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TARAGO RAIL CORRIDOR ENVIRONMENTAL SITE ASSESSMENT

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TARAGO RAIL CORRIDOR
ENVIRONMENTAL SITE ASSESSMENT

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Description	**This report presents the results of a detailed site investigation targeting lead within the Goulburn – Bombala rail corridor at Tarago, NSW.**

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1. INTRODUCTION

1.1 Preamble

Ramboll Australia Pty Ltd (Ramboll) was commissioned by John Holland Rail (JHR) to complete an Environmental Site Assessment (ESA) targeting lead within the Goulburn – Bombala rail corridor at Tarago NSW.

The site occupies an area of approximately 7.5 hectares including a rail siding historically used for load-out of lead ore concentrate from the Woodlawn Mine (the Woodlawn Siding). Development is underway to extend a loop line between the Woodlawn Siding and the main Goulburn – Bombala line (the main line) and contamination impacts associated with remnant lead ore concentrate were identified in planning for this work.

1.2 Proposed Construction

Proposed works include installation of signal services from CH: 261.500 km (northern city end) and CH: 265.200 km (southern country end). In addition to signal works, construction north of the Goulburn Street level crossing 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 main line, restoration of drainage between lines and reconditioning of the main line rail formation.

1.3 Objectives

The objective of this engagement was to assess risks associated with potential site contamination with specific regard for historic lead ore concentrate load out.

1.4 Scope of Work

The scope of work completed under this engagement comprised of an intrusive assessment of contaminants associated with rail corridors and historic use of the Tarago rail corridor for ore concentrate loadout. Sampling locations targeted shallow soils and were designed to supplement existing assessments to achieve systematic coverage.

1.5 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 historically identified contamination within the proposed construction footprint) falls within approximately 1,000 lineal meters of rail corridor from Chainage (CH): 261.950 km to CH: 263.000 km (as distance from Sydney, NSW and occupies an area of approximately 7.5 hectares. Tarago Station is located adjacent and east of the site at CH: 262.500 km.

Locality and site plans are presented as **Appendix 1**, **Figure 1** and **Figure 2** respectively.

1.6 Previous Investigation

Assessment and management support provided to JHR in relation to site contamination has targeted the footprint of current construction (to the exclusion of surrounding areas of the rail corridor) and is provided within the following documents:

- McMahon 2015 Tarago Rail Siding Extension: Preliminary Contaminated Site Assessment

- Ramboll 2019 Tarago Loop Extension Further Intrusive Assessment and Lead Management Plan
- Ramboll 2019a Tarago Loop Extension Preliminary Human Health Risk Assessment
- Ramboll 2019b Tarago Loop Extension August Surface Water Monitoring
- Ramboll 2019c Tarago Loop Extension September Surface Water Monitoring
- Ramboll 2019d Tarago Loop Extension Remedial Action Plan

These documents are summarised in the sub-sections below.

1.6.1 McMahon 2015 Tarago Rail Siding Extension: Preliminary Contaminated Site Assessment

A previous preliminary site assessment found lead levels exceeding relevant human-health guideline values in certain parts of the site (McMahon 2015). Based on review of this report Ramboll concluded:

1. A siding adjacent to Tarago Station (the Woodlawn Siding) was historically used to load lead ore from the former Woodlawn mine and this practice is identified as a source of potential contamination at the site
2. Intrusive assessment included composite sampling and analyses for a broad range of contaminants and identified contamination 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 (the Woodlawn Siding). Ramboll recommended that the results of composite sampling as described in McMahon (2015) should be used to screen the potential presence / absence of lead impacts only. Factoring required when interpreting composite sample results (i.e. multiplying reported concentrations by the number of sub-samples) can lead to conservative interpretation of the degree of impact and composite sample results (as described) should not be relied upon to assess risk associated with lead exposure
3. Further assessment of the degree and extent of lead impact between CH: 261.980 km and CH: 263.000 km was recommended
4. Further assessment of the Proposed Tarago Loop north of CH: 261.980 km was not considered warranted at the time and construction could proceed in this area without requirement for management measures associated with contamination. This included construction of the signal trench in this area
5. Construction of signal trench from CH: 263.027 km (the Goulburn Street level crossing) to CH: 265.200 km (the country end of the Crisps Creek Intermodal Facility) could occur without requirement for management measures associated with contamination.

1.6.2 Ramboll 2019a Tarago Loop Extension Further Intrusive Assessment and Lead Management Plan

Works completed targeted the Woodlawn Siding and surrounds within the area identified in the McMahon assessment as being lead impacted and a 2 km length of proposed signal trench south of the Goulburn Street level crossing. Works were completed in July – August 2019 and assessment of the Woodlawn Siding included:

- Advancement of nine test pits (TP1 to TP9) on approximate 100 m 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).
    - Soil conditions were logged for each of the nine test pits
    - Discrete soil samples were collected from each of the three distinct layers of material present within each test pit. This included the top ballast layer (mostly fines), middle capping layer and bottom structural base/subgrade.

    - Six samples from the ballast layer were analysed for petroleum hydrocarbons (TRH), benzene, toluene, ethyl benzene, xylene (BTEXN), polycyclic aromatic hydrocarbons (PAH), 8 metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) and asbestos. Remaining samples were analysed for lead
- 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 lead ore was historically transported to the siding) and the Woodlawn Siding where loading of lead 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

  All shallow soil samples were analysed for lead.
- Field measurement of lead using a portable X-Ray Fluorescence (XRF) device in the main line on 25 m to 50 m lineal increments at 29 locations including:
    - Hand removal of upper 0.1 – 0.3 m of ballast to expose fines between tracks and in the western shoulder of the main line formation
    - XRF measurement of lead of exposed fines in the shoulder and between tracks
    - Averaging of shoulder and in-track readings to define a representative impact at each location

Results identified site materials impacted by lead from CH: 261.950 to 262.950 including fines in ballast in the main and loop lines; ballast at the top of the Woodlawn Siding formation; and soils adjacent (west of) the Woodlawn Siding (CH: 261.980 km to CH: 262.880 km). A distinct area with much higher lead concentrations was observed between CH: 262.090 km and CH: 262.700 km. Samples from capping underlying ballast in the Woodlawn Siding from nine of nine test pits reported lead concentrations below site assessment criteria supporting conclusion that vertical migration is limited to shallow soils. Lead concentrations were observed to be highly variable over short distances and ranged from 7 mg/kg to 38,000 mg/kg within the proposed loop extension footprint. This variability was considered consistent with historical deposition of lead ore concentrate during loading of rail cars.

Assessment of the signal trench included:

- Advancement of five test pits on 400 lineal meter increments along the 2 km signal trench alignment to a depth of approximately one meter (anticipated depth of trenching)
- Collection of one sample from shallow soils within each test pit
- Analyses of all samples for TRH, BTEXN, PAH, 8 metals and asbestos

Results from assessment of the signal trench were reported below assessment criteria with the exception of zinc reported at TP13_0.1 (300 mg/kg) which exceeded the adopted EIL of 110 mg/kg).

1.6.3 Ramboll 2019b Tarago Loop Extension Short Term Lead Management Plan

A short-term lead management plan (SLMP) was developed to mitigate lead exposure risks to workers associated with the proposed Tarago loop extension. Recommendations included excavation of lead impacted soils to temporary stockpile areas to remove lead exposure risk from the proposed loop extension footprint as well as work practices to mitigate exposure while completing these excavation works.

1.6.4 Ramboll 2019c Tarago Loop Extension Preliminary Human Health Risk Assessment

The scope of works completed under the human health risk assessment (HHRA) included derivation of management criteria for lead in soil based on targeted blood lead levels prescribed in relevant regulatory guidance and an exposure scenario specific to rail workers. An assessment of lead bio-accessibility within soils targeting the range of observed concentrations above the generic HIL D (1500 mg/kg) was commissioned through the University of South Australia.

Concentrations of lead present at the site were considered likely to present an unacceptable level of risk to site workers. Based on current SafeWork NSW lead risk work guidelines of 10 µg/dL of lead in blood, a safe lead in soil concentration was estimated at **5,300 mg/kg** for current works within the known contaminated areas at the site. As concentrations at the site exceed this criterion it was recommended that any works at the site should implement the recommendations contained within the SLMP, unless there is certainty that work is being carried out in areas where current exposure concentrations are less than the calculated safe level. A clean-up criterion based on the future blood lead guideline value of 5 µg/dL was estimated at **2,200 mg/kg** and this was recommended as a clean-up criteria protective of future rail workers.

Observations of variability in lead concentrations observed through earlier works were supported by analyses completed as part of the HHRA. Of particular note, lead in surface ballast fines adjacent remnant ore load out infrastructure (concrete in Woodlawn Siding – Ramboll ref TP4a) was reported at 184,000 mg/kg. This varied from the concentration reported at TP4 collected from 0.1 – 0.3 m depth of 38,000 mg/kg. Through correspondence with the University of South Australia and the primary laboratory engaged for this project (Eurofins MGT) it was identified that while the analytical method applied (LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS) is endorsed under the NEPM as appropriate for assessment of lead in soil, application to samples significantly impacted by lead ore concentrate may underrepresent lead concentrations. This inferred a degree of uncertainty over results from previous assessment (Ramboll 2019) however this uncertainty was considered limited to highly concentrated impacts (>10,000 mg/kg) and the analytical method applied was considered adequate for assessing concentrations against the site assessment criteria ($\leq$ 5,300 mg/kg).

1.6.5 Ramboll 2019d - e Tarago Loop Extension August and September Surface Water Monitoring

The scope of works completed under this assessment included:

- Inspection of drain lines upstream and down stream of three culverts passing beneath he Woodlawn Siding (and adjacent lines).
- Observation of surface water at one upstream location plus one downstream location during August 2019 and two upstream locations plus two downstream locations during September 2019. Surface water was not observed upstream or downstream of the northern most culvert during August or September 2019
- Collection of samples during August and September 2019 where water was observed
- Analyses of samples for TRH, BTEXN, dissolved metals (Al, Ba, Be, Co, Fe, Mn, As, Cd, Cr, Cu, Pb, Ni, Zn, Hg), total lead and physicals/inorganics (pH, conductivity, TDS, TSS, turbidity, N02, N03, NH3, total N, kjehladl N, total P)

Results from the location upstream of the southern culvert were reported below assessment criteria for receiving waters. Results from the location upstream of the middle culvert included exceedances of assessment criteria however visual assessment indicated waters were likely impacted by fines from the Woodlawn Siding.

Results from downstream locations were reported above assessment criteria for receiving waters as follows:

- Phosphate was reported at a maximum of 30,000 ug/L, above the ANZG criteria protective of irrigation (800 – 1200 ug/L)
- Aluminium was reported at a maximum of 380 ug/L above the ANZG freshwater ecological criteria for 95% species protection (55 ug/L)
- Iron was reported at a maximum of 370 ug/L above the ANZG freshwater ecological criteria for 95% species protection (300 ug/L)
- Lead was reported at a maximum of 33 ug/L above the ANZG freshwater ecological criteria for 95% species protection (3.4 ug/L)
- Cadmium was reported at a maximum of 13 ug/L above the ANZG freshwater ecological criteria for 95% species protection (0.2 ug/L)
- Copper was reported at a maximum of 200 ug/L above the ANZG freshwater ecological criteria for 95% species protection (1.4 ug/L) and above the ANZG criteria protective of irrigation (100 ug/L)
- Nickel was reported at a maximum of 19 ug/L above the ANZG freshwater ecological criteria for 95% species protection (11 ug/L)
- Zinc was reported at a maximum of 2600 ug/L above the ANZG freshwater ecological criteria for 95% species protection (8 ug/L).

1.6.6 Ramboll 2019f Tarago Loop Extension Remedial Action Plan

A Remedial Action Plan (RAP) was developed for spoil projected to be generated during loop extension works. In consultation with JHR, above ground onsite containment was selected as the remedial strategy.

2. SAMPLING AND ANALYSIS QUALITY PLAN

2.1 Data Quality Objectives

Ramboll developed Data Quality Objectives (DQOs) and Data Quality Indicators (DQIs) for this assessment using the US EPA seven-step DQO process, endorsed in Schedule B2 of NEPM (2013). The DQOs set quality assurance and quality control parameters for the field and laboratory program to ensure data of appropriate reliability has been used in assessment of the area of previously identified lead impact and the proposed signal trench.

The DQOs outlined below focus on the assessment of contamination in soil (**Table 2-1**).

Table 2-1: Data Quality Objectives

DQO	Outcome
State the Problem	Previous investigations within the proposed Tarago Loop Extension identified lead in soils at concentrations that present potential risks to human health and the environment. The degree and extent of lead and other potential contaminants within the rail corridor surrounding the Loop Extension footprint (and Woodlawn Siding) remains unclear.
Identify the Decision	1. Is the data collected of sufficient quality to identify impacts to meet the project objectives? 2. What is the degree and extent of lead impacts in soil?
Identify Inputs to the Decision	Intrusive assessment of shallow soils surrounding the Woodlawn Siding, including logging of the soil profile and collection and analysis of soil samples for contaminants of potential concern
Define the Study Boundaries	Spatial boundaries include the Goulburn to Bombala rail corridor from CH: 261.980 km to CH: 263.000 km excluding the Loop Extension footprint previously assessed and soils within this area to a depth of 0.1 m
Develop a Decision Rule	The statistical parameters of interest are the concentrations of TRH, BTEXN, PAH, 8 metals and asbestos contaminants of potential concern (COPC). The action levels are the Assessment Criteria outlined in **Section 5.** The decision rules for this investigation are as follows: 1. If it is determined that the data generated through this investigation is reliable, complete, comparable, accurate and representative then this information will be used to address the assessment objectives. 2. If it is determined that the data generated through this investigation is not suitable, comprehensive or reliable for use in achieving the goals of the study, then further investigations may be recommended to reduce uncertainties. 3. If it is determined that insufficient information is available to make conclusions on the risk to receptors, then further information may be required. 4. If it is determined that contaminant concentrations are below adopted assessment criteria (integrating statistical assessment where appropriate) risks to human health or the environment will not be considered to exist. 5. If it is determined that contaminant concentrations are above assessment criteria potential requirements for further assessment and/or remediation will be considered to exist. .
Specify Limits on Decision Errors	The potential for significant decision errors are minimised by: 1. Completion of a quality assurance/ quality control (QA/QC) assessment of the investigation data to assess if the data satisfies the DQIs;

	2. Assessment of whether appropriate sampling and analytical densities were completed for the purposes of the investigation; and 3. Ensuring that the criteria set for the investigation were appropriate for the proposed use of the site.
Optimise the Design for Obtaining Data	The sampling plan was designed to: 1. Supplement existing investigations and achieve representative sampling on a systematic pattern across the site. To achieve this, a total 56 primary samples were collected on a grid pattern around the Loop Extension footprint 2. Target the boundary of the residence adjacent (north of) Tarago Station. To achieve this a total of four primary samples were collected 3. Further assess the extent of lead ore concentrate in surface soils adjacent remnant load out infrastructure in the Woodlawn Siding (ie: around TP4a where lead was reported at 184,000 mg/kg). One sample was collected 10 m south and one sample was collected 10 m north of TP4a to achieve this.

2.2 Data Quality Indicators

DQIs have been established to set acceptance limits on field and laboratory data collected as part of the soil and surface water program. The DQIs are outlined in **Table 2-2.**

Table 2-2: Data Quality Indicators

DQI	Field	Laboratory
Completeness – a measure of the amount of useable data from a data collection activity	All locations sampled. Experienced sampler. Documentation correct.	All samples analysed. All analysis completed according to standard operating procedures. Appropriate methods Appropriate Practical Quantitation Limits (PQLs).
Comparability – the confidence that data may be considered to be equivalent for each sampling and analytical event	Experienced sampler. Climatic conditions noted during sampling. Same types of samples collected using approved sampling methods.	Same analytical methods used. Same sample PQLs. Same NATA accredited laboratories used. Same units.
Representativeness – the confidence that data are representative of each medium present on-site.	Appropriate media sampled.	All samples analysed according to standard operating procedures.
Precision – a quantitative measure of the variability of the data.	Collection of intra-laboratory duplicates at a rate of 1 in 20 primary samples. Collection of inter-laboratory duplicate samples at a rate of 1 in 20 primary samples.	Analysis of field duplicate samples, relative percent difference (RPDs) to be $\leq$30%. Laboratory duplicates analysed, RPDs to be $\leq$ 30%.
Accuracy – a quantitative measure of the closeness of the reported data to the "true" value.	Sampling methodologies appropriate and complied with. Collection of background samples.	Analysis of: Method blanks Matrix spikes Surrogate spikes Laboratory control samples Results for blank samples to be non-detect. Results for spike samples to be between 70% and 130%.

A sampling plan was developed in accordance with the DQOs. Elements of the sampling plan are shown in **Table 2-3**.

Table 2-3: Sampling Plan

Method	Requirements	Chemical Analysis
Shallow soil sampling surrounding the Woodlawn Siding	Shallow soil (0-0.1m) samples were to be collected from areas within the rail cordor surrounding the Woodlawn Siding.	Lead in all samples. Analyses of twenty samples for TRH, BTEX, PAH, 8 metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) and asbestos.

3. FIELDWORK

3.1 Scope Summary

The following scope of fieldwork was undertaken:

- Mobilisation to the site on 22 September 2019 and demobilisation 24 September 2019
- Collection of 31 shallow soil samples to establish grid-based coverage across the site (integrating completed sampling locations).
- Collection of four samples targeting the boundary shared by the house adjacent and north of Tarago Station
- Collection of one sample from surface soils 10 m north of TP4a and one sample 10 m south of TP4a
- Analysis of all samples for lead
- Analysis of 20 samples for TRH, BTEXN, PAH, 8 metals and asbestos to supplement existing analyses for these COPC and to provide broad coverage across the site
- Analysis of 5 samples for pH, conductivity, particle size distribution, % Fe and organic carbon content (to facilitate consideration of site-specific ecological uptake)

Fieldwork over this period also included surface water sampling though this is considered under a separate Surface Water Monitoring report (Ramboll 2019e).

Soil sampling locations are shown on **Figure 3**, **Appendix 1.** A photographic log is presented as **Appendix 2**.

3.2 Quality Assurance and Quality Control

The fieldwork program was undertaken in accordance with the DQOs and DQIs outlined in **Section 2.** Specific field quality control measures implemented are described in **Table 3-1**. Assessment of data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations, as outlined in NEPC (2013) guidelines is presented in

Table 3-2. A quality assurance assessment of the DQIs for this report is presented in **Table 3-3**.

Table 3-1: QA/QC Sampling and Analysis Methodology Assessment

Sampling Methodology	Ramboll's Assessment
Sample Collection Method	Sub-surface soil samples were collected from undisturbed material inside the excavated test pits. Shallow soil samples were collected using a shovel to excavate 0-0.1 m. All samples were collected using disposable nitrile gloves that were changed between sampling locations.
Decontamination Procedures	Decontamination was not required as samples were collected directly into laboratory-supplied soil sampling bags or jars using a gloved hand. New gloves were worn for each sample collection.
Sample Handling and Storage	Samples were collected into laboratory-supplied soil sampling bags or jars. Samples were stored in a chilled esky in the field and in transit to the laboratory.
Chain of Custody	The samples were dispatched to the laboratory under chain of custody conditions.

