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Bungendore Rail Corridor – SAQP for Detailed Site Investigation

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Description **This report describes the Sampling and Analysis Quality Plan for the Bungendore Rail Corridor Detailed Site Investigation.**

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1	24 June 2024	E Eden	G Butterfield	G Butterfield	Draft
2	11 September 2024	V Perkins	G Butterfield	G Butterfield	Revised Draft
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7	2 April 2025	V Perkins	S Maxwell CEnvP SC 41184	G Butterfield & S Maxwell CEnvP SC 41184	Revised Final

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1. Introduction

1.1 Background

Ramboll Australia Pty Ltd (Ramboll) was engaged by Transport Asset Holding Entity (TAHE) to complete a Detailed Site Investigation (DSI) for the Bungendore rail corridor, located in Bungendore, New South Wales (NSW). The site is defined as Lot 4 in Deposited Plan (DP) 830878, Lot 1 in DP814520, and public infrastructure lands, and broadly comprises railway corridor and is collectively referred to as 'the site' in this report. The former Stationmasters Cottage (SMC) is outside of the scope of the investigation. The site layout is shown on **Figure 1, Appendix A**.

X-ray fluorescence (XRF) testing has previously been undertaken by ERM along the railway corridor and at the SMC that identified elevated lead concentrations in near surface soils and in dust within the cottage (ERM, 2022e and ERM 2022d respectively). Several other investigations have previously been completed at the site including Preliminary Site Investigations (PSI), XRF surveys and soil investigation reports. Further, TfNSW identified significant lead contamination at Captains Flat on an iron ore loading site approximately 40 km away which is of relevance as similar unloading/loading activities occurred at the site. The site investigations were undertaken because of the planned construction of a high school opposite (west) the railway corridor and station by the NSW Department of Education. The previous contamination investigations that have been undertaken at the site are summarised in **Section 4**.

Ramboll is engaged to undertake a DSI to further assess metal contamination including an assessment of groundwater quality to further assess the contamination status of the site and to meet the obligations of a Voluntary Management Plan (VMP) with NSW Environmental Protection Authority (EPA). The investigations are required to be undertaken, reviewed, or approved by a certified environmental consultant and in accordance with NSW EPA statutory guidelines under the Contaminated Land Management (CLM) Act 1997. Ramboll understands that a NSW EPA-accredited auditor has been appointed by TAHE to review the environmental investigations and confirm the site suitability for the proposed land use as well as inform the proposed development of the adjacent high school.

This Sampling and Analysis Quality Plan (SAQP) has been prepared to review previous investigations, identify data gaps in understanding of the contamination status, derive a preliminary conceptual site model (CSM) and develop a suitable sampling and analysis approach to both resolve existing data gaps and further characterise metal contamination at the site. The SAQP includes considerations of groundwater as well as soil conditions. Air quality will be dealt with in a separate report.

This SAQP was prepared in general accordance with Table 2.2 of the NSW Environmental Protection Authority (EPA) (2020) *Consultants Reporting on Contaminated Land: Contaminated Land Guidelines*.

1.2 Objectives

The primary project objectives are to better understand and delineate previously identified metal contamination at the site with respect to human health and the environment for current land uses (on and off-site). The findings of the DSI will be used to inform and update the site's Interim Environmental Management Plan (IEMP).

The objective of the SAQP is to present sampling, analysis, and quality processes to delineate metal contamination at the site.

The scope of the SAQP includes a desktop review, preparation of a preliminary conceptual site model (CSM) and identify data gaps to inform the DSI. These data gaps are anticipated to be primarily focused on metal contamination, however if additional data gaps are identified a secondary scope will be prepared for these additional data gaps. A secondary objective of this SAQP and the DSI is therefore to present sampling, analysis, and quality processes to investigate additional data gaps.

1.3 Scope of Work

The scope of work for preparation of this SAQP included:

- Review of previous environmental investigations;
- Summarise other published data to establish the environmental setting and sensitivity;
- Summarise historical aerial photographs from previous reports, as well as review of recent Nearmap aerial photograph findings;
- Development of a preliminary Conceptual Site Model (CSM);
- Establish existing data gaps for the site;
- Development of Data Quality Objectives for sampling of soil and surface water;
- Development of Data Quality Indicators (DQI);
- Identification of suitable soil, surface water and groundwater criteria; and
- Identification of reporting requirements.

1.4 Report Limitations

This report has been prepared by Ramboll Australia Pty Ltd ("Ramboll") exclusively for the intended use by the client Transport Asset Holdings Entity and Transport for New South Wales in accordance with the agreement (contract reference SC1000483477, signed 12 March 2024) between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete, and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for

the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its current purpose and end-use without significant changes either on-site or off-site.

Ramboll's scope of services for this report did not include collecting samples of any environmental media for this report. As such, Ramboll cannot rule out the existence of conditions, including, but not limited to, contamination not identified and defined by the data and information available to and/or obtained by Ramboll. As an example, this assessment must not be considered as an asbestos survey (whether in built structures, waste, soils, etc.), even though the subject of asbestos-containing materials may have been discussed in the report.

2. Site Background

2.1 Site Identification

The site details are presented in **Table 2-1** and the site locality and layout is shown in **Figure 1, Appendix A**.

Table 2-1: Site Identification

Information	Description
Street Address	Bungendore rail corridor, the nearest intersection is Malbon Street and Majara Street, Bungendore, NSW 2621.
Eastings and Northings[1]	Northern most point E:722742.1915 N:6096261.913 Eastern most point E:722765.6742 N:6095481.7457 Southern most point E:721933.9188 N:6093693.191 Western most point E:721913.4762 N:6093812.9632
Identifier	Lot 4 in DP830878, Lot 1 in DP814520 and other contiguous public infrastructure lands
Site Area	Approximately 17.5 hectares
Site Perimeter	6,530 m
Zoning	SP2 rail infrastructure
Local Government	Queanbeyan-Palerang Regional Council
Current Land Use	Railway corridor and sidings, part of Country Railway Network (CRN)
Future Land Use	Land uses permissible under the current zoning of Infrastructure (SP2) (see **Section 2.2**)

1. The projected coordinate system is GDA 1994 MGA Zone 55

2.2 Site Description

The following site description has been compiled using previous reports that are referenced and summarised in **Section 4**.

Most of the site is comprised of an active railway corridor between Turallo Creek Railway Bridge (chainage 290.000 km) and Hoskinstown Road Level Crossing (295.677 km). The rail corridor and easement is approximately 40-50 m wide and includes two level crossings; Hoskintown Road bordering the south of the site, and the Kings Highway passing to the south of the station. The bulk of the site is vacant, vegetated with grasses, invasive weeds, and occasional tree cover either side of the railway formation.

In addition to the rail corridor, the site also includes two areas outlined below. The 'Area' naming is consistent with previous reports (summarised in **Section 4**).

- **Area A:** Area A is in the central part of the site, and immediately west of the railway. Area A primarily comprises Bungendore Railway Station and associated facilities, as well as a former 'wool shed' building that is currently used as a Mens Shed. The wool shed was historically used to load and unload goods from the railway and is currently used as a Men's Shed. Historical goods loading occurred between Forster and Gibraltar Street, i.e. at and near to the station.

- **Area B:** Decommissioned former railway triangular junction, historically known as the "Southern Fork" immediately east of the rail corridor and wool shed building. The area is currently vacant; railway infrastructure was removed from Area B in 1972.

The site is fenced with chain wire along the western and the eastern boundary along Powell Street. The south western boundary is fenced with barbed wire along rural properties that contain livestock. All fencing was previously noted to be in generally good condition, however some evidence of illegal access to the north of the station (damage to fencing and dirt paths into the site) was previously noted by ERM (2022e – refer to **Section 4**).

2.3 Surrounding Land Uses

The site is surrounded predominately by low-density residential and rural land. The key land and zoning types use surrounding the site are illustrated on **Figure 1, Appendix A** and summarised in **Table 2-2**.

Table 2-2: Site Identification

Cardinal Points	Description
North – East	Low density residential (R2) including 1 Mathews Place, and primary production (RU1), with a small parcel of recreational zoning (RE1) bordering the north of the site which forms part of Turallo Creek, within environmental conservation (E2) zoned land.
South – East	Primary production (RU1), and a small parcel zoned National Parks/Nature reserves (E1) to the south of the site, a small parcel to the east is zoned for Water supply infrastructure (SP2) and road infrastructure (SP2).
South – West	Low density residential (R2) and primary production (RU1), with a small parcel of industrial zoning (IN2) fringing the centre of the site.
North - West	A mixture of general residential (R1), recreational (RE1), local centre (B2), road infrastructure (SP2), and mixed use (B4) zoned land including a scout hall and Queanbeyan-Palerang Regional Council building that includes child care facilities. The former signalman's cottage at 63 Turallo Terrace is located adjacent to the north western site boundary, as is Bungendore Community Centre. The former Station Masters' Cottage (FSMC) is located adjacent to the west boundary, just north of the main station building. Bungendore scout hall is located approximately 45 m north west of the site.

2.4 Environmental Setting

2.4.1 Topography

Regional mapping of 10 m ground contours from MinView[1] indicates the elevation of the site is approximately 700 m Australian Height Datum (AHD); the site and surrounding area is broadly flat and slopes gently towards the north west, i.e., towards Lake George which is situated approximately 6 km north west of the site.

Stormwater and associated runoff are directed offsite through drainage channels at two locations towards Turallo Creek, to the north and into municipal drainage at King Street. Where drainage is not present, surface water is generally expected to either infiltrate directly through the soil profile or flow across the ground surface in a north-westerly direction away from the railway line.

[1] https://minview.geoscience.nsw.gov.au/#/?lon=149.3969&lat=-35.25334&z=12&bm=bm3&l=smx02:y:100,ad98:y:100. Last accessed 11 June 2024.

2.4.2 Geology

According to the mapping units provided by the NSW Department of Industry, Resources and Energy (ERM, 2022e), the site is underlain by three primary units of Cainozoic geology. These include: fluvial deposits of gravel, sand, silt, and clay, fanglomerates and poorly cemented conglomerates of colluvium gravel and sand, and coarse sand and gravel existing in strandlines.

A small portion at the northernmost edge of the site is underlain by a turbiditic sequence of sandstone, mudstone, shale, quartzite, quartz phillite, phyllite, and slate. A fault running north-west exists south of the site. The soils observed during the sampling event generally consisted of sandy, gravelly, and occasionally clayey brown silts, with occasional yellow to red components.

The Atlas of Australian Acid Sulfate Soils maps shows that the site contains of sodosol soils, with a 'Low (6% - 70%)' probability of occurrence of acid sulfate soils which aligns with the inland and elevated location of the site (ERM, 2021).

2.4.3 Hydrogeology

A review of the groundwater bore information by ERM (2022e) identified 82 boreholes within a 1,000 m radius of the site. The five nearest bores were 400418 (adjacent to the site boundary on Trucking Yard Lane), 403876 (12 m south), 403878 (12 m south), 416600 (63 m north) and 403783 (79 m north). Domestic bore 400418, which is located onsite, although not a monitoring bore, reports a relatively consistent water depth of 7.0 m below ground level (bgl). Several other bores are located within 500 m of the site; four of the five nearest bores were registered for domestic use, with the remaining bore used for monitoring purposes. Monitoring bore (416600) is located 63 m north of the site and was installed in 2015 to 5.1 m bgl with a recorded standing water level (SWL) of 4.35 m bgl.

The water supply for the township of Bungendore is via municipal extraction bores. It is assumed that the bores close to the site may be used for drinking purposes. According to NSW Government Groundwater Annual Report (Bungendore Alluvial Groundwater Sources) for 2020, some bores are used for stock and domestic purposes, however most are used for irrigation and town water supply[2].

Depth to groundwater and groundwater flow direction at the site has not been confirmed to date through the installation of groundwater monitoring wells. However, based on the location of Turallo Creek, and the local topography, it is anticipated that groundwater will primarily flow towards the north west although this may vary due to the heterogeneity of the underlying geology and recharge/discharge rates because it is anticipated that the groundwater is primarily unconfined.

[2] https://water.dpie.nsw.gov.au/__data/assets/pdf_file/0016/341404/bungendore-alluvial-groundwater-sources.pdf. Last accessed 21 June 2024.

3. Site History

The following sections summarises information pertaining to key site history and has been prepared based on review of previous investigations (see **Section 4**) and review of recent Nearmap aerial photographs.

3.1 Lotsearch Report

A summary of information provided in the Lotsearch report in ERM (2021) and an updated review by Ramboll in August 2024 is included in **Table 3-1**.

Table 3-1: Lotsearch Report and Updated Review Information

Source / Topic	Summary of Information
NSW EPA Contaminated Land Database	The site is included on the 'List of NSW contaminated sites notified to EPA'. The site listed as Bungendore Railway Station and Rail Corridor classified as 'Contamination formerly regulated under the CLM Act'. In addition, Bungendore former Station Masters Cottage and Bungendore to Captains Flat – Rail Corridor' are also listed and classified as 'Under assessment'. The site is not listed on the NSW EPA 'Contaminated Land: Record of Notices'. A former timber treatment plant near-adjacent to the western boundary of the site has been classified as 'contamination formerly regulated under the CLM Act'.
Geoscience Australia National Waste Management Site database	The database lists the locations of Australia's known landfills, waste transfer stations and waste reprocessing facilities. As presented in ERM (2021) the site does not appear in this database and there were no identified waste management sites within 1,000 m distance from the site. Three current or former service stations with petrol storage facilities were identified within 1,000 metres of the site at 42-44 Malbon Street (Caltex Bungendore), 1 Gibraltar Street (BP Bungendore) and at 2 Gibraltar Street (former service station).
Department of Defence PFAS Investigation and Management Program	The site, nor any properties within 2 km are currently being managed or investigated by the Department of Defence for per- and polyfluoralkyl substances (PFAS) contamination. Additionally, the site, nor any properties within 2 km have been assessed as part of the Defence Three Year Regional Contamination Investigation Program for PFAS.
Universal Business Directories (UBD)	Motor garages were present within 500 m of the site including at 42 Malbon Street, Bungendore (Bungendore Motors), Malbon Street (Raymond, A. and Son), Gibraltar Street (Gallagher, R. and Gardners Motor Works).
Groundwater Bore Register	Eighty-two boreholes were registered within a 1,000 m radius of the site. The five nearest bores are 400418 (adjacent to the site boundary on Trucking Yard Lane), 403876 (12 m south), 403878 (12 m south), 416600 (63 m north) and 403783 (79 m north). Four of the five nearest bores are registered for domestic use and the fifth (416600) is registered for monitoring purposes. Bore 4166600 was installed in 2015, is located 63 m to the north of site and was installed to 5.1 m bgl with a recorded static water level (SWL) of 4.35 m bgl. Onsite domestic bore 400418 reports a SWL of 7.0 m bgl. The water supply for the township of Bungendore is via municipal extraction bores therefore there is the potential that groundwater near to the site is used for potable purposes.
Salinity	Dryland salinity was not present within the site, but a high risk of dryland salinity was present to the west of the site.
ASS	The probability of the occurrence of acid sulfate soils (ASS) within 1,000 m of the site was mapped as low.
Historical Mining	No mining subsidence districts were reported within 1,000 m of the site and no mining and exploration titles were located at or within a 1,000 m buffer from the site. Historical mining and exploration titles within the 1,000 m buffer around the site include: - Clay shale (Spar Resources Pty Ltd) (2001-2005); - Gold (Au), copper (Cu), lead (Pb), silver (Ag) (New Southern Mining Pty Ltd) (2007-2009); - Cu, Pb, zinc (Zn) (Teck Exploration Ltd (1980-1982); - Cu, Pb, Zn (Electrolytic Zinc Company of Australasia Ltd (1965-1966); - Cu, Pb, Zn, Ni (Jododex Australia Pty Ltd (1970-1972); - Cobalt (Co) (Eastern Cobalt Pty Ltd); and

Source / Topic	Summary of Information
	- Au, Ag, indium (In), manganese (Mn) (Orion Resources NL) (1983-1995).
Bureau of Meteorology Groundwater Dependant Ecosystems	The Lotsearch report identified a high potential groundwater dependant ecosystem associated with Turallo Creek across the northern boundary of the site, and an area of Southern Forests (woodlands / grasslands) approximately 600 m south of the site.

3.2 Review of Environment Protection License

The NSW Protection of the Environment Operations (POEO) Act 1997 establishes licensing and monitoring requirements for certain activities where there is a potential risk to the environment if not managed appropriately. A search of NSW POEO Licenses by Lotsearch in ERM (2021) indicated that there was one Environment Protection Licence (EPL) connected to the site (EPL 13421). The licence is for the entire CRN for the operation of railway systems and activities. A summary of the EPL is included in **Table 3-2** and a copy is provided in **Appendix B**. There are no other licensed activities under the POEO Act (1997) occurring within 1,000 m of the site.

Several records, including applications, notices, audits, and annual returns, are connected to EPL 13421, as summarised in chronological order in **Table 3-3**.

Table 3-2: Summary of Environment Protection License

	EPL 13421
Licensee	UGL Regional Linx Pty Ltd
Scheduled Activity	Railway activities – railway infrastructure operations
Fee-Based Activity	Railway infrastructure operations
Scale	Any annual capacity
Recording of Pollutant Complaints	A record must be kept of all complaints in relation to pollution for four years and produced upon request to the EPA.
Reporting Conditions	An annual return document must be supplied to the EPA within 60 days of the end of the reporting period with the following information: • Statement of compliance; • Monitoring and complaints summary; • Statement of compliance – licence conditions; • Statement of Compliance – Load based Fee; • Statement of Compliance – Requirement to Prepare Pollution Incident Response Management Plan; • Statement of Compliance – Requirement to Publish Pollution Monitoring Data; and • Statement of Compliance – Environmental Management Systems and Practices. The annual return must be kept for four years. Written reports must be produces where an EPA officer suspects that: • An event has occurred at the premises; and • An event has occurred with the carrying out of activities and is likely to cause material harm to the environment.

	EPL 13421
Notification of Environmental Harm	Notification of environmental harm must be made by telephoning the Environment Line service. Written notification must be made to the EPA within 7 days. All relevant authorities must be notified.

Table 3-3: Records Associated with EPL 13421

Number	Issue Date	Notice Type	Summary of Record
1504575	27 Feb 2012	s.58 Licence Variation	This notice amends the licence as follows: - Variation to premises description to include additional disused lines, namely – Cowra to Blainey, Koorawatha to Demondrille and Koorawatha to Cowra - Condition R2 varied to reflect changes to Part 5.7 of the Protection of the Environment Operations Act 1997 – In Condition R2 'immediately' replaces 'as soon as practicable'.
1519800	10 Feb 2014	s.58 Licence Variation	This notice amends the licence as follows: - Addition of Condition L2.3 – stating that only locomotives listed in Condition E2 may be operated on the premises. - Addition of Condition E2 – List of locomotives approved for operation on the premises. - The CFCLA CM Class locomotive has been added to the list of approved locomotives for operation on the premises
1548217	27 Jan 2017	s.58 Licence Variation	This notice amends the licence as follows: - Variation to premises description to include additional disused lines, namely – Moree (Broadbent Grain 669.250 km) to Inverell, Casino to Murwillumbah – excluding 882.580 km – End of Byron, Railway Station Precinct to 886.000 km – Bayshore Drive Level Crossing, Queanbeyan to Bombala excluding 416.180 km near Chakola to 423.960 north of Bunyan, Goulburn to Crookwell – excluding 226.500 km near North Goulburn to 232.500 km near Campbells Lane, 282.500 km – East St to 283.000 km Railway St Crookwell, Armidale to Wallagnarra – excluding 621.000 km to 622.820 km within Guyra, Tarana to Oberon – excluding 222.200 km Albion Ave to Scotia Ave 222.600 km Oberon, Wagga Wagga to Tumbarumba excluding 539.251 km north of Ladysmith Station to 540.297 km Tywong St. - Amendment of Condition L1.2 and removal of Condition L1.3. - Amendment of Condition L2.4 and removal of Condition L2.6. - Amendment of Condition E2 to update the approved locomotives for operation on the licensed premises.
1551483	27 Apr 2017	s.58 Licence Variation	This notice amends the licence as follows: - Condition L2.7 has been varied to direct the licensee to submit data obtained by type testing of the locomotive required under condition L2.6 (not condition L2.7).
1560821	23 Feb 2018	s.58 Licence Variation	This notice amends the licence as follows: - Replace Condition A2.2 (entirely) with the following condition: "The premises comprises the John Holland Rail Network depicted in the rail network diagram (RAILWAYS OF NEW SOUTH WALES, Rev 11 dated November 2017) at which railway systems activities are carried out, shown as: - Country Regional Network Operational track; and - Country Regional Network Non-Operational track.
1586295	02 Oct 2019	s.58 Licence Variation	This notice amends the licence as follows: - Administrative Conditions – Update Premise Map Railways of NSW – 2018 JHR v0.7.
1593551	05 Aug 2020	s.58 Licence Variation	This notice amends the licence as follows: - Conditions that relate to the operation of rolling stock have been removed from the rail infrastructure operators' licences and included in the rolling stock operators' licences. This includes: the requirement for new locomotives to meet specified noise

			emission limits prior to operating on the rail network, the approval process for new locomotives and the list of locomotives. - The scheduled activity listed in the licence has been amended from 'railway systems activities' to 'railway infrastructure operations'. - The licence includes new operating conditions and Pollution Studies in relation to environmental issues of locomotive idling, horn use and braking, bunching and stretching of rolling stock. These conditions and Pollution Studies complement conditions and Pollution Studies on the rolling stock operators' licences. This is in recognition that both railway infrastructure operators and rolling stock operators can undertake actions to mitigate the impacts from these issues. - The licences include a new condition requiring monthly reporting of complaints received by the licensee to the EPA to assist in responding to complaints and emerging issues. - The EPA has also made a range of administrative changes to the licence. This has been necessary to enable the railways infrastructure operators' licences and rolling stock operators' licences to complement each other. - In issuing this variation, the EPA has considered s45 of the Act.
1614426	28 Jan 2022	Licence transfer effective on 29 Jan 2022	POEO Licence transfer to UGL Regional Linx Pty Ltd.
1616523	11 Mar 2022	s.58 Licence Variation	This notice amends the licence as follows: - References to previous licensee in condition A2 have been updated. - PRP's on the Licence have been marked as completed and are no longer visible on the Licence.

