Captains Flat to Bungendore – Rail Corridor XRF Survey

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Captains Flat to Bungendore – Rail Corridor XRF Survey

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Acronyms and Abbreviations

Name	Description
AHD	Australian Height Datum
AMG	Australian Map Grid
ASC NEPM	Assessment of Site Contamination National Environment Protection Measure
bgl	Below ground level
CoPC	Contaminant of Potential Concern
CRN	Country Regional Rail Network
CSM	Conceptual Site Model
DP	Deposited Plan
DQO	Data Quality Objective
EPA	Environment Protection Authority
ERM	Environmental Resources Management Australia Pty Ltd
ha	Hectare
JHR	John Holland Rail Pty Ltd
kg	kilogram
m	Metre
mg	Milligram
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW	New South Wales
QA/QC	Quality Assurance and Quality Control
TfNSW	Transport for NSW
UGL	United Group Limited
XRF	X-ray fluorescence

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by John Holland Rail Pty Ltd (JHR) to undertake an X-Ray Fluorescence (XRF) soil assessment with supplementary shallow soil assessment for the rail line between the township of Bungendore and Captains Flat, New South Wales (the Site). The Site extended from the intersection of Hoskinstown Road and the active rail line in Bungendore in the north to a point in the former rail corridor approximately 2 km north of Captains Flat. The Site included approximately 3 km of active rail corridor (Bombala Line) and 32 km of the disused Captains Flat Line.

The primary objective of the Shallow Soil Assessment was to assess the nature and extent of lead concentrations in the surface soils of the Investigation Area and to use this information to develop a preliminary Conceptual Site Model (CSM). The Preliminary CSM aims to provide a representation of site-related contamination sources, receptors within 100 m of the Site and exposure pathways between these sources and receptors. Additionally, as required, the preliminary conceptual site model can be used to assess potential implications for notification to the New South Wales Environment Protection Authority (NSW EPA) under Section 60 of the Contaminated Land Management Act 1997 (CLM Act).

The Site is zoned as Infrastructure (SP2) and has historically been utilised for rail activities, including the transport of lead ore concentrate from the Lake George Mine which historically operated in Captains Flat. The primary potentially contaminating activity identified was the historical use of the Site as a rail corridor transporting lead, copper and zinc ore concentrates via uncovered timber wagons from the Captains Flat Mine.

During this investigation it was identified that contaminated materials were likely to have been used in the construction of the rail line. These materials may have included slag, mine tailings, ore concentrates and/or overburden which also represent a potentially significant contamination source. No previous formal investigations have been completed at the Site, however a 2 km portion of the Non-Operational Corridor approaching Captains Flat was previously investigated by Ramboll Australia Pty Ltd (2021), which concluded that the corridor was impacted by lead. The Site passes through a number of rural agricultural properties, which include grazing livestock and residences. The Site also intersects a number of surface water features, including the Molonglo River and passes through forested areas.

The in-situ XRF analysis completed as part of this investigation focused on lead in surface soils to provide a general understanding of the extent and distribution of lead in soils throughout the site, and its potential to impact upon local receptors. A total of 305 XRF measurements were taken at 66 transects along the length of the Site with 22 confirmatory laboratory samples for comparative purposes. The sampling was completed on transects spaced at approximately 500 m intervals and each transect generally included measurements at track, mid corridor and the corridor boundary on both sides for spatial coverage.

The concentrations of lead within the ballast materials generally exceeded the adopted commercial/industrial screening criteria, and were recorded up to at a maximum value of 38,399 parts per million (ppm). Concentrations were observed to decrease with distance from the rail line, however remained elevated in areas where degradation of the rail line had resulted in ballast material being "washed out".

Although one exceedance of commercial industrial criteria was noted within the active rail corridor, section, lead impact did not appear to be widespread through the Active portion of the Site and the ballast material which was noted in the Non-Operational Corridor did not appear to be present. Lead concentrations are broadly present along the Non-Operational Corridor and may primarily be associated with the ballast material used in the construction of the former rail line.

Offsite areas, including surface water features were not assessed as this was outside of the scope of this assessment, however it is noted that surface water bodies near Captains Flat, including the Molonglo River are known to be impacted by historical mine activities. Based on exceedances of criteria at the boundary of the corridor, it is possible that lead impact is present offsite. Due to the link between lead concentrations and the presence of visible ballast materials it is considered likely that offsite impacts would be localised and primarily associated with areas where the rail embankment has eroded, allowing ballast material to mobilise.

Through the development of a preliminary Conceptual Site Model ERM considers that there are a number of potentially complete SPR linkages at the Site relating specifically to lead. These are considered potential as further assessment is required in order to confirm whether or not a risk exists. The receptors listed have been generalised due to the extensive length of the corridor. Note that the SPR linkages have been conservatively identified and have largely been included based on the lack of access controls for the Site and the delineated or unassessed areas of impact.

The identified potential SPR linkages include:

- *Intrusive maintenance workers through direct contact or dust inhalation.*
- *On and offsite agricultural workers, recreational receptors and rural residents through direct contact, dust inhalation or incidental ingestion.*
- *Potential Recreational users of the Site (with unfenced portions of the corridor passing through townships) through direct contact and/or dust inhalation.*
- *On and offsite ecological receptors (both terrestrial and freshwater aquatic) in areas of elevated heavy metals, noting surface water has not been assessed.*
- *Livestock watering at potentially impacted surface water features and (to a lesser extent) feeding on vegetation in impacted areas.*
- *Offsite abstraction bore users if lead is present in groundwater and extends to offsite domestic bores, noting ground water has not been assessed.*

Based on the data collected during this investigation lead impact is present in surface soils at the Site. The potential exists for impacts to extend offsite and potentially complete SPR Linkages are present for on and offsite receptors. Based on these considerations a duty to notify the NSW EPA under S.60 of the CLM Act (1997) is considered to have been triggered.

In order to manage this issue, it is recommended that the following initial actions be taken:

- *Notify the Site to the NSW EPA under S.60 of the CLM Act (1997);*
- *Advise land owners and occupants of properties adjacent to the Non-Operational Corridor of the presence of lead within the footprint of the former tracks and immediate vicinity and that access to the corridor should be avoided.*
- *The following actions should be taken with regards to further develop the CSM:*
  - *A Detailed Site Investigation should be undertaken to vertically and laterally delineate concentrations in soil and groundwater;*
  - *The SPR linkage to livestock and ecological receptors should be further assessed through surface water and sediment sampling at offsite surface water features within 50m of the rail line initially.*
- *Based on the results an outcomes of the DSI works a formal Human Health and Ecological Risk Assessment (HHERA) may be required to further assess risks to receptors and remediation may be required to effectively manage unacceptable risks.*

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by John Holland Rail Pty Ltd (JHR) to undertake a Shallow Soil Survey along a 35 km portion of rail corridor land which runs from the former Lake George Mine at Captains Flat to Bungendore, New South Wales (NSW).

The 'Site' extended from the intersection of Hoskinstown Road and the active rail line in Bungendore in the north to a point in the former rail corridor approximately 2 km north of Captains Flat. The Site comprised of 3 km of active rail corridor (Bombala Line) and 32 km of the disused Captains Flat Line.

A Site location plan is provided as *Figure 1* of *Appendix A*.

1.1 Background

The rail line from Captains Flat to Bungendore and beyond was historically used to transport lead, copper and zinc ore concentrates from the Lake George Mine at Captains Flat, located approximately 37 km to the south of Bungendore. The Lake George Mine was closed in 1962 and the rail corridor was decommissioned. The former Lake George Mine historically produced lead, copper, zinc, silver and gold during two periods from 1882-1889 and 1937-1962. The former mine is known to have caused heavy metals contamination to the surrounding environment, primarily though significant tailing dam collapses in 1939 and 1942 which impacted the Molonglo River, and ongoing leaching from tailings dumps. The mine site has been undergoing various stages rehabilitation since closure, which are ongoing (Mainwaring, R. 2011, Department of Regional NSW, 2022).

In 2021 a Detailed Site Assessment (DSI) was undertaken by Ramboll Australia Pty Ltd (Ramboll) of the former load-out area and adjacent rail corridor at Captains Flat (Ramboll 2021). The DSI identified lead contamination in soils and reported that the activities of the former Lake George Mine was the source of contamination. The contamination was considered to be significant enough to warrant regulation by the New South Wales Environmental Protection Authority (NSW EPA) under the Contaminated Land Management Act (1997) (CLM Act). The Ramboll DSI also included a portion of the former Captains Flat Rail Line extending approximately 1.7 km north of Captains Flat. The DSI identified significant lead concentrations in soils in proximity to the former rail line. Ramboll also noted that portions of the rail line appeared to be constructed from slag ballast, likely sourced from historic smelting activities at the Lake George Mine.

ERM completed a Preliminary Site Investigation (PSI) (ERM 2022a) for the Bungendore Rail Precinct, which is part of the Country Regional Network (CRN), including the rail corridor and all sidings within the township of Bungendore. The PSI aimed to assess whether historical activities (including transport of ore concentrates by rail) had potentially resulted in contamination of surface soils.

Given that lead has been identified in [matrices] at concentrations exceeding the adopted screening values along the rail corridor at both Captains Flat and Bungendore, investigation of the former rail corridor between the impacted areas was considered to be warranted to assess the potential for elevated lead concentrations to be present in soils along the length of the corridor.

1.2 Objectives

The primary objective of the Shallow Soil Assessment was to provide preliminary assessment of the nature and extent of lead concentrations in the surface soils of the Investigation Area and to use this information to develop a preliminary Conceptual Site Model (CSM).

The Preliminary CSM aims to provide a representation of site-related contamination sources, receptors within immediate vicinity of the Site and exposure pathways between these sources and receptors.

Additionally, as required, the preliminary CSM can be used to assess potential implications for notification to the NSW Environment Protection Authority (EPA) under Section 60 of the *Contaminated Land Management Act* (1997) (CLM Act) and to assess and manage potential liabilities in relation to ongoing human health and/or environmental risks.

1.3 Scope of Works

The Corridor Shallow Soil assessment included a shallow soil survey using a handheld XRF analyser supplemented with laboratory analysis. The scope of works included the following tasks:

- Health and safety preparation including:
  - development of an overarching Health, Safety and Environment Plan; and
  - arrangement of rail protection officers (PO).
- Mobilisation to Site with all equipment and materials required to complete the planned scope;
- Navigate the active and inactive portions of the Investigation Area for the purposes of Site inspection and soil assessment;
- Completion of an XRF survey of surface soils at 66 transects along the length to of the corridor;
- Logging of soils at each location by an appropriately experienced ERM field scientist in general accordance with the requirements of AS1726; and
- Twenty soil samples were collected for submission to a NATA accredited laboratory for lead analysis in order to validate XRF field readings.

2. SITE SETTING

2.1 Site Identification

The Site identification information is presented within Table 2.1 below:

Table 2-1: Site Identification

Item	Description
Site Owner	Transport for New South Wales
Site Occupier / Usage	CRN Manager (formerly JHR, currently United Group Limited [UGL])
Site Address	Not Applicable – Non-operational rail corridor from Captains Flat to Bombala Line (~3 km south of Bungendore), and the 3 km operational corridor immediately south of Bungendore (Bombala Line)
Current Zoning	Infrastructure (SP2)
Site Perimeter	Approximately 68 km
Site Area[1]	Approximately 95 Hectares (Ha) comprising: - Active corridor (approx. 3km x 50m wide corridor) - Non-operational corridor (approx. 32km x 25m wide rail corridor)
Elevation	870-707 m Australian Height Datum (AHD)[1]
Site Location and Site Layout	Figures 1 - 2 Appendix B

[1] Data sourced from https://maps.six.nsw.gov.au/

2.2 Site Description and Use

The Site is owned by the New South Wales Government (TfNSW) and at the time of the assessment was managed by JHR, however is currently managed by UGL as part of the CRN. The Site can be divided into two key portions for the purposes of description; Active Corridor and Non-Operational Corridor. These are further described below. The Site layout is illustrated in *Figure 1, Appendix A*. Further details regarding observations made during the site inspection are presented in *Section 3.6*.

2.2.1 Active Corridor

The active corridor is the 3 km portion of the Bombala line from the junction of the former Captains Flat Line to intersection of Hoskinstown Road level crossing, Bungendore at (Chainage 295.677 km). The active corridor is approximately 50 m wide and is generally flat, with limited vegetation other than grass cover. The active rail corridor portion of the Site is fenced with chainlink wire mesh to maintain separation between adjoining public lands and private properties from the active Rail Corridor. The fencing was noted to be in generally good condition.

2.2.2 Non-Operational Corridor

The non-operational corridor is the 32km of inactive railway corridor known as the Captains Flat Line. The corridor intersects with the Bombala Line 3 km south of Bungendore and runs through Hoskinstown and onto Bungendore. The setting is primarily within agricultural lands, however enters forested areas of the Yanununbeyan National Park towards Captains Flat. A number of water ways and drainage channels, including the Molonglo River, intersect the corridor at various points. The corridor is generally unfenced and appears to have been reclaimed as part of the agricultural uses through which the corridor passes.

The rail infrastructure within the corridor is derelict and highly degraded. With the exception of some former railway infrastructure, the bulk of the Site is vacant, vegetated with small trees, grasses, and invasive weeds. The width of the corridor appears to vary from 20-30m, although the lack of corridor demarcation in some areas makes the determination of the precise Site boundary difficult in the field. The rail corridor cuts through slight rises and is artificially built up with ballast above the lower natural landforms to reduce variations in gradient along the rail corridor.

2.3 Description of Offsite Areas

Given the length of the Site, the adjacent land uses vary along the corridor. The non-operational rail corridor portion of the Site traverses through private agricultural properties, residential areas, level crossings and public lands (open space). The majority of the inactive corridor has been opened to the adjoining properties either through the removal or damage of the Sites' fences and the addition of private fences and gates.

The Site passes through landscapes ranging from flat fields to hills, slopes and gorges and the southern portion of the Site enters forested areas which are in proximity to the Yanununbeyan National Park.

The key land uses surrounding the Site along the length of the corridor are illustrated on *Figure 2, Appendix A* and a description is given in *Table 2.2* below:

Table 2-2: Key Offsite Land Features

Direction	Land use
North	Directly north of the site is the township of Bungendore. Bungendore has a range of land uses including residential properties, a primary school and preschools, and recreational public spaces.
East	East of the rail corridor is comprised of mostly private residential and agricultural land. The corridor runs through the small township of Hoskinstown, whilst also intersecting the Molonglo River.
South	South of the Site is the township of Captains Flat. Captains Flat consists of the Lake George (legacy) Mine, a public school, preschool, recreational public spaces, and residential properties.
West	To the west of Site, the majority of land consists of private residential and agricultural properties. Yanununbeyan National Park lay west of the southern portion of the Site, whilst the Yandyguinula Creek and the Molonglo river intersect the Site and flow westward.

Source: NSW DPIE (2021)

2.4 Environmental Setting

The following description of the Site's environmental setting is based on sampling investigation undertaken on 22 to 24 November and 15 to 17 December, 2021 and information obtained from publicly available databases and reference sources.

2.4.1 Local Topography and Hydrology

Based on topographical information obtained from topographic mapping, the elevation of the Site ranges from 707 m AHD in the north to 870 m AHD in the south. The local topography onsite is highly variable, ranging from generally flat in the north to undulating in the south towards Captains Flat.

Regionally, the Site is sloping gently from the south-east towards the north-west, with run off generally draining though a series of drainage channels, creeks and rivers towards either Lake Burley Griffin (southern portions of the Site) or Lake George (northern portions of the Site). Major water ways intersecting the Site are shown on *Figure 2, Appendix A*.

2.4.2 Geology and Soils

According to the mapping units provided by the NSW Department of Industry, Resources and Energy the Site is underlain by five primary geological units. These include;

- Colluvium and/or residual deposits, sheetwash, talus, scree; boulder, gravel, sand; possibly including minor alluvial or sand plain deposits, local calcrete and reworked laterite.
- Rhyodacitic ignimbrite, agglomerate; dark grey shale, siltstone, limestone, quartzite with conglomerate.
- Shale, siltstone, acid and basic volcanic flows and tuff; minor basalt and basaltic breccia, dacite and rhyodacite, lithic tuff and minor shale and conglomerate, volcanic chert.
- Turbiditic sequences of sandstone, mudstone, shale, carbonaceous shale, greywacke; chert, quartzite, phyllite, slate; and
- Channel and flood plain alluvium; gravel, sand, silt, clay; possibly locally calcreted.

The soils observed during the sampling event generally consisted of sandy, gravelly, and occasionally clayey brown silts, with occasional yellow to red components. Under and immediately adjacent to the rail line, a layer of loose dark grey gravelly fill was present underlain by other soils gathered from the surrounds.

The Atlas of Australian Acid Sulfate Soils maps indicates the site contains of sodosol soils, with a ‘Low’ to ‘Extremely Low’ Probability of occurrence of acid sulfate soils.

2.4.3 Hydrogeology

A review of groundwater bore information on *WaterNSW Water Information Hub: Groundwater Bores (2022)* identified 52 registered groundwater bores within 500 m of the Site. The bores located are presented on *Figure 4, Appendix A*. The bores are registered for a variety of purposes, including irrigation, stock and domestic and water supply. The quality in the bores is not known, however it is possible that groundwater may be used for drinking and domestic purposes in agricultural settings.

Water level information was not available for the identified bores. The shallowest of the bores were installed to depths of 25-30 m below ground surface (bgs). Groundwater flow direction is expected to be locally variable along the length of the Site, however the regional flow is expected to flow the general flow direct of the creeks and rivers towards the north.

3. FIELD WORKS

3.1 General

Fieldworks associated with this investigation were undertaken over two mobilisations on 22 - 24 November and 15 - 17 December 2021. The works had been scheduled to be undertaken in a single mobilisation, however inclement weather led to a postponement of the works until the soils had dried to improve accuracy of the XRF. The works included the collection of 305 XRF readings & 20 soil samples throughout the study area. Sample locations are presented on *Figure 3a-3g, Appendix A*. Field notes pertinent to the works are contained in *Appendix D* and a photographic log is presented in *Appendix E*.

All works were conducted in general accordance with relevant industry guidelines and ERM Standard Operating Procedures (SOPs) and with *USEPA (2007) Method 6200 – Field Portable X-Ray Florescence Spectrometry for the Determination of Element Concentrations in Soil and Sediment*.

3.2 Data Quality Objectives

Data quality objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in *Section 1.2*. The DQOs have been prepared in line with the seven-step approach outlined in *National Environment Protection (Assessment of Site Contamination) Measure (the ASC NEPM)* (NEPC, 1999) (as amended 2013).The seven steps of the DQO process, and how they were applied to the preliminary shallow soil sampling, are presented in *Appendix C*. The DQO process is validated, in part, by the quality assurance and quality control (QA/QC) procedures and assessment presented in *Appendix G* of this report.

3.3 Contaminants of Concern

Based on the initial desktop review and observations made during the Site Inspection the key contaminants of concern for the Site are heavy metals (in particular lead), due to the historical transport of lead ore concentrates along the Rail Line by uncovered wagons of unknown integrity and the identification of lead in the southern portion of the corridor by Ramboll (2021).

3.4 Rationale for Sampling Design

The primary potentially contaminating activity historically undertaken within the investigation area was the transport of lead ore by rail. It is possible that dust from wagons, as well as potential spills along the rail line and sidings have resulted in the presence of heavy metals such as lead, as well as hydrocarbons and other contaminants associated with rail machinery and equipment in shallow soils onsite.

Given the preliminary nature of the investigation and the large investigation area, soil sampling design and spread were focussed upon gaining a representative understanding of the condition of surface soils (upper 0.1 m) within the rail corridor along the entire Site investigation area. By focusing on the surface soils only, an assessment of the potential exposure to lead for identified receptors can be made under a preliminary CSM (refer to *Section 6*). Sampling locations are illustrated in *Figure 3a – 3f* and also presented in *Tables 3 - 4*.

The strategy for soil sampling within the rail corridor was as follows:

- As the length of the corridor is approximately 35 km, measurements were undertaken in a number of transects perpendicular to the former rail line.
- Transects were spaced at approximately 500 m intervals along the corridor.
- Where sufficient space allowed, five measurements were taken at each transect. Measurements were conducted between the track rails, adjacent to the track, and between the track and on both corridor boundaries in safely accessible locations.

- Areas of interest such as areas of washed out rail ballasts and/or drainage channels were also targeted.
- The analysis was designed to provide an initial assessment of potential soil contamination issues to the extent practicable and is considered appropriate for the purposes of this report. Assessment of soils below 0.1 m below ground level (bgl) and groundwater was not included within the design.

3.5 XRF Analysis Method

In-situ XRF measurements were undertaken at 305 individual locations along the Active and Non-Operational Corridors. XRF readings were taken in general accordance with USEPA (2007) Method using the following methodology:

- Analysis locations were sampled in-situ using a Delta Handheld XRF Analyser and was undertaken by an appropriately licensed operator;
- The Delta Handheld XRF Analyser was calibrated daily prior to starting the analysis sampling (annual calibration certificate is provided in *Appendix C*);
- Each XRF location was prepared by clearing vegetation and loose gravels. Locations where soils were observed to be overly damp were avoided;
- Soil at each location was logged by an appropriately experienced ERM field scientist. Soil descriptions for each sample location are summarized in *Table 3, Appendix B*;
- XRF analysis was undertaken for 120 seconds per location with results logged instantly (sample logs are provided in *Appendix D*); and
- A total of 22 soil samples were collected for inter and intra laboratory analysis for comparability purposes by collecting the surface soils from which the XRF measurement was taken; and
- Soil samples were submitted to ALS, a NATA accredited laboratory for analysis of lead and moisture content under chain of custody (COC). Laboratory documentation is included in *Appendix F*.

3.6 Field Observations

Observations made during the Site inspection regarding the Site are outlined below. Results of XRF measurements presented in Section 4.2 are not referenced in this section.

The key feature within the rail corridor was the former rail lines, which had generally been constructed on a raised embankment. The construction of the rail lines differed between the active corridor of the Bombala line (section of Site 3 km to the south of Bungendore) and the non-operational Captains Flat line. The active rail corridor is approximately 50 m wide, with a single track constructed on basalt ballast in the centre of the corridor. The corridor was appropriately fenced, and sparsely vegetated as would be considered appropriate for an active rail infrastructure Site.

The rail infrastructure within the Non-Operational Corridor was derelict and unmaintained, with the majority of the corridor having little to no formal demarcation. The rail lines were constructed on a raised embankment along the majority of the corridor and it appeared include slag and/or ore concentrates within ballast material in the embankment. The ballast was generally present to a depth of approximately 0.1 - 0.3m along the line and appeared limited to the immediate rail footprint. This material ranged from light brown to dark grey with slag like qualities. Larger fragments (50-100mm) were dark grey to black when fractured and the finer gravels were also dark grey to black and of a noticeably lower density than the larger fragments.

Photographs taken of the ballast material are included in *Appendix E*. However, the occasional washed out area was observed where the ballast gravels had migrated towards drainage channels which passed through the corridor. The ballast was underlain by road base like fill material, which formed the bulk of the embankment.

The rail corridor profile was observed to be relatively consistent along the length of the non-operational corridor. The general profile of the embankment is illustrated in *Figure 5, Appendix A*.

In the area of the corridor outside of the footprint of the rail line, the soils were generally variable, consisting of light to dark brown silts with varying components of sand and clay, occasionally with minor gravel inclusions.

Whilst some locations, particularly those closer to the rail line or areas of ballast were bare of vegetation, most of the non-operational corridor had some degree of grass cover, and subsequently also had a degree of organic content. The moisture content of the soils surveyed ranged from slightly damp to moist, with moisture increasing in vegetated and low lying areas.