Table 3-2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Ramboll Assessment
Field quality control samples	Five intra-laboratory duplicate samples and three inter-laboratory duplicates were analysed for 62 primary soil samples resulting in a percentage of 8.1% for intra-laboratory duplicates and 4.8% inter-laboratory duplicates. The intra-laboratory duplicate percentage surpassed the targeted 5%. The inter-laboratory duplicate percentage was marginally below the targeted 5% In combination with the laboratory quality control samples, this is not considered prohibitive of reliance on the data set.
Field quality control results	Duplicate results are included in **Appendix 3**. Relative percent differences (RPDs) were calculated for duplicate and primary sample pairs. For the assessment of RPDs, it is noted that concentrations close to the practical quantitation limit (PQL) will have higher RPDs. As such, a range of RPDs were considered as requiring further assessment, as follows: • RPD >30% where both sample results exceed 20 times the PQL. • RPD > 50% where both sample results are within 10 to 20 x PQL • RPD no limit where one or both sample results are <10 x PQL Duplicate RPDs outside of acceptance criteria were limited to two sample pairs with concentrations exceeding 20 times the PQL where the RPD was >30% (62%, 40%). The RPD exceedances are considered representative of variable lead content within samples rather than sampling error. Variable lead content is considered likely to be a function of a low variability in distribution of highly concentrated lead ore (lead observed at concentrations of up to 18% w/w) rather than higher variability of comparatively low concentrations as commonly drives elevated duplicate RPDs. Uncertainty associated with results at any given location is offset by a high sampling density such that the general characterisation of lead distribution is considered reliable. Lead distribution is characterised by a localised and highly concentrated area of impact within the Woodlawn Siding and immediate surrounds with far less concentrated impacts in other areas of the corridor. Potential uncertainty in assessment of lead concentrations against assessment criteria is considered to be low and limited to the periphery of concentrated impacts where concentrations are within the same order of magnitude as the criteria.
NATA registered laboratory and NATA endorsed methods	Eurofins MGT was used as the primary laboratory. Eurofins MGT's laboratory certificates are NATA stamped and are accredited for the analyses performed for this assessment.
Analytical methods	A summary of analytical methods is included in the laboratory test certificates. Through correspondence with the University of South Australia and the primary laboratory engaged for this project (Eurofins MGT) it was identified that while the analytical method applied for metals analyses (LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS) is endorsed under the NEPM as appropriate for assessment of lead in soil, application to samples significantly impacted by lead ore concentrate may have underrepresented lead concentrations. Based on previous experience with lead ore concentrate, replicates of samples used in the HHRA were extracted using varying soil masses (1g, 0.2g and 0.1g) and multiplication factors of 1, 5 and 10 respectively were applied to assess potential upper limit capacity of the extraction. Results supported conclusion that concentrations over 10,000 mg/kg may be underrepresented by the standard LTM-MET-3040 extraction. Underrepresentation of concentrated lead concentrations >10,000 mg/kg is not considered to negatively impact assessment of risk however as the assessment criteria are significantly lower than 10,000 mg/kg.

Field and Lab QA/QC	Ramboll Assessment
	Within this assessment samples suspected to contain an elevated ore concentrate content.
Holding times	Review of the COCs and laboratory certificates indicate that holding times were met.
Practical Quantitation Limits (PQLs)	PQLs for the soil analytes were below the assessment criteria.
Laboratory quality control samples	Laboratory quality control samples including duplicates, laboratory control samples, matrix spikes, surrogate spikes and blanks were undertaken by the laboratories at appropriate frequencies.
Laboratory quality control results	All results for laboratory soil duplicates, laboratory control samples and surrogates were acceptable.

Table 3-3: QA/QC – Assessment of DQIs

DQI	Ramboll Assessment
Completeness	Completeness is a measure of whether all the data necessary to meet the project objectives was collected. The grid-based sampling comprised 62 shallow soil samples collected from targeted locations within the rail corridor outside of the loop extension footprint. Grid-based sampling allows for the degree and extent of lead impact be characterised within the sample area. The targeted assessment is considered to provide adequate data to meet the project objectives.
Comparability	Comparability is a measure of confidence that the data may be considered to be equivalent for each sampling and analysis event. The field investigations were completed by experienced personnel from Ramboll using standard operating procedures. The laboratory analysis was undertaken by NATA registered laboratories using accredited analytical methods. At several locations duplicate samples were observed to ensure comparability of sample measurements.
Representativeness	Representativeness is the confidence that the data is representative of each media present at the site. Sampling was completed to supplement existing datasets from McMahon (2015), Ramboll (2019) and Ramboll (2019a). A total of 62 soil samples were collected to further characterise the degree and extent of lead impacts within the rail corridor. The sampling density achieved is considered to inform assessment of the degree of contamination sufficiently to assess risks and develop management options during construction.
Precision	Precision is a measure of the reproducibility of the data. In the field, Ramboll achieved precision by using standard operating procedures for the collection of soil samples and by collecting duplicate and triplicate samples for analysis. As outlined in **Table 3-2**, RPD results for duplicate samples indicated heterogeneity in the lead concentrations however these were not considered significant in the context of the assessment.

DQI	Ramboll Assessment
	At the laboratory, precision was assessed using blind duplicates samples and split duplicates. As outlined in **Table 3-2**, RPDs were acceptable and no detections were made in blank samples.
Accuracy	Accuracy is a measure of the closeness of a measurement to the true parameter value. In the field, Ramboll achieved accuracy by using standard operating procedures for the collection of soil including background samples to prevent cross contamination. At the laboratory, precision was assessed using blind duplicate samples, method blanks, laboratory control samples and spikes. All results for laboratory control samples were within acceptable ranges.

It is considered that the data obtained adequately complied with the DQIs stated in **Section 2** and that the data is of suitable quality to meet the project DQO's objectives. Quality assurance analysis concluded that concentrations in excess of 10 000 mg/kg are likely to be underestimated and variability at these higher concentrations occurs due to the distribution of ore concentrate within the soil sample. Concentrations above 10, 000 mg/kg have therefore lower reliability. Concentrations of analytes in soil within the same order of magnitude as the assessment criteria and below were found to be adequately reliable.

4. FIELD OBSERVATIONS

4.1 Site Geology

Soil profiles encountered at the site across this assessment and the historic assessments are outlined in **Table 4.1**. Further details are provided in test pit logs in the historic reports (Ramboll 2019a – c).

Table 4-1: Summary of Observed Geology

Location	Approximate depth	Lithology
Woodlawn Siding (test pits)	Ballast layer: 0-0.3 m	Fill: silty gravel, coarse – cobbles, grey/brown (higher silt content and orange / yellow staining localised within area of lead impact), dry, loose, angular
	Capping layer (ie: structural component of the rail formation – not capping for remediation): 0.3-0.5 m	Fill: clayey gravelly sand, grey/black, moist, coarse, fine sub-angular gravel
	Structural base/subgrade: 0.5-0.7 m	Fill: gravelly clay, grey with brown mottling, moist, stiff, low plasticity
Signalling trench (test pits)	0-0.2 m	Fill: gravelly sand, medium grained, dry, angular coarse-grained gravel with some silt and ballast. Traces of clay, brown
	0.5 m – 0.8 m	Natural: silty sand, clay, low plasticity, brown
	0.8-1 m	Natural sandy clay, low plasticity, pale brown and medium grained sand, coarse gravel, sub angular
Surface soils	0-0.1 m	Variable between but generally: Fill: gravelly sandy silt east of the rail lines and, silty gravel (ballast) within the lines and within

Photographs in **Appendix 2** provide a general depiction of the site and the fill material encountered during the investigation.

4.2 Field Observations

- Siding – the siding area was characterised by old and rusty track works including degraded sleepers and rusty rail works. Fine rust coloured dusts were evident on the underlying ballast. This also appeared to contain fine soil dusts. Discolouration and staining were present in some locations considered potentially indicative of contamination.
- Adjacent areas – areas adjacent to the siding where samples were taken had very limited vegetation. Areas immediately next to the track contained fill material, while other areas had a mixture of natural material and fill material on the surface.
- General area – dense and established trees were observed south of Tarago Station and along the eastern site boundary opposite Tarago Station and further south. Surface water was observed upstream and downstream of culverts at two of three culverts passing beneath the Woodlawn Siding. This was interpreted as melt water from snow fall on or around 17 September 2019.

5. ASSESSMENT CRITERIA

The activity to be undertaken at the site involves mostly outdoor construction work and will include only adult receptors. Site specific assessment criteria for current and future rail worker exposure have been developed though an HHRA (Ramboll 2019c).

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.

Tier 1 assessment criteria were adopted for the adjacent residence and footpaths.

The assessment criteria are shown in **Table 5-1**.

Table 5-1 Assessment Criteria

Contaminant	HHRA[1]	Site Specific Ecological Investigation Level (EIL)[2]	Open Space Human Health[3]	Open Space Ecological[4]	Residential Human Health[5]	Residential Ecological[4]
Metals						
Arsenic	-	160	300 (HIL C)	100 (EIL)	100 (HIL A)	100 (EIL)
Cadmium	-	-	90 (HIL C)		20	-
Chromium	-	710	300 (HIL C)	190 (EIL)	100	190 (EIL)
Copper	-	160	17,000 (HIL C)	60 (EIL)	6,000	60 (EIL)
Lead	2,200	1,800	600 (HIL C)	1,100 (EIL)	300	1,100 (EIL)
Nickel	-	340	1,200 (HIL C)	30 (EIL)	400	30 (EIL)
Zinc	-	370	30,000 (HIL C)	70 (EIL)	7,400	70 (EIL)
Mercury	-	-	80 (HIL C)	-	40	-
TRH						
C6 - C10 Fraction	-	-	-	180 (ESL)	-	180 (ESL)
C6 - C10 Fraction minus BTEX (F1)	-	-	-	180 (ESL)	-	180 (ESL)
>C10 - C16 Fraction	-	-	-	-	-	-
>C16 - C34 Fraction (F3)	-	-	-	300 (ESL)	-	300 (ESL)
>C34 - C40 Fraction (F4)	-	-	-	2,800 (ESL)	-	2,800 (ESL)
>C10 - C16 Fraction minus Naphthalene (F2)	-	-	-	120 (ESL)	-	120 (ESL)
BTEX						
Benzene	-	-	-	50 (ESL)	-	50 (ESL)

Contaminant	HHRA[1]	Site Specific Ecological Investigation Level (EIL)[2]	Open Space Human Health[3]	Open Space Ecological[4]	Residential Human Health[5]	Residential Ecological[4]
Toluene	-	-	-	85 (ESL)	-	85 (ESL)
Ethylbenzene	-	-	-	70 (ESL)	-	70 (ESL)
Total Xylenes	-	-	-	45 (ESL)	-	45 (ESL)
PAH						
Naphthalene	-	370	-	170 (EIL)	-	170 (EIL)
Benzo(a)pyrene	-	-	-	33 (ESL)	-	33 (ESL)
Sum of polycyclic aromatic hydrocarbons	-	-	300 (HIL C)	-	300 (HIL A)	-
Benzo(a)pyrene TEQ (LOR)	-	-	3 (HIL C)	-	3 (HIL A)	-
Asbestos						
Bonded ACM	-	-	0.02 % (HSL C)	-	0.01 % (HSL A)	-
FA and AF (friable asbestos)	-	-	0.001 % (HSL C)	-	0.001% (HSL A)	-
All forms of asbestos	-	-	No visible asbestos for surface soil (HSL C)	-	No visible asbestos for surface soil (HSL A)	-

- means no criteria available

All values are in mg/kg unless stated

[1] Values adopted from the Human Health Risk Assessment (Ramboll 2019d)

[2] Values calculated using NEPC Ecological Investigation Levels – Interactive (Excel) Calculation Spreadsheet

[3] Values adopted from NEPM 2013 for Recreational C (public open space) i.e. parks playgrounds, playing fields

[4]Values adopted from NEPM 2013 for urban residential and public open space

[5]Values adopted from NEPM 2013 for Residential A i.e. garden accessible soil

6. RESULTS

Tabulated assessment of analytical results from recent and historic sampling (integrating works described here-in and Ramboll 2019a and 2019c) against site assessment criteria is presented in **Appendix 3.** TRH, BTEXN, PAH, and asbestos were assessed in 30 primary samples and found to fall below site assessment criteria at all locations. Metals (in particular lead) were reported above site assessment criteria at a number of locations. A statistical summary of metals concentrations is shown in **Table 6.1.** Results exceeding site criteria are presented in **Appendix 1**, **Figures 2a – 2d**.

Table 6-1: Summary of observed metals concentrations

Analyte	Count	Min	Max	Average	n > Human Health Criteria	n > Ecological Criteria
Arsenic	30	1	150	18.01	0	0
Cadmium	30	0.2	14	2.70	0	-
Chromium	30	2.5	57	12.95	0	0
Copper	30	2.5	990	185.66	0	11
Lead	148	2.5	184,000	5032.34	36	39
Nickel	30	2.5	17	4.90	0	0
Zinc	30	12	1600	407.77	0	8
Mercury	30	0.05	0.6	0.118333333	0	-

Interpretation of results suggests that:

- Contamination in soil appears limited to lead
- Lead impacts do not appear to extend west outside of the corridor
- Lead impacts along the eastern boundary infer potential for offsite impacts exceeding generic residential criteria of 300 mg/kg. This criteria is relevant to the residence north of Tarago Station only and samples SS52 – SS55 exceed 300 mg/kg.
- Lead impacts along the eastern boundary infer potential for offsite impacts exceeding generic open space criteria of 600 mg/kg. This criteria is relevant to public open spaces including footpaths and samples SS55, SS61, SS71, SS75 and SS88 exceed this criteria.

Laboratory reports are presented as **Appendix 4**.

7. 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. The findings of all assessments referenced here-in are considered in the exposure pathway assessment presented in **Table 7-1.**

Table 7-1: 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**	**P**	Concentrations in soils exceed onsite assessment criteria. There is the potential for onsite worker exposure if sufficient controls are not put in place and potential for impacts to onsite ecology. Concentrations in soils on rail corridor boundaries and in the Tarago Station carpark were found to be above the HIL and EIL criteria for adjacent residential and open space land uses and so there is potential for impacts to offsite human health and ecological receptors. While results infer low contaminant mobility, Tarago Station is close to the high impact lead area (approximately 15 m) 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**	**P**	
Outdoor dust inhalation	**P**	**Y**	**Y**	**P**	
Surface Water					
Dermal Contact	N	N	N	**P**	

	Source-Pathway-Receptor Link? (Yes/ No/ Potential (P))				
	Offsite members of the public	**Onsite workers**	**Onsite Ecology**	**Offsite Ecological Receptors including livestock**	**Justification**
Incidental Ingestion	N	N	N	**P**	Flow was not observed in any of the drains or culverts present at the site. However, this may change upon rainfall, which can mobilise contaminated material into the local waterway where aquatic ecological receptors may become exposed.
Potable Ingestion	N	NA	N	NA	
Irrigation Pathways	N	N	N	**P**	

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

A short-term lead management plan (SLMP) was prepared to guide management of contaminated materials during construction (2019b). The SLMP recommends measures for the temporary management of the above risks to site workers (during loop expansion works).

While the SLMP may serve to mitigate worker exposure, impacts observed over assessment criteria present drivers for remediation protective of onsite human health and ecological receptors in the long term. Concentrations reported on site boundaries exceeding assessment criteria for adjacent land use present drivers for further assessment of offsite impacts and potentially remediation.

7.1 CSM Data Gaps

The following gaps remain in our understanding of impacts:

- The lay-out and specific operation of the historic lead ore concentrate load-out facility remains unclear and so potential exists for localised impacts to remain and/or potential for impacts to extend deeper than the shallow soil currently identified. An example of potential deeper migration exists around the remnant infrastructure within the Woodlawn Siding around CH: 262.450 (depicted on **Figure 2c**, **Appendix A** set by a rectangular polygon from apparent survey).
- Soil impacts outside of the Woodlawn Siding have not been vertically delineated. Impacts within the Woodlawn Siding were limited in the nine test pits to ballast fines and with lead concentrations in underlying capping reported below assessment criteria. This provides a strong line of evidence to support limited vertical migration of lead contamination however further assessment of historic operations may warrant further assessment of lead in site soils at depth
- Soil impacts on or near site boundaries infer potential for offsite impacts
- Impacts to offsite surface water receivers remain unclear

It is also noted that groundwater has not been assessed. Ramboll do not consider this warranted based on apparent limitation of impacts to shallow soils though review of historic operations may identify drivers for groundwater assessment.

8. REGULATORY CONSIDERATION

8.1 SafeWork NSW

SafeWork NSW requires notification if "lead risk work" is being carried out. Lead risk work is currently defined as work that can cause the following change in blood lead levels:

a. 10 µg/dL (0.48 µmol/L) for a female of reproductive capacity
b. 30 µg/dL (1.45 µmol/L) in other cases

SafeWork NSW also suggests notification if the above cannot be clearly determined.

Although it is unlikely that blood lead levels for workers would increase to these levels if the SLMP is adhered to, it is prudent to notify SafeWork NSW as quantitative determination of the expected change in blood lead levels has not occurred. SafeWork NSW should provide further advice on any blood lead level testing requirements for site workers.

8.2 Contaminated Land Management Act

Section 60 of the *Contaminated Land Management Act 1997* outlines the responsibilities and triggers for people whose activities contaminate land, or owners of land that has been contaminated. An evaluation of the duty to report contamination, as outlined in the NSW EPA (2015) Guidelines on the Duty to Report, follows.

The Guidelines outline that the following people are to notify the EPA as soon as practical after they become aware of the contamination:

- anyone whose activities have contaminated land, (the polluter)
- an owner of land that has been contaminated (the landowner)

In the above, JHR is neither the polluter, as contamination appears historical, nor the land owner, as land is owned by Transport for NSW. It is therefore recommended that JHR discuss the requirement to report with the land owner.

In terms of the requirement to report the following triggers are to be considered to assess the duty to report:

1) *the 95 % upper confidence limit on the arithmetic average concentration of a contaminant in or on soil is equal to or above the Health Investigation Level and/or Health Screening Level for that contaminant for the current or approved use of the respective on-site land, as specified in Section 6, Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013)*

   OR

2) *the concentration of a contaminant in an individual soil sample is equal to or more than 250% of the Health Investigation Level and/or Health Screening Level for that contaminant for the current or approved use of the respective on-site land, as specified in Section 6, Schedule B1 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013)*

   AND

1) *a person has been or foreseeably will be exposed to the contaminant or a by-product of the contaminant.*

OR

2) *the contaminant or a by-product has entered, or will foreseeably enter, neighbouring land, the atmosphere, groundwater or surface water, and is above, or will foreseeably be above, a level of contamination set out in National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPC 2013) or other approved guidelines and will foreseeably continue to remain equal to or above that level.*

Concentrations of lead exceeding assessment criteria as nominated above are considered to exist between CH: 261.950 km to CH: 262.950 km.

The CSM identified the potential for exposure to onsite workers and offsite public receptors. Exposure to the onsite worker is currently controlled through the SLMP (Ramboll 2019b). The onsite worker is therefore not considered to be at risk of exposure to the contaminant.

Public users of Tarago Station may have been, or foreseeably could be, exposed to dust contained elevated lead concentrations during use of the Tarago Station. Assessment of lead concentrations in dust at the Tarago Station has not been undertaken and therefore it is uncertain if this exposure pathway is complete.

Lead in soil on site boundaries exceeds criteria protective of human health applicable to adjacent residential and public open space land uses. It is uncertain if associated exposure pathways to offsite receptors are complete.

Further assessment of offsite concentrations is recommended to inform consideration of the land owner's duty to notify contamination to the NSW EPA.

8.3 State Environmental Planning Policy 55: Remediation of Land

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). Notification and consent requirements should be considered further following confirmation of a remedial strategy.

9. CONCLUSION

Environmental assessment of the site confirms the presence of concentrated lead impacts in soil within the rail corridor, and to a lesser extent on eastern site boundaries, associated with the use of Woodlawn Siding as a lead ore concentrate load out facility.

Further works are recommended to refine characterisation of risks associated with site contamination as follows:

- A detailed review of site history should be completed to assess potential for localised areas of impact that may not have been characterised. This should include assessment of historic aerial photographs, council held records and plans for historic site infrastructure as well as discussion with persons with knowledge of the operation and decommissioning of the historic lead ore concentrate load out complex.
- Onsite soil impacts outside of the Woodlawn Siding (ie: all sampling locations outside of the Woodlawn Siding) have not been vertically delineated. Consideration should be afforded to assessing the vertical extent of shallow soil impacts outside of the rail lines
- Potential offsite soil impacts should be assessed along the eastern boundary
- Offsite receiving waters should be assessed.