3.3 Historical Aerial Photographs

Available historical images were reviewed by ERM (2021) from the years 1944 to 2022 and additional observations made by Ramboll from review of available Nearmap aerial photographs for the site was also undertaken. Key information from the ERM (2021) review, and review of recent Nearmap aerial photographs are summarised below:

- Most of the current day roadways, rain infrastructure (including the triangular junction in Area B), the wool shed and structures in Area A were present form the earliest aerial photograph (1944). The surrounding township was sparsely developed. Smaller structures not observed in recent aerial photographs are visible in occasional parts of the site, but were not visible in subsequent aerial photographs.
- The development of and population of Bungendore township extended in later aerials, particularly from 2002 onwards.
- The timberworks previously mentioned to the west of the site was present from 1961 onwards.
- The triangular junction in Area B was removed in or prior to 1976.
- Some structures in Area A south of the main station building were removed in or prior to 2009.
- The following observations have been made by Ramboll from review of available Nearmap aerial photographs, and key observations are shown in figures further below. Three Nearmap aerial photograph dates are available, and these are also referenced below:
    - In July 2017 (**Figure 3-1**), land to the south of the train station building and near the former wool shed is used for stockpiling of what appears to be railway ballast and other material that appears to be soil. The surrounding area appears to have had some ground disturbance, likely from traffic access to and from the stockpiles and the wool shed. Drainage is evident immediately south of Kings Highway, which is visible next to the northern part of **Figure 3-2**. In Area B, this part of the site is grass cover, however some

evidence of storage immediately adjacent to residences to the north is evident. It is not clear whether Area B is accessible to residents, or whether dumping of material (over the fence) has occurred.

- In December 2022 (**Figure 3-2**) some of the stockpiles near the wool shed have been removed and the remainder of Area A and Area B and wider site appears to be more vegetated compared to the previous aerial photograph. Small structures possibly shipping containers are located immediately south of the wool shed. Less evidence of dumping is observed in Area B compared to the previous aerial photograph.
- In September 2023 (**Figure 3-3**) there is little change except for an additional shipping container near the wool shed, grass cutting or tilling activities across the site including in Area B, and possible clearance of land in Area B next to an adjacent residence.

Figure 3-1: Area A and B in Nearmap aerial photograph dated July 21 2017

Figure 3-2: Area A and B in Nearmap aerial photograph dated 27 December 2022

Figure 3-3: Area A and B in Nearmap aerial photograph dated 29 September 2023

3.4 Dangerous Goods

From review of previous investigations for the site (**Section 4**) a SafeWork NSW search for dangerous goods records has not been undertaken for the site.

The potential for use or storage of hazardous chemicals at the site was assessed by ERM (2021) by aerial photograph analysis. ERM (2021) noted that the National Liquid Fuel Facilities databases did not indicate any instances of chemical storage at the site. Based on the review of historical aerial photographs, ERM (2021) concluded that it is unlikely that the historical storage of bulk above ground hazardous chemicals occurred on the site. Further, ERM (2021) stated that historical aerial photographs showed that the site has remained mostly consistent with its current layout dating back as far as 1944.

Although ERM considered that there is no indication that underground storage tanks (USTs) were historically present at the site, ERM (2021) noted that goods loading sidings such as that historically occurred in Area B commonly include USTs across the CRN and the historical presence of USTs at Area B is a possibility.

4. Previous Investigations

4.1 Historical Reports

Previous investigations relevant to site contamination that were provided for review were:

- Ramboll (2021) Bungendore Train Station Environmental Site Assessment. Report No. 318001025-T11-01;
- ERM (2021). *Preliminary Site Investigation, Bungendore Rail Corridor.* Report prepared for John Holland Rail dated 10 November 2021. Project No. 0608750;ERM (2022a). *XRF Site Survey, 1 Mathews Pl, Bungendore.* Report prepared for John Holland Rail Pty Ltd dated 2 March 2022. Project No. 0698750;
- ERM (2022b). *XRF Site Survey, 'Former Signalman's Cottage' 63 Turallo Terrace, Bungendore, NSW 2621.* Report prepared for John Holland Rail Pty Ltd dated 11 March 2022. Project No. 0698750;
- ERM (2022c). *Bungendore Indoor Lead Dust Assessment Report, Bungendore Station and Woolshed Areas'.* Report prepared for John Holland Rail dated 15 March 2022. Project No. 0608750;
- ERM (2022d). *XRF Site Survey, 'Former Stationmasters Cottage', 16 Majara Street, Bungendore, NSW 2621.* Report prepared for John Holland Rail Pty Ltd dated 15 March 2022. Project No. 0698750;
- ERM (2022e). *Offsite Shallow Soil Survey, Bungendore Rail Precinct.* Report prepared for John Holland Rail dated 29 April 2022. Project No. 0608750;
- ERM (2022f). *Preliminary Site Investigation, Bungendore Station.* Report prepared for John Holland Rail Pty Ltd dated 3 May 2022. Project No. 0608750;
- ERM (2022g) *Environmental Site Assessment, TfNSW – Bungendore Stationmasters Residence*. Report prepared for Transport for NSW dated 8 November 2022. Project No.0650140; and
- ERM (2024) *Environmental Site Assessment, TfNSW – Bungendore Former Signalman's Cottage*. Report prepared for Transport for New South Wales dated 2 July 2024. Project No. 0733205.

The findings of the above reports are summarised in the following sections. Previous investigation locations are shown on **Figures 2a** to **2d, Appendix A**.

4.1.1 Ramboll (2021) Bungendore Train Station Environmental Site Assessment

In 2021 Ramboll undertook an Environmental Site Assessment (ESA) of the Bungendore Station area to assess the likelihood of lead impacts within the investigation area. The ESA included an X-Ray Fluorescence (XRF) survey of surface soils at a depth of 0.05 to 0.1 m bgl and select (49 samples) laboratory analysis for metals (As, Cr, Cu, Fe, Pb, Ni and Zn).

The results can be broadly separated into results from the rail corridor and from near the station, as follows:

- Concentrations of lead in surface soils analysed from within the rail corridor, ranged between 65 and 5,740 mg/kg, with eight of the eleven samples analysed exceeding the adopted commercial/ industrial (HIL-D) screening criteria.

- Concentrations of lead in surface soils at the Bungendore Station area identified lead concentrations above commercial/industrial and recreational open space land use criteria in the southern portion of the station area, nearest to the wool shed (maximum: 10,770 mg/kg). Concentrations of lead were significantly lower at 0.1 m bgl depth, indicating that lead impact at this location had not significantly migrated below near-surface conditions.
- Results for all other metals and metalloids analysed (As, Cr, Cu, Fe, Ni and Zn) were below the adopted commercial/industrial criteria.

4.1.2 ERM (2021) Preliminary Site Investigation, Bungendore Rail Corridor

ERM undertook a PSI and supplementary shallow soil assessment of the rail corridor within the site, as well as adjoining areas that historically extended through the township of Bungendore (**Figure 1, Appendix A**). The rail corridor is approximately 40-50 m wide along its length and includes two level crossings (Hoskintown Road bordering the south of the site, and the Kings Highway passing to the south of the station). The bulk of the site is vacant, vegetated with grasses, invasive weeds, and the occasional tree on the eastern side of the railway. ERM divided the PSI site into several 'sub-areas' including the aforementioned Area A and Area B, and all lands within the active rail corridor from chainage 293.000 km (Turallo Creek Bridge) to 295.677 km (Ellendon Street Level Crossing), i.e. the site. Land south of the Bungendore Station and to the north of Area A of the PSI that forms part of the current site was excluded from the PSI area.

The scope of work undertaken for the PSI included a desktop database review, a site inspection, limited shallow soil investigation, and the development of a preliminary Conceptual Site Model (CSM).

ERM (2021) noted that although several potentially contaminating activities may have historically occurred at the site that are associated with long-term rail usage, the primary potentially contaminating activities appear to be the transport of lead ore by rail. Lead ore was historically transported via Bungendore in uncovered wagons from the Captains Flat Mine, located approximately 35 km to the south, and the ore was transferred into larger wagons in the wool shed area of the site. This activity likely resulted in the elevated presence of lead in surface soils, at the site. Soil sampling completed as part of the ERM PSI included 119 shallow soil sampling locations which were undertaken using a combination of systematic and judgemental sampling patterns. The soil samples were collected representative of the top 0.1 m of the soil profile.

Soil chemical analytical results were screened by ERM against Tier 1 criteria. Lead concentrations were broadly found to be elevated immediately adjacent to, or beneath the rail lines where soil conditions primarily comprised rail ballast. The lead concentrations and the extent of impact increased in areas where trains are required to slow down, stop and/or load/unload.

Concentrations of lead in soils were generally observed by ERM to decrease significantly with distance from the rail line. Based on the relatively low concentrations of lead at the boundary and the pattern of significant decrease in lead concentrations with distance from the rail line across the site, ERM (2021) considered it unlikely that significant lead impacts in shallow soils extend offsite, adjacent to the corridor.

4.1.3 ERM (2022a). XRF Site Survey, 1 Mathews Pl, Bungendore

In 2022 ERM undertook a surface soil site survey for lead at 1 Mathews Place, a residential lot east of the rail line and broadly south, south east of the station. The intention of the survey was

to collect additional soil information to further understand whether lead concentrations identified in soils within the rail corridor extend to the residence.

The soil analyses undertaken indicated that the concentrations of lead in soils at the site were below the adopted human health and ecological residential criteria.

ERM (2022a) concluded that it is unlikely that lead impacts associated with transport of lead ore through the site extends to the surface soils at this residential site. However, ERM (2022a) also concluded that impacts may be present in subsurface soils at the site.

4.1.4 ERM (2022b). XRF Site Survey, 'Former Signalman's Cottage' 63 Turallo Terrace, Bungendore

In March 2022 ERM undertook a surface soil site survey using XRF for lead at 63 Turallo Terrace, i.e. the Former Signalman's Cottage that is located to the north of the station but not part of the current site (see **Figure 1, Appendix A**). Fourteen surface sampling locations were analysed for lead. The results indicated that the concentrations of lead in soils at the site were below the adopted human health (residential and commercial/industrial) and ecological (residential and open space) criteria, except for one location (SIG_02) that exceeded the adopted residential criterion (470 mg/kg compared to 300 mg/kg). Sample SIG_02 was collected by ERM from garden bed adjacent to the eastern fence line of the Signalman's Cottage, adjacent to the rail corridor.

ERM (2022b) stated that based on the results of the assessment, widespread lead contamination does not appear to be present at the former ERM undertook further statistical assessment of the whole database and calculated that the 95% UCL of the mean was below the relevant screening criteria, and the standard deviation was <50% of the screening criteria. ERM (2022a) concluded that based on the available data, significant concentrations of lead are not present in surface soils near the Former Signalman's Cottage, and that no further management or investigation is required.

4.1.5 ERM (2022c). Bungendore Indoor Lead Dust Assessment Report, Bungendore Station and Wool Shed

In March 2022 ERM undertook an indoor lead dust assessment (LDA) for Bungendore Station and wool shed because the PSI (ERM, 2022a) identified windblown dust impacted with lead may migrate from the rail corridor to inside these structures.

Several dust samples were collected from the wool shed (main workshop, pottery room, bathroom, kitchen, equipment samples, shipping containers and associated items), from Bungendore Station (waiting room, server room, adjoining empty rooms, toilet block, station platform), and from inside a caravan (internal and external surfaces). Ambient air monitoring was also undertaken; two air monitors were placed internally at the northern and southern extents of the wool shed, and one air monitor was placed inside Bungendore Station waiting room, server room, office (Adjoining Room, 'N1'), and public toilet.

The results of the dust sampling indicated the following:

- Inside Bungendore Station: 1 of 26 indoor samples exceeded the relevant criteria. The exceeding sample was collected from the windowsill of the waiting room. Further, 5 of 8

samples collected from publicly accessible areas, including the toilets block and station platform exceeded the relevant criteria.
- Inside the wool shed Area: 2 of 25 indoor samples exceeded relevant criteria; the exceeding samples were collected from the floor of the pottery room. No samples collected from the wool shed exceeded the relevant criteria.
- Inside the offsite caravan: 2 of 8 samples exceeded the USEPA residential criteria for 'floors'.

ERM (2022c) concluded that the highest concentrations of lead dust are located within areas of accumulation such as windowsills/ledges, and areas of low traffic. Locations which are sealed or are subject to regular cleaning generally returned lower concentrations below the laboratory limit of reporting. ERM recommended that areas where exceedances have been recorded require cleaning, such that visible dust is removed to the extent practicable and the concentrations of lead fall below the relevant criteria.

4.1.6 ERM (2022d). XRF Site Survey, 'Former Station Masters Cottage', 16 Majara Street, Bungendore, NSW 2621.

In March 2022 ERM undertook a surface soil site survey for lead at the former Station Master's Cottage (FSMC) at 16 Majara Street, Bungendore to further assess whether lead concentrations identified in soils within the rail corridor extend to the FSMC. It is noted that the FSMC is located outside of the current site but is useful to inform the CSM for the current site.

The scope of the soil survey comprised the sampling and analysis of 27 surface soil locations for lead using XRF. The results indicated that the concentrations of lead in soils at the site exceeded the adopted residential criterion (300 mg/kg) in ten samples, with a maximum concentration of 856 mg/kg, which exceeds the screening criteria by more than 250%. The locations which exceeded criteria were primarily located along the northern fence line that adjoins the rail corridor or in the courtyard to the south of the residence. All lead concentrations in soils were below the adopted ecological (urban residential & open space) screening level.

4.1.7 ERM (2022e). Offsite Shallow Soil Survey, Bungendore Rail Precinct

In April 2022 ERM undertook an XRF survey of soils within the township of Bungendore (i.e. offsite) to assess the potential nature and extent of lead concentrations in the surface soils adjacent to the site from windblown deposited lead from past activities at the site and to refine the existing CSM for the site.

The survey included 252 soil measurements, specifically targeting shallow soils (top 0.05 m bgl) at or near to offsite sensitive receptors. Measurements were primarily taken along transects on municipal road verges, however additional measurements were also undertaken onsite along boundaries where receptors were located immediately adjacent to the site.

Using the data collected, ERM concluded that widespread impacts of lead in surface soils do not appear to be present offsite, as most offsite results were either at background levels, or significantly below the relevant screening criteria. Exceedances were not recorded for lead concentrations for samples collected from Bungendore Primary School, the Bungendore Community Centre, the Bungendore Preschool, the Scout Hall, Queanbeyan-Palerang Regional Council building, Powell Street, Malbon Street, or for most residential properties near the site.

However, ERM (2022e) observed exceedances of screening criteria at the boundaries of three residential properties that border the site (former Stationmaster's Cottage, former Signalman's

Cottage, and as the residence at 1 Mathews Place). A lead 'hotspot' was also identified at the Mick Sherd Oval which is located approximately 75 m west of the site, immediately west of Queanbeyan-Palerang Regional Council building. However, based on the distance of the impacts from site and the distribution of the impacts, the lead concentrations were considered more likely to be the result of the historical placement of impacted fill, rather than by windblown dust from the site.

Overall, ERM (2022e) concluded that the transportation of lead ore by rail at the site does not appear to have caused significant widespread offsite surface soil lead impacts. Exceedances of criteria in a small number of samples taken either at or near the site boundary may indicate that lead concentrations extend to three residential properties which are located adjacent to the site. These properties were not accessed during the survey undertaken by ERM (2022e) and further assessment of the extent of lead in soils is required to determine the extent of concentrations in relation to the properties. It is noted by Ramboll that the residence at 1 Mathews Place was previously subject to a shallow soil XRF investigation that observed concentrations were all significantly below the criteria (see **Section 4.1.3**).

4.1.8 ERM (2022f). Preliminary Site Investigation, Bungendore Station

In May 2022 ERM (2022f) undertook a PSI at Bungendore Station including shallow soil sampling and analysis to complement data previously collected and assessed by Ramboll in 2021 (**Section 4.1.1**).

ERM considered that although several potentially contaminating activities may have occurred at the Bungendore Station site in association with the long-term rail usage, the primary potentially contaminating activities appears to be the historical transport of lead ore along the adjacent rail line. Based on historical site photographs provided and assessed by ERM, rail infrastructure was historically present in the southernmost part of Bungendore Station, however the purpose of the infrastructure is unknown.

The previous investigation undertaken by Ramboll (2021) and discussed in **Section 4.1.1** identified lead concentrations in surface soils likely associated with historical lead ore transport and/or handling. The data collected by Ramboll (2021) was included in the ERM (2022f) assessment.

Soil samples from near surface depths (0.05 to 0.1 m) at 15 locations were collected and analysed for arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead manganese, nickel, selenium, vanadium, zinc, mercury. Results were screened against Tier 1 criteria which were selected by ERM based on the identified site receptors. ERM observed concentrations of lead in shallow soils (<0.1 m bgl) above criteria at three locations (location SS-STN-01 (978 mg/kg) and duplicate samples D01_211007 (555 mg/kg) and T01_211007 (77 mg/kg) from location SS-STN-01, location SS-STN-02 (680 mg/kg) and location SS-STN-13 (515 mg/kg) and the highest concentrations were observed in the southern part of the site and near to the rail line.

Concentrations of lead in the ERM (2022f) investigation exceeded recreational criteria at depths of 0.05-0.1 m bgl, and in the Ramboll (2021), which collected samples from the same depth range, exceeded commercial/industrial criteria. Concentrations of lead appeared to decrease rapidly with distance from the rail line. the concentrations of all other metals assessed by ERM (2022f) in soils were below residential and commercial/industrial site criteria in all samples.

Results from the ERM (2022f) and the Ramboll (2021) investigations demonstrated that the concentrations of lead in near surface soils were up to an order of magnitude higher than the corresponding concentrations of lead in soils at a depth of 0.1m bgl, indicating that lead impact in soil is likely limited to near surface (above 0.1 m) depths.

ERM (2022f) concluded that a number of potentially complete Source–Pathway–Receptor (SPR) linkages may exist at the Bungendore Station site, including for onsite commercial/industrial and recreational users of the site, such as rail patrons and other members of the public. ERM (2022f) noted that onsite risks could be managed through the implementation of appropriate institutional controls. The potential SPR linkage has been conservatively identified for the former Stationmasters residence based on data from the eastern boundary. However, ERM (2022f) noted that the potential risk to offsite residences has not been confirmed through direct sampling on the property and there is evidence to suggest that concentrations of lead in surface soils may not extend to the adjacent residence, which is supported by the rapidly decreasing concentrations of lead in soils with greater distance from the rail corridor.

ERM (2022f) also noted that additional potential SPR linkages may exist for offsite groundwater bore users and ecological receptors, however these issues have not been assessed through previous groundwater and surface water assessments at the site to date.

Based on the identified lead impact in surface soils at the Bungendore Station site, and the potentially complete SPR linkages present, a duty to notify the NSW EPA under s.60 of the CLM Act (1997) was considered by ERM (2022f) to have been triggered. As part of the notification process, it was recommended by ERM (2022f) that the NSW EPA should be engaged to discuss whether additional data collection and further assessment of potentially complete SPR linkages may be beneficial in the NSW EPA's assessment of the Bungendore Station site.

4.1.9 ERM (2022g). Environmental Site Assessment, Bungendore Stationmasters Residence

In June 2022 ERM (2022g) undertook an environmental site assessment at the FSMC including shallow soil, surface XRF, water and indoor dust sampling. The objective of the works was to further assess the presence of lead at the site. Specifically, to delineate the extent of contamination identified in the previous XRF survey, conduct an internal lead dust assessment within the residential property and, using the data gathered, provide advice on the suitability of the property as a residential premises in its current state.

The investigation included 8 XRF measurements and collection of soil samples from 7 soil bore locations, a grab sample from the onsite rainwater tank and an indoor dust assessment of 20 locations.

Lead was present within the top 0.3 m of the soil profile across the eastern portion of the site adjoining the rail corridor and within the courtyard to the south of the residence. Dust containing lead was identified exceeding criteria in areas of low traffic and accessibility. Locations which are subject to regular cleaning generally returned lower concentrations. Detectable concentrations of lead were also reported within the rainwater tank however were below the relevant Australian Drinking Water Guidelines.
ERM concluded that the rail corridor is the primary contributor of lead. The distribution of lead concentrations is highly surficial and decreasing in concentration with distance from the source. Based on the CSM potentially complete SPR linkages were identified for onsite residentis including direct contact with soils and accumulated indoor dust, inhalation of dust and consumption of

home grown produce. It was recommended that management through an IEMP should remain in place until assessment of site conditions or site remediation.

4.1.10 ERM (2024). Environmental Site Assessment, Bungendore Former Signalman's Cottage

In May 2024 ERM (2024) undertook an environmental site assessment at the former Signalman's cottage including shallow soil sampling and analysis to further assess the presence of lead at the site and to delineate the extent of contamination identified by previous independent soil analysis.

The investigation included 13 soil bores to a maximum depth of 1.0 m and the collection and laboratory analysis of 41 primary soil samples for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc). The location of the soil bores were conducted within the fence line of the former Signalman's cottage. Seven of these soil bores (SB01-SB04; SB08; SB12 and SB13) are located with the rail corridor boundary.

Concentrations of heavy metals were screened against the residential screening criteria. A total of 13 soil samples reported concentrations of lead above residential human health criteria with one sample SB09 0.15-0.25 (3,280 mg/kg) reporting a concentration 250% above criteria (note this sample location is located outside of the rail corridor). ERM reported that lead contamination appeared to decrease rapidly with depth, with no exceedances deeper than 0.4 m bgl and majority of the exceedances identified within the 0 – 0.25 m bgl range.

Ramboll subsequently screened the concentrations recorded by ERM within the rail corridor. No concentrations were identified above commercial/industrial human health screening criteria. Results from within the rail corridor will be included in the DSI which will be prepared by Ramboll following the intrusive investigation as specified in this SAQP.

5. Preliminary Conceptual Site Model

An understanding of potential exposure scenarios is necessary to evaluate the suitability of a site for a particular land use, being the current approved or potential future land use. Potential exposure pathways are evaluated for completeness based on the existence of:

- a source of contamination/impact;
- a mechanism for release of contaminants from identified sources;
- a contaminant retention or transport medium (e.g. soil, groundwater, etc.);
- potential receptors of contamination; and
- a mechanism for chemical intake by the receptors at the point of exposure.

A CSM is a site-specific qualitative description of the source(s) of contamination, the pathway(s) by which contaminants may migrate through the environmental media, and the populations (human or ecological) that may potentially be exposed. This relationship is commonly known as a Source-Pathway-Receptor (SPR) linkage. Where one or more elements of the SPR linkage are missing, the exposure pathway is considered to be incomplete, the risk to the receptor is negligible, and no further assessment is required.

