate for a macro understanding of the weather of the region in the absence of local monitored meteorological data.

2.3 Relevant air quality criteria

Air quality criteria relevant to the program are presented in **Figure 2-1**.

Figure 2-1: Air quality criteria relevant to JHR Tarago air quality monitoring program

Pollutant	Averaging period	Criteria	Source
Lead	Annual	0.5 µg/m³	NEPC (2021)
TSP	Annual	90 µg/m³	NHMRC (1996)
Deposited dust (as insoluble solids)	Annual	4 g/m²/month	NERDDC (1988), NSW EPA (2022)

3. Results

3.1 Deposited dust and lead

Deposited dust (insoluble solids) at the DDG1, DDG2 and DDG3 locations were below the annual average criteria of 4 g/m^2/month. No lead was measured above the detection limit (1 µg) in any of these locations. The DDG4 sample (Mulwaree Street) was relocated to a different location (i.e. DDG4-B), so was only exposed for one week during the initial monitoring month. These data will be averaged and presented in the next report iteration. Results are presented in Table 3-1.

3.2 TSP and lead

Lead was detected in all TSP samples collected from 21 October to 14 November 2022. In all cases, the concentrations were below the annual average criteria for lead; similarly, TSP measured during the period was below the annual average criteria (Figure 3-1).

3.3 Regional meteorological monitoring

Rainfall contributes to suppressing dust. Total daily rainfall measured in Goulburn from 19 October to 16 November 2022 is presented in Figure 3-3. On two occasions the daily rainfall exceeded 30 mm, on 31 October and 13 November. The latter was the day when the last TSP and lead 24-hour sampling for this period started; however, TSP results from this day are similar to the ones of previous sampling events.

Analysis of monitored meteorological data indicates that regional winds during the monitoring period were predominantly from the west, followed by east and east-north-east winds (Figure 3-4). Winds ranged in speed, where the strongest winds of 4 to 6.3 m/s prevailed from the west. Calm conditions have an important influence on pollutant dispersion in the atmosphere. Calm conditions can result in elevated concentrations of pollutants from low level fugitive sources near to the source. Conversely, higher wind speeds can also generate elevated concentrations of particulate matter through the wind erosion of sources.

Analysis of the wind on the TSP and lead sampled days shows a similar pattern to the overall wind characteristics (Figure 3-5). Figure 3-6 shows the measured 24-hour average TSP and lead concentrations and the recorded prevailing wind on those days, suggesting that the most part of lead-containing TSP travels with the prevailing westerly winds.

Table 3-1: Measured lead content in deposited dust and deposited dust at four properties around Tarago, NSW

Month	DDG1, Stewart St		DDG2, Station Masters Cottage		DDG3, Boyd St		DDG4-B, Mulwaree St	
	Lead (µg)	Insoluble solids (g/m^2 /month)	Lead (µg)	Insoluble solids (g/m^2 /month)	Lead (µg)	Insoluble solids (g/m^2 /month)	Lead (µg)	Insoluble solids (g/m^2 /month)
Oct/Nov 2022 (18-10-2022 to 17-11-2022)	<1	0.3	<1	0.5	<1	1.2	[a] N/A	
Rolling annual average	**<1**	**0.3**	**<1**	**0.5**	**<1**	**1.2**	**N/A**	**N/A**

Limit of reporting = 1 µg for lead and 0.1 g/m^2/mth for insoluble solids
[a] To be averaged in next report (short exposure period during November)

