Intended for
John Holland Rail Pty Ltd

Document type
Report

Date
July 2020

TARAGO AIR QUALITY MONITORING REPORT JUNE 2020

RAMBOLL Bright ideas. Sustainable change.

TARAGO AIR QUALITY MONITORING REPORT JUNE 2020

Project name	**Tarago Air Quality Monitoring Report**
Project no.	**318000780.140**
Recipient	**John Holland Rail Pty Ltd**
Document type	**Report**
Version	**1**
Date	**31/07/2020**
Prepared by	**Greer Laing**
Checked by	**Martin Parsons**
Approved by	**Fiona Robinson**
Description	**Data collected during June 2020 for the air quality monitoring program at Tarago, NSW**

Ramboll
Level 2, Suite 18 Eastpoint
50 Glebe Road
PO Box 435
The Junction
NSW 2291
Australia

T +61 2 4962 5444
https://ramboll.com

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

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 comprising 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 June 2020 and is compared against data collected in the previous months from April.

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 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 generally 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 recently 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.

2.3 Relevant air quality criteria

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

Table 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)

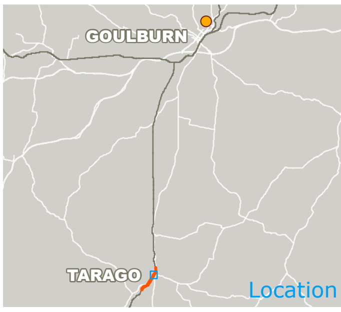

Figure 2-1 | Tarago air quality monitoring locations

3. RESULTS

3.1 Deposited dust and lead

No lead was measured above the detection limit (1 µg) at the four monitoring locations during June 2020. Overall, all sites measured low deposited dust (insoluble solids) against the monthly goal of 4g/m²/month.

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, 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 1-5-2020)	<1	0.9	<1	0.4	<1	0.4	<1	0.3
June (1-5-2020 to 1-7-2020)	<1	0.9	<1	0.5	<1	1.3	<1	0.3

Limit of reporting = 0.01 µg during April and 1 µg during May following change in laboratory location completing analysis

3.2 TSP and lead

Lead was detected in each TSP sample collected during May 2020, however in all cases the concentration was below the annual average criteria for lead (**Figure 3-1**). Similarly, TSP measured during the period was below the annual average (**Figure 3-2**). There was little observable correlation between lead and TSP concentrations during this period (**Figure 3-3**).

