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TARAGO AIR QUALITY MONITORING REPORT JULY 2021

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Checked by	**Martin Parsons**
Approved by	**Fiona Robinson**
Description	**Data collected during July 2021 for the air quality monitoring program at Tarago, NSW**

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CONTENTS

1. OVERVIEW

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by John Holland Rail Pty Ltd (JHR) to implement and maintain an air quality monitoring program to inform air quality impacts resulting from retained lead containing ore within the Goulburn - Bombala rail corridor in the Tarago Area. Impacts from lead have been observed in the railway corridor and surrounding areas, likely from historical spillage associated with loading of ore at the site (Ramboll, 2019). The location is shown on **Figure 2-1**.

Lead is emitted to the air from both natural and anthropogenic sources. Measured concentrations in ambient air have greatly reduced nationally following the phase-out of leaded fuels from 2000 to 2002, where typically urban concentrations are now less than 10% of the air quality criteria (NEPC, 2001). **Appendix 1** shows historic annual average lead concentration in Australian capital cities from 1981 to 2000, after which monitoring ceased in urban areas. Ambient lead remains a risk in areas where local point sources exist, such as metal smelting facilities, mining operations and waste incineration. Inhalation and ingestion of lead at elevated levels can lead to a range of health impacts, including cancer, neurotoxicity, and reproductive toxicity.

JHR is implementing management measures to minimise dust generation at the site. The Interim Lead Management Plan (Ramboll, 2019) requires all stockpiles to be covered and water to be applied to materials to minimise dust generation. A dust mitigation program was undertaken for the project from 6 to 9 of April 2020 (Green Track Solutions, 2020). Approximately 8,210 L of acrylate-based polymer soil binding agent ('DirtGlue Regular') was applied. The key sections where product was applied were: Goulburn Street level crossing to 260 m north of the rail station platform (0.3 L/m^2); eastern side of the service rail line adjacent to Goulburn Street and level crossing (surface application) and the hardstand area to the west of the rail section and surrounding area (0.27 L/m^2). Approximately 4,160 L of a fluid dust suppressant, comprised of a blend of alkane and alkylated organic compounds ('DustLess'), was applied to the undisturbed area immediately to the west of the service rail corridor (0.5 L/m^2) and the access road to the west of the hardstand area (surface application).

The focus of this air quality monitoring program is lead in particulate form, both for ambient airborne fractions and deposited dust. This program was commissioned during early April 2020 in Tarago, NSW. The monitoring program does not capture conditions prior to the dust mitigation project. This report comprises data collected during July 2021 and is compared against data collected in the previous months commencing from April 2020.

2. METHODOLOGY

2.1 Approach

The monitoring program consisted of three dust monitoring techniques and was 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.

The program is outlined in the following sections:

- Deposited dust and lead measured continuously throughout each month (Section 2.1.1).
- 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).
- Particulates less than 10 microns in aerodynamic diameter (PM_{10}) and less than 2.5 microns measured continuously throughout each month ($PM_{2.5}$; Section 2.1.3).

Siting of all equipment was completed, as far as practicable, in accordance with the recommendations of *AS/NZS 3580.1.1 Guide to siting air monitoring equipment*. Locations of all equipment are shown in **Figure 2-1** and images of the monitoring equipment in-situ are shown in **Appendix 2**. 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.

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 Determination of Particulate Matter – Deposited Matter – Gravimetric method*. 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.9.15 Determination of suspended particulate matter – Particulate metals high or low volume sampler gravimetric collection – Inductively coupled plasma (ICP) spectrometric method)* 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 Continuous PM_{10} and $PM_{2.5}$

PM_{10} refers to particles of less than 10 microns in aerodynamic diameter, and $PM_{2.5}$ to those of less than 2.5 microns. These size fractions can be drawn into the respiratory system and can cause serious health effects, such as lung disease, asthma, heart attacks, respiratory and cardiovascular disease. As with other fractions of particulate matter, particles consist of a multitude of constituents from a range of local and regional sources.

For this program a particle counter (QAMS DMP 7000) is maintained to understand how concentrations of particulate matter vary over finer temporal scales. Whilst the focus of the program is on lead concentrations, PM_{10} and $PM_{2.5}$ data from the particle counter provide a useful indication of concentrations over a day or week relative to prevailing meteorological conditions which can provide an indication of likely sources if needed. The instrument is configured to measure PM_{10} and $PM_{2.5}$ at 5-minute intervals over the course of the program.

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. Additional analysis of predicted local wind conditions is provided in Section 3.2.1.

DPIE do not monitor lead routinely as part of their state-wide air quality monitoring program.

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 (1998)
TSP	Annual	90 μg/m³	NHMRC (1996)
$PM_{2.5}$	24 hours	25 μg/m³	DoE (2016)
	Annual	8 μg/m³	DoE (2016)
PM_{10}	24 hours	50 μg/m³	DoE (2016)
	Annual	25 μg/m³	DoE (2016)
Deposited dust	Annual	4 g/m²/month	NERDDC (1988)

A4
1:5,000

Legend

- Site boundary
- Rail corridor
- Rail corridor fence
- Area of lead contamination within the rail corridor

Sampling locations

- Deposited dust and lead (from dust deposition guage)
- TSP and lead (from high volume air samper)
- Continuous PM10 and PM2.5 (from particle counter)
- Regional meteorological monitoring from DPIE Air quality monitoring station (see location inset)

Figure 2-1 | Tarago air quality monitoring locations

3. RESULTS

3.1 Deposited dust and lead

No lead was measured above the detection limit (1 µg) at DDG1 Stewart Street and DDG3 Boyd Street during July 2021. Deposited dust (insoluble solids) at these locations were below the annual average criteria of 4 g/m^2/month. No valid lead or deposited dust (insoluble solids) values were recorded at DDG2 Station Masters Cottage and DDG4 Mulwaree Street during July 2021, as they were damaged, likely from high winds, and therefore invalidated. The rolling annual average for deposited dust (insoluble solids) at each location remained below the criteria of 4 g/m^2/month for the duration of the program.

3.2 TSP and lead

Lead was detected in all TSP samples collected during July 2021. In all cases, the concentrations were below the annual average criteria for lead (**Figure 3-2**). Similarly, TSP measured during the period was below the annual average criteria (**Figure 3-3**). When all measured data is considered together there is no linear relationship between lead and TSP. If the periods where lower concentrations of measured lead are isolated, there is a low to moderate correlation between these parameters (**Figure 3-4**). On days where higher lead was measured but without a corresponding relationship with TSP (i.e. the highest 11% of lead values selected for this analysis), suggests operations or local activities disturbed local lead sources during these periods. Lead concentrations measured during July 2021 remain low relative to April, September, October, and November 2020.

Rainfall contributes to suppressing dust. Total daily rainfall measured in Goulburn during July 2021 is presented in **Figure 3-5**. June was a relatively dry month with a total of 32.8 mm of rainfall recorded.

Analysis of monitored meteorological data indicated that regional winds during July 2021 were predominantly from the west-north-west (**Figure 3-6**). There were few winds from other directions during this period. The monitoring location is influenced by sources in the direction of the rail corridor when winds prevail roughly in a 180^0 arc from the north, west and south.