Lead impacted areas are not considered suitable for continuation of current use based on risks to human health and the environment and remediation is required. Additionally, elevated lead concentrations on the eastern site boundary present potential risks to offsite receptors and are drivers for assessment of offsite impacts and potentially remediation.

10. LIMITATIONS

This document is issued in confidence to John Holland Rail for the purposes of assessing risks associated with contamination within the Goulburn – Bombala rail corridor around Tarago. It should not be used for any other purpose.

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11. REFERENCES

McMahon (2015) *Tarago Rail Siding Extension: Preliminary Contaminated Site Assessment*, June 2015. DM McMahon Pty Ltd, NSW.

NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*. National Environment Protection Council, May 2013.

Ramboll (2019a) *Tarago Loop Extension Further Intrusive Assessment and Lead Management Plan*

Ramboll (2019b) *Tarago Loop Extension Short Term Lead Management Plan*

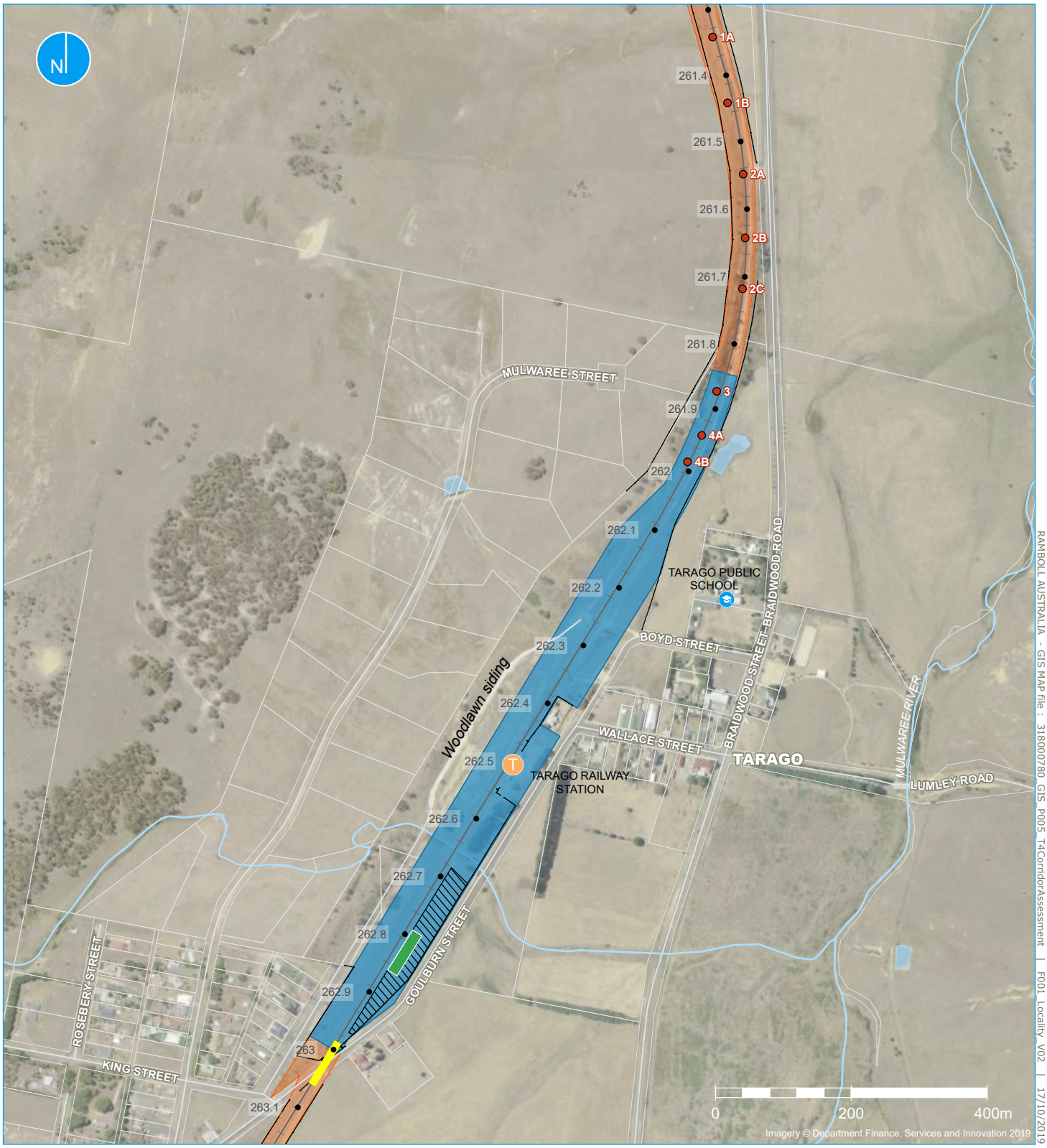
Ramboll (2019c) *Tarago Loop Extension Preliminary Human Health Risk Assessment*

Ramboll (2019d) *August 2019 Surface Water Monitoring – Tarago Rail Loop Expansion*

Ramboll (2019e) *September 2019 Surface Water Monitoring – Tarago Rail Loop Expansion*

Ramboll (2019f) *Tarago Loop Extension Remedial Action Plan*

APPENDIX 1
1.FIGURES



RAMBOLL AUSTRALIA - GIS MAP file : 318000780 GIS P005 T4CorridorAssessment | F001_Locality_V02 | 17/10/2019

A4
1:8,000

Legend

- Site boundary
- Rail corridor
- Rail corridor fence
- 0.1km chainage point
- Previous sample location (McMahon 2015)
- Goulburn Street level crossing
- Construction compound
- Goods shed exclusion zone

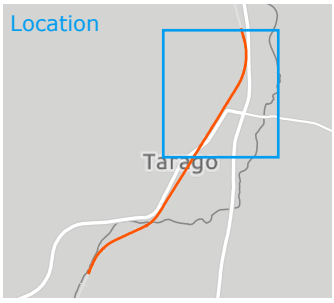
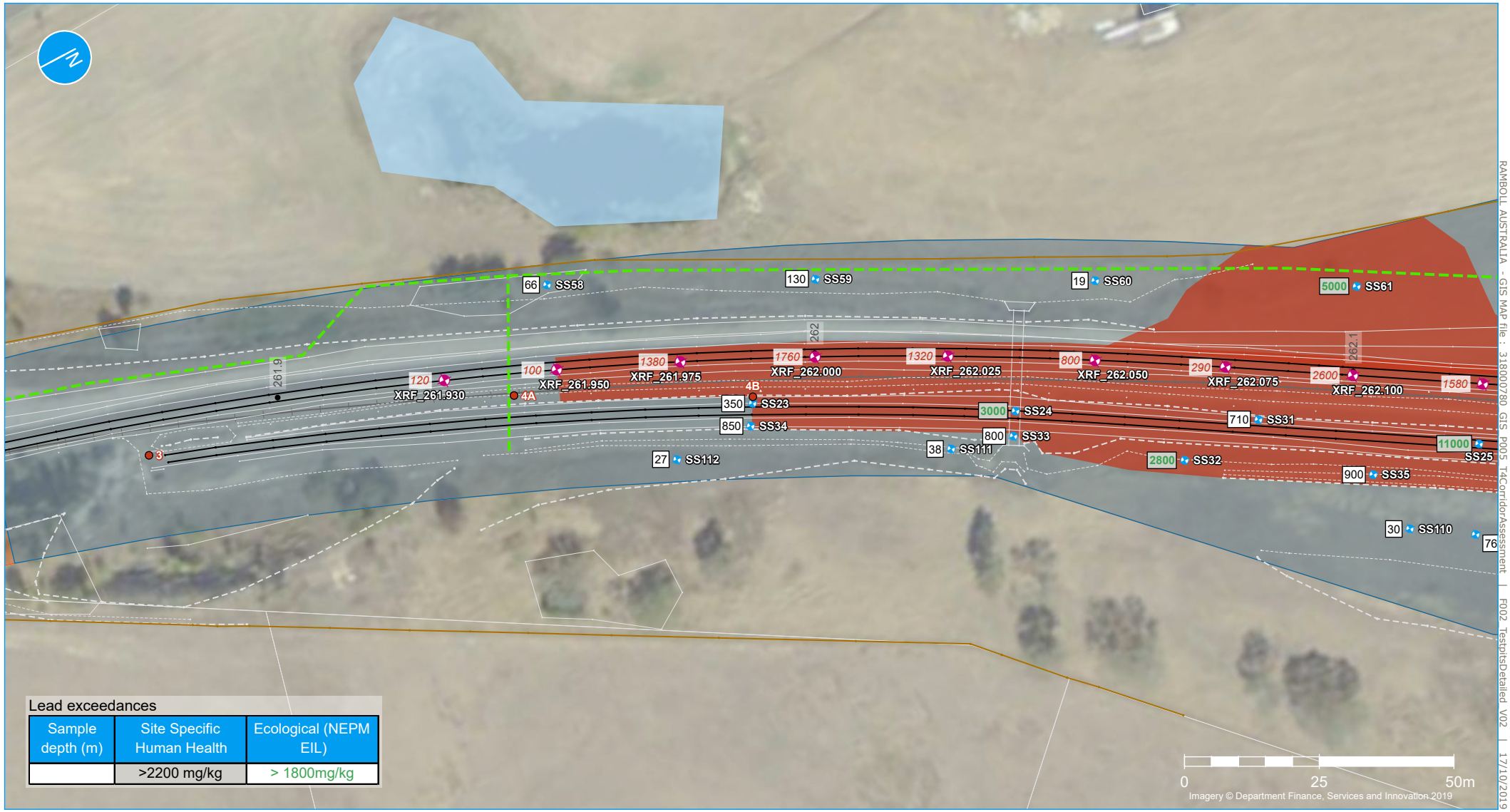


Figure 1 | Tarago Rail Corridor Environmental Site Assessment Locality Plan



Legend

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

Survey lines

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

Sampling locations

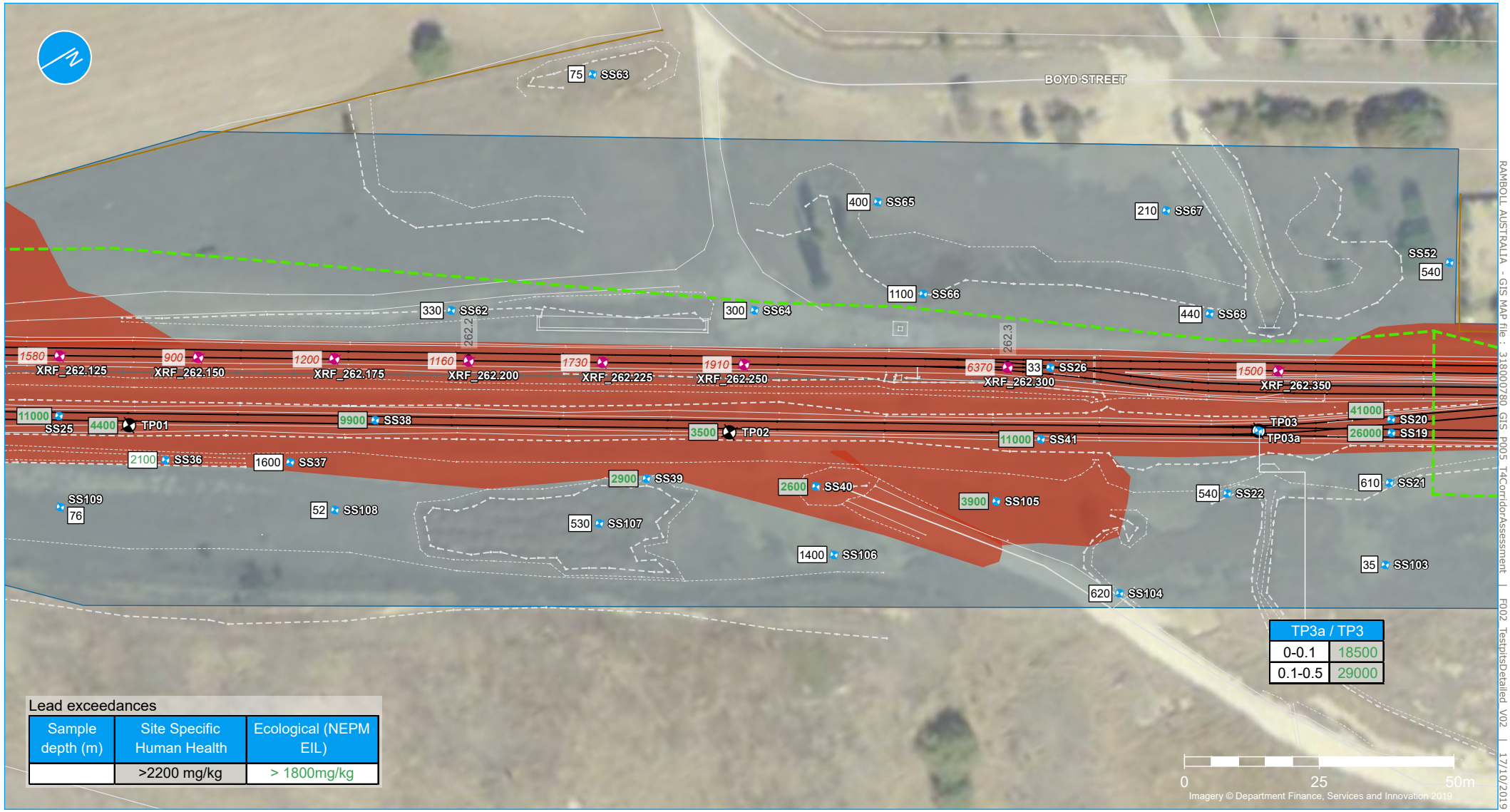
- Shallow soil (Ramboll 2019)
- X-Ray fluorescence sampling (Ramboll 2019)
- Previous sampling location (McMahon)
- 1200 Lead concentration for XRF sample (mg/kg)

Lead impacted area

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 Soil in the Tarago Rail Corridor



Legend

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

Survey lines

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

Sampling locations

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

Lead impacted area

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

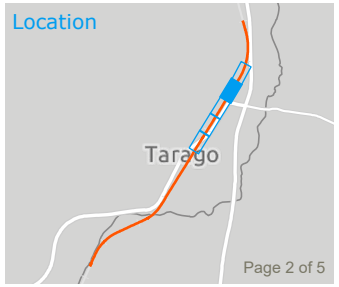
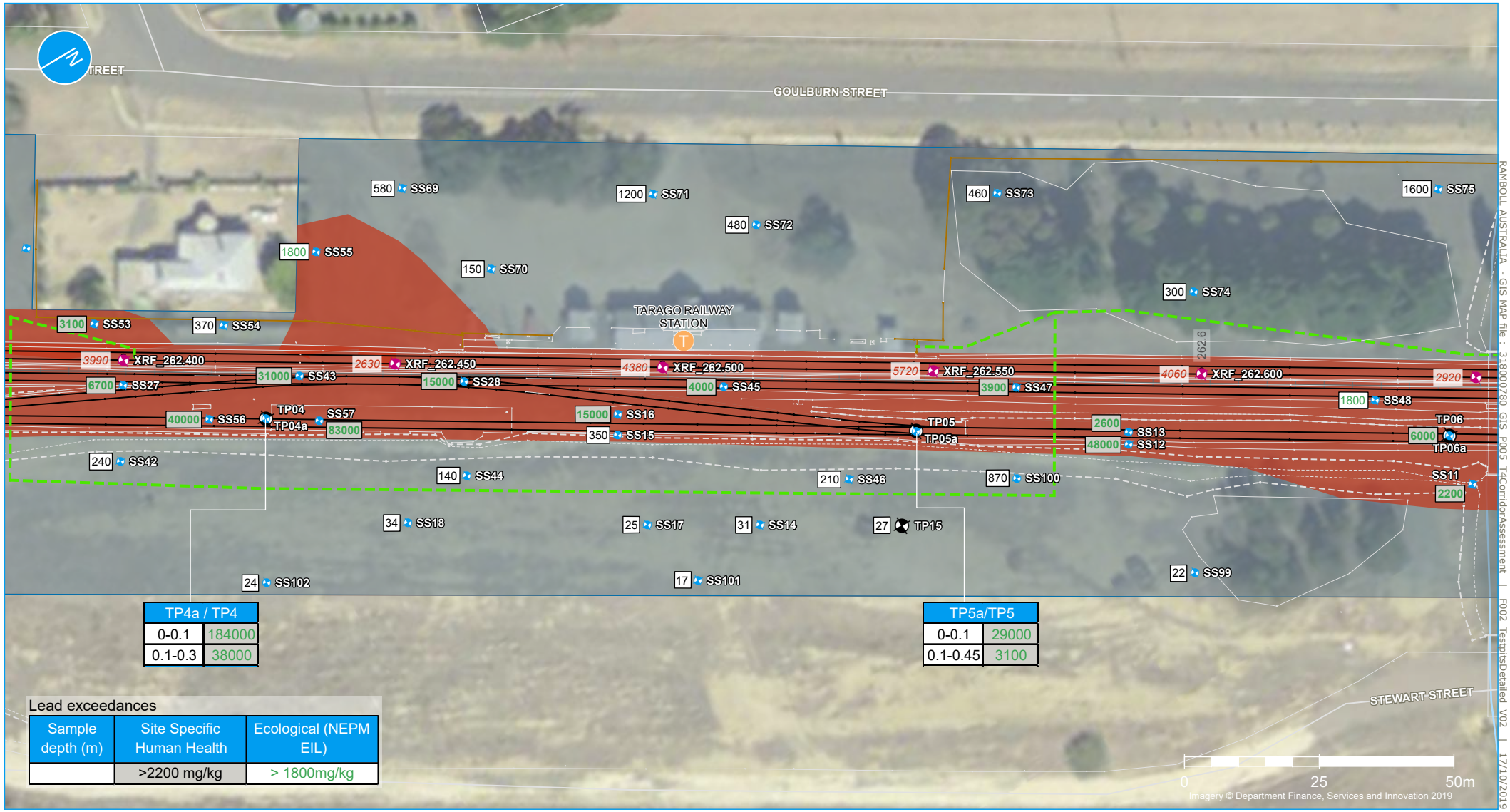


Figure 2b | Assessment of Lead in Soil in the Tarago Rail Corridor



RAMBOLL AUSTRALIA - GIS MAP file : 318000780 GIS P005 T4CorridorAssessment | F002 TestpitsDetailed V02 | 17/10/2019