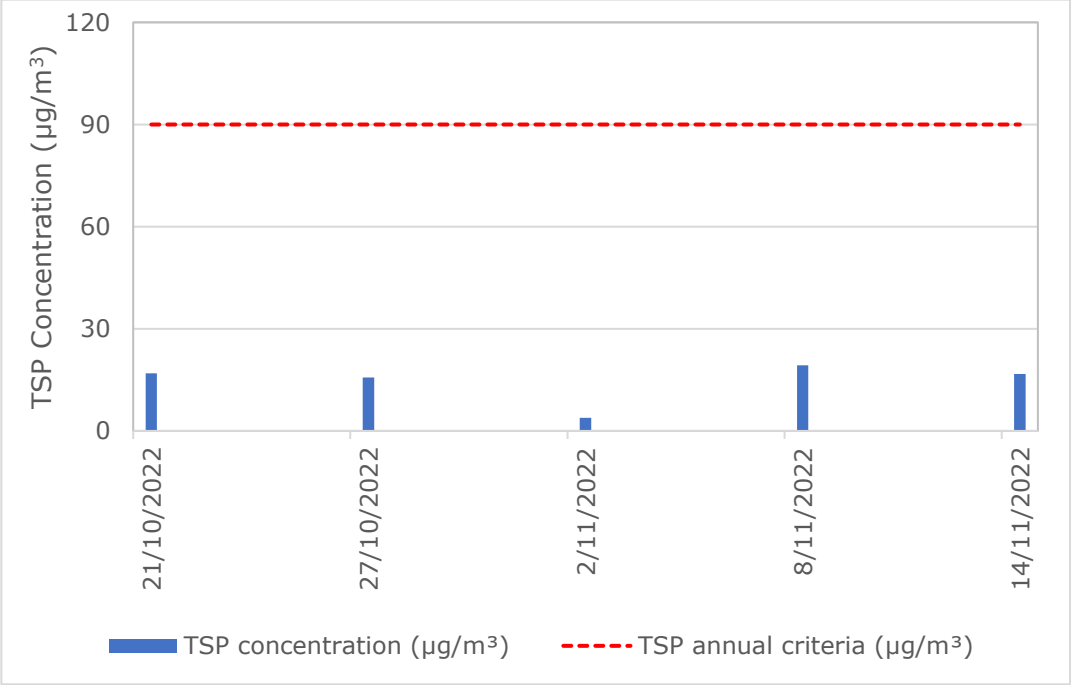

Figure 3-1: Measured 24-hour average TSP concentrations, one day in six since program commissioning

