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# TARAGO LOOP EXTENSION REMEDIATION ACTION PLAN

RAMBOLL

# TARAGO LOOP EXTENSION
# REMEDIAL ACTION PLAN

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| Description | **Ramboll has prepared a remediation strategy for lead impacted materials that are proposed to be disturbed as part of the Tarago Loop Extension.** |

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## TABLES



## APPENDICES

# ACRONYMS AND ABBREVIATIONS

| Measures | Description |
|---|---|
| % | per cent |
| µg/L | Micrograms per Litre |
| µg/m$^3$ | Micrograms per Cubic Metre |
| ha | Hectare |
| km | Kilometres |
| m | Metre |
| mAHD | Metres Australian Height Datum |
| mbgs | Metres below ground surface |
| µg/kg | Micrograms per Kilogram |
| mg/kg | Milligrams per Kilogram |
| mg/L | Milligrams per Litre |
| mg/m$^3$ | Milligrams per Cubic Metre |
| mm | Millimetre |
| ppm | Parts Per Million |
| ABC | Added Background Concentrations |
| ACL | Added Contaminant Limit |
| ACM | Asbestos contamination materials |
| ADWG | Australian Drinking Water Guidelines |
| AHD | Australian Height Datum |
| ALS | Australian Laboratory Services |
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| CLM Act | NSW Contaminated Land Management Act 1997 |
| COC | Chain of Custody |
| Council | Goulburn Council |
| DP | Deposited Plan |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| EIL | Ecological Investigation Level |
| EMP | Environmental Management Plan |
| Envirolab | Envirolab Services Pty Ltd |
| EPA | Environment Protection Authority (NSW) |
| ESL | Ecological Screening Level |
| GIL | Groundwater Investigation Level |
| GME | Groundwater Monitoring Event |
| HIL | Health Investigation Level |
| LCS | Laboratory Control Sample |
| LOR | Limit of Reporting |
| MS | Matrix Spike |
| NATA | National Association of Testing Authorities |
| NC | Not Calculated |
| ND | Not Detected |
| NEHF | National Environmental Health Forum |
| NEPM | National Environment Protection Measure |
| NEMP | National Environmental Management Plan |
| NHMRC | National Health and Medical Research Council |
| NL | Non-Limiting |
| n | Number of Samples |

| Measures | Description |
|---|---|
| OH&S | Occupational Health & Safety |
| pH | A measure of acidity, hydrogen ion activity |
| PQL | Practical Quantitation Limit |
| QA/QC | Quality Assurance/Quality Control |
| RPD | Relative Percent Difference |
| SAQP | Sampling Analysis and Quality Plan |
| SWL | Standing Water Level |
| TV | Trigger Value |
| UCL | Upper Confidence Limit |
| - | On tables is "not calculated", "no criteria" or "not applicable" |

# 1. EXECUTIVE SUMMARY

Ramboll Australia Pty Ltd was commissioned by John Holland Rail to prepare a Remedial Action Plan (RAP) for lead impacted materials proposed to be disturbed as part of the Tarago Loop Extension.

The site (as a function of contamination identified within the proposed construction footprint) falls within approximately 1,000 lineal meters of rail corridor from Chainage (CH): 261.950 km to CH: 262.950 km (as distance from Sydney, New South Wales) and occupies an area of approximately two hectares. Tarago Station is located adjacent and east of the site at CH: 262.500 km.

This RAP includes the following key elements:

- Review of information provided in '*Tarago Loop Extension, Further Intrusive Assessment and Lead Management Plan'* (Ramboll, 2019a)
- Assessment of remedial options to meet the remedial objectives
- A Remedial Action Works Plan (RAWP) defining key management measures to be considered during lead remedial works
- A validation plan to assess the degree to which remediation achieves its objectives.

Above ground onsite containment is recommended as a remedial strategy to mitigate risks associated with materials that are to be disturbed as part of the Tarago Loop Extension. The pathway for this strategy is described as **Figure 1** and the cross section for an indicative containment system is presented as **Figure 2** below.




**Figure 1: Remediation Pathway**

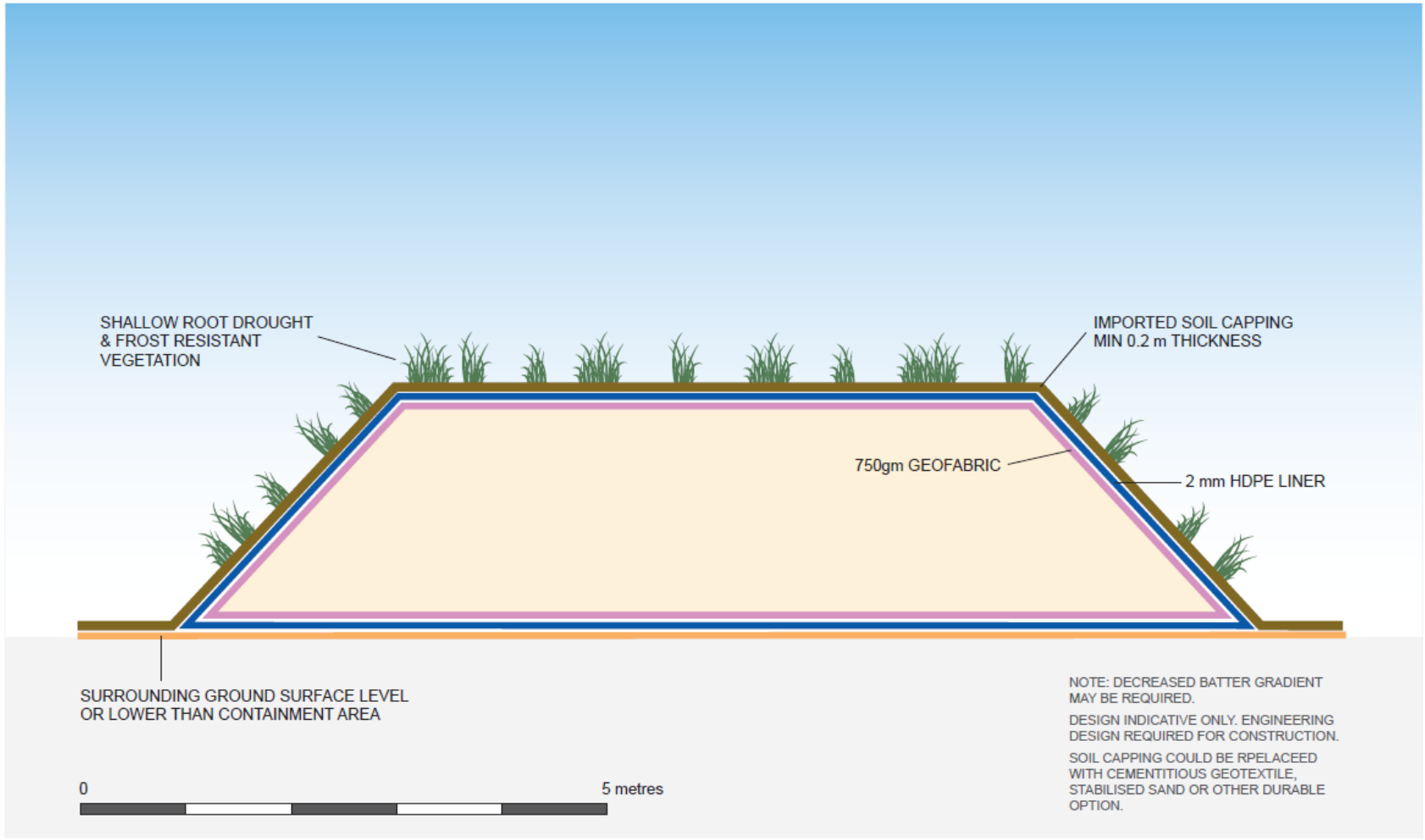



**Figure 2: Conceptual cross section for onsite above ground containment system**

# 2. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was commissioned by John Holland Rail (JHR) to prepare a Remedial Action Plan (RAP) for lead impacted materials proposed to be disturbed as part of the Tarago Loop Extension. The proposed construction footprint is here-in referred to as 'the site' and is shown in **Figure 1**, **Appendix 1**.

## 2.1 Background

Construction comprises extension of an existing passing loop opposite the Tarago Railway Station. The site (as a function of contamination identified within the proposed construction footprint) falls within approximately 1,000 lineal meters of rail corridor from Chainage (CH): 261.950 km to CH: 262.950 km.

Construction is understood to include excavation of the former Woodlawn Siding, extension of the existing loop, construction of a driver's walkway adjacent the existing loop, removal of tie-ins from the former Woodlawn siding to the existing loop, modification of tie-ins from the loop to the Goulburn – Bombala line (the main line), restoration of drainage between lines and reconditioning of the main line rail formation. The client has advised a total excavation depth of up to 0.95 m is required including 0.3 m ballast, 0.15 m capping and 0.5 m structural base/subgrade.

A preliminary site investigation (McMahon, 2015) found lead levels exceeding relevant human-health guideline values within certain parts of the site. Further, intrusive investigations completed by Ramboll in 2019 (Ramboll, 2019a) found ballast at the top of the Woodlawn Siding formation is impacted by lead (CH: 261.980 km to CH: 262.955 km) with a distinct area where much higher lead concentrations observed (CH: 262.090 km and CH: 262.700 km). Surface soils adjacent (west of) the Woodlawn Siding area also have concentrations exceeding the applicable HIL and EIL values.

Materials from the main line are expected to be disturbed as part of the loop extension during excavation and construction of a new turnout and track. Field XRF measurements of lead concentrations showed lead contamination within the main line occurs from approximately CH: 261.950 km to CH: 292.950 km. High lead exceedance areas in the main line generally correspond with high lead exceedances in the siding.

Ramboll (2019a) concluded that any work carried out between these chainages, including the section of signalling trench crossing beneath lead impacted areas, should be undertaken in accordance with the Short-Term Lead Management Plan (SLMP) (Ramboll, 2019b). The SLMP defines short term risk mitigation procedures to allow work to continue within the corridor until a more detailed longer term strategy can be developed.

The SLMP prescribes strategies for reducing risks associated with lead exposure which may arise as a result of the excavation of lead impacted materials at the site. The SLMP includes:

- Hazard identification
- Lead management strategies
- Hazard elimination
- Materials tracking requirements
- Stockpile management requirements
- Environmental controls, including the requirement for surface water and air monitoring

The SLMP is to remain in place until a long-term plan is developed and implemented or until the full extent of impacts are identified remediated and validated.

The RAP describes options for management of soils excavated from between CH: 261.950 km to CH: 292.950 km.

Potential exists for contamination to remain within the rail corridor adjacent the site following construction works. This report exclusively considers lead impacted soils to be disturbed as part of the Tarago Loop Extension. The Human Health Risk Assessment (HHRA), concurrently being developed, will improve capacity to assess risks associated with potential remnant impacts.

## 2.2 Objective

The remedial objective is to reduce to an acceptable level, any risks associated with lead impacted materials that are proposed to be disturbed as part of the Tarago Loop Extension. Additional objectives are:

- To define a plan for remedial works that is protective of human-health and the environment
- To facilitate the completion of remedial works relevant to National and State regulatory requirements.

## 2.3 Scope of Work

This RAP includes the following key elements:

- Review of information provided in *'Tarago Loop Extension, Further Intrusive Assessment and Lead Management Plan'* (Ramboll, 2019a)
- Assessment of remedial options to meet the remedial objectives
- A Remedial Action Works Plan (RAWP) defining key management measures to be considered during lead remedial works
- A validation plan to assess the degree to which remediation achieves its objectives

## 2.4 Regulatory Framework and Guidelines

This document has been prepared with reference to the following legislation and codes of practice:

- *NSW Work Health and Safety Act 2011*
- *NSW Work Health and Safety Regulation 2017*
- *Protection of the Environment Operations Act 1997*
- *Environmental Planning and Assessment Act 1979*
- *Protection if the Environment Operations (Waste) Regulation 2014*
- *Contaminated Land Management Act 1997*
- *SafeWork NSW Lead Guidance*
- *SafeWork Australia Code of Practice: Managing Risks of Hazardous Chemicals in the Workplace*
- *NSW EPA LeadSmart – Work Smart: Tradespeople and Mining Industry Workers*
- *NHMRC Managing Individual Exposure to Lead in Australia – A Guide for Health Practitioners 2016*
- *SafeWork NSW Workplace Exposure Standards for Airborne Contaminants*
- *NSW EPA 2017 Site Auditor Scheme Guidelines 3rd Edition*
- *NSW EPA Contaminated Sites Sampling Design Guidelines 1995*
- *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 2013*

# 3. SITE SETTING

## 3.1 Site Identification

The site is located off Goulburn Street, Tarago, New South Wales (NSW) 2580. Reference to the Spatial Information Exchange (NSW Dept of Finance and Services 2019) identifies the site forms part of forms part of Lot 1 DP 595856). Reference to design drawings identifies construction is proposed within approximately 3.7 km of the rail corridor from CH: 261.500 to CH: 265.200. The site (as a function of contamination identified within the proposed construction footprint) falls within approximately 1,000 lineal meters of rail corridor from Chainage (CH): 261.950 km to CH: 262.950 km (as distance from Sydney, New South Wales) and occupies an area of approximately two hectares. Tarago Station is located adjacent and east of the site at CH: 262.500 km.