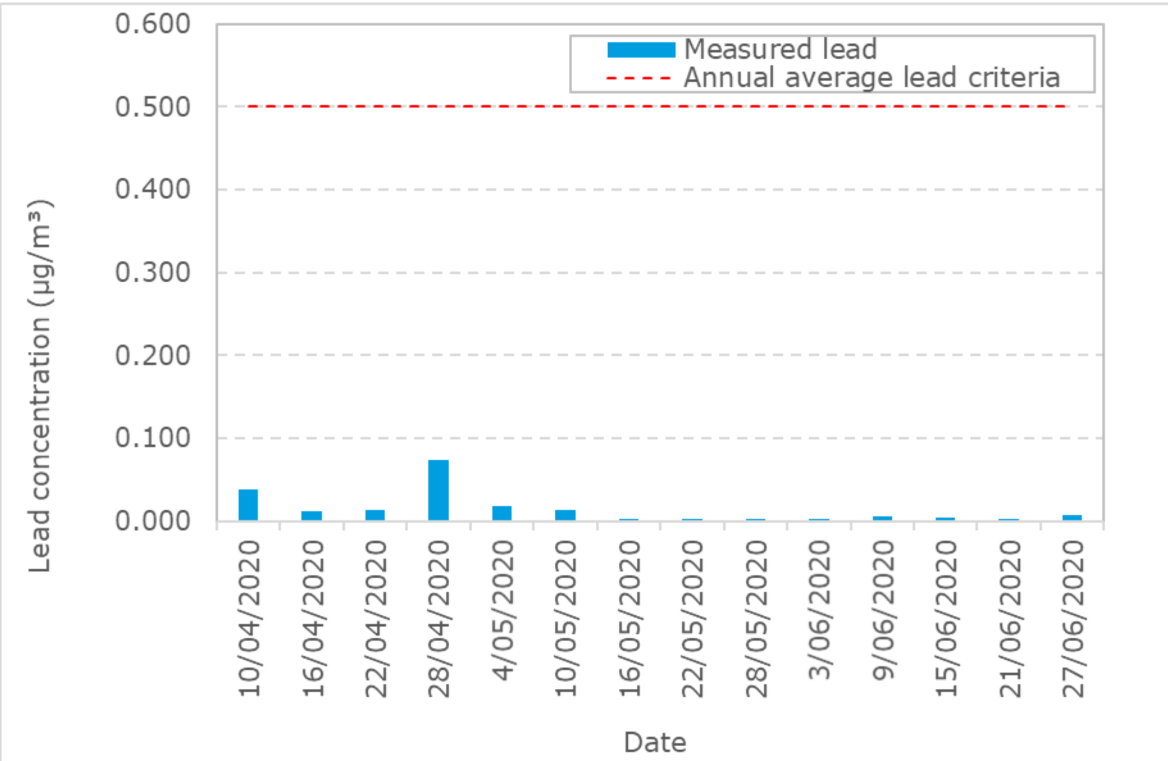

Figure 3.1: Measured 24-hour average lead concentration every one day in six since program commissioning