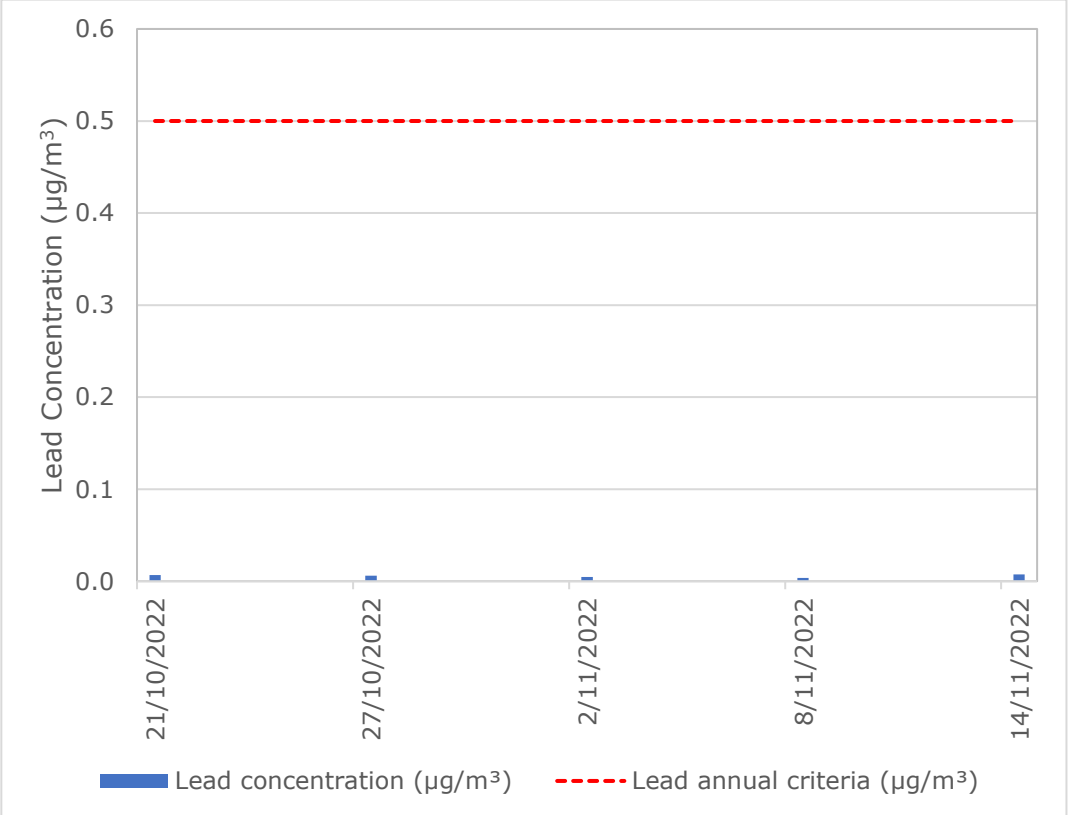

Figure 3-2: Measured 24-hour average lead concentrations, one day in six since program commissioning

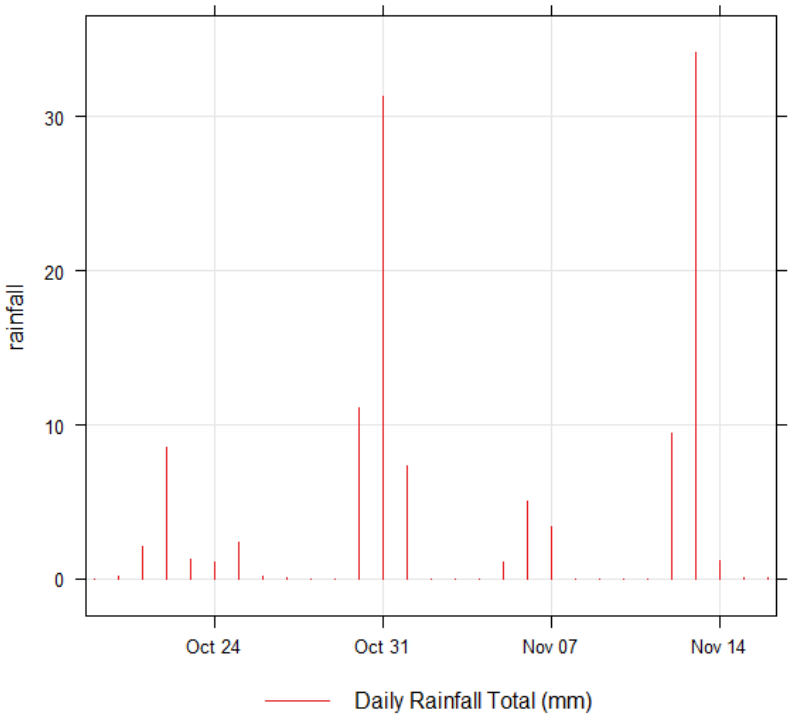

Figure 3-3: 24-hour total rainfall (mm/m²) measured in Goulburn during the monitoring period