In sections, the rail corridor was open to or ran adjacent to private agriculture, with livestock frequently observed to have access to the Site. Other sections of the rail corridor traversed bushland and were largely inaccessible open areas. A number of water ways and drainage channels intersected the rail line. Where these passed under the rail line, timber bridges or culverts had been constructed. These were generally in poor conditions and appeared unstable or were collapsed.

Field descriptions of each sample collected are provided in *Table 3, Appendix B,* and a photo-log is presented in *Appendix E.*

3.7 Laboratory Analysis

The laboratories used for the analysis of confirmatory soil samples was accredited by the National Association of Testing Authorities (NATA), Australia. The primary laboratory used for soil analysis, including intra-laboratory duplicate samples, was Australian Laboratory Services (ALS). Inter-laboratory duplicate samples were sent to Eurofins. The analytical methods used by each laboratory is provided in the laboratory certificates provided as *Appendix F*.

Laboratory duplicate samples were analysed for lead and moisture.

3.8 Waste

No soil waste was generated as a result of soil sampling activities, and each investigation location was backfilled using the soil cuttings removed and surrounding surface materials. General waste associated with disposable sampling equipment (e.g. gloves and zip lock bags) was removed from the Site and disposed off-site appropriately as general waste.

4. RESULTS

4.1 Soil Screening Criteria

The Tier 1 screening criteria for soil data was selected based on a review of the National Environment Protection Measure (Assessment of Site Contamination) (ASC NEPM) (Revised 2013): Schedule B1: Guideline on the Investigation Levels for Soil and Groundwater.

Health Investigation Levels (HILs) for human health – direct contact and Ecological Investigation Levels (EIL's) were applied. Given the broad area of investigation, criteria for various land uses were applied based on the identified Site receptors as described in *Section 6.3*.

The Screening Criteria were applied as follows:

- Commercial/Industrial (HIL D and EIL)
  - all samples were screened against commercial/industrial criteria, due to the Sites' primary intended use as a rail corridor;
- Open Space/ Recreation (HIL-C)
  - all samples were additionally screened against HIL C criteria due to the evidence of recreational and/ or communal walking tracks through the multiple area and evidence of illegal access to the Rail Corridor;
- Residential (HIL A) and EIL (Urban Residential & Open Space)
  - samples in transect locations T7-T41 as well as the boundary locations in transects T1-T6 were additionally screened against the relevant low density residential criteria (HIL A). This was used as an indication of whether any offsite risks may be plausible. HIL A and EIL have been applied to areas where agriculture interacts either adjacent or openly with the rail corridor in lieu of the availability of published livestock grazing screening values for lead in soils; and
- Areas of Ecological Significance EIL
  - locations within the forested areas near the Yanununbeyan National Park and where the corridor is in proximity to the Molonglo River have been screened against EILs which account for the presence of more sensitive specifies (protection of 99% of specifies). This area includes transect locations T51-T66.

The ASC NEPM (2013) provides the following guidance on the application of the screening criteria and interpretation of any exceedances of the criteria: "*Investigation and screening levels are not clean-up or response levels nor are they desirable soil quality criteria. Investigation and screening levels are intended for assessing existing contamination and to trigger consideration of an appropriate site-specific risk-based approach or appropriate risk management options when they are exceeded*."

4.2 XRF Analysis Results

Prior to screening of data against the criteria listed in Section 4.1, the XRF data was subject to thorough review, namely comparison to the confirmatory laboratory samples. Following the data review, it was deemed appropriate to adjust the data according to the average moisture content in laboratory samples (18% w/w). Where both XRF data and laboratory data were available, the higher of the two values was included in the corrected data set. XRF results were "moisture corrected" using the formula:

*Corrected XRF Lead Concentration = XRF Lead Concentration / (100 – Average moisture content%)*100)*

Further details of the data review and correction are provided in *Appendix G*. Both the raw data of the XRF analysis undertaken on the Site and the corrected data set used in the final data screening exercise are tabulated in *Tables 4a and 4b, Appendix B* and summarised below in *Tables 4-1* and *4-2* below. Sample locations and exceedances of relevant criteria are illustrated on *Figures 3.1 - 3.31, Appendix A*.

The data for the Active Corridor and the Non-Operational Corridor has been summarised separately due to the different exposure settings and the clear differences in the magnitude of concentrations between the two areas.

Table 4-1 – Corrected Data Results Summary – Active Corridor

Location		Adjacent to Tracks	Mid Corridor	Corridor Boundary	Total
Total Results		12	1	10	23
Average (mg/kg)		290.0	51.1	67.0	182.7
Highest Result (mg/kg)		1,992.0	51.1	280.4	1,992.0
Exceedances (NEPM, 2013)	**HIL A**	NA	NA	0	0
	HIL C	NA	NA	0	0
	HIL D	1	0	0	1
Exceedance Rate (%)		8%	0%	0%	4%

*Where laboratory soil data was reported higher than corrected XRF, laboratory analysed data is reported.

Table 4-2 – Corrected Data Results Summary – Non-Operational Corridor

Location		At Tracks	Mid Corridor	Corridor Boundary	Total
Total Results		59	125	98	282
Average (mg/kg)		5,719.9	1,954.3	411.7	2,395.4
Highest Result (mg/kg)		25,235.7	33,769.5	6,981.9	33,769.5
Exceedances (NEPM, 2013)	**HIL A**	52	81	23	156
	HIL C	51	60	15	126
	HIL D	46	41	6	93
Exceedance Rate (HIL-A) (%)		88.1%	64.8%	23.5%	55%

*Where laboratory soil data was reported higher than corrected XRF, laboratory analysed data is reported.

The comparison of the data collected at the Active Corridor to the Non-Operational Corridor demonstrates a significant difference in overall lead impact. There appears to be consistent lead impact along the length of the Non-Operational Corridor which does not appear to be present in the Active Corridor to the same extent.

Active Corridor

One sample exceeded HIL-D criteria within the Active corridor results. The result was <250% of the screening level and did not appear to represent wide spread or systematic impact. Furthermore the calculated UCL for the Active Corridor data was below the HIL-D criteria and the standard deviation was <50% of the criteria. UCL calculations are included in Appendix H and are summarised in Table 4, Appendix B.

The lead concentrations in this area of the Site were more likely a result of the historical transport of lead ore concentrates by rail through the corridor. The distribution was generally consistent with the lead concentrations identified in the portions of the Bombala Line which passes through the Bungendore Rail Precinct where braking and shunting or loading of material were limited (ERM 2022a). Sample locations and exceedances of relevant criteria for the Active Corridor are illustrated on *Figures 3.1 - 3.3, Appendix A.*

Non-Operational Corridor

Data collected from the Non-Operational Corridor indicates that significant lead impact exists within the corridor. The impact is concentrated both within the footprint of the former tracks and the area immediately adjacent. The lead appeared to be closely linked to the presence of the material used as ballast in the construction of the tracks. The results indicate lead concentrations generally decreased with increasing distance away from the rail line on occasion reaching assumed background levels (~20 mg/kg) by the edge of the corridor. However, in areas where ballast had been visibly washed out from the footprint of the tracks, lead concentrations were elevated at the boundary. The ballast material was readily identifiable and distinguishable from the underlying embankment gravels and surrounding natural soils due to its dark grey colouration and slag like form.

Although locations termed ‘corridor boundary’ generally exhibited significantly lower lead concentrations that those observed at the tracks, a number of measurements remained in excess of screening criteria at the corridor boundary. The areas of lead on the corridor boundary were generally associated with areas of wash out, where the ballast material had been eroded from the footprint of the tracks. Note that at a number of locations true boundary measurements could not be taken due to accessibility issues (vegetation, fencing, potentially unstable cutting ridges etc.). In these cases the location nearest to the boundary was used to assess potential offsite migration of lead. Overall, 25 of the 60 transect locations within the Non-Operational Corridor returned lead measurements at the corridor boundary (or location nearest to the boundary) in excess of relevant screening criteria. The exceedances were distributed relatively evenly along the entire corridor. Sample locations and exceedances of relevant criteria for the Non-Operational Corridor are illustrated on *Figures 3.3 - 3.31, Appendix A*

4.3 Quality Assurance / Quality Control Evaluation

A detailed QA/QC report including field procedures, laboratory methods and an analysis of QA/QC results from the investigation is provided in *Appendix G*.

In summary, the XRF data has been compared to the laboratory data and it was considered appropriate to adjust the XRF dataset to account for moisture content within soils, which overall increased the individual values. Where the laboratory concentration exceeded the adjusted data point, the laboratory concentration was used in the adjusted data set. The adjusted data is considered to be of sufficient accuracy to base conclusions on.

In summary, field and laboratory QA/QC data were adjusted to account for any systematic and method biases and the final adjusted data set was assessed to be of sufficient quality for the purposes of this investigation.

5. PRELIMINARY CONCEPTUAL SITE MODEL

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

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

Whenever one or more of the above elements is missing, the source/pathway/receptor linkage is incomplete and there can be no risk to the identified receptor.

This Preliminary CSM is based on the observations made during the Site walk over and the preliminary data obtained during this investigation. Given the focus of this investigation was on lead on surface soils, this Preliminary CSM has assessed only SPR linages related the presence of lead at the Site. Due to the length of the corridor and the various properties and land uses which the corridor passes through, assumptions and generalisations around land-use have been made to allow broad assessment of potentially complete SPR linkages. Where a potential risk is flagged in this Preliminary CSM, further assessment of risk to specific receptors will be required.

5.1 Potential Sources of Contamination

The primary contaminating activities which are known to have occurred at the Site are related to the historical operations at the former Lake George Mine at Captains Flat. Specific Mine activities which are likely to have contributed to lead contamination are:

- Transport of lead ore concentrate by rail along the length of both the Non-Operational and Active Corridors.
- Use of contaminated materials in the construction of the rail line, namely slag from the historical smelter at the Captains Flat Mine, mine overburden and/or unprocessed ore.

As noted earlier, this Preliminary CSM has been focused on lead contamination only, however it is possible that the long term use of the Site as a rail corridor and subsequent agricultural usage for portions of the corridor may have resulted other contaminant sources. If additional information indicates that other sources are likely, then the CSM for the Site may need to be updated and refined in the future.

5.2 Nature and Extent of Contamination

Although one exceedance of commercial industrial criteria was noted in the active corridor lead impact did not appear to be widespread through the Active portion of the Site.

Lead concentrations are broadly present along the Non-Operational Corridor and which are primarily associated the ballast material used in the construction of the former rail line. The concentrations within the ballast generally exceed commercial/industrial screening criteria, and were observed at a maximum of 38,399 mg/kg. Concentrations decreased significantly with distance from the rail line, however remained significantly elevated in areas were degradation of the rail line had resulted in ballast material being washed out.

Offsite areas, including surface water features have not been assessed. Based on exceedances of criteria at the boundary of the corridor, it is possible that lead impact is present offsite. Due to the observed link between lead concentrations and the presence of visible ballast gravels it is also likely that offsite impacts would primarily be localised to areas where the rail embankment has eroded, allowing ballast material to mobilise. It should also be noted that the surface water immediately downstream of the former Lake George Mine, namely the Molonglo River, is known to have been impacted by leachate from tailings dams and also historical dam collapses (Ramboll 2021, Mainwaring, R. 2011). No information is available for surface water in the vicinity of the northern portion of the Site.

5.3 Potential Receptors

The following potential receptors have been identified relevant to the Site:

Human Receptors:

- Onsite Intrusive Maintenance Workers;
- On and offsite agricultural workers;
- Onsite recreational users;
- Offsite residents;
- Offsite recreational users and recreational users of the downstream waterways; and
- Potential users of groundwater.

Ecological Receptors:

- Offsite freshwater receptors; and
- On and offsite terrestrial receptors.

Other Receptors

- On and offsite livestock.

5.4 Potential Pathways

The primary potential exposure pathways of concern at the Site are:

- Dermal contact and / or incidental ingestion with impacted soils / sediments, surface water);
- Private and agricultural produce consumption;
- Inhalation of dust (from impacted soils);
- Livestock ingesting surface water from dams; and
- Contact with groundwater via potential abstraction bores.

5.5 Qualitative Evaluation of Environmental Risk

5.5.1 Human Health

The primary land use is of the Site is intended to be as a rail corridor. Due to its primary purpose onsite commercial/industrial receptors (rail workers) have been assessed as being present onsite, however during field works the Non-Operational Corridor appeared to be unmaintained and therefore rail workers may not actually be accessing impacted areas.

The Non-Operational Corridor is largely unfenced and has been incorporated into surrounding landuse along the majority of the corridor. This includes agricultural and rural residential properties. The properties are generally large and the requirement for frequent access to the former rail line appears to be low, however for the purposes of this assessment it is assumed that given the impacted

areas are accessible, the Non-Operational Corridor is being accessed by occupants of rural properties and agricultural workers.

The Non-Operational Corridor passes through the Hoskinstown municipality and is located adjacent to residential properties. The corridor is unfenced and freely accessible and therefore it is possible that residents of Hoskinstown access the Site for recreational purposes.

The primary pathway for all human receptors is likely to be direct contact. Dust inhalation is also possible where soil disturbance occurs. It is unlikely that significant dust would be regularly generated from the soils within the track ballast, where the majority of lead is present and pose a risk to offsite receptors. These SPR linkages are considered to be potentially complete for all receptors in the absence of any access controls.

Dust inhalation is considered to be a potential SPR linkage for both commercial / industrial users, particularly given that the lead impacted area was sparsely vegetated which may promote dust generation. It is noted that the exposure under this scenario would be highly incidental based on the infrequent nature of weather events which may generate significant dust.

The potential for contamination to have migrated to groundwater has not been assessed, it is considered unlikely that the identified lead impacts would have migrated to groundwater given the likely low vertical mobility of the identified lead contamination and reported depth to groundwater in the area, however this cannot be ruled out.

5.5.2 Onsite Ecological

The Site is accessible to various fauna and no deterrent is in place for any ecological receptors. Exceedances of ecologically based lead criteria were noted across the Site, including in the portion of the Site towards Captains Flat which passes though forested areas in proximity to the Yanununbeyan National Park. Based on this, it is possible that areas of the Site where concentrations of heavy metals are elevated are supportive of ecological receptors.

5.5.3 Offsite Surface water

It is considered possible that lead in shallow soil may mobilise in surface water runoff during rainfall and could migrate offsite into drainage channels which are connected to offsite surface water receptors such as the Molonglo River. Although significant mobilisation of contaminated ballast was not generally observed to be widespread along the corridor, limited areas of wash out in surface water bodies were evident. Offsite surface water has not been assessed as part of this investigation, and as such a potential SPR linkage cannot be excluded from further consideration. The potential for impact to surface water bodies presents a risk to both offsite freshwater ecological receptors and recreational users of offsite surface water bodies. However, as discussed previously it is important to note that impacts to the Molonglo River associated with other mine activities and uncontrolled releases are well documented and thus may confound attempts to identify impacts associated solely with rail corridor materials

5.5.4 Livestock

An appropriate screening criteria for protection of grazing livestock was not identified for use in assessing the data set. The agricultural lands which the Site passes through are primarily used for grazing livestock. Although the livestock can access the impacted areas, the Site would be unlikely to represent a significant proportion of the livestock diet in the context of the large areas of grazing land available to the livestock. Furthermore, vegetation growth in the areas of highest lead concentration was limited or absent, limiting opportunity for grazing on impacted vegetation. Despite this, the impacted areas are open to grazing livestock, and impacts may extend beyond the Site boundary on agricultural properties. Therefore, until further assessment is completed a potential SPR linkage is present for livestock grazing in impacted areas.

A number of dams are located in proximity close to the corridor which may be used for the purpose of livestock watering. If runoff from the impacted areas enters the dams, lead concentrations may be present in the dams, creating a further potential SPR linkage for livestock.

5.6 Potentially Complete Exposure Pathways

A Source-Pathway-Receptor (SPR) linkage is considered to be present when a pathway links a source with a receptor. These linkages explain when there may be risks to the receptor, either now or in future. Based on available information, the following potentially complete SPR linkages currently exist:

- Onsite:
  - Intrusive maintenance workers through direct contact or dust inhalation.
  - Agricultural workers and rural resident through direct contact or dust inhalation.
  - Recreational users through direct contact and/or dust inhalation (with unfenced portions of the corridor passing through townships and being accessible for any use).
  - Onsite ecological receptors in areas of elevated heavy metals, noting that the Site is not intended to be supportive of ecological communities given its commercial / industrial use as a Rail Corridor and sidings.
- Offsite:
  - Livestock watering at potentially impacted surface water features and (to a lesser extent) feeding on vegetation in impacted areas.
  - Offsite agricultural receptors adjacent to areas in which contaminated material has migrated offsite (agricultural workers).
  - Offsite recreational receptors through direct contact or dust inhalation.
  - Offsite rural residents through direct contact, dust inhalation or incidental ingestion (through consuming home grown produce).
  - Offsite ecological receptors in surface water, noting the surface water has not been assessed.
  - Offsite ecological receptors (terrestrial), noting that contamination on Site has not been delineated in all areas.
  - Offsite abstraction bore users if lead is present in groundwater and extends to offsite domestic bores, noting ground water has not been assessed.

6. CONCLUSIONS

Based on the results of the investigation works completed for the Site and reported upon within this XRF Survey Report, the overall objectives are considered to have been met. A preliminary understanding of the nature of extent of lead in surface soils has been established. Potential SPR linkages have been assessed through the development of a Preliminary CSM for the Site.

The Site includes two distinct areas, an Active Corridor which includes 3 km of the Bombala Line immediately south of Bungendore and a Non-Operational Corridor which includes approximately 34 km of the former Captains Flat line. The Non-Operational Corridor is largely unfenced and passes through a number of rural agricultural properties, which include grazing livestock and residents. The Site also intersects a number of surface water features, including the Molonglo River and also passes through forested areas.

The primary potentially contaminating activity identified was the historical use of the Site as a rail corridor transporting lead ore concentrate via uncovered timber wagons from the former Lake George Mine. During this investigation it was considered that use of contaminated materials in the construction of the rail line, including slag, mine tailings and/or overburden also represents a potentially significant contamination source. No previous formal investigations have been completed at the Site, however a 2 km portion of the Non-Operational Corridor approaching Captains Flat was previously investigated by Ramboll (2021), which concluded that the corridor was impacted by lead.

Based on the data collected, concentrations of lead were present above applicable screening criteria at a significant proportion of the locations assessed. The distribution of lead in shallow soils at the Site can be summarised as follows:

- Although one exceedance of commercial industrial criteria was noted in the active corridor lead impact did not appear to be widespread through the Active portion of the Site.
- Lead concentrations up to 38,399 mg/kg are broadly present along the Non-Operational Corridor which are primarily associated the ballast material used in the construction of the former rail line.
- Concentrations within the ballast generally exceeded the adopted commercial/industrial screening criteria. Concentrations decreased significantly with distance from the rail line, however remained significantly elevated in areas where degradation of the rail line had resulted in ballast material being washed out.
- Offsite areas, including surface water features have not been assessed. Based on exceedances of criteria at the boundary of the corridor, it is possible that lead impact is present offsite. Due to the link between lead concentrations and the presence of visible ballast gravels it is likely that offsite impacts would be localised to areas where the rail embankment has eroded, allowing ballast material to mobilise. It is noted that surface water bodies near to Captains Flat, including the Molonglo River are known to be impacted by historical mine activities.

Through the development of a preliminary Conceptual Site Model ERM consider that a number of potentially complete SPR linkages may exist at the Site relating specifically to lead. These are considered potential as further assessment is required in order to confirm if a risk exists. The receptors listed have been generalised due to the extensive length of the corridor. Note that the SPR linkages have been conservatively identified and have largely been included based on the lack of access controls for the Site and the delineated or unassessed areas of impact. The identified potential SPR linkages include:

- Intrusive maintenance workers through direct contact or dust inhalation.
- On and offsite agricultural workers, recreational receptors and rural residents through direct contact, dust inhalation or incidental ingestion.
- Recreational users of the Site (with unfenced portions of the corridor passing through townships) through direct contact and/or dust inhalation.

- On and offsite ecological receptors (both terrestrial and freshwater aquatic in areas of elevated heavy metals, noting surface water has not been assessed.
- Livestock watering at potentially impacted surface water features and (to a lesser extent) feeding on vegetation in impacted areas.
- Offsite abstraction bore users if lead is present in groundwater and extends to offsite domestic bores, noting ground water has not been assessed.

Based on the data collected during this investigation lead impact is present in surface soils at the Site. The potential exists for impacts to extend offsite and potentially complete SPR Linkages are present for on and offsite receptors. Based on these considerations a duty to notify the NSW EPA under S.60 of the CLM Act (1997) is considered to have been triggered.

In order to manage this issue, it is recommended that the following initial actions be taken:

- Notify the Site to the NSW EPA under S.60 of the CLM Act (1997);
- Advise land owners and occupants of properties adjacent to the Non-Operational Corridor of the presence of lead within the footprint of the former tracks and immediate vicinity and that access to the corridor should be avoided;
- Additional interim management measures may be undertaken including installation of signage along the non-operational corridor to advise appropriate hygiene measures for human health protection;
- The following actions should be taken with regards to further develop the CSM:
  - A Detailed Site Investigation should be undertaken to vertically and laterally delineate concentrations in soil and groundwater;
  - The SPR linkage to livestock and ecological receptors should be further assessed through surface water and sediment sampling at offsite surface water features within 50m of the rail line initially.
- Further characterisation of the impacts identified are likely required through a DSI. Based on the results and outcomes of the DSI works a formal Human Health and Ecological Risk Assessment (HHERA) to further assess risks to receptors and requirement for remediation and/or ongoing management may be required to effectively manage unacceptable risks.

7. STATEMENT OF LIMITATIONS

This report was prepared in accordance with the scope of work outlined within this report and subject to the applicable cost, time and other constraints. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental profession. ERM makes no warranty concerning the suitability of the Site for any purpose or the permissibility of any use, development or re-development of the Site. Except as otherwise stated, ERM's assessment is limited strictly to identifying specified environmental conditions associated with the subject site and does not evaluate structural conditions of any buildings on the subject site. Lack of identification in the report of any hazardous or toxic materials on the subject site should not be interpreted as a guarantee that such materials do not exist on the Site.

This assessment is based on site inspection conducted by ERM personnel, sampling and analyses described in the report, and information provided by John Holland Rail Pty Ltd ('JHR' or 'the client') or other people with knowledge of the site conditions. All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no responsibility or liability for errors in data obtained from such sources, regulatory agencies or any other external sources, nor from occurrences outside the scope of this project.

ERM is not engaged in environmental consulting and reporting for the purpose of advertising, sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity or investment purposes.