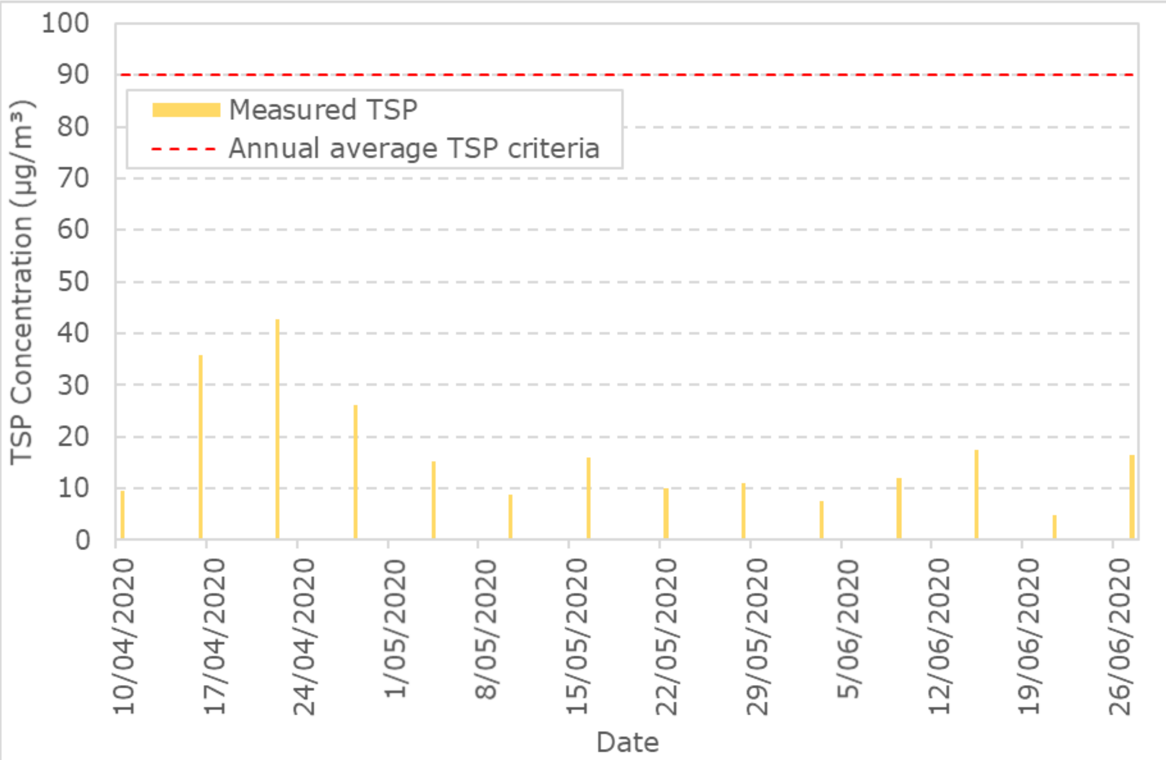

Figure 3.2: Measured 24-hour average TSP concentration every one day in six since program commissioning

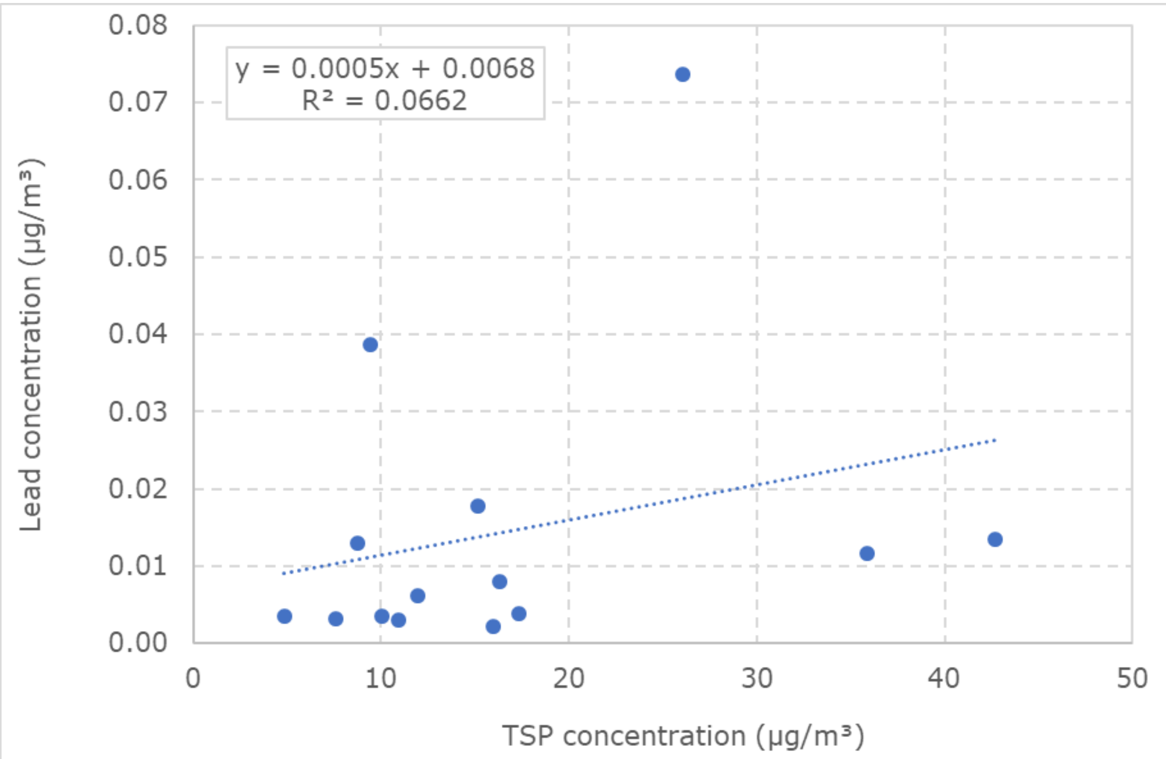

Figure 3.3: Correlation between TSP concentration and lead concentration from the same sample

Analysis of monitored meteorological data indicated that regional winds during June showed a similar wind speed and direction pattern to April (**Figure 3-4**). There continued to be a higher frequency of winds from westerly, west-south-westerly and west-north-westerly wind directions compared with other directions during June. Additionally, lighter winds were measured from the east. The monitoring location is influenced from sources in the direction of the rail corridor when wind prevails roughly from the 180⁰ to the north, west and south.