A site plan is presented as **Figure 2**, **Appendix 1**, and is defined by areas where elevated lead concentrations have been observed (pink and red shading).

This report exclusively considers lead impacted soils to be disturbed as part of the Tarago Loop Extension. Potential exists for contamination to remain within the rail corridor adjacent the site following remediation.

## 3.2 Site History

Review of Goulburn Mulwaree Local Environment Plan identifies the site is zoned RU2 Rural Landscape. Preliminary assessment (McMahon 2015) identified the main line was constructed in 1894 and it is considered likely that the site has fallen within the rail corridor since this time. Historic site use included load out of ore concentrate from the former Woodlawn Mine via the Woodlawn Siding. The siding was constructed adjacent and west of the loop and main rail lines and west of Tarago Station. Load out of ore concentrate is considered to be the primary source of site contamination. Ore was mined for metals including copper, lead, silver, gold and zinc until mine closure in March 1998 (Heron Resources 2019).

Potential for contamination associated with ore concentrate in the surrounding area remains unclear.

Preliminary assessment (McMahon 2015) identified groundwater use within 500m surrounding Tarago Station including a well licensed for industrial purposes associated with the Tarago Loading Station (assumed to be redundant as the loading station does not appear to remain), two wells licensed for domestic purposes including one well located approximately 140 m east of site (7 Wallace Street) and two wells licensed for disposal purposes located at Tarago Public School and Tarago Sports Ground.

Review of satellite imagery indicates downstream surface water use relates to a dam on a rural residence adjacent CH: 261.950 km and ephemeral water courses feeding the Mulwaree River approximately 600 m east of site.

## 3.3 Site Condition and Surrounding Environment

Further review of the preliminary assessment (McMahon, 2015) identified the following environmental site conditions:

- Level to very gently inclined topography, with elevation between 685 m Australian Height Datum (AHD) and 690 m AHD.

- At least three unnamed drainage lines which intersect the site from the west and travel east to the Mulwaree River.
- Geology distributed over a single unit; mixed sediments and volcanic rock, with Paleozoic Silurian lithology.
- Fractured / fissured aquifers of low to moderate productivity.
- A relatively shallow aquifer beneath the site, with standing water level identified at approximately 6.1 m bgl (GW 053976, located at the Tarago Rail Loading Station).

Review of satellite imagery and site inspection identified human receptors within the surrounding environment including:

- A residence adjacent (east of) the site and adjacent (north of) Tarago Station.
- A residence with a dam receiving waters from the site (during surface water flow) adjacent (east of) the northern end of site.
- Residences approximately 70 m west of the south end of site.
- Tarago Station adjacent (east of) the site.
- Tarago Public School approximately 120 m east of the northern end of site.
- Tarago Recreation Area approximately 300 m east of site.

The site was observed to be fenced on the western boundary and partially fenced on the eastern boundary. Access remains feasible from Tarago Station, the Goulburn Street level crossing and an unfenced area north of Tarago Station.

### 3.4 Basis for Assessment Criteria

The activity to be undertaken at the site involves mostly outdoor construction work and will include only adult receptors. The most appropriate tier 1 health investigation level (HIL) for lead specified in NEPC (2013) is the HIL D (commercial/industrial) value. The actual exposure scenario presented by this HIL value varies in this site specific exposure, as it considers part of the exposure occurs indoors and a longer time duration on the site. For JHR works, short term outdoor exposure occurs during rail maintenance periods. Nonetheless the HIL D value for tier 1 assessment is considered appropriate as it is the only lead HIL value that considers presence of adult receptors at the work site. Note that other lead HIL values provided in NEPC (2013) assume presence of children as the most sensitive receptor.

The lead ecological investigation level (EIL) provided in NEPC (2013) for commercial/industrial land use has been adopted. The actual EIL is calculated by adding the ambient background concentration to the added contaminant limit (above the background). However, the site background was not expected to significantly change the final EIL, therefore the added contaminant limit was conservatively adopted as the EIL value.

### 3.5 Summary of Site Assessment

Site assessment occurred in 2015 (McMahon 2015) and included composite sampling and analyses for a broad range of contaminants. Contamination identified was limited to lead along approximately 870 lineal meters of rail corridor (CH: 261.980 km to CH: 262.850 km) within the site including the siding historically used to load lead ore. Ramboll adopted the results of composite sampling as described in McMahon (2015) to screen the potential presence / absence of impacts though did not consider composite data adequate to assess risk associated with lead exposure.

Ramboll completed progressive assessment of lead impacts over July – September 2019 (consolidated in Ramboll, 2019a) which included:

- Advancement of nine test pits (TP1 to TP9) on approximate 100m lineal increments through the Woodlawn Siding rail formation along the approximate 900 m where elevated lead concentrations were considered likely to exist (based on review of historic assessment). A total of 27 primary samples were collected including a sample from ballast, capping and structural base layers from each test pit
- Collection of 51 shallow soil samples including:
    - 12 samples collected adjacent (west of) the Woodlawn Siding between test pit locations to refine assessment extent of lead impacts
    - Five samples collected from grassed land west of the Woodlawn Siding to assess potential presence of lead between the rail corridor access road (by which it is assumed ore was historically transported to the siding) and the Woodlawn Siding where loading of ore onto rail cars is understood to have occurred
    - Five sediment samples from cess drains feeding two culverts within the area of previously identified impact
    - Eight samples from within the Woodlawn siding targeting the northern end of site and 'tie-ins' to the active loop and main line.
    - Six samples from ballast fines in the loop line between CH 262.440 and CH 262.750
    - Portable XRF measurement of lead in ballast fines in the main line at 29 locations from CH: 261.900 to CH: 263.000. XRF measurements are semi-quantitative and to offset uncertainty associated with results, a conservative management threshold of 1200 mg/kg was adopted (instead of the HIL 1500 mg/kg). Readings were collected from ballast fines approximately 0.1 m below surface. At each location, one reading ($X^1$) was collected from between the two rail tracks while one reading ($X^2$) was collected directly adjacent the west rail track. The average of the two concentrations was then calculated and assessed against the 1,00 mg/kg management threshold.

- Analyses included lead at all locations (excluding XRF test locations) and a broader range of analytes (TRH, PAH, 8 metals, asbestos) in six samples from Woodlawn Siding ballast.

### 3.5.1 Summary of Results

Results are summarised on figures presented as **Appendix 1**.

A summary of exceedances observed in laboratory analyses is presented as **Table 3-1** below.

A summary of exceedances observed in XRF results (assessed against 1,200 mg/kg management threshold is presented as **Table 3-2**.

**Table 3-1: Summary of lead exceedances in projected loop extension spoil.**

| Location | Sampling site (depth m) | Chainage (km) | Lead Conc. (mg/kg) HIL/EIL 1500/1800 |
|---|---|---|---|
| Siding (test pits) ballast layer | TP1 0.1-0.5 | 262.145 | **4,400** |
| | TP2 0.1-0.4 | 262.245 | **3,500** |
| | TP3 0.1-0.5 | 262.345 | **29,000** |
| | TP4 0.1-0.3 | 262.430 | **38,000** |
| | TP5 0.1-0.45 | 262.545 | **3,100** |
| | TP6 0.1-0.4 | 262.645 | **6,000** |
| | TP7 0.1-0.4 | 262.745 | **3,300** |
| | TP8 0.1-0.3 | 262.845 | **2,800** |
| Surface soils | SS7 0.0-0.1 | 262.805 | **4,100** |
| | SS11 0.0-0.1 | 262.650 | **2,200** |
| | SS12 0.0-0.1 | 262.585 | **32,000** |
| | SS13 0.0-0.1 | 262.585 | **2,600** |
| | SS16 0.0-0.1 | 262.490 | **15,000** |
| | SS30 | 262.730 | **2,100** |
| | SS32 | 262.070 | **2,400** |
| | SS37 | 262.160 | **1,600** |
| | SS38 | 262.180 | **9,900** |
| | SS39 | 262.230 | **2,900** |
| | SS40 | 262.260 | **2,600** |
| | SS41 | 262.310 | **11,000** |
| | SS43 | 262.430 | **31,000** |
| | SS45 | 262.510 | **4,000** |
| | SS47 | 262.570 | **3,900** |
| | SS48 | 262.630 | **1,800** |

HIL D – (health investigation level) and EIL (ecological investigation) level are for commercial/industrial. EIL shown is the added contaminant limit (ACL).

**Table 3-2: XRF Results - Lead**

| Chainage | X[1] | X[2] | Average (ppm) | Error Estimate |
|---|---|---|---|---|
| 261.975 | 932 | 1,814 | **1,380** | |
| 262.000 | 2,746 | 774 | **1,760** | |
| 262.025 | 75 | 2,566 | **1,320** | |
| 262.100 | 2,133 | 3,065 | **2,600** | 2,133 ± 81 ppm |
| 262.125 | 1,063 | 2,104 | **1,580** | |
| 262.225 | 1,572 | 1,892 | **1,730** | |
| 262.250 | 1,515 | 2,313 | **1,910** | |
| 262.300 | 2,535 | 10,200 | **6,370** | |
| 262.350 | 930 | 2,064 | **1,500** | |
| 262.400 | 3,109 | 4,865 | **3,990** | |
| 262.450 | 1,870 | 3,392 | **2,630** | |
| 262.500 | 4,285 | 4,467 | **4,380** | |
| 262.550 | 4,839 | 6,606 | **5,720** | 6,606 ± 154 |
| 262.600 | 2,221 | 5,898 | **4,060** | |
| 262.650 | 3,227 | 2,617 | **2,920** | |
| 262.700 | 1,691 | 3,613 | **2,650** | |
| 262.750 | 1,644 | 2,269 | **1,960** | |
| 262.800 | 1,067 | 2,103 | **1,590** | |
| 262.850 | 5,354 | 4,220 | **4,790** | |
| 262.900 | 1,428 | 3,169 | **2,300** | |

** indicates concentrations that are elevated but fall below the threshold value.*

Results identified lead impacts exceeding assessment criteria in ballast at the top of the Woodlawn Siding formation (CH: 261.980 km to CH: 262.880 km) with a distinct area where much higher lead concentrations observed (CH: 262.090 km and CH: 262.700 km). Lead impacts in surface soils adjacent (west of) the Woodlawn Siding and in ballast fines from the loop and main lines were also observed in excess of site assessment criteria.

Lead in capping directly below ballast in the Woodlawn Siding was observed at concentrations below site assessment criteria indicating drivers for remediation within the Woodlawn Siding formation were limited to ballast.

Interpretation of XRF results suggests that:

- Lead contamination within the mainline occurs from approximately CH: 261.950 km to CH: 292.950 km.
- Lead concentrations in the main line appear lower in comparison to concentrations identified in the siding.
- Concentrations of lead in the main line exceed the management threshold value as well as HIL D and / or EIL for commercial / industrial, with the highest concentration being 6,370 ppm (equivalent to 6,370 mg/kg).
- High lead exceedance areas in the mainline generally correspond with high lead exceedances in the rail siding.

Other contaminants (TRH, BTEXN, PAH, 8 metals, asbestos) were not observed above site assessment criteria inferring lead was the primary contaminant of concern.

Based on the above findings, it was recommended that SafeWork NSW be notified that 'lead risk work' was being conducted and remediation of lead impacted soils was proposed for materials to be disturbed as part of the Loop Extension.

### 3.6 Conceptual Site Model

A Conceptual Site Model (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 and no further assessment is required. Where this linkage is found to be complete, it does not indicate that health or environmental risk is present, but rather triggers either a more detailed investigation or exposure controls.