5.1 Contaminant Sources

Based on review of the previous reports and Ramboll's knowledge and understanding of potential contamination associated with the historical use of the site as a rail infrastructure facility, the following potential contaminant sources have been identified:

1. Historical handling of lead ore: the operation of the rail infrastructure within and immediately adjacent to the site represents a potential contamination source from potential lead ore spillage and dust from cargoes and deposition at and near the rail corridor.
2. Stockpiling of potential contaminated soils: the use of the Woolshed yard for stockpiling materials could represent a potential contamination source, as the source of the materials historically stockpiled in this location is unknown.
3. Uncontrolled filling at the site: Ground disturbance was observed on historical aerial photographs which may indicate the placement of fill in parts of the site. The filling activity and source and quality of fill (if any) is unknown. Key areas include the wool shed area (Area A).
4. Use of hazardous materials in historical structures: heritage structures are known to have commonly been painted with lead-based paints before the phasing out of such lead-based paints in Australia. Paint fragments can weather and break away from the structure over time, which can enter soils near to the building footprint. PCBs may also be present in historical light fitting. Asbestos in building materials may also be present.
5. Historical operation of railway lands (various): the sites' long term use as rail yard and lines may have resulted in a number of additional contaminating activities which are not readily observable during the site inspections undertaken for previous investigations including (but not limited to):
    - Pesticide use near structures, particularly near the station building and the wool shed area;
    - the potential for localised hydrocarbon spills at the site – likely near areas where storage or refilling activities occur;
    - potential historical hydrocarbon storage near the wool shed area;

- use of contaminated building materials (asbestos) in structures that pre-date the deterioration of asbestos based braking systems along the current and historical (i.e. Area B) railway line);
- potential historical onsite fires; and
- potential impact from treated timber power poles (if present) including use of PCB oils in transformers present on power poles, also if present. Timber power poles have historically been commonly used to service properties with electricity across Australia. The timber power pole is typically treated with solvents to prevent degradation of the pole and these solvents often degrade over time and impact underlying soils with metals and PAH.

6. Former Timber Treatment Plant (Offsite Source): The former timber treatment plant approximately 200 m west of the site (located on the corner of King and Butmaroo Streets) has been classified as contaminated formerly regulated under the CLM act. Shallow soil arsenic concentrations at the former plant have been reported to exceed screening criteria, whilst other metal concentrations have been reported above ecological investigation levels. This contamination has the potential to have impacted the site.

It is noted that of the above potential contamination sources, 1, 2, 4, 5 and 6 were previously identified in the PSI reports prepared by ERM (2021 and 2022f) and 3 is additional potential contamination sources included by Ramboll based on the review of desktop information presented in this SAQP. Some specifics on potential sources of historical operations on railway lands (source 5) are also extended to inform this SAQP.

5.1.1 Potential Areas of Environmental Concern

Based on the findings of the site history review and observations made by Ramboll in previous site walkovers (for other engagements at the site), Potential Areas of Environmental Concern (PAECs) and associated Contaminants of Potential Concern (CoPCs) have been identified for the site as outlined in
Table 5-1.

Table 5-1: PAECs and Associated CoPCs

PAECs	Environmental Medium	CoPCs	Rationale
Rail Corridor (located along entire site length) and historical loading facilities	Soil in surface soils <0.05 m bgl and near-surface soils (0.05 – 0.1 m)	Metals (specifically lead, arsenic, copper, zinc)	Historical handling of lead ore may contribute spillages and dust from cargoes which may be deposited at and near the railway corridor. Previous investigations indicate that where present these contaminants are likely higher near the railway and decreases with distance from the railway.
FSMC	Deposited dust	Lead	Historical handling of lead ore may contribute spillages and dust from cargoes which may be deposited at the FSMC. Previous investigations indicate that there is elevated lead within the surrounds of the FSMC.
Wool shed (Area A)	Soil (surface soils <0.05 m bgl)	Metals (specifically lead, arsenic, copper, zinc), TRH, PAHs, BTEXN, asbestos.	Stockpiling activities – aerial photographs indicate railway ballast and other unknown materials were stored here. The CoPC depends on the types of materials that have been stored here. Previous investigations have observed elevated lead in this part of the site likely at least in part associated with the transfer of lead ore in this part of the site. This includes elevated lead dust inside the wool shed structure.
Wool shed area - potential historical underground and above-ground storage tanks (UST/AST)	Soil (surface and subsurface soils adjacent to AST/ UST respectively), groundwater, surface water	Metals, TRH, PAHs, BTEXN	No evidence of UST/AST presence has been observed to date, however a SafeWork NSW search for dangerous goods has not previously been undertaken. A search should be undertaken to establish if storage has occurred. One proposed groundwater monitoring well will be positioned in this general area that will characterise associated CoPC in this part of the site further.

PAECs	Environmental Medium	CoPCs	Rationale
Wool shed area	Soil (base of filling)	Metals (specifically lead, arsenic, copper, zinc), TRH, PAHs, BTEXN, asbestos, total phenols, OC/OP pesticides and PFAS	Ground disturbance visible in historical aerial photographs may indicate filling, if evidence of the presence of fill is observed during the investigation, the presented additional analytes will be requested.
Former rail triangular junction (Area B)	Soil (surface soils <0.05 m bgl)	Metals (specifically lead, arsenic, zinc). Additional analytes for areas of filling: TRH, PAHs, BTEXN, asbestos, total phenols, OC/OP pesticides and PFAS.	Spillages of materials and dust from the transportation of lead ore in this part of the site may have occurred. Limited investigations in this part of the site (ERM, 2021) did not observe elevated metals in surface soils, however further sampling is of benefit to further confirm these findings. There is the potential that filling may have been placed here and the timing and quality of fill (if any) is not known. If filling postdates railway activity here, the presence of fill may interfere with any metal impact from the transportation of lead ore before the junction was decommissioned in or prior to 1976.
Current or former structures containing lead-based paints (adjacent to houses, fences within site area) and other hazardous materials	Soil (surface soils <0.05 m bgl)	Lead, PCBs, asbestos.	Hazardous building materials including lead (paint), PCBs and asbestos may be present in building fabric past and current. Filling may also be present.
Pesticide use near station building	Surface soils	OC/OP pesticides	Localised use of pesticides may have occurred near the station building, it is considered unlikely that this use would have occurred in less accessible parts of the site.

PAECs	Environmental Medium	CoPCs	Rationale
Treated timber power poles	Soil near power pole	Metals and metalloids including arsenic, copper, nickel and zinc, PAHs, TPH/TRH. PCBs may also be present where a transformer is present on a power pole.	The solvents used to treat timber power poles may erode over time and impact underlying soils and potentially groundwater. It is not known if power poles are on the site, their presence/absence will be confirmed during the site work.

5.2 Transport Mechanisms

For a receptor to be exposed to a chemical contaminant derived from a site, there should be an exposure pathway linking the source of contamination and the exposed population. An exposure pathway describes the course a chemical or physical agent takes from the source to the exposed individual and generally includes the following elements (US EPA, 1989):

- A source and mechanism of chemical release;
- A retention or transport medium (or media where chemicals are transferred between media);
- A point of potential human contact with the contaminated media; and
- An exposure route (e.g., ingestion, inhalation) at the point of exposure.

Potential transport mechanisms at the site include:

- Aeolian lead-contaminated dust erosion and deposition;
- Overflow or leak of contaminated substances from storage structures such as tanks and bunds located on site into soil;
- Leaching from soil and/or impacted concrete to surface water run-off and transport to surface water bodies; and
- Movement through and leaching from soil, pools of surface water and areas of sediment deposition to groundwater and transport through groundwater.

5.3 Receptors

The human receptors identified are:

Onsite:

- Onsite workers including intrusive maintenance workers;
- Bungendore Station users and staff;
- Bungendore Station car park users; and
- Wool shed / Future users of the woolshed.

Offsite:

- Bungendore Preschool and Primary School students and teachers (offsite);
- Bungendore Scout Hall users;
- Queanbeyan-Palerang Regional Council Chambers and child care facility users;
- Bungendore Community Centre users;
- Off-site workers including intrusive maintenance workers;
- Off-site residential users, specifically residential and agricultural properties adjacent to the rail corridor;
- Recreational users of Turallo Creek; and
- Residents who use groundwater from bores for domestic purposes, irrigation or for stock watering.

The above offsite receptors are shown in **Figure 1, Appendix A**.

The ecological receptors identified are:

- Onsite ecology, primarily vegetation adjacent to the rail corridor; and
- Off-site aquatic ecology in Turallo Creek.

Locations of sensitive offsite human and ecological receptors mentioned above are shown in **Figure 1, Appendix A**.

5.4 Transport Mechanisms

Potential transport mechanisms at the site include:

- Aeolian transport of contaminated dust particles to human receptors (inhalation);
- Leaching from soil to surface water run-off and transport to surface water bodies (Turallo Creek);
- Movement of contaminants through and leaching from soil to groundwater and transport through groundwater;
- Surface water runoff of contaminated sediments and transport to surface water bodies (Turallo Creek).

5.5 Exposure Pathways

For a receptor to be exposed to a chemical contaminant derived from a site, there must be an exposure pathway linking the source of contamination and the exposed receptor. An exposure pathway described the course a chemical or physical agent takes from the source to the exposed receptor and generally includes the following elements (US EPA 1989):

- A source and mechanism of chemical release;
- A retention or transport medium (or media where chemicals are transferred between media);
- A point of potential human contact with the contaminated media; and
- Exposure route (e.g., ingestion, inhalation) at the point of exposure.

A preliminary evaluation of source-pathway-receptor linkages at the site is provided in

Table 5-2.

Identified exposure pathways include:

- Outdoor dust inhalation near rail corridor;
- Indoor dust inhalation in structures including FSMC, Bungendore Station and the wool shed.
- Direct ingestion or inhalation with contaminated soil or sediment;
- Direct ingestion or dermal contact with impacted groundwater during intrusive works or groundwater extraction; and
- Vegetation that has been impacted by contaminated groundwater or surface water (dust, and root uptake of groundwater).

Preferential pathways may also be present, such as surface (culverted drainage) and near surface services.

The potential SPR linkage has been conservatively identified for the FSMC based on data from the eastern boundary. However, the potential risk to offsite residences has not been confirmed through direct sampling on the property and there is evidence to suggest that concentrations of lead in surface soils may not extend to the adjacent residence. Additional potential SPR linkages may exist for offsite groundwater bore users and offsite ecological receptors, however these

issues have not been comprehensively assessed through previous groundwater and surface water assessments at the site.

The development of a preliminary CSM suggests that several potentially complete SPR linkages at the site may exist and that most are related specifically to lead. The identified potential SPR linkages include:

- Onsite commercial / industrial worker and wool shed users through direct contact and/or dust inhalation. This risk may be managed through institutional controls and management of hotspot areas;
- Onsite recreational users through direct contact and/or dust inhalation. This risk may be managed by further restricting recreational access to the site;
- Offsite human health (including residential users) through direct contact and/or potential dust inhalation;
- Offsite abstraction bore users if lead is present in groundwater and extends to offsite domestic bores;
- Onsite ecological receptors, noting that the site is not intended to be supportive of significant ecological communities given its use as a rail corridor and sidings; and
- Offsite ecological receptors in surface water.

It is noted that the remaining data gaps on the site required further investigation, which is subject to the DSI to be undertaken at the site.

Table 5-2: Preliminary SPR Linkages

Pathway	Onsite workers including IMW	Off-site workers including IMW	Off-site residents	Use of Creek for stock watering	Use of GW for irrigation and stock watering	Recreational users of Turallo Creeks	Onsite ecology	Off-site ecology	Comment
Dust									
Dermal contact	**P**	N	N	**P**	**P**	**P**	**P**	**P**	Inhalation and dermal contact with contaminated dust by onsite and offsite workers and residents
Incidental ingestion	**P**	N	N	**P**	**P**	**P**	**P**	**P**	
Dust inhalation	**P**	**P**	**P**	N	N	N	N	N	
Groundwater									
Dermal contact	N	N	N	**P**	**P**	**P**	N	**P**	Dermal contact, incidental ingestion and groundwater uptake by plants is unlikely.
Incidental ingestion	N	N	**P**	**P**	**P**	**P**	N	**P**	Groundwater may be accessed by residential users for stock watering and irrigation through groundwater bores.
Vapor inhalation	N	N	N	N	N	N	N	N	Groundwater may discharge into nearby surface water bodies.
Soil									
Dermal contact	**P**	**P**	**P**	N	N	N	**P**	**P**	Potential for soil contamination to exist on site and for

Pathway	Onsite workers including IMW	Off-site workers including IMW	Off-site residents	Use of Creek for stock watering	Use of GW for irrigation and stock watering	Recreational users of Turallo Creeks	Onsite ecology	Off-site ecology	Comment
Incidental ingestion	**P**	**P**	**P**	N	N	N	**P**	**P**	migration off-site. Surface water runoff from the site during rainfall may mobilise contaminated soils into Turallo Creek where aquatic ecology, off-site residents and recreational users of the Creek may become exposed.
Vapor inhalation	N	N	N	N	N	N	N	N	
Surface Water									
Dermal contact	**P**	**P**	N	**P**	N	**P**	**P**	**P**	Surface waters may be present in onsite pools following rainfall events and surface water is present in Turallo Creek. Contaminated surface water runoff during rainfall may mobilise into surrounding Turallo Creek where aquatic ecology, off-site residents and recreational users of the Creek may become exposed.
Incidental ingestion	N	N	N	N	N	**P**	**P**	**P**	
Vapor inhalation	**P**	**P**	N	**P**	N	**P**	**P**	**P**	

N: No; P: Potentially

5.6 Data Gaps

From review of previous investigations and regional data, the following data gaps have been identified.

5.6.1 Lead Impact

Lead impact in surface / near surface soils and airborne solid particles identified in previous investigations has not to date been fully delineated.

5.6.2 Potential for the Presence of Filling

From review of historical aerial photographs, there is the potential for filling to have been applied to the site. The source and contamination status of any filling (if any) is not known.

5.6.3 Timber Power Poles

It is not known if there are timber power poles present on site, and if present, soil conditions near timber power poles have not been characterised. Power poles mounted with a transformer may also be a source of PCB impact to underlying soils.

5.6.4 Potential for Use of Pesticides near Bungendore Station

Historical use of pesticides near Bungendore Station (if occurred) may contribute to localised OC/OP impact to soils and this has not been assessed to date.

5.6.5 Storage of Dangerous Goods such as Fuels

Whilst no evidence of storage of bulk hazardous chemicals was observed in the PSI undertaken by ERM (2021), a SafeWork NSW search for dangerous goods records has not been undertaken. This would be of benefit to establish if any documented storage of such chemicals has historically or currently occurs on the site. This should be undertaken before the DSI so to inform the scope of the DSI. If no records exist for the site, it will not be necessary to undertake any intrusive investigation for this data gap. If however records do indicate the storage of hazardous chemicals at the site, proposed investigation locations will be utilised to characterise soil and groundwater conditions in the proximity of their storage accordingly.

5.6.6 Groundwater

Groundwater conditions have not been assessed to date. From limited geology and hydrogeology information available, it is anticipated that groundwater is likely present at shallow depths (approximately 5 m bgl) and is unconfined. Groundwater monitoring bore installation and monitoring is included in the SAQP.

5.6.7 Characterisation of Surface Water or Sediments

Some characterisation of pooled surface water has previously been undertaken (ERM, 2022f) however additional characterisation is of benefit to further characterise this potential secondary

source / pathway for offsite migration. If surface water is not present, sediments will be sampled instead.

6. Sampling and Analysis Quality Plan

6.1 Objectives

The primary objectives of the DSI are to better delineate metal concentrations at the site to inform remediation and/or management requirements. The secondary objective of the DSI is to better understand contamination (other than metals) to establish if further works are required including remediation and/or management.

To meet the project objectives, the following sub-objectives for each media identified in the CSM has been defined:

- **Soil:** To better delineate concentrations at the site and complement the existing dataset from previous investigations completed by Ramboll and ERM (summarised in **Section 4.1**) and meet the sampling density requirements of NSW EPA (2022) *Sampling Design, Contaminated Land Guidelines – Part 1 and Part 2*.
- **Surface water:** To characterise this secondary source. If surface water is not present during the field work, representative sediment samples will be collected instead.
- **Groundwater:** To characterise metal concentrations in groundwater and to establish groundwater conditions (depth and flow directions).

Air quality and the risk of airborne metals from dust generation will be investigated separately.

6.2 Scope of Works

The general proposed scope of works is outlined in **Sections 6.2.1** to **Section 6.2.5** below.

6.2.1 Before Mobilisation

It is recommended that a SafeWork NSW search for dangerous goods records for the site is undertaken before mobilisation occurs, to check for records on storage of dangerous goods including fuels occurred at the site. The proposed investigation locations may be revised or additional investigation locations recommended based on the findings of review of the search results.

6.2.2 Site Walkover

The site walkover will be undertaken at the start of the field works and will observe for the following key items of interest:

- Any areas identified in the historical aerial photograph review as previously being subject to ground disturbance and/or filling (presumed uncontrolled).
- Any areas of historical site surface levels and recent filling.
- Surface water drainage including culverted drainage, ponding areas, and drainage lines – this information will be used to confirm surface water/sediment sampling locations.
- Any evidence of current or recent stockpiling of soils at the site and documenting in field notes a description of material stored on site. Any material suspected as potentially contaminated (e.g. visual/olfactory evidence of contamination, or the presence of building and demolition rubble) will be recommended to TAHE for additional sampling.
- Presence of timber power poles (if any).
- Any evidence of possible current/historical UST/AST at the site.

6.2.3 Soil Investigation

The proposed soil sampling locations are shown on **Figures 3a** to **3d, Appendix A** along with previous investigation locations. Most of the investigation locations (135 sample locations) will be done using hand tools (trowel or similar), except for five groundwater monitoring wells which will be drilled and installed, however soil samples will also be collected from these five locations. In addition, at 15 of the 135 locations, an additional soil sample will be taken at depth. The depth of the soil sample collected will be determined using a handheld x-ray fluorescence (XRF) meter to field screen the excavated soil.
Soil samples will also be collected from five groundwater monitoring wells that will be installed at the site (**Section 6.2.5**).

Proposed soil sampling locations are mapped on an approximate 20 m grid or better in areas of the site previously observed as comprising higher concentrations of lead in surface soils by ERM (broadly near Bungendore Station), and an approximate 30 m grid across the remainder of the site. Proposed locations next to the railway line are placed in a manner that provides a range of data relative to distance from the railway line to complement the existing dataset. The 135 proposed soil sample locations across the site of 17.5 ha are slightly below the minimum sampling density outlined in the NSW EPA (2022) Sampling Design Guidelines that requires a 30 m grid size for sites greater than 5 ha for a systematic design.

Soil sampling will be conducted in accordance with requirements specified in *Australian Standard Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005). **Table 6-1** outlines the soil sampling methodology, and the rationale for the proposed investigation locations are presented in **Table 6-2** (metal delineation) and **Table 6-3** (additional data gaps).

Table 6-1: Soil Sampling Methodology

Task	Methodology
General Equipment Requirements	All equipment used for sampling and monitoring must be clean and decontaminated prior to use at each location. Equipment requiring calibration is to be appropriately calibrated in accordance with manufacturer's instructions prior to use
Service clearance	Service clearance will be undertaken prior to commencing any hand auger or drilling locations. Service trenches will be positively identified.
Target Depth	Target depths for the 135 subsurface locations will be to 0.0-0.1 m depth. Target depths at 15 subsurface locations will be up to 1.0 m at depth and will be determined through XRF field screening. Target depths for surface water / sediment locations will be surface (top 0.2 m) soil conditions. Target depths for the monitoring wells are at least 2 metres past water strike, up to a maximum depth of 10 m bgl. Groundwater is anticipated to be approximately or less than 5 m depth.
Sampling Nomenclature	Sampling nomenclature shall comprise the sample location number (1 to 135), followed by the sample depth, e.g. 1_0-0.1.
Sample Collection	Soil samples will be collected from each borehole either from the trowel, from within the push tube liner or from solid stem auger cuttings as practicable. Depth intervals (start and end depth) and lithologic materials will be recorded for each sample. Samples will be collected at the following depths unless otherwise specified: • 0 - 0.1 m bgl • 0.1 - 0.2 m bgl • 0.5 m bgl • Every 0.5 m thereafter • Upon change in lithologic material and suspicious staining, odours or anthropogenic material

Task	Methodology
Soil Logging	All soil sample locations will be logged in accordance with the Unified Soil Classification System (USCS).
Investigation Location Reinstatement	On completion of sampling, boreholes will be reinstated with drill cuttings originating from the borehole and backfilled and compacted to ground level with clean sand if required. Boreholes drilled in paved areas will be reinstated with cement or cold mix asphalt as appropriate. Monitoring wells will be reinstated as outlined in **Table 6-4**.
Sample Management	Collected soil is to be placed into laboratory supplied solvent washed acid rinsed sample containers and placed on ice in transit to the lab. All samples must be named in accordance Ramboll standards for sample naming
Duplicate Sample Procedure	Intra-lab duplicate samples will be collected at a rate of 1 per 20 primary samples. Inter-lab duplicate samples will be collected at a rate of 1 per 20 primary samples
QAQC Samples	One field rinsate is to be collected from reusable sampling equipment per day post decontamination to evaluate the cross-contamination potential
Data recording	Sample information (name, date, type, matrix, sample depth) are to be electronically recorded in Survey123 and retained by Ramboll for upload to the data management system. Eastings northings and approximate elevations coordinates of each borehole are to be recorded with GPS or surveyed by a licenced surveyor

Table 6-2: Soil investigation rationale – metal delineation

Investigation location (s)	Targeting Area	PAEC	CoPCs
1 – 8, 113 - 118 (13 locations)	Area near Bungendore station	Historical loading area in this proximity as well as current or former structures containing lead-based paints	Metals (lead, arsenic, copper and zinc)
9 – 25, 27, 28, 31, 39 – 41, 47 – 112, 119, 120, 127 – 134 (103 locations)	Rail corridor at various distances from the railway to complement the existing dataset on metal concentrations with distance from the railway.	Railway corridor – previous investigation locations have observed lead concentrations that decrease with increasing distance from the railway. Historical handling of lead ore, and spillage from trains.	Metals (lead, arsenic, copper and zinc)
26, 29, 30, 42 – 45, 46, 121 – 124 (10 locations)	Wool shed area	Near historical loading and transportation area	Metals (lead, arsenic, copper and zinc)
32 – 38, 125, 126, 135 (9 locations)	Former rail triangular junction (Area B)	Near historical loading and transportation area	Metals (lead, arsenic, copper and zinc)
Total locations: 135			

Table 6-3: Soil investigation rationale – other data gaps

Investigation location (s)	Targeting Area	PAEC	CoPCs (additional to Table 6-2)	Number of Samples to be Analysed
1 – 8, –113-118 (13 locations)	Area near Bungendore station	Current or former structures containing potentially other hazardous materials and pesticide use	PCBs, asbestos, OC/OP pesticides	4, i.e. approx. 1/3 selecting locations that capture next to structures
30 (1 location)	Wool shed area	Stockpiling activities	TRH, PAHs, BTEXN, asbestos, total phenols, OC/OP pesticides	1
26, 29, 42 – 45, 46, 121 – 124 (9 locations)	Wool shed area	Possible filling, pesticide use near structures, possible hazardous materials near current or former structures.	TRH, PAHs, BTEXN, OC/OP, asbestos. Additional analytes for areas of filling: total phenols, OC/OP pesticides and PFAS	8, i.e. broadly 1/3 selecting locations in areas of filling
32 – 38, 125, 126, 135 (9 locations)	Former rail triangular junction (Area B)	Possible presence of fill.	Additional analytes for areas of filling (if any): total phenols, OC/OP pesticides and PFAS	4 i.e. 1/3 of locations, if evidence of the presence of filling is observed
Where relevant (depends on site observations). Nominally 3 samples.	Treated timber power poles (if present)	-	Metals and metalloids including arsenic, copper, nickel and zinc, PAHs, TPH/TRH. PCBs if a transformer is observed.	3 near power poles (if any) including 1 below transformer for PCBs (if present)
Historical or current UST/AST (if identified), groundwater bore will be relocated near to such a structure. 1 location	Historical or current UST/AST	-	Metals, TRH, PAHs, BTEXN	1 location, 2 samples
Total locations: up to 32 of the existing locations (of which up to 22 will be analysed)				

6.2.4 Surface Water / Sediments

A total of 10 surface water or (where dry at the time of sampling) sediment samples will be collected from the following general locations to assess this secondary source / pathway:

- Six samples shall be collected along drainage lines identified during the site walkover, including culverted drainage.
- Four samples shall be collected from topographical low points at the site where pooled water is either present or is known to be present during or after rainfall events.