Winds ranged in speed, where the strongest winds of 4 to 8 m/s prevailed from the west-north-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.

Figure 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, Mulwaree St	
	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)	Lead (µg)	Insoluble solids (g/m2 /month)
April (1-4-2020 to 30-4-2020)	<0.01	1.0	<0.01	0.7	<0.01	0.6	<0.01	0.4
May (30-4-2020 to 1-6-2020)	<1	0.9	<1	0.4	<1	0.4	<1	0.3
June (1-6-2020 to 1-7-2020)	<1	0.9	<1	0.5	<1	1.3	<1	0.3
July (1-7-2020 to 13-08-2020)	<1	1.9	<1	0.8	<1	0.2	<1	0.7
August (13-08-2020 to 1-09-2020)	<1	0.5	<1	0.2	<1	0.2	<1	0.2
September (1-09-2020 to 30-09-2020)	<1	2.1	<1	1.2	<1	7.2[a]	<1	0.8
October (30-09-2020 to 30-10-2020)	<1	3.0	<1	3.9	<1	1.4	<1	1.2
November (30-10-2020 to 1-12-2020)	<1	0.9	<1	1.4	<1	1.2	<1	0.6
December (1-12-2020 to 29-12-2020)	<1	2.3	<1	1.0	<1	4.0	<1	1.0
January (29-12-2020 to 28-01-2021)	<1	1.8	<1	**4.3**	<1	4.2[b]	<1	1.5
February (28-01-2021 to 26-02-2021)	<1	1	<1	1.8	<1	**8.8**	<1	0.7
March (26-02-2021 to 29-03-2021)	<1	1.2	<1	1.2	<1	1.5	<1	0.2
April (29-03-2021 to 30-04-2021)	<1	1.6	<1	0.7	<1	3.4	<1	2
May (30-04-2021 to 1-06-2021)	<1	1.0	<1	0.4	<1	0.2	<1	0.4
June (1-06-2021 to 2-07-2021)	<1	0.3	<1	0.5	<1	1.9	<1	0.4
July (2-07-2021 to 3-08-2021)	<1	0.7	Dc	-[c]	<1	3.3	-[c]	-[c]
Rolling annual average	**<1**	**1.4**	**<1**	**1.5**	**<1**	**2.6**	**<1**	**0.8**

Limit of reporting = 0.01 µg during April and 1 µg from May forward following change in laboratory facility completing analysis
[a] Sample invalidated – DDG3 September 2020 sample contaminated with animal faeces
[b] Sample invalidated – DDG3 January 2021 sample contaminated with spiders and insects
[c] Sample invalidated – DDG2 and DDG4 July 2021 sample funnel damaged by high winds

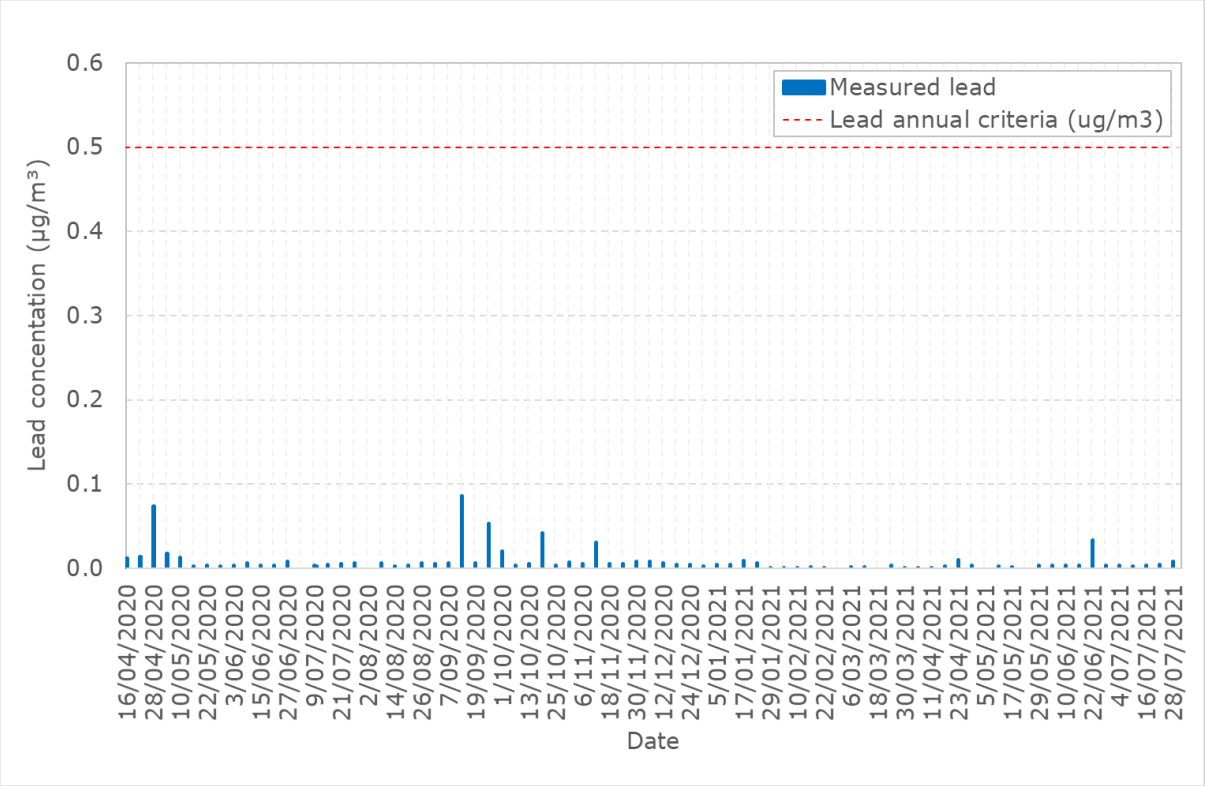


Figure 3-2: Measured 24-hour average lead concentration, one day in six since program commissioning