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8. REFERENCES

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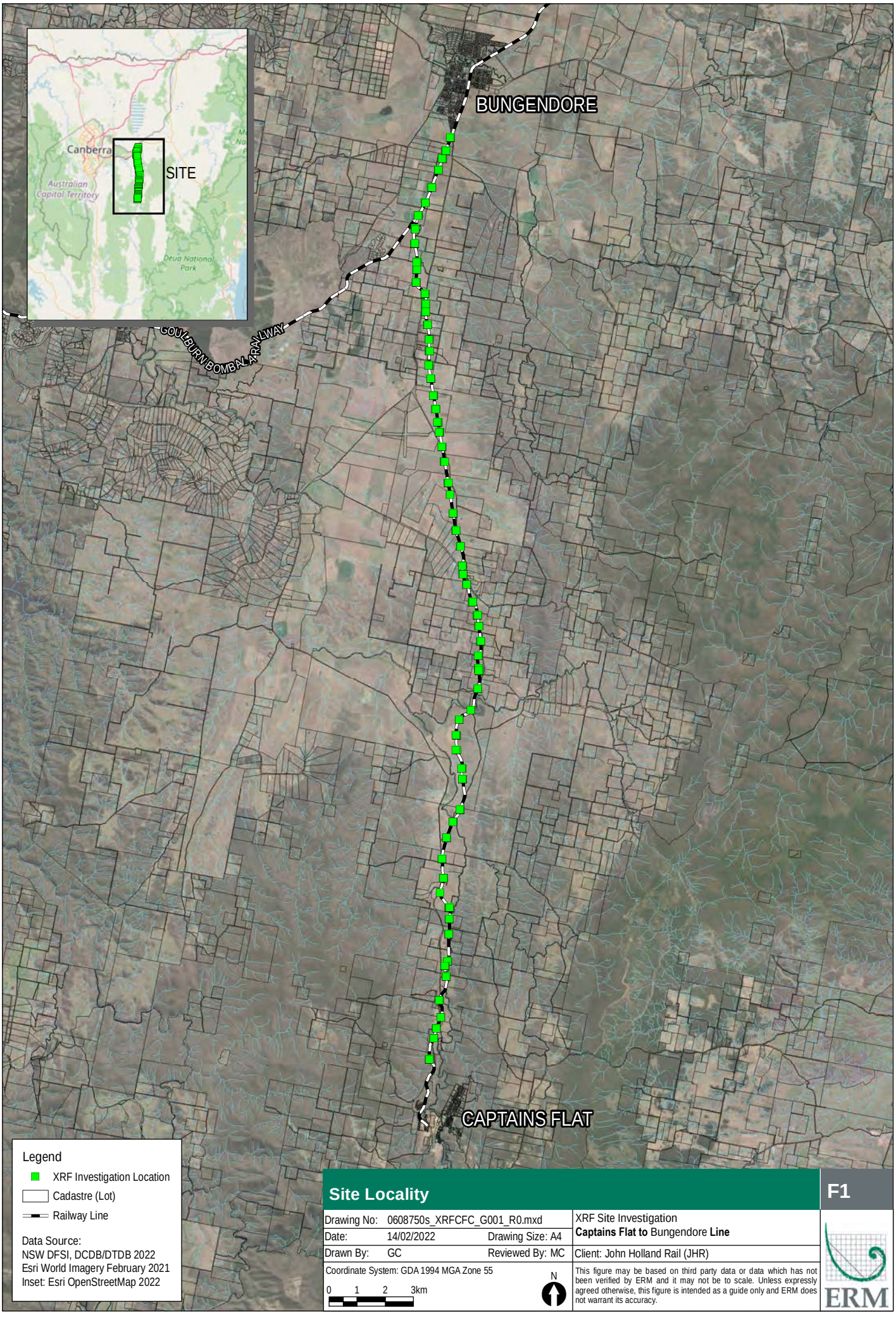
APPENDIX A FIGURES



Site Locality

F1

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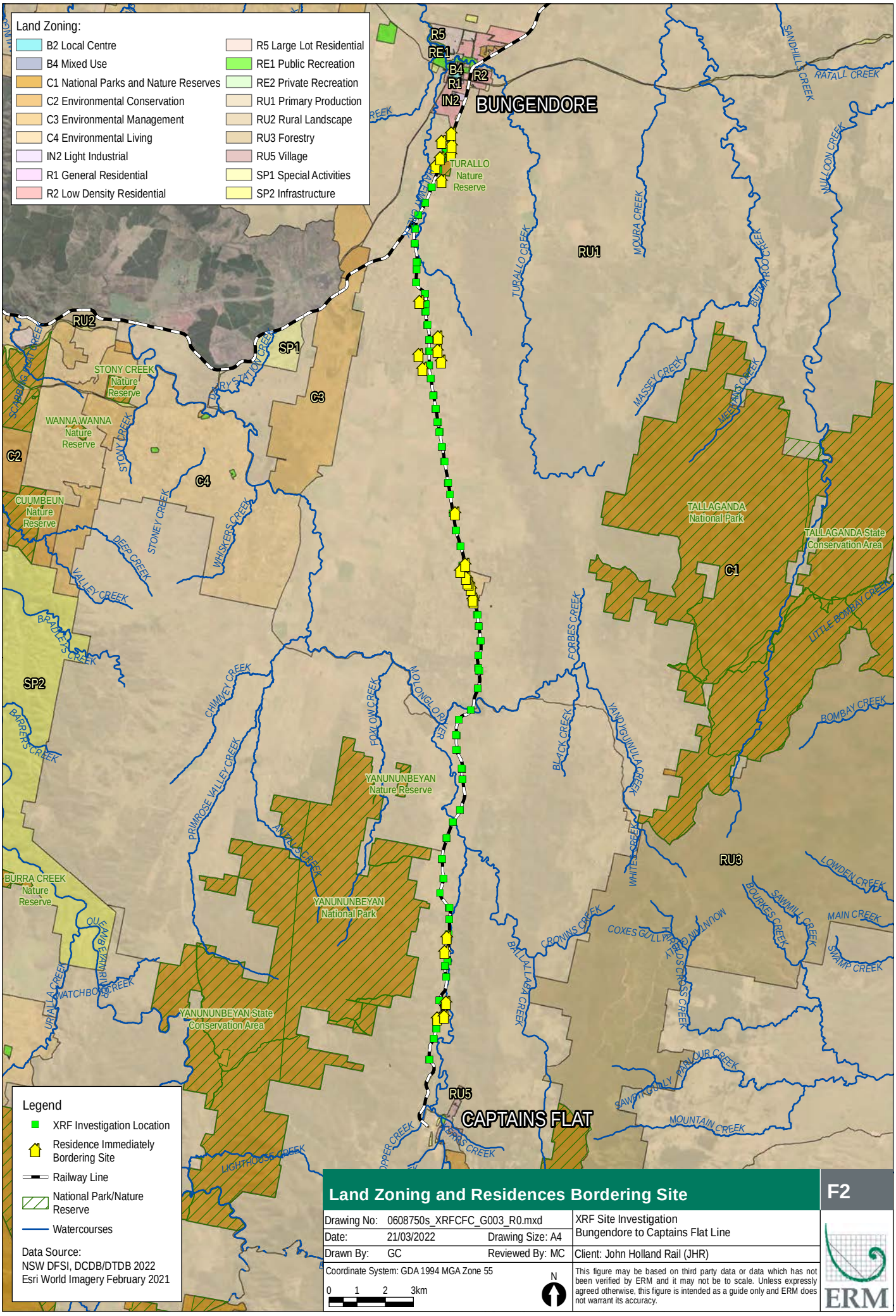
Date:	14/02/2022	Drawing Size: A4
Drawn By:	GC	Reviewed By: MC

Coordinate System: GDA 1994 MGA Zone 55

XRF Site Investigation
Captains Flat to Bungendore **Line**

Client: John Holland Rail (JHR)

ERM


Land Zoning:
B2 Local Centre
B4 Mixed Use
C1 National Parks and Nature Reserves
C2 Environmental Conservation
C3 Environmental Management
C4 Environmental Living
IN2 Light Industrial
R1 General Residential
R2 Low Density Residential
R5 Large Lot Residential
RE1 Public Recreation
RE2 Private Recreation
RU1 Primary Production
RU2 Rural Landscape
RU3 Forestry
RU5 Village
SP1 Special Activities
SP2 Infrastructure
BUNGENDORE
CAPTAINS FLAT
TURALLO Nature Reserve
STONY CREEK Nature Reserve
WANNA WANNA Nature Reserve
CUUMBEUN Nature Reserve
BURRA CREEK Nature Reserve
YANUNUNBEAN Nature Reserve
YANUNUNBEAN National Park
YANUNUNBEAN State Conservation Area
TALLAGANDA National Park
TALLAGANDA State Conservation Area
Legend
XRF Investigation Location
Residence Immediately Bordering Site
Railway Line
National Park/Nature Reserve
Watercourses
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
Land Zoning and Residences Bordering Site
F2
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Date: 21/03/2022
Drawing Size: A4
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
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XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T1_W3
T1_W2
T1_W1
T1_E2
T1
HOSKINSTOWN ROAD
BURROWS LANE
COOLBURN BOMBALA RAILWAY
T2
T2_W2
T2_W1
T2_E1
T2_E2
T3
T3_W2
T3_W1
T3_E1
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.1
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Reviewed By: MC
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XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


BURROWS LANE
T4
GOULBURN BOMBALA RAILWAY
T5
T4_W2
T4_E2
T4_W1
T4_E1
T5_W2
T5_E2
T5_W1
T5_E1
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
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0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T6_W2
T6_W1
T6_E1
T6_E2
T6
GOULBURN BOMBALA RAILWAY
HALFWAY CREEK
T7
T7_W2
T7_B
T7_W1
T7_E1
T7_E2
BUNGENDORE CAPTAINS FLAT RAILWAY
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
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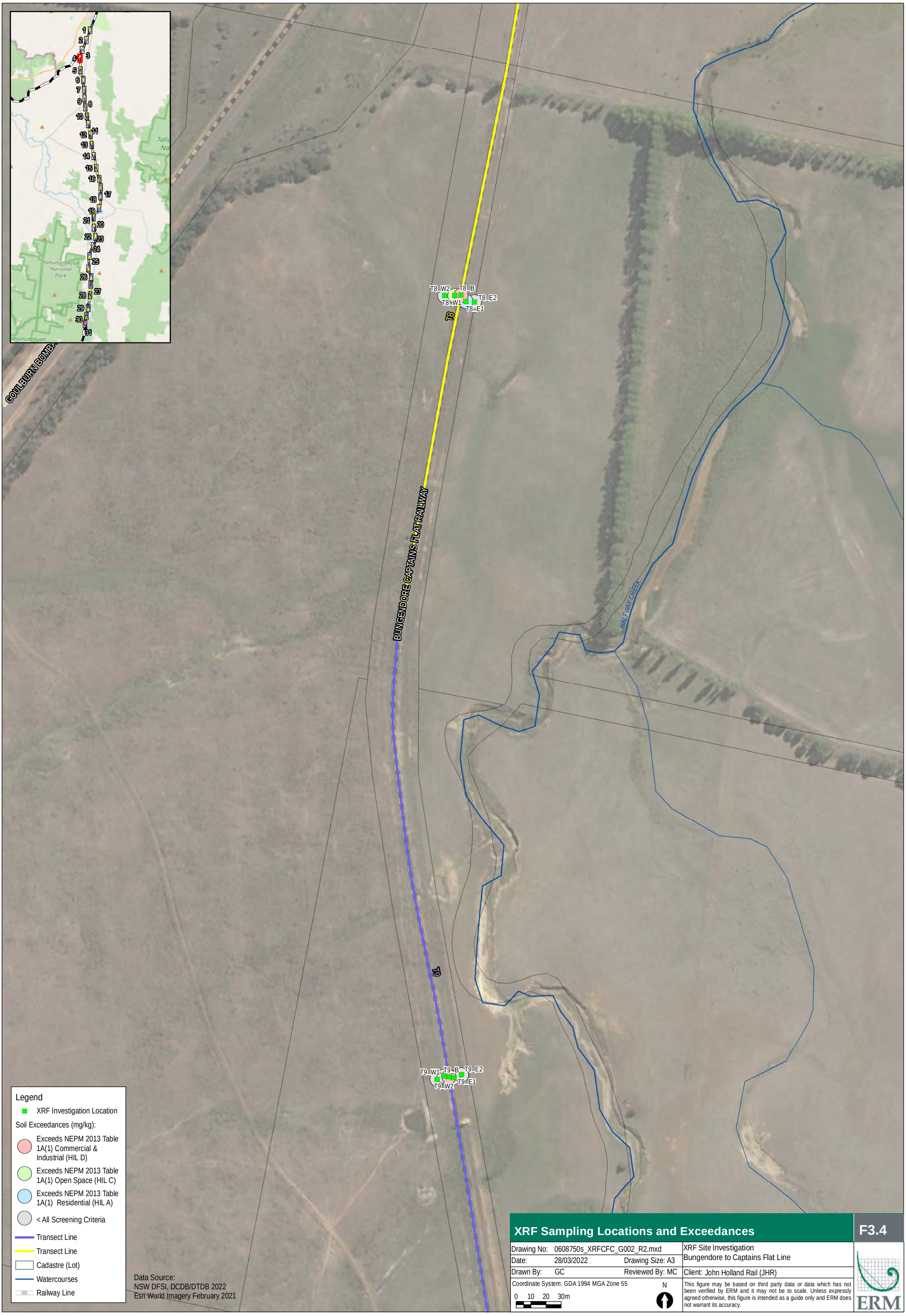
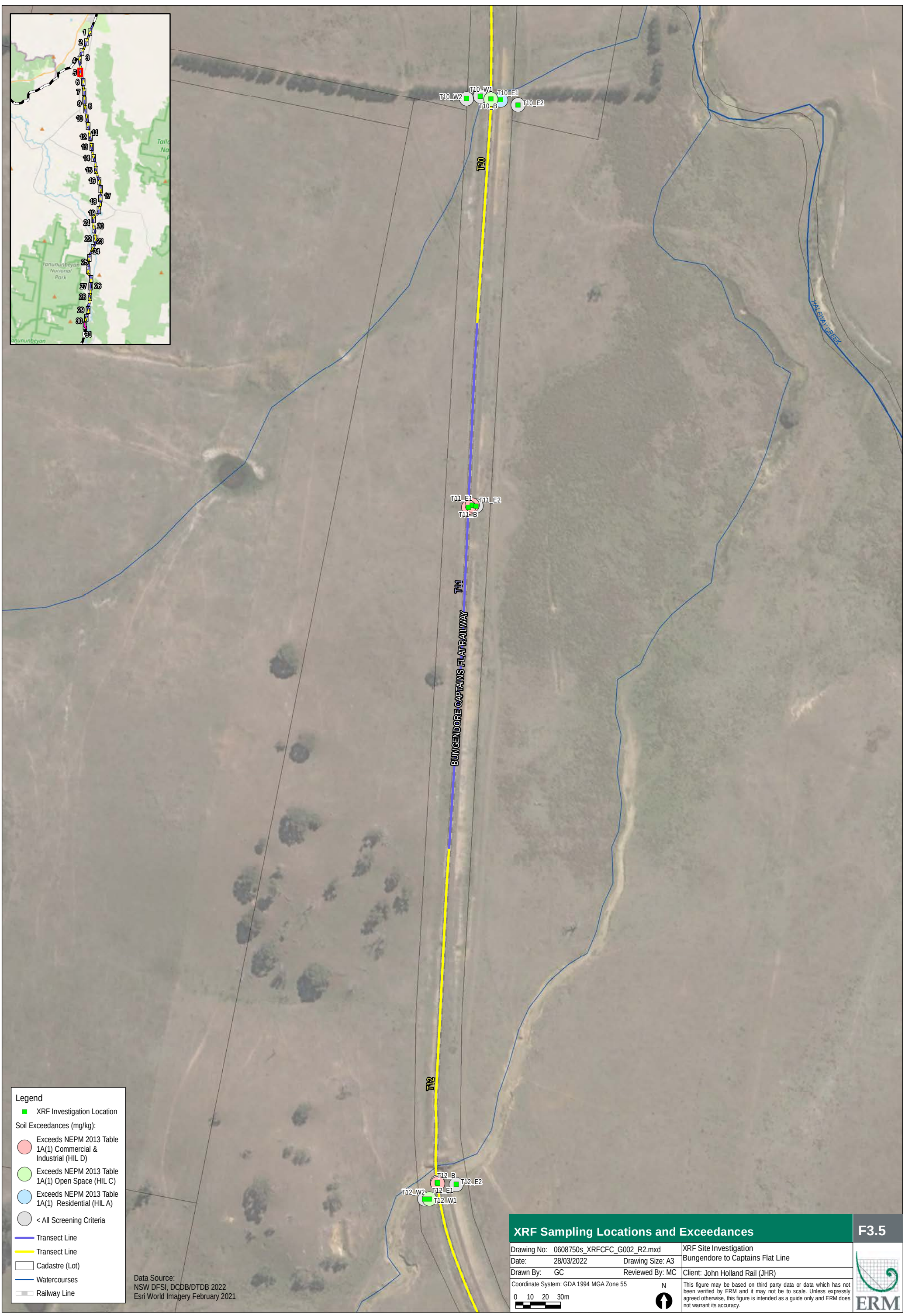
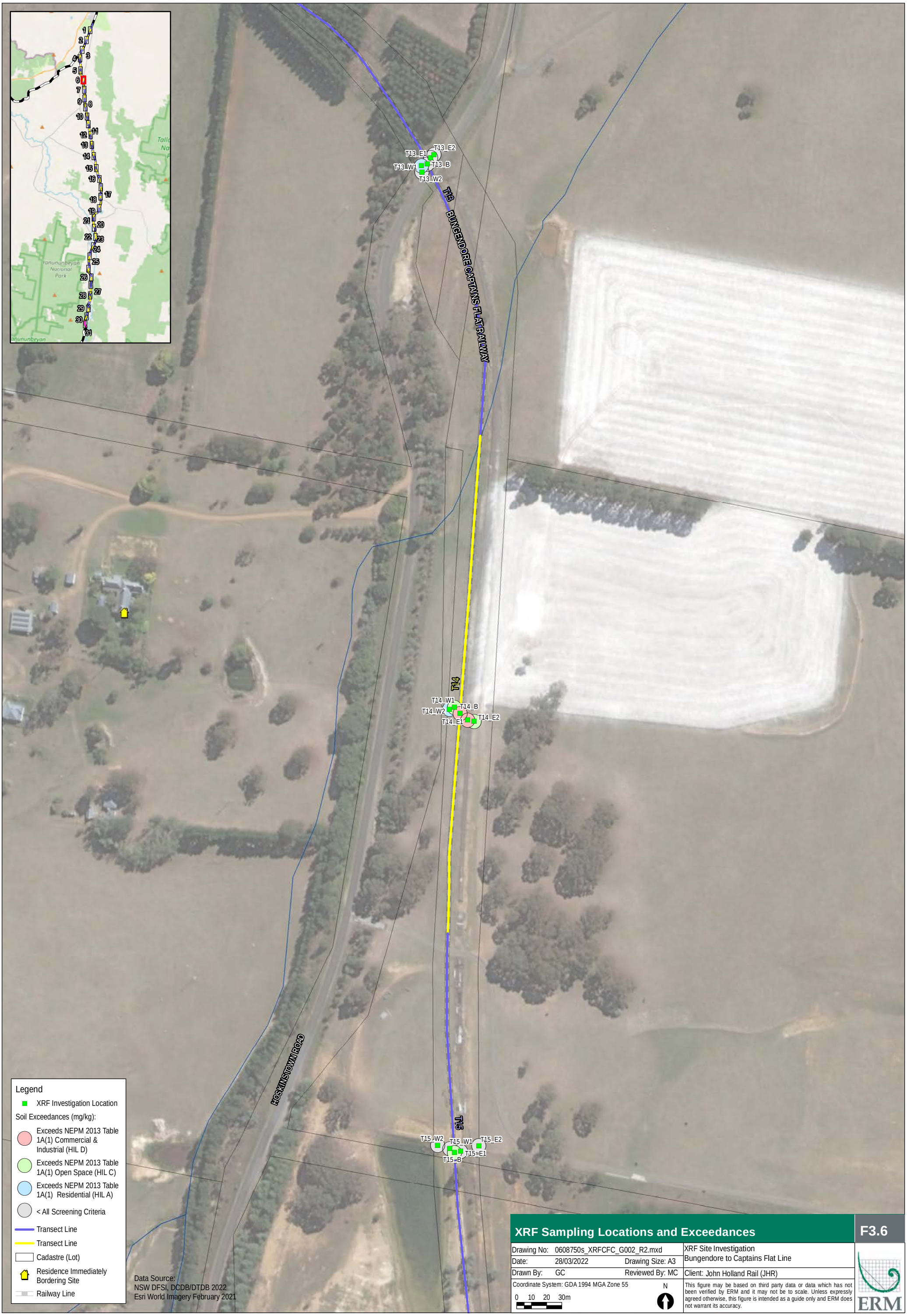
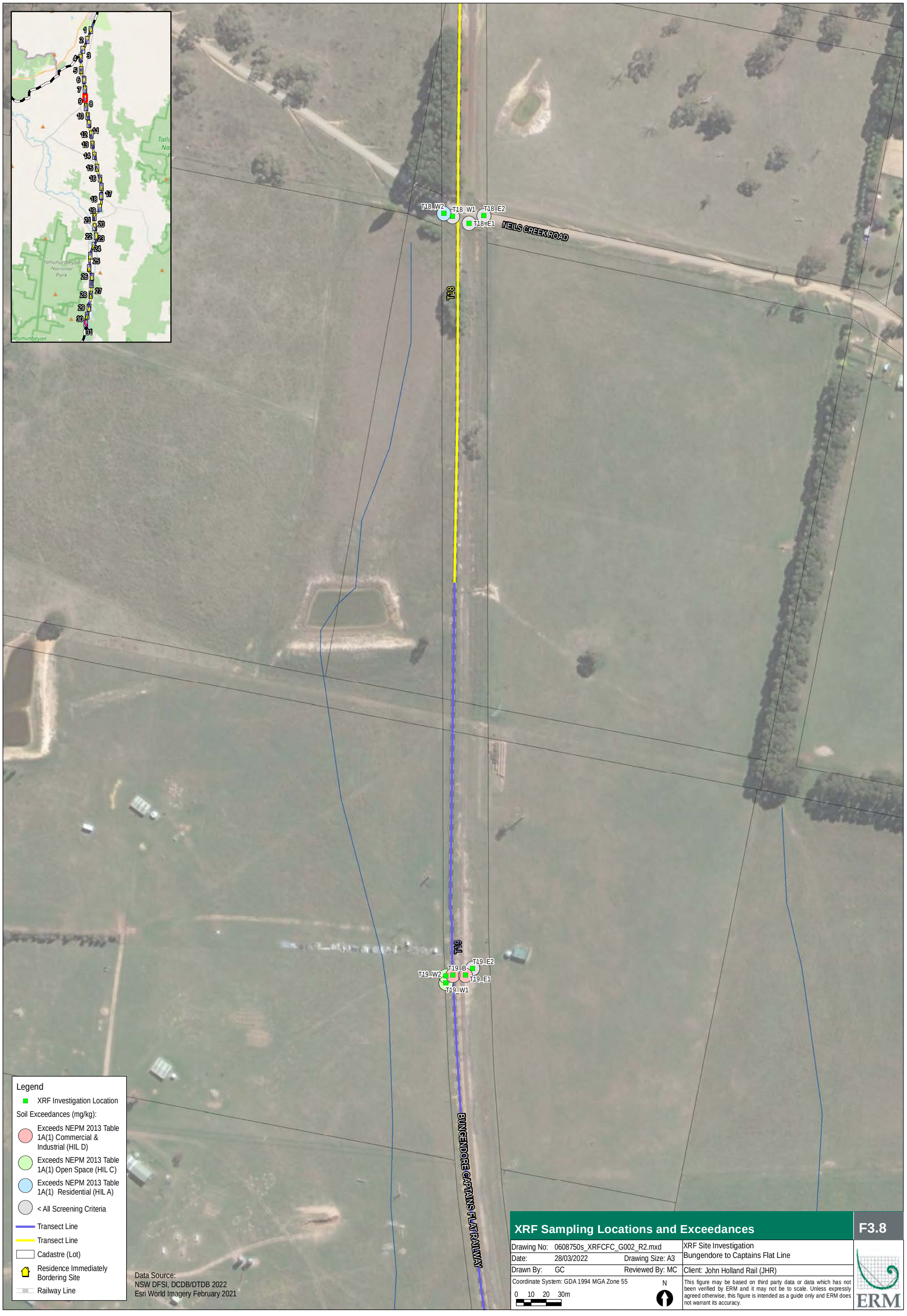
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T8_W2
T8_B
T8_E2
T8_W1
T8_E1
T8
BUNGENDORE CAPTAINS FLAT RAILWAY
HALFWAY CREEK
T9
T9_W1
T9_B
T9_E2
T9_E1
T9_W2
GOULBURN BOMBA
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.4
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
N
0 10 20 30m
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T10_W2
T10_W1
T10_E1
T10_B
T10_E2
T10
T11_E1
T11_E2
T11_B
T11
BUNGENDORE CAPTAINS FLAT RAILWAY
T12
T12_B
T12_E2
T12_E1
T12_W2
T12_W1
HALFWAY CREEK
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.5
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T13_E1
T13_E2
T13_W1
T13_B
T13_W2
T13
BUNGENDORE CAPTAINS FLAT RAILWAY
T14
T14_W1
T14_B
T14_W2
T14_E1
T14_E2
T15
T15_W2
T15_W1
T15_E2
T15_E1
T15_B
HOSKINSTOWN ROAD
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.6
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T16
BUNGENDORE CAPTAINS FLAT RAILWAY
T17
T16_W2
T16_B
T16_E2
T16_E1
T16_W1
T17_B
T17_E2
T17_W1
T17_E1
T17_W2
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.7
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T18_W2
T18_W1
T18_E2
T18_E1
NEILS CREEK ROAD
T18
T19
T19_E2
T19_B
T19_W2
T19_E1
T19_W1
BUNGENDORE CAPTAINS FLAT RAILWAY
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.8
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