Wind speeds were slightly lower during June compared to May (**Figure 3-4**). Calm conditions have an important influence on pollutant dispersion in the atmosphere, where calm conditions can concentrate pollutants near the source. Conversely, higher wind speeds can generate wind erosion sources of particulate matter.

Total daily rainfall during the period measured in Goulburn (refer to **Figure 3.4**) indicates that while there was some periods of moderate rainfall in early to mid-April, the period was characterised as dry for the remainder of the month. May and June experienced periods of moderate and light rainfall consistently which would have an influence on suppressing dust.

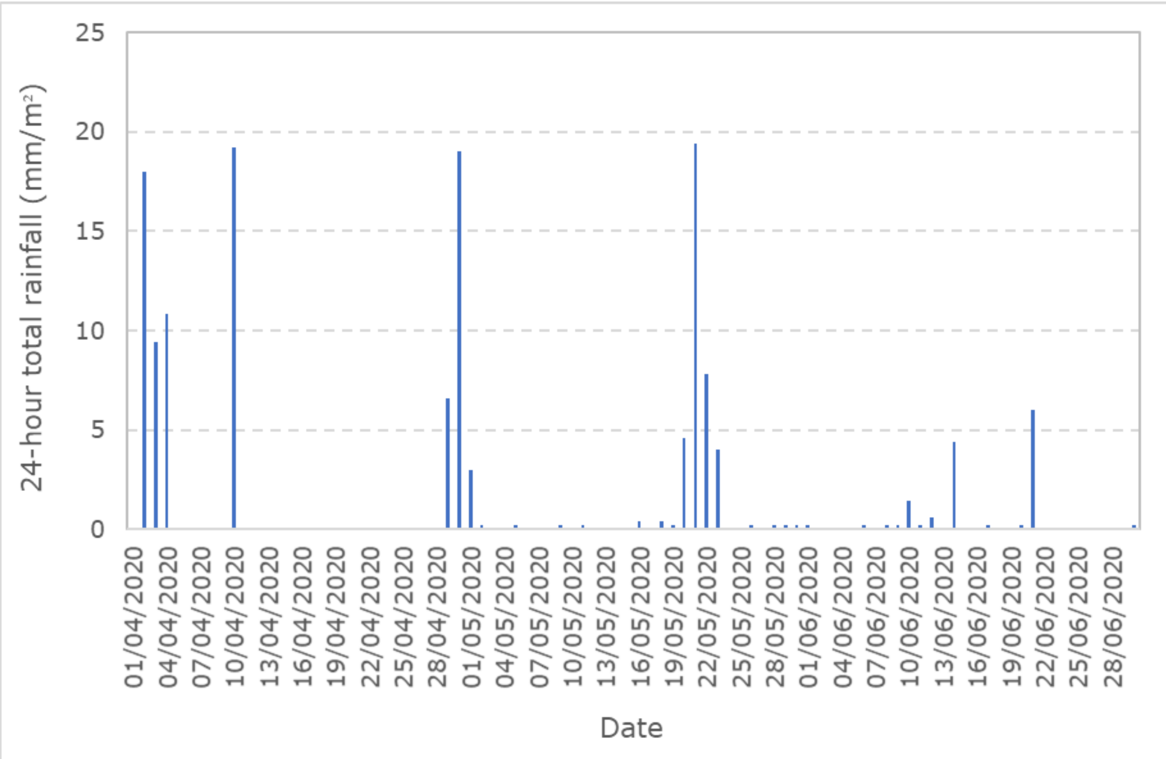

Figure 3.4: 24-hour total rainfall (mm/m^2) measured in Goulburn during the monitoring period