**Table 3-3: Exposure Pathway Assessment**

| | Source-Pathway-Receptor Link? (Yes/ No/ Potential (P)) | | | | |
|---|---|---|---|---|---|
| | Offsite members of the public | Onsite workers | Onsite Ecology | Offsite Ecological Receptors including livestock | Justification |
| **Soil** | | | | | |
| Dermal contact with dust/soil | **P** | **Y** | **Y** | NA | Concentrations in soils were found to be above the adopted HIL and EIL criteria. There is the potential for onsite worker exposure if sufficient controls are not put in place.<br>While results infer low contaminant mobility, Tarago Station is close to the high impact lead area (approximately 15m) and potential exists for public users of the station to be exposed to the lead contamination via dust emissions. |
| Incidental ingestion of dust/soil | **P** | **Y** | **Y** | NA | |
| Outdoor dust inhalation | **P** | **Y** | **Y** | NA | |
| **Surface Water** | | | | | |
| Dermal Contact | N | N | N | **P** | Flow was not observed in any of the drains or culverts present at the site. However, this might change upon rainfall, which can mobilise contaminated material into the local waterway where aquatic ecological receptors may become exposed. |
| Incidental Ingestion | N | N | N | **P** | |
| Potable Ingestion | N | NA | N | NA | |
| Irrigation Pathways | N | N | N | N | |

Y – Yes, N – No, P – Potential, NA – not applicable

A short-term lead management plan (STLMP) was prepared to guide management of contaminated materials during construction and is appended to the assessment report (Ramboll 2019a). The STLMP recommends measures for the temporary management of the above risks during loop expansion works.

# 4. REMEDIAL ACTION PLAN

## 4.1 Remediation Goal

The remedial goal is to reduce to an acceptable level, any risks associated with lead impacted materials that are proposed to be disturbed as part of the Tarago Loop Extension. Acceptable levels are defined as levels which meet commercial / industrial land use criteria as defined within the NEPM 2013.

## 4.2 Waste Streams and Extent of Remediation Required

The extent of remediation is summarised by volume of projected waste streams in **Table 4-1** below.

**Table 4-1: Waste Stream Summary**

| Waste Stream | Volume (m3) |
|---|---|
| Fouled ballast (high fines content) | 1250 |
| Timber sleepers | 50 |
| Soils from adjacent areas and fines from track reconditioning | 1500 |
| Total Volume | 2800 |

**Notes:**

1. Approximately 1000 timber sleepers are proposed to be removed from lead impacted areas with a total estimated volume of 50$m^3$.
2. The expected depth of excavation within the rail formation is 0.5 m deep, however may extend to 0.7 m below current surface levels. The volume of fouled ballast to be excavated from the rail formation is estimated at 1250$m^3$ based on excavation dimensions 600 m long x 0.7 m deep x 3 m wide excavation (average of trapezoidal ballast formation). This estimate however does not allow for lead impacted soils adjacent the track or fines that may be generated during ancillary works (eg: restoration of drainage lines or reconditioning of the existing main and loop lines). The total volume of lead impacted material requiring remediation has been conservatively estimated at 2800$m^3$.
3. Assuming a volume to mass ratio of 1$m^3$:1.8T at a bulk density of 1.8 kg/$m^3$ the mass of lead impacted material is estimated at 5000T.

Rail lines have been removed and stockpiled adjacent (west of) impacted areas associated with the Woodlawn Siding). Rail lines are excluded as a waste stream for the purpose of remediation planning as they are considered unlikely to present a risk to human health. Ramboll understand minor amounts of lead impacted soil may remain adhered to the rail lines and recommend soil should be brushed from the lines before further movement occurs. This soil should be consolidated with other lead impacted materials once removed.

Excavation areas will undergo validation sampling in accordance with the SLMP summarised in **Section 6** of this report.

## 4.3 Remedial Options Assessment

Remedial options considered capable of satisfying regulatory requirements and adequately mitigating exposure risks associated with the spoil to be generated during construction have been compared in **Table 4-2** with regard for cost, time to implement, requirements for ongoing management and sustainability.

**Table 4-2: Remedial Options Assessment**

| Option | Description | Approximate Cost (ex GST) | Time to Implement (including prelim planning provisions) | Sustainability | Long Term Management |
|---|---|---|---|---|---|
| **Option 1 - Onsite containment above ground** | The onsite containment option considered includes:<br>1. Location of a cell onsite to mitigate potential risks to human health or the environment in the event of disturbance to the containment system<br>3. Welded 2 mm thick High Density Polyethylene (HDPE) geomembrane at the base and sides with a 750gm geofabric cushion layer inside the HDPE<br>4. Placement of contaminated soils to form a low elongated stockpile with sides battered to allow efficient placement/retention of clean (site won) soil capping comprising low permeability clay. Capping can also comprise completion of a HDPE capping layer over contaminated soils and seam welding to join the base and sides.<br>5. If a clay cap is placed then, vegetation to mitigate erosion of capping<br>A 100 year design life is projected as a required parameter for engineering design. | $250,000-350,000 | 16 – 20 weeks integrating provision to source long lead items (if required). | Consolidation of impacted soils onsite presents the lowest carbon footprint during remediation.<br>Onsite containment systems can provide durable long term management options.<br>A need to manage the contaminated soils in the future may impact future generations. | Would require a long term management plan (LTEMP) attached to the land title. Long term monitoring requirements are considered unlikely however if disturbed rectification works would be required.<br>Retention of contaminated soils onsite could be expected to devalue the land and complicate potential development in the future. |
| **Option 2 - Onsite containment above ground following chemical immobilisation** | This option replicates the option above though impacted soils would be chemically immobilised onsite before containment<br>Chemical immobilisation under this option would require mixing of soils onsite however could occur within a contained environment (shipping container, plastic enclosure or similar). | $600,000-700,000 | 20 – 24 weeks integrating provision to source long lead items (if required). | Consolidation of impacted soils onsite presents the lowest carbon footprint during remediation. The addition of chemical immobilisation in this option increases the carbon footprint when compared to Option 1.<br>Onsite containment systems can provide durable long term management options. | Would require a LTEMP attached to the land title. Long term monitoring requirements are considered unlikely. If disturbed rectification works would be required though the chemical immobilisation would provide extra protection against lead exposure and lower costs for offsite disposal (if required in the future).<br>Retention of contaminated soils onsite could be expected to devalue the land and complicate potential development in the future. |
| **Option 3 - Offsite chemical immobilisation and disposal** | Impacted soils would be excavated and disposed of at a Hazardous Waste treatment facility. | $4M - $5M | 6 -8 weeks depending on truck movements and restrictions at the licenced receiver. | Offsite disposal presents a comparatively high carbon footprint during remediation though the durability of containment following disposal at licensed landfill is not considered an issue | Would not require a LTEMP. Potential for rectification works would not exist. Land value would not be negatively affected. |
| **Option 4 – Onsite chemical immobilisation and disposal as general solid waste** | This option involves chemical immobilisation of the contaminated soils and disposal to landfill. The option requires treatment trials to demonstrate immobilisation and approval from the NSW EPA for specific immobilisation of the material. | $1.8M – $2.0M | 12-16 weeks. Requires approval from the NSW EPA | Provides a significant cost saving to disposal as untreated material however has the highest carbon footprint of all options | Would not require a LTEMP. Potential for rectification works would not exist. Land value would not be negatively affected. |

**Notes:**

1. Cost estimates have been developed for the purpose of comparing remedial options and are based on provision of limited information to potential remedial contractors. Further consultation with remedial contractors should occur to confirm costs and assumptions.
2. Immobilisation of ballast and timber sleepers may prove difficult and complicate immobilisation options. Screening of oversize could occur before immobilisation though onsite screening is considered unfavourable based on potential for dust generation.
3. Hazardous waste treatment facilities have not been identified within NSW. Transport to Victoria would likely be required.
4. Onsite containment options have been limited to above ground systems to mitigate potential interference with groundwater (inferred at 6.1m bgl at the former Tarago Loading Station).

5. Excavation of contaminated materials to stockpile is projected to occur as part of loop expansion and costs for excavation are not considered here.
6. Costs associated with all other services such as planning, stakeholder engagement, environmental protection during the works and validation of remediation, are excluded from this assessment.
7. Costs are based on 5000T of material requiring remediation.
8. If onsite containment is preferred at Containment Area 2 (see Section 4.4 below) further consideration of potential restrictions associated with the heritage listed Goods Shed is recommended. This schedule under this scenario as presented above could be expected to increase buy 4 – 6 weeks.

## 4.4 Proposed Remediation Strategy

Based on the options assessment outlined above, and in consultation with the John Holland Rail, remediation of lead impacted spoil is proposed via onsite containment without chemical immobilisation (Option 1).

A suitably qualified and experienced remedial contractor should be engaged to design and construct the remedial system within the general parameters described in **Table 4-2**. Proposed suitable locations for onsite containment have been identified with regard for sensitive offsite receptors and are detailed in **Table 4-3**. These locations do not consider operational constraints.

**Table 4-3: Proposed Containment Locations**

| Location ID | Position Description | Distance from Receptors | **Approximate Dimensions of Containment** | Current Land Cover |
|---|---|---|---|---|
| **Area 1** | West of rail lines opposite Tarago Station. | Approximately 100 m south-west of the nearest residential property, 400 m south-west of Tarago Public School, 480 m south-west of Tarago Recreation Area and 80 north of the nearest surface water body. | 200m x 20m x 1.5m parallel to the rail | Cleared land. |
| **Area 2** | East of rail lines south of Tarago Station (current JHR compound). | Approximately 240 m north-east of the nearest residential property, 140 m south-west of Tarago Station, 380 m south-west of Tarago Public School and 460 m south-west of Tarago Recreation Area. | 80 m x 20 m x 2 m parallel to the rail | Capped with temporary hardstand (railway ballast). |

The two containment area options are presented on **Figure 2**, **Appendix A**. Further consideration of potential restrictions associated with the heritage listed Goods Shed is recommended if Area 2 is the preferred containment location.

## 4.5 Contingency Plan

**Table 4-4**Error! Reference source not found. outlines the potential failure scenarios that could occur and the contingency mechanisms that will be implemented to achieve the overall remediation objective.

**Table 4-4: Remediation Contingency Planning**

| Failure Scenario | Contingency Response |
|---|---|
| **Stakeholders refuse onsite containment** | Offsite disposal will be pursued. |
| **Preliminary design infers onsite containment unsuitable** | Offsite disposal will be pursued. |
| **Increased volumes of contaminated material** | The Short Term Lead Management Plan prescribes temporary stockpiling of lead impacted soils as a precurser to remediation. The onsite containment cell will be designed based on the total volume of spoil generated. If a maxiumum cell volume is defined and the amount of spoil exceeds the capacity of the cell, offsite disposal of outstanding spoil will be pursued. |
| **Discovery of unexpected materials** | In the event that unexpected material is identified during the remedial works, such materials would be placed in a segregated stockpile pending evaluation of remedial and / or disposal options. The primary source of potential unexpected finds is considered to be incomplete excavation of lead impacts. This will be assessed through sampling to be completed during Short Term Lead Management Plan described in **Section 4.6**. |

## 4.6 Short Term Lead Management Plan

The SLMP (Ramboll, 2019b) was prepared to provide interim management strategies for activities which may result in the disturbance of lead impacted soils at the site.

Lead dust generated during the proposed construction is a hazard which may cause a risk if exposure occurs. The main route of human exposure identified is via inhalation and ingestion of lead dust. The SLMP details procedures to minimise dust generation and exposure at the worksite and includes the following key components:

- Personal protective equipment to be worn at all times, including long sleeve trousers and shirt or overalls, steel capped boots, protective eyewear, hard hat or hat and gloves plus a P2 dust mask whenever exposure to lead dusts are considered likely
- Office, break and bathroom facilities to remain clean and free of dust
- Minimum required number of workers to excavate materials identified as being lead contaminated
- Tracking of materials excavated to verify appropriate movement and handling
- Lead impacted materials to be excavated into temporary stockpiles outside the main works area (though within the rail corridor and within close proximity to identified locations of impact) taking into account the following stockpile management procedures:
    - Stockpiles shall be placed away from drainage lines, gutters or storm water pits or inlets
    - Stockpiles shall be covered securely ensuring that surface water infiltration cannot occur and that the cover is not disturbed or blown away under windy conditions
    - Stockpiles shall be stored in secure areas and sign posted to ensure the stockpile is not inadvertently moved or uncovered, e.g. 'Contaminated Stockpile – DO NOT MOVE OR UNCOVER. Contact [name and phone number of contact]'
    - Stockpiles will be positioned on level surfaces to the extent practicable and construction of bunds to control ingress/egress of surface water to stockpiles shall occur
    - Stockpiles will be constructed in low elongated mounds to the extent practicable

- During construction works, stockpile controls (cover, bunds and absence of leachate in bunds) will be inspected daily and maintained / rectified as required. Daily inspection and maintenance of stockpile controls will continue following active construction works until a long-term management strategy is implemented.