BUNGENDORE CAPTAINS FLAT RAILWAY

T20

T21

T20_B
T20_E2
T20_W2
T20_E1
T20_W1

T21_B
T21_E1
T21_W2
T21_E2
T21_W1

Yanununbeyan National Park

Legend

- XRF Investigation Location

Soil Exceedances (mg/kg):

- Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
- Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
- < All Screening Criteria
- Transect Line
- Transect Line
- Cadastre (Lot)
- Railway Line

Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021

XRF Sampling Locations and Exceedances

F3.9

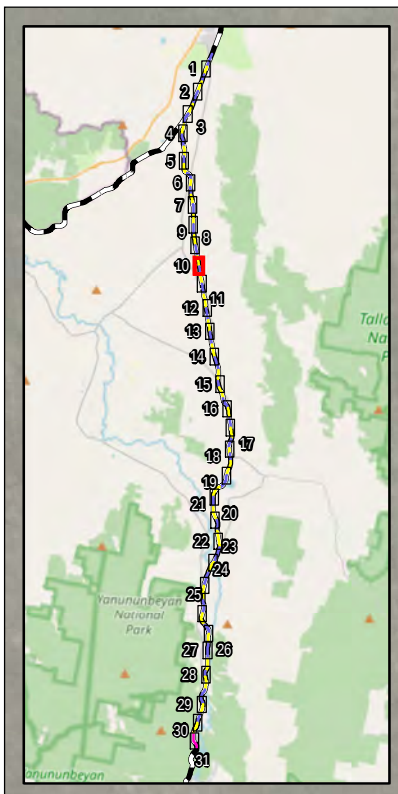
Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)

Coordinate System: GDA 1994 MGA Zone 55

N

0 10 20 30m

ERM



T22_W1
T22_B
T22_E2
T22_W2
T22_E1
T22
BUNGENDORE CAPTAINS FLAT RAILWAY
T23
T23_W2
T23_E1
T23_E2
T23_W1
T23_B

Legend

- XRF Investigation Location

Soil Exceedances (mg/kg):

- Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
- Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
- < All Screening Criteria
- Transect Line
- Transect Line
- Cadastre (Lot)
- Railway Line

Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021

XRF Sampling Locations and Exceedances

F3.10

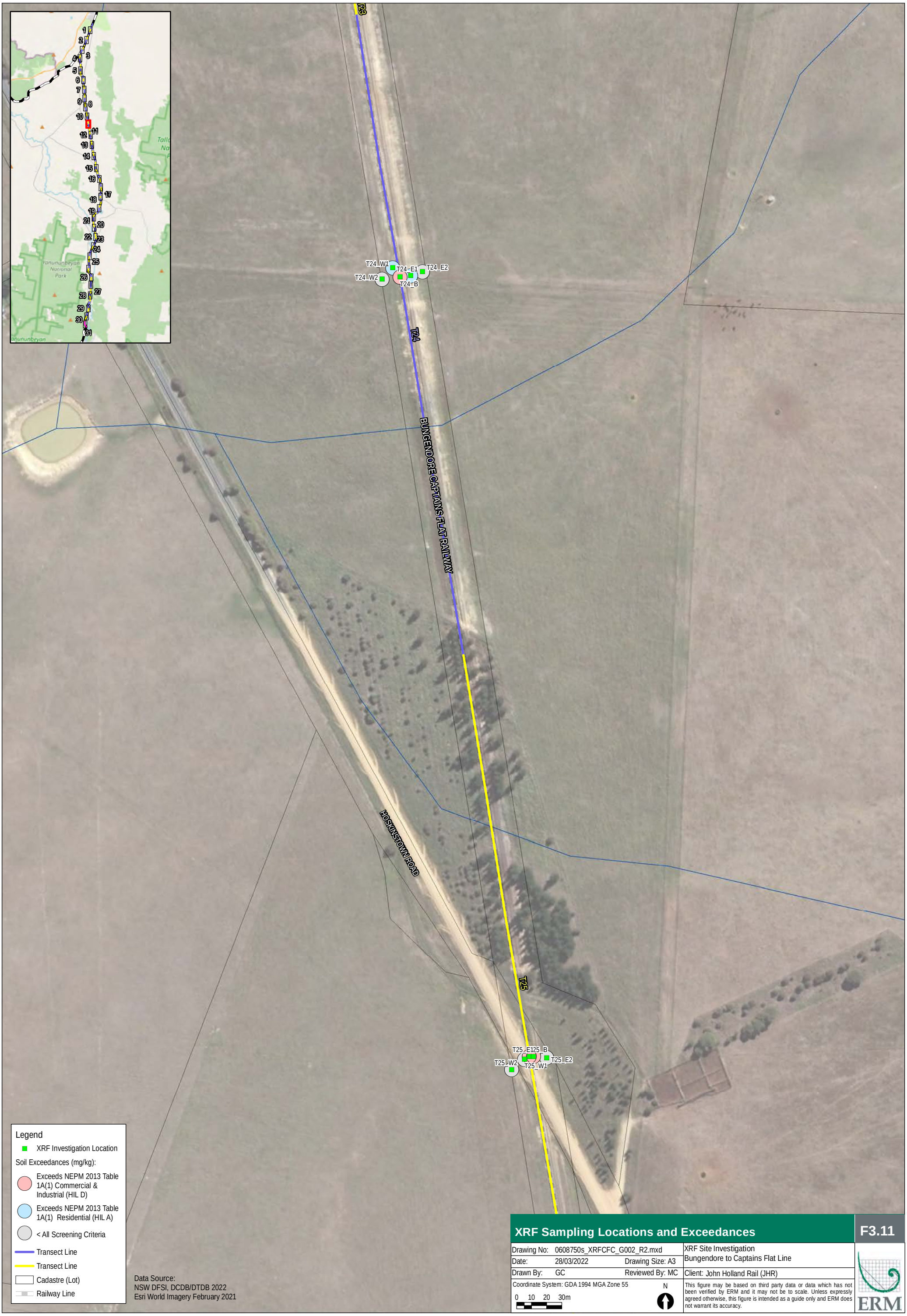
Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)

Coordinate System: GDA 1994 MGA Zone 55

N

0 10 20 30m

ERM


T23
T24
T24_W1
T24_E1
T24_E2
T24_W2
T24_B
BUNGENDORE CAPTAINS FLAT RAILWAY
HOSKINSTOWN ROAD
T25
T25_E125_B
T25_E2
T25_W2
T25_W1
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.11
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T26_W1
T26_E1
T26_W2
T26_E2
T26_B
T26
HOSKINSTOWN ROAD
BUNGENDORE CAPTAINS FLAT RAILWAY
T27
T27_W1
T27_B
T27_E2
T27_W2
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.12
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


HOSKINSTOWN ROAD
T28
BUNGENDORE CAPTAINS FLAT RAILWAY
T29
T28_E1
T28_B
T29_B
T29_E2
T29_W2
T29_E1
T29_W1
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.13
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T30_W2
T30_B
T30_E2
T30_E1
T30_W1
T30
BUNGENDORE-CAPTAINS FLAT RAILWAY
HOSKINSTOWN ROAD
T31
T31_E1
T31_E2
T31_W1
T31_B
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.14
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


HOSKINSTOWN ROAD
T32
T32_W1
T32_B
T32_E1
PLAINS ROAD
T33
T33_E1
T33_E2
T33_W2
T33_B
T33_W1
BUNGENDORE CAPTAINS FLAT RAILWAY
T34
T34_W1
T34_E1
T34_E2
T34_W2
T34_B
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.15
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


FORBES CREEK ROAD
T35_E1
T35_E2
T35_W1
T35_B
T35_W2
T35
BUNGENDORE CAPTAINS FLAT RAILWAY
HOSKINSTOWN ROAD
T36
T36_W1
T36_B
T36_E2
T36_W2
T36_E1
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.16
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

XRF Sampling Locations and Exceedances

F3.17

Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)

Coordinate System: GDA 1994 MGA Zone 55

0 10 20 30m

N

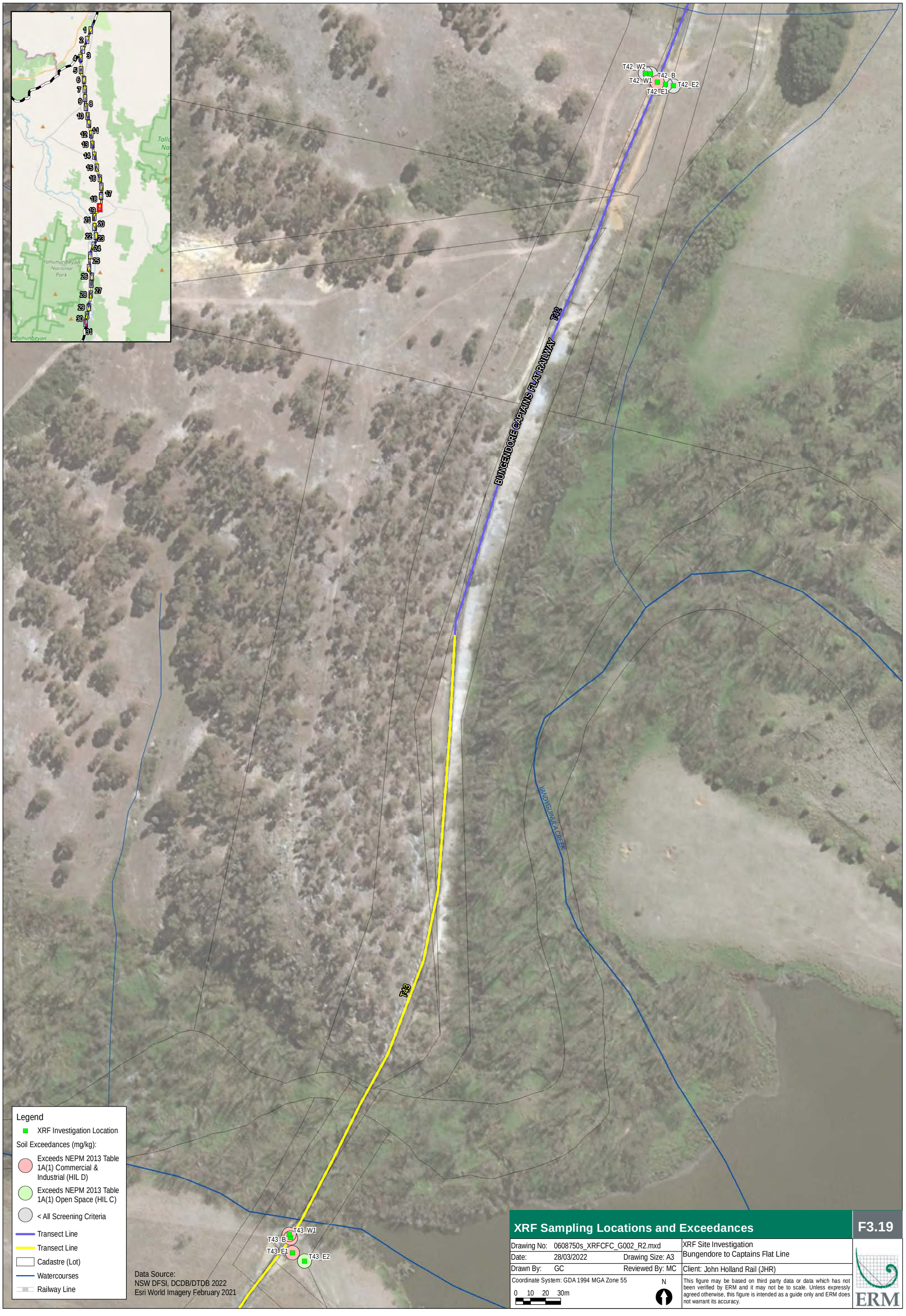
ERM

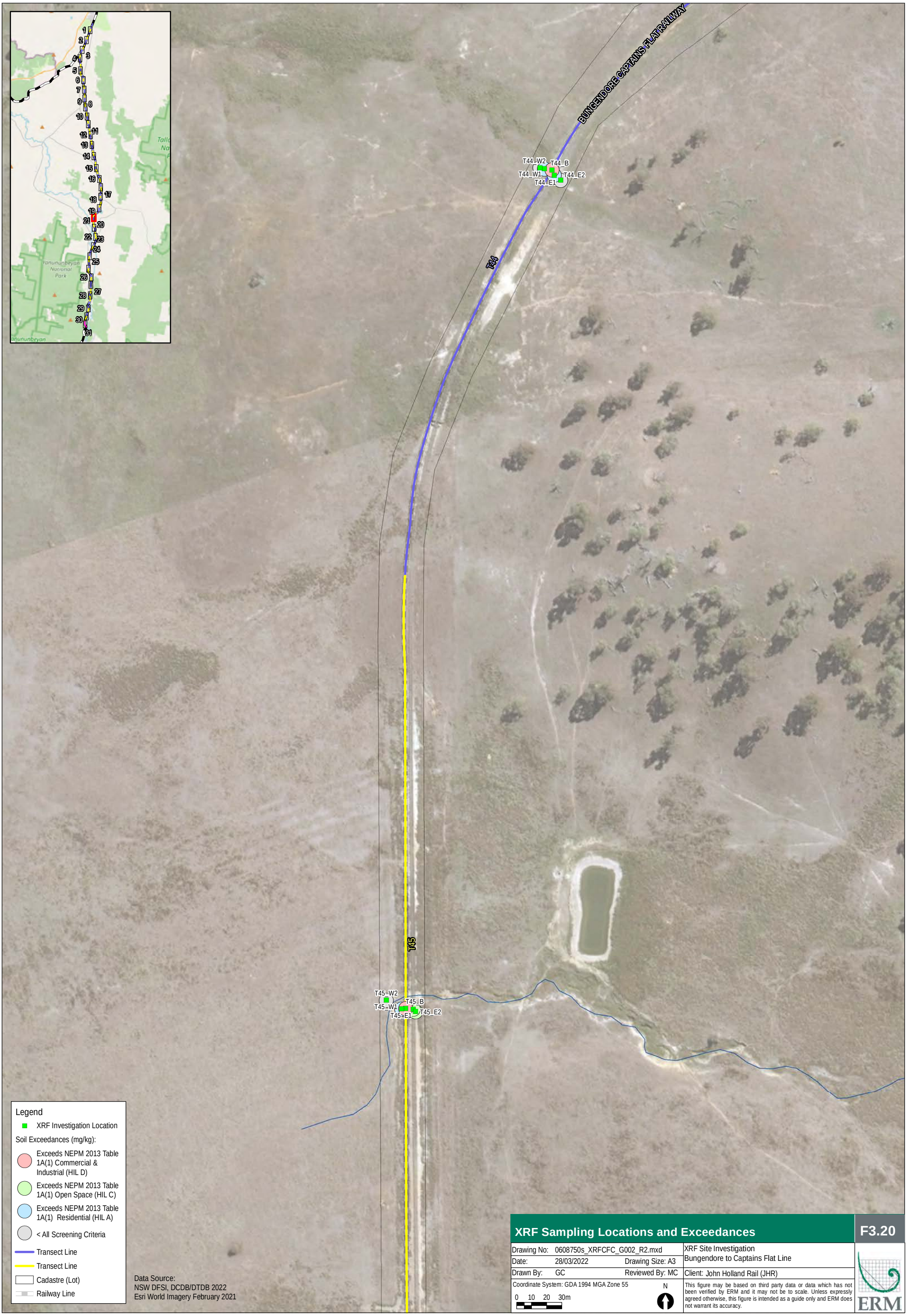
XRF Sampling Locations and Exceedances

F3.18

Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)
Coordinate System: GDA 1994 MGA Zone 55			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


T42_W2
T42_B
T42_W1
T42_E2
T42_E1
T42
BUNGENDORE CAPTAINS FLAT RAILWAY
YANDYGUINULA CREEK
T43
T43_W1
T43_B
T43_E1
T43_E2
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.19
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


BUNGENDORE CAPTAINS FLAT RAILWAY
T44
T44_W2
T44_B
T44_W1
T44_E2
T44_E1
T45
T45_W2
T45_B
T45_W1
T45_E2
T45_E1
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.20
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

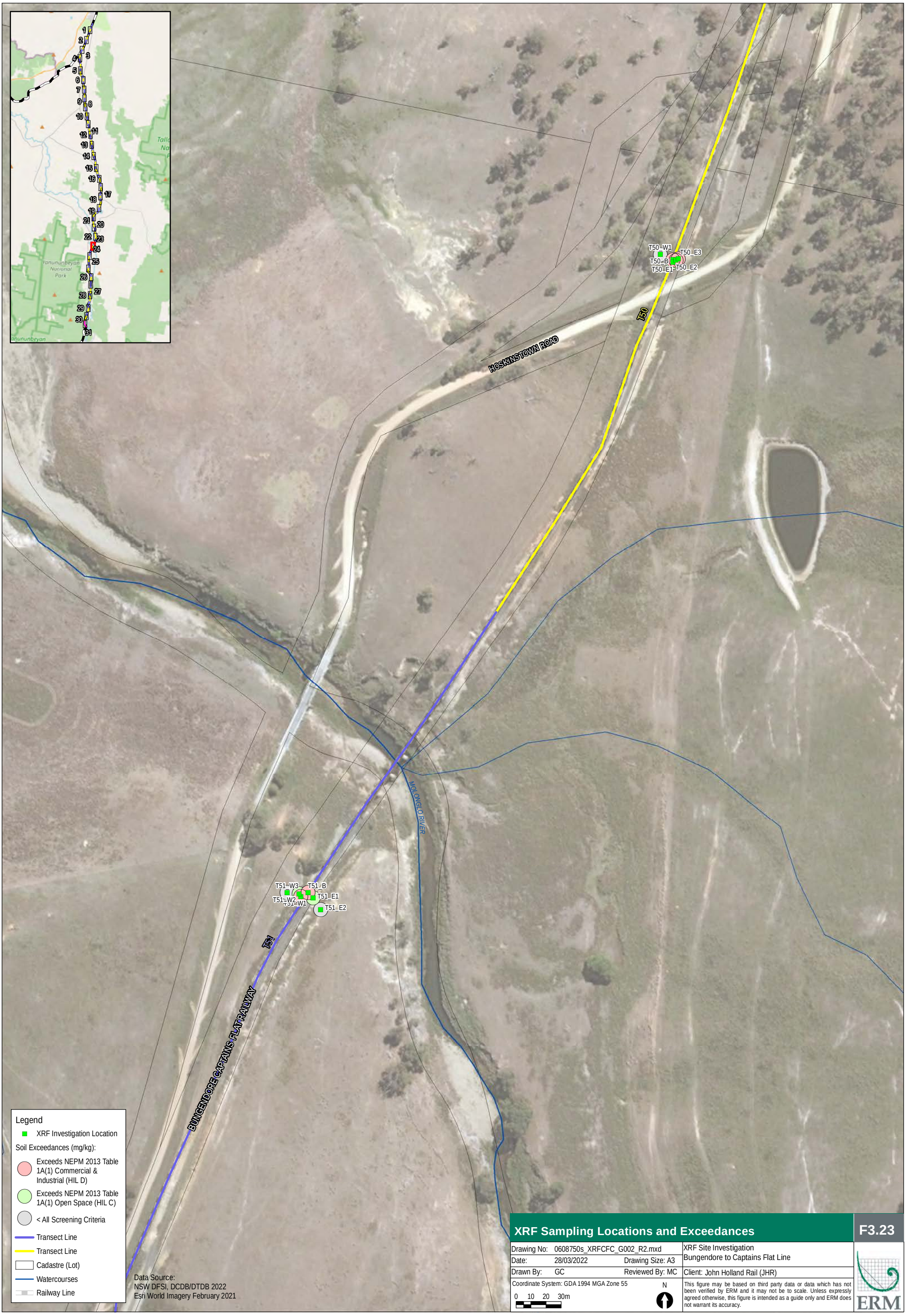
XRF Sampling Locations and Exceedances

F3.21

Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)
Coordinate System: GDA 1994 MGA Zone 55 0 10 20 30m		N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


T48_W2
T48_E1
T48_W1
T48_B
T48
MOLONGLO RIVER
HOSKINSTOWN ROAD
T49
T49_W2
T49_E1
T49_W1
T49_B
BUNGENDORE CAPTAINS FLAT RAILWAY
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.22
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