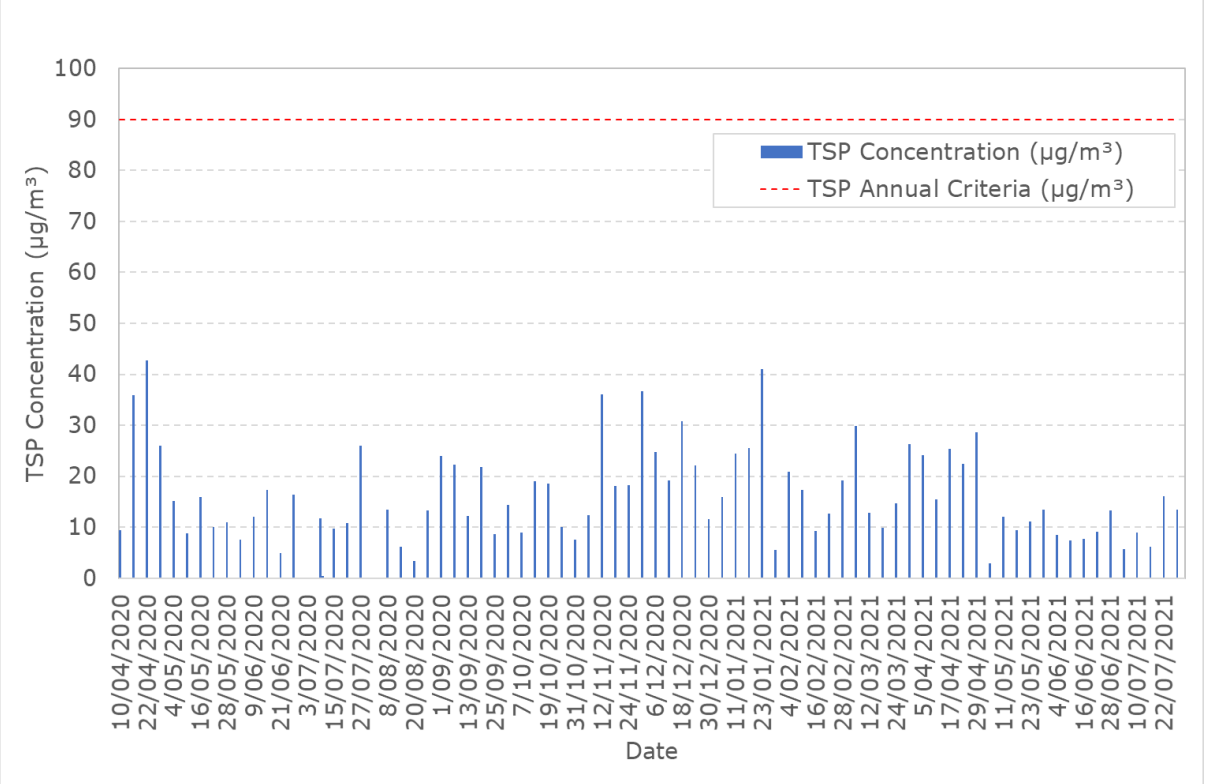


Figure 3-3: Measured 24-hour average TSP concentration, one day in six since program commissioning

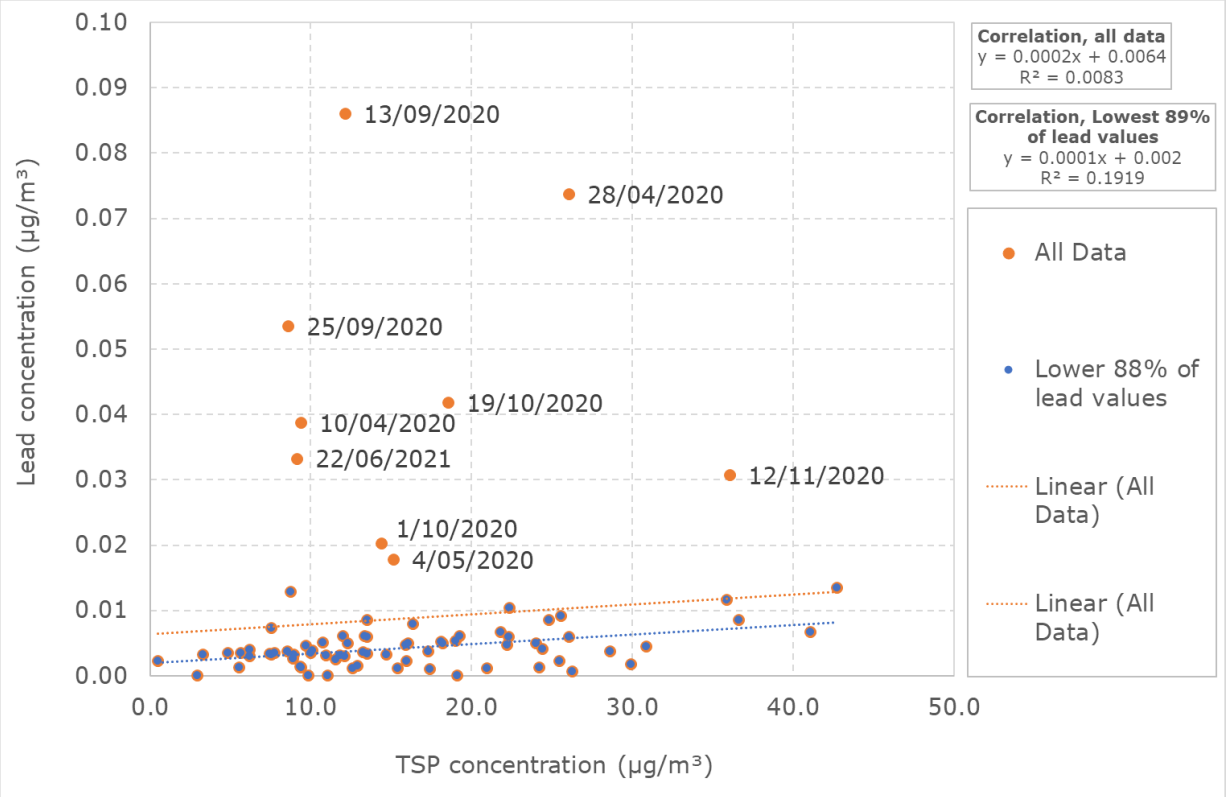


Figure 3-4: Correlation between TSP concentration and lead concentration from the same sample

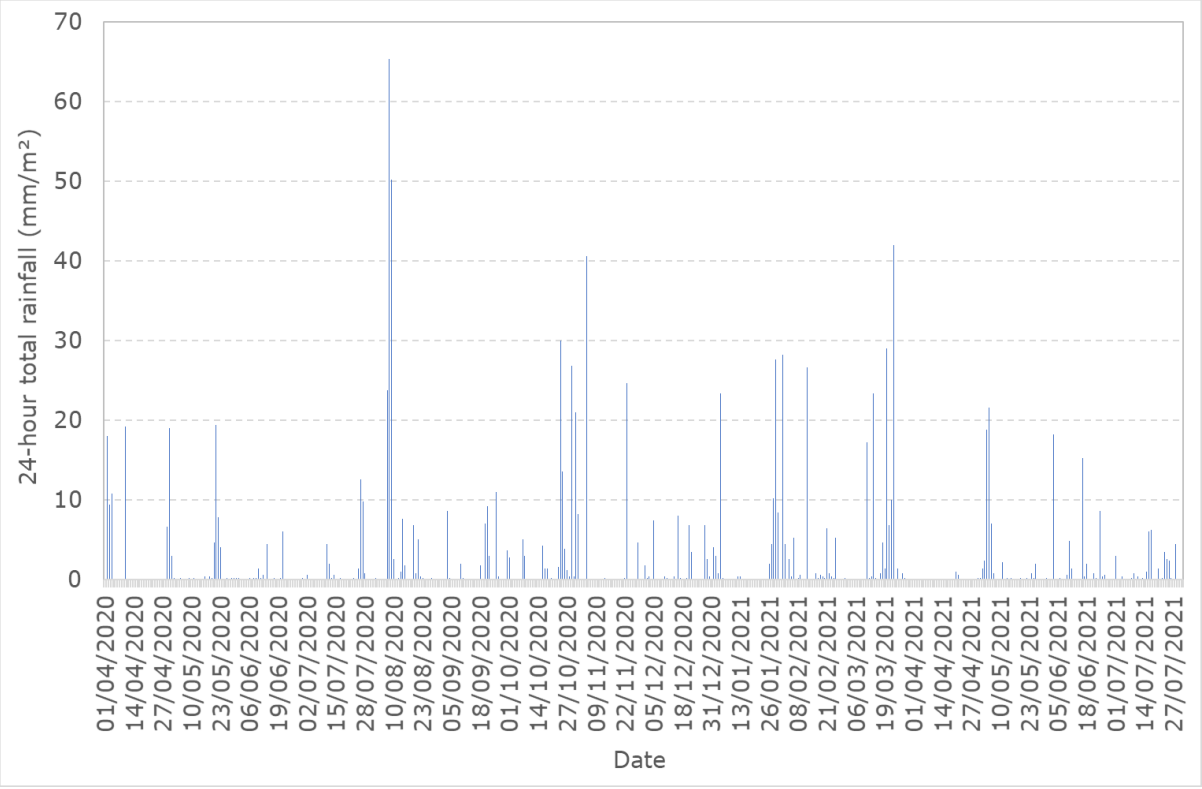


Figure 3-5: 24-hour total rainfall (mm/m²) measured in Goulburn during the monitoring period