The SLMP prescribes validation sampling of remnant soils after excavation and secure stockpiling is complete, to assess removal of lead impacted materials. Validation is prescribed on 50m lineal increments within medium and high impact areas from the remnant Woodlawn Siding formation, in adjacent soils and in the eastern excavation face (ballast associated with adjacent rail lines). Validation sampling will confirm the extent of remaining contamination and any additional remediation or management measures required.

The SLMP is to remain in place until a long-term management plan is developed and implemented or until the site has been remediated and validated.

# 5. REMEDIAL ACTION WORKS PLAN

Excavation, transport and temporary stockpiling of lead impacted soils should occur in accordance with guidance described under the STLMP and should occur under supervision of a suitably qualified and experienced environmental representative.

## 5.1 Remediation Methodology

In general, the remedial methodology is as follows:

- Acquire necessary approvals for the chosen remedial option if required
- Engage remedial contractor for the design and construction of the containment cell
- Conduct a preliminary registered survey of the base and perimeter of the proposed containment area
- Transport lead impacted materials from the temporary stockpiles to the designated containment area (materials should be shaped so that they form a low elongated mound within a HDPE lined bund). Excavation, transport and placement of lead impacted soils should occur under supervision of a suitably qualified and experienced environmental representative.
- Validate the removal of impacted materials from the temporary stockpile area by collecting analytical samples from surface soils located within the stockpile footprint
- Conduct a subsequent registered survey, following capping of lead impacted soils with appropriately welded HDPE
- Cap with low permeability soils and apply drought and frost resistant shallow rooted vegetation to stabilise. Management of vegetation will be required until established.

An indicative cross section for the containment cell design is presented as **Figure 3** below.

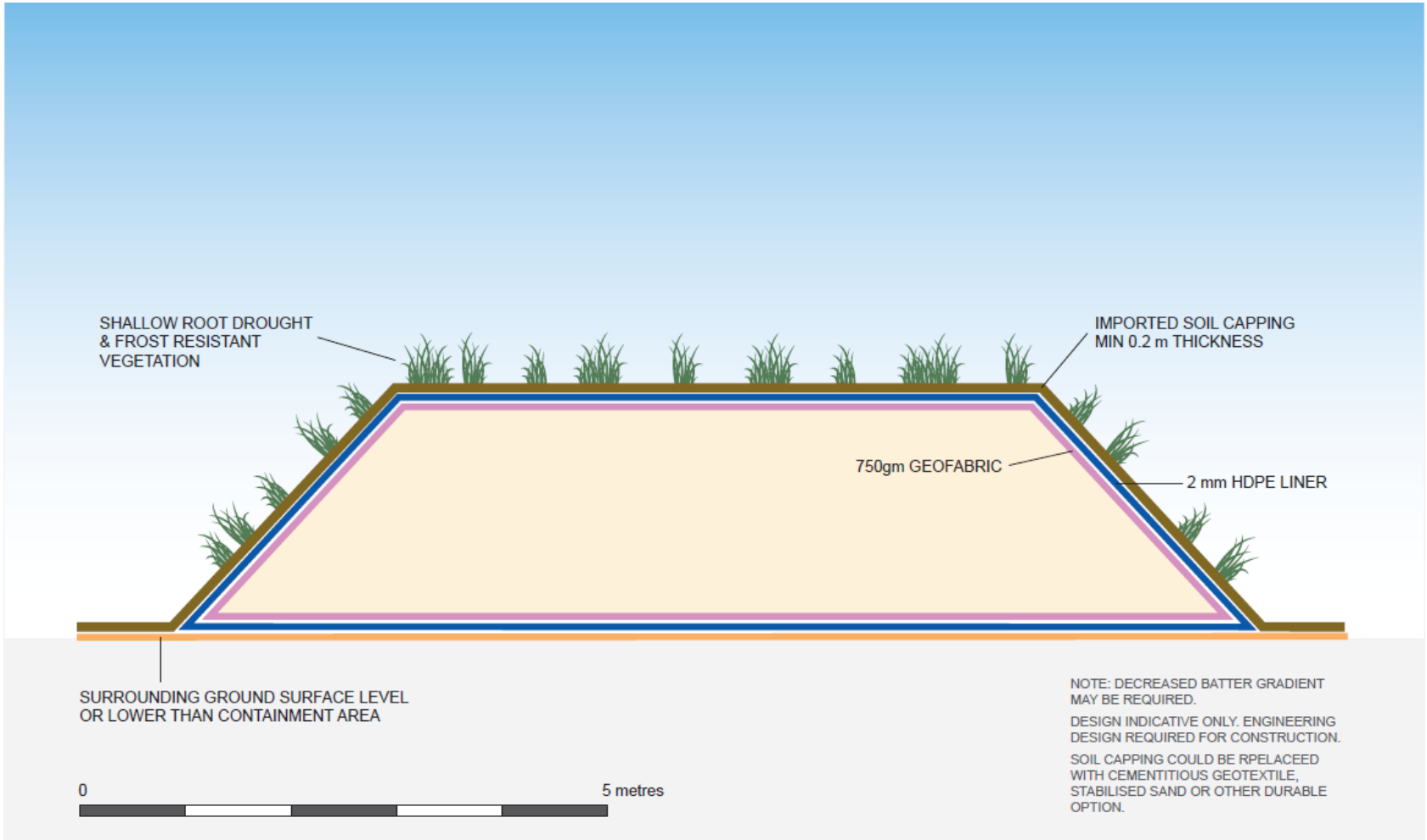



**Figure 3: Conceptual cross section for above ground containment system at Area Option 1**

## 5.2 Preliminaries

Material containment, including engineered cell design will be undertaken by an appropriately qualified and experienced Contractor and overseen by JHR's Environmental Representative.

Prior to commencing works, the Contractor would provide a proposed works methodology to the Principal for written approval. The methodology is to describe:

- Cell design and specifications to achieve maximum permeability of $10^{-9}$ m/s and a 100 year design life
- Mobilisation and site facilities required
- Methods of excavation and materials tracking
- Environmental control procedures consistent with SLMP, RAP and JHR requirements

## 5.3 Site Establishment

The required personnel and plant are required to mobilise to site, set up boundaries for the remedial works and review current lead work controls, including environmental and safety systems in accordance with the SLMP.

## 5.4 Stormwater Management Plan

The remedial contractor must review and / or implement controls to manage surface water runoff during remedial works. The following control measures should be considered and are further detailed in the SLMP:

- Erosion and sediment controls must be implemented.
- Stockpile areas are to be on flat land where possible and out of any drainage line.

## 5.5 Noise Control

Remedial works shall comply with the noise monitoring requirements defined for the broader construction project. The following noise control measures should be considered:

- Construction vehicles and machinery would be selected with consideration of noise emissions. Equipment should be fitted with appropriate silencers (where applicable) and be maintained in accordance with manufacturer's requirements. Machines found to produce excessive noise compared to typical noise levels should be removed and replaced or repaired or modified prior to recommencing works.
- Where possible construction vehicles and machinery would be turned off or throttled down when not in use.
- All site personnel would be informed of their obligations to minimise potential noise impacts on residents during the site induction and need to take reasonable and practical measures to minimise noise.

## 5.6 Dust Control

Dust emissions shall be managed in accordance with the SLMP to avoid dust generation that could impact on a sensitive receiver. Dust emission measures should include:

- Securely covering all loads entering or exiting the site.
- Use of water carts (note: watering should not exceed the liquid limit of the contaminated materials and evidence of run-off during watering should be adopted as a key indicator of over watering).

- All vehicles to travel on designated access roads.
- Temporarily ceasing any activity that generates dust that could travel across the site boundary.

## 5.7 Preparation of Containment System

The containment cell will be engineered by a suitably qualified and experienced contractor. Specific dimensions of the cell are optional however, it is expected that the cell will form a low elongated mound with suitable battering as to minimise potential for surface erosion and exposure of the HDPE lining.

The containment cell is to be positioned within the rail corridor at an appropriate distance from surface water and human health receptors. The location should be outside areas of native vegetation and cleared areas within the corridor shall take preference. Potential areas include those detailed in **Table 4-3**.

## 5.8 Placement of Lead Impacted Spoil

Lead impacted spoil is currently being managed under the SLMP, which prescribes temporary stockpiling onsite pending approval of a remedial strategy and long term management plan. It is anticipated that lead impacted spoil will be stockpiled as a precursor to remediation.

The proposed containment system includes an impermeable HDPE liner with a geofabric cushion placed inside the liner to mitigate potential puncturing. Lead impacted spoil may be placed directly on the geofabric cushion once placed. Spoil is to be placed and spread to avoid trafficking directly on the HDPE. Spoil should be placed and compacted to achieve density that will not substantially settle and promote surface water channel or infiltration.

## 5.9 Survey

A survey of the containment cell must be undertaken by a registered surveyor. The survey will involve:

- Pre-remediation survey of the base and perimeter of the containment bund
- Following consolidation of lead impacted soils and application of HDPE capping
- Post-remediation, following application of topsoil and vegetation (optional)

The survey will be conducted such that a 3D model of the containment cell can be located laterally and vertically on a registered survey plan.

This survey forms part of the validation requirements described in **Table 6-1**.

## 5.10 Remediation Schedule

The final remediation schedule will be discussed with the Contractor. A proposed indicative schedule up to the completion of a draft validation report is outlined in **Table 5-1.**

**Table 5-1: Remediation Schedule**

| Task | Estimated Duration |
|---|---|
| **Confirmation of remedial strategy** | 4 weeks |
| **Engagement with regulators** | 4 weeks |
| **Engagement of a remedial contractor and sourcing of containment materials** | 8 - 10 weeks |
| **Lining Works** | 1 to 3 weeks |
| **Preparation of a validation report and LTEMP** | 2 weeks |
| **Total Duration** | 20 – 24 weeks |

## 5.11 Hours of Operation

The contractor shall only undertake works associated with validation works that may generate an audible noise at the closest residential receptor during the following hours, unless under direction from relevant authority for safety reasons or in the event of an emergency:

- 7:00 am to 6:00 pm Monday to Friday
- 7:00 am to 1:00 pm Saturdays
- At no time on Sundays or public holidays

## 5.12 Environmental Controls Contingency Plan

The environmental controls prescribed in the SLMP are designed to be sufficiently protective under the expected site conditions. The contingencies presented in **Table 5-2** are to be implemented where unexpected site conditions or circumstances occur.

**Table 5-2: Environmental Controls Contingency Plan**

| Contingency Event | Contingency Action | Personnel Responsible |
|---|---|---|
| **Discovery of unexpected materials**[1] | Contact the Principal's representative, sort materials into a segregated stockpile and discuss possible disposal options with the Principal or the Principal's Representative. | Principal, following notification from the remedial contractor. |
| **Receival of a noise complaint** | Identify noise source and implement noise control measures. | Remedial Contractor. |
| **Receival of a dust complaint** | Stop work. Identify dust source and review control measures. | Remedial Contractor. |

[1] The primary source of potential unexpected finds is considered to be incomplete excavation of lead impacts. This will be assessed through sampling to be completed during Short Term Lead Management Plan described in Section 4.6. Where further excavation is required to achieve project design levels materials will be excavated as lead impacted soils under direction of the environmental representative.

## 5.13 Licenses and Approvals

SEPP 55 defines a framework for management of contamination in NSW. It defines requirements for engagement with consent authorities and local councils according to whether remediation is considered Category 1 (requiring development consent) or Category 2 (requiring notification 30 days before remediation). Ramboll consider the long-term management of contamination associated with the Tarago Loop to be Category 2 remediation. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 9 of SEPP 55.

The proposed remediation works do not trigger the criteria in clause 9 (a) – (f) and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under SEPP55. Refer Notification Letter included in **Appendix 2**.

## 5.14 Key Personnel

All site personnel (including JHR and its contractors) have the responsibility of protecting human health and the environment. Key personnel and their roles and responsibilities are outlined in **Table 5-3**.