Legend

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

Survey lines

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

Sampling locations

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

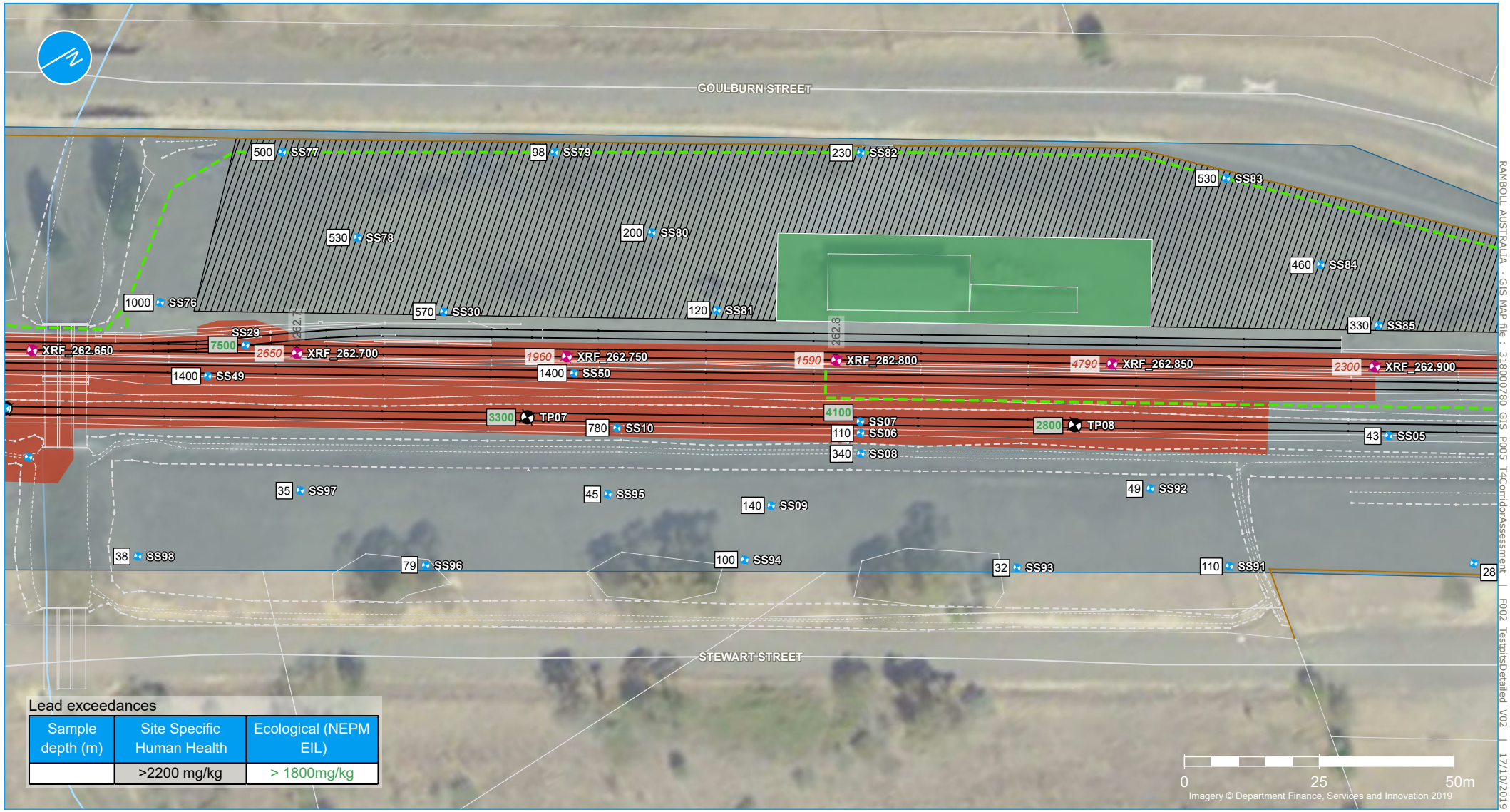
Lead impacted area

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

Location

Figure 2c | Assessment of Lead in Soil in the Tarago Rail Corridor



Lead exceedances

Sample depth (m)	Site Specific Human Health	Ecological (NEPM EIL)
	>2200 mg/kg	> 1800mg/kg

Legend

- Site boundary
- 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

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

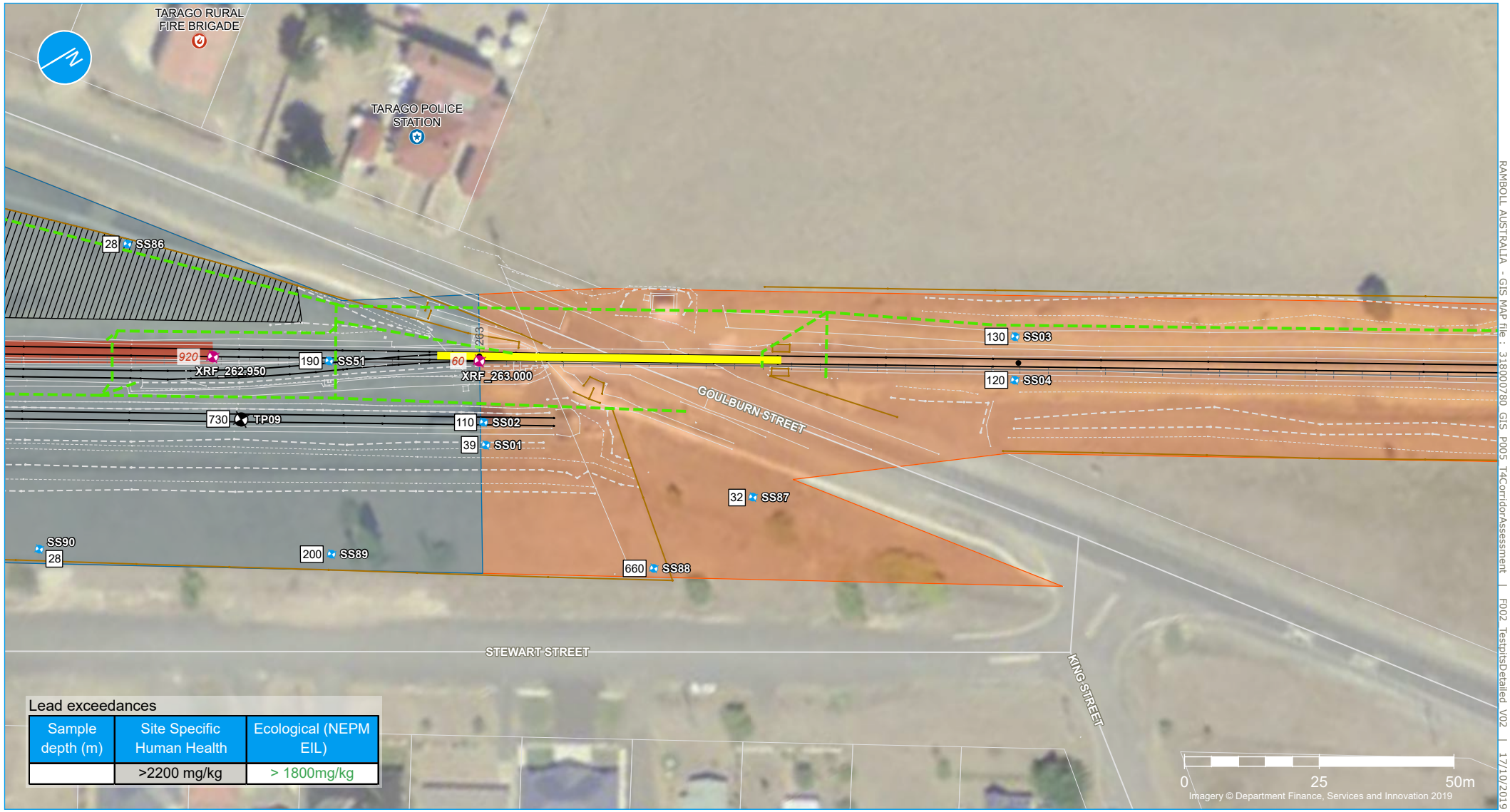
Lead impacted area

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

Location

Figure 2d | Assessment of Lead in Soil in the Tarago Rail Corridor



RAMBOLL AUSTRALIA - GIS MAP file : 318000780 GIS P005 T4CorridorAssessment | F002 TestpitsDetailed V02 | 17/10/2019

Legend

- Site boundary
- 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

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

Lead impacted area

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

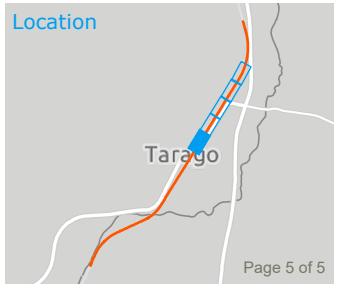


Figure 2e | Assessment of Lead in Soil in the Tarago Rail Corridor

APPENDIX 2
2.PHOTOGRAPHIC LOG

Tarago Rail Loop Lead Management – Corridor Assessment

Photographic Log

22-09-19

23-09-19

24-09-19

APPENDIX 3
3.RESULTS

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 1:
Summary of EIL Inputs

		SS94	SS95	SS101	SS112	D03_230919	Average
	Units						
Cation exchange capacity	cmol/kg	15	15	10	15	9	12.8
pH (calcium chloride method)	pH Units	5.9	5.4	5.2	4.7	4.9	5.22
Organic carbon content	%	2.2	2.5	0.8	1.3	2.1	1.78
Iron content (aqua regia method)	%	1.1	0.76	0.88	1.4	1.1	1.048
% clay	%	13	13	8.5	18	7.5	12
Measured background concentration							
Copper	mg/kg	-	-	6.9	-	-	-
Nickel	mg/kg	-	-	2.5	-	-	-
Chromium	mg/kg	-	-	7.2	-	-	-
Zinc	mg/kg	-	-	31	-	-	-

Underlined values were reported <LOR and have been halved to allow for comparison of data.

SS101 selected for background due to low concentrations.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 2:
Commercial/Industrial Soil Sampling Results (Lead)

	NEPM 2013 HIL D Commercial / Industrial	NEPM 2013 ESLCommercial / Industrial [B]	NEPM 2013 Management Limits Commercial/ Industrial [C]	CRC CARE 2011 Direct Contact[D] HSL D	CRC CARE 2011 Direct Contact[D]HSL for Intrusive Maintenance Workers	CRC CARE 2011 Vapour Intrusion HSL for Intrusive Maintenance Workers Sand 0-<2m[A]	NEPC EIL Commercial / Industrial (site specific)	Sample Type:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
								ALS Sample number:		S19-JI39840	S19-JI39841	S19-JI39842	S19-JI39843	S19-JI39844	S19-JI39845	S19-JI39846	S19-JI39847	S19-JI39848	S19-JI39849	S19-JI39850	S19-JI39851	S19-Se36992	S19-Se36993	S19-Se36994	S19-Se36995
								Sample date:		26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	22-09-19	22-09-19	22-09-19	22-09-19
								Sample ID:		TP4 0.1-0.3	TP5 0.1-0.45	TP6 0.1-0.4	TP7 0.1-0.4	TP8 0.1-0.3	TP9 0.1-0.3	TP10 0.2	TP11 0.1	TP12 0.1	TP13 0.1	TP14 0.1	TP16 0.1	SS52	SS53	SS54	SS55
								Project Name:		Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management
								Sampling Method:		Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit	Test Pit				
								Sample Description																	
Analyte grouping/Analyte								**Units**	**LOR**																
EA055: Moisture Content																									
Moisture Content (dried @ 103°C)								%	--	3	3.7	2.4	< 1	1.1	21	9.1	10	9.4	11	2.3	7.3	8	2.5	14	17
EA200: AS 4964 - 2004 Identification of Asbestos in Soils																									
Asbestos Detected								g/kg	0.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Asbestos Type								--	--	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
Sample weight (dry)								g	0.1	594	540	65	247	430	259	59	53	68	51	66	751	853	1120	937	574
Description								--	--	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown fine-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil, rocks and bitumous material	Brown coarse-grained soil, rocks and bitumous material	Brown coarse-grained soil, rcoks and organic debris
EG005T: Total Metals by ICP-AES																									
Arsenic	3000						160	mg/kg	2	47	13	11	5.8	23	8.6	6.1	6.6	1	9.6	1	2.1	25	150	19	32
Cadmium	900							mg/kg	0.4	3.3	1.1	1	0.7	1.6	1	0.2	0.2	0.2	2.1	0.2	0.2	5.6	8.1	0.2	12
Chromium	3600						710	mg/kg	5	25	7.4	7.6	2.5	11	6.8	2.5	29	2.5	8.7	2.5	2.5	12	15	9	13
Copper	240000						160	mg/kg	5	990	180	190	62	190	91	2.5	9.9	2.5	21	2.5	2.5	220	660	95	320
Lead	2200[E]						1800	mg/kg	5	38,000	3,100	6,000	3,300	2800	730	18	43	11	39	6.4	10	540	3100	370	1800
Nickel	6000						340	mg/kg	5	8.8	2.5	2.5	2.5	5.7	2.5	2.5	5.9	2.5	2.5	2.5	2.5	11	2.5	6.6
Zinc	400000						370	mg/kg	5	940	320	350	130	320	200	17	81	15	300	14	12	770	1300	47	1500
EG035T: Total Recoverable Mercury by FIMS																									
Mercury	730							mg/kg	0.1	0.4	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.3	0.05	0.05	0.05	0.05	0.6	0.05	0.2
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																									
Naphthalene				11000	29000	NL	370	mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Acenaphthylene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Acenaphthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluorene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Phenanthrene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.6
Pyrene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.7	0.5	0.25	0.5
Benz(a)anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.7	0.6	0.25	0.6
Chrysene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(b+j)fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(k)fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(a)pyrene		172						mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.7	0.6	0.25	0.6
Indeno(1.2.3.cd)pyrene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.6	0.25	0.25	0.6
Dibenz(a.h)anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(g.h.i)perylene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.6	0.25	0.25	0.5
Sum of polycyclic aromatic hydrocarbons	4000							mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	3.3	1.7	0.25	3.4
Benzo(a)pyrene TEQ (zero)								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.8	0.7	0.25	0.7
Benzo(a)pyrene TEQ (half LOR)								mg/kg	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.1	1	0.6	1
Benzo(a)pyrene TEQ (LOR)	40							mg/kg	0.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.4	1.3	1.2	1.3
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions																									
C6 - C10 Fraction			700	26000	82000	NL		mg/kg	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
C6 - C10 Fraction minus BTEX (F1)		215						mg/kg	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
>C10 - C16 Fraction			1000	20000	62000	NL		mg/kg	50	25	25	25	92	25	25	25	25	25	25	25	25	25	25	25	25
>C16 - C34 Fraction (F3)		1700	3500	27000	85000			mg/kg	100	50	140	50	220	50	50	50	50	50	50	150	50	130	300	50	220
>C34 - C40 Fraction (F4)		3300	10000	38000	120000			mg/kg	100	50	50	50	120	50	50	50	50	50	50	50	50	130	50	50	50
>C10 - C40 Fraction (sum)								mg/kg	100	50	140	50	432	50	50	50	50	50	50	150	50	130	430	50	220
>C10 - C16 Fraction minus Naphthalene (F2)		170						mg/kg	50	25	25	25	92	25	25	25	25	25	25	25	25	25	25	25	25
EP080: BTEXN																									
Benzene		75		430	1100	77		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Toluene		135		99000	120000	NL		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Ethylbenzene		165		27000	85000	NL		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
meta- & para-Xylene								mg/kg	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ortho-Xylene								mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total Xylenes		95		81000	130000	NL		mg/kg	0.3	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Naphthalene				11000	29000	NL	370	mg/kg	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Blank Cell indicates no criterion available

LOR = Limit of Reporting

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

CRC Care Technical Report no.10, *Health Screening Levels for petroleum hydrocarbons in soil and groundwater* September 2011

[A] For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out. Generally SAND has been adopted in these scenarios.

[B] The most conservative ESL guideline value has been adopted for all analytes

[C] Management limits are applied after consideration of relevant ESLs and HSLs. Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

[D] Direct Contact are applied to surface soils or soils that could result in immediate contact.

[E] Human Health Guideline for Lead adopted from the Human Health Risk Assessment (Ramboll 2019d)

NL = Non Limiting. No HSL is presented for these chemicals as a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.

Health Investigation Levels for chromium based on chromium (VI)

Chromium (III) EIL, based on a low clay content (% clay) of 1%

Nickel EIL, based on CEC of 5cmol/kg

Copper EIL, based on CEC of 5cmol/kg

Zinc EIL, based on slightly acidic soil pH of 4.0 and CEC of 5cmol/kg

To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

To obtain F2 subtract naphthalene from the >C10-C16 fraction.

Benzo(a)Pyrene ESL derived ecological guideline (95% confidence limits) based on CRC CARE Technical Report no. 39 Risk-based remediation and management guidance for benzo(a)pyrene developed using a species sensitivity distribution (SSD) for eco-toxicity data from five independent studies involving one soil bacteria, three soil invertebrate taxa and four plant taxa (13 endpoints) in preference to NEPM low reliability data.

Concentration in **red** font and grey box exceed the adopted HIL/HSL 'D' for Commercial/Industrial

Concentration in **orange** font and grey box exceed the adopted EIL/ESL 'D' for Commercial/Industrial use

Concentrations in box exceed the screening value >2.5 times

Where one or more guideline value is exceeded, the highest guideline exceeded will be highlighted

Underlined values were reported <LOR and have been halved to allow for comparison of data.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 2:
Commercial/Industrial Soil Sampling Results (Lead)

	NEPM 2013 HIL D Commercial / Industrial	NEPM 2013 ESLCommercial / Industrial [B]	NEPM 2013 Management Limits Commercial/ Industrial [C]	CRC CARE 2011 Direct Contact[D] HSL D	CRC CARE 2011 Direct Contact[D]HSL for Intrusive Maintenance Workers	CRC CARE 2011 Vapour Intrusion HSL for Intrusive Maintenance Workers Sand 0-<2m[A]	NEPC EIL Commercial / Industrial (site specific)															
Sample Type:										**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
ALS Sample number:										S19-Se37002	S19-Se37007	S19-Se37010	S19-Se37012	S19-Se37016	S19-Se37018	S19-Se37036	S19-Se37039	S19-Se37043	S19-Se37046	S19-Se37049	S19-Se37051	S19-Se37052	S19-Se37054
Sample date:										22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
Sample ID:										SS58	SS63	SS66	SS68	SS72	SS74	SS92	SS95	SS99	SS102	SS105	SS107	SS108	SS110
Project Name:										Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management	Tarago Loop Lead Management
Sampling Method:																							
Sample Description																							
Analyte grouping/Analyte								**Units**	**LOR**														
EA055: Moisture Content																							
Moisture Content (dried @ 103°C)								%	--	7.1	9.4	15	12	6.7	11	8.7	14	11	3.5	13	24	9.4	11
EA200: AS 4964 - 2004 Identification of Asbestos in Soils																							
Asbestos Detected								g/kg	0.1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Asbestos Type								--	--	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
Sample weight (dry)								g	0.1	735	652	690	701	892	742	776	649	823	1006	892	588	673	521
Description								--	--	Brown coarse-grained soil, rocks and organic debris	Brown coarse-grained soil, rocks and bitumous material	Brown coarse-grained soil, rocks and organic debris	Brown coarse-grained soil, rocks and plaster-like material	Brown coarse-grained soil, rocks and cement fragments	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks	Brown coarse-grained soil and rocks
EG005T: Total Metals by ICP-AES																							
Arsenic	3000						160	mg/kg	2	3.7	5.4	20	12	15	15	2.9	2.4	3.1	6.2	65	11	4.9	13
Cadmium	900							mg/kg	0.4	0.8	1.6	14	7.4	2.3	6.6	0.8	0.7	0.2	0.2	4.3	3.2	0.9	0.2
Chromium	3600						710	mg/kg	5	7.2	2.5	57	8.2	22	14	8.6	8.3	7.3	9.3	27	13	11	36
Copper	240000						160	mg/kg	5	26	44	700	240	85	76	16	20	8.9	11	790	450	20	14
Lead	2200[E]						1800	mg/kg	5	66	75	1100	440	480	300	49	45	22	24	**3900**	530	52	30
Nickel	6000						340	mg/kg	5	2.5	2.5	17	5.4	5.3	8.9	8.4	2.5	2.5	2.5	9.2	6.4	2.5	5.9
Zinc	400000						370	mg/kg	5	210	180	1600	650	320	1300	130	120	38	42	760	350	170	27
EG035T: Total Recoverable Mercury by FIMS																							
Mercury	730							mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.6	0.05	0.05	0.05	0.05	0.2	0.05	0.05	0.05
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																							
Naphthalene				11000	29000	NL	370	mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Acenaphthylene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Acenaphthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluorene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Phenanthrene								mg/kg	0.5	0.25	0.25	0.25	0.25	1.3	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	1.2	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Pyrene								mg/kg	0.5	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benz(a)anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.7	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Chrysene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(b+j)fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(k)fluoranthene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(a)pyrene		172						mg/kg	0.5	0.25	0.25	0.25	0.25	0.7	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Indeno(1.2.3.cd)pyrene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.6	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Dibenz(a.h)anthracene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(g.h.i)perylene								mg/kg	0.5	0.25	0.25	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Sum of polycyclic aromatic hydrocarbons	4000							mg/kg	0.5	0.25	0.25	0.25	0.25	6	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(a)pyrene TEQ (zero)								mg/kg	0.5	0.25	0.25	0.25	0.25	0.8	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Benzo(a)pyrene TEQ (half LOR)								mg/kg	0.5	0.6	0.6	0.6	0.6	1.1	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (LOR)	40							mg/kg	0.5	1.2	1.2	1.2	1.2	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions																							
C6 - C10 Fraction			700	26000	82000	NL		mg/kg	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10
C6 - C10 Fraction minus BTEX (F1)		215						mg/kg	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10
>C10 - C16 Fraction			1000	20000	62000	NL		mg/kg	50	25	25	25	25	25	25	25	25	25	25	56	25	25	25
>C16 - C34 Fraction (F3)		1700	3500	27000	85000			mg/kg	100	150	130	160	140	140	250	50	50	50	50	50	310	50	50
>C34 - C40 Fraction (F4)		3300	10000	38000	120000			mg/kg	100	50	50	50	50	50	100	50	50	50	50	50	140	50	50
>C10 - C40 Fraction (sum)								mg/kg	100	150	130	160	140	140	350	50	50	50	50	50	506	50	50
>C10 - C16 Fraction minus Naphthalene (F2)		170						mg/kg	50	25	25	25	25	25	25	25	25	25	25	25	56	25	25
EP080: BTEXN																							
Benzene		75		430	1100	77		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Toluene		135		99000	120000	NL		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Ethylbenzene		165		27000	85000	NL		mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
meta- & para-Xylene								mg/kg	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ortho-Xylene								mg/kg	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total Xylenes		95		81000	130000	NL		mg/kg	0.3	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Naphthalene				11000	29000	NL	370	mg/kg	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Blank Cell indicates no criterion available

LOR = Limit of Reporting

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

CRC Care Technical Report no.10, *Health Screening Levels for petroleum hydrocarbons in soil and groundwater* September 2011

[A] For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out. Generally SAND has been adopted in these scenarios.