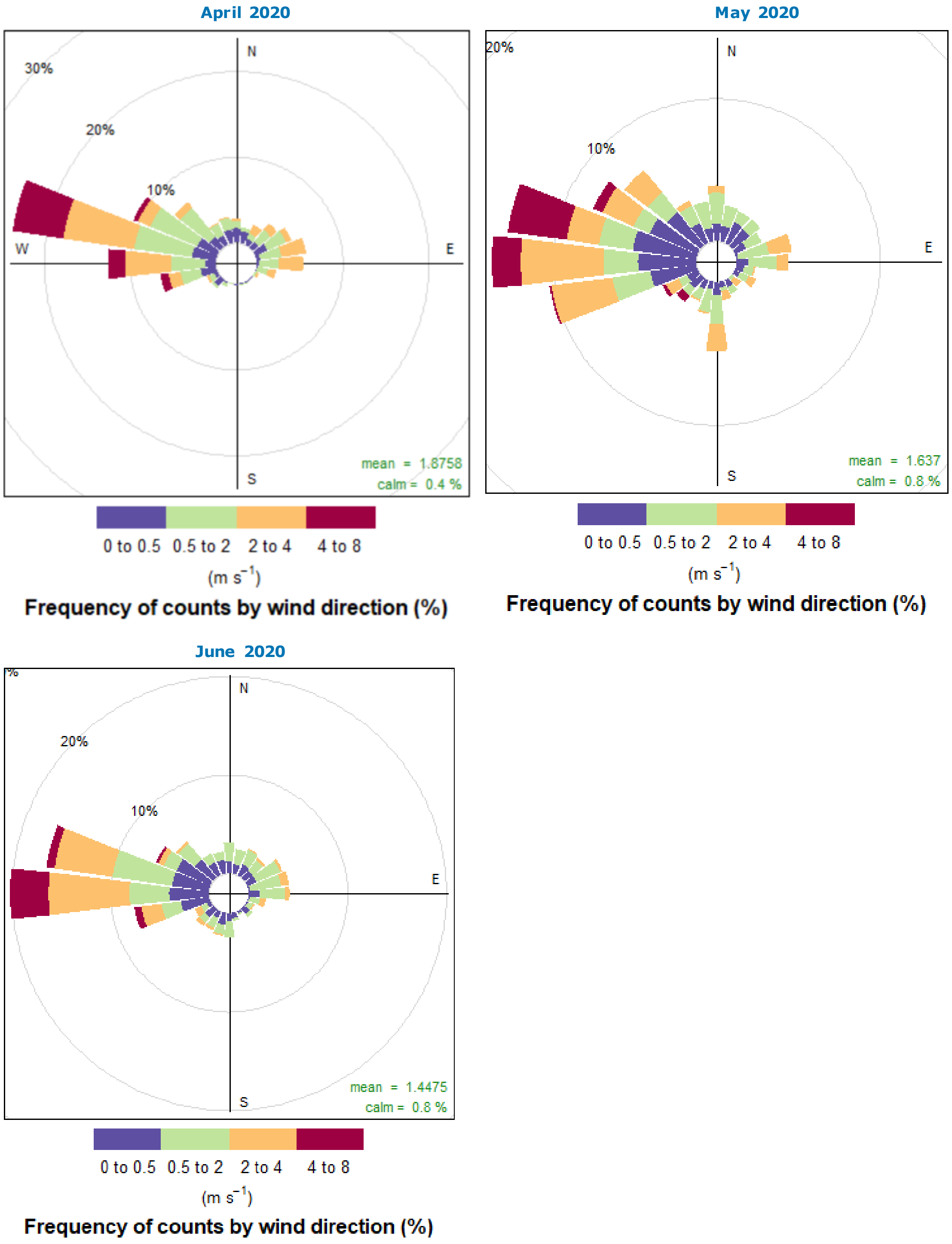

Figure 3.5: Prevailing regional hourly average wind speed and wind direction measured at Goulburn during each monitoring month

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 for sampling during June (Figure 3-5). There was no evident correlation between these particulate size fractions and lead measured from TSP during April to June.