- Surface water samples will be field filtered and analysed for dissolved metals (see last bullet point).
- QA/QC sampling comprising one inter- and intra- laboratory duplicates.
- All samples including the primary samples and the QA/QC samples will be analysed for eight metals (arsenic, cadmium, total chromium, copper, lead, mercury, nickel, and zinc).

The sampling locations will be selected during the site walkover and coordinates documented in field notes.

6.2.5 Groundwater

Five boreholes will be advanced using a mechanical drilling plant and converted to groundwater monitoring wells at locations presented in **Figures 3a** to **3d, Appendix A** and as follows:

Table 6-4: Monitoring Well Installation Methodology

Activity	Proposed Methodology
General Equipment Requirement	All equipment used for sampling and monitoring must be clean and decontaminated prior to use at each location. Equipment requiring calibration is to be appropriately calibrated in accordance with manufacturer's instructions prior to use
Borehole Drilling	Boreholes are to be advanced with non-destructive digging to 1.2 m bgl, followed by push tube to the target depth of 3 m bgl, and as far as practicable for monitoring well boreholes (to the target depth). Where impenetrable material is encountered, solid stem auger will be used to achieve the target depth.
Well Installation	Wells are to be advanced with non-destructive di1gging to 1.2 m bgl, followed by push tube to the target depth of 3 m bgl, and as far as practicable for monitoring well boreholes (to the target depth). Where impenetrable material is encountered, solid stem auger will be used to achieve the target depth. Wells will be constructed using a licensed drilling contractor and will be constructed as follows: • 50 mm PVC class 18 factory slotted (0.5mm) well screen (no filter socks will be used to assess the presence of LNAPL/DNAPL) • 50 mm PVC class 18 blank casing • A push-on end cap at the base of each well • A top cap suitable for suspension of groundwater level data loggers • A graded 2 mm gravel pack installed from the base, generally to 0.5 m above the top of the well screen in the annulus between the well screen/casing and the borehole wall • An annular seal consisting of at least 1 m of 3/8" bentonite chips installed on top of the gravel pack • A cementitious grout slurry installed on top of the bentonite annular seal to near surface • Wells will be completed on the surface with a surface bentonite seal and a concrete plinth in which a flush mount well cover will be set and the well capped with a lockable steel cap that is finished flush with the surrounding surface level. Wells will be installed ensuring screens are located within the aquifer of concern (shallow), are screened across the top of the water table (for identification of LNAPL) and are not screened across the two distinct aquifers causing cross contamination. Typical screen lengths will include at least 0.5 m above and 2 m below the water table.
Well Development	Following installation, the wells will be developed/purged to remove disturbed fines and to try to re-establish the natural hydraulic flow conditions of the formations which may have been disturbed by well construction, around the immediate vicinity of each well. The wells will be left for up to one week to equilibrate prior to collection of groundwater samples.
Survey	Completed monitoring wells will be surveyed by an accredited land surveyor, recording easting, northing, ground elevation and top of casing elevation for all wells.

Activity	Proposed Methodology
Data Recording	Well construction details are to be electronically recorded in Survey123 and retained by Ramboll for upload to the data management system. Eastings northings and approximate elevations coordinates of each monitoring well are to be recorded with GPS or surveyed by a licenced surveyor.

Monitoring wells will be sampled using the low flow/low stress technique, following guidance contained in AS 5667.11-1998 Guidance on Sampling of Groundwaters (updated 2016). The groundwater sampling methodology is detailed in **Table 6-5**.

Table 6-5: Groundwater Sampling Methodology

Task	Methodology
Gauging	Depth to water and total depth of well will be measured with an oil/water interface probe prior to and during sample collection to ensure low/zero drawdown conditions are achieved
Sample Collection	Groundwater sampling will be completed using the low flow/low stress technique using a peristaltic pump, in accordance with AS5667.11-1998. The following procedure will be used: The tubing or pump intake will be positioned at a depth approximately in the centre of the screened interval of the well Groundwater will be purged at such a rate so as not to result in groundwater drawdown, or a rate of approximately 0.2-0.25 L/min (or approximately 4 – 5 L) until ex-situ water quality parameters are stable. Groundwater will then be pumped directly into the laboratory provided sample containers from the tubing outlet (i.e. disconnected from the flow cell) In the event that peristaltic pump is not able to collect a sample, bailing will be used as a backup method, in accordance with AS5667.11-1998 Sampling at each groundwater monitoring well will take approximately 1hr to complete. Stormwater and surface water sampling will be completed using a swing sampler directly from the source.
Sample Management	Samples are to be placed on ice once in the sample bottles immediately after collection. All samples must be named in accordance with Ramboll standards on sampling naming
Duplicate Sample Procedure	Intra-lab duplicate samples will be collected at a rate of 1 per 20 primary samples. Inter-lab duplicate samples will be collected at a rate of 1 per 20 primary samples
Data recording	Sample information (name, date, type, matrix, sample depth) are to be electronically recorded in Survey123 and retained by Ramboll for upload to the data management system. Eastings northings and approximate elevations coordinates of each monitoring well are to be recorded with GPS or surveyed by a licenced surveyor
Sample analysis	Samples will be analysed for metals (lead, arsenic, copper, and zinc). One well positioned near to any known or suspected UST will be analysed for BTEX and TRH if visual/olfactory observations indicate potential contamination is present.

6.3 Data Quality Objectives

The Data Quality Objectives (DQO) process is used to define the type, quantity and quality of the data needed to support decisions relating to the environmental condition of a site.

A precis of the site specific DQO process to be adopted in this investigation is provided in the following sections, in the context of the seven-step iterative planning approach provided in US EPA (2000) documents *Guidance for the Data Quality Objectives Process and Data Quality Objectives for Hazardous Waste Site Investigations.*

Step 1 – State the Problem

Metal (lead) impact has previously been identified in shallow soils at the site, but the lateral extent of impact has not to date been fully delineated. The risks associated with surface water drainage of metals as a secondary source or a pathway has not to date has been characterised, nor has the risk to sensitive human health receptors from airborne concentrations of metals in dust. Groundwater quality, depth and flow direction has not previously been characterised for the site.

Step 2 – Identify the Decision

The principal study questions that arise from Step 1 are:

- What is the extent of metal (in particular lead) impact at the site?
- Is there adequate data to confirm the extent of impact and to inform remedial options for soils, surface water, and groundwater?
- Are there any additional data gaps that may require assessment either as part of the DSI or as a separate exercise?

Step 3 – Identify the Inputs to the Decision

The primary inputs required include:

- Relevant background data and any relevant data obtained from previous investigations.
- New data collected and observations made during fieldworks.
- Results of chemical (metal) analysis of samples collected.
- Statistical interpretation of new and existing datasets.
- Assessment of the suitability of new data for the purposes of this investigation through the application of Data Quality Indicators (DQI), namely precision, accuracy, representativeness, completeness and comparability parameters.
- Assessment of the data in the context of the adopted human and ecological health investigation levels.
- Assessment of potential hazards to human and ecological offsite receptors through the development of conceptual site models.

The spatial boundaries are limited to:

- **Lateral** – the lateral boundaries of the study are the site as defined in this report and accompanying figures.
- **Vertical** – the vertical boundaries are as follows:
  - For the soil (only) investigation, surface and near surface soils comprising the top 1.2 m of the soil profile.

- For the groundwater investigation (drilling of groundwater wells) - to the base of the aquifer.

The temporal boundaries for this investigation are limited to the period of mobilisation to site, which is anticipated to be in August/September 2024. However, when the data is assessed, the temporal boundaries shall include the period of mobilisation for each study, that is between 2021 and 2022.

Step 5 – Develop a Decision Rule

The sampling and analysis program has been designed to assess the need for management of site contamination where it exceeds the adopted assessment criteria.

A decision on the acceptance of the analytical data will be made based on the Data Quality Indicators (DQI) as follows:

- **Precision** – a quantitative measure of the variability or reproducibility of the data.
- **Accuracy** – a quantitative measure of the closeness of the reported data to the "true" value.
- **Representativeness** – a qualitative expression of confidence that the data is representative of each media present onsite, supplemented by statistical analysis.
- **Completeness** – a measure of the amount of usable data from each data collection activity.
- **Comparability** – a qualitative expression of confidence that the data may be considered equivalent for each sampling event, also supplemented with statistical analysis.

The quantitative and qualitative measures employed to satisfy these parameters are detailed in **Table 6-7**.

Table 6-6: Data Quality Indicators

DQI	Performance Standards	Acceptable Criteria
Precision	• Collection and analysis of intra-laboratory duplicate samples and calculation of Relative Percent Differences (RPD) between the duplicate and primary samples • Collection and analysis of inter-laboratory duplicate samples and calculation of RPD values between the primary and duplicate samples	RPD values will be considered acceptable if they are below 30% relative difference. RPD's which exceed this range may be considered acceptable where: • Results are less than 10 times the LOR • Results are less than 20 times the LOR and the RPD is less than 50% • Heterogeneous materials are encountered
Accuracy	The closeness of the reported data to the "true" value is assessed through review of the performance of: • Method blank samples • Matrix spike and matrix spike duplicate samples • Laboratory control samples	• All method blank samples below the LOR for all analytes • MS and MSD sample RPD's within 30% • LCS results ranging from 70% to 130% recovery

DQI	Performance Standards	Acceptable Criteria
Representativeness	To ensure the data produced by the laboratory is representative of conditions encountered in the field, the following measures will be implemented: • Blank samples will be run in parallel with field samples to detect laboratory analytical artefacts • Review of lab and field RPD's to reveal discrepancies in analytical methods (if any) • The appropriateness of sample collection methodologies, handling, storage and preservation techniques will be assessed to ensure interference is minimised	• All blank sample results below the LOR • All RPD' within acceptable control limits • All sampling conducted in accordance with ASC NEPM (2013) and Australian Standards as appropriate
Completeness	• Groundwater identified to be potentially impacted by contamination pose a potential risk to health, safety and the environment and may require risk management to limit exposure to onsite users • Appropriate sampling procedures to be used • Experienced field team to undertake preliminary investigation Correct documentation to be completed	• All required samples analysed • Appropriate methods • Appropriate laboratory Level of Reporting (LORs) • Sample documentation correct Sample holding times in compliance
Comparability	• Correct sample procedures used at each location • Experienced field team Same type (medium, volume and sampling technique) of samples collected	• Same analytical methods used • Appropriate LORs • Samples submitted to the same NATA accredited laboratory • Analytical data is presented in the same units

6.4 Assessment Criteria

6.4.1 Soil

The criteria proposed for the assessment of soil contamination are sourced from the following references:

- National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013).

The NEPM (2013) provides HILs and EILs for various land uses. The NEPM (2013) also introduced HSLs and ESLs, management limits and direct contact HSLs for petroleum hydrocarbons, which are not relevant for this investigation.

The assessment criteria to be adopted for the delineation investigation will depend on the local land use. The following categories as defined by NEPM (2013) below:

- HIL A – Health investigation level for residential use including residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, no poultry), also includes children's day care centres, preschools and primary schools.
- HIL C – Health investigation level for recreational/open space such as parks, playgrounds, playing fields, secondary schools, and footpaths.
- HIL D – Health investigation level for commercial/industrial such as shops, offices, factories and industrial sites.
- EIL for urban recreational and public open space and EIL for commercial/ industrial use – ecological investigations levels applicable for assessing risk to terrestrial ecosystems.

The HILs are applicable for assessing human health risk via all relevant pathways of exposure. The HILs are generic to all soil types and apply generally to a depth of 3 mbgl. EILs depend on specific soil physicochemical properties and generally apply to the top 2 m of soil.

EILs depend on specific soil physio-chemical properties such as pH, clay content, cation exchange capacity and background concentrations. The published range of the added contaminant limits are listed in **Table 6-8** as an initial screen.

The soil assessment criteria for the metals of concern (likely lead and co-located arsenic, copper, and zinc) are summarised in **Table 6-8**. Zinc has previously been identified at concentrations above the EIL – Tier 2 screening criteria will be derived using background data (where available) and/or pH and cation exchange capacity results from the current investigation.

Table 6-7: Soil Assessment Criteria (mg/kg)

Contaminant	HIL A	HIL C	HIL D	EIL/ESL (Urban residential/ public open space)	EIL/ESL (Commercial/ Industrial)
Arsenic	100	300	3,000	100	160
Cadmium	20	90	900	-	-
Chromium	100[a]	300[a]	3,600[a]	130	320
Copper	6,000	17,000	240,000	95	140
Lead	300	600	1,500	1,100	1,800
Mercury	40	80	730	-	
Nickel	400	1,200	6,000	30	55
Zinc	7,400	30,000	400,000	70	110
Carcinogenic PAHs (as benzo(a)pyrene TEQ	3	3	40	-	-
Total PAHs	300	300	4000	-	-
Phenol	3000	40000	240000		
DDT+DDE+DDD	240	400	3600	180 (DDT only)	640 (DDT only)
Aldrin and dieldrin	6	10	45	-	-
Chlordane	50	70	530	-	-
Endosulfan	270	340	2000	-	-
Endrin	10	20	100	-	-
Heptachlor	6	10	50	-	-
HCB	10	10	80	-	-

Contaminant	HIL A	HIL C	HIL D	EIL/ESL (Urban residential/ public open space)	EIL/ESL (Commercial/ Industrial)
Methoxychlor	300	400	2500	-	-
Mirex	10	20	100	-	-
Toxaphene	20	30	160	-	-
Atrazine	320	400	2500	-	-
Chlorpyrifos	160	250	2000	-	-
Bifenthrin	600	730	4500	-	-
PCBs	1	1	7	-	-
F1 C6-C10	-	-	-	180	215
F2 C10-C16	-	-	-	120	170
F3 C16-C34	-	-	-	300	1700
F4 C34-C40	-	-	-	2800	3300
Benzene	-	-	-	50	75
Toluene	-	-	-	85	135
Ethylbenzene	-	-	-	70	165
Xylenes	-	-	-	105	180
Benzo(a)pyrene	-	-	-	0.7	1.4

- Indicates no criteria available, [a]HIL for chromium (VI)

EILs are presented for the most conservative pH and cation exchange capacity (CEC) conditions in the first instance, and can be amended subject to the collection of pH and CEC data. Where criteria are not available, international criteria endorsed by NEPC (2013) will be applied.

6.4.1.1 PFAS in Soil

The risk of PFAS contamination at the site is generally low except for (based on the findings of the site history review – **Section 3**) if uncontrolled filling is present at the site. Therefore, sampling and analysis for PFAS will only targeted areas of identified uncontrolled filling.

As PFAS compounds are emerging contaminants of concern, assessment criteria were not included in the National Environmental Protection (Assessment of Site Contamination) Measure Amendment 2013 (No. 1) (NEPC, 2013). In January 2018, the Heads of NSW EPA (HNSW EPA) Australia and New Zealand issued a PFAS National Environmental Management Plan (NEMP) Version 1.0. The NEMP included a list of further work completed by the HNSW EPA National Chemicals Working Group and the outcomes of this work led to an update of the NEMP Version 2.0 (HEPA, 2020).

The environmental guidelines listed in the PFAS NEMP Version 2.0 represent a nationally agreed suite that should be used to inform site investigations. Where possible, these guidance values have been derived based on, or using, existing nationally agreed and long-standing Australian processes. For guidance values that are not yet available, appropriate interim criteria are recommended.

Exceedances of these values do not constitute a risk if other pathways are controlled.

The criteria proposed for the assessment of soil contamination are outlined in **Table 6-9**.

Table 6-8: Soil Assessment Criteria (mg/kg)

Compound	HIL A[1]	HIL C[3]	HIL D[4]	Ecological Direct Exposure[5]	Ecological Indirect Exposure[6]
Sum of PFOS/PFHxS	0.01	1	20	-	-
PFOS	-	-	-	1	0.01
PFOA	0.1	10	50	10	-

[1] Residential with garden/accessible soil, assumes home grown produce provides up to 10% of fruit and vegetable intake (does not account for consumption of any eggs from home poultry), also includes childcare centres, preschools and primary schools.

[3] Public Open Space, assumes users (both adults and children) predominantly spend the majority of their time outdoors and includes parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. Excludes undeveloped public open space (such as urban bushland and reserves) where the potential for exposure is lower and/ or a site-specific assessment may be more appropriate.

[4] Industrial/Commercial, assumes eight hours is spent indoors and one hour spent outdoors at a site such as a shop, office, factory, or industrial site.

[5] Relevant for all land uses, sourced from HNSW EPA (2020) *NEMP 2.0.*

[6] This value is based on the most conservative permissible use of the site under the current LEP zoning and current layout of the site. For intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate, sourced from HNSW EPA (2020) *NEMP 2.0.*

6.4.2 Groundwater and Surface Waters

The criteria proposed for the assessment of groundwater and surface water contamination are sourced from the following references:

- National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (NEPM 2013);
- National Health and Medical Research Council (2008) Guidelines for Managing Risks in Recreational Water;
- NSW DEC (2007) Guidelines for the Assessment and Management of Groundwater Contamination;
- ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- HEPA (2020) PFAS National Environmental Management Plan Version 2.0, January 2020, and
- DoH (2014) Contaminated sites ground and surface water chemical screening guidelines, December 2014.

Based on the beneficial uses of groundwater and surface water, the criteria for protection of aquatic ecosystems and recreation will be used to assess groundwater analytical results.

NEPM (2013) provides groundwater investigation levels (GILs) in the context of the framework for risk-based assessment of groundwater contamination, i.e., levels above which further assessment is required.

The investigation levels presented in ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality are considered applicable for the protection of aquatic ecosystems of receiving waters. ANZECC (2000) advocates a site-specific approach to developing guideline trigger values based on factors such as local biological affects data and the

current levels of disturbance of the ecosystem. The guidelines present 'low risk trigger values' which are defined as concentrations of key performance parameters below which there is a low risk of adverse biological effects. If these trigger values are exceeded, then further action is required which may include further site-specific investigations to assess potential contamination or management/ remedial action.

Low risk trigger values are presented in Table 3.4.1 of ANZECC (2000) for the protection of 80-99% of species in fresh and marine waters, with trigger values depending on the health of the receiving waters. Groundwater results will be compared against trigger values for the protection of 95% of marine water species where available (low reliability values are used in absence of high reliability values) in the first instance.

Guidelines for Managing Risks in Recreational Water (2008) indicate that a qualitative assessment of recreational use can be undertaken using 10 times the concentrations of chemicals stipulated in the Australian Drinking Water Guidelines (2011). This is based on an assumed contribution for swimming equivalent to 10% of drinking water consumption.

Guidelines for PFAS compounds are presented in the PFAS National Environmental Management Plan, Version 2.0 (NEMP) (HEPA, 2020). The PFAS NEMP presents health based environmental guideline values and values for the protection of 80-99% of species in fresh and marine waters. The adopted assessment criteria are the health based guideline values for recreational water and the 95% species protection (for slightly to moderately disturbed systems) for PFOS and PFOA in freshwater.

The groundwater assessment criteria are presented in **Table 6-10**.

Table 6-9: Groundwater Assessment Criteria - GILs, 95% Freshwater Protection for Aquatic Ecosystems, and Human Health Recreational Water (µg/L)

Analyte	NEPM 2013 GIL Marine Waters	95% Fresh Water Protection for Aquatic Ecosystems	Human Health – Recreational	DoH 2014 Domestic Non-Potable Groundwater Use
Arsenic (III)	-	-	100	70
Arsenic (V)	-	13	100	70
Copper	1.3	1.4	20,000	20,000
Lead	4.4	3.4	100	100
Zinc	15	8	-	30,000
Benzene	500	950	10	10
Toluene	-	180	8,000	25
Ethylbenzene	-	80	3,000	3
meta- & para-Xylene	-	75	-	-
ortho-Xylene	-	350	-	-
Total Xylenes	-	-	6,000	20
Naphthalene	50	16	-	-

* This is a reasonable guide to meeting the level of protection required for Cockburn Sound under the Draft (Cockburn Sound) Environmental Protection Policy 2002 (EPP), and is based on a similar level of protection as the Jandakot Groundwater Protection Policy - SPP No 6. Proponents may propose to vary this rate, through a more detailed analysis of site characteristics and proposed management techniques.

NEPM (2013) also provides health screening levels (HSLs) for vapour intrusion from petroleum hydrocarbons in affected groundwater, presented in **Table 6-11**.

Table 6-10: Groundwater Assessment Criteria - Health Screening Levels (Commercial/Industrial) for Petroleum Hydrocarbons in Groundwater (mg/L)

Analyte	NEPM 2013 HSL D 2-<4m	NEPM 2013 HSL D 4-<8m	NEPM 2013 HSL D 8m+
C6 - C10 Fraction minus BTEX (F1)	6,000	6,000	7,000
>C10 - C16 Fraction minus Naphthalene (F2)	NL	NL	NL
Benzene	5,000	5,000	5,000
Toluene	NL	NL	NL
Ethylbenzene	NL	NL	NL
Total Xylenes	NL	NL	NL
Naphthalene	NL	NL	NL

6.4.3 Sediments

Sediment data will be assessed against ANZECC and ARMCANZ (2000) and ANZG (2018) sediment DGVs for toxicants in sediment (**Table 6-12**) and to assess risks to human health will also be assessed against human health criteria for soils previously provided.