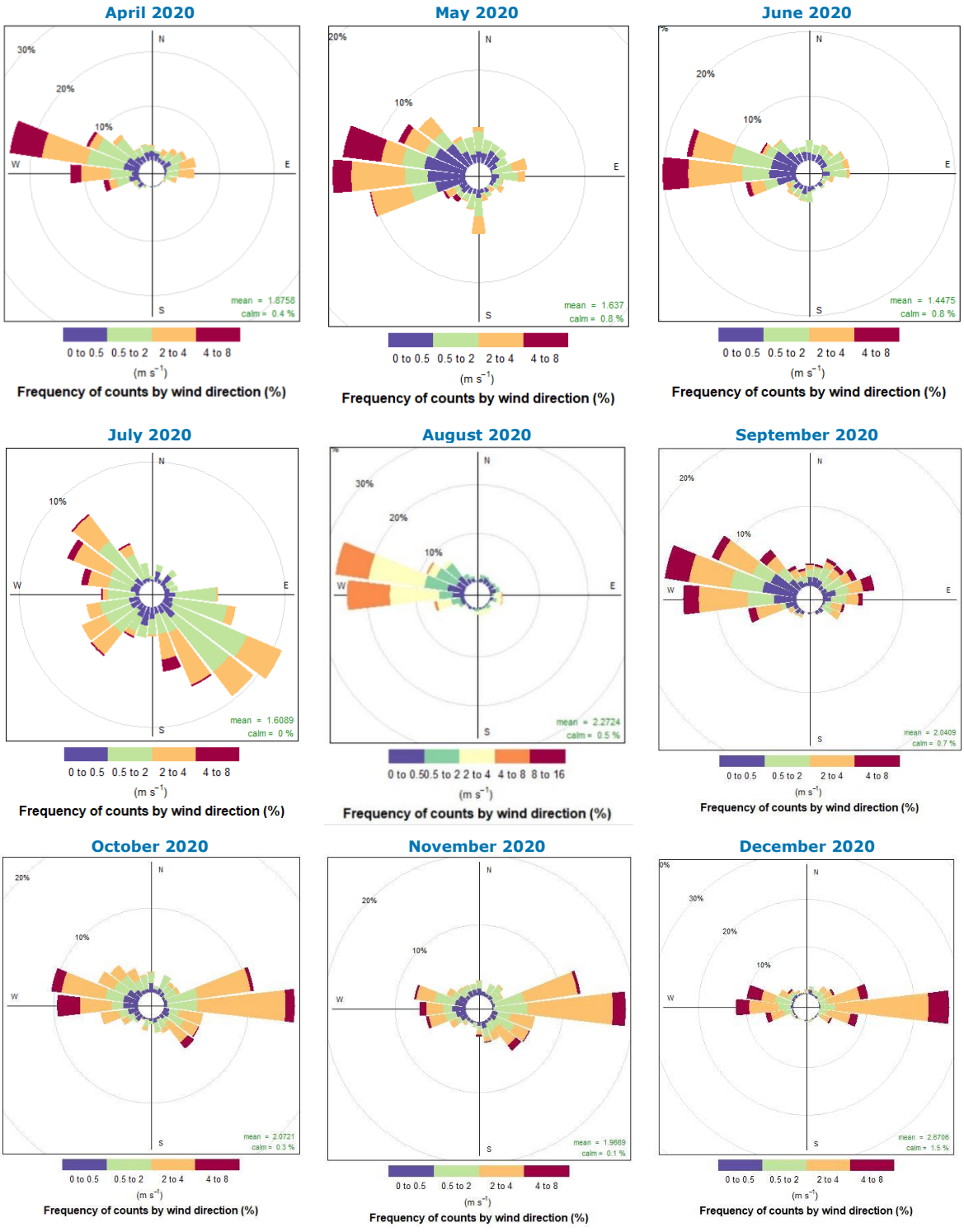


Figure 3-6: Prevailing regional hourly average wind speed and wind direction measured at Goulburn during each monitoring month during 2020