**Table 5-3: Key Personnel roles and Responsibilities**

| Personnel | Name and Contact Details | Role / Responsibility |
|---|---|---|
| **Land Owner** | TfNSW | Responsible for implementation of the LTEMP including management of the containment system and remnant lead impacts. |
| **Principal** | JHR | Current custodian of the CRN and responsible for all works carried out at the site. Responsible for engaging / contracting all other parties. |
| **Principals Environmental Representative** | TBA | Personnel employed by JHR or sub-contracted to JHR to oversee / provide technical advice on remediation works and ensure works are completed in accordance with relevant guidelines. |
| **Remediation Contractor** | TBA | Company contracted to undertake remediation works. Responsible for supplying all plant and personnel to conduct the works as outlined in this RAP and as required under local, state and federal legislation. |
| **Remediation Supervisor or Project Manager** | TBA | Responsible person appointed by contractor to supervise / coordinate all aspects of remedial works on behalf of the contractor. The primary point of contact for the project. |
| **Contractors Environmental Representative** | TBA | Personnel responsible for implementation, monitoring and management of the RAP. |
| **Contractors Environmental Consultant** | TBA | Appropriately qualified environmental consulting company / personnel appointed to validate the implementation of the RAP. The contractors Environmental Consultant will supervise the works, conduct validation sampling and undertake all necessary activates to prepare the validation report which documents the implementation of |

| | | |
|---|---|---|
| | | the RAP for submission and review by the Principal. |
| **Contaminated Land Auditor** | TBA | If required, the Contaminated Land Audit will be prepared for the site in accordance with the Contaminated Land Management Act 1997. The Contaminated Land Auditor will be appointed by JHR. |

## 5.15 Long Term Environmental Management Plan

A Long-Term Environmental Management Plan (LTEMP) will be required to provide guidance for ongoing maintenance of the containment cell, location of known contamination post remediation and ongoing limitations associated with the cell and remnant impacts. The LTEMP will include the as-built drawings and sufficient information to detail the nature of the contained materials and the management requirements to mitigate associated risk. A legal requirement to implement the LTEMP should be defined through a covenant to the land title.

# 6. VALIDATION PLAN

The following is the validation Sampling and Analysis Quality plan (SAQP) to be implemented to validate the remedial objective has been achieved for the site.

## 6.1 Validation Data Quality Objectives

Specific Data Quality Objectives (DQOs) have been developed for the validation of field and analytical data obtained during the remediation. The DQO process is a systemic, seven step process that defines the criteria that the validation sampling should satisfy in accordance with the requirements of NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme* (3rd Edition). The DQOs are as follows:

### 6.1.1 Step 1: State the Problem

Lead impacts have been identified within soils proposed to be disturbed as part of the Tarago Loop Extension. Concentrations of lead have been found to exceed both HILs and EILs for commercial / industrial land use. Remediation of disturbed soils is required to reduce to an acceptable level, any risks to human and ecological receptors created as a result of construction works.

### 6.1.2 Step 2: Identify the Decisions

The validation SAQP is to ensure that remediation has been carried out successfully. The site will be considered remediated when the remediation and validation program has been carried out successfully. Remediation is deemed to be successful when:

- Lead impacted materials disturbed as part of the Loop Extension (temporarily being stockpiled) are secure onsite, within a purpose-built HDPE lined containment cell that has been visually verified to have been built to design with conforming survey data
- Validation sampling within the footprint of temporary contaminated stockpiles demonstrates that no lead impacts exceeding commercial / industrial land use remain in surface soils
- A Validation Report and Long-Term Management Plan has been provided defining the degree to which lead impacts have been removed and if / where impacts remain.

### 6.1.3 Step 3: Identify Inputs to the Decision

The following inputs into the decision-making process are required:

- Documented materials tracking demonstrating all materials have been appropriately stockpiled
- Containment cell built to design (including maximum permeability of $10^{-9}$ m/s and 100 year design life) by a suitably qualified and experienced contractor
- Registered survey of the containment cell before and after the consolidation of lead impacted materials
- Soil sampling validating surfaces below temporary stockpiles and soils beneath / adjacent areas where lead impacted materials are excavated.

### 6.1.4 Step 4: Define the Study Boundary

The Remediation Area is limited to lead impacted materials disturbed as part of the Tarago Loop Extension.

Potential exists for contamination to remain within the rail corridor adjacent the site following remediation, however, HHRA being concurrently developed, will improve capacity to assess risks associated with potential remnant impacts.

### 6.1.5 Step 5: Development of Decision Rules

The types of data quality required, appropriate field methods (including sampling procedure and preservation of samples) and the quality of analytical data undertaken by the commercial laboratories are summarised in the following.

- All sample analyses are to be conducted using National Association of Testing Authorities (NATA) registered methods in accordance with NEPM (2013) guidelines.
- All samples are to be extracted within the laboratory specified acceptable sample holding time.
- Samples are to be appropriately preserved and handled in accordance with the sampling methodology outlined in Step 7.
- PQLs are to be less than the adopted assessment criteria.
- Duplicates, spikes, blanks, and control samples are to meet the DQIs presented in Step 6.

### 6.1.6 Step 6: Specific Limits of Decision Error

Acceptable limits and the manner of addressing possible decision errors are outlined in the sections below:

*Accuracy:* Accuracy is defined as the nearness of a result to the true value, where all random errors have been statistically removed. Internal accuracy is measured using percent recovery '%R' and external accuracy is measured using the Relative Percent Difference '%RPD'.
*Internal accuracy* will be tested utilising:

| | |
|---|---|
| Surrogates | Surrogates are QC monitoring spikes, which are added to all field and QA/QC samples at the beginning of the sample extraction process in the laboratory, where applicable. Surrogates are closely related to the organic target analytes being measured, are to be spiked at similar concentrations, and are not normally found in the natural environment; |
| Laboratory control samples | An externally prepared and supplied reference material containing representative analytes under investigation. These will be undertaken at a frequency of one per analytical batch; |
| Matrix spikes | Field samples which are injected with a known concentration of contaminant and then tested to determine the potential for adsorption onto the matrix. These will be undertaken at a frequency of 5%. |

Recovery data shall be categorised into one of the following control limits:

- 70%-130%R confirming acceptable data, note that there are some larger %R for intractable substances;
- 69%-20%R indicates discussion required. May be considered acceptable data, or may be regarded with uncertainty;
- 10-19 %R indicating that the data should be treated as an estimate result; and

- <10 %R indicating that the data should be rejected.

*External accuracy* will be determined by the submission of interlaboratory duplicates at a frequency of 5%. Data will be analysed in accordance with the following control limits:
- 60% RPD at concentration levels greater than ten times the PQL.
- 85% RPD at concentrations between five to ten times the PQL.
- 100% RPD at concentration levels between two and five times the PQL.

Where concentration levels are less than two times the PQL, the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if the AD <2.5 times the PQL.

Any data which does not conform to these acceptance criteria will be examined for determination of suitability for the purpose of site characterisation.

*Precision:* The degree to which data generated from replicate or repetitive measurements differ from one another due to random errors. Precision is measured using the standard deviation 'SD' or Relative Percent Difference '%RPD'.

*Internal precision* will be determined by the undertaking of laboratory duplicates, where two sub samples from a submitted sample are analysed. These will be undertaken at a frequency of 10%. An RPD analysis is calculated and results compared to:
- 50% RPD at concentration levels greater than ten times the PQL.
- 75% RPD at concentrations between five to ten times the PQL.
- 100% RPD at concentration levels between two and five times the PQL.

Where concentration levels are less than two times the PQL, the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if the: AD <2.5 times the PQL.
Any data which does not conform to these acceptance criteria will be examined for determination of suitability.

*External precision* will be determined by the submission of intra-laboratory duplicates at a frequency of 5%. The external duplicate samples are to be obtained by mixing and then splitting the primary sample to create two identical sub samples. Field duplicate samples are to be labelled with a unique identification that does not reveal the association between the primary and duplicate samples e.g., QA1.

It must be noted that significant variation in duplicate results is often observed (particularly for solid matrix samples) due to sample heterogeneity or concentrations reported near the Practical Quantification Limit (PQL).

Data will be analysed in accordance with the following control limits:

- 50% RPD at concentration levels greater than ten times the PQL.
- 75% RPD at concentrations between five to ten times the PQL.
- 100% RPD at concentration levels between two and five times the PQL.

Where concentration levels are less than two times the PQL, the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if the: AD <2.5 times the PQL.
Any data which does not conform to these acceptance criteria will be examined for determination of suitability.

Blank samples will be submitted with the analytical samples and analysed for the contaminants of concern: One Field Blank will be collected each day.

The laboratory will additionally undertake a method blank with each analytical batch of samples. Laboratory method blank analyses are to be below the PQLs. Results shall be examined, and any positive results shall be examined. Positive blank results may not be subtracted from sample results.

Positive results may be acceptable if sample analyte concentrations are significantly greater than the amount reported in the blank (ten times for laboratory reagents such as methylene chloride, chloroform, and acetone etc., and five times for all other analytes). Alternatively, the laboratory PQL may be raised to accommodate blank anomalies provided that regulatory guidelines are not compromised by any adjustment made to the PQL.

*Completeness:* The completeness of the data set shall be judged as:

- The percentage of data retrieved from the field compared to the proposed scope of works. The acceptance criterion is 95%.
- The percentage of data regarded as acceptable based on the above data quality objectives. 95% of the retrieved data must be reliable.
- The reliability of data based on cumulative sub-standard performance of data quality objectives.

Where two or more data quality objectives indicate less reliability than what the acceptance criteria dictates, the data will be considered with uncertainty.

*Representativeness:* Sufficient samples must have been collected from the soil present at the site. This will be calculated for soil samples by Procedure B, NSW EPA Sampling Design Guidelines, 1995.

Samples must be collected and preserved in accordance with the sampling methodology proposed in Step 7 to ensure that the sample is representative of the assessed stratum.
*Comparability:* The data must show little to no inconsistencies with results and field observations and include likely associates e.g. TPH C6-C9 and BTEX.

*Sensitivity:* Sensitivity is a measure of the suitability of the laboratory results against the adopted assessment criteria. Sensitivity is achieved through the laboratory PQL, which should fall below assessment criteria values to allow for appropriate comparison of data.

***Decision Error Protocol***

If the data received is not in accordance with the defined acceptable limits outlined in Steps 5 and 6, it may be considered to be an estimate or be rejected. Determination of whether this data may be used or if re-sampling is required will be based on the following considerations:

- Closeness of the result to the guideline concentrations.
- Specific contaminant of concern (e.g. response to carcinogens may be more conservative).
- The area of site and the potential lateral and vertical extent of questionable information.
- Whether the uncertainty can be effectively incorporated into site management controls.

***Rectifying Non-conformances***

If any of the validation procedures or criteria identified are not followed or met, this will constitute a non- conformance. The significance of the non-conformance will determine if rectification is required after discussion with the site auditor. In order to address any non-conformances, the Contractor's Environmental Consultant must assess the significance of each non-conformance and put their conclusion and recommendation to the auditor for approval.

### 6.1.7 Step 7: Optimise the Design for Obtaining Data – Soil Validation

All validation samples are to be collected in accordance with the DQOs outlined in this Section. The sampling methodology for the site remediation work is outlined below.

The objective of the sampling pattern is to demonstrate that the adopted sample density and total number of samples collected is suitable to validate remediation.

Validation samples, frequency of collection, the analysis required, and justification presented in **Table 6-1**.

**Table 6-1: Validation Plan**

| Validation Method | Validation Requirements | Chemical Analysis |
|---|---|---|
| **Validation of remnant soils** | As outlined in Section 3.7 of the SLMP (Ramboll, 2019b), sampling of remnant soils will be required following the completion of excavation to validate the removal of lead impacted materials. Sampling is to occur on 12 transects on 50 lineal metre increments perpendicular to the Woodlawn Siding, including three samples at each transect (adjacent soils to the west, from the base of the excavation and from the east wall (remnant formation).<br><br>Potential exists for contamination to remain within the rail corridor adjacent the site following remediation. The Human Health Risk Assessment (HHRA) being concurrently developed, will improve capacity to assess risks associated with potential remnant impacts. | Lead. |
| **Validation of containment** | Construction of the containment cell will be overseen by the JHR environmental representative and must meet the specifications outlined within the cell design (to be completed).<br><br>The containment cell must be constructed by a suitably qualified and experienced contractor.<br><br>Survey data is to be collected for the containment cell including:<br>• Survey of base and perimeter prior to addition of lead impacted materials<br>• Survey of top and perimeter after the consolidation of lead impacted materials and application of HDPE capping<br>• Survey of the top and perimeter after application of top soil and surface stabiliser, i.e. turf (optional) | CQA in accordance with manufacture specifications for HDPE liner (eg: visual confirmation of welds between sheets). Visual validation and registered survey. |
| **Validation of stockpile removal** | Once materials have been transported from the temporary stockpile area to the containment cell, sampling must be completed to validate the removal of lead impacts from soils beneath the temporary stockpiles<br><br>Analytical samples are to be collected from surface soils within the footprint of the former stockpile. | Lead. |

#### 6.1.7.1 Validation Reporting

A validation Report will be prepared in general accordance with the relevant sections of NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NSW EPA

*Guidelines for the NSW Site Auditor Scheme 3rd Edition* (NSW EPA 2017). The Validation Report will include:

- Executive summary
- Scope of work
- Site Description
- Summary of site history and previous investigations
- Remediation activities undertaken, including the extent of the excavation works (survey information) and observations made during excavation works
- Supporting factual evidence of the remediation work including photographic and field records and materials tracking data
- Validation sampling and analysis results
- Quality assurance/ quality control (QA/QC) protocols for field work and laboratory analysis and
- A statement indicating the degree to which lead impacts have been removed and if / where impacts remain.