Table 6-11: Sediment criteria

Type of toxicant	Toxicant	DGV	GV-high
Metals (mg/kg dry weight)a	Antimony	2	25
	Cadmium	1.5	10
	Chromium	80	370
	Copper	65	270
	Lead	50	220
	Mercury (Inorganic)	0.15	1
	Nickel	21	52
	Silver	1	4
	Zinc	200	410
Metalloids (mg/kg dry weight)	Arsenic	20	70
Organics (µg/kg dry weight, 1% OC)	Total PAH	10000	50000
	Total DDT	1.2	5
	p.p'-DDE	1.4	7
	o,p'- + p,p'-DDD	3.5	9
	Chlordane	4.5	9
	Dieldrin	2.8	7
	Endrin	2.7	60
	Lindane	0.9	1.4
	Total PCBs	34	280
Organics (mg/kg dry weight)	TPH	280	550

6.5 Quality Assurance / Quality Control

6.5.1 Outline

A QA/QC program has been developed that aims at ensuring that the data collected is sufficiently accurate, precise, and reproducible to be used for the purposes of the works. All stages of the assessment (data gathering, sample handling etc.) will be conducted in accordance with the QA/QC program outlined in the following sections.

6.5.2 Field Sampling and Field QAQC

All field procedures will be in accordance with the following guidelines and documents:

- Australian and New Zealand Environment & Conservation Council (ANZECC), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).
- ANZG, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018)

The general sampling strategy will be as follows:

- All samples will be collected into laboratory prepared and supplied glass jars, bottles and vials with Teflon lined lids. The sampling locations will be accurately recorded.
- All samples will be collected using decontaminated equipment and a new pair of nitrile gloves.
- Samples for analysis for organic compounds will be immediately placed on ice.
- Intra-laboratory field duplicate samples will be analysed at a rate of at least one per 20 primary samples.
- Inter-laboratory field duplicate samples will be analysed at a rate of at least one per 20 primary samples.
- Equipment rinsate blanks will be collected where sampling equipment is used by pouring laboratory prepared and supplied deionised water over the sampling equipment between sampling locations, collected at a rate of 1 per day of sampling or as appropriate to represent potential cross contamination.
- Field reagent blanks will be collected by decanting a laboratory prepared and measured quantity of deionised water into a labelled sample bottle, then leaving the bottle open for a period of time before sealing.
- Water trip blank samples will be prepared by decanting laboratory supplied deionised water into sample containers, sealed and stored in transit in each Esky to measure potential contaminant loss or cross contamination during transport.
- All samples will be forwarded to an analytical laboratory for analysis under chain-of-custody protocols.

6.5.3 Laboratory QAQC Procedures

All primary and duplicate samples will be submitted to a NATA accredited laboratory who will conduct analysis. Ramboll will also perform an independent assessment of the QA/QC measures adopted by the laboratory. The performance of the lab QA/QC measures will be assessed in accordance with the PARCC parameters (precision, accuracy, representativeness, comparability and completeness) as described in Schedule B2 of NEPM (2013). The performance of laboratory QAQC procedures will be assessed independently by Ramboll will include evaluation of the following:

- Method Blanks
- Laboratory control samples
- Matrix Spike and Matrix Spike Duplicates
- Laboratory Duplicates
- Surrogates
- Holding and extraction times
- Limits of reporting
- Issues affecting results (elevated LORs, poor precision, poor recovery, etc…)

6.6 Reporting

Ramboll will document the findings of the DSI in accordance with Table 2.2 of the NSW Environmental Protection Authority (EPA) (2020) *Consultants reporting on contaminated land: Contaminated Land Guidelines*.

The report will provide conclusions and recommendations on the extent of metals at the site including risks to on and off-site receptors and recommendations for management requirements (if any required). Recommendations on the findings of the investigation of other data gaps will also be provided including management recommendations or recommendations for additional investigations (if required).

It is noted that the findings of the DSI will also be used to update the IEMP for the site.

7. References

ANZG 2018. Australian and New Zealand *Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. Available at www.waterquality.gov.au/anz-guidelines

ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Australian Standard (AS) *Guide to the investigation and sampling of sites with potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).

AS 5667.11-1998 Guidance on Sampling of Groundwaters (updated 2016).

DoH (2014) *Contaminated sites ground and surface water chemical screening guidelines*, December 2014.

ERM (2021). *Preliminary Site Investigation, Bungendore Rail Corridor.* Report prepared for John Holland Rail dated 10 November 2021. Project No. 0608750.

ERM (2022a). *XRF Site Survey, 1 Mathews Pl, Bungendore.* Report prepared for John Holland Rail Pty Ltd dated 2 March 2022. Project No. 0698750.

ERM (2022b). *XRF Site Survey, 'Former Signalman's Cottage' 63 Turallo Terrace, Bungendore, NSW 2621.* Report prepared for John Holland Rail Pty Ltd dated 11 March 2022. Project No. 0698750.

ERM (2022c). *Bungendore Indoor Lead Dust Assessment Report, Bungendore Station and Woolshed Areas'.* Report prepared for John Holland Rail dated 15 March 2022. Project No. 0608750.

ERM (2022d). *XRF Site Survey, 'Former Stationmasters Cottage', 16 Majara Street, Bungendore, NSW 2621.* Report prepared for John Holland Rail Pty Ltd dated 15 March 2022. Project No. 0698750.

ERM (2022e). *Offsite Shallow Soil Survey, Bungendore Rail Precinct.* Report prepared for John Holland Rail dated 29 April 2022. Project No. 0608750.

ERM (2022f). *Preliminary Site Investigation, Bungendore Station.* Report prepared for John Holland Rail Pty Ltd dated 3 May 2022. Project No. 0608750.

ERM (2022) *Environmental Site Assessment, TfNSW – Bungendore Stationmasters Residence*. Report prepared for Transport for NSW dated 8 November 2022. Project No. 0650140

ERM (2022h). *Interim Environmental Management Plan, Bungendore Rail Corridor and Woolshed Siding.* Report prepared for John Holland Rail Pty Ltd dated 29 July 2022. Project No. 0608750.

ERM (2022i). *Interim Environmental Management Plan, Bungendore Station.* Report prepared for John Holland Rail Pty Ltd dated 23 August 2022. Project No. 0608750.

ERM (2024). *Environmental Site Assessment, TfNSW- Bungendore Former Signalman's Cottage*. Report prepared for Transport of New South Wales dated 2 July 2024. Project No. 0733205.

Heads of NSW EPA (HNSW EPA) *PFAS National Environmental Management Plan* (NEMP) Version 2.0 (HNSW EPA, 2020).

National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013)

National Health and Medical Research Council (2008) Guidelines for Managing Risks in Recreational Water

NSW DEC (2007) *Guidelines for the Assessment and Management of Groundwater Contamination.*

NSW Environmental Protection Authority (EPA) (2020) *Consultants Reporting on Contaminated Land: Contaminated Land Guidelines*.

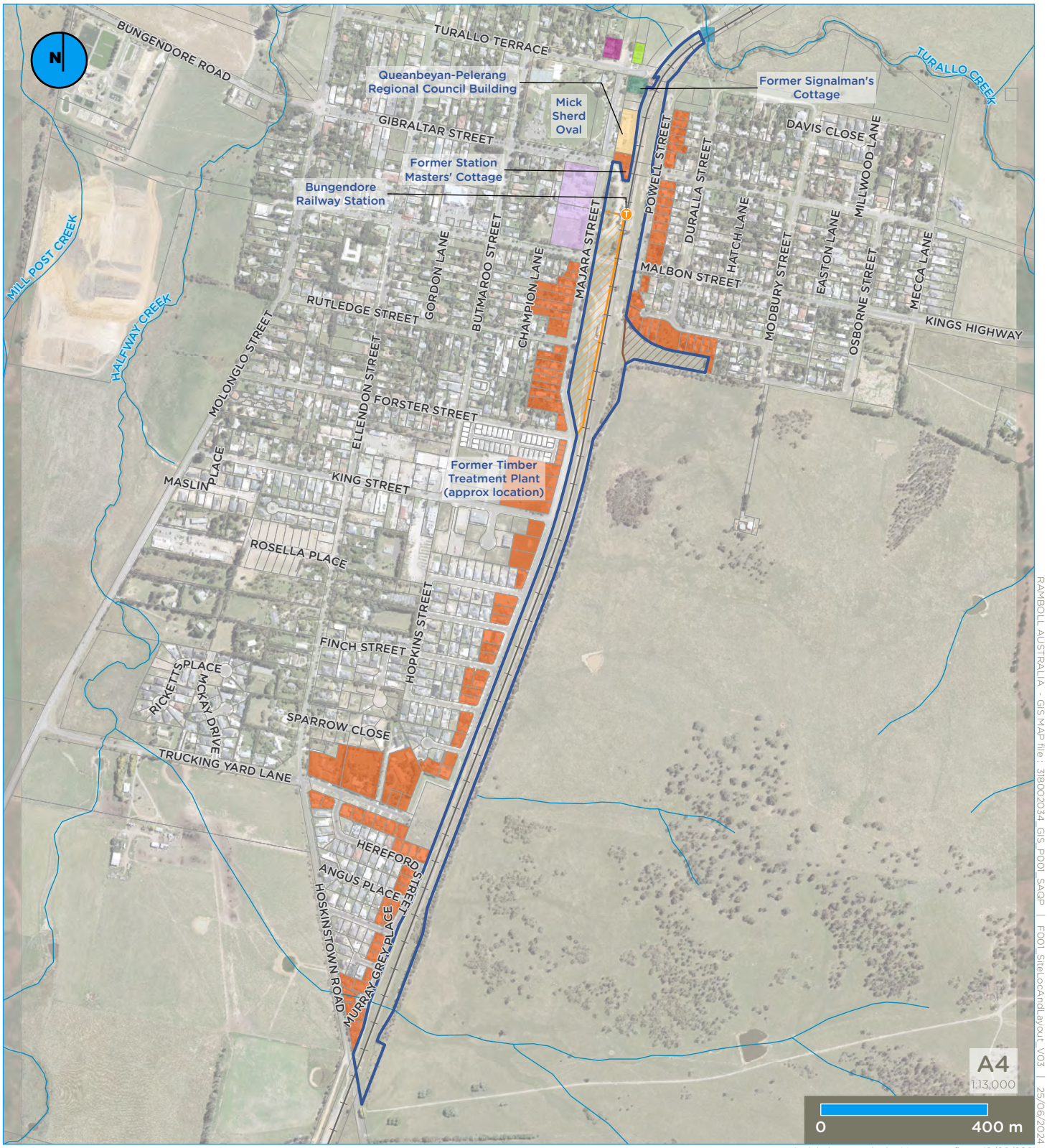
NSW EPA (2022) *Sampling Design, Contaminated Land Guidelines – Part 1 and Part 2*

Ramboll (2021) Bungendore Train Station Environmental Site Assessment. Report No. 318001025-T11-01, October 2021.

US EPA (1989) *Risk Assessment Guidance for Superfund.*

US EPA (2000) *Guidance for the Data Quality Objectives Process and Data Quality Objectives for Hazardous Waste Site Investigations.*

Appendix A
Figures



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file - 318002034_GIS_P001_SAQP | F001_SiteLocAndLayout_V03 | 25/06/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Investigation areas

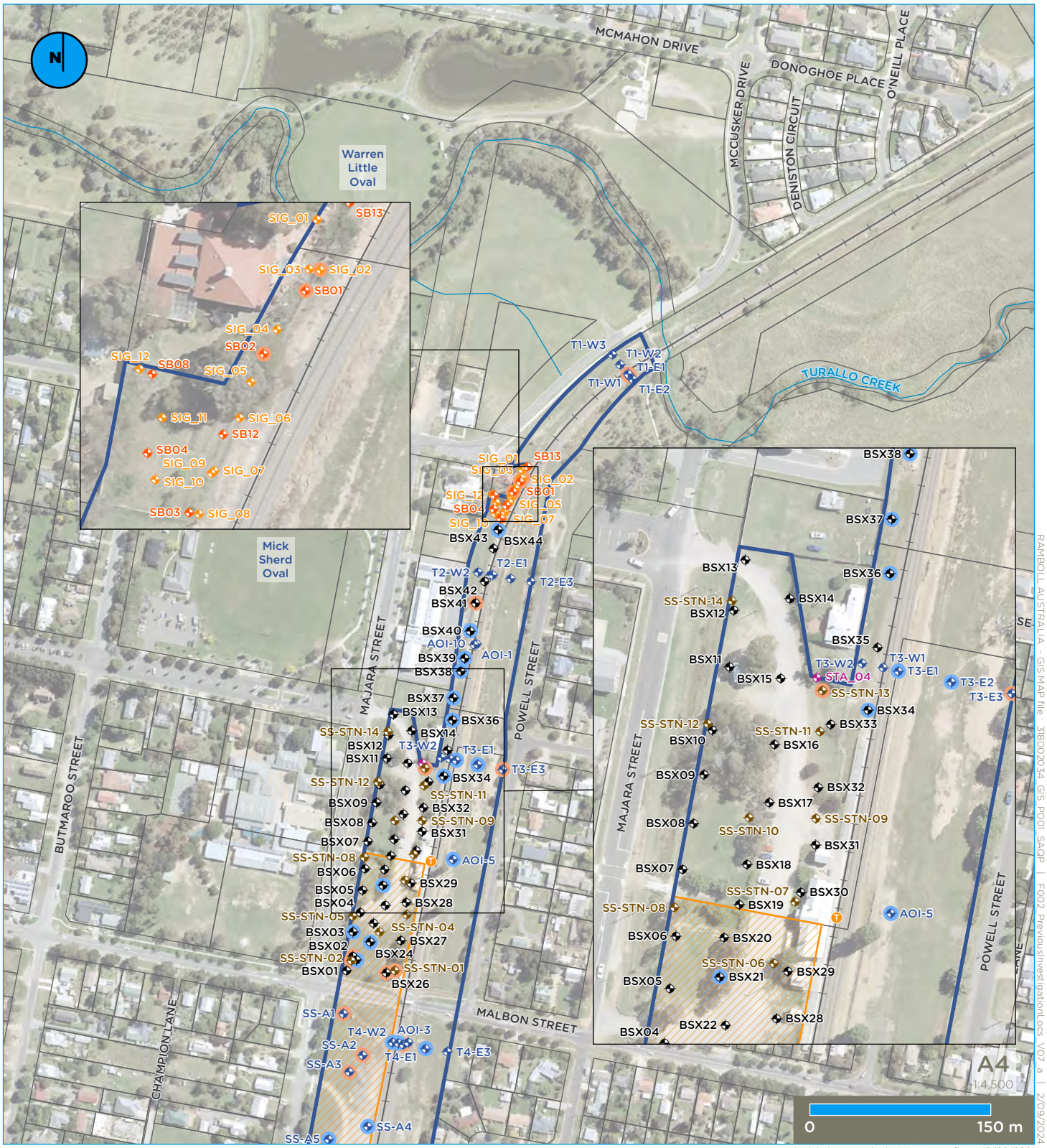
- Area A
- Area B

Sensitive receptors

- Bungendore Community Center
- Bungendore Preschool
- Bungendore Primary School
- Bungendore Scout Hall
- Queanbeyan-Pelerang Regional Council Chambers and Child Care
- Residential
- Turallo Creek

Figure 1 : Site Location and Layout

Bungendore Sampling and Analysis Quality Plan



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file - 318002034_GIS_P001_SAQP | F002_PreviousInvestigationLocs_V07_a | 2/09/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)
- Bungendore Railway Station

Investigation areas

- Area A

Investigation locations

- Ramboll (2021)
- ERM (2021)
- ERM (2022b)
- ERM (2022d)
- ERM (2022f)
- ERM (2024)

Exceedances

- Pb above adopted HIL
- Pb above adopted HIL and EIL

Figure 2a : Previous Investigation Locations

Bungendore Sampling and Analysis Quality Plan

Aerial photography by Metromap, flown 19/08/2021

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Investigation areas

- Area A
- Area B

Investigation locations

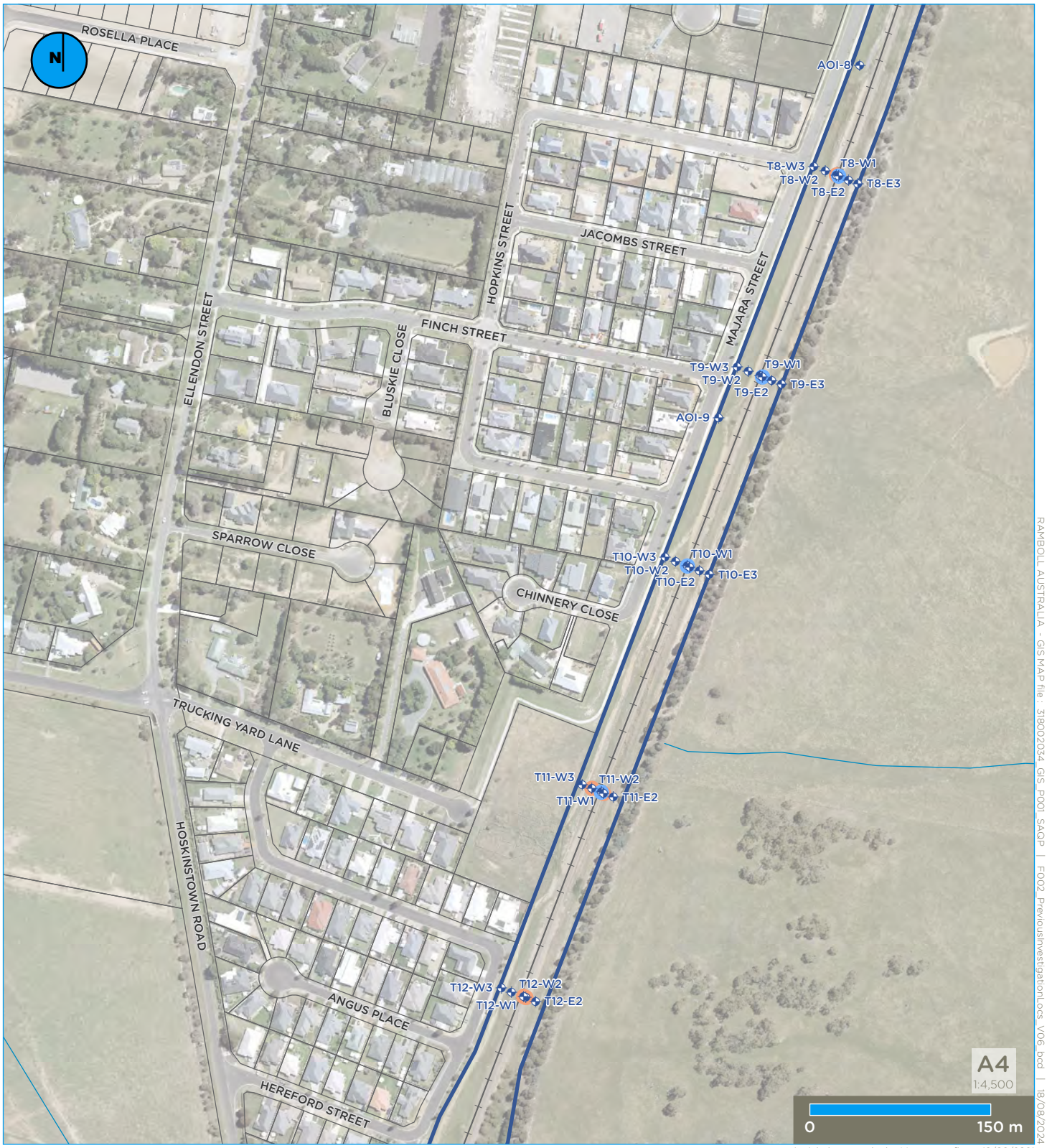
- Ramboll (2021)
- ERM (2021)
- ERM (2022a)
- ERM (2022f)

Exceedances

- Pb above adopted HIL
- Pb above adopted HIL and EIL

Figure 2b : Previous Investigation Locations

Bungendore Sampling and Analysis Quality Plan



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file : 318002034_GIS_P001_SAQP | F002_PreviousInvestigationLocs_V06.bcd | 18/08/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Investigation locations

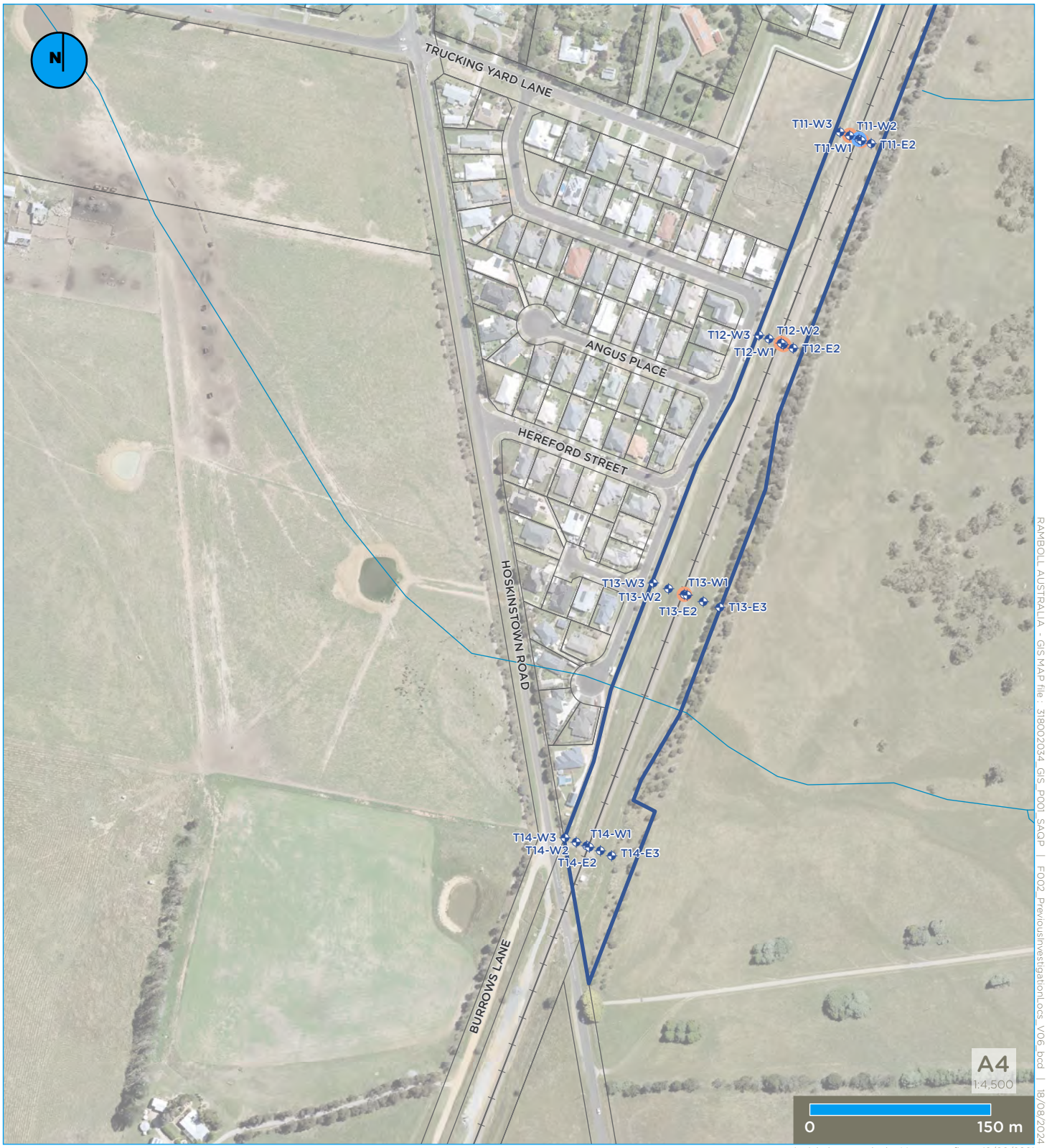
- ERM (2021)