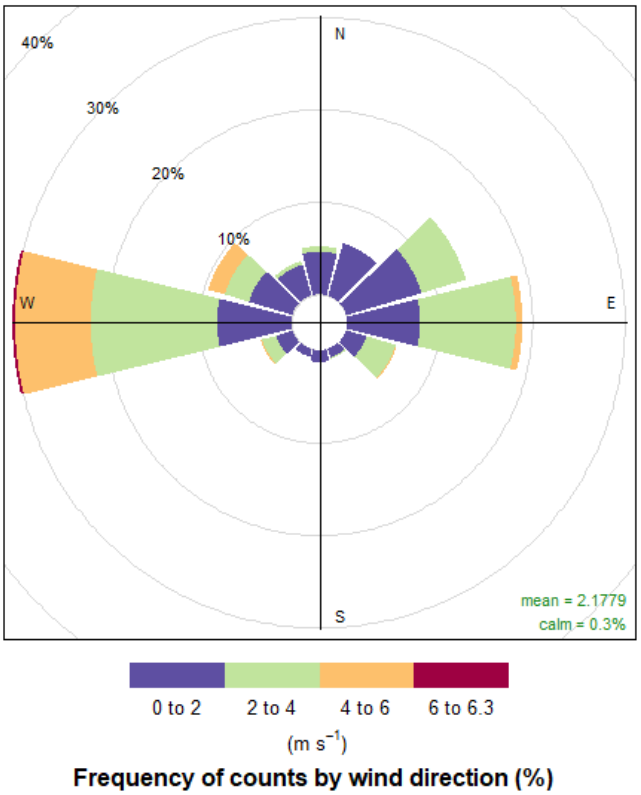

Figure 3-4: Wind rose with meteorological data from the entire monitoring period

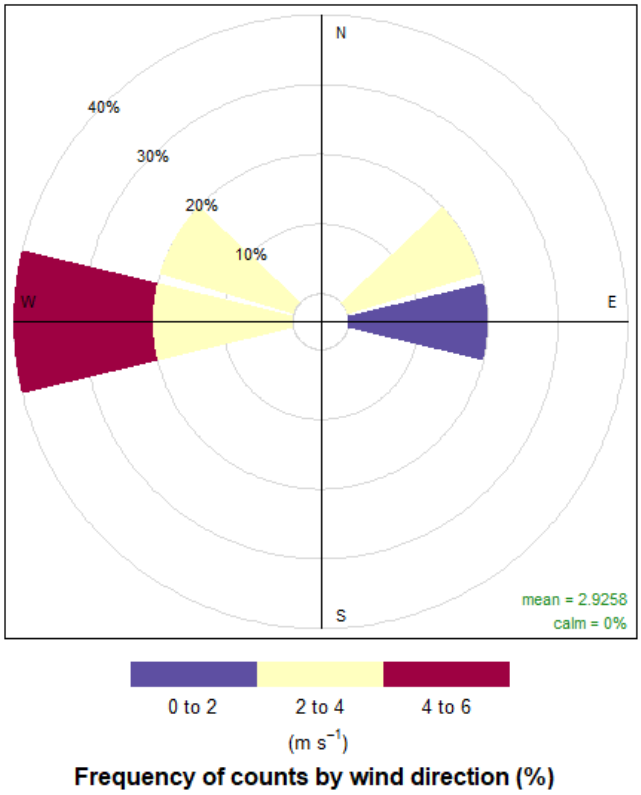

Figure 3-5: Wind rose with meteorological data from the five TSP and lead sampled days