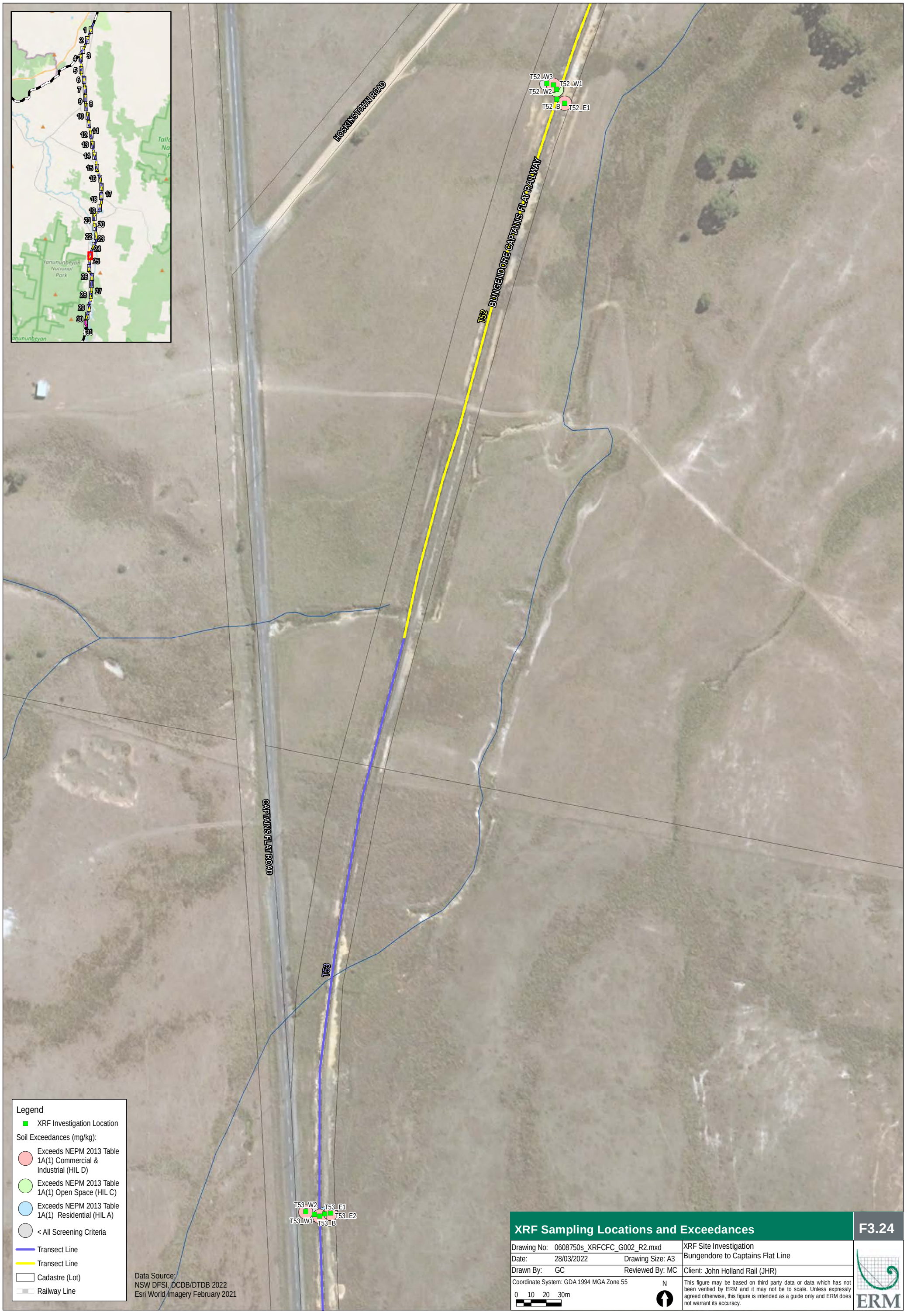


XRF Sampling Locations and Exceedances

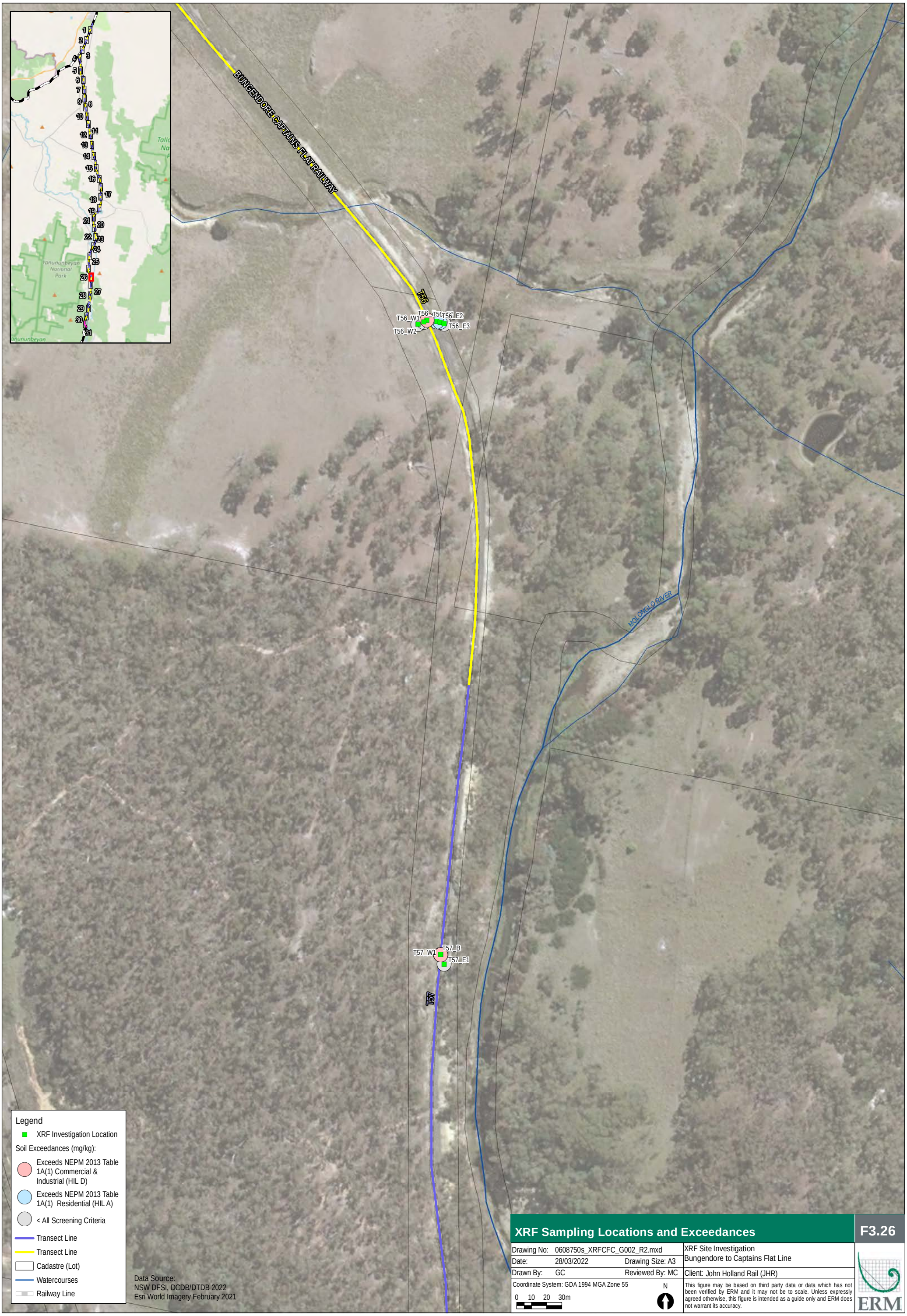
F3.23

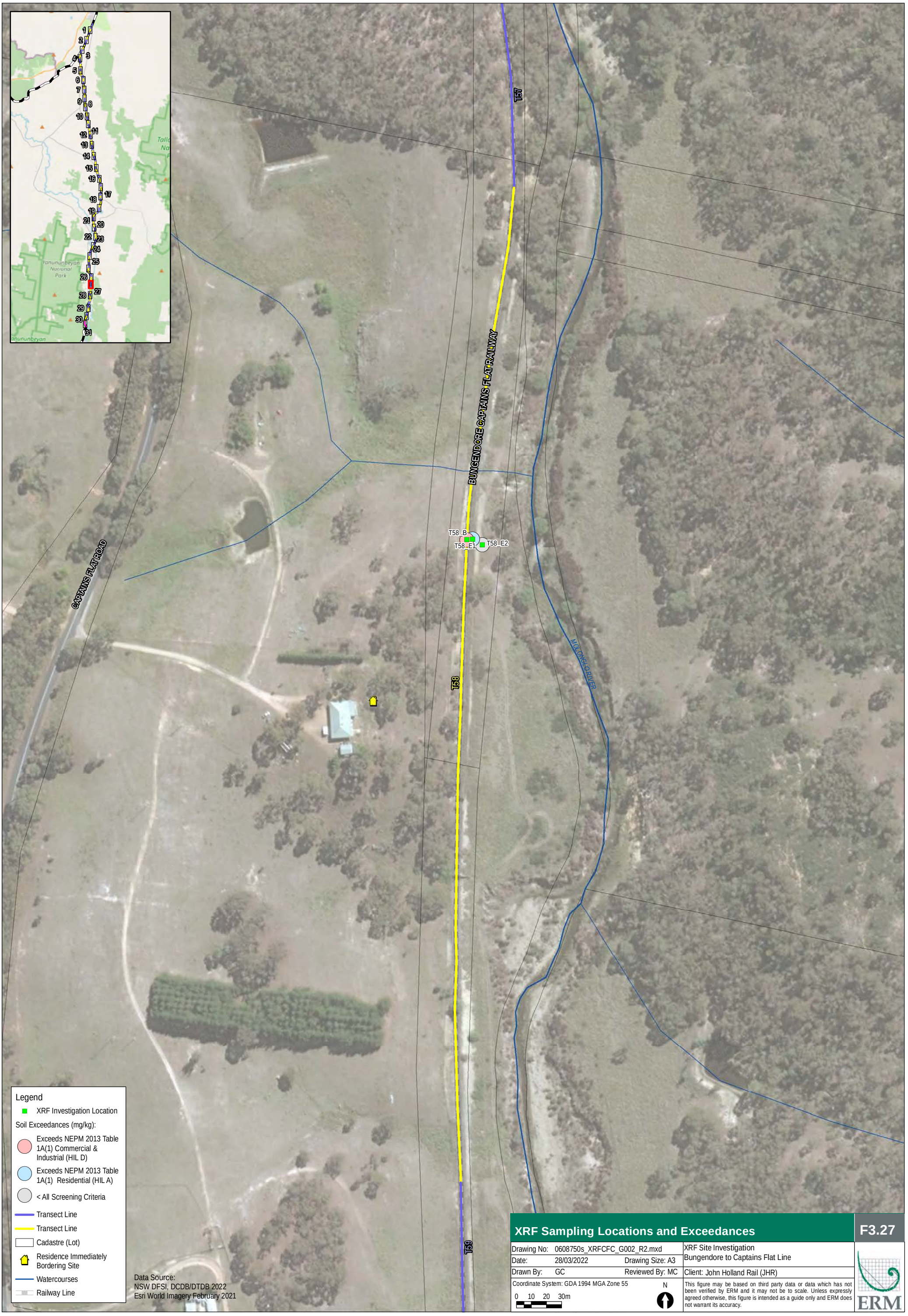
Drawing No:	0608750s_XRFCFC_G002_R2.mxd		XRF Site Investigation Bungendore to Captains Flat Line
Date:	28/03/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: MC	Client: John Holland Rail (JHR)
Coordinate System: GDA 1994 MGA Zone 55 0 10 20 30m		N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

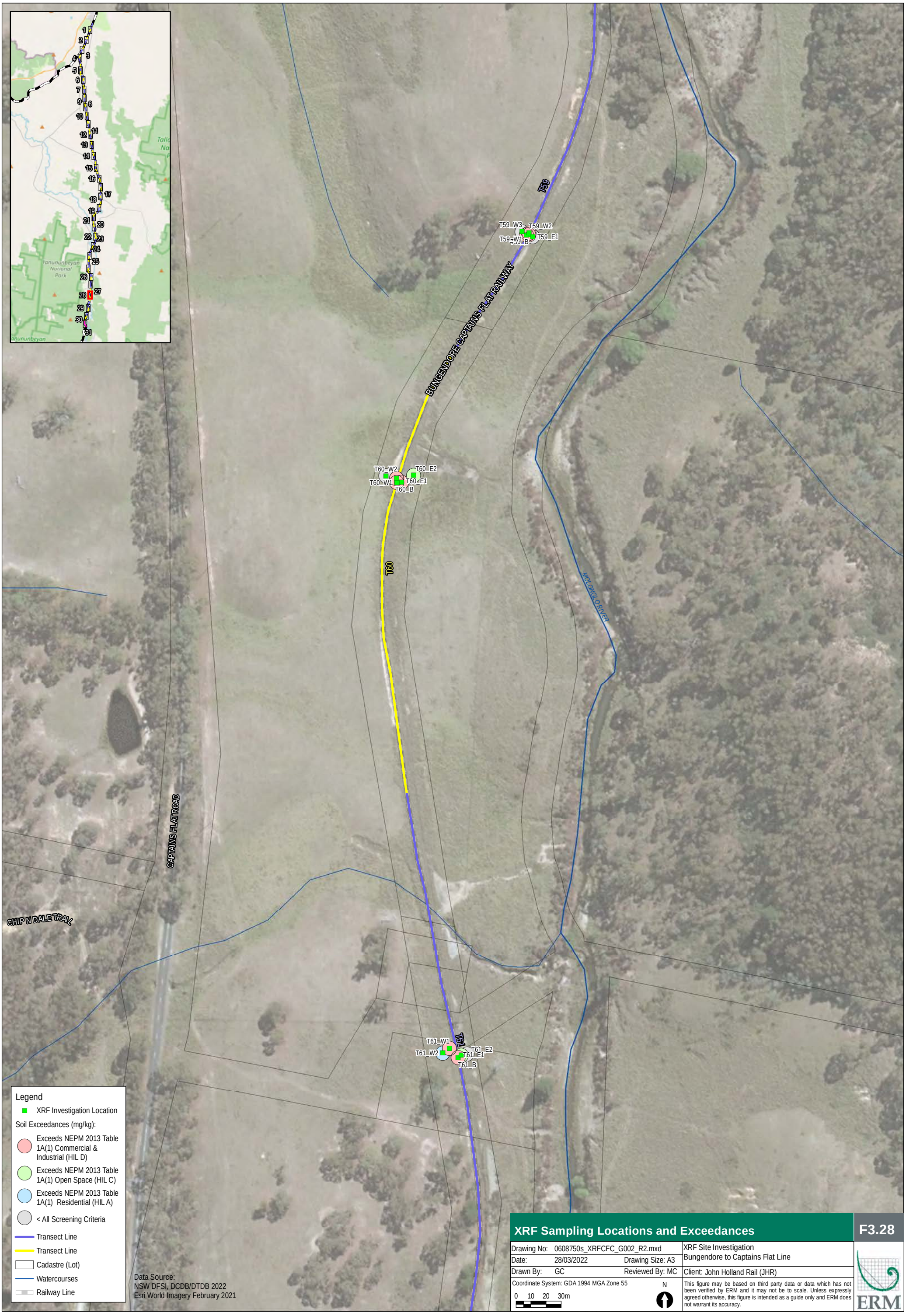
ERM


HOSKINSTOWN ROAD
BUNGENDORE CAPTAINS FLAT RAILWAY
T52
T52_W3
T52_W1
T52_W2
T52_B
T52_E1
CAPTAINS FLAT ROAD
T53
T53_W2
T53_E1
T53_E2
T53_W1
T53_B
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.24
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

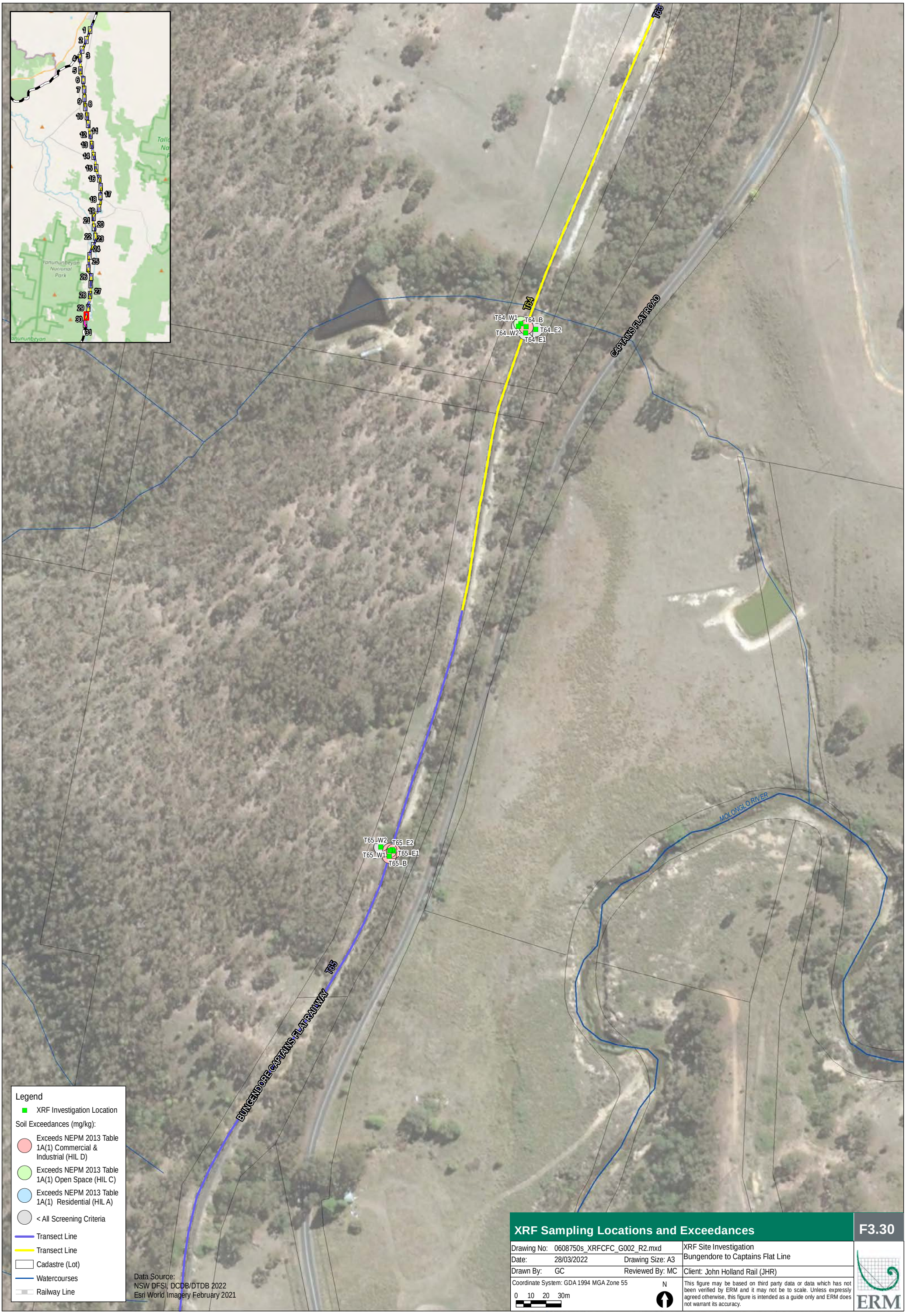

T54_W2
T54_E1
T54_W1
T54_E2
T54_B
T54
CAPTAINS FLAT ROAD
SINCLAIR ROAD
T55
T55_W1
T55_B
T55_E1
BUNGENDORE CAPTAINS FLAT RAILWAY
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.25
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

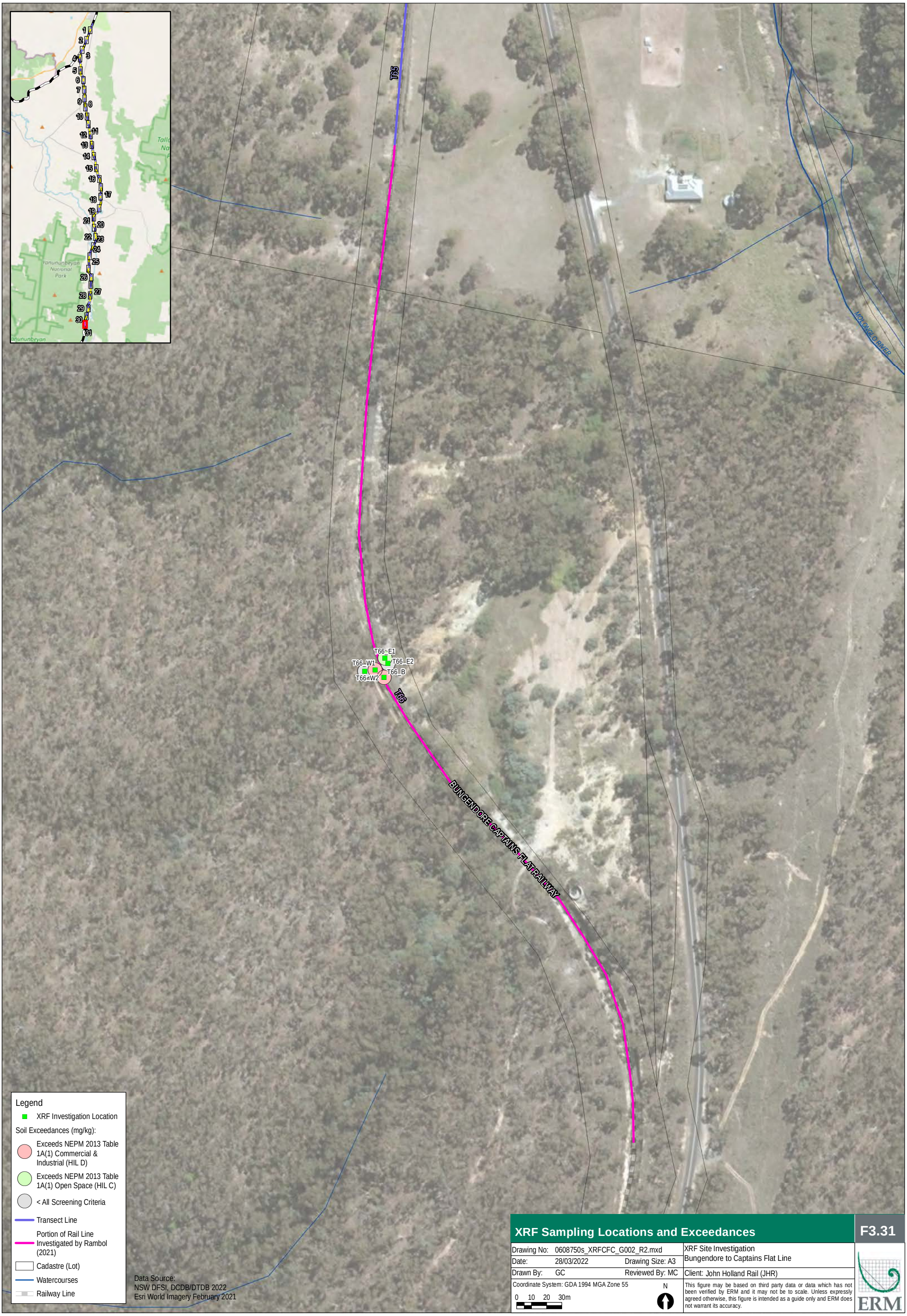

BUNGENDORE CAPTAINS FLAT RAILWAY
T56
T56_W1
T56_W2
T56_E1
T56_E2
T56_E3
MOLONGLO RIVER
T57
T57_W1
T57_B
T57_E1
Yanununbeyan National Park
Yanununbeyan
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.26
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