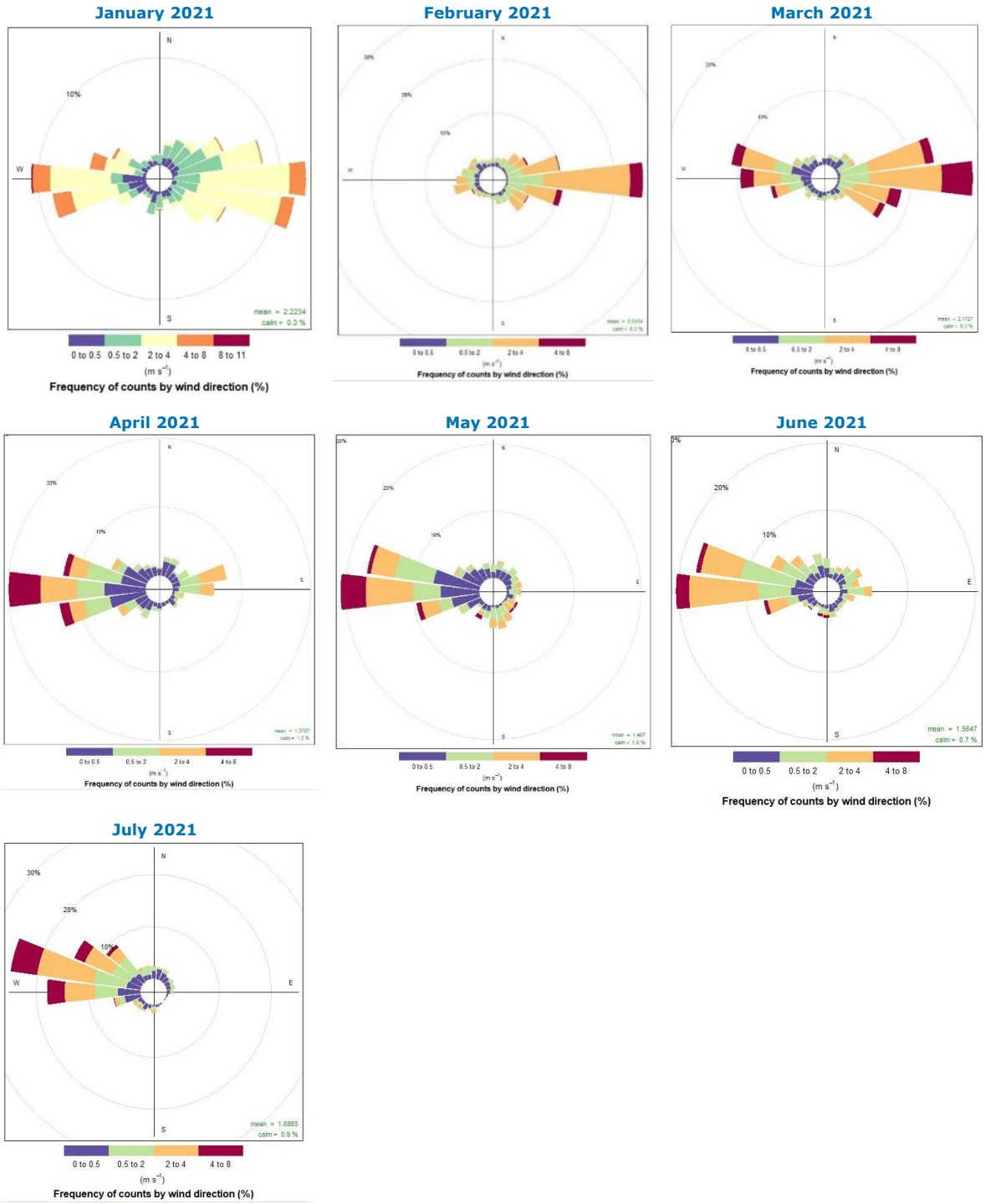
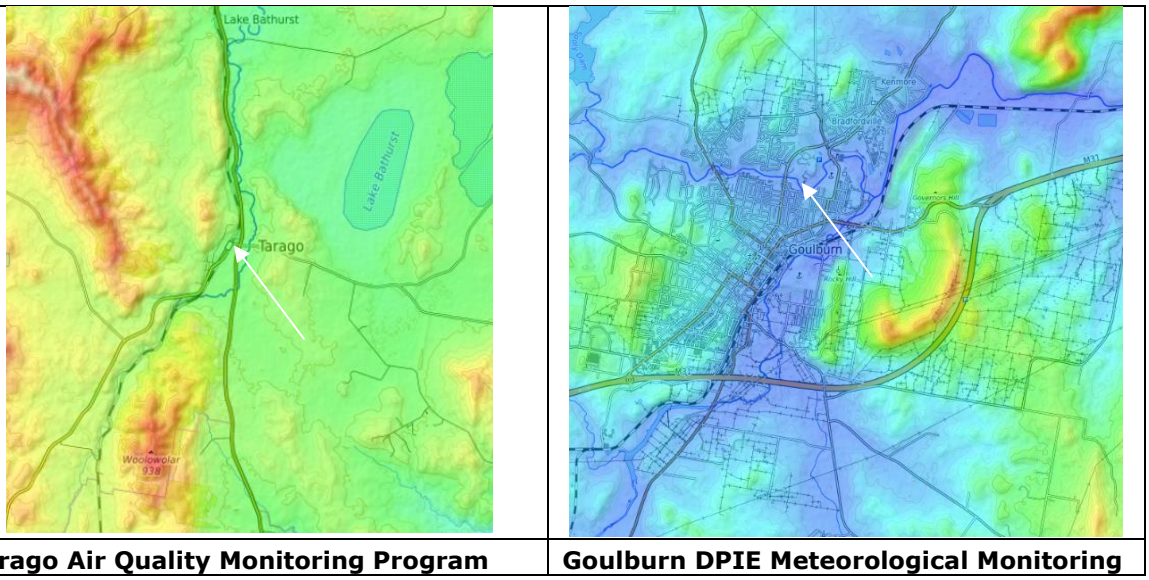


Figure 3-7: Prevailing regional hourly average wind speed and wind direction measured at Goulburn during each monitoring month during 2021

3.2.2 Detailed meteorological analysis

Given the distance of the Goulburn air quality monitoring station to the Tarago site (38 km to the north-north-east), wind conditions were modelled to predict local conditions. Land use and terrain features between the two locations have the potential to alter wind conditions, creating localised effects such as wind tunnelling and shielding. The Goulburn monitoring station is located within the Wollondilly River valley, and the Tarago monitoring site is located near the Mulwaree River valley with elevated terrain to the west. Terrain features near the Goulburn meteorology monitoring station and Tarago air quality monitoring program are illustrated in Figure 3-8.



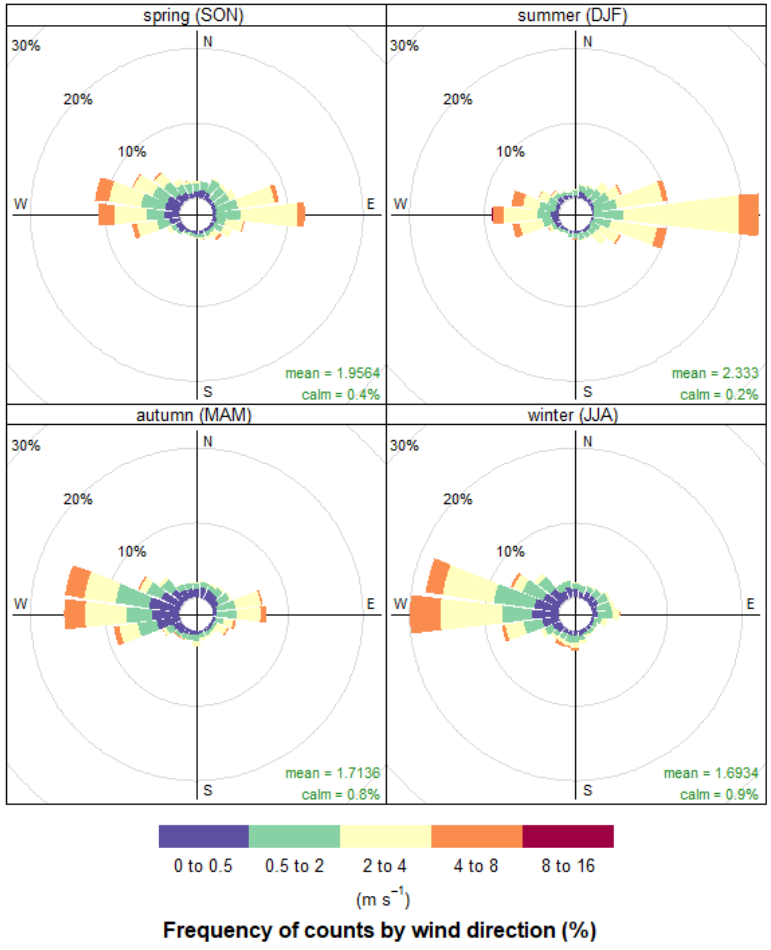
Tarago Air Quality Monitoring Program	Goulburn DPIE Meteorological Monitoring

Figure 3-8: Terrain elevations surrounding Tarago and Goulburn (red high, purple low)