[B] The most conservative ESL guideline value has been adopted for all analytes

[C] Management limits are applied after consideration of relevant ESLs and HSLs. Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

[D] Direct Contact are applied to surface soils or soils that could result in immediate contact.

[E] Human Health Guideline for Lead adopted from the Human Health Risk Assessment (Ramboll 2019d)

NL = Non Limiting. No HSL is presented for these chemicals as a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.

Health Investigation Levels for chromium based on chromium (VI)

Chromium (III) EIL, based on a low clay content (% clay) of 1%

Nickel EIL, based on CEC of 5cmol/kg

Copper EIL, based on CEC of 5cmol/kg

Zinc EIL, based on slightly acidic soil pH of 4.0 and CEC of 5cmol/kg

To obtain F1 subtract the sum of BTEX concentrations from the C6-C10 fraction.

To obtain F2 subtract naphthalene from the >C10-C16 fraction.

Benzo(a)Pyrene ESL derived ecological guideline (95% confidence limits) based on CRC CARE Technical Report no. 39 Risk-based remediation and management guidance for benzo(a)pyrene developed using a species sensitivity distribution (SSD) for eco-toxicity data from five independent studies involving one soil bacteria, three soil invertebrate taxa and four plant taxa (13 endpoints) in preference to NEPM low reliability data.

Concentration in **red** font and grey box exceed the adopted HIL/HSL 'D' for Commercial/Industrial

Concentration in **orange** font and grey box exceed the adopted EIL/ESL 'D' for Commercial/Industrial use

Concentrations in box exceed the screening value >2.5 times

Where one or more guideline value is exceeded, the highest guideline exceeded will be highlighted

Underlined values were reported <LOR and have been halved to allow for comparison of data.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3:
Commercial/Industrial Soil Sampling Results

	HHRA (Ramboll 2019d)	NEPM 2013 EIL Commercial / Industrial																
Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numbe					S19-JI39891	S19-JI39892	S19-JI39893	S19-JI39894	S19-JI39895	Report 677385	S19-JI39896	S19-JI39897	S19-JI39898	Report 677385	S19-JI39899	S19-JI39900	Report 677385	S19-JI39901
Sample date:					26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	16-09-19	26/07/19	26/07/19	26/07/19	16-09-19	26/07/19	26/07/19	16-09-19	26/07/19
Sample ID:					TP1 0.1-0.5	TP1 0.5-0.6	TP2 0.1-0.4	TP2 0.4-0.5	TP2 0.5-0.7	TP3a 0-0.1	TP3 0.1-0.5	TP3 0.5-0.6	TP3 0.6-0.7	TP4a 0-0.1	TP4 0.1-0.3	TP4 0.3-0.4	TP5a 0-0.1	TP5 0.1-0.45
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	**4,400**	10	**3,500**	110	16	**18,500**	**29,000**	74	13	**184,000**	**38,000**	70	**29,000**	**3,100**

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18-10-19

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Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-JI39902	S19-JI39903	S19-JI39904	S19-JI39905	S19-JI39906	S19-JI39907	S19-JI39908	S19-JI39909	S19-JI39910	S19-JI39911	S19-JI39912	S19-JI39845	S19-JI39914	S19-JI39915
Sample date:					26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19
Sample ID:					TP5 0.45-0.55	TP5 0.6-0.7	TP6 0.1-0.4	TP6 0.4-0.5	TP6 0.5-0.7	TP7 0.1-0.4	TP7 0.4-0.5	TP7 0.5-0.7	TP8 0.1-0.3	TP8 0.3-0.5	TP8 0.5-0.8	TP9 0.1-0.3	TP9 0.3-0.5	TP9 0.5-0.7
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	150	47	**6,000**	20	7	**3,300**	76	7	**2,800**	24	22	730	2.50	8

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Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

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Commercial/Industrial Soil Sampling Results

	HHRA (Ramboll 2019d)	NEPM 2013 EIL Commercial / Industrial																
Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-JI39846	S19-JI39847	S19-JI39848	S19-JI39849	S19-JI39850	S19-JI39918	S19-JI39919	S19-JI39851	S19-JI39920	S19-JI39921	S19-JI39922	S19-JI39923	S19-JI39924	S19-JI39925
Sample date:					26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19
Sample ID:					TP10 0.2	TP11 0.1	TP12 0.1	TP13 0.1	TP14 0.1	TP15 0.1	TP15 0.8	TP16 0.1	SS1 0.0-0.1	SS2 0.0-0.1	SS3 0.0-0.1	SS4 0.0-0.1	SS5 0.0-0.1	SS6 0.0-0.1
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	18	43	11	39	6.4	27	26	10	39	110	130	120	43	110

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Project Name: Tarago Loop Lead Management
18-10-19

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	HHRA (Ramboll 2019d)	NEPM 2013 EIL Commercial / Industrial																
Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-JI39926	S19-JI39927	S19-JI39928	S19-JI39929	S19-JI39930	Report 67385	S19-JI39932	S19-JI39933	S19-JI39934	S19-JI39935	S19-JI39997	S19-JI39998	S19-JI39999	Report 67385
Sample date:					26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19	26/07/19
Sample ID:					SS7 0.0-0.1	SS8 0.0-0.1	SS9 0.0-0.1	SS10 0.0-0.1	SS11 0.0-0.1	SS12 0.0-0.1	SS13 0.0-0.1	SS14 0.0-0.1	SS15 0.0-0.1	SS16 0.0-0.1	SS17_0.0-0.1	SS18_0.0-0.1	SS19_0.0-0.1	SS20_0.0-0.1
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Test pit	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	**4,100**	340	140	780	**2,200**	**48,000**	**2,600**	31	350	**15,000**	25	34	**26,000**	**41,000**

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Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3:
Commercial/Industrial Soil Sampling Results

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Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-Jl40001	S19-Jl40002	S19-Au17274	S19-Au17275	S19-Au17276	S19-Au17277	S19-Au17278	S19-Au17279	Report 67385	S19-Au17281	S19-Au39076	S19-Au39077	S19-Au39078	S19-Au39079
Sample date:					26/07/19	26/07/19	12-08-19	12-08-19	12-08-19	12-08-19	12-08-19	12-08-19	12-08-19	12-08-19	27-08-19	27-08-19	27-08-19	27-08-19
Sample ID:					SS21	SS22	SS23	SS24	SS25	SS26	SS27	SS28	SS29	SS30	SS31	SS32	SS33	SS34
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	610	540	350	**3,000**	**11,000**	33	**6,700**	**15000***	**7,500**	570*	710	**2800***	800	850

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Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-Au39080	S19-Au39075	S19-Au39082	S19-Au39083	S19-Au39084	S19-Au39085	S19-Au39086	S19-Au39087	S19-Au39088	S19-Au39089	S19-Au39090	S19-Au39091	S19-Au39092	S19-Au39093
Sample date:					27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19	27-08-19
Sample ID:					SS35	SS36	SS37	SS38	SS39	SS40	SS41	SS42	SS43	SS44	SS45	SS46	SS47	SS48
Site:					Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop	Tarago Loop
Sampling Method:					Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil	Shallow Soil
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	900	**2,100**	1,600	**9,900**	**2,900**	**2,600**	**11,000**	240	**31,000**	140	**4,000**	210	**3,900**	**1,800**

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			Sample Type:		**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
			Laboratory Sample numb		S19-Au39094	S19-Au39095	S19-Au39096	S19-Se36992	S19-Se36993	S19-Se36994	S19-Se36995	S19-Se36998	S19-Se37001	S19-Se37002	S19-Se37003	S19-Se37004	S19-Se37005	S19-Se37006
			Sample date:		27-08-19	27-08-19	27-08-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
			Sample ID:		SS49	SS50	SS51	SS52	SS53	SS54	SS55	SS56_0.1g	SS57_0.1g	SS58	SS59	SS60	SS61	SS62
			Site:		Tarago Loop	Tarago Loop	Tarago Loop	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor
			Sampling Method:		Shallow Soil	Shallow Soil	Shallow Soil	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	1,400	1,400	190	540	**3,100**	370	**1,800**	**40,000**	**83,000**	66	130	19	**5,000**	330

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Laboratory Sample numb					S19-Se37007	S19-Se37008	S19-Se37009	S19-Se37010	S19-Se37011	S19-Se37012	S19-Se37013	S19-Se37014	S19-Se37015	S19-Se37016	S19-Se37017	S19-Se37018	S19-Se37019	S19-Se37020
Sample date:					22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
Sample ID:					SS63	SS64	SS65	SS66	SS67	SS68	SS69	SS70	SS71	SS72	SS73	SS74	SS75	SS76
Site:					Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor
Sampling Method:					Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	75	300	400	1,100	210	440	580	150	1,200	480	460	300	1,600	1,000

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			Laboratory Sample numb		S19-Se37021	S19-Se37022	S19-Se37023	S19-Se37024	S19-Se37025	S19-Se37026	S19-Se37027	S19-Se37028	S19-Se37029	S19-Se37030	S19-Se37031	S19-Se37032	S19-Se37033	S19-Se37034
			Sample date:		22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
			Sample ID:		SS77	SS78	SS79	SS80	SS81	SS82	SS83	SS84	SS85	SS86	SS87	SS88	SS89	SS90
			Site:		Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor
			Sampling Method:		Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	500	530	98	200	120	230	530	460	330	28	32	660	200	28

Blank Cell indicates no criterion available

LOR = Limit of Reporting

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

Concentration in **red** font and grey box exceed the adopted Human Health Guideline for Commercial/Industrial (Ramboll 2019d)

Concentration in **orange** font and grey box exceed the adopted EIL 'D' for Commercial/Industrial

Concentrations in box exceed the screening value >2.5 times

Where one or more guideline value is exceeded, the highest guideline exceeded will be highlighted

* indicates higher duplicate value adopted

Underlined values were reported <LOR and have been halved to allow for comparison of data.

Concentrations at TP3a, TP4a, TP5a, SS12, SS20 and SS29 are reported based on 250um fractions separated and analysed to inform bio-accessibility analyses completed as part of HHRA (Ramboll 2019c)

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3:
Commercial/Industrial Soil Sampling Results

	HHRA (Ramboll 2019d)	NEPM 2013 EIL Commercial / Industrial																
Sample Type:					Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Laboratory Sample numb					S19-Se37035	S19-Se37036	S19-Se37037	S19-Se37038	S19-Se37039	S19-Se37040	S19-Se37041	S19-Se37042	S19-Se37043	S19-Se37044	S19-Se37045	S19-Se37046	S19-Se37047	S19-Se37048
Sample date:					22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
Sample ID:					SS91	SS92	SS93	SS94	SS95	SS96	SS97	SS98	SS99	SS100	SS101	SS102	SS103	SS104
Site:					Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor
Sampling Method:					Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Analyte grouping/Analyte			**Units**	**LOR**														
EG005T: Total Metals by ICP-AES																		
Lead	2,200	1,800	mg/kg	5	110	49	32	100	45	79	35	38	22	870	17	24	35	620

Blank Cell indicates no criterion available

LOR = Limit of Reporting

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

Concentration in **red** font and grey box exceed the adopted Human Health Guideline for Commercial/Industrial (Ramboll 2019d)

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Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3:
Commercial/Industrial Soil Sampling Results

	HHRA (Ramboll 2019d)	NEPM 2013 EIL Commercial / Industrial										
			Sample Type:		**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
			Laboratory Sample numb		S19-Se37049	S19-Se37050	S19-Se37051	S19-Se37052	S19-Se37053	S19-Se37054	S19-Se37145	S19-Se37146
			Sample date:		22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19	22-09-19
			Sample ID:		SS105	SS106	SS107	SS108	SS109	SS110	SS111	SS112
			Site:		Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor	Tarago Rail Corridor
			Sampling Method:		Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Analyte grouping/Analyte			**Units**	**LOR**								
EG005T: Total Metals by ICP-AES												
Lead	2,200	1,800	mg/kg	5	**3,900**	1,400	530	52	76	30	38	27

Blank Cell indicates no criterion available

LOR = Limit of Reporting

National Environment Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1) (NEPM).

Concentration in **red** font and grey box exceed the adopted Human Health Guideline for Commercial/Industrial (Ramboll 2019d)

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Concentrations at TP3a, TP4a, TP5a, SS12, SS20 and SS29 are reported based on 250um fractions separated and analysed to inform bio-accessibility analyses completed as part of HHRA (Ramboll 2019c)

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number:		S19-Jl39901	S19-Jl39937	RPD (%)	S19-Jl39901	222573-2	RPD (%)
	Sample date:		26/07/19	26/07/19		26/07/19	26/07/19	
	Sample ID:		TP5 0.1-0.45	D03_260719		TP5 0.1-0.45	T03_260719	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	150	120	22.2	150	24	**144.8**

LOR = Limit of Reporting
<value = Less than the laboratory Limit of Reporting (LOR)
Bold and Shaded cells exceed RPD >30%
Bold indicates when above the acceptance criteria for Trip Spikes/Blanks and Rinsates
nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Jl39913	S19-Jl39936	RPD (%)	S19-Jl39913	222573-1	RPD (%)
	Sample date:		26/07/19	26/07/19		26/07/19	26/07/19	
	Sample ID:		TP9 0.1-0.3	D02_260719		TP9 0.1-0.3	T02_260719	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	600	280	**72.7**	600	260	**79.1**

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Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Au17279	S19-Au17282	RPD (%)	S19-Au17279	ES1925785001	RPD (%)
	Sample date:		12-08-19	12-08-19		12-08-19	12-08-19	
	Sample ID:		SS28	D01_120819		SS28	T01_120819	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	12000	13000	8	12000	15000	22

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Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

		Laboratory Sample number	S19-Au17281	S19-Au17283	RPD (%)	S19-Au17281	ES1925785002	RPD (%)
		Sample date:	12-08-19	12-08-19		12-08-19	12-08-19	
		Sample ID:	SS30	D02_120819		SS30	T02_120819	
		Project Name:	Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
		Sample Type:	Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	470	570	19	470	405	15

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Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Au39077	S19-Au39097	RPD (%)	S19-Au39077	ES1927426001	RPD (%)
	Sample date:		27/08/2019	27/08/2019		27/08/2019	27/08/2019	
	Sample ID:		SS32	D01_270819		SS32	T01_270819	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	2400	2800	15	2400	2300	4

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nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Au39087	S19-Au39098	RPD (%)	S19-Au39087	ES1927426002	RPD (%)
	Sample date:		27/08/2019	27/08/2019		27/08/2019	27/08/2019	
	Sample ID:		SS42	D02_270819		SS42	T02_270819	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	240	230	4	240	191	23

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nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

		Laboratory Sample number:	S19-Se36998	S19-Se37057	RPD (%)	S19-Se36998	ES1931127001	RPD (%)
		Sample date:	22-09-19	22-09-19		22-09-19	22-09-19	
		Sample ID:	SS56_0.1g	02_220919_0.1		SS56_0.1g	T02_220919	
		Project Name:	Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
		Sample Type:	Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	40,000	21000	**62**	40,000	22800	23

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nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Se37053	S19-Se37066	RPD (%)	S19-Se37010	S19-Se37058	RPD (%)
	Sample date:		22-09-19	22-09-19		22-09-19	22-09-19	
	Sample ID:		SS109	D01_240919		SS66	D01_230919	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	76	71	7	1100	890	21

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nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Se37010	ES1931127002	RPD (%)	S19-Se37015	S19-Se37059	RPD (%)
	Sample date:		22-09-19	22-09-19		23-09-19	23-09-19	
	Sample ID:		SS66	T01_230919		SS71	D02_2309192	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	1100	735	**40**	1200	910	27

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nc = not calculated as one or more results are below the LOR.

Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3a:
QA/QC Results

	Laboratory Sample number		S19-Se37015	ES1931127003	RPD (%)	S19-Se37040	S19-Se37060	RPD (%)
	Sample date:		23-09-19	23-09-19		22-09-19	22-09-19	
	Sample ID:		SS71	T02_230919		SS96	D03_2309192	
	Project Name:		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management		Tarago Rail Loop lead Management	Tarago Rail Loop lead Management	
	Sample Type:		Soil Jar	Soil Jar		Soil Jar	Soil Jar	
Total Metals by ICP-AES								
Lead	mg/kg	5	1200	1020	16	79	58	**31**

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Bold and Shaded cells exceed RPD >30%
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Client: John Holland Rail
Job No: 318000780
Project Name: Tarago Loop Lead Management
18-10-19

Table 3b:
QA/QC Results

		Soil	Soil	RPD (%)	Soil	Soil	RPD (%)
		S19-Se37010	S19-Se37058		S19-Se37010	ES1931127002	
		23-09-19	23-09-19		23-09-19	23-09-19	
		SS66	D01_230919		SS66	T01_230919	
		Tarago Loop Lead Management	Tarago Loop Lead Management		Tarago Loop Lead Management	Tarago Loop Lead Management	
Analyte grouping/Analyte							
AS 4964 - 2004 Identification of Asbestos in Soils							
Asbestos detected		Nil	Nil	NC	Nil	Nil	NC
Total Metals by ICP-AES							
Arsenic		20	22	9.5	20	16	22.2
Cadmium		14	8.7	**46.7**	14	6	**80.0**
Chromium		57	33	**53.3**	57	27	**71.4**
Copper		700	310	**77.2**	700	382	**58.8**
Lead		1100	890	21.1	1100	735	**39.8**
Nickel		17	21	21.1	17	15	12.5
Zinc		1600	1500	6.5	1600	912	**54.8**
Total Recoverable Mercury by FIMS							
Mercury		< 0.1	< 0.1	NC	< 0.1	<0.1	NC
Polynuclear Aromatic Hydrocarbons							
Naphthalene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Acenaphthylene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Acenaphthene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Fluorene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Phenanthrene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Anthracene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Fluoranthene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Pyrene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benz(a)anthracene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Chrysene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(b+j)fluoranthene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(k)fluoranthene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(a)pyrene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Indeno(1.2.3.cd)pyrene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Dibenz(a.h)anthracene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(g.h.i)perylene		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Sum of polycyclic aromatic hydrocarbons		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(a)pyrene TEQ (zero)		< 0.5	< 0.5	NC	< 0.5	<0.5	NC
Benzo(a)pyrene TEQ (half LOR)		0.6	0.6	0	0.6	0.6	0
Benzo(a)pyrene TEQ (LOR)		1.2	1.2	0	1.2	1.2	0
Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
C6 - C10 Fraction		< 20	< 20	NC	< 20	<10	NC
C6 - C10 Fraction minus BTEX (F1)		< 20	< 20	NC	< 20	<10	NC
>C10 - C16 Fraction		< 50	< 50	NC	< 50	<50	NC
>C16 - C34 Fraction (F3)		160	140	13.3	160	<100	NC
>C34 - C40 Fraction (F4)		< 100	< 100	NC	< 100	<100	NC
>C10 - C40 Fraction (sum)		160	140	13.3	160	<50	NC
>C10 - C16 Fraction minus Naphthalene (F2)		< 50	< 50	NC	< 50	<50	NC
BTEXN							
Benzene		< 0.1	< 0.1	NC	< 0.1	<0.2	NC
Toluene		< 0.1	< 0.1	NC	< 0.1	<0.5	NC
Ethylbenzene		< 0.1	< 0.1	NC	< 0.1	<0.5	NC
meta- & para-Xylene		< 0.2	< 0.2	NC	< 0.2	<0.5	NC
ortho-Xylene		< 0.1	< 0.1	NC	< 0.1	<0.5	NC
Total Xylenes		< 0.3	< 0.3	NC	< 0.3	<0.5	NC
Naphthalene		< 0.5	< 0.5	NC	< 0.5	<1	NC

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APPENDIX 4
4.LABORATORY REPORTS

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 222573

Client Details

Client	Ramboll Australia Pty Ltd
Attention	Stephen Maxwell
Address	PO Box 560, North Sydney, NSW, 2060

Sample Details

Your Reference	**318000780**
Number of Samples	2 Soil
Date samples received	29/07/2019
Date completed instructions received	29/07/2019

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	30/07/2019
Date of Issue	30/07/2019

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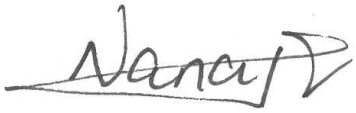
Results Approved By
Jaimie Loa-Kum-Cheung, Metals Supervisor

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable metals in soil			
Our Reference		222573-1	222573-2
Your Reference	UNITS	T02_260719	T03_260719
Date Sampled		26/07/2019	26/07/2019
Type of sample		Soil	Soil
Date prepared	-	29/07/2019	29/07/2019
Date analysed	-	29/07/2019	29/07/2019
Lead	mg/kg	260	24

Moisture			
Our Reference		222573-1	222573-2
Your Reference	UNITS	T02_260719	T03_260719
Date Sampled		26/07/2019	26/07/2019
Type of sample		Soil	Soil
Date prepared	-	29/07/2019	29/07/2019
Date analysed	-	30/07/2019	30/07/2019
Moisture	%	2.1	5.9

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			29/07/2019	[NT]	[NT]	[NT]	[NT]	29/07/2019	[NT]
Date analysed	-			29/07/2019	[NT]	[NT]	[NT]	[NT]	29/07/2019	[NT]
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	[NT]	[NT]	98	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

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02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
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☐ Perth Laboratory
Unit 2, 91 Leach Highway, Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Contact Name	Stephen Maxwell				
Phone №	0478 658 194				
Special Directions					
Purchase Order					
Quote ID №	180813RAMN_1				

Sampler(s)	SM and SC
Handed over by	Stephen Maxwell
Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Email for Results	smaxwell@ramboll.com cgoodbody@ramboll.com

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 222543
Date Received: 29/07/19
Time Received: 12:56
Received by: TN
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Analyses (Note: Where metals are required please specify Total or Filtered) SUITE codes must be used to assist SUITE pricing	Containers: 1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	SS12_0-0.1	26/07/19	S	X (Lead)							1		
2	SS13_0-0.1	26/07/19	S	X							1		
3	SS14_0-0.1	26/07/19	S	X							1		
4	SS15_0-0.1	26/07/19	S	X							1		
5	SS16_0-0.1	26/07/19	S	X							1		
6													
7	D02_260719	26/07/19	S	X							1		
8	D03_260719	26/07/19	S	X							1		
9	[redacted] T02_260719	26/07/19	S	X							1		Please send to Envirolab for analysis
10	[redacted] T03_260719	26/07/19	S	X							1		Please send to Envirolab for analysis
	Total Counts			9							9		

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)*
☑ 1 Day* ☐ 2 Day*
☐ 3 Day* ☐ 5 Day
* Surcharges apply
☐ Other ( )

Method of Shipment	☐ Courier (#)	☑ Hand Delivered	☐ Postal	Name		Signature		Date / /	Time :
Eurofins | mgt Laboratory use Only	Received By	SYD BNE MEL PER AD DRW		Signature		Date 29/7/19	Time 5:54PM	Temperature 16.7°C
	Received By	SYD BNE MEL PER AD DRW		Signature		Date	Time	Temperature

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

QS3009_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

☐ **Sydney Laboratory** Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066 02 9900 8400 EnviroSampleNSW@eurofins.com

☐ **Brisbane Laboratory** Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172 07 3902 4600 EnviroSampleQLD@eurofins.com

☐ **Perth Laboratory** Unit 2, 91 Leach Highway, Kewdale WA 6105 08 9251 9600 EnviroSampleWA@eurofins.com

☐ **Melbourne Laboratory** 2 Kingston Town Close, Oakleigh, VIC 3166 03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Contact Name	Stephen Maxwell				
Phone №	0478 658 194				
Special Directions					
Purchase Order					
Quote ID №	180813RAMN_1				

Sampler(s)	SM and SC
Handed over by	Stephen Maxwell
Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)* ☐ 1 Day* ☐ 2 Day* ☑ 3 Day* ☐ 5 Day * Surcharges apply ☐ Other ( )

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Analyses (Note: where metals are requested, please specify "Total" or "Filtered"). SUITE code must be used to attract SUITE pricing: TRH, BTEX, PAH	8 Metals	Asbestos (Presence/Absence)	Containers: 1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	TP4_0.1-0.3	26/07/19	S	X	X	X							1		
2	TP5-0.1-0.45	26/07/19	S	X	X	X							1		
3	TP6_0.1-0.4	26/07/19	S	X	X	X							1		
4	TP7_0.1-0.4	26/07/19	S	X	X	X							1		
5	TP8_0.1-0.3	26/07/19	S	X	X	X							1		
6	TP9_0.1-0.3	26/07/19	S	X	X	X							1		
7	TP10_0.2	26/07/19	S	X	X	X							1		
8	TP11_0.1	26/07/19	S	X	X	X							1		
9	TP12_0.1	26/07/19	S	X	X	X							1	1	Asbestos bag for analysis
10	TP13_0.1	26/07/19	S	X	X	X							1		
	Total Counts			10	10	10							10	1	

Method of Shipment: ☐ Courier (#) ☑ Hand Delivered ☐ Postal — Name — Signature — Date — Time — :

Eurofins | mgt Laboratory Use Only

Received By	Elvis D	(SYD) | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date 26/7/19	Time 5_54pm	Temperature 16.7°C
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date __/__/__	Time __:__	Report № 668044

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

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QS3009_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

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☐ Perth Laboratory — Unit 2, 91 Leach Highway, Kewdale WA 6105 — 08 9251 9600 — EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory — 2 Kingston Town Close, Oakleigh, VIC 3166 — 03 8564 5000 — EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell	Sampler(s)	SM and SC
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF	Handed over by	Stephen Maxwell
						Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Contact Name	Stephen Maxwell					Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com
Phone №	0478 658 194						
Special Directions							
Purchase Order							
Quote ID №	180813RAMN_1						

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered"). SUITE code must be used to attract SUITE pricing.

Containers

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)* ☐ 1 Day* ☐ 2 Day* ☑ 3 Day* ☐ 5 Day * Surcharges apply ☐ Other ( )

Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	TRH, BTEX, PAH	8 Metals	Asbestos (Presence/Absence)	1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
TP14_0.1	26/07/19	S	X	X	X							1		
TP15_0.1	26/07/19	S	X	X	X							1		
													1	
													1	
													1	
Total Counts			2	2	2							2	3	

Method of Shipment	☐ Courier (#)	☑ Hand Delivered	☐ Postal	Name		Signature		Date	__/__/__	Time	__:__
Eurofins | mgt Laboratory Use Only	Received By	Elvis P	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	26/7/19	Time	5.54PM	Temperature	16.7°C
	Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	__/__/__	Time	__:__	Report №	668044

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Site # 1254 & 14271

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

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**Ramboll Australia Pty Ltd**
Contact name:	Stephen Maxwell
Project ID:	318000780
COC number:	Not provided
Turn around time:	3 Day
Date/Time received:	Jul 26, 2019 5:54 PM
Eurofins reference:	**668044**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☒ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Notes

Sample TP15 0.1 not received; instead TP16_0.1 received, logged in for same analysis.

Contact notes

If you have any questions with respect to these samples please contact:

Andrew Black on Phone : (+61) 2 9900 8490 or by e.mail: AndrewBlack@eurofins.com

Results will be delivered electronically via e.mail to Stephen Maxwell - smaxwell@ramboll.com.

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NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668044
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 31, 2019
Priority: 3 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	Moisture Set	Eurofins | mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP4 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39840	X	X	X
2	TP5 0.1-0.45	Jul 26, 2019		Soil	S19-Jl39841	X	X	X
3	TP6 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39842	X	X	X
4	TP7 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39843	X	X	X
5	TP8 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39844	X	X	X
6	TP9 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39845	X	X	X
7	TP10 0.2	Jul 26, 2019		Soil	S19-Jl39846	X	X	X
8	TP11 0.1	Jul 26, 2019		Soil	S19-Jl39847	X	X	X
9	TP12 0.1	Jul 26, 2019		Soil	S19-Jl39848	X	X	X

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
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NATA # 1261
Site # 1254 & 14271

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NATA # 1261 Site # 18217

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Murarrie QLD 4172
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NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668044
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 31, 2019
Priority: 3 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	Moisture Set	Eurofins | mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
10	TP13 0.1	Jul 26, 2019		Soil	S19-Jl39849	X	X	X
11	TP14 0.1	Jul 26, 2019		Soil	S19-Jl39850	X	X	X
12	TP16 0.1	Jul 26, 2019		Soil	S19-Jl39851	X	X	X
Test Counts						12	12	12

Certificate of Analysis

eurofins | Environment Testing

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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

Attention:	Stephen Maxwell
Report	668044-AID
Project Name	
Project ID	318000780
Received Date	Jul 26, 2019
Date Reported	Jul 31, 2019

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name
Project ID 318000780
Date Sampled Jul 26, 2019
Report 668044-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
TP4 0.1-0.3	19-Jl39840	Jul 26, 2019	Approximate Sample 594g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP5 0.1-0.45	19-Jl39841	Jul 26, 2019	Approximate Sample 540g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP6 0.1-0.4	19-Jl39842	Jul 26, 2019	Approximate Sample 65g Sample consisted of: Brown soil residue and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP7 0.1-0.4	19-Jl39843	Jul 26, 2019	Approximate Sample 247g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP8 0.1-0.3	19-Jl39844	Jul 26, 2019	Approximate Sample 430g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP9 0.1-0.3	19-Jl39845	Jul 26, 2019	Approximate Sample 259g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP10 0.2	19-Jl39846	Jul 26, 2019	Approximate Sample 59g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP11 0.1	19-Jl39847	Jul 26, 2019	Approximate Sample 53g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
TP12 0.1	19-Jl39848	Jul 26, 2019	Approximate Sample 68g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP13 0.1	19-Jl39849	Jul 26, 2019	Approximate Sample 51g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP14 0.1	19-Jl39850	Jul 26, 2019	Approximate Sample 66g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.
TP16 0.1	19-Jl39851	Jul 26, 2019	Approximate Sample 751g Sample consisted of: Brown fine-grained soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No respirable fibres detected.

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Jul 26, 2019	Indefinite

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Brisbane
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NATA # 1261 Site # 20794

Perth
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NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668044
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 31, 2019
Priority: 3 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	Moisture Set	Eurofins | mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP4 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39840	X	X	X
2	TP5 0.1-0.45	Jul 26, 2019		Soil	S19-Jl39841	X	X	X
3	TP6 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39842	X	X	X
4	TP7 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39843	X	X	X
5	TP8 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39844	X	X	X
6	TP9 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39845	X	X	X
7	TP10 0.2	Jul 26, 2019		Soil	S19-Jl39846	X	X	X
8	TP11 0.1	Jul 26, 2019		Soil	S19-Jl39847	X	X	X
9	TP12 0.1	Jul 26, 2019		Soil	S19-Jl39848	X	X	X

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

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

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668044
Phone: 02 9954 8118
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Received: Jul 26, 2019 5:54 PM
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Sample Detail						Asbestos - AS4964	Moisture Set	Eurofins | mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
10	TP13 0.1	Jul 26, 2019		Soil	S19-Jl39849	X	X	X
11	TP14 0.1	Jul 26, 2019		Soil	S19-Jl39850	X	X	X
12	TP16 0.1	Jul 26, 2019		Soil	S19-Jl39851	X	X	X
Test Counts						12	12	12

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

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

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

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

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

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

S19-Jl39842, S19-Jl39846, S19-Jl39847, S19-Jl39848, S19-Jl39849, S19-Jl39850: The samples received were not collected in an approved asbestos bag and was therefore sub-sampled from the 250mL glass jar. Valid sub-sampling procedures were applied so as to ensure that the sub-samples to be analysed accurately represented the samples received.

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Karthik Surisetty	Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu	Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

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

Attention: **Stephen Maxwell**

Report **668044-S**
Project name
Project ID 318000780
Received Date Jul 26, 2019

Client Sample ID			**TP4 0.1-0.3**	**TP5 0.1-0.45**	**TP6 0.1-0.4**	**TP7 0.1-0.4**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S19-Jl39840**	**S19-Jl39841**	**S19-Jl39842**	**S19-Jl39843**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	96
TRH C15-C28	50	mg/kg	< 50	60	< 50	150
TRH C29-C36	50	mg/kg	< 50	110	< 50	120
TRH C10-36 (Total)	50	mg/kg	< 50	170	< 50	366
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	68	72	69	64
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	92
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	92
TRH >C16-C34	100	mg/kg	< 100	140	< 100	220
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	120
TRH >C10-C40 (total)*	100	mg/kg	< 100	140	< 100	432
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			TP4 0.1-0.3	TP5 0.1-0.45	TP6 0.1-0.4	TP7 0.1-0.4
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39840	S19-JI39841	S19-JI39842	S19-JI39843
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	99	108	112	112
p-Terphenyl-d14 (surr.)	1	%	105	148	INT	126
Heavy Metals						
Arsenic	2	mg/kg	47	13	11	5.8
Cadmium	0.4	mg/kg	3.3	1.1	1.0	0.7
Chromium	5	mg/kg	25	7.4	7.6	< 5
Copper	5	mg/kg	990	180	190	62
Lead	5	mg/kg	8800	1500	1300	510
Mercury	0.1	mg/kg	0.4	0.1	< 0.1	< 0.1
Nickel	5	mg/kg	8.8	< 5	< 5	< 5
Zinc	5	mg/kg	940	320	350	130
% Moisture	1	%	3.0	3.7	2.4	< 1

Client Sample ID			TP8 0.1-0.3	TP9 0.1-0.3	TP10 0.2	TP11 0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39844	S19-JI39845	S19-JI39846	S19-JI39847
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	67	74	71	66
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100

Client Sample ID			TP8 0.1-0.3	TP9 0.1-0.3	TP10 0.2	TP11 0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39844	S19-JI39845	S19-JI39846	S19-JI39847
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	115	129	118	INT
p-Terphenyl-d14 (surr.)	1	%	INT	INT	INT	INT
Heavy Metals						
Arsenic	2	mg/kg	23	8.6	6.1	6.6
Cadmium	0.4	mg/kg	1.6	1.0	< 0.4	< 0.4
Chromium	5	mg/kg	11	6.8	< 5	29
Copper	5	mg/kg	190	91	< 5	9.9
Lead	5	mg/kg	870	730	18	43
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	5.7	< 5	< 5	5.9
Zinc	5	mg/kg	320	200	17	81
% Moisture	1	%	1.1	21	9.1	10

Client Sample ID			TP12 0.1	TP13 0.1	TP14 0.1	TP16 0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39848	S19-JI39849	S19-JI39850	S19-JI39851
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	22	31	< 20
TRH C15-C28	50	mg/kg	< 50	54	89	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	80	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	76	200	< 50

Client Sample ID			TP12 0.1	TP13 0.1	TP14 0.1	TP16 0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39848	S19-JI39849	S19-JI39850	S19-JI39851
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	66	71	66	79
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	150	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	150	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	INT	INT	INT	121
p-Terphenyl-d14 (surr.)	1	%	INT	INT	INT	130
Heavy Metals						
Arsenic	2	mg/kg	< 2	9.6	< 2	2.1
Cadmium	0.4	mg/kg	< 0.4	2.1	< 0.4	< 0.4
Chromium	5	mg/kg	< 5	8.7	< 5	< 5
Copper	5	mg/kg	< 5	21	< 5	< 5
Lead	5	mg/kg	11	39	6.4	10
Mercury	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	< 5
Zinc	5	mg/kg	15	300	14	12
% Moisture	1	%	9.4	11	2.3	7.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Jul 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Jul 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jul 30, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Jul 30, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Sydney	Jul 30, 2019	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8	Sydney	Jul 30, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Jul 26, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

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NATA # 1261 Site # 20794

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NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668044
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 31, 2019
Priority: 3 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Asbestos - AS4964	Moisture Set	Eurofins | mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP4 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39840	X	X	X
2	TP5 0.1-0.45	Jul 26, 2019		Soil	S19-Jl39841	X	X	X
3	TP6 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39842	X	X	X
4	TP7 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39843	X	X	X
5	TP8 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39844	X	X	X
6	TP9 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39845	X	X	X
7	TP10 0.2	Jul 26, 2019		Soil	S19-Jl39846	X	X	X
8	TP11 0.1	Jul 26, 2019		Soil	S19-Jl39847	X	X	X
9	TP12 0.1	Jul 26, 2019		Soil	S19-Jl39848	X	X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
10	TP13 0.1	Jul 26, 2019		Soil	S19-Jl39849	X	X	X
11	TP14 0.1	Jul 26, 2019		Soil	S19-Jl39850	X	X	X
12	TP16 0.1	Jul 26, 2019		Soil	S19-Jl39851	X	X	X
Test Counts						12	12	12