Exceedances

- Pb above adopted HIL
- Pb above adopted HIL and EIL

Figure 2c : Previous Investigation Locations

Bungendore Sampling and Analysis Quality Plan



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file - 318002034_GIS_P001_SAQP | F002_PreviousInvestigationLocs_V06.bcd | 18/08/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Investigation locations

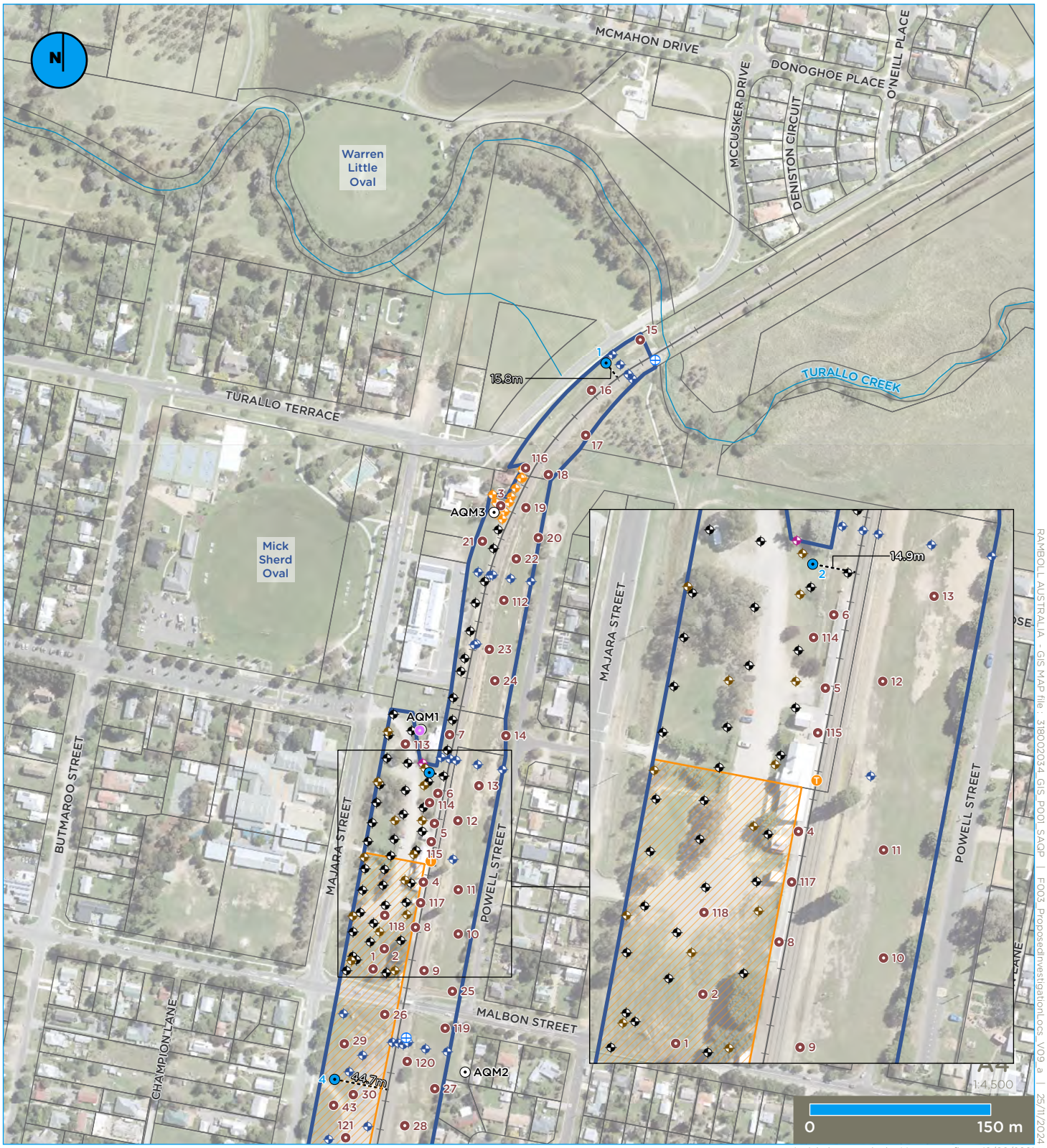
- ERM (2021)

Exceedances

- Pb above adopted HIL
- Pb above adopted HIL and EIL

Figure 2d : Previous Investigation Locations

Bungendore Sampling and Analysis Quality Plan



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file - 31800203.4_GIS_P001_SAQP | F003_ProposedInvestigationLocs_V09_a | 25/11/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)
- Bungendore Railway Station

Proposed investigation locations

- Proposed soil investigation location
- Proposed surface water location
- Proposed groundwater monitoring bore
- Proposed air quality monitor location
- Proposed meteorological station
- Distance between proposed groundwater monitoring bore and railway

Investigation areas

- Area A

Investigation locations

- Ramboll (2021)
- ERM (2021)
- ERM (2022b)
- ERM (2022d)
- ERM (2022f)

Figure 3a : Proposed Investigation Locations

Bungendore Sampling and Analysis Quality Plan

Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file : 318002034_GIS_P001_SAQP | F003_ProposedInvestigationLocs_V09_bcd | 25/11/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Proposed investigation locations

- Proposed soil investigation location
- Proposed surface water location
- Proposed groundwater monitoring bore
- Proposed air quality monitor location

Distance between proposed groundwater monitoring bore and railway

Investigation areas

- Area A
- Area B

Investigation locations

- Ramboll (2021)
- ERM (2021)
- ERM (2022a)
- ERM (2022f)

Figure 3b : Proposed Investigation Locations

Bungendore Sampling and Analysis Quality Plan

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Proposed investigation locations

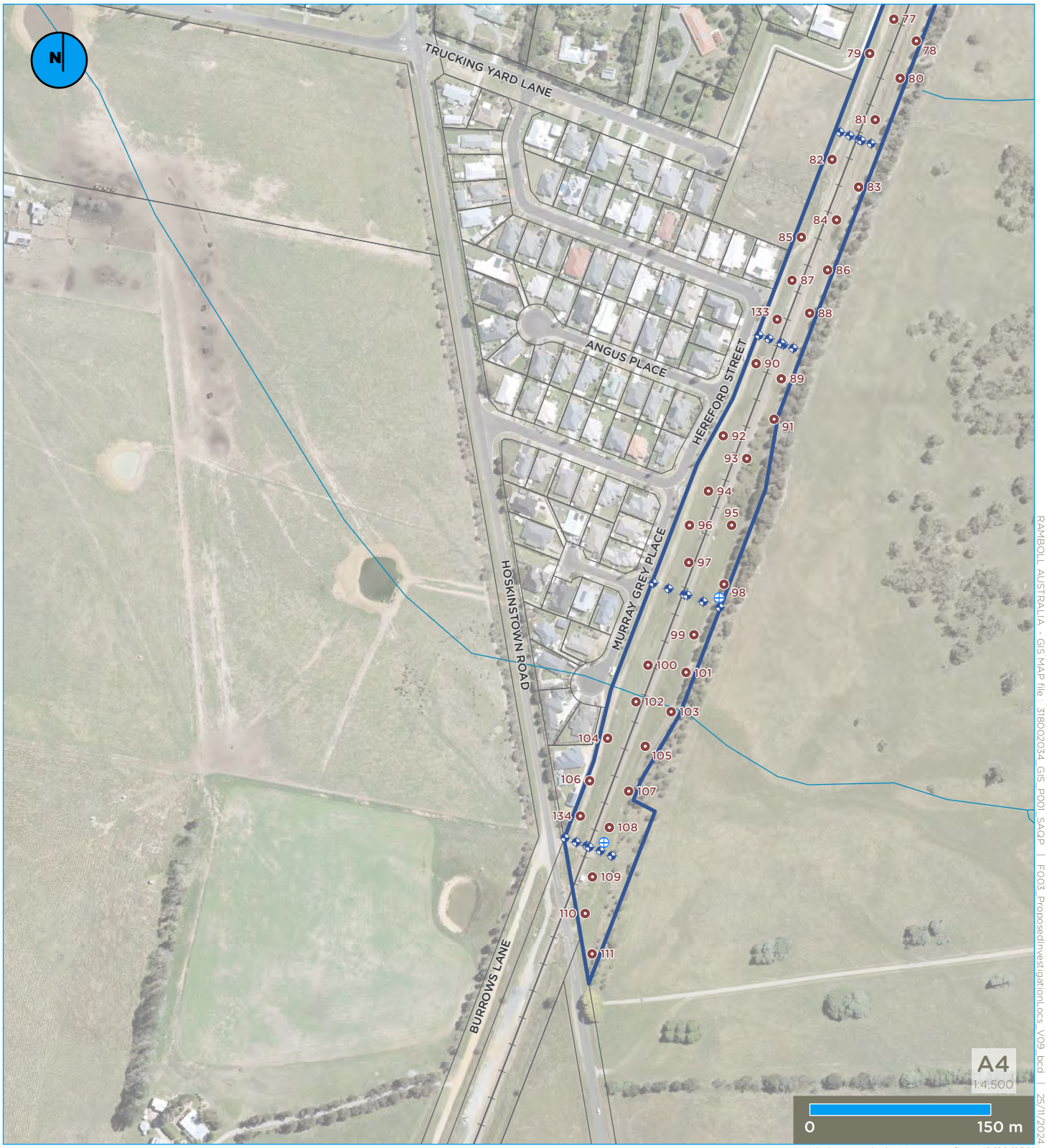
- Proposed soil investigation location
- Proposed groundwater monitoring bore
- Proposed air quality monitor location
- Distance between proposed groundwater monitoring bore and railway

Investigation locations

- ERM (2021)

Figure 3c : Proposed Investigation Locations

Bungendore Sampling and Analysis Quality Plan



Aerial photography by Metromap, flown 19/08/2021

RAMBOLL AUSTRALIA - GIS MAP file : 318002034_GIS_P001_SAQP | F003_ProposedInvestigationLocs_V09_bcd | 25/11/2024

Legend

- Site boundary
- Lot boundary (NSWSS)
- Railway (NSWSS)

Proposed investigation locations

- Proposed soil investigation location
- Proposed surface water location

Investigation locations

- ERM (2021)

Figure 3d : Proposed Investigation Locations

Bungendore Sampling and Analysis Quality Plan

Appendix B
Environment Protection Licence 13421

Environment Protection Licence

Licence - 13421

Licence Details	
Number:	13421
Anniversary Date:	13-January

Licensee

UGL REGIONAL LINX PTY LTD

PO BOX 1069

ORANGE NSW 2800

Premises

COUNTRY REGIONAL NETWORK

COUNTRY REGIONAL NETWORK

ORANGE NSW 2800

Scheduled Activity

Railway activities - railway infrastructure operations

Fee Based Activity	Scale
Railway infrastructure operations	Any annual capacity

Contact Us

NSW EPA

4 Parramatta Square

12 Darcy Street

PARRAMATTA NSW 2150

Phone: 131 555

Email: info@epa.nsw.gov.au

Locked Bag 5022

PARRAMATTA NSW 2124

Environment Protection Licence

Licence - 13421

Environment Protection Licence

Licence - 13421

Environment Protection Licence

Licence - 13421

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

UGL REGIONAL LINX PTY LTD
PO BOX 1069
ORANGE NSW 2800

subject to the conditions which follow.

Environment Protection Licence

Licence - 13421

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Railway activities - railway infrastructure operations	Railway infrastructure operations	Any annual capacity

Objectives of this licence

A1.2 It is an objective of this licence to control and progressively reduce noise and air quality impacts from the operation of rolling stock and management of rail infrastructure.

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
COUNTRY REGIONAL NETWORK
COUNTRY REGIONAL NETWORK
ORANGE
NSW 2800
THE PREMISES TO WHICH THIS LICENCE APPLIES COMPRISES THE COUNTRY REGIONAL NETWORK WHICH IS DEFINED BY THE FOLLOWING RAIL NETWORK DIAGRAM **A) RAIL NETWORK DIAGRAM - RAILWAYS OF NEW SOUTH WALES - 2018 JHR V0.7 SHOWN AS:** **I) COUNTRY REGIONAL NETWORK OPERATIONAL TRACK; AND** **II) COUNTRY REGIONAL NETWORK NON-OPERATIONAL TRACK.** **NOTE: THE RAIL NETWORK DIAGRAM IS CONTAINED IN EPA FILE EF13/4211 (ALSO AVAILABLE AT DOC 22/121189)**

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application,

except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

3 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 The premises must be operated and managed to minimise the generation of dust.

O4 Ongoing track maintenance

O4.1 The premises must be maintained to minimise noise impacts on noise sensitive receivers where safe and practicable to do so.

Environment Protection Licence

O5 Idling and horn use

O5.1 The licensee must minimise noise and air emissions and impacts on sensitive receivers, from locomotive idling on the premises.

O5.2 The licensee must minimise noise impacts on noise sensitive receivers from locomotive horn usage on the premises.

O6 Braking, bunching and stretching

O6.1 The licensee must minimise noise impacts on noise sensitive receivers from braking, bunching and stretching of rolling stock on the premises.

O7 Environmental awareness

O7.1 All staff, including contractors and subcontractors, involved in the carrying out of the activities authorised by this licence must be aware of their environmental responsibilities relating to the activities regulated by this licence.

O8 Waste management

O8.1 The licensee must assess, classify and manage any waste generated at the premises in accordance with the Waste Classification Guidelines Part 1: Classifying Waste, November 2014 prior to transporting the waste off the premises.

O8.2 The licensee must not cause, permit or allow any waste generated:
a) outside the licensed premises to be received at the licensed premises, except as expressly permitted by a condition of this licence or a resource recovery order and resource recovery exemption under the POEO Act.
b) at the premises to be disposed of at the premises, except as expressly permitted by another condition of this licence.

O8.3 Waste that is generated at the premises (including excavated material) may be:
a) Lawfully re-used or recovered within the premises; or
b) Transported from one part of the premises to another part by road in accordance with Condition O8.4.

O8.4 The licensee must ensure that:
a) the body of any vehicle or trailer, used to transport waste or excavated material from the premises, is covered before leaving the premises to minimise any spill or escape of any dust, waste, or spoil from the vehicle or trailer; and
b) mud, splatter, dust and other material likely to fall from or be cast off the wheels, underside or body of any vehicle, trailer or motorised plant leaving the premises, is removed to the greatest extent practicable before the vehicle, trailer or motorised plant leaves the premises; and
c) the surfaces of access roads connecting the premises to public roads are effectively cleaned of any tracked material.

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O9 Other operating conditions

Railway maintenance and construction activities

Note: The objectives of these conditions are to minimise noise impacts from railway maintenance and construction activities, recognising that operational safety and other factors constrain when these activities can be carried out on the premises. These factors include avoiding disruptions during peak periods for passenger services and ensuring that programmed track closures facilitate the efficient completion of maintenance and construction activities. Night-time and weekend work will be required for some activities.

Railway maintenance activities

Standard railway maintenance hours

O9.1 Maintenance activities must be undertaken:
a) between the hours of 7:00am and 6:00pm Mondays to Friday
b) between the hours of 8:00am and 1:00pm Saturday; and
c) not on Sundays or public holidays,
unless an exception in Condition O9.2 or Condition O9.3 applies.

Exception to standard railway maintenance hours

O9.2 The licensee may undertake maintenance activities outside of the hours specified in Condition O9.1:
a) to provide safe and reliable services or a safe working environment; or
b) for emergency works; or
c) for the delivery of oversized plant or structures that require special arrangements or authorisation to be lawfully transported along public roads.

Exception to standard railway maintenance hours for low noise impact generating works

O9.3 (a) The licensee may undertake maintenance activities outside of the hours specified in Condition O9.1, if the activities do not exceed:
(i) 5dBA (LAeq, 15min) above the relevant rating background levels at day, evening and night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation, and
(ii) 15dBA (LA1, 1min or LAmax) above the relevant rating background level at night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation.
(b) The results of any acoustic investigation undertaken in relation to Conditions O9.3(a)(i) and O9.3(a)(ii) must be provided by the licensee when requested by an authorised officer of the EPA.
(c) An acoustic investigation referred to in Conditions O9.3(a)(i) and O9.3(a)(ii) is not required if there are no noise sensitive receivers impacted by the activities.

Management of noise impacts from railway maintenance

O9.4 Where maintenance activities are undertaken, including outside of the hours specified in Condition O9.1, noise impacts must be managed in accordance with the recommendations of the Interim Construction Noise Guideline (DECCW, 2009), as updated from time to time. Consistent with those recommendations, under this condition the licensee is required to:
a) identify noise sensitive receivers that may be affected;

b) identify hours of work for the proposed activities;
c) identify noise impacts at noise sensitive receivers;
d) select and apply reasonable and feasible work practices to minimise noise impacts; and
e) notify the identified noise sensitive receivers at least 5 days prior to the commencement of maintenance activities undertaken outside of the hours specified in Condition O9.1, except where the licensee first becomes aware of the need to undertake those maintenance activities less than 5 days prior to the proposed commencement date, in which case the notification must be provided as soon as practicable after becoming aware of the need to undertake the maintenance activities.

O9.5 When requested by an authorised officer of the EPA, the licensee must provide the following information regarding any proposed maintenance activities on the premises:
a) dates and times of the proposed maintenance activity;
b) location of the proposed maintenance activity;
c) type(s) of work to be performed in conducting the proposed maintenance activity;
d) plant and equipment to be used; and
e) contact name and telephone number of a person who will be on site during the activity and who is authorised by the licensee to take action, including the cessation of the activity or any part of it, if so directed by the EPA. A contact person must be contactable 24 hours a day via the supplied telephone number(s) during the whole of the period that the activity takes place outside the hours specified in Condition O9.1.

O9.6 When requested by an authorised officer of the EPA, the licensee must provide written reasons that demonstrate that maintenance activities undertaken outside of the hours specified in Condition O9.1 comply with the licence.

Railway construction activities

Standard railway construction hours

O9.7 Construction activities must be undertaken:
a) between the hours of 7:00am and 6:00pm Mondays to Friday
b) between the hours of 8:00am and 1:00pm Saturday; and
c) not on Sundays or public holidays,
unless an exception in condition O9.8, O9.9 or O9.10 applies.

Exception to standard railway construction hours

O9.8 a) The licensee may undertake construction activities outside of the hours specified in Condition O9.7:
i) to provide safe and reliable services or a safe working environment; or
ii) for emergency works; or
ii) for the delivery of oversized plant or structures that require special arrangements or authorisation to be lawfully transported along public roads.
b) If emergency works outside of the hours specified in Condition O9.7 are to be undertaken in proximity to noise sensitive receivers the licensee must, on becoming aware of the need to undertake the emergency works, notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 2pm on the next business day after the emergency works commenced that describes:
i) the cause, time and duration of the emergency;
ii) action taken by or on behalf of the licensee in relation to the emergency; and
iii) details of any measures taken or proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency.

c) For emergency works undertaken under this condition, the licensee is not required to comply with Condition O9.13.

Exception to standard railway construction hours for low noise impact generating works

O9.9 (a) The licensee may undertake construction activities outside of the hours specified in Condition O9.7, if the activities do not exceed:
i) 5dBA (LAeq, 15min) above the day, evening and night relevant rating background levels, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation, and
ii) 15dBA (LA1, 1min or LAmax) above the relevant rating background level at night, as determined at the nearest noise sensitive receiver as assessed by acoustic investigation;
(b) The results of any acoustic investigation undertaken in relation to Conditions O9.9(a)(i) and O9.9(a)(ii) must be provided by the licensee when requested by an authorised officer of the EPA.
(c) An acoustic investigation referred to in Conditions O9.9(a)(i) and O9.9 (a)(ii) is not required if there are no noise sensitive receivers impacted by the activities.

Other exceptions to standard railway construction hours

O9.10 The licensee may undertake construction activities outside of the hours specified in Condition O9.7 if agreement between the licensee and potentially affected noise sensitive receivers, termed the ‘local community', has been reached. Any agreement(s) between the licensee and the local community must be recorded in writing and a copy of the agreement(s) kept at the premises by the licensee for the duration of the works and provided to the EPA at any time during or following the works, on request.

Hours for high noise impact generating works

O9.11 With regard to construction activities, any high noise impact generating works must only be undertaken:
a) Between 08:00am – 06:00pm Monday to Friday;
b) Between 08:00am – 01:00pm Saturday; and
c) in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same noise sensitive receivers. For the purposes of this condition, ‘continuous’ includes any period during which there is less than a 1 hour respite between ceasing and recommencing any of the work that is the subject of this condition, or
d) at any other time where there are no noise sensitive receivers identified under Condition O9.12(a) or agreement has been reached with the local community in accordance with Condition O9.10.

Management of noise impacts from railway construction

O9.12 Where railway construction activities are undertaken, including outside of the hours specified in Condition O9.7, noise impacts must be managed in accordance with the recommendations of the Interim Construction Noise Guideline (DECCW, 2009), as updated from time to time. Consistent with those recommendations, the licensee is required to:
a) identify noise sensitive receivers that may be affected;
b) identify hours of work for the proposed activities;
c) identify noise impacts at noise sensitive receivers;
d) select and apply reasonable and feasible work practices to minimise noise impacts; and
e) notify the noise sensitive receivers in accordance with Condition O9.13.

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O9.13 Where noise sensitive receivers are required to be notified under Condition O9.12(e), and except in relation to emergency works undertaken under Condition O9.8, the notification must be made not less than 5 days and not more than 14 days before those works and activities are to be undertaken, unless agreement has been reached with the local community in accordance with Condition O9.10.
a) The notification must be:
i) by letterbox drop or other targeted and equivalent method; and
ii) published on the project website where one exists,
b) The notification must:
i) clearly outline the reason that the work is required to be undertaken outside the hours specified in Condition O9.7;
ii) include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks;
iii) include details of relevant time restrictions that apply to the proposed works;
iv) clearly outline in plain English the location, nature, scope and duration of the proposed works;
v) detail the expected noise impact of the works on noise sensitive receivers;
vi) detail any mitigation measures to be implemented to minimise noise and/or vibration impacts;
vii) clearly state how complaints may be made and additional information obtained; and
viii) include the number of the telephone complaints line required by this licence, an afterhours contact phone number specific to the works and activities, and the project website address where applicable.