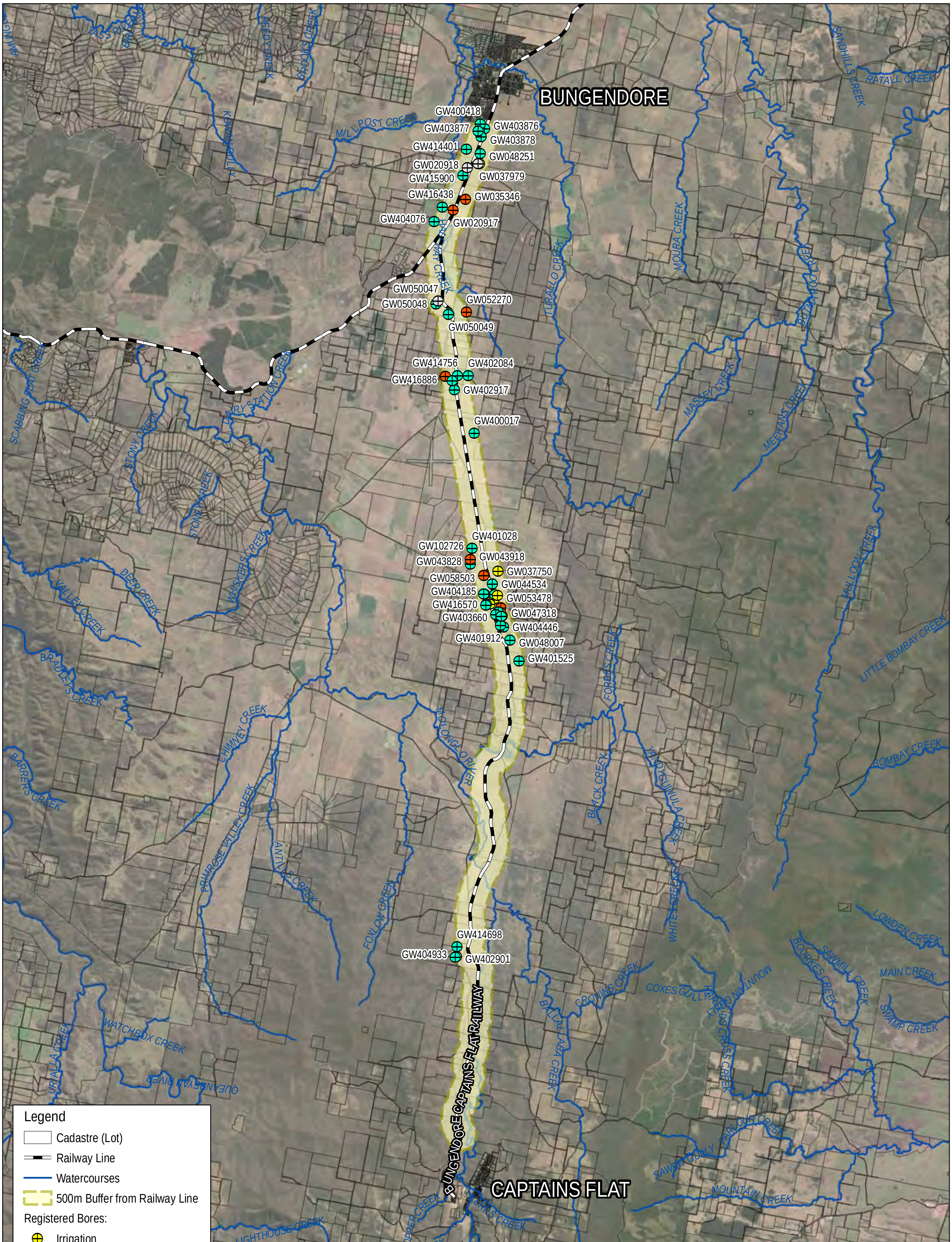

T57
BUNGENDORE CAPTAINS FLAT RAILWAY
T58_B
T58_E1
T58_E2
T58
MOLONGLO RIVER
CAPTAINS FLAT ROAD
T59
Yanununbeyan National Park
Yanununbeyan
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.27
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T59
BUNGENDORE CAPTAINS FLAT RAILWAY
T59_W3
T59_W2
T59_W1
T59_E1
T59_B
T60
T60_W2
T60_E2
T60_W1
T60_E1
T60_B
MOLONGLO RIVER
CAPTAINS FLAT ROAD
CHIP N DALE TRAIL
T61
T61_W1
T61_W2
T61_E2
T61_E1
T61_B
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.28
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T62_W2
T62_B
T62_W1
T62_E1
T62_E2
T62
BUNGENDORE CAPTAINS FLAT RAILWAY
CAPTAINS FLAT ROAD
MOLONGLO RIVER
T63
T63_W1
T63_B
T63_E1
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Residence Immediately Bordering Site
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.29
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T63
T64
T64_W1
T64_B
T64_E2
T64_W2
T64_E1
CAPTAINS FLAT ROAD
MOLONGLO RIVER
T65_W2
T65_E2
T65_W1
T65_E1
T65_B
T65
BUNGENDORE CAPTAINS FLAT RAILWAY
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
Exceeds NEPM 2013 Table 1A(1) Residential (HIL A)
< All Screening Criteria
Transect Line
Transect Line
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.30
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


T65
MOLONGLO RIVER
T66_E1
T66_W1
T66_E2
T66_B
T66_W2
T66
BUNGENDORE CAPTAINS FLAT RAILWAY
Yanununbeyan National Park
Legend
XRF Investigation Location
Soil Exceedances (mg/kg):
Exceeds NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)
Exceeds NEPM 2013 Table 1A(1) Open Space (HIL C)
< All Screening Criteria
Transect Line
Portion of Rail Line Investigated by Rambol (2021)
Cadastre (Lot)
Watercourses
Railway Line
Data Source:
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
XRF Sampling Locations and Exceedances
F3.31
Drawing No: 0608750s_XRFCFC_G002_R2.mxd
Date: 28/03/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: MC
Coordinate System: GDA 1994 MGA Zone 55
0 10 20 30m
N
XRF Site Investigation
Bungendore to Captains Flat Line
Client: John Holland Rail (JHR)
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

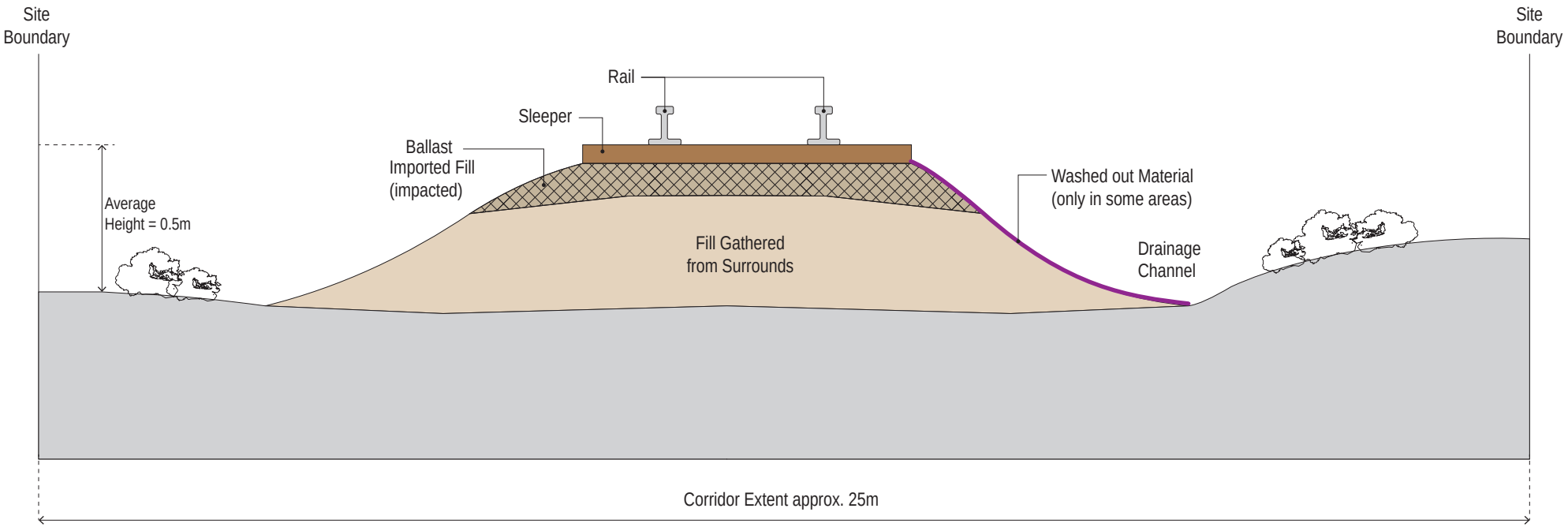

BUNGENDORE
CAPTAINS FLAT
BUNGENDORE CAPTAINS FLAT RAILWAY
GW400418
GW403877
GW403876
GW403878
GW414401
GW048251
GW020918
GW415900
GW037979
GW416438
GW035346
GW404076
GW020917
GW050047
GW050048
GW052270
GW050049
GW414756
GW402084
GW416886
GW402917
GW400017
GW401028
GW102726
GW043828
GW043918
GW037750
GW058503
GW044534
GW404185
GW053478
GW416570
GW047318
GW403660
GW404446
GW401912
GW048007
GW401525
GW414698
GW404933
GW402901
MILLPOST CREEK
TURALLO CREEK
MOURA CREEK
MASSEY CREEK
MEEHANS CREEK
MULLOON CREEK
LITTLE BOMBAY CREEK
BOMBAY CREEK
FORBES CREEK
BLACK CREEK
MOLONGLO RIVER
ANTILLS CREEK
FOXLOW CREEK
CHIMNEY CREEK
PRIMROSE VALLEY CREEK
WHISKERS CREEK
DEEP CREEK
VALLEY CREEK
BRADLEYS CREEK
BARRETS CREEK
STONY CREEK
SCABBING FLAT CREEK
WATCHBOX CREEK
QUEANBEYAN RIVER
URIALLA CREEK
LIGHTHOUSE CREEK
WHITES CREEK
CROWNS CREEK
COXES GULLY
BALLALABA CREEK
LOWDEN CREEK
MAIN CREEK
SAWMILL CREEK
BOOKES CREEK
SWAMP CREEK
SANDHILLS CREEK
RATALL CREEK
REEDY CREEK
BROOKS CREEK
MOUNTAIN CREEK
SAWPIT GULLY
Legend
Cadastre (Lot)
Railway Line
Watercourses
500m Buffer from Railway Line
Registered Bores:
Irrigation
Stock and Domestic
Water Supply
Unknown
Data Source:
GW Bores : (c) WaterNSW 2022
NSW DFSI, DCDB/DTDB 2022
Esri World Imagery February 2021
N
0 1 2 3km

Groundwater Bore Search - 500m Buffer

F4

Drawing No: 0608750s_XRFCFC_G004_R0.mxd	XRF Site Investigation Bungendore to Captains Flat Line
Date: 21/03/2022 Drawing Size: A4	
Drawn By: GC Reviewed By: MC	Client: John Holland Rail (JHR)
Coordinate System: GDA 1994 MGA Zone 55	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Schematic Cross-section (A-A')

F5

Drawing No.: 0608750s_XRFCFC_I001_R0.ai	XRF Site Investigation Bungendore to Captains Flat Line
Date: 28/03/2022 Drawing Size: A4	
Drawn by: GC Reviewed by: MC	Client: John Holland Rail (JHR)
Drawing Not to Scale	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX B DATA TABLES

	Site Information
Site Identification	Captains Flat to Bungendore Non-Opperational Rail Corridor
Site Location	Bungendore, NSW, 2621
Latitude/Longitude[1]	35.414089°, 149.448244° (at T33 - Hoskinstown)
Property Description	CRN - Acrtive Rail Corridor and Non-Opperational Corridor
Site Area (Ha)[1]	~95 Ha
Site Elevation (m AHD)	870-707m AHD
Ownership of Site	TAHE/TfNSW
Legal Description (Lot/DP) [2]	5 109735 9 109735 21 109735 10 109735 15 109735 4 109735 8 109735 6 109735 18 109735 3 109735 12 109735 19 109735 4419 1218357 4418 1218356 4422 1218361 13 109735 4420 1218359 4417 1218355 4421 1218360 4424 1217099 1 189797 20 109735 1 109735 2 109735 9 188288 8 188288 17 109735 53 923679 4 188288 54 923679 4415 1218352 4411 1218347 4416 1218353 4413 1218349 4414 1218351 4412 1218348 11 188288 10 188288 3 188288 7 188288 4409 1218344 7 110580 10 110580 9 110580 8 110580 4410 1218345 4407 1218342 17 110580 2 188288 1 1137414 12 110580 11 110580 13 110580 14 110580 4408 1218343 4401 1218334 4403 1218337 4402 1218335 15 110580 4406 1218341 4404 1218338 3 110580 2 110580 5 110580 16 110580 6 110580 1 110580 4 110580 4405 1218340
Current Zoning[2]	Infrastructure (SP2)
Source of Information:	1. Google Earth 2. NSW Planning Portal

Date	Site Activities
22 - 24 November 2021	XRF Survey at T1-T39
15 - 17 December, 2021	XRF Survey at T40-T66

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T1_E1	1	Soil	22/Nov/21		0.0-0.1	Lead	Red/brown silty sand with ballast, damp.
T1_W1	1	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with ballast underlain by light brown sand, damp, bare.
T1_W2	1	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with ballast underlain by light brown sand, damp, bare, next to ballast stockpile.
T1_W3	1	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with ballast underlain by light brown sand, damp, bare, next to ballast stockpile.
T2_E1	2	Soil	22/Nov/21		0.0-0.1	Lead	Brown sandy clayey silt amongst ballast, damp.
T2_E2	2	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with organics, damp, under grass.
T2_W1	2	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with sand and minor gravels, damp.
T2_W2	2	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with gravels and sand, damp, bare patch.
T3_E1	3	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown sandy silt with gravel and ballast under dead grass.
T3_W1	3	Soil	22/Nov/21		0.0-0.1	Lead	Brown gravelly sandy silt next to ballast, damp.
T3_W2	3	Soil	22/Nov/21	D01_211122	0.0-0.1	Lead	Orange/brown gravelly sandy silt, damp.
T4_E1	4	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown sandy silt under ballast.
T4_E2	4	Soil	22/Nov/21		0.0-0.1	Lead	Dark brown silt with gravel under gras, damp.
T4_W1	4	Soil	22/Nov/21		0.0-0.1	Lead	Dark brown sandy silt with gravels, bare, damp.
T4_W2	4	Soil	22/Nov/21		0.0-0.1	Lead	Brown/orange silt, gravels, grass, damp.
T5_E1	5	Soil	22/Nov/21		0.0-0.1	Lead	Brown sandy silt with gravels and ballast, damp, bare patch.
T5_E2	5	Soil	22/Nov/21		0.0-0.1	Lead	Light brown and orange clayey silt with minor gravels, bare. Sample taken from drainage channel.
T5_W1	5	Soil	22/Nov/21		0.0-0.1	Lead	Light brown and orange clayey silt with minor gravels, bare. Sample taken from drainage channel.
T5_W2	5	Soil	22/Nov/21		0.0-0.1	Lead	Light brown and orange clayey silt, with organics, under grass. Sample taken from drainage channel.
T6_E1	6	Soil	22/Nov/21		0.0-0.1	Lead	Light brown sandy silt with ballast, moist.
T6_E2	6	Soil	22/Nov/21		0.0-0.1	Lead	Light brown sandy silt with ballast, moist. Sample taken at top of cutting.
T6_W1	6	Soil	22/Nov/21		0.0-0.1	Lead	Light brown silt with large ballast gravels, damp.
T6_W2	6	Soil	22/Nov/21		0.0-0.1	Lead	Light brown silt under grass with organics, damp.
T7_B	7	Soil	22/Nov/21		0.0-0.1	Lead	Brown silty sand overlain by gravels and large ballast, damp.
T7_E1	7	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with sand and gravels, damp.
T7_E2	7	Soil	22/Nov/21		0.0-0.1	Lead	Yellow/brown clayey silt with gravels, damp, bare patch.
T7_W1	7	Soil	22/Nov/21		0.0-0.1	Lead	Brown/orange sandy silt with gravels, damp.
T7_W2	7	Soil	22/Nov/21		0.0-0.1	Lead	Light brown silt with gravels, damp.
T8_B	8	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with ballast gravels, damp, some grass
T8_E1	8	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under dead/live grass, damp, slightly bare
T8_E2	8	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under dead/live grass, damp, slightly bare
T8_W1	8	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with large grey gravels under grass
T8_W2	8	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under dead/live grass, damp
T9_B	9	Soil	23/Nov/21		0.0-0.1	Lead	Dark brown silt under grass with organics, damp
T9_E1	9	Soil	23/Nov/21		0.0-0.1	Lead	Dark brown silt under grass with organics, damp
T9_E2	9	Soil	23/Nov/21		0.0-0.1	Lead	Dark brown silt under grass with organics, damp, small bare patch in thick grass
T9_W1	9	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass with gravels, damp
T9_W2	9	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, damp
T10_B	10	Soil	23/Nov/21		0.0-0.1	Lead	Dark grey/black sandy gravels, ballast, damp
T10_E1	10	Soil	23/Nov/21		0.0-0.1	Lead	Dark grey brown organic silt, under grass, damp
T10_E2	10	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt near some large gravel, damp, near grass
T10_W1	10	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass, damp
T10_W2	10	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass, dry, no grass/bare patch
T11_B	11	Soil	23/Nov/21	D01_211123	0.0-0.1	Lead	Dark brown sandy silt with black gravels, damp, organics. Note, barbed wire fence down middle of tracks, unable to access western side.

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T11_E1	11	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with 'ballast' gravels spilled from between rails, bare, damp
T11_E2	11	Soil	23/Nov/21		0.0-0.1	Lead	Orange/red brown sandy silt with gravels
T12_B	12	Soil	23/Nov/21		0.0-0.1	Lead	Brown/light brown sandy silt, dry, hard, bare patch under bridge, flood drainage.
T12_E1	12	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with gravels on top, dry/damp, bare
T12_E2	12	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with sand and gravels, bare, ant mound next to grass
T12_W1	12	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with gravel amongst grass, damp
T12_W2	12	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with gravel amongst increased grass, damp, with clay and rocks
T13_B	13	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with organics under grass
T13_E1	13	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with organics under grass
T13_E2	13	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with organics under grass
T13_W1	13	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy silt with organics under grass, gravels
T13_W2	13	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, damp
T14_B	14	Soil	23/Nov/21	D02_211123	0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T14_E1	14	Soil	23/Nov/21		0.0-0.1	Lead	Brown sandy gravelly silt, bare, next to grass
T14_E2	14	Soil	23/Nov/21		0.0-0.1	Lead	Brown, silt with minor gravel under grass, damp
T14_W1	14	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt surrounded by grass, bare, damp
T14_W2	14	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with minor gravel under grass, damp
T15_B	15	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T15_E1	15	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels, damp, bare, some grass
T15_E2	15	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, under grass, damp
T15_W1	15	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with medium to large gravels, bare patch
T15_W2	15	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with medium to large gravels, bare patch with some grass
T16_B	16	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown clayey silt with gravels, damp.
T16_E1	16	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown silt underlain by dark grey/black gravels spilled from between rails.
T16_E2	16	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with gravels, under grass, damp.
T16_W1	16	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown clayey silt with gravels, damp.
T16_W2	16	Soil	22/Nov/21		0.0-0.1	Lead	Orange/brown clayey silt with gravels, damp.
T17_B	17	Soil	22/Nov/21	D02_211122	0.0-0.1	Lead	Dark grey sandy gravel with large slag like rock inclusions.
T17_E1	17	Soil	22/Nov/21		0.0-0.1	Lead	Black and orange/brown sandy silt with gravels, bae.
T17_E2	17	Soil	22/Nov/21		0.0-0.1	Lead	Green/brown gravelly silt under grass.
T17_W1	17	Soil	22/Nov/21		0.0-0.1	Lead	Brown silty gravelly sand under grass, next to drainage.
T17_W2	17	Soil	22/Nov/21		0.0-0.1	Lead	Brown silty gravelly sand under grass, next to drainage.
T18_E1	18	Soil	22/Nov/21		0.0-0.1	Lead	Brown/orange crumbly silt, damp, under grass. Note - transect located at level crossing - no suitable "B" sample location
T18_E2	18	Soil	22/Nov/21		0.0-0.1	Lead	Brown sandy silt with minor gravels, damp, under grass.
T18_W1	18	Soil	22/Nov/21		0.0-0.1	Lead	Brown sandy gravelly silt, under grass, wet, next to drainage.
T18_W2	18	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with gravels, edge of dirt road.
T19_B	19	Soil	22/Nov/21		0.0-0.1	Lead	Black/grey gravelly sand with slag rocks.
T19_E1	19	Soil	22/Nov/21		0.0-0.1	Lead	Brown sandy silt with ballast like gravels, crumbly, bare patch, slag like rocks.
T19_E2	19	Soil	22/Nov/21		0.0-0.1	Lead	Grey brown silt with organics under grass, damp.
T19_W1	19	Soil	22/Nov/21		0.0-0.1	Lead	Brown gravelly sandy silt, bare patch.
T19_W2	19	Soil	22/Nov/21		0.0-0.1	Lead	Light brown silt with fine sand and gravels at surface, bare patch.
T20_B	20	Soil	22/Nov/21		0.0-0.1	Lead	Black gravelly sand with slag rocks.
T20_E1	20	Soil	22/Nov/21		0.0-0.1	Lead	Black gravelly 'ballast' sand with slag rocks spilled from between rails, underlain by brown silt, damp, bare patch.
T20_E2	20	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with organics, damp, under grass.
T20_W1	20	Soil	22/Nov/21		0.0-0.1	Lead	Black sandy gravel 'ballast' spilled from between rails, dry, bare patch near grass.
T20_W2	20	Soil	22/Nov/21		0.0-0.1	Lead	Brown silt with dark gravels, under grass, damp.
T21_B	21	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T21_E1	21	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt and minor gravels in drainage next to grass, bare

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T21_E2	21	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, bare damp
T21_W1	21	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, bare damp
T21_W2	21	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, bare damp, under grass
T22_B	22	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T22_E1	22	Soil	23/Nov/21	D03_211123	0.0-0.1	Lead	Brown silt and gravels, bare, moist
T22_E2	22	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, under grass, moist
T22_W1	22	Soil	23/Nov/21		0.0-0.1	Lead	Silt and gravels, brown, bare, damp
T22_W2	22	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, moist
T23_B	23	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T23_E1	23	Soil	23/Nov/21		0.0-0.1	Lead	Brown, silt with minor gravels, bare, damp
T23_E2	23	Soil	23/Nov/21		0.0-0.1	Lead	Brown, silt with minor gravels, bare, damp
T23_W1	23	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, bare, minor gravels, damp
T23_W2	23	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, damp
T24_B	24	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T24_E1	24	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with 'ballast' gravels, damp, bare
T24_E2	24	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with organics under grass, moist
T24_W1	24	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels, damp, bare
T24_W2	24	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravel and clay, bare, damp
T25_B	25	Soil	23/Nov/21		0.0-0.1	Lead	Orange brown silt underlain by grey/black 'ballast'
T25_E1	25	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt, bare patch, gravels, moist
T25_E2	25	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with organics under grass
T25_W1	25	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels, bare patch
T25_W2	25	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels, grass
T26_B	26	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T26_E1	26	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels, bare, near grass, damp
T26_E2	26	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with organics, under grass, damp
T26_W1	26	Soil	23/Nov/21		0.0-0.1	Lead	Brown gravelly silt with medium to large black gravels, bare, damp
T26_W2	26	Soil	23/Nov/21		0.0-0.1	Lead	Brown, clayey silt, dmall bare patch in grass, damp
T27_B	27	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels underlain by fine black gravels, some grass
T27_E1	27	Soil	23/Nov/21		0.0-0.1	Lead	Dark grey silty sand/gravels, damp, bare
T27_E2	27	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, damp
T27_W1	27	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravels and sand, bare, damp
T27_W2	27	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt under grass, damp
T28_B	28	Soil	23/Nov/21		0.0-0.1	Lead	Dark brown silt, patchy grass, gravel. Note, high grass limited access within the corridor at this transect.
T28_E1	28	Soil	23/Nov/21		0.0-0.1	Lead	Brown silt with gravel next to grass
T29_B	29	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass with rocks, damp
T29_E1	29	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass with rocks, damp
T29_E2	29	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass with rocks, damp
T29_W1	29	Soil	23/Nov/21	D04_211123	0.0-0.1	Lead	Brown clayey silt under grass with rocks, damp
T29_W2	29	Soil	23/Nov/21		0.0-0.1	Lead	Brown clayey silt under grass, moist
T30_B	30	Soil	24/Nov/21		0.0-0.1	Lead	Black gravelly sand 'ballast', damp
T30_E1	30	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with organics, damp under grass
T30_E2	30	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with organics, damp under grass
T30_W1	30	Soil	24/Nov/21		0.0-0.1	Lead	Dark brown silt with black gravel, bare patch, damp
T30_W2	30	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with organics, damp under grass
T31_B	31	Soil	24/Nov/21		0.0-0.1	Lead	Black gravelly sand 'ballast', damp
T31_E1	31	Soil	24/Nov/21		0.0-0.1	Lead	Dark grey/brown sandy silt with organics under grass, damp
T31_E2	31	Soil	24/Nov/21		0.0-0.1	Lead	Dark grey/brown sandy silt with organics under grass, damp