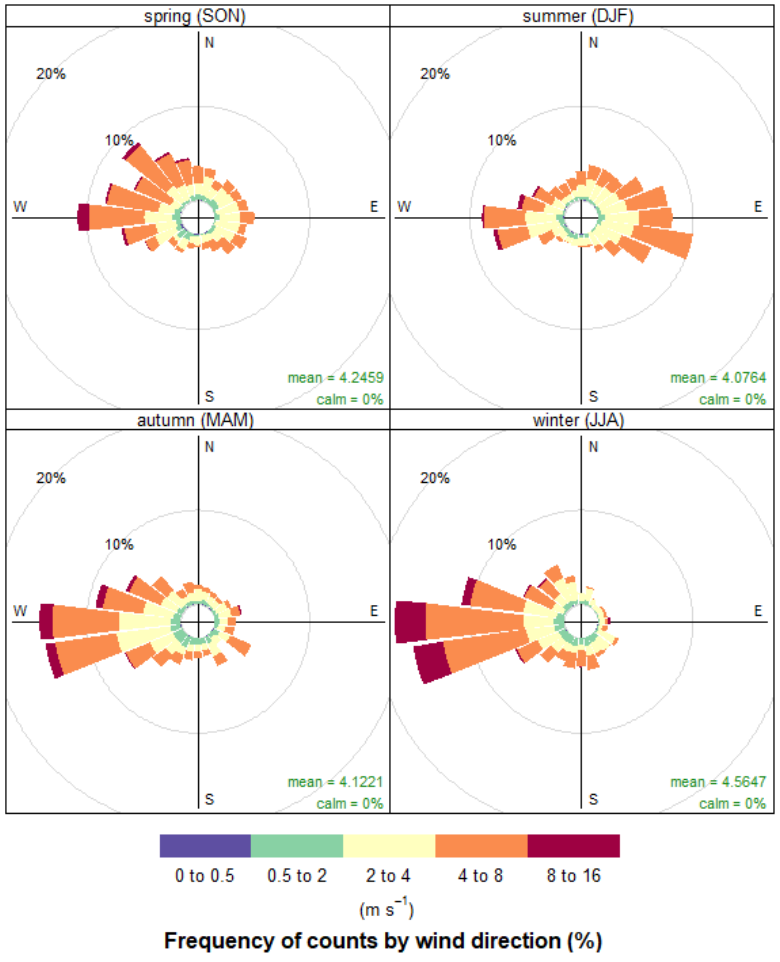
Prognostic meteorological modelling for Tarago was performed using the CSIRO's The Air Pollution Model (TAPM) model centred on Tarago. TAPM predicts three-dimensional meteorology, drawing on databases of observed synoptic scale meteorology, terrain, vegetation, soil type, leaf area index and sea-surface temperature. TAPM is widely recognised by regulators in Australia with meteorological output used in regulatory dispersion models where suitable observed meteorology is not available, and therefore is considered suitable for meteorological comparison. At the time of reporting, the CSIRO meteorology database was only available to the end of June for TAPM modelling and therefore only results up to June 2021 are included in the analysis.

Seasonal windroses comparing measured wind conditions in Goulburn and predicted wind conditions in Tarago are presented below in Figure 3-9. Both datasets show prevailing westerly winds, with a secondary easterly component. The TAPM Tarago data predicts higher wind speeds in Tarago than measured in Goulburn, consistent with observations while on site. 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.

Figure 3-9: Seasonal windrose comparison between measured at distance and predicted at location, April 2020 to June 2021



Measured wind conditions at Goulburn (DPIE)



Predicted wind conditions at Tarago (TAPM)

The measured and predicted wind conditions were further analysed against lead and TSP concentrations measured from the high-volume air samplers. Bivariate polar plots can be useful for source identification with longer datasets; this technique has been applied to present concentrations against the average wind conditions during each sampling day. The requirement to average 24-hour wind conditions to compare to the 24-hour sampling period is a limitation of the method, where wind conditions can vary considerably over a diurnal period.

Bivariate polar plots are presented below in Figure 3-11 using both DPIE measured meteorology data from Goulburn and TAPM predictions at Tarago, acknowledging the limitations of both datasets. Generally, the TSP and lead concentrations are highest when winds are from the north to north-west, which coincides with the location of the rail corridor and former non-operational mine.

Broadly both datasets suggest TSP and lead impacts originate most frequently from the north-west quadrant with some differences for elevated concentrations between each meteorology dataset. When comparing lead concentrations to TSP concentrations there are notable differences in the variability of direction, highlighting again that lead concentrations are more likely dependant on source location whereas higher TSP concentrations are more likely to originate from regional influences in other directions.

3.3 Continuous PM_{10} and $PM_{2.5}$

All PM_{10} and $PM_{2.5}$ 24-hour average concentrations were below the air quality criteria at the Station Masters Cottage during July 2021 (**Figure 3-10**). There was no evident correlation between these smaller particulate size fractions and lead measured from TSP during April 2020 to July 2021.

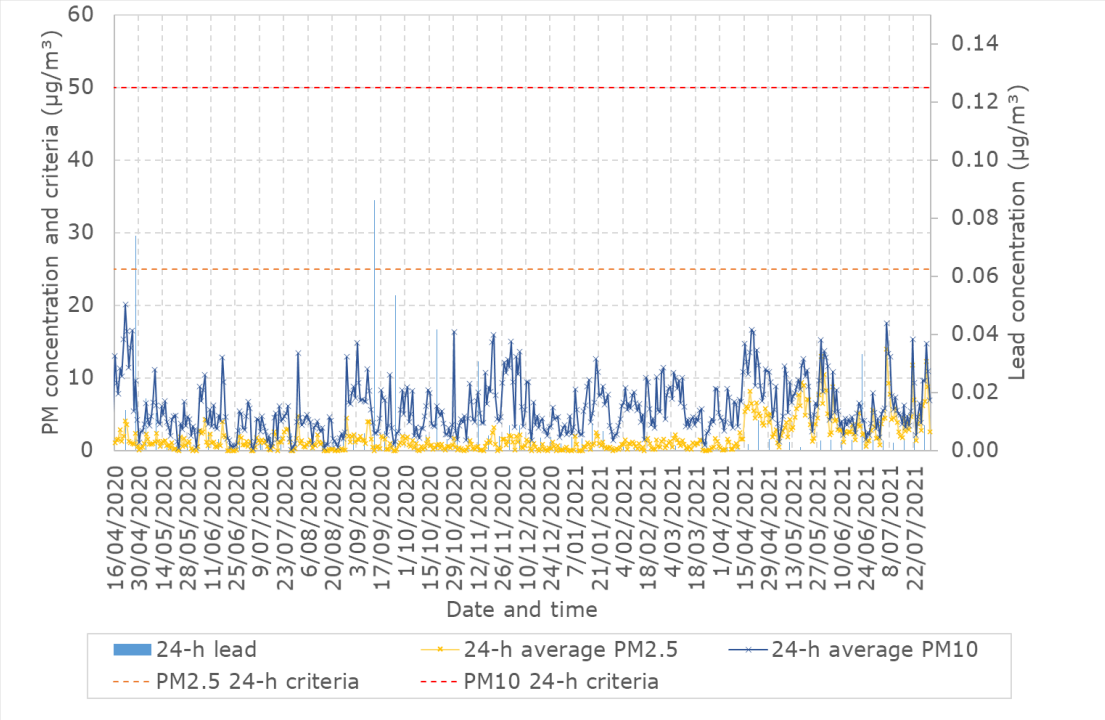


Figure 3-10: PM_{10} and $PM_{2.5}$ 24-hour average measured during the program against the air quality criteria compared to measured lead concentrations from TSP