O9.14 When requested by an authorised officer of the EPA, the licensee must provide the following information regarding any proposed construction activities on the premises:
a) dates and times of the proposed construction activity;
b) location of the proposed construction activity;
c) type(s) of work to be performed in conducting the proposed construction activity;
d) plant and equipment to be used; and
e) contact name and telephone number of a person who will be on site during the activity and who is authorised by the licensee to take action, including the cessation of the activity or any part of it, if so directed by the EPA. A contact person must be contactable 24 hours a day via the supplied telephone number(s) during the whole of the period that the activity takes place outside the hours specified in Condition O9.7.

O9.15 When requested by an authorised officer of the EPA, the licensee must provide written reasons that demonstrate that construction activities undertaken outside of the hours specified in Condition O9.7 comply with the licence.

Blasting

O9.16 All blasting activities are prohibited unless permitted under another condition of this licence.

Erosion and sediment control

O9.17 The licensee must, before and during maintenance activities and/or construction activities, implement all feasible and reasonable erosion and sediment controls to minimise sediment leaving the premises.

O9.18 Erosion and sediment controls must be designed, constructed, operated and maintained in accordance with “Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition” (Landcom, 2004) to be read and used in conjunction with the relevant DECC Managing Urban Stormwater – Soils and Construction volume.

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4 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

M2 Recording of pollution complaints

M2.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M2.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M2.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M2.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M3 Telephone complaints line

M3.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M3.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M3.3 The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.

M4 Other avenues for complaints

M4.1 The licensee must have an avenue for complaints, such as an email address, accessible from its website, for the purpose of receiving any complaints from members of the public in relation to activities carried out under this licence.

5 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee notification that the Annual Return is due.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is

given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which they became aware of the incident.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;

f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

Identification of rolling stock on the premises in response to complaints

R4.1 a) At the request of an EPA authorised officer, the licensee must make all reasonable inquiries to identify the Rolling Stock Operator which is the subject of a complaint reported to the EPA and to supply those details to the EPA within such time as may be specified in the request.
b) Where the licensee receives a pollution complaint, including noise and vibration complaints, through the telephone complaints line (Condition M3) or other avenues (Condition M4), which relates to rolling stock operating on the premises, the licensee must make all reasonable inquiries to identify the Rolling Stock Operator which is the subject of the complaint (except where the complaint arises because of the actions or instructions of the licensee) where it will assist in resolving the complaint. The details of the complaint must then be provided to the relevant Rolling Stock Operator as soon as is reasonably practicable.

Complaints register reporting

R4.2 a) Within 10 business days of the end of each calendar month, the licensee must submit a report to the EPA, in a form nominated by the EPA, that provides details of all pollution complaints, including noise and vibration complaints, received on the telephone complaints line (Condition M3) or through other avenues (Condition M4) or otherwise referred to the licensee in regards to the activities authorised and controlled by this licence. The report must include:
i) a unique identifier number for each complaint;
ii) the details required by condition M2.2;
iii) the Rolling Stock Operator which is the subject of the complaint, where relevant; and
iv) the date and time that the complaint was reported to any identified Rolling Stock Operator which is the subject of the complaint.
b) The licensee is not required to submit a report for any calendar month during which no complaints were received by or referred to the licensee.
c) The preceding conditions do not apply until 3 months from 5 of August 2020.

Notification of railway construction projects

R4.3 Within 10 days of the end of each calendar month, the licensee must provide a monthly report to the EPA listing all construction activities being undertaken on the premises or scheduled to be undertaken on the premises prior to the next monthly reporting period. The report must include:
a) the dates and times of the construction activities;
b) the location(s) of the construction activities;
c) a description of the works to be undertaken, including the type of plant and equipment used;
d) details of any mitigation or management measures implemented at the construction location to meet the conditions of this licence and the requirements of the Act; and

e) The licensee is not required to submit a report for any calendar month during which there were no construction activities undertaken or scheduled to be undertaken by the licensee.

6 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G1.4 For the purpose of Condition G1.1 the premises is defined as the principal office of the licensee.

G1.5 For the purpose of G1.3 "available for inspection" includes inspection via electronic means.

G2 Contact number for incidents and responsible employees

G2.1 The licensee must provide the EPA with up to date contact details to enable the EPA:
a) to contact either the licensee or a representative of the licensee who can respond at all times to incidents relating to the premises, and
b) to contact the licensee's senior employees or agents authorised at all times to:
i) speak on behalf of the licensee, and
ii) provide any information or document required under the licence.

G2.2 The contact details required by Condition G2.1 above must include:
a) the full name and title of the authorised representatives and the scope of their respective authorisations; and
b) the direct telephone number, mobile number, email address and postal address for contacting each authorised representative.

7 Special Conditions

E1 Special Dictionary

Railway Infrastructure Operations Licence Dictionary

E1.1 In this licence, unless the contrary is indicated, the terms below have the following meanings:

Term	Definition

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construction activities	means construction of railway infrastructure carried out at a scale below the threshold for the scheduled activity of “railway activities—railway infrastructure construction” in clause 33(2) of Schedule 1 to the Protection of the Environment Operations Act 1997. ‘Railway infrastructure’ has the same meaning as in clause 33(4) of Schedule 1 to the Act.
day	the period from 0700 to 1800 h (Monday to Saturday) and 0800 to 1800 h (Sundays and Public Holidays).
emergency works	means unforeseen works: (a) to avoid harm to persons (loss of life and personal injury) or damage to property or to prevent environmental harm; or (b) To restore safe and reliable railway passenger and freight services or to prevent imminent interruptions to those services.
evening	the period from 1800 to 2200 h.
feasible and reasonable	has the same meaning as defined in the Rail Infrastructure Noise Guideline (EPA, 2013) for operational rail activities and has the same meaning as defined in the Interim Construction Noise Guideline (DECC, 2009) for construction / maintenance activities.
freight wagon	a railway vehicle that is used or intended to be used to transport freight for reward, but does not include a locomotive.
high noise impact generating works	means: (a) rail regulating and tamping, jack hammering, grinding, line drilling, pile driving, vibratory rolling, rock hammering, rock breaking, saw cutting, sheet piling; or (b) any other activities where those activities in (a) above generate offensive noise (as defined in the Dictionary to the Protection of the Operations Act 1997) at noise sensitive receivers, because of their impulsive, intermittent, low frequency or tonal characteristics.
LAFMax	means A-weighted maximum noise level, fast weighting.
locomotive	a vehicle powered by an internal combustion engine that is primarily intended for hauling freight and/or passenger rolling stock.
LZFMax	means Z-weighted maximum noise level, fast weighting.
maintenance activities	means repair, upgrading or alteration of ‘railway infrastructure’ as defined in clause 33(4) of Schedule 1 to the Act.
night	the period from 2200 to 0700 h (Monday to Saturday) and 2200 to 0800 h (Sundays and Public Holidays)
noise sensitive receivers	receiver types and land-uses identified in Table 1, 2 and 3 of the Rail Infrastructure Noise Guideline (EPA, 2013).
railway infrastructure operations	means the scheduled activity in clause 33A of Schedule 1 to the Act.
railway infrastructure operator	means a person authorised by an environment protection licence to carry out the scheduled activity of Railway Infrastructure Operations under clause 33A of Schedule 1 to the Act.

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rating background level (RBL)	is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). Determination of the rating background level is by the method described in the NSW Noise Policy for Industry (EPA, 2017)
rolling stock	has the same meaning as in clause 33B of Schedule 1 to the Act.
rolling stock operations	means the scheduled activity in Clause 33B of Schedule 1 to the Act.
rolling stock operator	means a person authorised by an environment protection licence to carry out the scheduled activity of Rolling Stock Operations under Clause 33B of Schedule 1 to the Act.
sensitive receiver	a location where people are likely to work or reside; this includes residential dwellings, schools, hospitals, offices or public recreational areas.

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder describe d at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same me aning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non - putrescible), special waste or hazardous waste

Ms Jacinta Hanemann

Environment Protection Authority

(By Delegation)
Date of this edition: 13-January-2012

End Notes

2	Licence varied by notice 1504575 issued on 27-Feb-2012
3	Licence varied by notice 1519800 issued on 10-Feb-2014
4	Licence format updated on 27-Feb-2014
5	Licence varied by notice 1548217 issued on 27-Jan-2017
6	Licence varied by notice 1551483 issued on 27-Apr-2017
7	Licence varied by notice 1560821 issued on 23-Feb-2018
8	Licence varied by notice 1586295 issued on 02-Oct-2019
9	Licence varied by notice 1593551 issued on 05-Aug-2020
10	Licence transferred through application 1614426 approved on 28-Jan-2022 , which came into effect on 29-Jan-2022
11	Licence varied by notice 1616523 issued on 11-Mar-2022

Appendix C
Historical Result Tables

Client: John Holland Rail
Job No:318001025
Project Name: Bungendore Train Station ESA
5/10/2021

Table 1 - Analytical Summary - FPXRF Moisture Corrected Data

	NEPM 2013 HIL D Commercial / Industrial	Generic EIL Commercial / Industrial	Sample Type:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample ID:	BSX01	BSX02	BSX03	BSX04	BSX05	BSX06	BSX07	BSX08	BSX09	BSX10	BSX11	BSX12	BSX13	BSX14	BSX15	BSX16	BSX17	BSX18
			Sample date:	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021
			Project Name:	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor
			Sampling Method:	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
Analyte grouping/Analyte			**Units**	**LOR**																		
Heavy Metals																						
Arsenic	3000	160	mg/kg	5	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Chromium	3600		mg/kg	2	24	47	< LOD	40	25	71	29	42	25	47	< LOD	39	< LOD	< LOD	< LOD	28	< LOD	< LOD
Copper	240000		mg/kg	5	< LOD	99	299	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Iron			mg/kg	0.005	11352	50047	25713	15937	13572	24171	11274	5869	11075	17783	12917	9899	11950	7085	9091	10283	13923	13124
Lead	1500	1800	mg/kg	5	21	1573	3640	< LOD	102	< LOD	< LOD	< LOD	< LOD	45	18	45	70	< LOD	< LOD	76	261	32
Nickel	6000		mg/kg	2	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	66	< LOD	< LOD	< LOD
Zinc	400000		mg/kg	5	46	546	810	< LOD	55	< LOD	< LOD	47	< LOD	< LOD	< LOD	< LOD	40	< LOD	< LOD	42	123	258

Blank Cell indicates no criterion available
LOD = Limit of Detection
National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).
Concentrations in orange box exceed adopted EIL for commercial/industrial use
Concentrations in orange bold font exceed adopted HIL D for commercial/industrial use
*higher field duplicate value adopted
**hgher laboratory duplicate value adopted

Client: John Holland Rail
Job No:318001025
Project Name: Bungendore Train Station ESA
5/10/2021

Table 1 - Analytical Summary - FPXRF Moisture Corrected Data

	NEPM 2013 HIL D Commercial / Industrial	Generic EIL Commercial / Industrial	Sample Type:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample ID:	BSX19	BSX20	BSX21	BSX21_0.05	HA-BSX21_0.1	BSX22	BSX23	BSX24	HA-BSX24_0.1	BSX25	HA-BSX25_0.1	HA-BSX25_0.15	BSX26	BSX27	BSX28	BSX29	BSX30	BSX31
			Sample date:	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021
			Project Name:	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor
			Sampling Method:	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
Analyte grouping/Analyte			**Units**	**LOR**																		
Heavy Metals																						
Arsenic	3000	160	mg/kg	5	< LOD	< LOD	66	421	< LOD	< LOD	< LOD	< LOD	187	< LOD	330	< LOD	< LOD	84	54	< LOD	< LOD	< LOD	< LOD
Chromium	3600		mg/kg	2	< LOD	41	< LOD	34	34	35	< LOD	< LOD	< LOD	41	< LOD	29	< LOD	< LOD	< LOD	< LOD	36	32	< LOD
Copper	240000		mg/kg	5	< LOD	< LOD	73	430	< LOD	< LOD	< LOD	218	< LOD	537	< LOD	< LOD	118	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Iron			mg/kg	0.005	8699	15225	19201	37290	5662	11701	10525	17921	4500	36007	11666	12723	22949	32027	11245	8407	5168	10750
Lead	1500	1800	mg/kg	5	36	44	962	4910	209	< LOD	26	3770	69	10770	364	149	1724	834	44	88	33	95
Nickel	6000		mg/kg	2	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Zinc	400000		mg/kg	5	242	< LOD	344	588	< LOD	< LOD	< LOD	1331	< LOD	837	55	67	540	509	39	< LOD	< LOD	29

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Client: John Holland Rail
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Table 1 - Analytical Summary - FPXRF Moisture Corrected Data

	NEPM 2013 HIL D Commercial / Industrial	Generic EIL Commercial / Industrial	Sample Type:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
			Sample ID:	BSX32	BSX33	BSX34	BSX35	BSX36	BSX37	BSX38	BSX39	BSX40	BSX41	BSX42	BSX43	BSX44
			Sample date:	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021
			Project Name:	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor	Bungendore Rail Corridor
			Sampling Method:	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF	XRF
Analyte grouping/Analyte			**Units**	**LOR**												
Heavy Metals																
Arsenic	3000	160	mg/kg	5	< LOD	< LOD	137	150	276	2983	1012	567	279	205	114	29	352
Chromium	3600		mg/kg	2	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	50	< LOD	64	47	< LOD	< LOD	82
Copper	240000		mg/kg	5	< LOD	< LOD	272	91	125	1008	497	325	177	< LOD	80	< LOD	454
Iron			mg/kg	0.005	5855	6162	43285	28746	41585	62911	43171	30907	33459	19274	21374	20172	50906
Lead	1500	1800	mg/kg	5	22	185	1898	855	2006	5740	2480	2601	2087	1662	825	65	1801
Nickel	6000		mg/kg	2	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Zinc	400000		mg/kg	5	53	374	559	531	1078	7286	770	423	593	598	1169	552	1257

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Table 2 - QA/QC Summary

Table III: Laboratory QA/QC Results

	XRF and Lab Duplicate			XRF and Lab Duplicate			XRF and Lab Duplicate			Inter Lab Duplicate			Inter Lab Duplicate			Inter Lab Duplicate			Field Blank (SiO2)	Field Blank (SiO2)	Field Blank (SiO2)	Reference Material (RCRApp)	Reference Material (RCRApp)	Reference Material (RCRApp)	Reference Material (RCRApp)
Date:	13/02/2021	13/02/2021		13/02/2021	13/02/2021		13/02/2021	13/02/2021		13/02/2021	13/02/2021		13/02/2021	13/02/2021		13/02/2021	13/02/2021		13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021	13/02/2021
Sample ID:	BSX10	QA35	RPD %	BSX24	QA39	RPD %	BSX37	QA43	RPD %	QA35	QA36	RPD %	QA39	QA40	RPD %	QA43	QA44	RPD %	CHECK BLANK	CHECK BLANK	CHECK BLANK	RCRA APP	RCRA APP	RCRA APP	RCRA APP
Calibration Concentration:	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		< LOD	< LOD	< LOD	500	500	500	500
Laboratory Report:	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Analyte grouping/Analyte																									
Heavy Metals																									
Arsenic	< LOD	8	-	187	48	**118%**	2983	3000	**1%**	8	5	**46%**	48	1600	**188%**	3000	14	**198%**	<LOD	<LOD	<LOD	474	430	435	472
Chromium	47	19	**85%**	< LOD	22	-	< LOD	31	-	19	15	24%	22	13	**51%**	31	43	**32%**	<LOD	<LOD	<LOD	594	633	651	632
Copper	< LOD	16	-	218	200	**9%**	1008	670	**40%**	16	15	6%	200	460	**79%**	670	77	**159%**	<LOD	<LOD	<LOD	< LOD	< LOD	< LOD	< LOD
Lead	45	26	**53%**	3770	3500	**7%**	5740	4300	**29%**	26	39	**40%**	3500	2200	**46%**	4300	90	**192%**	<LOD	<LOD	<LOD	440	457	454	445
Nickel	< LOD	9	-	< LOD	8	-	< LOD	22	-	9	4	**75%**	8	10	23%	22	6	**114%**	<LOD	<LOD	<LOD	< LOD	< LOD	< LOD	< LOD
Zinc	< LOD	26	-	1331	710	**61%**	7286	4300	**52%**	26	45	**54%**	710	2600	**114%**	4300	290	**175%**	<LOD	<LOD	<LOD	< LOD	< LOD	< LOD	< LOD

Note all units in ppm unless stated otherwise
<LOD = Less than Limit of Detection
<LOR = Less than laboratory Limit of Reporting