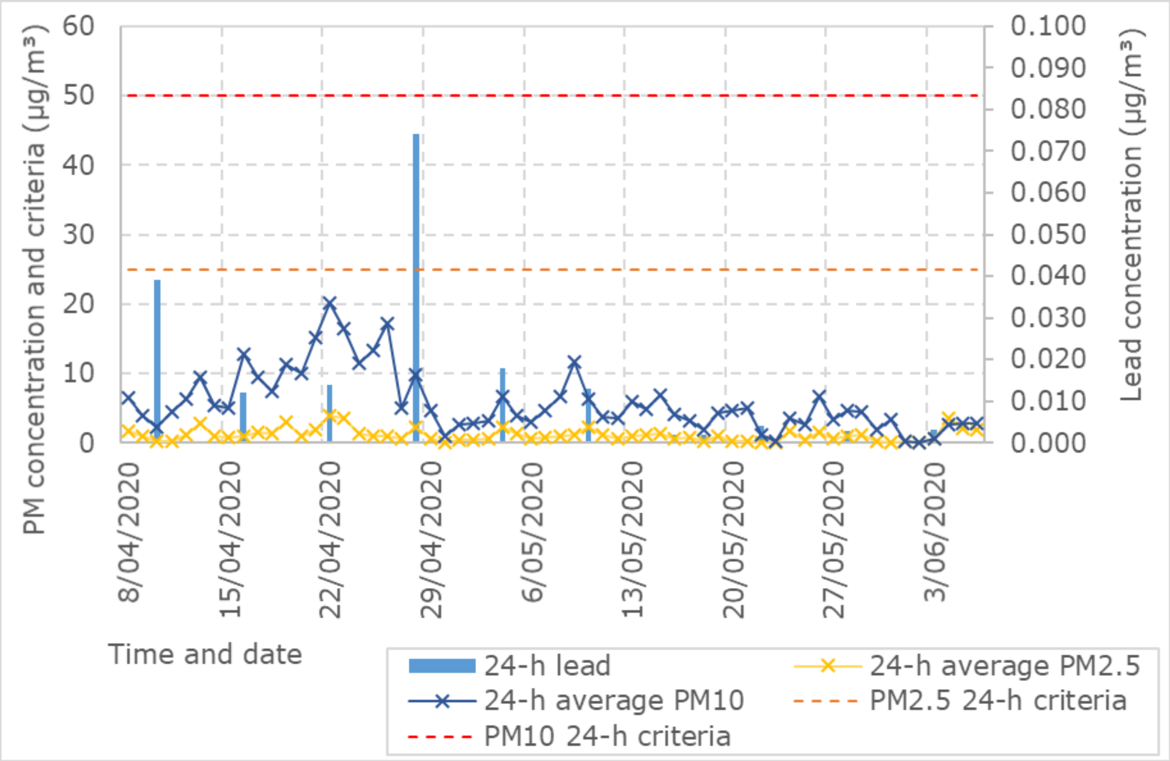

Figure 3.6: PM_{10} and $PM_{2.5}$ 24-hour average measured during the program against the air quality criteria compared to measured lead concentrations from TSP

4. SUMMARY

No lead was detected in deposited dust above the limit of reporting during monitoring undertaken for the month of June 2020 at the four measured locations around Tarago, NSW consistent with the monitoring results in April and May 2020. Lead was detected in all five 24-hour average TSP samples, but in all cases the concentration was well below the annual average criterion. All 24-hour PM_{10} and $PM_{2.5}$ averages were below the 24-hour average air quality criteria during June and there was no evident correlation with these parameters and lead concentrations from TSP. Both lead and particulate matter concentrations at the monitoring locations in June were comparable to May and April, where May and June concentrations were consistently low and less variable.

Further air quality monitoring is ongoing to assess impacts of broader weather conditions on entrainment of contaminated soil to air. Data collected to date indicates that dust concentrations are below the air quality criteria in 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.

The report must not be reproduced in whole or in part except with the prior consent of Ramboll Australia Pty Ltd and subject to inclusion of an acknowledgement of the source. No information as to the contents or subject matter of this document or any part thereof may be communicated in any manner to any third party without the prior consent of Ramboll Australia Pty Ltd.