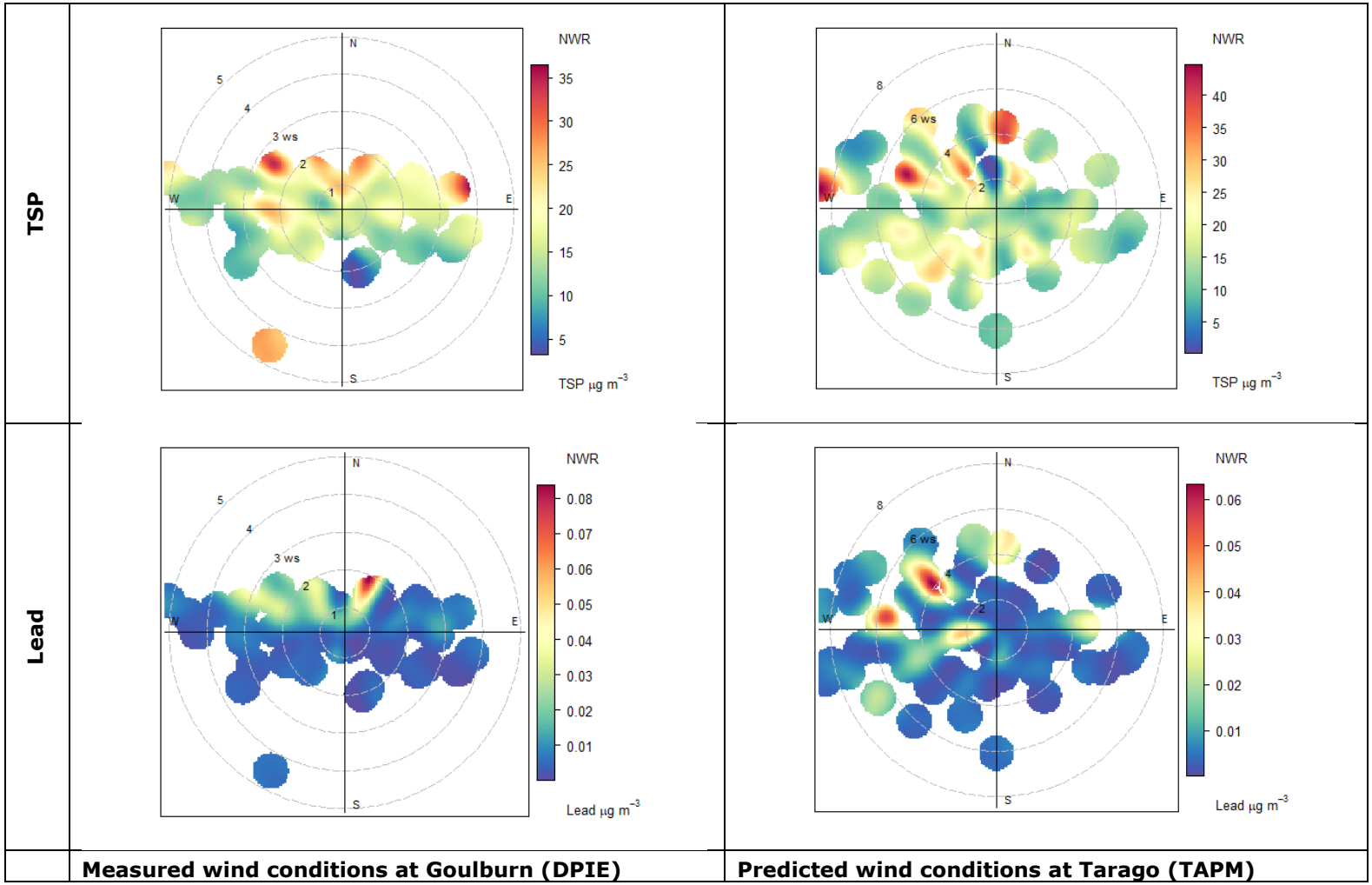


Figure 3-11: Bivariate polar plots of lead and TSP relative to wind conditions, using measured and predicted meteorology data (produced with Openair, Carslaw & Ropkins, 2012)

4. SUMMARY

No lead was detected in deposited dust above the limit of reporting during monitoring undertaken for the month of July 2021 at DDG1 and DDG3, consistent with the monitoring results from April 2020 to June 2021. Deposited dust at both locations was below the air quality criteria in July 2021. Sampling at DDG2 and DDG4 were invalidated following damage to the sampling equipment, likely caused by high winds. The rolling average for deposited dust at all four monitoring locations around Tarago, NSW remained below the annual average dust deposition criteria for the duration of the study.

Lead was detected in all 24-hour average TSP samples, but in all cases the concentrations were below the annual average criterion. The TSP and lead monitoring location (Station Masters Cottage) is influenced by sources in the direction of the rail corridor and former non-operational mine when winds prevail roughly in a 180º arc from the north, west and south.

Regional winds measured in Goulburn during July prevailed from the west. Modelled predictions of winds at Tarago suggest winds measured in Goulburn adequately represent wind directions in Tarago but wind speeds are likely higher, consistent with site observations.

There was a low observable correlation between TSP and lead when considering the lowest 89% of measured lead values. The outliers suggest local lead sources may have been disturbed during previous monitoring months. Decreasing lead concentrations with no corresponding decrease in TSP concentrations in more recent data suggests there is a lower fraction of lead in TSP in more recent data.

Bivariate polar plots were prepared to provide an illustration of where potential sources of lead may be located relative to the monitoring locations. Elevated lead concentrations more often originated from winds prevailing form the north-west quadrant. TSP source locations were more variable suggesting regional influences.

All 24-hour PM_{10} and $PM_{2.5}$ averages were below the 24-hour average air quality criteria during July 2021, and there is no evident correlation between finer particulate fractions and elevated lead concentrations.

The air quality monitoring program to understand concentrations of lead and particulate matter in Tarago was temporarily decommissioned in early August 2021 but is expected to the recommissioned during remediation. 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 John Holland Rail 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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APPENDIX 1
HISTORIC LEAD CONCENTRATIONS AROUND AUSTRALIA (NEPC, 2001)