# 7. REFERENCES


1. Department of Environment and Climate Change (DECC) (2019) NSW EPA Interim Construction Noise Guideline
2. DM McMahon Pty Ltd (2015) Tarago Rail Sliding Extension: Preliminary Contaminated Site Assessment, June 2015
3. Heron Resources https://www.heronresources.com.au/woodlawn-zinc-copper-project accessed 6 September 2019
4. National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) 2013
5. NSW EPA 2017 Site Auditor Scheme Guidelines 3rd Edition
6. NSW EPA Contaminated Sites Sampling Design Guidelines 1995
7. Office of Environment and Heritage (2011) Guidelines for Consultants Working on Contaminated Sites
8. Ramboll. (2019a) Tarago Loop Extension, Further Intrusive Assessment and Lead Management Plan, August 2019
9. Ramboll. (2019b) Tarago Loop Extension, Short-Term Lead Management Plan, August 2019

# 8. LIMITATIONS

Ramboll Australia Pty Ltd prepared this report in accordance with the scope of work as outlined in our proposal to John Holland Rail and in accordance with our understanding and interpretation of current regulatory standards.

A representative program of sampling and laboratory analyses was undertaken as part of this investigation, based on past and present known uses of the site. While every care has been taken, concentrations of contaminants measured may not be representative of conditions between the locations sampled and investigated. We cannot therefore preclude the presence of materials that may be hazardous.

Site conditions may change over time. This report is based on conditions encountered at the site at the time of the report and Ramboll disclaims responsibility for any changes that may have occurred after this time.

The conclusions presented in this report represent Ramboll's professional judgment based on information made available during the course of this assignment and are true and correct to the best of Ramboll's knowledge as at the date of the assessment.

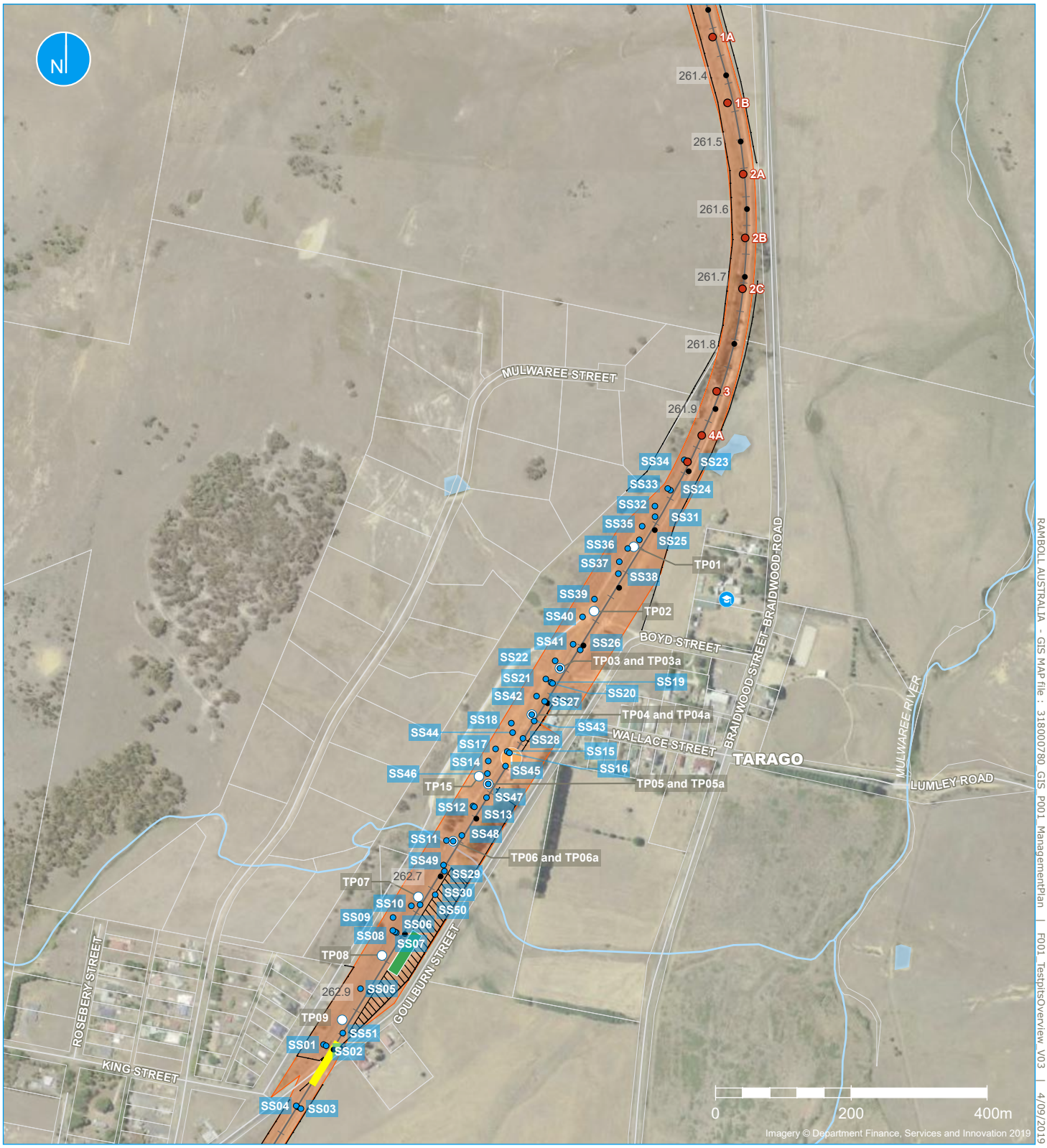
Ramboll did not independently verify all of the written or oral information provided to it during the course of this investigation. While Ramboll has no reason to doubt the accuracy of the information provided to it, the report is complete and accurate only to the extent that the information provided to Ramboll was itself complete and accurate.

This report does not purport to give legal advice. This advice can only be given by qualified legal advisors.

## 8.1 User Reliance

This report has been prepared exclusively for John Holland Rail and may not be relied upon by any other person or entity without Ramboll's express written permission.

# APPENDIX 1
# FIGURES




RAMBOLL AUSTRALIA - GIS MAP file : 318000780_GIS_P001_ManagementPlan | F001_TestpitsOverview_V03 | 4/09/2019

A4
1:8,000

**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Goulburn Street level crossing
- Construction compound
- Goods shed exclusion zone

Sampling locations (siding works)

- Shallow soil (Ramboll 2019)
- Test pit (Ramboll 2019)
- Previous sample location (McMahon)

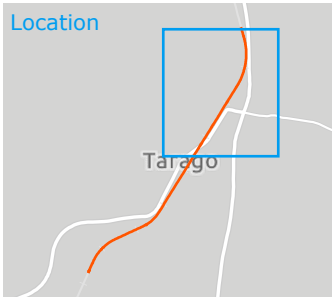
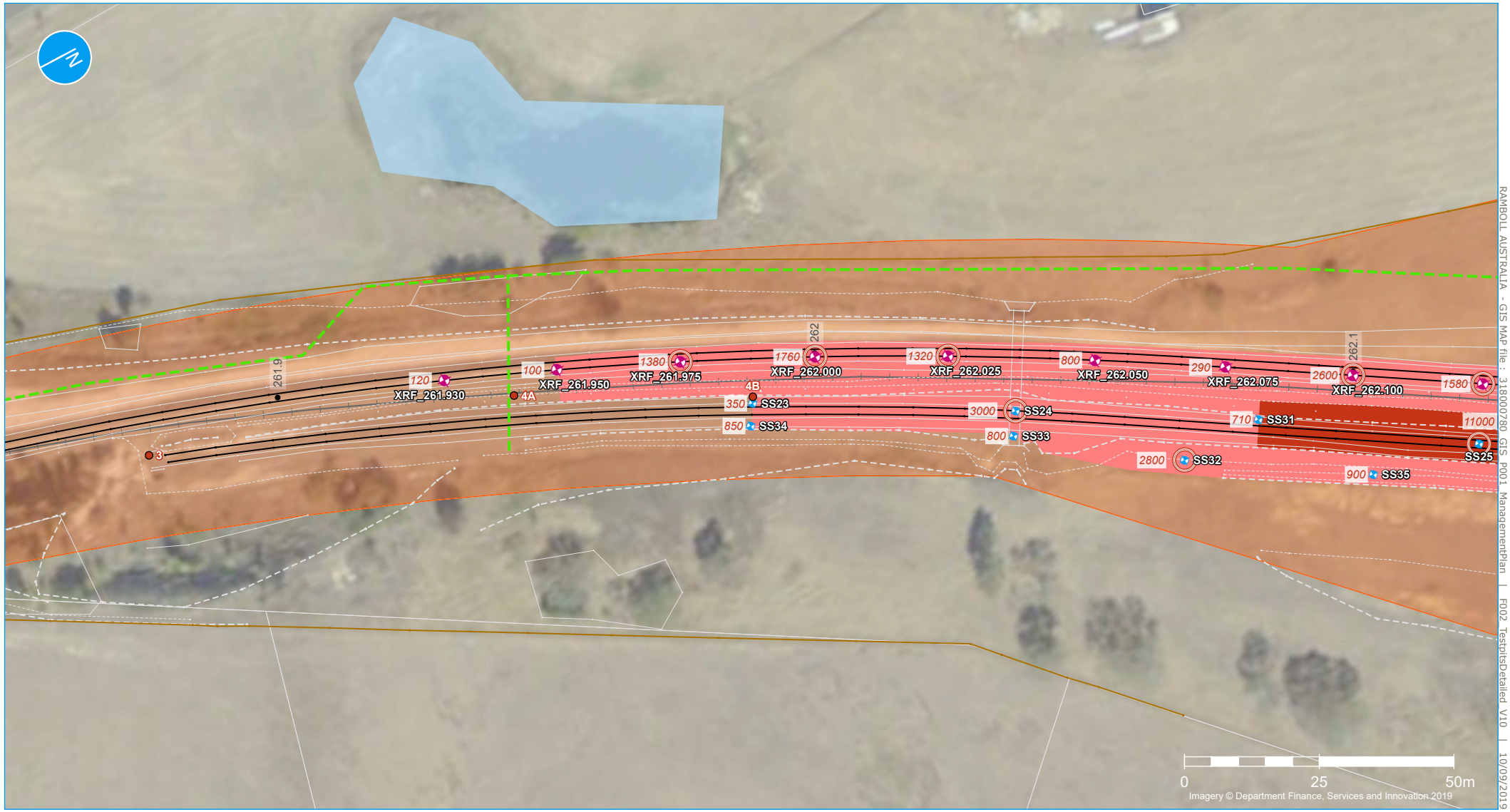



Figure 1 | Overview of siding works sampling locations




RAMBOLL AUSTRALIA - GIS MAP file : 318000780 GIS P001 ManagementPlan | F002 TestpitsDetailed V10 | 10/09/2019

**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Signal trench (approximate)

Survey lines

- Rail track
- Top of bank
- Bottom of bank
- Other elements

Sampling locations

- 1200 Lead concentration (mg/kg)
- Shallow soil (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)
- Previous sampling location (McMahon)
- Exceedance location