Whilst reasonable attempts have been made to ensure that the contents of this report are accurate and complete at the time of writing, Ramboll Australia Pty Ltd disclaims any responsibility for loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of this report.

6. REFERENCES

DoE (2016). National Environment Protection (Ambient Air Quality) Measure – as amended, Federal Register of Legislative Instruments F2016C00215, Department of the Environment, Canberra.

DPIE (2020). Search for and download air quality data. NSW Department of Planning, Industry and Environment. Retrieved from https://www.dpie.nsw.gov.au/air-quality/search-for-and-download-air-quality-data

Green Track Solutions (2020). John Holland Rail Tarago Rail Station Dust Mitigation Project. Report no. JH-TARAGO-06420 dated 14 April 2020.

NEPC (1998). Ambient Air – National Environment Protection Measure for Ambient Air Quality, National Environment Protection Council, Canberra.

NEPC (2001). Technical Paper No. 9: Lead Monitoring. National Environment Protection (Ambient Air Quality) Measure. May 2001.

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.

Ramboll (2019). Tarago Loop Extension Interim Lead Management Plan. 318000780-02, version 1, 16 December 2019.

APPENDIX 1
HISTORIC LEAD CONCENTRATIONS AROUND AUSTRALIA (NEPC, 2001)

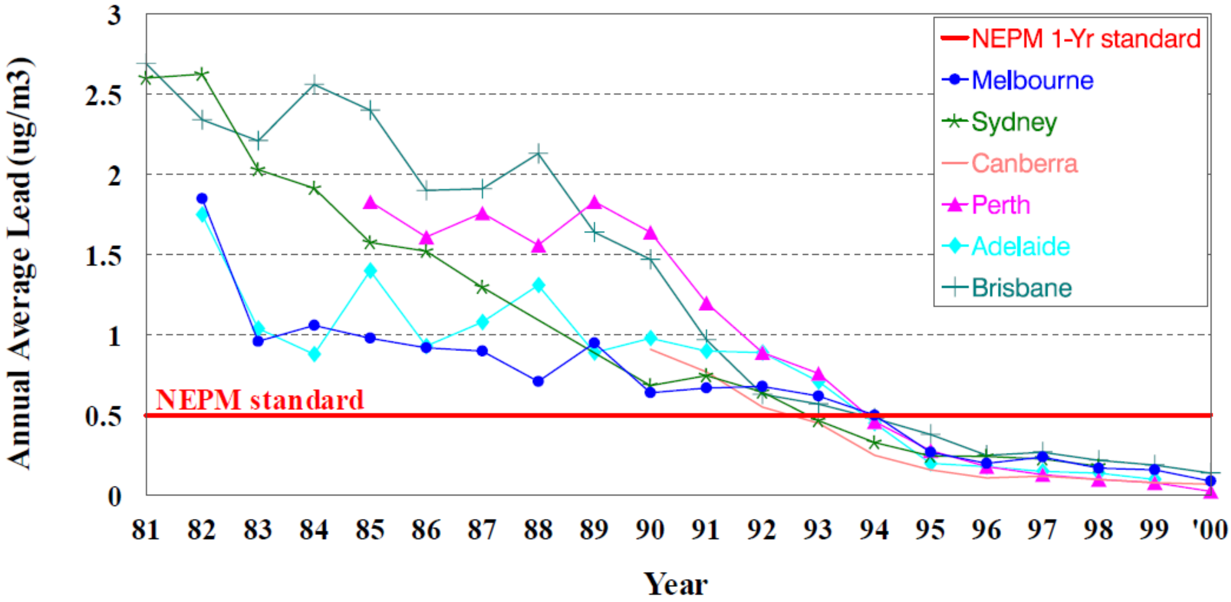

Figure A: Annual lead concentrations in Australian Capital Cities, 1981-2000 (NEPC, 2001)

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