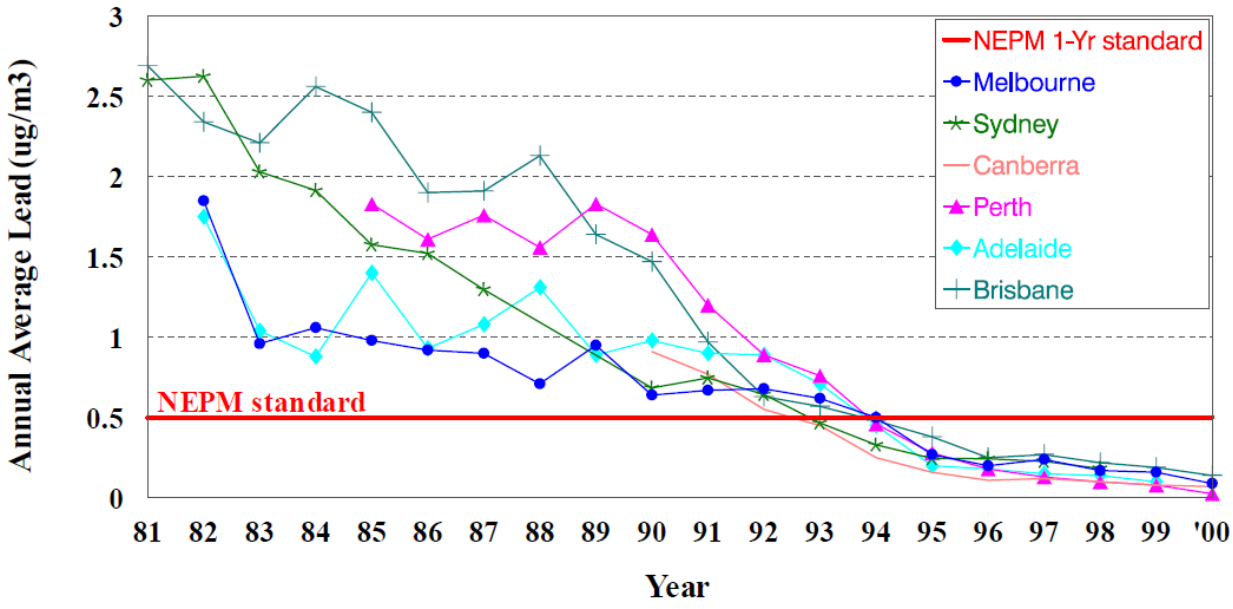

Figure A: Annual lead concentrations in Australian Capital Cities, 1981-2000 (NEPC, 2001)

APPENDIX 2
IMAGES OF AIR QUALITY MONITORING INSTRUMENTS IN-SITU

Figure B: Dust deposition gauge (DDG2), particle counter and high-volume air sampler at Station Masters Cottage, 106 Goulburn St, Tarago NSW

Figure C: Dust deposition gauge DDG1, 18 Stewart St, Tarago NSW; DDG3, Boyd St, Tarago NSW and DDG4, 96 Mulwaree St, Tarago NSW

APPENDIX 3
LABORATORY REPORTS

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

Attention: **Greer Laing**

Report **814443-A**
Project name RAIL
Project ID 318000780
Received Date Aug 03, 2021

Client Sample ID			**HVS570**	**HVS548**	**HVS598**	**HVS546**
Sample Matrix			**Filter paper**	**Filter paper**	**Filter paper**	**Filter paper**
Eurofins Sample No.			**S21-Au04441**	**S21-Au04442**	**S21-Au04443**	**S21-Au04444**
Date Sampled			**Jul 04, 2021**	**Jul 10, 2021**	**Jul 16, 2021**	**Jul 22, 2021**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	1	Total ug	5.7	4.3	6.6	8.1
Particulates - Final weighing	0.01	mg	2773.8	2732.2	2766.5	2737.6
Particulates - Initial weighing	0.01	mg	2764.6	2717.7	2756.4	2711.5

Client Sample ID			**HVS596**
Sample Matrix			**Filter paper**
Eurofins Sample No.			**S21-Au04445**
Date Sampled			**Jul 28, 2021**
Test/Reference	LOR	Unit	
Heavy Metals			
Lead	1	Total ug	14
Particulates - Final weighing	0.01	mg	2780.2
Particulates - Initial weighing	0.01	mg	2758.2

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	Aug 06, 2021	180 Days
- Method: NIOSH Methods 7300 - Heavy Metals			
Particulates - Final weighing	Field	Aug 03, 2021	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters)			
Particulates - Initial weighing	Field	Aug 03, 2021	30 Days
- Method: Filters weighed according to AS 3640 (Inhalable), AS 2985 (Respirable), AS4323.3 (Stack Filters) & QS-INS-4033 (HVAS - Non NATA Endorsed).			

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
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New Zealand

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

Project Name: RAIL
Project ID: 318000780

Order No.:
Report #: 814443
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Aug 3, 2021 12:04 PM
Due: Aug 10, 2021
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 Site # 1254						X		
Sydney Laboratory - NATA Site # 18217								
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory - NATA Site # 25079								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	HVS570	Jul 04, 2021		Filter paper	S21-Au04441	X	X	X
2	HVS548	Jul 10, 2021		Filter paper	S21-Au04442	X	X	X
3	HVS598	Jul 16, 2021		Filter paper	S21-Au04443	X	X	X
4	HVS546	Jul 22, 2021		Filter paper	S21-Au04444	X	X	X
5	HVS596	Jul 28, 2021		Filter paper	S21-Au04445	X	X	X
Test Counts						5	5	5

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.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - 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.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
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.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

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. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. 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.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Lead	Total ug	< 1			1	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
Emily Rosenberg	Senior Analyst-Metal (VIC)

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.

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

NATA Accredited
Accreditation Number 1261
Site Number 18217

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 **815544-A**
Project name TARAGO AQM
Project ID 318000780-002
Received Date Aug 06, 2021

Client Sample ID			**DDG1 - 18 STEWART ST**	**DDG3 - BOYD ST**
Sample Matrix			**Dust Deposition**	**Dust Deposition**
Eurofins Sample No.			**N21-Au14300**	**N21-Au14302**
Date Sampled			**Aug 03, 2021**	**Aug 03, 2021**
Test/Reference	LOR	Unit		
Dust Deposition				
Combustible Solids	0.1	g/m2/mth	0.6	2.6
Soluble Solids	0.1	g/m2/mth	1.2	6.2
Total Solids Dried at 103–105°C	0.1	g/m2/mth	1.9	9.5
Volume (total)*	0.1	mL	930	800
Ash	0.1	g/m2/mth	0.1	0.7
Insoluble Solids	0.1	g/m2/mth	0.7	3.3
Heavy Metals				
Lead	1	Total ug	< 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	Aug 09, 2021	5 Days
- Method: LTM-INO-4160 Determination of Dust Deposition of Ambient Air			
Heavy Metals	Sydney	Aug 09, 2021	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

eurofins | Environment Testing

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
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Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

Newcastle
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Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 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: 318000780-002

Order No.:
Report #: 815544
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Aug 6, 2021 8:30 AM
Due: Aug 13, 2021
Priority: 5 Day
Contact Name: Greer Laing

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Lead	Dust Deposition
Melbourne Laboratory - NATA Site # 1254								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory - NATA Site # 25079								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	DDG1 - 18 STEWART ST	Aug 03, 2021	12:05PM	Dust Deposition	N21-Au14300		X	X
2	DDG2 - SMC	Aug 03, 2021		Dust Deposition	N21-Au14301	X		
3	DDG3 - BOYD ST	Aug 03, 2021	11:50AM	Dust Deposition	N21-Au14302		X	X
Test Counts						1	2	2

Date Reported:Aug 17, 2021

Date Reported:Aug 17, 2021

eurofins | Environment Testing

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PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

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9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
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Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	N21-Au14302	CP	%	92			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	N21-Au14300	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
Charl Du Preez	Senior Analyst-Inorganic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)

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.