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T31_W1	31	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with organics and gravels, bare, damp. Measurement taken at corridor boundary
T32_B	32	Soil	24/Nov/21		0.0-0.1	Lead	Black grey sandy gravel, ballast, some grass, damp
T32_E1	32	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravels, bare, damp. Long grass resticted access to the boundary beyond this location
T32_W1	32	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravels, bare, damp. Long grass resticted access to the boundary beyond this location
T33_B	33	Soil	24/Nov/21	D01_211124	0.0-0.1	Lead	Black grey sandy gravel, ballast, some grass, damp
T33_E1	33	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with sand and gravels, bare, damp
T33_E2	33	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with sand and gravels, bare, damp
T33_W1	33	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with large gravels and sand, damp
T33_W2	33	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with large gravels and sand, damp, grass
T34_B	34	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt, grass underlain by black grey ballast sand
T34_E1	34	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravels, bare, damp
T34_E2	34	Soil	24/Nov/21		0.0-0.1	Lead	Orangeish silt with gravels, bare, damp
T34_W1	34	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravels, scattered grass
T34_W2	34	Soil	24/Nov/21		0.0-0.1	Lead	Orange/brown clayey silt with gravels, bare
T35_B	35	Soil	24/Nov/21	D02_211124	0.0-0.1	Lead	Black grey sandy gravel, ballast, some grass, damp
T35_E1	35	Soil	24/Nov/21		0.0-0.1	Lead	Grey brown, sandy silty gravel, dry, bare
T35_E2	35	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with minor gravel, bare patch in grass, damp
T35_W1	35	Soil	24/Nov/21		0.0-0.1	Lead	Brown sandy gravelly silt underlain with black gravel, bare
T35_W2	35	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with sand under grass, damp
T36_B	36	Soil	24/Nov/21		0.0-0.1	Lead	Dark grey brown sandy silty gravel ballast, bare, damp
T36_E1	36	Soil	24/Nov/21		0.0-0.1	Lead	Light brown silt and gravel, bare dry
T36_E2	36	Soil	24/Nov/21		0.0-0.1	Lead	White/brown silt and gravel with clay, bare dry
T36_W1	36	Soil	24/Nov/21		0.0-0.1	Lead	Red brown gravelly sandy silt, bare, damp
T36_W2	36	Soil	24/Nov/21		0.0-0.1	Lead	Light brown silt and gravel, bare dry
T37_B	37	Soil	24/Nov/21		0.0-0.1	Lead	Light brown silt with clay, damp, soft, grass
T37_E1	37	Soil	24/Nov/21		0.0-0.1	Lead	Light brown silt with gravels, dry, bare
T37_E2	37	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt, under grass, damp
T37_W1	37	Soil	24/Nov/21		0.0-0.1	Lead	Brown/orange silt with white gravels, bare
T37_W2	37	Soil	24/Nov/21		0.0-0.1	Lead	Brown/orange (less orange) silt with white gravels, bare
T38_B	38	Soil	24/Nov/21		0.0-0.1	Lead	Dark grey ballast sand with white gravels, dry
T38_E1	38	Soil	24/Nov/21		0.0-0.1	Lead	Silty sand with gravels and rocks, bare damp
T38_E2	38	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravels and organics under grass, damp, drainage channel.
T38_W1	38	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt with gravel, bare, damp
T38_W2	38	Soil	24/Nov/21		0.0-0.1	Lead	Brown silt, dry, organics
T39_B	39	Soil	24/Nov/21		0.0-0.1	Lead	Typical 'ballast' fill. Note - rain affected conditionals after measurements were taken, T39 sampling terminated.
T39_W1	39	Soil	24/Nov/21		0.0-0.1	Lead	Gravelly silt fill, light brown, hard, crumbly, taken from road/track.
T40_B	40	Soil	15/Dec/21	D01_211215	0.0-0.1	Lead	Brown silt underlain by 'ballast' fill, damp
T40_E1	40	Soil	15/Dec/21		0.0-0.1	Lead	Bare, brown/orange silt with large rocks, damp
T40_E2	40	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T40_W1	40	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with large quartz/marble rocks fill, damp
T40_W2	40	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T41_B	41	Soil	15/Dec/21		0.0-0.1	Lead	Dark brown/grey silty gravel, underlain with ballast fill
T41_DAM	41	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, heavily washed out, damp, crumbly, hard
T41_E1	41	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, heavily washed out, damp, crumbly, hard
T41_E2	41	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, heavily washed out, damp, crumbly, hard
T41_W1	41	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt in uphill drainage channel, damp

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T41_W2	41	Soil	15/Dec/21		0.0-0.1	Lead	Damp brown silt with organics under grass
T42_B	42	Soil	15/Dec/21		0.0-0.1	Lead	Dark grey/brown silt underlain by 'ballast', some grass
T42_E1	42	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under gravels, bare, damp
T42_E2	42	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under gravels, with grass, moist
T42_W1	42	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt, small bare patch in grass, damp
T42_W2	42	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt, under grass, damp
T43_B	43	Soil	15/Dec/21		0.0-0.1	Lead	Gravel/sand, 'ballast' fill
T43_E1	43	Soil	15/Dec/21	D02_211215	0.0-0.1	Lead	Gravel/sand, 'ballast' fill, spilled out from between rails towards creek.
T43_E2	43	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels under grass, moist
T43_W1	43	Soil	15/Dec/21		0.0-0.1	Lead	Gravel/sand, 'ballast' fill, spilled out from between rails towards creek.
T44_B	44	Soil	15/Dec/21		0.0-0.1	Lead	Dry brown silt underlain by black gravel 'ballast'
T44_E1	44	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, dry with small gravel
T44_E2	44	Soil	15/Dec/21		0.0-0.1	Lead	Brown clayey silt under grass, damp
T44_W1	44	Soil	15/Dec/21		0.0-0.1	Lead	Dry brown silt with shaley gravels
T44_W2	44	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt, under live and dead grass with organics, damp
T45_B	45	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, dry, underlain by black 'ballast' fill
T45_E1	45	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with minor gravels, bare, next to grass
T45_E2	45	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with minor gravels, bare, under grass, damp
T45_W1	45	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, dry, base, next to grass
T45_W2	45	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt, dry, base, next to grass
T46_B	46	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass underlain by black 'ballas't gravel at 0.15m bgl
T46_E1	46	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T46_E2	46	Soil	15/Dec/21		0.0-0.1	Lead	Bare, brown silt, hard
T46_W1	46	Soil	15/Dec/21		0.0-0.1	Lead	Dark brown/grey gravelly sand, moist, bare, material spilled out from between rails.
T46_W2	46	Soil	15/Dec/21		0.0-0.1	Lead	Brown damp silt with gravels near grass
T46_W3	46	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with organics, damp
T47_B	47	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt underlain by black ballast
T47_E1	47	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T47_E2	47	Soil	15/Dec/21		0.0-0.1	Lead	Orange/brown silt with large gravels and rocks, near grass
T47_W1	47	Soil	15/Dec/21		0.0-0.1	Lead	Clayey silt with gravels, bare, near grass
T47_W2	47	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt, damp, near grass
T48_B	48	Soil	15/Dec/21		0.0-0.1	Lead	Brown gravelly silt, dry, underlain with ballast, some grass
T48_E1	48	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with organics near grass, damp
T48_W1	48	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels, bare patch
T48_W2	48	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels, under grass
T49_B	49	Soil	15/Dec/21		0.0-0.1	Lead	Gravelly silt, underlain with 'ballast'
T49_E1	49	Soil	15/Dec/21		0.0-0.1	Lead	Dry brown silt with shaley gravels, near to grass, dry. Fence resticting access to corridor boundary beyond this location
T49_W1	49	Soil	15/Dec/21		0.0-0.1	Lead	Grey dry silt with shale, next to grass
T49_W2	49	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt, under grass, damp
T50_B	50	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt underlain by black 'ballast'
T50_E1	50	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels spilled out from between rails.
T50_E2	50	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels spilled out from between rails.
T50_E3	50	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravels, bare
T50_W1	50	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with gravel, windrow/bare
T51_B	51	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravel underlain with 'ballast'
T51_E1	51	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with grey gravel, dry
T51_E2	51	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with grey gravel, dry
T51_W1	51	Soil	15/Dec/21	D04_211215	0.0-0.1	Lead	Black/grey sandy gravel ballast, dry, spilled out from between rails

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T51_W2	51	Soil	15/Dec/21		0.0-0.1	Lead	Black/grey sandy gravelly 'ballast' spilled out from between rails, dry, with brown silt, next to grass
T51_W3	51	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T52_B	52	Soil	15/Dec/21		0.0-0.1	Lead	Grey silt underlain by grey 'ballast'
T52_E1	52	Soil	15/Dec/21		0.0-0.1	Lead	Orange/brown dry silt with gravels
T52_E2	52	Soil	15/Dec/21		0.0-0.1	Lead	Light brown dry silt with gravels
T52_W1	52	Soil	15/Dec/21		0.0-0.1	Lead	Light brown dry silt with black gravels
T52_W2	52	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T52_W3	52	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt under grass, damp
T53_B	53	Soil	15/Dec/21		0.0-0.1	Lead	Silt with large gravels underlain by black 'ballast'
T53_E1	53	Soil	15/Dec/21		0.0-0.1	Lead	Brown/grey silt overlain with black gravels
T53_E2	53	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with organics under grass, damp
T53_W1	53	Soil	15/Dec/21		0.0-0.1	Lead	Brown/grey silt underlain by gravels
T53_W2	53	Soil	15/Dec/21		0.0-0.1	Lead	Brown silt with gravel under grass, damp
T54_B	54	Soil	15/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T54_E1	54	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with gravels, dry, bare
T54_E2	54	Soil	15/Dec/21		0.0-0.1	Lead	Light brown silt with gravels, dry, bare
T54_W1	54	Soil	15/Dec/21		0.0-0.1	Lead	Silt brown under grass with gravel, damp
T54_W2	54	Soil	15/Dec/21		0.0-0.1	Lead	Silt brown under grass with gravel, damp
T55_B	55	Soil	15/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T55_E1	55	Soil	15/Dec/21		0.0-0.1	Lead	Silt under grass with organics. Steep slope resticting safe access to the corridor boundary beyond this location
T55_W1	55	Soil	15/Dec/21	D05_211215	0.0-0.1	Lead	Light brown silt with gravels, bare, dry. Steep slope resticting safe access to the corridor boundary beyond this location
T56_B	56	Soil	16/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T56_E1	56	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, moist, organics, grass
T56_E2	56	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, moist, organics, grass, with larger gravels
T56_E3	56	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, under gravel, damp, bare
T56_W1	56	Soil	16/Dec/21		0.0-0.1	Lead	Brown/red silt with gravels and sand, bare, damp
T56_W2	56	Soil	16/Dec/21		0.0-0.1	Lead	Brown/red silt, under grass with organics, moist
T57_B	57	Soil	16/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T57_E1	57	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, under shales
T57_W1	57	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, under shales
T58_B	58	Soil	16/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill. Private fence immediately west of tracks resticing acess.
T58_E1	58	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with shale gravels, dry base
T58_E2	58	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt, under grass, damp
T59_B	59	Soil	16/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T59_E1	59	Soil	16/Dec/21		0.0-0.1	Lead	Orange/brown silt with gravels, dry
T59_W1	59	Soil	16/Dec/21		0.0-0.1	Lead	Dark grey dry silty ballast material, spilled out from between rails with minor organics
T59_W2	59	Soil	16/Dec/21		0.0-0.1	Lead	Light brown silt with gravels spilled from between rails.
T59_W3	59	Soil	16/Dec/21		0.0-0.1	Lead	Silt, brown under grass with organics
T60_B	60	Soil	16/Dec/21		0.0-0.1	Lead	Typical 'ballast' fill
T60_E1	60	Soil	16/Dec/21		0.0-0.1	Lead	Standard Ballast, spilled out from between rails
T60_E2	60	Soil	16/Dec/21		0.0-0.1	Lead	Dark grey silt, gravels
T60_W1	60	Soil	16/Dec/21		0.0-0.1	Lead	Standard Ballast, spilled out from between rails
T60_W2	60	Soil	16/Dec/21		0.0-0.1	Lead	Silt under grass, damp
T61_B	61	Soil	16/Dec/21		0.0-0.1	Lead	Standard 'ballast' with silt, dry
T61_E1	61	Soil	16/Dec/21		0.0-0.1	Lead	Light brown silt under gravels
T61_E2	61	Soil	16/Dec/21		0.0-0.1	Lead	Silt with gravels
T61_W1	61	Soil	16/Dec/21		0.0-0.1	Lead	Orange/grey silt with minor gravels, dry

Sampling Location	Transect	Sample Type	Sampling Date	Duplicate/ Triplicate	Sample Depth (m bgl)	Analysis	Comments
T61_W2	61	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with organics under grass
T62_B	62	Soil	16/Dec/21	D01_211216	0.0-0.1	Lead	Standard 'ballast' with grey brown silt, grass
T62_E1	62	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with minor small gravels, dry
T62_E2	62	Soil	16/Dec/21		0.0-0.1	Lead	Brown, silt sand with organics under grass
T62_W1	62	Soil	16/Dec/21	D02_211216	0.0-0.1	Lead	Brown/grey silt with gravels
T62_W2	62	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with minor small gravels, dry
T63_B	63	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with gravels, dry
T63_E1	63	Soil	16/Dec/21		0.0-0.1	Lead	Dark grey/brown silt with organics, damp - level crossing road verge
T63_W1	63	Soil	16/Dec/21		0.0-0.1	Lead	Brown silt with organics and gravels, roadbase - level crossing road verge
T64_B	64	Soil	16/Dec/21	D03_211216	0.0-0.1	Lead	Dark brown silt underlain by 'ballast' fill, with organics, damp
T64_E1	64	Soil	16/Dec/21		0.0-0.1	Lead	Brown and light brown clayey silt, damp, shales, bare
T64_E2	64	Soil	16/Dec/21		0.0-0.1	Lead	Reddish clayey silt, damp, shales, bare
T64_W1	64	Soil	16/Dec/21	D04_211216	0.0-0.1	Lead	Brown silt with organics under leaf litter
T64_W2	64	Soil	16/Dec/21		0.0-0.1	Lead	Gravelly silt, grey, with shale inclusions, dry
T65_B	65	Soil	16/Dec/21	D05_211216	0.0-0.1	Lead	Typical 'ballast' fill
T65_E1	65	Soil	16/Dec/21		0.0-0.1	Lead	Dark grey gravelly silty sand, leaf litter organics
T65_E2	65	Soil	16/Dec/21		0.0-0.1	Lead	Brown sandy silt under gravels
T65_W1	65	Soil	16/Dec/21	D06_211216	0.0-0.1	Lead	Organic silt, dry, loose, bare, leaf litter
T65_W2	65	Soil	16/Dec/21		0.0-0.1	Lead	Organic silt, dry, loose, bare, leaf litter with shales
T66_B	66	Soil	16/Dec/21		0.0-0.1	Lead	Standard ballast
T66_E1	66	Soil	16/Dec/21		0.0-0.1	Lead	Light brown silt with gravels, next to ballast
T66_E2	66	Soil	16/Dec/21		0.0-0.1	Lead	Silt with organics and large gravels
T66_W1	66	Soil	16/Dec/21		0.0-0.1	Lead	Standard ballast
T66_W2	66	Soil	16/Dec/21		0.0-0.1	Lead	Dry brown silt with gravel

									Lead			Moisture
									XRF Reading	Laboratory Result	Corrected Data Set*	Moisture Content
EQL									ppm 1-4	mg/kg 5	mg/kg 1-4	% 0.1
NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)											1500	
NEPM 2013 Table 1A(1) Open Space (HIL C)**											600	
NEPM 2013 Table 1A(1) Residential (HIL A)**											300	
NEPM 2013 Table 1B(4) EIL Commercial and Industrial											**1800**	
Sample Point	**Date**	**Transect**	**Site Area**	**Location inTransect**	**Easting**	**Northing**	**Laboratory Sample**	**Lab Report Number**				
T1_E1	22/11/2021	1	Active Corridor	Adjacent to Tracks	721887.4981	6093671.448			110.8	-	135.1	-
T1_W1	22/11/2021	1	Active Corridor	Adjacent to Tracks	721881.7432	6093678.027			8.8	-	10.7	-
T1_W2	22/11/2021	1	Active Corridor	Mid Corridor	721880.023	6093689.503			41.9	-	51.1	-
T1_W3	22/11/2021	1	Active Corridor	Corridor Boundary	721874.8949	6093691.96			29.7	-	36.2	-
T2_E1	22/11/2021	2	Active Corridor	Adjacent to Tracks	721712.1308	6093214.103			82.2	-	100.2	-
T2_E2	22/11/2021	2	Active Corridor	Corridor Boundary	721721.2321	6093217.765			45	-	54.9	-
T2_W1	22/11/2021	2	Active Corridor	Adjacent to Tracks	721704.2693	6093223.843			50.3	-	61.3	-
T2_W2	22/11/2021	2	Active Corridor	Corridor Boundary	721693.1229	6093229.556			19	-	23.2	-
T3_E1	22/11/2021	3	Active Corridor	Adjacent to Tracks	721604.2022	6092929.927			69.1	-	84.2	-
T3_W1	22/11/2021	3	Active Corridor	Adjacent to Tracks	721595.9098	6092933.239			24.9	-	30.4	-
T3_W2	22/11/2021	3	Active Corridor	Corridor Boundary	721586.8311	6092949.003	D01_211122	CA2107572-2	6.7	15.8	15.8	14.7
T4_E1	22/11/2021	4	Active Corridor	Adjacent to Tracks	721449.0949	6092540.458			74.2	-	90.5	-
T4_E2	22/11/2021	4	Active Corridor	Corridor Boundary	721456.6245	6092543.16			98.7	-	120.3	-
T4_W1	22/11/2021	4	Active Corridor	Adjacent to Tracks	721447.4947	6092542.024			1634	-	**1992.0**	-
T4_W2	22/11/2021	4	Active Corridor	Corridor Boundary	721445.1447	6092544.565			24.8	-	30.2	-
T5_E1	22/11/2021	5	Active Corridor	Adjacent to Tracks	721217.3982	6091917.169			386	-	470.6	-
T5_E2	22/11/2021	5	Active Corridor	Corridor Boundary	721225.3394	6091919.569			16.4	-	20.0	-
T5_W1	22/11/2021	5	Active Corridor	Adjacent to Tracks	721213.4157	6091912.091			265	-	323.1	-
T5_W2	22/11/2021	5	Active Corridor	Corridor Boundary	721193.6998	6091924.564			33.5	-	40.8	-
T6_E1	22/11/2021	6	Active Corridor	Adjacent to Tracks	720991.7037	6091365.963			76.5	-	93.3	-
T6_E2	22/11/2021	6	Active Corridor	Corridor Boundary	720992.9591	6091361.492			230	-	280.4	-
T6_W1	22/11/2021	6	Active Corridor	Adjacent to Tracks	720989.1886	6091371.02			73.2	-	89.2	-
T6_W2	22/11/2021	6	Active Corridor	Corridor Boundary	720983.3842	6091371.828			39.2	-	47.8	-
Count									23	1	26	1
Exceedences									2	-	3	-
Average									-	-	182.7	-
95% UCL									-	-	555.0	-
Standard Deviation									-	-	410.0	-

* Moisture correction has been applied using exact moisture where lab data is available. Where lab data is not available, average lab moisture has been used to account for the variability in moisture content observed across the Site. Moisture Corrected XRF Lead = XRF Lead/(100 – moisture content %)*100

**HIL C and HIL A applied only to 'Corridor Boundary' locations

*** Where laboratory duplicate analysed by primary and secondary laboratories, the higher of the analytical results is shown.