Reference RPD for Lead	13%	9%	10%	12%

ERM

Field_ID	LocCode	Sampled_Date-Time	Lab_Report_Number	Purpose	Monitoring_Zone	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
						Metals														
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						2	10	1	10	0.4	2	2	5	5	5	0.1	2	2	5	5
*NEPM (1999) EIL - Urban Residential & Open Space**						*108*					*190*		*73*	*1122*			*177*			*206*
NEPM (1999) EIL - Commercial/Industrial						**168**					**310**		**98**	**1822**			**297**			**316**
NEPM 2013 Table 1A(1) Residential (HIL A)*						100		60	4500	20		100	6000	300	3800	40	400	200		7400
NEPM 2013 Table 1A(1) Recreation (HIL C)						300		90	20000	90		300	17000	600	19000	80	1200	700		30000
NEPM 2013 Table 1A(1) Comm/Ind (HIL D)						3000		500	300000	900		4000	240000	1500	60000	730	6000	10000		400000
AOI-1	AOI-1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	26	20	<1	<50	<1	9	<2	93	542	64	<0.1	<2	<5	12	250
AOI-2	AOI-2	5/08/2021	ES2128631	Primary	Rail Corridor - Boundary / Drainage - Adjacent Turallo Creek	<5	30	<1	<50	<1	10	3	11	8	135	<0.1	4	<5	18	22
AOI-3	AOI-3	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor / Drainage to Malbon St	15	150	1	<50	2	29	13	47	495	415	<0.1	16	<5	53	1210
AOI-5	AOI-5	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	63	100	<1	<50	2	22	3	404	4710	144	0.9	6	<5	32	1220
D04_210805	AOI-5	5/08/2021	ES2128631	Intra Laboratory Dup	Rail Corridor - Mid Corridor	83	130	1	<50	4	25	<2	342	4360	114	1	7	5	27	1330
T04_210805	AOI-5	3/08/2021	815855	Inter Laboratory Dup	Rail Corridor - Mid Corridor	81	110	<2	<10	2.6	26	<5	310	3900	200	0.7	7.8	<2	56	1000
AO1-6	AOI-6	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	502	90	<1	<50	6	263	<2	906	39,000	109	1.9	4	7	17	2570
AOI-7	AOI-7	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	410	150	<1	<50	6	6	<2	1120	9200	32	11	<2	23	12	829
AOI-8	AOI-8	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	17	60	<1	<50	<1	17	6	25	148	413	<0.1	3	<5	34	208
AOI-9	AOI-9	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	5	40	<1	<50	<1	17	5	12	28	412	<0.1	3	<5	27	47
AOI-10	AOI-10	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	46	30	<1	<50	<1	25	5	62	169	234	<0.1	16	<5	30	165
SS-A1	SS-A1	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	34	80	<1	<50	2	16	8	107	1230	566	0.1	7	<5	25	603
SS-A2	SS-A2	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	22	100	<1	<50	2	12	3	184	1160	416	<0.1	6	<5	17	732
SS-A3	SS-A3	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	24	80	<1	<50	2	11	4	161	1490	607	<0.1	5	<5	15	734
SS-A4	SS-A4	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	67	90	<1	<50	4	13	8	333	2120	433	0.1	8	<5	25	1630
SS-A5	SS-A5	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	257	80	<1	<50	4	6	<2	962	53,900	41	23.6	<2	19	13	3120
SS-A6	SS-A6	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	20	40	<1	<50	<1	9	3	87	1010	124	0.2	5	<5	16	203
SS-A7	SS-A7	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	18	50	<1	<50	1	12	4	113	746	237	<0.1	6	<5	21	728
SS-A8	SS-A8	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding / Drainage to Majara St	10	40	<1	<50	<1	11	4	96	627	356	0.1	2	<5	18	138
SS-A9	SS-A9	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	16	60	<1	<50	5	16	4	136	1020	143	0.2	5	<5	20	576
SS-A10	SS-A10	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	23	90	<1	<50	<1	11	5	73	260	348	<0.1	6	<5	18	192
SS-A11	SS-A11	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	12	50	<1	<50	<1	13	3	35	950	192	<0.1	4	<5	17	154
SS-A12	SS-A12	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	16	40	<1	<50	<1	13	3	35	154	296	<0.1	3	<5	20	154
SS-A13	SS-A13	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	42	60	<1	<50	4	14	5	187	817	582	0.3	4	<5	21	1740
SS-A14	SS-A14	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	27	30	<1	<50	<1	11	2	38	225	273	<0.1	2	<5	17	182
SS-A15	SS-A15	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	7	60	<1	<50	<1	12	<2	26	193	274	0.4	3	<5	14	151
SS-A16	SS-A16	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	75	170	<1	<50	3	8	3	219	1920	269	0.2	5	<5	14	711
SS-A17	SS-A17	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	6	30	<1	<50	<1	12	2	6	33	280	<0.1	<2	<5	16	80
SS-A18	SS-A18	4/08/2021	ES2128631	Primary	Area A - Woolshed Siding	14	160	<1	<50	1	11	2	106	174	212	<0.1	7	<5	12	565
SS-B1	SS-B1	5/08/2021	ES2128631	Primary	Area B - Former Rail Fork	9	40	<1	<50	<1	10	3	38	378	279	<0.1	2	<5	18	*254*
D02_210805	SS-B1	5/08/2021	ES2128631	Intra Laboratory Dup	Area B - Former Rail Fork	10	40	<1	<50	<1	16	3	45	406	313	<0.1	3	<5	23	*275*
T02_210805	SS-B1	3/08/2021	815855	Inter Laboratory Dup	Area B - Former Rail Fork	41	29	<2	<10	0.9	17	7.8	53	230	240	<0.1	7.7	<2	23	*220*
SS-B2	SS-B2	5/08/2021	ES2128631	Primary	Area B - Former Rail Fork	*147*	50	<1	<50	<1	14	7	26	317	418	0.1	4	<5	29	176
SS-B3	SS-B3	5/08/2021	ES2128631	Primary	Area B - Former Rail Fork	<5	80	<1	<50	<1	10	4	12	59	573	<0.1	3	<5	20	130
SS-B4	SS-B4	5/08/2021	ES2128631	Primary	Area B - Former Rail Fork	5	50	<1	<50	<1	18	6	12	58	531	<0.1	4	<5	26	77
SS-B5	SS-B5	5/08/2021	ES2128631	Primary	Area B - Former Rail Fork	<5	40	<1	<50	<1	19	5	9	31	556	<0.1	3	<5	28	109
D01_210805	SS-B5	5/08/2021	ES2128631	Intra Laboratory Dup	Area B - Former Rail Fork	<5	40	<1	<50	<1	19	5	10	33	550	<0.1	4	<5	27	89
T01_210805	SS-B5	3/08/2021	815855	Inter Laboratory Dup	Area B - Former Rail Fork	2	35	<2	<10	<0.4	15	<5	7.3	23	370	<0.1	<5	<2	20	96
SS-C1	SS-C1	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	17	120	<1	<50	<1	27	13	16	27	772	<0.1	8	<5	39	47
SS-C2	SS-C2	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	5	90	<1	<50	<1	18	10	13	12	469	<0.1	7	<5	31	19
SS-C3	SS-C3	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	5	70	<1	<50	<1	20	10	13	13	381	<0.1	7	<5	35	17
SS-C4	SS-C4	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	6	40	<1	<50	<1	8	4	9	62	264	<0.1	3	<5	13	22
SS-C5	SS-C5	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	7	80	<1	<50	<1	34	11	14	15	628	<0.1	9	<5	38	21
SS-C6	SS-C6	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	<5	50	<1	<50	<1	12	5	10	7	255	<0.1	5	<5	21	26
SS-C7	SS-C7	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	6	90	<1	<50	<1	25	18	14	23	686	<0.1	7	<5	32	27
SS-C8	SS-C8	3/08/2021	ES2128631	Primary	Area C - Trucking Yard Lane	11	80	<1	<50	<1	33	17	15	20	541	<0.1	12	<5	80	29
T1-E1	T1-E1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	45	70	<1	<50	3	20	9	196	870	482	0.1	9	<5	30	879
T1-E2	T1-E2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	18	70	<1	<50	1	13	5	35	165	319	0.1	6	<5	18	461
T1-E3	T1-E3	5/08/2021	ES2128631	Primary	Rail Corridor - Boundary	7	80	<1	<50	<1	21	8	25	60	300	<0.1	12	<5	39	*211*
T1-W1	T1-W1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	282	50	<1	<50	2	18	7	169	919	358	0.4	5	<5	33	427
T1-W2	T1-W2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	9	40	<1	<50	<1	8	4	35	70	174	<0.1	5	<5	16	77
T1-W3	T1-W3	5/08/2021	ES2128631	Primary	Rail Corridor - Boundary	6	100	3	<50	<1	16	8	23	62	277	<0.1	14	<5	43	136
T2-E1	T2-E1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	38	30	<1	<50	<1	14	2	49	231	145	<0.1	5	<5	17	268
T2-E2	T2-E2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	14	70	<1	<50	<1	14	5	21	87	247	<0.1	4	<5	20	70
D03_210805	T2-E2	5/08/2021	ES2128631	Intra Laboratory Dup	Rail Corridor - Mid Corridor	51	50	<1	<50	1	16	3	72	408	229	<0.1	7	<5	20	357
T03_210805	T2-E2	3/08/2021	815855	Inter Laboratory Dup	Rail Corridor - Mid Corridor	7.6	34	<2	<10	0.6	11	<5	32	290	230	<0.1	<5	<2	18	180
T2-E3	T2-E3	5/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	40	<1	<50	<1	12	9	8	11	282	<0.1	2	<5	16	19
T2-W1	T2-W1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	60	40	<1	<50	<1	12	6	151	1370	323	0.2	12	<5	23	334
T2-W2	T2-W2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	35	20	<1	<50	<1	13	2	30	189	142	<0.1	3	<5	20	104
T3-E1	T3-E1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	155	120	<1	<50	1	12	2	506	7430	104	1.8	5	10	18	673
T3-E2	T3-E2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	87	30	<1	<50	<1	11	<2	180	2010	52	0.2	3	<5	15	339
T3-E3	T3-E3	5/08/2021	ES2128631	Primary	Rail Corridor - Boundary	73	40	<1	<50	<1	13	<2	53	320	31	<0.1	3	<5	21	118
T3-W1	T3-W1	5/08/2021	ES2128631	Primary	Rail Corridor - Rail line	22	30	<1	<50	<1	6	<2	73	581	81	<0.1	3	<5	15	124
T3-W2	T3-W2	5/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	9	40	<1	<50	<1	12	3	13	88	288	<0.1	2	<5	19	142
T4-E1	T4-E1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	138	30	<1	<50	<1	9	3	124	957	166	0.2	3	<5	14	200
T4-E2	T4-E2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	70	80	<1	<50	1	27	4	252	2730	227	0.3	8	<5	35	684
T4-E3	T4-E3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	6	50	<1	<50	<1	20	4	24	146	420	<0.1	4	<5	29	182
T4-W1	T4-W1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	250	100	<1	<50	2	22	3	1240	26,300	202	1.6	7	6	34	1020
T4-W2	T4-W2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	137	50	<1	<50	2	16	4	473	2750	222	0.4	6	<5	30	833
T5-E1	T5-E1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	105	60	<1	<50	4	20	3	644	15,600	247	2.9	5	6	23	1260
T5-E2	T5-E2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	335	90	<1	<50	3	9	<2	835	47,000	26	20.4	<2	29	13	1570
T5-E3	T5-E3	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	48	40	<1	<50	<1	15	6	51	367	343	<0.1	4	<5	24	*216*
T5-W1	T5-W1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	158	80	<1	<50	6	38	5	473	7710	205	1.3	6	<5	26	1320
T5-W2	T5-W2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	20	80	<1	<50	3	12	2	146	711	135	0.1	4	<5	16	559
T6-E1	T6-E1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	12	40	<1	<50	<1	27	4	90	272	338	<0.1	7	<5	20	192
T6-E2	T6-E2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor / Drainage to Agricultural Land	<5	40	<1	<50	<1	14	3	10	53	314	<0.1	3	<5	18	46
T6-E3	T6-E3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	60	<1	<50	<1	14	6	10	46	860	<0.1	2	<5	17	*226*
T6-W1	T6-W1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	93	60	<1	<50	2	16	5	199	771	307	0.1	7	<5	27	388
T6-W2	T6-W2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	72	50	<1	<50	2	19	3	528	2450	212	0.5	4	<5	36	633
T7-E1	T7-E1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	119	30	<1	<50	1	23	2	190	941	202	<0.1	3	<5	24	189
T7-E2	T7-E2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	24	40	<1	<50	<1	48	6	29	54	346	<0.1	4	<5	37	124
T7-E3	T7-E3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	8	40	<1	<50	<1	23	4	11	23	519	<0.1	2	<5	28	129
T7-W1	T7-W1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	38	20	<1	<50	<1	43	9	138	395	408	<0.1	46	<5	20	151
T7-W2	T7-W2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	22	30	<1	<50	<1	29	3	22	63	400	<0.1	4	<5	20	198
T7-W3	T7-W3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	15	40	<1	<50	<1	26	5	31	80	523	<0.1	8	<5	25	188
T8-E1	T8-E1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	125	20	<1	<50	<1	11	2	339	2360	151	0.4	6	<5	19	240
T8-E2	T8-E2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	9	40	<1	<50	<1	19	3	19	101	223	<0.1	3	<5	32	135
T8-E3	T8-E3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	50	<1	<50	<1	14	7	8	26	724	<0.1	3	<5	24	52
T8-W1	T8-W1	4/08/2021	ES2128631	Primary	Rail Corridor - Rail line	37	40	<1	<50	2	22	10	76	646	337	<0.1	6	<5	40	975
T8-W2	T8-W2	4/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	14	50	<1	<50	<1	15	5	28	147	448	<0.1	4	<5	27	387
T8-W3	T8-W3	4/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	20	<1	<50	<1	12	3	8	28	231	<0.1	3	<5	21	67
T9-E1	T9-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	208	160	1	<50	<1	12	3	246	3630	72	1.9	6	6	27	216
T9-E2	T9-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	10	110	<1	<50	<1	23	6	35	186	692	<0.1	8	<5	34	246
T9-E3	T9-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	6	130	<1	<50	<1	31	9	19	38	1190	<0.1	9	<5	40	97
T9-W1	T9-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	24	110	1	<50	<1	46	27	56	369	828	<0.1	13	<5	77	252
T9-W2	T9-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	<5	80	<1	<50	<1	17	7	14	39	756	<0.1	6	<5	30	76
T9-W3	T9-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	7	70	<1	<50	<1	24	9	17	17	482	<0.1	8	<5	34	37
T10-E1	T10-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	25	60	<1	<50	<1	16	3	21	196	196	<0.1	5	<5	24	89
T10-E2	T10-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	16	90	<1	<50	<1	39	15	15	37	777	<0.1	9	<5	61	45
T10-E3	T10-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	9	100	<1	<50	<1	18	5	12	56	379	<0.1	4	<5	28	135
T10-W1	T10-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	156	60	<1	<50	<1	9	<2	217	3770	101	0.6	5	<5	21	226
D02_210803	T10-W1	3/08/2021	ES2128631	Intra Laboratory Dup	Rail Corridor - Rail line	170	40	<1	<50	<1	8	<2	166	2720	76	0.8	3	<5	13	183
T02_210803	T10-W1	3/08/2021	815855	Inter Laboratory Dup	Rail Corridor - Rail line	190	53	<2	<10	<0.4	12	<5	200	3100	100	0.7	6.8	<2	23	220
T10-W2	T10-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	34	70	<1	<50	1	26	8	12	21	562	<0.1	7	<5	45	450
T10-W3	T10-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	6	80	<1	<50	<1	28	8	21	12	261	<0.1	13	<5	47	28
T11-E1	T11-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	119	70	<1	<50	<1	24	12	190	1190	369	0.2	13	<5	44	221
T11-E2	T11-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	215	70	<1	<50	<1	42	5	104	304	313	0.2	8	<5	59	296
T11-E3	T11-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	8	100	<1	<50	<1	28	13	20	42	932	<0.1	10	<5	45	*285*
T11-W1	T11-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	203	80	<1	<50	1	12	4	555	6010	215	0.8	11	<5	32	613
T11-W2	T11-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	178	50	<1	<50	<1	15	5	143	1040	149	0.1	13	<5	21	249
T11-W3	T11-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	66	70	<1	<50	<1	20	9	17	42	495	<0.1	7	<5	35	70
T12-E1	T12-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	116	50	<1	<50	1	15	17	141	904	502	0.2	8	<5	45	307
T12-E2	T12-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	6	60	<1	<50	<1	17	5	12	66	652	<0.1	5	<5	29	72
T12-E3	T12-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	9	70	<1	<50	<1	24	5	11	46	635	<0.1	5	<5	41	52
T12-W1	T12-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	133	20	<1	<50	<1	11	3	80	634	183	0.1	5	<5	27	86
T12-W2	T12-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	47	110	<1	<50	<1	34	6	25	50	428	<0.1	8	<5	59	55
T12-W3	T12-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	5	40	<1	<50	<1	15	4	15	25	434	<0.1	3	<5	27	47
T13-E1	T13-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	7	70	<1	<50	<1	33	14	15	43	873	<0.1	6	<5	59	54
T13-E2	T13-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	<5	60	<1	<50	<1	17	11	17	35	502	<0.1	5	<5	36	60
T13-E3	T13-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary / Drainage to Agricultural Land	<5	50	<1	<50	<1	18	14	9	17	508	<0.1	6	<5	45	16
T13-W1	T13-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	188	30	<1	<50	<1	30	3	204	1430	133	0.2	6	<5	58	156
D01_210803	T13-W1	3/08/2021	ES2128631	Intra Laboratory Dup	Rail Corridor - Rail line	167	20	<1	<50	<1	22	2	179	1300	137	0.2	4	<5	29	152
T01_210803	T13-W1	3/08/2021	815855	Inter Laboratory Dup	Rail Corridor - Rail line	110	13	<2	<10	<0.4	12	<5	120	920	64	0.1	<5	<2	17	87
T13-W2	T13-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	6	90	<1	<50	<1	27	10	14	28	780	<0.1	8	<5	53	47
T13-W3	T13-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	40	<1	<50	<1	20	7	9	16	616	<0.1	5	<5	35	34
T14-E1	T14-E1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	24	30	<1	<50	<1	32	8	19	31	389	<0.1	6	<5	35	65
T14-E2	T14-E2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor / Drainage - To Hoskintown Rd	6	60	<1	<50	<1	20	11	25	86	632	<0.1	7	<5	26	109
T14-E3	T14-E3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	<5	110	<1	<50	<1	18	21	14	82	1500	<0.1	9	<5	24	72
T14-W1	T14-W1	3/08/2021	ES2128631	Primary	Rail Corridor - Rail line	9	40	<1	<50	<1	29	7	39	197	275	<0.1	10	<5	53	200
T14-W2	T14-W2	3/08/2021	ES2128631	Primary	Rail Corridor - Mid Corridor	8	100	<1	<50	<1	39	14	14	34	977	<0.1	8	<5	64	51
T14-W3	T14-W3	3/08/2021	ES2128631	Primary	Rail Corridor - Boundary	5	60	<1	<50	<1	25	10	18	32	644	<0.1	7	<5	33	72

Statistical Summary

Statistic	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
Number of Results	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131
Number of Detects	116	131	5	0	37	131	114	131	131	131	45	123	9	131	131
Minimum Concentration	2	13	<1	<10	<0.4	6	<2	6	7	26	<0.1	<2	<2	12	16
Minimum Detect	2	13	1	ND	0.6	6	2	6	7	26	0.1	2	5	12	16
Maximum Concentration	502	170	3	<50	6	263	27	1240	53900	1500	23.6	46	29	80	3120
Maximum Detect	502	170	3	ND	6	263	27	1240	53900	1500	23.6	46	29	80	3120
Average Concentration	57	63	0.56	24	1	21	5.8	132	2206	369	0.63	6.1	3.1	29	350
Median Concentration	18	60	0.5	25	0.5	16	5	35	197	313	0.05	5	2.5	26	182
Standard Deviation	85	33	0.25	4.2	1.2	23	4.4	219	7512	247	2.9	4.7	3.4	14	483
Number of Guideline Exceedances	12	0	0	0	0	1	0	53	43	0	0	0	0	0	56
Number of Guideline Exceedances(Detects Only)	12	0	0	0	0	1	0	53	43	0	0	0	0	0	56

* screening criteria applied only to areas adjacent to Site boundaries

Table 1. Soil Lead Analytical Results
XRF Site Investigation
Signalmans Residence, Bungendore - 0608750

				Lead		Moisture
				XRF Reading	Laboratory Result	Moisture Content
				ppm	mg/kg	%
EQL				1-4	5	1
NEPM (1999) EIL - Urban Residential & Open Space				1100	1100	
NEPM 2013 Table 1A(1) Residential (HIL A)				**300**	**300**	
Sample Point	**Date**	**Laboratory Sample**	**Lab Report Number**			
SIG_01	17/12/2021			26.9	-	-
SIG_02	17/12/2021			**470**	-	-
SIG_03	17/12/2021			32.5	-	-
SIG_04	17/12/2021			173	-	-
SIG_05	17/12/2021			28	-	-
SIG_06	17/12/2021	D05_211217	ES2146881-AC	18.6	230	45.5
SIG_07	17/12/2021			288	-	-
SIG_08	17/12/2021			47.5	-	-
SIG_09	17/12/2021			123	-	-
SIG_10	17/12/2021			40.4	-	-
SIG_11	17/12/2021	D06_211217	ES2146881-AC	130	140	12.8
SIG_12	17/12/2021			104.9	-	-
SIG_13	17/12/2021			159.8	-	-
SIG_14	17/12/2021			66.3	-	-

Table 1. Soil Lead Analytical Results
XRF Site Investigation
Stationmasters Residence, Bungendore - 0608750

				Lead		Moisture
				XRF Reading	Laboratory Result	Moisture Content
				ppm	mg/kg	%
EQL				1-4	5	1
NEPM (1999) EIL - Urban Residential & Open Space				1100	1100	
NEPM 2013 Table 1A(1) Residential (HIL A)				**300**	**300**	
Sample Point	**Date**	**Laboratory Sample**	**Lab Report Number**			
STA_01	17/12/2021			204	-	-
STA_02	17/12/2021			98.2	-	-
STA_03	17/12/2021			123.4	-	-
STA_04	17/12/2021	D01_211217	ES2146881-AB	110.7	277	47.8
STA_05	17/12/2021			32.1	-	-
STA_06	17/12/2021			115	-	-
STA_07	17/12/2021	D02_211217	ES2146881-AB	**326**	**856**	30
STA_08	17/12/2021			46.6	-	-
STA_09	17/12/2021			283	-	-
STA_10	17/12/2021			**557**	-	-
STA_10_2	17/12/2021	D03_211217	ES2146881-AB	**498**	**648**	8.1
STA_10_3	17/12/2021			148.7	-	-
STA_11	17/12/2021			**465**	-	-
STA_12	17/12/2021			**368**	-	-
STA_13	17/12/2021			225	-	-
STA_14	17/12/2021			172	-	-
STA_15	17/12/2021			275	-	-
STA_16	17/12/2021			**360**	-	-
STA_17	17/12/2021			**599**	-	-
STA_18	17/12/2021			**471**	-	-
STA_19	17/12/2021			**363**	-	-
STA_20	17/12/2021			**367**	-	-
STA_21	17/12/2021			227	-	-
STA_22	17/12/2021			89	-	-
STA_23	17/12/2021			86.9	-	-
STA_24	18/12/2021			82.5	-	-
STA_25	19/12/2021			287	-	-

Table 4. Soil Metals Analytical Results
Preliminary Site Investigation
Bungendore Station - 0608750-03

						Metals													
						Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL						5	10	1	50	1	2	2	5	5	5	0.1	2	5	5	5
NEPM (1999) EIL - Urban Residential & Open Space						*100*								*1100*						
NEPM (1999) EIL - Commercial/Industrial						**160**								**1800**						
NEPM 2013 Table 1A(1) HILs Res A Soil						100		60	4500	20		100	6000	300	3800	40	400	200		7400
NEPM 2013 Table 1A(1) HILs Rec C Soil						300		90	20000	90		300	17000	600	19000	80	1200	700		30000
NEPM 2013 Table 1A(1) HILs Comm/Ind D Soil						3000		500	300000	900		4000	240000	1500	60000	730	6000	10000		400000
Field_ID	**LocCode**	**Sampled_Date-Time**	**Lab_Report_Number**	**Purpose**	**Monitoring Zone**															
SS-STN-01	SS-STN-01	7/10/2021	ES2136206	Primary	Bungendore Station	19	60	<1	<50	1	16	3	70	978	146	0.2	5	<5	25	419
D01_211007	SS-STN-01	7/10/2021	ES2136205	Intralab Duplicate	Bungendore Station	12	40	<1	<50	<1	12	3	49	555	111	0.1	4	<5	22	335
T01_211007	SS-STN-01	7/10/2021	25/08/4178	Interlab Duplicate	Bungendore Station	17	67	<2	<10	1.2	32	11	78	770	240	0.2	12	-	81	650
SS-STN-02	SS-STN-02	7/10/2021	ES2136207	Primary	Bungendore Station	15	90	<1	<50	<1	28	6	58	680	267	0.1	11	<5	40	234
SS-STN-03	SS-STN-03	7/10/2021	ES2136208	Primary	Bungendore Station	<5	30	<1	<50	<1	6	<2	10	42	67	<0.1	3	<5	10	47
SS-STN-04	SS-STN-04	7/10/2021	ES2136209	Primary	Bungendore Station	6	60	<1	<50	<1	13	3	38	142	224	<0.1	5	<5	27	122
SS-STN-05	SS-STN-05	7/10/2021	ES2136210	Primary	Bungendore Station	<5	50	<1	<50	<1	15	2	10	42	134	<0.1	4	<5	20	50
SS-STN-06	SS-STN-06	7/10/2021	ES2136211	Primary	Bungendore Station	<5	30	<1	<50	<1	10	2	13	54	88	<0.1	5	<5	17	40
SS-STN-07	SS-STN-07	7/10/2021	ES2136212	Primary	Bungendore Station	<5	40	<1	<50	<1	7	2	6	27	164	<0.1	3	<5	11	28
SS-STN-08	SS-STN-08	7/10/2021	ES2136213	Primary	Bungendore Station	15	70	<1	<50	<1	25	5	25	35	185	<0.1	10	<5	30	55
SS-STN-09	SS-STN-09	7/10/2021	ES2136214	Primary	Bungendore Station	<5	100	<1	<50	<1	5	3	<5	12	79	<0.1	3	<5	12	14
SS-STN-10	SS-STN-10	7/10/2021	ES2136215	Primary	Bungendore Station	12	60	<1	<50	<1	19	4	41	183	290	<0.1	7	<5	33	220
SS-STN-11	SS-STN-11	7/10/2021	ES2136216	Primary	Bungendore Station	17	50	<1	<50	<1	29	2	35	282	189	<0.1	7	<5	26	237
SS-STN-12	SS-STN-12	7/10/2021	ES2136217	Primary	Bungendore Station	8	70	<1	<50	<1	21	5	14	35	676	<0.1	7	<5	26	64
SS-STN-13	SS-STN-13	7/10/2021	ES2136218	Primary	Bungendore Station	26	80	<1	<50	<1	16	4	35	515	243	0.1	5	<5	23	244
SS-STN-14	SS-STN-14	7/10/2021	ES2136219	Primary	Bungendore Station	8	120	<1	<50	<1	29	4	28	17	197	<0.1	12	<5	32	33
SS-STN-15	SS-STN-15	7/10/2021	ES2136220	Primary	Bungendore Station	<5	20	<1	<50	<1	23	9	12	14	235	<0.1	9	<5	46	32
Statistical Summary																				
Number of Results						17	17	17	17	17	17	17	17	17	17	17	17	16	17	17
Number of Detects						11	17	0	0	2	17	16	16	17	17	5	17	0	17	17
Minimum Concentration						<5	20	<1	<10	<1	5	<2	<5	12	67	<0.1	3	<5	10	14
Minimum Detect						6	20	ND	ND	1	5	2	6	12	67	0.1	3	ND	10	14
Maximum Concentration						26	120	<2	<50	1.2	32	11	78	978	676	0.2	12	<5	81	650
Maximum Detect						26	120	ND	ND	1.2	32	11	78	978	676	0.2	12	ND	81	650
Average Concentration						10	61	0.53	24	0.57	18	4.1	31	258	208	0.076	6.6	2.5	28	166
Median Concentration						8	60	0.5	25	0.5	16	3	28	54	189	0.05	5	2.5	26	64
Standard Deviation						7.3	26	0.12	4.9	0.2	8.7	2.6	23	316	138	0.05	3.1	0	17	175
Number of Guideline Exceedances						0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)						0	0	0	0	0	0	0	0	5	0	0	0	0	0	0