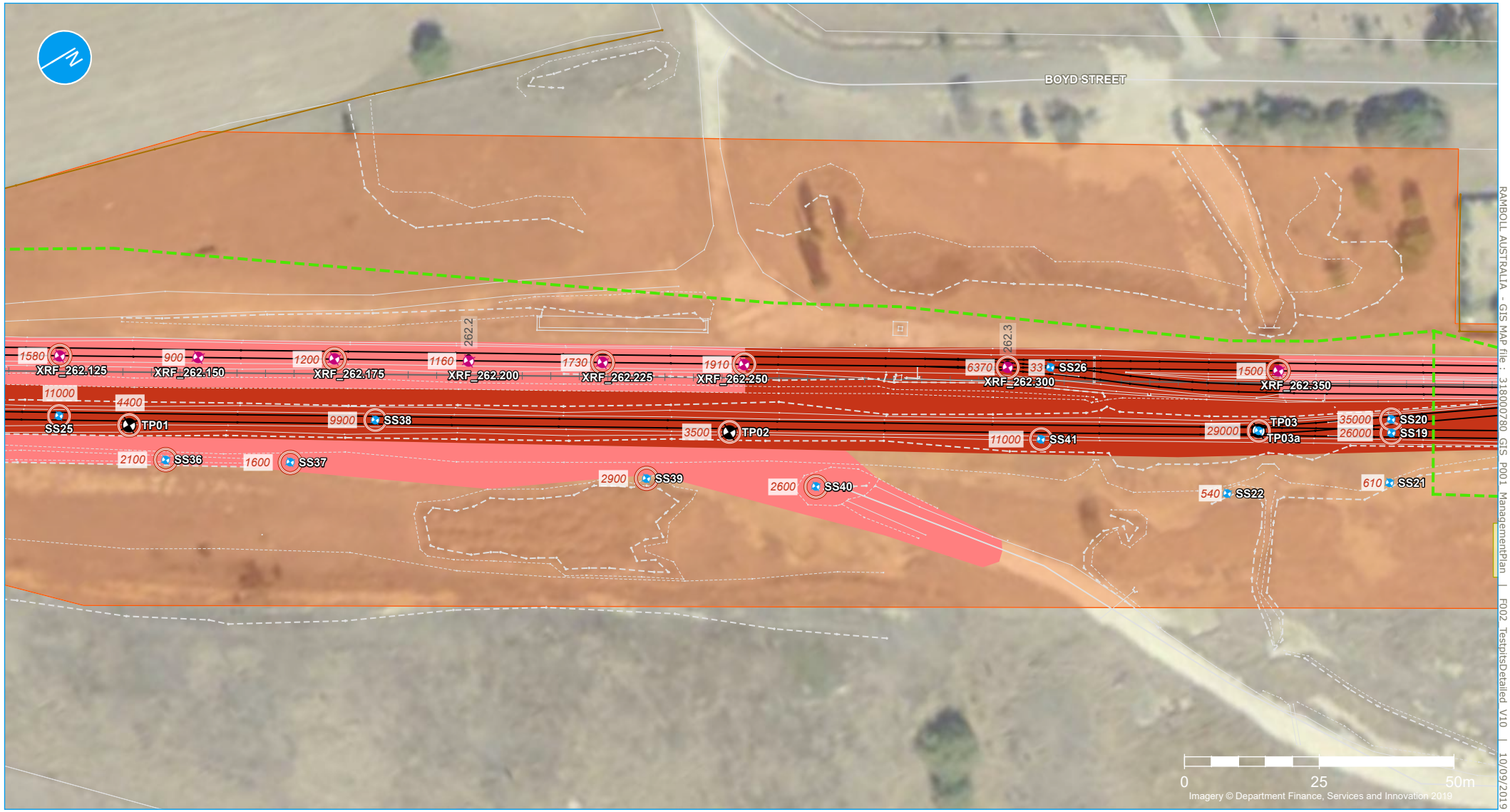
Exceedance area within construction footprint

- High (>4000 mg/kg Pb)
- Medium (1500-4000 mg/kg Pb)

*Note: X-Ray fluorescence sampling results were conservatively assessed against a management threshold of 1200 mg/kg Pb to mitigate uncertainty associated with these.*

A4
1:1,000


Figure 2a | Assessment of lead in the construction footprint




**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Signal trench (approximate)

Survey lines

- Rail track
- Top of bank
- Bottom of bank
- Other elements

Sampling locations

- 1200 Lead concentration (mg/kg)
- Shallow soil (Ramboll 2019)
- Test pit (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)
- Exceedance location

Exceedance area within construction footprint

- High (>4000 mg/kg Pb)
- Medium (1500-4000 mg/kg Pb)
- Containment area option

*Note: X-Ray fluorescence sampling results were conservatively assessed against a management threshold of 1200 mg/kg Pb to mitigate uncertainty associated with these.*

A4
1:1,000

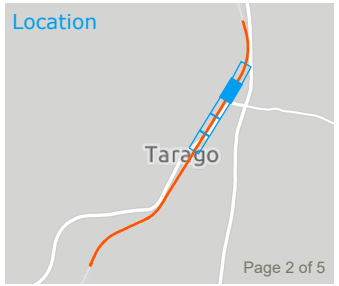
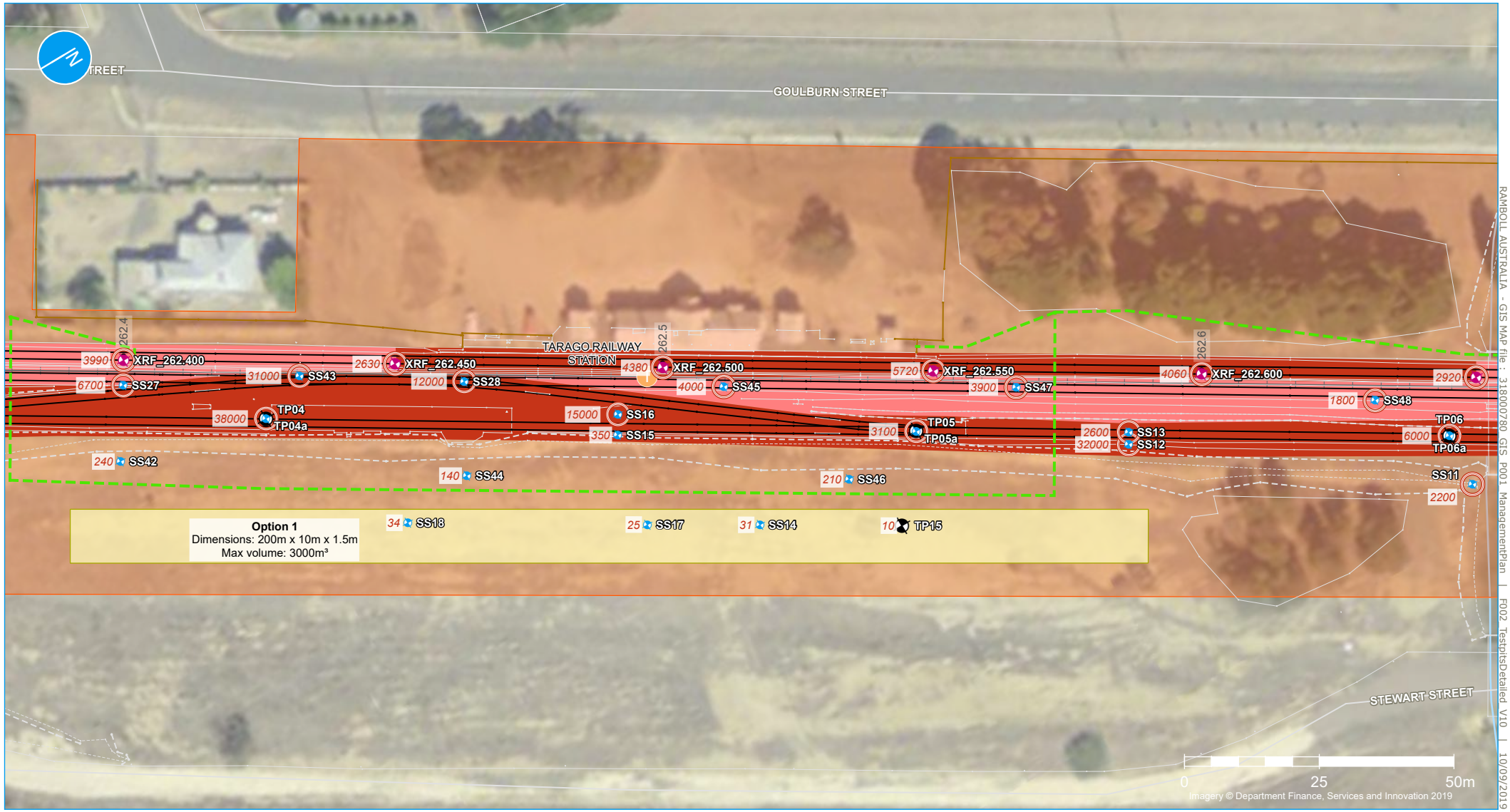



Figure 2b | Assessment of lead in the construction footprint




**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Signal trench (approximate)

Survey lines

- Rail track
- Top of bank
- Bottom of bank
- Other elements

Sampling locations

- 1200 Lead concentration (mg/kg)
- Shallow soil (Ramboll 2019)
- Test pit (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)
- Exceedance location

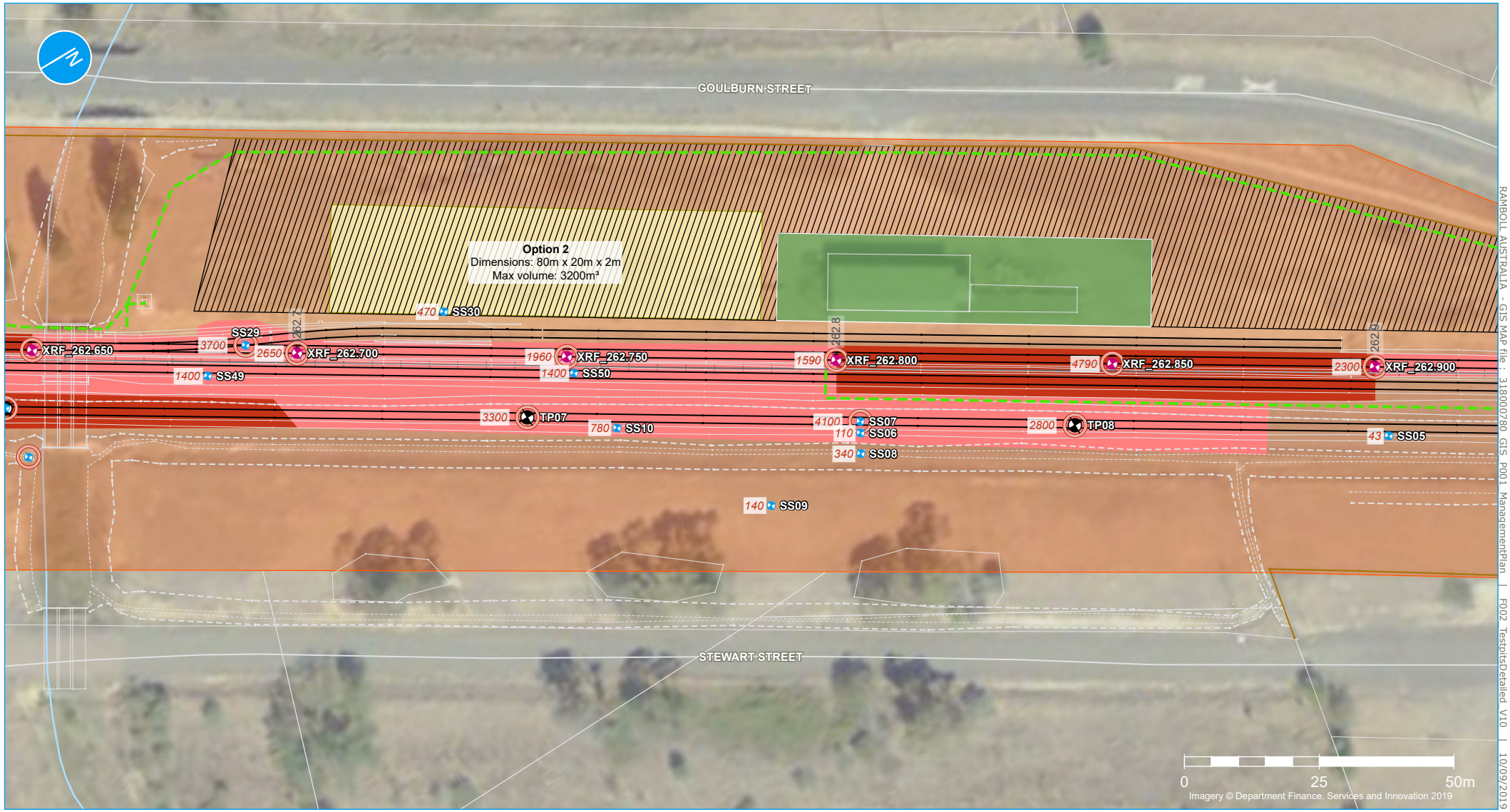
Exceedance area within construction footprint