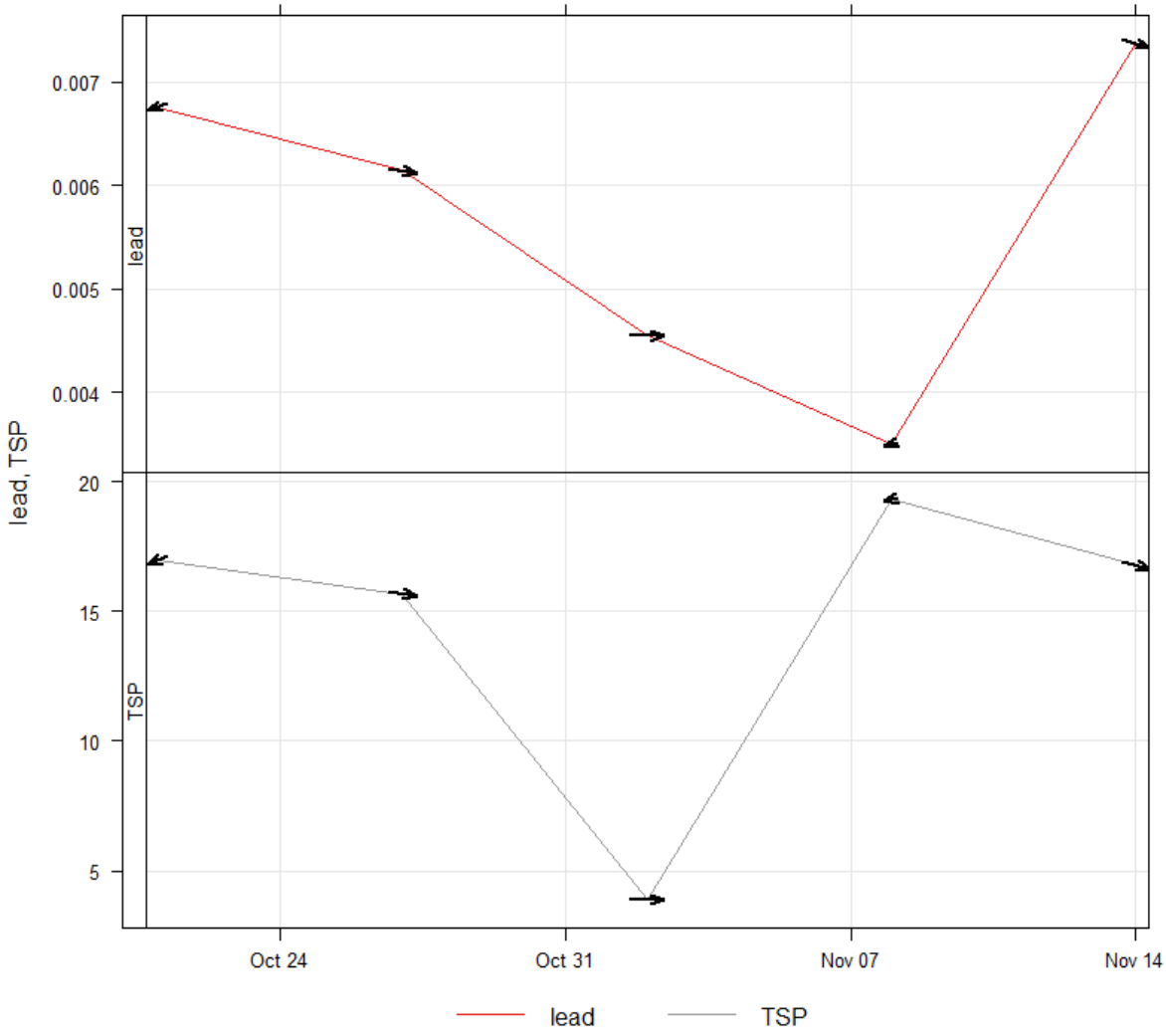

Figure 3-6: Measured 24-hour average TSP and lead concentrations and prevailing winds on the day

4. Summary

This report presents results from one month of dust deposition monitoring (18 October to 17 November 2022) and five TSP and lead 24-average samples (21 and 27 October and 2, 8 and 14 November 2022). One of four DDG samples was not exposed for the full month (DDG4) so was left in place to be averaged during the next monitoring month (Nov/Dec 2022).

No lead was detected in deposited dust above the limit of reporting. Deposited dust as insoluble solids were below the annual average dust deposition criteria. Lead was detected in all 24-hour average TSP samples, but in all cases the concentrations were below the annual average criterion.

Regional winds measured in Goulburn during the monitoring period prevailed from the west. Data collected to date indicates that lead and particulate matter concentrations are below the air quality criteria at all locations monitored.

5. Limitations

This document is issued in confidence to TfNSW for the purposes of assessing air quality impacts from lead containing ore within the Goulburn – Bombala rail corridor in the Tarago Area. It should not be used for any other purpose.

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6. References

NEPC, 2021. National Environment Protection (Ambient Air Quality) Measure. National Environment Protection Council.

NERDDC, 1988. Air Pollution from Surface Coal Mining: Measurement, Modelling and Community Perception, Project No. 921. National Energy Research Development and Demonstration Council, Canberra.

NHMRC, 1996. Ambient Air Quality Goals Recommended by the National Health and Medical Research Council. National Health and Medical Research Council, Canberra.