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	74			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH C10-C14	%	85			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	100			70-130	Pass	
Toluene	%	96			70-130	Pass	
Ethylbenzene	%	89			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
o-Xylene	%	92			70-130	Pass	
Xylenes - Total	%	90			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	89			70-130	Pass	
TRH C6-C10	%	71			70-130	Pass	
TRH >C10-C16	%	84			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	90			70-130	Pass	
Acenaphthylene	%	91			70-130	Pass	
Anthracene	%	94			70-130	Pass	
Benz(a)anthracene	%	91			70-130	Pass	
Benzo(a)pyrene	%	96			70-130	Pass	
Benzo(b&j)fluoranthene	%	92			70-130	Pass	
Benzo(g.h.i)perylene	%	96			70-130	Pass	
Benzo(k)fluoranthene	%	105			70-130	Pass	
Chrysene	%	98			70-130	Pass	
Dibenz(a.h)anthracene	%	89			70-130	Pass	
Fluoranthene	%	105			70-130	Pass	
Fluorene	%	107			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	94			70-130	Pass	
Naphthalene	%	91			70-130	Pass	
Phenanthrene	%	89			70-130	Pass	
Pyrene	%	104			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	109			70-130	Pass	
Cadmium	%	99			70-130	Pass	
Chromium	%	103			70-130	Pass	
Copper	%	102			70-130	Pass	
Lead	%	105			70-130	Pass	
Mercury	%	89			70-130	Pass	
Nickel	%	104			70-130	Pass	
Zinc	%	116			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C10-C14	S19-Jl34164	NCP	%	73			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S19-Jl34164	NCP	%	72			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Jl46517	NCP	%	112			70-130	Pass	
Acenaphthylene	S19-Jl46517	NCP	%	106			70-130	Pass	
Anthracene	S19-Jl46517	NCP	%	105			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benz(a)anthracene	S19-Jl46517	NCP	%	110			70-130	Pass	
Benzo(a)pyrene	S19-Jl46517	NCP	%	108			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Jl46517	NCP	%	108			70-130	Pass	
Benzo(g.h.i)perylene	S19-Jl46517	NCP	%	112			70-130	Pass	
Benzo(k)fluoranthene	S19-Jl46517	NCP	%	118			70-130	Pass	
Chrysene	S19-Jl46517	NCP	%	114			70-130	Pass	
Dibenz(a.h)anthracene	S19-Jl46517	NCP	%	103			70-130	Pass	
Fluorene	S19-Jl46517	NCP	%	121			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S19-Jl46517	NCP	%	108			70-130	Pass	
Naphthalene	S19-Jl46517	NCP	%	102			70-130	Pass	
Phenanthrene	S19-Jl46517	NCP	%	106			70-130	Pass	
Pyrene	S19-Jl46517	NCP	%	128			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S19-Jl46290	NCP	%	88			70-130	Pass	
Cadmium	S19-Jl46290	NCP	%	87			70-130	Pass	
Chromium	S19-Jl46290	NCP	%	90			70-130	Pass	
Copper	S19-Jl35169	NCP	%	76			70-130	Pass	
Lead	S19-Jl46290	NCP	%	87			70-130	Pass	
Mercury	S19-Jl46290	NCP	%	90			70-130	Pass	
Nickel	S19-Jl46290	NCP	%	89			70-130	Pass	
Zinc	S19-Jl46290	NCP	%	124			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Jl39848	CP	%	111			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Jl39848	CP	%	100			70-130	Pass	
Toluene	S19-Jl39848	CP	%	98			70-130	Pass	
Ethylbenzene	S19-Jl39848	CP	%	91			70-130	Pass	
m&p-Xylenes	S19-Jl39848	CP	%	93			70-130	Pass	
o-Xylene	S19-Jl39848	CP	%	92			70-130	Pass	
Xylenes - Total	S19-Jl39848	CP	%	93			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Jl39848	CP	%	73			70-130	Pass	
TRH C6-C10	S19-Jl39848	CP	%	105			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S19-Jl47798	NCP	mg/kg	1.3	< 0.5	110	30%	Fail	Q15
Benzo(a)pyrene	S19-Jl47798	NCP	mg/kg	1.2	< 0.5	110	30%	Fail	Q15
Benzo(b&j)fluoranthene	S19-Jl47798	NCP	mg/kg	0.9	< 0.5	120	30%	Fail	Q15
Benzo(g.h.i)perylene	S19-Jl47798	NCP	mg/kg	0.6	< 0.5	98	30%	Fail	Q15
Benzo(k)fluoranthene	S19-Jl47798	NCP	mg/kg	1.1	< 0.5	110	30%	Fail	Q15
Chrysene	S19-Jl47798	NCP	mg/kg	1.2	< 0.5	110	30%	Fail	Q15
Dibenz(a.h)anthracene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S19-Jl47798	NCP	mg/kg	3.3	0.8	120	30%	Fail	Q15
Fluorene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S19-Jl47798	NCP	mg/kg	0.6	< 0.5	110	30%	Fail	Q15
Naphthalene	S19-Jl47798	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Phenanthrene	S19-Jl47798	NCP	mg/kg	1.1	< 0.5	97	30%	Fail	Q15
Pyrene	S19-Jl47798	NCP	mg/kg	2.7	0.8	110	30%	Fail	Q15
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Jl46289	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	S19-Jl46289	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Jl46289	NCP	mg/kg	5.1	5.4	7.0	30%	Pass	
Copper	S19-Jl46289	NCP	mg/kg	210	210	<1	30%	Pass	
Lead	S19-Jl46289	NCP	mg/kg	6.2	6.4	3.0	30%	Pass	
Mercury	S19-Jl46289	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S19-Jl46289	NCP	mg/kg	6.6	7.2	8.0	30%	Pass	
Zinc	S19-Jl46289	NCP	mg/kg	51	52	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl48261	NCP	%	14	13	2.0	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S19-Jl39846	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S19-Jl39846	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S19-Jl39846	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S19-Jl39846	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S19-Jl39846	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S19-Jl39846	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Jl39847	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Jl39847	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S19-Jl39847	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S19-Jl39847	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S19-Jl39847	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S19-Jl39847	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S19-Jl39847	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Jl39847	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S19-Jl39847	CP	mg/kg	< 20	< 20	<1	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Andrew Black	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)

Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

☐ Sydney Laboratory
Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2, 91 Leach Highway, Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Contact Name	Stephen Maxwell				
Phone №	0478 658 194				
Special Directions					
Purchase Order					
Quote ID №	180813RAMN_1				

Sampler(s)	SM and SC
Handed over by	Stephen Maxwell
Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.)

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Lead	Containers: 1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	TP1_0.1-0.5	26/07/19	S	X							1		
2	TP1_:0.5-0.6	26/07/19	S	X							1		
3	TP2_0.1-0.4	26/07/19	S	X							1		
4	TP2_0.4-0.5	26/07/19	S	X							1		
5	TP2_0.5-0.7	26/07/19	S	X							1		
6	TP3_0.1-0.5	26/07/19	S	X							1		
7	TP3_0.5-0.6	26/07/19	S	X							1		
8	TP3_0.6-0.7	26/07/19	S	X							1		
9	TP4_0.1-0.3	26/07/19	S	X							1	1	Asbestos bag for analysis
10	TP4_0.3-0.4	26/07/19	S	X							1		
	Total Counts			10							10	1	

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)*
☑ 1 Day* ☐ 2 Day*
☐ 3 Day* ☐ 5 Day
* Surcharges apply
☐ Other ( )

Method of Shipment: ☐ Courier (#) ☑ Hand Delivered ☐ Postal Name Signature Date __/__/__ Time __:__

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Received By: Elvio P (SYD | BNE | MEL | PER | ADL | NTL | DRW) Signature: Z Date: 26.7.19 Time: 5.55PM Temperature: 16.7°C

Received By: (SYD | BNE | MEL | PER | ADL | NTL | DRW) Signature: Date: __/__/__ Time: __:__ Report №: 668047

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

QS3005_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

☐ Sydney Laboratory
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02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2, 91 Leach Highway, Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell	Sampler(s)	SM and SC
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF	Handed over by	Stephen Maxwell
Contact Name	Stephen Maxwell					Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Phone №	0478 658 194					Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com
Special Directions							
Purchase Order							
Quote ID №	180813RAMN_1						

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered") SUITE code must be used to attract SUITE pricing.

Containers

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)* ☑ 1 Day* ☐ 2 Day* ☐ 3 Day* ☐ 5 Day * Surcharges apply ☐ Other ( )

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Lead	1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	TP5-0.1-0.45	26/07/19	S	X							1	1	
2	TP5_0.45-0.55	26/07/19	S	X							1		
3	TP5_0.6-0.7	26/07/19	S	X							1		
4	TP6_0.1-0.4	26/07/19	S	X							1	1	
5	TP6_0.4-0.5	26/07/19	S	X							1		
6	TP6_0.5-0.7	26/07/19	S	X							1		
7	TP7_0.1-0.4	26/07/19	S	X							1	1	
8	TP7_0.4-0.5	26/07/19	S	X							1		
9	TP7_0.5-0.7	26/07/19	S	X							1		
10	TP8_0.1-0.3	26/07/19	S	X							1	1	
	Total Counts			10							10	4	

Method of Shipment: ☐ Courier (#) ☑ Hand Delivered ☐ Postal Name Signature Date __/__/__ Time __:__

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Received By	Elise	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date 26/7/19	Time 5:00pm	Temperature 16.7°C
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date __/__/__	Time __:__	Report №

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | mgt Standard Terms and Conditions unless agreed otherwise. A copy of Eurofins | mgt Standard Terms and Conditions is available on request.

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GS3005_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

☐ Sydney Laboratory
Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2, 91 Leach Highway, Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Contact Name	Stephen Maxwell				
Phone №	0478 658 194				
Special Directions					
Purchase Order					
Quote ID №	180813RAMN_1				

Sampler(s)	SM and SC
Handed over by	Stephen Maxwell
Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.)

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Lead	Containers: 1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	TP80.3-0.5	26/07/19	S	X							1		
2	TP8_0.5-0.8	26/07/19	S	X							1		
3	TP9_0.1-0.3	26/07/19	S	X							1	1	
4	TP9_0.3-0.5	26/07/19	S	X							1		
5	TP9_0.5-0.7	26/07/19	S	X							1		
6	TP15_0.1	26/07/19	S	X							1		
7	TP15_0.8	26/07/19	S	X							1		
8	SS1_0.0-0.1	26/07/19	S	X							1		
9													
10													
	Total Counts			8							8	1	

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)*
☑ 1 Day* ☐ 2 Day*
☐ 3 Day* ☐ 5 Day
* Surcharges apply
☐ Other ( )

Method of Shipment	☐ Courier (#)	☑ Hand Delivered	☐ Postal	Name		Signature		Date	__/__/__	Time	__:__
Eurofins | mgt Laboratory Use Only	Received By	Elvio D	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	26/8/19	Time	5:54pm	Temperature	16.9°C
	Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	__/__/__	Time	__:__	Report №	

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QS3009_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

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☐ Brisbane Laboratory
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07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2, 91 Leach Highway, Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
2 Kingston Town Close, Oakleigh, VIC 3166
03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll	Project №	318000780	Project Manager	Stephen Maxwell	Sampler(s)	SM and SC
Address	50 Glebe Road the Junction	Project Name		EDD Format (ESdat, EQuIS, Custom)	Excel and PDF	Handed over by	Stephen Maxwell
Contact Name	Stephen Maxwell					Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Phone №	0478 658 194					Email for Results	smaxwell@ramboll.com jblackwell@ramboll.com
Special Directions							
Purchase Order							
Quote ID №	180813RAMN_1						

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered"| SUITE code must be used to attract SUITE pricing)

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Lead	Containers: 1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	SS2_0-0.1	26/07/19	S	X							1		
2	SS3-0-0.1	26/07/19	S	X							1		
3	SS4_0-0.1	26/07/19	S	X							1		
4	SS5_0-0.1	26/07/19	S	X							1		
5	SS6_0-0.1	26/07/19	S	X							1		
6	SS7_0-0.1	26/07/19	S	X							1		
7	SS8_0-0.1	26/07/19	S	X							1		
8	SS9_0-0.1	26/07/19	S	X							1		
9	SS10_0-0.1	26/07/19	S	X							1		
10	SS11_0-0.1	26/07/19	S	X							1		
	Total Counts			10							10		

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked)

☐ Overnight (9am)*
☑ 1 Day* ☐ 2 Day*
☐ 3 Day* ☐ 5 Day
* Surcharges apply
☐ Other ( )

Method of Shipment	☐ Courier (#)	☑ Hand Delivered	☐ Postal	Name		Signature		Date	__/__/__	Time	__:__
Eurofins | mgt Laboratory Use Only	Received By	Elvis P	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	26/7/19	Time	5:54pm	Temperature	16.7
	Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	__/__/__	Time	__:__	Report №	

Eurofins Environment Testing Australia Pty Ltd trading as Eurofins | mgt

QS3009_R7 Modified by: Dr. R Symons Approved by: T. Lakeland Approved on: 17 August 2017

CHAIN OF CUSTODY RECORD

ABN 50 005 085 521

- ☐ Sydney Laboratory — Unit F3 Bld.F, 16 Mars Rd, Lane Cove West, NSW 2066 — 02 9900 8400 EnviroSampleNSW@eurofins.com
- ☐ Brisbane Laboratory — Unit 1, 21 Smallwood Pl., Murarrie, QLD 4172 — 07 3902 4600 EnviroSampleQLD@eurofins.com
- ☐ Perth Laboratory — Unit 2, 91 Leach Highway, Kewdale WA 6105 — 08 9251 9600 EnviroSampleWA@eurofins.com
- ☐ Melbourne Laboratory — 2 Kingston Town Close, Oakleigh, VIC 3166 — 03 8564 5000 EnviroSampleVic@eurofins.com

Company	Ramboll
Project №	318000780
Project Manager	Stephen Maxwell
Sampler(s)	SM and SC
Address	50 Glebe Road the Junction
Project Name	
EDD Format (ESdat, EQuIS, Custom)	Excel and PDF
Handed over by	Stephen Maxwell
Email for Invoice	smaxwell@ramboll.com asiapac-accounts@ramboll.com
Email for Results	smaxwell@ramboll.com cgoodbody@ramboll.com
Contact Name	Stephen Maxwell
Phone №	0478 658 194
Special Directions	
Purchase Order	
Quote ID №	180813RAMN_1

Analyses (Note: Where metals are requested, please specify "Total" or "Filtered") SUITE code must be used to attract SUITE pricing.

Turnaround Time (TAT) Requirements (Default will be 5 days if not ticked): ☐ Overnight (9am)* ☑ 1 Day* ☐ 2 Day* ☐ 3 Day* ☐ 5 Day ☐ Other ( ) * Surcharges apply

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix (Solid (S) Water (W))	Lead	1L Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	SS12_0-0.1	26/07/19	S	X							1		
2	SS13_0-0.1	26/07/19	S	X							1		
3	SS14_0-0.1	26/07/19	S	X							1		
4	SS15_0-0.1	26/07/19	S	X							1		
5	SS16_0-0.1	26/07/19	S	X							1		
6													
7	D02_260719	26/07/19	S	X							1		
8	D03_260719	26/07/19	S	X							1		
9	T02_260719	26/07/19	S	X							1		Please send to Envirolab for analysis
10	T03_260719	26/07/19	S	X							1		Please send to Envirolab for analysis
	Total Counts			9							9		

Method of Shipment: ☐ Courier (#) ☑ Hand Delivered ☐ Postal Name Signature Date __/__/__ Time __:__

Eurofins | mgt Laboratory Use Only						
Received By: Elvis	(SYD) | BNE | MEL | PER | ADL | NTL | DRW	Signature: [signed]	Date: 26/7/19	Time: 5:54pm	Temperature: 16.7°C
Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature	Date __/__/__	Time __:__	Report №

Enviro Sample NSW

From: Stephen Maxwell <SMAXWELL@ramboll.com>
Sent: Monday, 29 July 2019 9:08 AM
To: Enviro Sample NSW
Cc: Joshua Blackwell
Subject: RE: Eurofins | mgt Sample Receipt Advice - Report 668047 : Site 318000780

Follow Up Flag: Follow up
Flag Status: Flagged

Hi

Please report TP16 0.1 & TP16 0.8 as TP15 0.1 & TP15 0.8 (these were labelled out of sequence in the field).

Please analyse SS17_0-0.1, SS18_0.0-0.1, SS19_0.0-0.1 SS20_0.0-0.1, SS21, SS22 for lead on fastest available turnaround. {Please hold bags for SS15, SS16, SS19 and SS20.

Please hold all other samples described in red in trail below.

Kind regards
Stephen Maxwell
Lead Consultant

D +61 478658194
M +61 478658194
smaxwell@ramboll.com

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

From: EnviroSampleNSW@eurofins.com <EnviroSampleNSW@eurofins.com>
Sent: 26 July, 2019 7:20 PM
To: Stephen Maxwell <SMAXWELL@ramboll.com>
Cc: Joshua Blackwell <JBLACKWELL@ramboll.com>
Subject: Eurofins | mgt Sample Receipt Advice - Report 668047 : Site 318000780

Dear Valued Client,

T02_260719(jar+bag) & T03_260719(jar) to be sent to Envirolab for analysis.

Sample TP15 0.1 & TP15 0.8 not received; analysis cancelled. Additional samples TP16 0.1 & TP16 0.8 received and placed on analysis.

Extra samples received, TP10_0.8-1.0, TP11_0.5-0.6, TP11_0.8-1.0, TP12_0.5, TP13_0.5-0.6, TP13_0.8-0.9, TP14_0.6-0.8, SS17_0.0-0.1, SS18_0.0-0.1 - ALL JARS.

SS19_0.0-0.1(JAR+2BAGS), SS20_0.0-0.1(JAR+2 BAGS), SS21(BAG), SS22(BAG), all placed on HOLD. Please advise further instructions.

Please find attached a Sample Receipt Advice (SRA), a Summary Sheet and a scanned copy of your Chain-of-Custody (COC). It is important that you check this documentation to ensure that the details are correct such as the Client Job Number, Turn Around Time, any comments in the Notes section and sample numbers as well as the requested analysis. If there are any irregularities then please contact your Eurofins Analytical Services Manager as soon as possible to make certain that they get changed.

Regards

Rupan Virk
Sample Receipt

Eurofins | Environment Testing
Unit F3, Parkview Building
16 Mars Road
LANE COVE WEST NSW 2066
AUSTRALIA
Phone: +61 299 008 400
Email: EnviroSampleNSW@eurofins.com
Website:environment.eurofins.com.au
EnviroNote 1068 - Eurofins Perth Laboratory
EnviroNote 1069 - Eurofins Overnight TAT
EnviroNote 1079 - PFAS Fingerprinting
EnviroNote 1080 - Total Organofluorine Analysis & PFAS Investigations

eurofins | Environment Testing

Melbourne
6 Monterey Road
Dandenong South Vic 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

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

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

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 23736

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name:	**Ramboll Australia Pty Ltd**
Contact name:	Stephen Maxwell
Project ID:	318000780
COC number:	Not provided
Turn around time:	1 Day
Date/Time received:	Jul 26, 2019 5:54 PM
Eurofins reference:	**668047**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☒ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☑ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Andrew Black on Phone : (+61) 2 9900 8490 or by e.mail: AndrewBlack@eurofins.com

Results will be delivered electronically via e.mail to Stephen Maxwell - smaxwell@ramboll.com.