- High (>4000 mg/kg Pb)
- Medium (1500-4000 mg/kg Pb)
- Containment area option

*Note: X-Ray fluorescence sampling results were conservatively assessed against a management threshold of 1200 mg/kg Pb to mitigate uncertainty associated with these.*

A4
1:1,000


Figure 2c | Assessment of lead in the construction footprint




RAMBOLL AUSTRALIA - GIS MAP file : 318000780 GIS P001 ManagementPlan | F002 TestpitsDetailed V10 | 10/09/2019

**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Signal trench (approximate)
- Construction compound
- Goods shed exclusion zone

Survey lines

- Rail track
- Top of bank
- Bottom of bank
- Other elements

Sampling locations

- 1200 Lead concentration (mg/kg)
- Shallow soil (Ramboll 2019)
- Test pit (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)
- Exceedance location

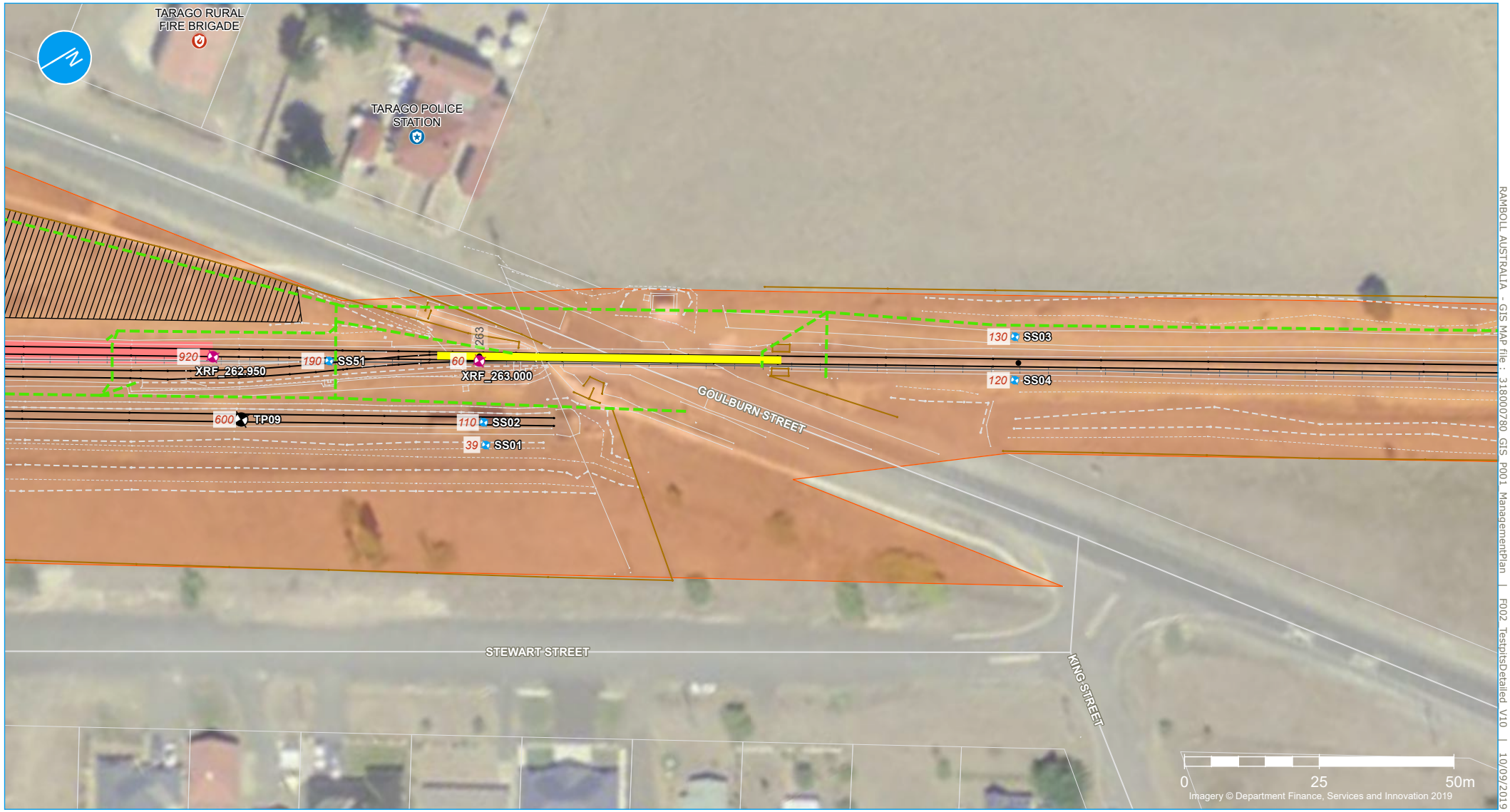
Exceedance area within construction footprint

- High (>4000 mg/kg Pb)
- Medium (1500-4000 mg/kg Pb)
- Containment area option

*Note: X-Ray fluorescence sampling results were conservatively assessed against a management threshold of 1200 mg/kg Pb to mitigate uncertainty associated with these.*

A4
1:1,000


Figure 2d | Assessment of lead in the construction footprint




**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Goulburn Street level crossing
- Signal trench (approximate)
- Construction compound

Survey lines

- Rail track
- Top of bank
- Bottom of bank
- Other elements

Sampling locations

- 1200 Lead concentration (mg/kg)
- Shallow soil (Ramboll 2019)
- Test pit (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)

Exceedance area within construction footprint

- Medium (1500-4000 mg/kg Pb)

*Note: X-Ray fluorescence sampling results were conservatively assessed against a management threshold of 1200 mg/kg Pb to mitigate uncertainty associated with these.*

A4
1:1,000


Figure 2e | Assessment of lead in the construction footprint


RAMBOLL AUSTRALIA - GIS MAP file : 318000780_GIS_P001_ManagementPlan_F003_TestptsSignalingWorks_V02 | 10/09/2019

A4
1:15,000

**Legend**

- Sampling location (signalling works)
- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Bridge crossing
- Goulburn Street level crossing
- Construction compound
- Goods shed exclusion zone


Figure 3 | Tarago loop extension and signalling works sampling locations

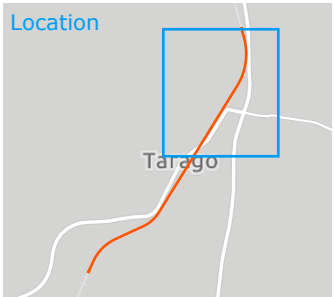

A4
1:8,000

**Legend**

- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Goulburn Street level crossing
- Construction compound
- Goods shed exclusion zone

Surface water sampling locations

- Sampled
- Proposed (dry)




RAMBOLL AUSTRALIA - GIS MAP file : 318000780_GIS_P001_ManagementPlan | F004-SurfaceWaterSamples_V01 | 20/08/2019

Figure 4 | Surface Water Sampling Locations

## APPENDIX 2
## NOTIFICATION LETTER

RAMBOLL

ENVIRONMENT
& HEALTH

Goulburn-Mulwaree Council
Locked Bag 22
Goulburn NSW 2580
Attention: The General Manager

Date 10/09/2019

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

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

Ref 318000780

# TARAGO TRACK WORKS
# NOTIFICATION OF CATEGORY 2 REMEDIATION WORKS

## INTRODUCTION

John Holland Rail (JHR) respectfully notify Goulburn Mulwaree Council of the planned Category 2 remediation works, as defined by *State Environmental Planning Policy 55 – Remediation of Land* (SEPP 55), to be carried out at a site near Tarago Station off Goulburn Street and referred to as the Tarago Siding.

The Tarago Siding is located completely within Lot 22 on deposited plan (DP) 1202608. The location of the Tarago Siding is shown on the attached plan. The Tarago siding is near to the former Woodlawn Mine siding. Woodlawn Mine was lead and zinc ore mine that operated at Woodlawn between 1978 and 1998. The siding was used to transfer ore from the mine to rail wagons for transport to a smelter.

## BACKGROUND

JHR is currently mobilising to undertake the following activities at Tarago (including the Tarago Siding):

- Extension and refurbishment of the existing siding opposite the Tarago Station between 261.280 km and 263.100 km
- The existing turn out at 262.357 km will be straight railed and replaced with a new turn out
- Construction of a new turn out at the City end to connect the siding to the main line
- 4 km of signalling upgrades between 261.500 km and 265.200 km
- Other ancillary works such as installation of rail infrastructure, signage and remediation of drainage channels within the rail corridor



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

In preparing environmental management documents and project planning, JHR identified that potentially contaminated soils associated with the operation of the former Woodlawn Mine siding would be impacted by the project activities. Subsequent investigations have consequently identified that the works will generate contaminated material that will require remediation following excavation and completion of the key construction activities. These construction activities are critical to allow the track to remain available for passenger and freight train use.

**REMEDIATION WORK**

JHR intends to undertake the following:

- Undertake the construction works (including excavation and spoil management) in accordance with a Site Environmental Plan, consistent with the management measures described in a Review of Environmental Factors (REF) determined under Part 5 of *the Environmental Planning and Assessment Act 1979* (EP&A Act), and subsequent addenda to the REF
- Temporarily stockpile any contaminated spoil generated within the known contaminated area in a manner consistent with the *Tarago Siding Lead Management Plan*. This includes temporary controls to protect human health and the environment
- Develop and implement a remedial action plan for the contaminated material
- Consider and mitigate potential risks to human health integrating notification of works to Comcare / SafeWork NSW

JHR is developing this remedial action plan and will advise Council of the outcomes of this plan when completed. It is expected that the remedial plan will comprise above ground onsite containment and this approach has been adopted in assessing the SEPP 55 category for the remedial works.

**CATEGORY 2 REMEDIATION WORKS**

This project is deemed to be Category 2 remediation work in accordance with SEPP 55. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 9 of SEPP 55. The triggers for Category 1 remediation work are evaluated in **Table 1**.

**Table 1: Evaluation of Category 1 Triggers**

| SEPP 55, Clause 9 Trigger | Evaluation |
|---|---|
| a) Designated development | The project is not designated development. Schedule 3 Clause 15 of the *Environmental Planning and Assessment Regulation 2000* describes conditions under which contaminated soil treatment works are deemed designated development. Of specific relevance to this project:<br>• The volume of contaminated material falls below 30,000m3 (estimated at < 1000m3)<br>The area of contaminated soil to be disturbed is less than 3 hectares (estimated at 2 hectares). |
| b) carried out or to be carried out on land declared to be a critical habitat, or | The project would not be carried out on land declared to be a critical habitat. |
| c) likely to have a significant effect on a critical habitat or a threatened species, population or ecological community, or | The Tarago Siding has been significantly disturbed by historical and ongoing rail related activities. It will not require disturbance of critical habitat or a threatened species, population or ecological community. |

| SEPP 55, Clause 9 Trigger | Evaluation |
|---|---|
| d) development for which another State environmental planning policy or a regional environmental plan requires development consent, or | No State Environmental Planning Policy or Regional Environmental Plan identifies the proposed remediation as an activity requiring development consent. |
| e) carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:<br>(i) coastal protection,<br>(ii) conservation or heritage conservation,<br>(iii) habitat area, habitat protection area, habitat or wildlife corridor,<br>(iv) environment protection,<br>(v) escarpment, escarpment protection or escarpment preservation,<br>(vi) floodway,<br>(vii) littoral rainforest,<br>(viii) nature reserve,<br>(ix) scenic area or scenic protection,<br>(x) wetland, or | The project is located on land zoned RU2 Rural Landscape under the *Goulburn Mulwaree Local Environmental Plan 2009*. No other environmental planning instrument prescribes the project site as one of the areas listed in point (e). |
| f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner). | The *Goulburn Mulwaree Development Control Plan 2009* includes guidance that applies to Contaminated Land. The proposed remediation complies with the guidance. |

The proposed remediation works do not trigger the criteria in clause 9 (a) – (f) as outlined in **Table 1**, and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under SEPP 55.

It is anticipated that remediation of the activities associated the Tarago Siding Project would commence in late September/ early October 2019 and be completed XXX.

Yours sincerely

**Shaun Taylor**
Senior Managing Consultant

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M +61408386663
staylor@ramboll.com