NSW EPA, 2022. Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales. NSW Environment Protection Authority, Parramatta NSW.

Ramboll, 2021. Tarago Air Quality Monitoring Report (Report, Project no. 318000780).

Ramboll, 2020. Tarago Lead Management Action Plan, prepared for previous client.

Ramboll, 2022. Tarago Lead Management Action Plan, prepared for Transport for NSW, December 2022.

Standards Australia, Standards New Zealand, 2016a. AS/NZS 3580.1.1:2016 Methods for sampling and analysis of ambient air Guide to siting air monitoring equipment. Australian/New Zealand Standard.

Standards Australia, Standards New Zealand, 2016b. AS/NZS 3580.10.1:2016 Methods for sampling and analysis of ambient air Determination of particulate matter - Deposited matter - Gravimetric method. Australian/New Zealand Standard.

Standards Australia, Standards New Zealand, 2014. AS/NZS 3580.9.15:2014 Methods for sampling and analysis of ambient air Method 9.15: Determination of suspended particulate matter — Particulate metals high or low volume sampler gravimetric collection — Inductively coupled plasma (ICP) spectrometric method. Australian/New Zealand Standard.

Appendix 1

Images of Air Quality Monitoring Instruments in-Situ

Figure A: Dust deposition gauge DDG2 and high-volume air sampler at Station Masters Cottage, 106 Goulburn St, Tarago NSW

Figure B: Dust deposition gauge DDG1, 18 Stewart St, Tarago NSW; DDG3, Boyd St, Tarago NSW; and DDG4, 72 Mulwaree St, Tarago NSW

Appendix 2
Laboratory Reports

Ramboll Australia Pty Ltd
Level 3/100 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Greer Laing**

Report **941342-A**
Project name TARAGO AQM
Project ID 318001376-004
Received Date Nov 11, 2022

Client Sample ID			**HVS1472**	**HVS1484**	**HVS1494**	**HVS1511**
Sample Matrix			**Filter paper**	**Filter paper**	**Filter paper**	**Filter paper**
Eurofins Sample No.			**M22-No0036723**	**M22-No0036724**	**M22-No0036725**	**M22-No0036726**
Date Sampled			**Oct 21, 2000**	**Oct 27, 2022**	**Nov 02, 2022**	**Nov 08, 2022**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	11	10	7.4	5.7
Particulates - Final weighing	0.01	mg	2765.6	2786.3	2748.6	2766
Particulates - Initial weighing	0.01	mg	2738	2760.8	2742.3	2734.6

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Melbourne	Nov 18, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Particulates - Final weighing	Field	Nov 16, 2022	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters)			
Particulates - Initial weighing	Field	Nov 17, 2022	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters) & QS-INS-4033 (HVAS - Non NATA Endorsed).			

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Project Name: TARAGO AQM
Project ID: 318001376-004

Order No.: 318001376-004
Report #: 941342
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Nov 11, 2022 11:35 AM
Due: Nov 18, 2022
Priority: 5 Day
Contact Name: Greer Laing

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Lead	Particulates - Final weighing
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	HVS1472	Oct 21, 2000		Filter paper	M22-No0036723	X	X
2	HVS1484	Oct 27, 2022		Filter paper	M22-No0036724	X	X
3	HVS1494	Nov 02, 2022		Filter paper	M22-No0036725	X	X
4	HVS1511	Nov 08, 2022		Filter paper	M22-No0036726	X	X
Test Counts						4	4

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	N/A
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Mary Makarios	Senior Analyst-Metal

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Level 3/100 Pacific Highway
North Sydney
NSW 2060

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Accreditation Number 1261
Site Number 18217

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Attention: **Greer Laing**

Report **942976-A**
Project name TARAGO AQM
Project ID 318001376-004
Received Date Nov 17, 2022