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

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

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

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668047
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 29, 2019
Priority: 1 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP1 0.1-0.5	Jul 26, 2019		Soil	S19-Jl39891		X	X
2	TP1 0.5-0.6	Jul 26, 2019		Soil	S19-Jl39892		X	X
3	TP2 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39893		X	X
4	TP2 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39894		X	X
5	TP2 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39895		X	X
6	TP3 0.1-0.5	Jul 26, 2019		Soil	S19-Jl39896		X	X
7	TP3 0.5-0.6	Jul 26, 2019		Soil	S19-Jl39897		X	X
8	TP3 0.6-0.7	Jul 26, 2019		Soil	S19-Jl39898		X	X
9	TP4 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39899		X	X

eurofins | Environment Testing

ABN – 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
6 Monterey Road
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Site # 1254 & 14271

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668047
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 29, 2019
Priority: 1 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
10	TP4 0.3-0.4	Jul 26, 2019		Soil	S19-Jl39900		X	X
11	TP5 0.1-0.45	Jul 26, 2019		Soil	S19-Jl39901		X	X
12	TP5 0.45-0.55	Jul 26, 2019		Soil	S19-Jl39902		X	X
13	TP5 0.6-0.7	Jul 26, 2019		Soil	S19-Jl39903		X	X
14	TP6 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39904		X	X
15	TP6 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39905		X	X
16	TP6 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39906		X	X
17	TP7 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39907		X	X
18	TP7 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39908		X	X
19	TP7 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39909		X	X
20	TP8 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39910		X	X
21	TP8 0.3-0.5	Jul 26, 2019		Soil	S19-Jl39911		X	X

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Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
22	TP8 0.5-0.8	Jul 26, 2019		Soil	S19-Jl39912		X	X
23	TP9 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39913		X	X
24	TP9 0.3-0.5	Jul 26, 2019		Soil	S19-Jl39914		X	X
25	TP9 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39915		X	X
26	TP15 0.1	Jul 26, 2019		Soil	S19-Jl39918		X	X
27	TP15 0.8	Jul 26, 2019		Soil	S19-Jl39919		X	X
28	SS1 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39920		X	X
29	SS2 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39921		X	X
30	SS3 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39922		X	X
31	SS4 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39923		X	X
32	SS5 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39924		X	X
33	SS6 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39925		X	X

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Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
34	SS7 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39926		X	X
35	SS8 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39927		X	X
36	SS9 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39928		X	X
37	SS10 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39929		X	X
38	SS11 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39930		X	X
39	SS12 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39931		X	X
40	SS13 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39932		X	X
41	SS14 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39933		X	X
42	SS15 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39934		X	X
43	SS16 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39935		X	X
44	D02_260719	Jul 26, 2019		Soil	S19-Jl39936		X	X
45	D03_260719	Jul 26, 2019		Soil	S19-Jl39937		X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
46	TP10_0.8-1.0	Jul 26, 2019		Soil	S19-Jl39990	X		
47	TP11_0.5-0.6	Jul 26, 2019		Soil	S19-Jl39991	X		
48	TP11_0.8-1.0	Jul 26, 2019		Soil	S19-Jl39992	X		
49	TP12_0.5	Jul 26, 2019		Soil	S19-Jl39993	X		
50	TP13_0.5-0.6	Jul 26, 2019		Soil	S19-Jl39994	X		
51	TP13_0.8-0.9	Jul 26, 2019		Soil	S19-Jl39995	X		
52	TP14_0.6-0.8	Jul 26, 2019		Soil	S19-Jl39996	X		
53	SS17_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39997		X	X
54	SS18_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39998		X	X
55	SS19_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39999		X	X
56	SS20_0.0-0.1	Jul 26, 2019		Soil	S19-Jl40000		X	X
57	SS21	Jul 26, 2019		Soil	S19-Jl40001		X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
58	SS22	Jul 26, 2019		Soil	S19-Jl40002		X	X
59	D01_260719	Jul 26, 2019		Soil	S19-Jl40003	X		
Test Counts						8	51	51

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

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Stephen Maxwell**

Report **668047-S**
Project name
Project ID 318000780
Received Date Jul 26, 2019

Client Sample ID			**TP1 0.1-0.5**	**TP1 0.5-0.6**	**TP2 0.1-0.4**	**TP2 0.4-0.5**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S19-Jl39891**	**S19-Jl39892**	**S19-Jl39893**	**S19-Jl39894**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	4400	10	3500	110
% Moisture	1	%	3.9	4.8	2.7	4.4

Client Sample ID			**TP2 0.5-0.7**	**TP3 0.1-0.5**	**TP3 0.5-0.6**	**TP3 0.6-0.7**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S19-Jl39895**	**S19-Jl39896**	**S19-Jl39897**	**S19-Jl39898**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	16	29000	74	13
% Moisture	1	%	9.2	9.8	6.4	9.1

Client Sample ID			**TP4 0.1-0.3**	**TP4 0.3-0.4**	**TP5 0.1-0.45**	**TP5 0.45-0.55**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S19-Jl39899**	**S19-Jl39900**	**S19-Jl39901**	**S19-Jl39902**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	38000	70	3100	150
% Moisture	1	%	4.2	8.4	5.6	5.4

Client Sample ID			TP5 0.6-0.7	TP6 0.1-0.4	TP6 0.4-0.5	TP6 0.5-0.7
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39903	S19-JI39904	S19-JI39905	S19-JI39906
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	47	6000	20	6.7
% Moisture	1	%	12	5.8	6.5	11

Client Sample ID			TP7 0.1-0.4	TP7 0.4-0.5	TP7 0.5-0.7	TP8 0.1-0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39907	S19-JI39908	S19-JI39909	S19-JI39910
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	3300	76	6.9	2800
% Moisture	1	%	3.7	5.7	11	2.2

Client Sample ID			TP8 0.3-0.5	TP8 0.5-0.8	TP9 0.1-0.3	TP9 0.3-0.5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39911	S19-JI39912	S19-JI39913	S19-JI39914
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	24	22	600	< 5
% Moisture	1	%	6.0	9.5	2.4	6.1

Client Sample ID			TP9 0.5-0.7	TP15 0.1	TP15 0.8	SS1 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39915	S19-JI39918	S19-JI39919	S19-JI39920
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	8.1	27	26	39
% Moisture	1	%	10	6.1	12	4.6

Client Sample ID			SS2 0.0-0.1	SS3 0.0-0.1	SS4 0.0-0.1	SS5 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39921	S19-JI39922	S19-JI39923	S19-JI39924
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	110	130	120	43
% Moisture	1	%	3.2	7.5	5.6	2.8

Client Sample ID			SS6 0.0-0.1	SS7 0.0-0.1	SS8 0.0-0.1	SS9 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39925	S19-JI39926	S19-JI39927	S19-JI39928
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	110	4100	340	140
% Moisture	1	%	2.8	4.4	19	6.2

Client Sample ID			SS10 0.0-0.1	SS11 0.0-0.1	SS12 0.0-0.1	SS13 0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39929	S19-JI39930	S19-JI39931	S19-JI39932
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	780	2200	32000	2600
% Moisture	1	%	2.2	5.8	3.3	1.2

Client Sample ID			SS14 0.0-0.1	SS15 0.0-0.1	SS16 0.0-0.1	D02_260719
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39933	S19-JI39934	S19-JI39935	S19-JI39936
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	31	350	15000	280
% Moisture	1	%	6.8	4.7	1.9	5.0

Client Sample ID			D03_260719	SS17_0.0-0.1	SS18_0.0-0.1	SS19_0.0-0.1
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S19-JI39937	S19-JI39997	S19-JI39998	S19-JI39999
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	120	25	34	26000
% Moisture	1	%	5.5	3.2	4.8	2.4

Client Sample ID			SS20_0.0-0.1	SS21	SS22
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			S19-JI40000	S19-JI40001	S19-JI40002
Date Sampled			Jul 26, 2019	Jul 26, 2019	Jul 26, 2019
Test/Reference	LOR	Unit			
Heavy Metals					
Lead	5	mg/kg	35000	610	540
% Moisture	1	%	3.6	2.2	3.4

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Sydney	Jul 29, 2019	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Jul 29, 2019	14 Days
- Method: LTM-GEN-7080 Moisture			

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Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP1 0.1-0.5	Jul 26, 2019		Soil	S19-Jl39891		X	X
2	TP1 0.5-0.6	Jul 26, 2019		Soil	S19-Jl39892		X	X
3	TP2 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39893		X	X
4	TP2 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39894		X	X
5	TP2 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39895		X	X
6	TP3 0.1-0.5	Jul 26, 2019		Soil	S19-Jl39896		X	X
7	TP3 0.5-0.6	Jul 26, 2019		Soil	S19-Jl39897		X	X
8	TP3 0.6-0.7	Jul 26, 2019		Soil	S19-Jl39898		X	X
9	TP4 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39899		X	X

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Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
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11	TP5 0.1-0.45	Jul 26, 2019		Soil	S19-Jl39901		X	X
12	TP5 0.45-0.55	Jul 26, 2019		Soil	S19-Jl39902		X	X
13	TP5 0.6-0.7	Jul 26, 2019		Soil	S19-Jl39903		X	X
14	TP6 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39904		X	X
15	TP6 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39905		X	X
16	TP6 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39906		X	X
17	TP7 0.1-0.4	Jul 26, 2019		Soil	S19-Jl39907		X	X
18	TP7 0.4-0.5	Jul 26, 2019		Soil	S19-Jl39908		X	X
19	TP7 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39909		X	X
20	TP8 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39910		X	X
21	TP8 0.3-0.5	Jul 26, 2019		Soil	S19-Jl39911		X	X

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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

Project Name:
Project ID: 318000780

Order No.:
Report #: 668047
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 26, 2019 5:54 PM
Due: Jul 29, 2019
Priority: 1 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
22	TP8 0.5-0.8	Jul 26, 2019		Soil	S19-Jl39912		X	X
23	TP9 0.1-0.3	Jul 26, 2019		Soil	S19-Jl39913		X	X
24	TP9 0.3-0.5	Jul 26, 2019		Soil	S19-Jl39914		X	X
25	TP9 0.5-0.7	Jul 26, 2019		Soil	S19-Jl39915		X	X
26	TP15 0.1	Jul 26, 2019		Soil	S19-Jl39918		X	X
27	TP15 0.8	Jul 26, 2019		Soil	S19-Jl39919		X	X
28	SS1 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39920		X	X
29	SS2 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39921		X	X
30	SS3 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39922		X	X
31	SS4 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39923		X	X
32	SS5 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39924		X	X
33	SS6 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39925		X	X

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Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
34	SS7 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39926		X	X
35	SS8 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39927		X	X
36	SS9 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39928		X	X
37	SS10 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39929		X	X
38	SS11 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39930		X	X
39	SS12 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39931		X	X
40	SS13 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39932		X	X
41	SS14 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39933		X	X
42	SS15 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39934		X	X
43	SS16 0.0-0.1	Jul 26, 2019		Soil	S19-Jl39935		X	X
44	D02_260719	Jul 26, 2019		Soil	S19-Jl39936		X	X
45	D03_260719	Jul 26, 2019		Soil	S19-Jl39937		X	X

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Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
46	TP10_0.8-1.0	Jul 26, 2019		Soil	S19-Jl39990	X		
47	TP11_0.5-0.6	Jul 26, 2019		Soil	S19-Jl39991	X		
48	TP11_0.8-1.0	Jul 26, 2019		Soil	S19-Jl39992	X		
49	TP12_0.5	Jul 26, 2019		Soil	S19-Jl39993	X		
50	TP13_0.5-0.6	Jul 26, 2019		Soil	S19-Jl39994	X		
51	TP13_0.8-0.9	Jul 26, 2019		Soil	S19-Jl39995	X		
52	TP14_0.6-0.8	Jul 26, 2019		Soil	S19-Jl39996	X		
53	SS17_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39997		X	X
54	SS18_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39998		X	X
55	SS19_0.0-0.1	Jul 26, 2019		Soil	S19-Jl39999		X	X
56	SS20_0.0-0.1	Jul 26, 2019		Soil	S19-Jl40000		X	X
57	SS21	Jul 26, 2019		Soil	S19-Jl40001		X	X

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Contact Name: Stephen Maxwell

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Sample Detail						HOLD	Lead	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
58	SS22	Jul 26, 2019		Soil	S19-Jl40002		X	X
59	D01_260719	Jul 26, 2019		Soil	S19-Jl40003	X		
Test Counts						8	51	51

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Lead	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Heavy Metals							
Lead	%	127			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	S19-Jl39895	CP	%	119			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S19-Jl39894	CP	mg/kg	110	92	19	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl39896	CP	%	9.8	9.4	5.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S19-Jl39904	CP	mg/kg	6000	6600	10	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl39906	CP	%	11	11	4.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S19-Jl39914	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl39918	CP	%	6.1	5.5	10	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl39928	CP	%	6.2	5.2	17	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S19-Jl39997	CP	%	3.2	3.8	17	30%	Pass	

Comments

Sample Integrity

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

Authorised By

Andrew Black	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Metal (NSW)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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

Enviro Sample NSW

To: Andrew Black
Subject: RE: 2 DAY TAT ADDITIONAL LEACHATES: FW: Eurofins Test Results, Invoice - Report 668044 : Site 318000780

From: Stephen Maxwell [mailto:SMAXWELL@ramboll.com]
Sent: Wednesday, 31 July 2019 5:03 PM
To: Andrew Black
Cc: Joshua Blackwell; Anand Chandra; Nibha Vaidya
Subject: RE: Eurofins Test Results, Invoice - Report 668044 : Site 318000780

EXTERNAL EMAIL*

Thanks Andrew

Very much appreciated. Can we commission the following additional leachate analyses to have data in hand before COB Friday?
TCLP prep followed by lead analyses on:

- TP1 0.1-0.5,
- TP5 0.1-0.45 and
- TP7 0.1-0.4

ASLP prep followed by lead analyses on:

- TP3_ 0.1-0.5,
- SS20 0-0.1,
- TP4 0.1-0.3

Kind regards
Stephen Maxwell
Lead Consultant

D +61 478658194
M +61 478658194
smaxwell@ramboll.com

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

From: AndrewBlack@eurofins.com <AndrewBlack@eurofins.com>
Sent: 31 July, 2019 4:34 PM
To: Stephen Maxwell <SMAXWELL@ramboll.com>
Cc: &AsiaPac-Accounts <asiapac-accounts@ramboll.com>; Joshua Blackwell <JBLACKWELL@ramboll.com>
Subject: Eurofins Test Results, Invoice - Report 668044 : Site 318000780

Regards

Andrew Black
Analytical Services Manager

Eurofins | Environment Testing
Unit 7
7 Friesian Close
SANDGATE NSW 2304
AUSTRALIA
Phone: +61 299 008 490
Mobile: +61 410 220 750

Email: AndrewBlack@eurofins.com
Website:environment.eurofins.com.au
EnviroNote 1079 - PFAS Fingerprinting
EnviroNote 1080 - Total Organofluorine Analysis & PFAS Investigations

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Sample Receipt Advice

Company name:	**Ramboll Australia Pty Ltd**
Contact name:	Stephen Maxwell
Project name:	ADDITIONAL
Project ID:	318000780
COC number:	Not provided
Turn around time:	2 Day
Date/Time received:	Jul 31, 2019 5:03 PM
Eurofins reference:	**668864**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ All samples have been received as described on the above COC.

☑ COC has been completed correctly.

☑ Attempt to chill was evident.

☑ Appropriately preserved sample containers have been used.

☑ All samples were received in good condition.

☑ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

☑ Appropriate sample containers have been used.

☒ Split sample sent to requested external lab.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Andrew Black on Phone : (+61) 2 9900 8490 or by e.mail: AndrewBlack@eurofins.com

Results will be delivered electronically via e.mail to Stephen Maxwell - smaxwell@ramboll.com.

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Site # 23736

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

Project Name: ADDITIONAL
Project ID: 318000780

Order No.:
Report #: 668864
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 31, 2019 5:03 PM
Due: Aug 2, 2019
Priority: 2 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Lead	AUS Leaching Procedure	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP1 0.1-0.5	Jul 26, 2019		US Leachate	S19-Jl50740	X		X
2	TP5 0.1-0.45	Jul 26, 2019		US Leachate	S19-Jl50741	X		X
3	TP7 0.1-0.4	Jul 26, 2019		US Leachate	S19-Jl50742	X		X
4	TP3 0.1-0.5	Jul 26, 2019		AUS Leachate - Reagent Water	S19-Jl50743	X	X	
5	SS20 0-0.1	Jul 26, 2019		AUS Leachate - Reagent Water	S19-Jl50744	X	X	
6	TP4 0.1-0.3	Jul 26, 2019		AUS Leachate - Reagent	S19-Jl50745	X	X	

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NATA # 1261
Site # 23736

Company Name:	Ramboll Australia Pty Ltd	**Order No.:**		**Received:**	Jul 31, 2019 5:03 PM
Address:	Level 3/100 Pacific Highway North Sydney NSW 2060	**Report #:**	668864	**Due:**	Aug 2, 2019
		Phone:	02 9954 8118	**Priority:**	2 Day
		Fax:	02 9954 8150	**Contact Name:**	Stephen Maxwell
Project Name:	ADDITIONAL				
Project ID:	318000780				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail	Lead	AUS Leaching Procedure	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271			
Sydney Laboratory - NATA Site # 18217	X	X	X
Brisbane Laboratory - NATA Site # 20794			
Perth Laboratory - NATA Site # 23736			
Water			
Test Counts	6	3	3

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

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Stephen Maxwell**

Report **668864-L**
Project name ADDITIONAL
Project ID 318000780
Received Date Jul 31, 2019

Client Sample ID			**TP1 0.1-0.5**	**TP5 0.1-0.45**	**TP7 0.1-0.4**	**TP3 0.1-0.5**
Sample Matrix			**US Leachate**	**US Leachate**	**US Leachate**	**AUS Leachate - Reagent Water**
Eurofins Sample No.			**S19-JI50740**	**S19-JI50741**	**S19-JI50742**	**S19-JI50743**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	0.01	mg/L	4.3	32	8.2	1.1
AUS Leaching Procedure						
Leachate Fluid[C01]		comment	-	-	-	4.0
pH (initial)	0.1	pH Units	-	-	-	4.1
pH (Leachate fluid)	0.1	pH Units	-	-	-	7.0
pH (off)	0.1	pH Units	-	-	-	3.8
USA Leaching Procedure						
Leachate Fluid[C01]		comment	1.0	1.0	1.0	-
pH (initial)	0.1	pH Units	4.7	4.6	4.7	-
pH (off)	0.1	pH Units	5.2	5.0	5.0	-
pH (USA HCl addition)	0.1	pH Units	1.8	1.8	1.8	-

Client Sample ID			**SS20 0-0.1**	**TP4 0.1-0.3**
Sample Matrix			**AUS Leachate - Reagent Water**	**AUS Leachate - Reagent Water**
Eurofins Sample No.			**S19-JI50744**	**S19-JI50745**
Date Sampled			**Jul 26, 2019**	**Jul 26, 2019**
Test/Reference	LOR	Unit		
Heavy Metals				
Lead	0.01	mg/L	0.03	< 0.01
AUS Leaching Procedure				
Leachate Fluid[C01]		comment	4.0	4.0
pH (initial)	0.1	pH Units	3.7	4.1
pH (Leachate fluid)	0.1	pH Units	7.0	7.0
pH (off)	0.1	pH Units	3.5	4.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Heavy Metals	Sydney	Jul 31, 2019	180 Days
- Method:			
AUS Leaching Procedure	Sydney	Jul 31, 2019	7 Days
- Method:			
USA Leaching Procedure	Sydney	Jul 31, 2019	14 Days
- Method:			

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NATA # 1261
Site # 23736

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

Project Name: ADDITIONAL
Project ID: 318000780

Order No.:
Report #: 668864
Phone: 02 9954 8118
Fax: 02 9954 8150

Received: Jul 31, 2019 5:03 PM
Due: Aug 2, 2019
Priority: 2 Day
Contact Name: Stephen Maxwell

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Lead	AUS Leaching Procedure	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	TP1 0.1-0.5	Jul 26, 2019		US Leachate	S19-Jl50740	X		X
2	TP5 0.1-0.45	Jul 26, 2019		US Leachate	S19-Jl50741	X		X
3	TP7 0.1-0.4	Jul 26, 2019		US Leachate	S19-Jl50742	X		X
4	TP3 0.1-0.5	Jul 26, 2019		AUS Leachate - Reagent Water	S19-Jl50743	X	X	
5	SS20 0-0.1	Jul 26, 2019		AUS Leachate - Reagent Water	S19-Jl50744	X	X	
6	TP4 0.1-0.3	Jul 26, 2019		AUS Leachate - Reagent	S19-Jl50745	X	X	

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Site # 23736

Company Name:	Ramboll Australia Pty Ltd	**Order No.:**		**Received:**	Jul 31, 2019 5:03 PM
Address:	Level 3/100 Pacific Highway North Sydney NSW 2060	**Report #:**	668864	**Due:**	Aug 2, 2019
		Phone:	02 9954 8118	**Priority:**	2 Day
		Fax:	02 9954 8150	**Contact Name:**	Stephen Maxwell
Project Name:	ADDITIONAL				
Project ID:	318000780				

Eurofins Analytical Services Manager : Andrew Black

Sample Detail	Lead	AUS Leaching Procedure	USA Leaching Procedure
Melbourne Laboratory - NATA Site # 1254 & 14271			
Sydney Laboratory - NATA Site # 18217	X	X	X
Brisbane Laboratory - NATA Site # 20794			
Perth Laboratory - NATA Site # 23736			
Water			
Test Counts	6	3	3

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Lead			mg/L	< 0.01			0.01	Pass	
LCS - % Recovery									
Heavy Metals									
Lead			%	84			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Heavy Metals				Result 1					
Lead	S19-Jl50745	CP	%	92			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S19-Jl50740	CP	mg/L	4.3	4.1	6.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Lead	S19-Jl50743	CP	mg/L	1.1	0.92	15	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
C01	Leachate Fluid Key: 1 - pH 5.0; 2 - pH 2.9; 3 - pH 9.2; 4 - Reagent (DI) water; 5 - Client sample, 6 - other

Authorised By

Andrew Black	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Metal (NSW)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

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