Client Sample ID			**DDG 1 - STEWART STREET**	**DDG 2 -SMC**	**DDG 3 -BOYD STREET**
Sample Matrix			**Dust Deposition**	**Dust Deposition**	**Dust Deposition**
Eurofins Sample No.			**S22-No0049303**	**S22-No0049304**	**S22-No0049305**
Date Sampled			**Oct 18, 2022**	**Oct 18, 2022**	**Oct 18, 2022**
Test/Reference	LOR	Unit			
Dust Deposition					
Combustible Solids	0.1	g/m2/mth	0.2	0.5	1.1
Soluble Solids	0.1	g/m2/mth	2.9	4.9	4.8
Total Solids Dried at 103 °C to 105 °C	0.1	g/m2/mth	3.2	5.4	6.0
Volume (total)*	0.1	mL	3600	3400	3500
Ash*	0.1	g/m2/mth	< 0.1	< 0.1	< 0.1
Insoluble Solids	0.1	g/m2/mth	0.3	0.5	1.2
Heavy Metals					
Lead	1	Total ug	< 1	< 1	< 1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Dust Deposition	Sydney	Nov 21, 2022	5 Days
- Method: LTM-INO-4160 Determination of Dust Deposition of Ambient Air			
Heavy Metals	Sydney	Nov 21, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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Company Name: Ramboll Australia Pty Ltd
Address: Level 3/100 Pacific Highway
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NSW 2060

Project Name: TARAGO AQM
Project ID: 318001376-004

Order No.: 318001376-004
Report #: 942976
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Nov 17, 2022 6:20 PM
Due: Nov 29, 2022
Priority: 7 Day
Contact Name: Greer Laing

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						CANCELLED	Lead	Dust Deposition
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	DDG 1 - STEWART STREET	Oct 18, 2022		Dust Deposition	S22-No0049303		X	X
2	DDG 2 -SMC	Oct 18, 2022		Dust Deposition	S22-No0049304		X	X
3	DDG 3 -BOYD STREET	Oct 18, 2022		Dust Deposition	S22-No0049305		X	X
4	DDG 4 - MULWAREE STREET	Oct 18, 2022		Dust Deposition	S22-No0049306	X		
Test Counts						1	3	3

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Lead			Total ug	< 1			1	Pass	
LCS - % Recovery									
Heavy Metals									
Lead			%	105			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	S22-No0049305	CP	%	100			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S22-No0049303	CP	Total ug	< 1	< 1	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	N/A
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Fang Yee Tan	Senior Analyst-Metal
Roopesh Rangarajan	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

Ramboll Australia Pty Ltd
Level 3/100 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Greer Laing**

Report **943494-A**
Project name TARAGO AQM
Project ID 318001376-004
Received Date Nov 17, 2022

Client Sample ID			**HVS 1503**
Sample Matrix			**Filter paper**
Eurofins Sample No.			**M22-No0053592**
Date Sampled			**Nov 14, 2022**
Test/Reference	LOR	Unit	
Heavy Metals			
Lead	1	Total ug	12
Particulates - Final weighing	0.01	mg	2766.6
Particulates - Initial weighing	0.01	mg	2739.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Melbourne	Nov 25, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Particulates - Final weighing	Field	Nov 22, 2022	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters)			
Particulates - Initial weighing	Field	Nov 22, 2022	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters) & QS-INS-4033 (HVAS - Non NATA Endorsed).			

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Tel: 0800 856 450
IANZ# 1290

Company Name: Ramboll Australia Pty Ltd
Address: Level 3/100 Pacific Highway
North Sydney
NSW 2060

Project Name: TARAGO AQM
Project ID: 318001376-004

Order No.: 318001376-004
Report #: 943494
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Nov 17, 2022 6:20 PM
Due: Nov 25, 2022
Priority: 5 Day
Contact Name: Greer Laing

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Lead	Particulates - Final weighing	Particulates - Initial weighing
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X	X
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	HVS 1503	Nov 14, 2022		Filter paper	M22-No0053592	X	X	X
Test Counts						1	1	1

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TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

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Comments

Sample Integrity

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Attempt to Chill was evident	N/A
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Andrew Black	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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