									Lead			Moisture
									XRF Reading	Laboratory Result	Corrected Data Set*	Moisture Content
EQL									ppm 1-4	mg/kg 5	mg/kg 1-4	% 0.1
NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)											1500	
NEPM 2013 Table 1A(1) Open Space (HIL C)											600	
NEPM 2013 Table 1A(1) Residential (HIL A)											300	
NEPM 2013 Table 1B(4) EIL Commercial and Industrial											**1800**	
NEPM 2013 Table 1B(4) EIL Urban Residenitial and Public Open Space											1100	
NEPM 2013 Table 1B(4) EIL Areas of Ecological Significance (Applicable to T51-T66 Only)											*470*	
Sample Point	**Date**	**Transect**	**Site Area**	**Location inTransect**	**Easting**	**Northing**	**Laboratory Sample**	**Lab Report Number**				
T7_B	22/11/2021	7	Non-Operational Corridor	Between Tracks	720743.8614	6090937.133			20700	-	**25235.7**	-
T7_E1	22/11/2021	7	Non-Operational Corridor	Mid Corridor	720745.9707	6090934.085			1380	-	1682.4	-
T7_E2	22/11/2021	7	Non-Operational Corridor	Corridor Boundary	720748.3131	6090933.172			21.9	-	26.7	-
T7_W1	22/11/2021	7	Non-Operational Corridor	Mid Corridor	720742.0942	6090937.483			22.8	-	27.8	-
T7_W2	22/11/2021	7	Non-Operational Corridor	Corridor Boundary	720737.2208	6090937.847			14.9	-	18.2	-
T8_B	23/11/2021	8	Non-Operational Corridor	Between Tracks	720621.5791	6090451.166			3555	-	**4334.0**	-
T8_E1	23/11/2021	8	Non-Operational Corridor	Mid Corridor	720625.0252	6090446.975			312	-	380.4	-
T8_E2	23/11/2021	8	Non-Operational Corridor	Corridor Boundary	720631.8456	6090446.808			72.6	-	88.5	-
T8_W1	23/11/2021	8	Non-Operational Corridor	Mid Corridor	720617.5696	6090450.932			1061	-	1293.5	-
T8_W2	23/11/2021	8	Non-Operational Corridor	Corridor Boundary	720610.8346	6090450.875			24.5	-	29.9	-
T9_B	23/11/2021	9	Non-Operational Corridor	Between Tracks	720612.0299	6089931.247			2336	-	**2847.9**	-
T9_E1	23/11/2021	9	Non-Operational Corridor	Mid Corridor	720615.2926	6089930.723			126.5	-	154.2	-
T9_E2	23/11/2021	9	Non-Operational Corridor	Corridor Boundary	720620.4311	6089932.484			150.2	-	183.1	-
T9_W1	23/11/2021	9	Non-Operational Corridor	Mid Corridor	720608.9436	6089931.544			241.8	-	294.8	-
T9_W2	23/11/2021	9	Non-Operational Corridor	Corridor Boundary	720604.2543	6089929.55			22.2	-	27.1	-
T10_B	23/11/2021	10	Non-Operational Corridor	Between Tracks	720693.5309	6089269.344			1205	-	1469.0	-
T10_E1	23/11/2021	10	Non-Operational Corridor	Mid Corridor	720699.9786	6089268.853			422	-	514.5	-
T10_E2	23/11/2021	10	Non-Operational Corridor	Corridor Boundary	720711.5439	6089265.572			199	-	242.6	-
T10_W1	23/11/2021	10	Non-Operational Corridor	Mid Corridor	720686.3912	6089271.295			57	-	69.5	-
T10_W2	23/11/2021	10	Non-Operational Corridor	Corridor Boundary	720677.3486	6089269.852			35.7	-	43.5	-
T11_B	23/11/2021	11	Non-Operational Corridor	Between Tracks	720677.4935	6088997.338	D01_211123	CA2107572-2	3561	8020	**8020**	26
T11_E1	23/11/2021	11	Non-Operational Corridor	Mid Corridor	720679.8984	6088998.944			10900	-	**13288.4**	-
T11_E2	23/11/2021	11	Non-Operational Corridor	Corridor Boundary	720682.4807	6088998.394			104	-	126.8	-
T12_B	23/11/2021	12	Non-Operational Corridor	Between Tracks - Drainage	720662.5694	6088548.035			75.9	-	92.5	-
T12_E1	23/11/2021	12	Non-Operational Corridor	Mid Corridor	720662.914	6088547.25			2187	-	**2666.2**	-
T12_E2	23/11/2021	12	Non-Operational Corridor	Corridor Boundary	720675.271	6088546.614			74.8	-	91.2	-
T12_W1	23/11/2021	12	Non-Operational Corridor	Mid Corridor	720657.2941	6088536.953			1113	-	1356.9	-
T12_W2	23/11/2021	12	Non-Operational Corridor	Corridor Boundary	720654.2029	6088537.029			48.6	-	59.2	-
T13_B	23/11/2021	13	Non-Operational Corridor	Between Tracks	720974.4233	6088155.747			21	-	25.6	-
T13_E1	23/11/2021	13	Non-Operational Corridor	Mid Corridor	720976.6062	6088159.914			27.7	-	33.8	-
T13_E2	23/11/2021	13	Non-Operational Corridor	Corridor Boundary	720978.8299	6088161.944			14.7	-	17.9	-
T13_W1	23/11/2021	13	Non-Operational Corridor	Mid Corridor	720970.5429	6088154.523			262	-	319.4	-
T13_W2	23/11/2021	13	Non-Operational Corridor	Corridor Boundary	720970.875	6088150.328			8.3	-	10.1	-
T14_B	23/11/2021	14	Non-Operational Corridor	Between Tracks	720997.211	6087789.895	D02_211123	CA2107572-2	4222	11000	**11000.0**	12.8
T14_E1	23/11/2021	14	Non-Operational Corridor	Mid Corridor	721002.2922	6087785.663			1855	-	**2261.5**	-
T14_E2	23/11/2021	14	Non-Operational Corridor	Corridor Boundary	721006.4497	6087784.562			846	-	1031.4	-
T14_W1	23/11/2021	14	Non-Operational Corridor	Mid Corridor	720993.3998	6087793.984			1118	-	1363.0	-
T14_W2	23/11/2021	14	Non-Operational Corridor	Corridor Boundary	720990.1852	6087792.731			407	-	496.2	-
T15_B	23/11/2021	15	Non-Operational Corridor	Between Tracks	720992.9533	6087497.952			1047	-	1276.4	-
T15_E1	23/11/2021	15	Non-Operational Corridor	Mid Corridor	720997.157	6087498.736			66.1	-	80.6	-
T15_E2	23/11/2021	15	Non-Operational Corridor	Corridor Boundary	721009.1615	6087502.327			43.7	-	53.3	-
T15_W1	23/11/2021	15	Non-Operational Corridor	Mid Corridor	720989.8341	6087500.581			23.2	-	28.3	-
T15_W2	23/11/2021	15	Non-Operational Corridor	Corridor Boundary	720981.7895	6087502.666			24.4	-	29.7	-
T16_B	22/11/2021	16	Non-Operational Corridor	Between Tracks	721064.8738	6087041.185			144.7	-	176.4	-
T16_E1	22/11/2021	16	Non-Operational Corridor	Mid Corridor	721069.5573	6087039.294			5416	-	**6602.7**	-
T16_E2	22/11/2021	16	Non-Operational Corridor	Corridor Boundary	721073.8653	6087040.632			27.1	-	33.0	-
T16_W1	22/11/2021	16	Non-Operational Corridor	Mid Corridor	721067.4365	6087038.125			25.9	-	31.6	-
T16_W2	22/11/2021	16	Non-Operational Corridor	Corridor Boundary	721050.5091	6087037.764			19.5	-	23.8	-
T17_B	22/11/2021	17	Non-Operational Corridor	Between Tracks	721127.6096	6086518.264	D02_211122	CA2107572-2/ES2143866	11200	10600	**11200.0**	16.1
T17_E1	22/11/2021	17	Non-Operational Corridor	Mid Corridor	721134.0307	6086516.774			1665	-	**2029.8**	-
T17_E2	22/11/2021	17	Non-Operational Corridor	Corridor Boundary	721138.6775	6086517.104			161.8	-	197.3	-
T17_W1	22/11/2021	17	Non-Operational Corridor	Mid Corridor	721123.7991	6086511.253			1488	-	**1814.0**	-
T17_W2	22/11/2021	17	Non-Operational Corridor	Corridor Boundary	721118.4169	6086510.609			191	-	232.9	-
T18_E1	22/11/2021	18	Non-Operational Corridor	Mid Corridor	721134.6597	6086102.052			40.1	-	48.9	-
T18_E2	22/11/2021	18	Non-Operational Corridor	Corridor Boundary	721151.5845	6086106.076			17.8	-	21.7	-
T18_W1	22/11/2021	18	Non-Operational Corridor	Mid Corridor	721123.7623	6086106.427			16.6	-	20.2	-
T18_W2	22/11/2021	18	Non-Operational Corridor	Corridor Boundary	721117.9031	6086108.569			288	-	351.1	-
T19_B	22/11/2021	19	Non-Operational Corridor	Between Tracks	721119.1922	6085602.364			2849	-	**3473.3**	-
T19_E1	22/11/2021	19	Non-Operational Corridor	Mid Corridor	721127.6505	6085602.378			1574	-	**1918.9**	-
T19_E2	22/11/2021	19	Non-Operational Corridor	Corridor Boundary	721132.4886	6085606.81			200	-	243.8	-
T19_W1	22/11/2021	19	Non-Operational Corridor	Mid Corridor	721114.6077	6085597.149			636	-	775.4	-
T19_W2	22/11/2021	19	Non-Operational Corridor	Corridor Boundary	721111.2602	6085601.56			699	-	852.2	-
T20_B	22/11/2021	20	Non-Operational Corridor	Between Tracks	721178.0432	6085136.813			6606	-	**8053.5**	-
T20_E1	22/11/2021	20	Non-Operational Corridor	Mid Corridor	721181.4005	6085136.509			3486	-	**4249.8**	-
T20_E2	22/11/2021	20	Non-Operational Corridor	Corridor Boundary	721187.9961	6085138.455			95.8	-	116.8	-
T20_W1	22/11/2021	20	Non-Operational Corridor	Mid Corridor	721177.2924	6085132.169			10600	-	**12922.6**	-
T20_W2	22/11/2021	20	Non-Operational Corridor	Corridor Boundary	-	-			1470	-	1792.1	-
T21_B	23/11/2021	21	Non-Operational Corridor	Between Tracks	721277.9839	6084538.045			3186	-	**3884.1**	-
T21_E1	23/11/2021	21	Non-Operational Corridor	Mid Corridor	721282.4343	6084537.824			101.7	-	124.0	-
T21_E2	23/11/2021	21	Non-Operational Corridor	Corridor Boundary	721291.7813	6084537.039			305	-	371.8	-
T21_W2	23/11/2021	21	Non-Operational Corridor	Mid Corridor	721274.6576	6084535.907			152.5	-	185.9	-
T21_W2	23/11/2021	21	Non-Operational Corridor	Corridor Boundary	721271.3314	6084533.769			260	-	317.0	-
T22_B	23/11/2021	22	Non-Operational Corridor	Between Tracks	721361.011	6084054.548			4018	-	**4898.4**	-
T22_E1	23/11/2021	22	Non-Operational Corridor	Mid Corridor	721363.9787	6084053.063	D03_211123	CA2107572-2	993	1580	1580.0	12.3
T22_E2	23/11/2021	22	Non-Operational Corridor	Corridor Boundary	721371.8007	6084060.53			70	-	85.3	-
T22_W1	23/11/2021	22	Non-Operational Corridor	Mid Corridor	721354.7142	6084057.176			775	-	944.8	-
T22_W2	23/11/2021	22	Non-Operational Corridor	Corridor Boundary	721342.492	6084048.264			57.3	-	69.9	-
T23_B	23/11/2021	23	Non-Operational Corridor	Between Tracks	721436.4344	6083591.058			2400	-	**2925.9**	-
T23_E1	23/11/2021	23	Non-Operational Corridor	Mid Corridor	721442.8883	6083594.673			57.3	-	69.9	-
T23_E2	23/11/2021	23	Non-Operational Corridor	Corridor Boundary	721449.7336	6083595.725			23.2	-	28.3	-

									Lead			Moisture
									XRF Reading	Laboratory Result	Corrected Data Set*	Moisture Content
EQL									ppm 1-4	mg/kg 5	mg/kg 1-4	% 0.1
NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)											1500	
NEPM 2013 Table 1A(1) Open Space (HIL C)											600	
NEPM 2013 Table 1A(1) Residential (HIL A)											300	
NEPM 2013 Table 1B(4) EIL Commercial and Industrial											**1800**	
NEPM 2013 Table 1B(4) EIL Urban Residenitial and Public Open Space											1100	
NEPM 2013 Table 1B(4) EIL Areas of Ecological Significance (Applicable to T51-T66 Only)											*470*	
Sample Point	**Date**	**Transect**	**Site Area**	**Location inTransect**	**Easting**	**Northing**	**Laboratory Sample**	**Lab Report Number**				
T23_W1	23/11/2021	23	Non-Operational Corridor	Mid Corridor	721426.751	6083600.288			172	-	209.7	-
T23_W2	23/11/2021	23	Non-Operational Corridor	Corridor Boundary	721415.453	6083599.345			32.5	-	39.6	-
T24_B	23/11/2021	24	Non-Operational Corridor	Between Tracks	721494.6282	6083240.628			4454	-	**5429.9**	-
T24_E1	23/11/2021	24	Non-Operational Corridor	Mid Corridor	721500.6446	6083241.257			414	-	504.7	-
T24_E2	23/11/2021	24	Non-Operational Corridor	Corridor Boundary	721508.5302	6083243.949			57.1	-	69.6	-
T24_W1	23/11/2021	24	Non-Operational Corridor	Mid Corridor	721488.7732	6083246.545			416	-	507.2	-
T24_W2	23/11/2021	24	Non-Operational Corridor	Corridor Boundary	721481.7668	6083238.947			59.5	-	72.5	-
T25_B	23/11/2021	25	Non-Operational Corridor	Between Tracks	721580.8591	6082722.223			1747	-	**2129.8**	-
T25_E1	23/11/2021	25	Non-Operational Corridor	Mid Corridor	721582.3102	6082722.076			1270	-	1548.3	-
T25_E2	23/11/2021	25	Non-Operational Corridor	Corridor Boundary	721585.1296	6082722.118			193	-	235.3	-
T25_W1	23/11/2021	25	Non-Operational Corridor	Mid Corridor	721576.3577	6082720.336			11.3	-	13.8	-
T25_W2	23/11/2021	25	Non-Operational Corridor	Corridor Boundary	721567.091	6082713.238			14.6	-	17.8	-
T26_B	23/11/2021	26	Non-Operational Corridor	Between Tracks	721669.3458	6082185.223			5409	-	**6594.2**	-
T26_E1	23/11/2021	26	Non-Operational Corridor	Mid Corridor	721671.7272	6082185.941			1236	-	1506.8	-
T26_E2	23/11/2021	26	Non-Operational Corridor	Corridor Boundary	721674.83	6082186.42			558	-	680.3	-
T26_W1	23/11/2021	26	Non-Operational Corridor	Mid Corridor	721665.26	6082185.435			1370	-	1670.2	-
T26_W2	23/11/2021	26	Non-Operational Corridor	Corridor Boundary	721659.8858	6082185.013			869	-	1059.4	-
T27_B	23/11/2021	27	Non-Operational Corridor	Between Tracks	721794.8489	6081432.291			2524	-	**3077.0**	-
T27_E1	23/11/2021	27	Non-Operational Corridor	Mid Corridor	721798.4829	6081432.202			3892	-	**4744.8**	-
T27_E2	23/11/2021	27	Non-Operational Corridor	Corridor Boundary	721810.4032	6081432.684			69.1	-	84.2	-
T27_W1	23/11/2021	27	Non-Operational Corridor	Mid Corridor	721789.8992	6081430.638			2547	-	**3105.1**	-
T27_W2	23/11/2021	27	Non-Operational Corridor	Corridor Boundary	721786.8766	6081429.713			330	-	402.3	-
T28_B	23/11/2021	28	Non-Operational Corridor	Between Tracks	721864.3386	6081021.746			453	-	552.3	-
T28_E1	23/11/2021	28	Non-Operational Corridor	Mid Corridor	721866.2185	6081024.252			266	-	324.3	-
T29_B	23/11/2021	29	Non-Operational Corridor	Between Tracks	721972.7725	6080355.813			868	-	1058.2	-
T29_E1	23/11/2021	29	Non-Operational Corridor	Mid Corridor	721975.9353	6080355.069			239	-	291.4	-
T29_E2	23/11/2021	29	Non-Operational Corridor	Corridor Boundary	721983.2188	6080355.555			67.8	-	82.7	-
T29_W1	23/11/2021	29	Non-Operational Corridor	Mid Corridor	721970.5943	6080353.435	D04_211123	CA2107572-2	347	629	629.0	15.4
T29_W2	23/11/2021	29	Non-Operational Corridor	Corridor Boundary	721967.1502	6080352.89			235	-	286.5	-
T30_B	24/11/2021	30	Non-Operational Corridor	Between Tracks	722075.883	6079747.399			3637	-	**4433.9**	-
T30_E1	24/11/2021	30	Non-Operational Corridor	Mid Corridor	722079.1806	6079744.764			308	-	375.5	-
T30_E2	24/11/2021	30	Non-Operational Corridor	Corridor Boundary	722088.1617	6079747.761			44.7	-	54.5	-
T30_W1	24/11/2021	30	Non-Operational Corridor	Mid Corridor	722071.9912	6079744.387			5772	-	**7036.7**	-
T30_W2	24/11/2021	30	Non-Operational Corridor	Corridor Boundary	722064.8125	6079748.117			35.8	-	43.6	-
T31_B	24/11/2021	31	Non-Operational Corridor	Between Tracks	722235.6486	6079181.537			2281	-	**2780.8**	-
T31_E1	24/11/2021	31	Non-Operational Corridor	Mid Corridor	722242.4394	6079184.648			3529	-	**4302.3**	-
T31_E2	24/11/2021	31	Non-Operational Corridor	Corridor Boundary	722249.2805	6079188.858			131	-	159.7	-
T31_W1	24/11/2021	31	Non-Operational Corridor	Corridor Boundary	722232.28	6079177.624			4217	-	**5141.0**	-
T32_B	24/11/2021	32	Non-Operational Corridor	Between Tracks	722298.2832	6078496.193			2746	-	**3347.7**	-
T32_E1	24/11/2021	32	Non-Operational Corridor	Mid Corridor	722300.7464	6078492.913			348	-	424.3	-
T32_W1	24/11/2021	32	Non-Operational Corridor	Mid Corridor	722331.1381	6078182.787			169	-	206.0	-
T33_B	24/11/2021	33	Non-Operational Corridor	Between Tracks	722296.9236	6078496.337	D01_211124	CA2107572-2	6252	8770	**8770.0**	19.9
T33_E1	24/11/2021	33	Non-Operational Corridor	Mid Corridor	722324.5388	6078180.509			2894	-	**3528.1**	-
T33_E2	24/11/2021	33	Non-Operational Corridor	Corridor Boundary	722326.8505	6078182.117			5727	-	**6981.9**	-
T33_W1	24/11/2021	33	Non-Operational Corridor	Mid Corridor	722321.4952	6078178.697			1108	-	1350.8	-
T33_W2	24/11/2021	33	Non-Operational Corridor	Corridor Boundary	722312.7713	6078178.691			33.2	-	40.5	-
T34_B	24/11/2021	34	Non-Operational Corridor	Between Tracks	722457.4254	6077819			686	-	836.3	-
T34_E1	24/11/2021	34	Non-Operational Corridor	Mid Corridor	722459.7177	6077823.494			22.6	-	27.6	-
T34_E2	24/11/2021	34	Non-Operational Corridor	Corridor Boundary	722465.4361	6077823.241			727	-	886.3	-
T34_W1	24/11/2021	34	Non-Operational Corridor	Mid Corridor	722451.6189	6077823.029			89.5	-	109.1	-
T34_W2	24/11/2021	34	Non-Operational Corridor	Corridor Boundary	722449.4037	6077817.978			54.3	-	66.2	-
T35_B	24/11/2021	35	Non-Operational Corridor	Between Tracks	722658.2502	6077204.262	D02_211124	CA2107572-2	6950	9140	**9140.0**	16.6
T35_E1	24/11/2021	35	Non-Operational Corridor	Mid Corridor	722661.844	6077206.282			8324	-	**10147.9**	-
T35_E2	24/11/2021	35	Non-Operational Corridor	Corridor Boundary	722668.5583	6077209.556			477	-	581.5	-
T35_W1	24/11/2021	35	Non-Operational Corridor	Mid Corridor	722656.0571	6077203.761			2691	-	**3280.6**	-
T35_W2	24/11/2021	35	Non-Operational Corridor	Corridor Boundary	722651.4341	6077196.883			38	-	46.3	-
T36_B	24/11/2021	36	Non-Operational Corridor	Between Tracks	722831.9568	6076746.266			6802	-	**8292.4**	-
T36_E1	24/11/2021	36	Non-Operational Corridor	Mid Corridor	722840.3573	6076744.281			77.9	-	95.0	-
T36_E2	24/11/2021	36	Non-Operational Corridor	Corridor Boundary	722847.7839	6076746.983			140	-	170.7	-
T36_W1	24/11/2021	36	Non-Operational Corridor	Mid Corridor	722824.9156	6076748.106			3669	-	**4472.9**	-
T36_W2	24/11/2021	36	Non-Operational Corridor	Corridor Boundary	722817.5302	6076743.405			27.5	-	33.5	-
T37_B	24/11/2021	37	Non-Operational Corridor	Between Tracks	722884.4189	6076349.336			58.7	-	71.6	-
T37_E1	24/11/2021	37	Non-Operational Corridor	Mid Corridor	722889.0855	6076350.663			44.7	-	54.5	-
T37_E2	24/11/2021	37	Non-Operational Corridor	Corridor Boundary	722894.4616	6076347.643			16.1	-	19.6	-
T37_W1	24/11/2021	37	Non-Operational Corridor	Mid Corridor	722877.0944	6076347.076			100.2	-	122.2	-
T37_W2	24/11/2021	37	Non-Operational Corridor	Corridor Boundary	722872.4443	6076342.751			29.1	-	35.5	-
T38_B	24/11/2021	38	Non-Operational Corridor	Between Tracks	722954.3747	6075815.876			1604	-	**1955.5**	-
T38_E1	24/11/2021	38	Non-Operational Corridor	Mid Corridor	722956.7454	6075818.868			231	-	281.6	-
T38_E2	24/11/2021	38	Non-Operational Corridor	Corridor Boundary	722960.5454	6075818.872			1098	-	1338.6	-
T38_W1	24/11/2021	38	Non-Operational Corridor	Mid Corridor	722949.2741	6075819			29.6	-	36.1	-
T38_W2	24/11/2021	38	Non-Operational Corridor	Corridor Boundary	722945.9203	6075819.305			101.4	-	123.6	-
T39_B	24/11/2021	39	Non-Operational Corridor	Between Tracks	722872.8162	6075305.276			9759	-	**11897.4**	-
T39_W1	24/11/2021	39	Non-Operational Corridor	Mid Corridor	722866.6208	6075308.205			4620	-	**5632.3**	-
T40_B	15/12/2021	40	Non-Operational Corridor	Between Tracks	722867.8067	6074866.369	D01_211215	ES2146882	49.7	246	246.0	15.3
T40_E1	15/12/2021	40	Non-Operational Corridor	Mid Corridor	722872.2303	6074865.26			67.6	-	82.4	-
T40_E2	15/12/2021	40	Non-Operational Corridor	Corridor Boundary	-	-			50.6	-	61.7	-
T40_W1	15/12/2021	40	Non-Operational Corridor	Mid Corridor	722868.0625	6074865.697			22.4	-	27.3	-
T40_W2	15/12/2021	40	Non-Operational Corridor	Corridor Boundary	722860.9591	6074861.322			15.2	-	18.5	-
T41_B	15/12/2021	41	Non-Operational Corridor	Between Tracks	722881.0814	6074768.242			8038	-	**9799.3**	-
T41_DAM	15/12/2021	41	Non-Operational Corridor	Boundary - Drainage Channel	722913.0694	6074765.116			18.2	-	22.2	-
T41_E1	15/12/2021	41	Non-Operational Corridor	Mid Corridor	-	-			69.1	-	84.2	-
T41_E2	15/12/2021	41	Non-Operational Corridor	Corridor Boundary	722898.9295	6074766.355			129	-	157.3	-
T41_W1	15/12/2021	41	Non-Operational Corridor	Mid Corridor	722876.5012	6074770.354			33.2	-	40.5	-
T41_W2	15/12/2021	41	Non-Operational Corridor	Corridor Boundary	-	-			28.8	-	35.1	-
T42_B	15/12/2021	42	Non-Operational Corridor	Between Tracks	722853.0572	6074130.873			3803	-	**4636.3**	-
T42_E1	15/12/2021	42	Non-Operational Corridor	Mid Corridor	-	-			191	-	232.9	-
T42_E2	15/12/2021	42	Non-Operational Corridor	Corridor Boundary	-	-			244	-	297.5	-
T42_W1	15/12/2021	42	Non-Operational Corridor	Mid Corridor	722848.3841	6074136.54			31.4	-	38.3	-
T42_W2	15/12/2021	42	Non-Operational Corridor	Corridor Boundary	722845.1189	6074136.732			45.2	-	55.1	-
T43_B	15/12/2021	43	Non-Operational Corridor	Between Tracks	722603.615	6073362.47			12000	-	**14629.4**	-
T43_E1	15/12/2021	43	Non-Operational Corridor	Mid Corridor - Drainage	-	-	D02_211215	ES2146882	3469	4900	**4900.0**	16.1
T43_E2	15/12/2021	43	Non-Operational Corridor	Corridor Boundary	-	-			1105	-	1347.1	-
T43_W1	15/12/2021	43	Non-Operational Corridor	Mid Corridor - Drainage	722604.5503	6073363.557			2837	-	**3458.6**	-
T44_B	15/12/2021	44	Non-Operational Corridor	Between Tracks	722185.2121	6073037.397			4341	-	**5292.2**	-
T44_E1	15/12/2021	44	Non-Operational Corridor	Mid Corridor	722186.667	6073033.809			465	-	566.9	-
T44_E2	15/12/2021	44	Non-Operational Corridor	Corridor Boundary	722190.9439	6073030.484			142.1	-	173.2	-
T44_W1	15/12/2021	44	Non-Operational Corridor	Mid Corridor	-	-			411	-	501.1	-
T44_W2	15/12/2021	44	Non-Operational Corridor	Corridor Boundary	-	-			103.2	-	125.8	-
T45_B	15/12/2021	45	Non-Operational Corridor	Between Tracks	722091.9027	6072479.241			1717	-	**2093.2**	-

									Lead			Moisture
									XRF Reading	Laboratory Result	Corrected Data Set*	Moisture Content
EQL									ppm 1-4	mg/kg 5	mg/kg 1-4	% 0.1
NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)											1500	
NEPM 2013 Table 1A(1) Open Space (HIL C)											600	
NEPM 2013 Table 1A(1) Residential (HIL A)											300	
NEPM 2013 Table 1B(4) EIL Commercial and Industrial											**1800**	
NEPM 2013 Table 1B(4) EIL Urban Residenitial and Public Open Space											1100	
NEPM 2013 Table 1B(4) EIL Areas of Ecological Significance (Applicable to T51-T66 Only)											*470*	
Sample Point	**Date**	**Transect**	**Site Area**	**Location inTransect**	**Easting**	**Northing**	**Laboratory Sample**	**Lab Report Number**				
T45_E1	15/12/2021	45	Non-Operational Corridor	Mid Corridor	722093.9847	6072478.967			806	-	982.6	-
T45_E2	15/12/2021	45	Non-Operational Corridor	Corridor Boundary	722095.3955	6072477.267			725	-	883.9	-
T45_W1	15/12/2021	45	Non-Operational Corridor	Mid Corridor	722086.273	6072479.269			350	-	426.7	-
T45_W2	15/12/2021	45	Non-Operational Corridor	Corridor Boundary	722076.1521	6072484.96			32.5	-	39.6	-
T46_B	15/12/2021	46	Non-Operational Corridor	Between Tracks	-	-			86	-	104.8	-
T46_E1	15/12/2021	46	Non-Operational Corridor	Mid Corridor	722104.7138	6071952.309			33.5	-	40.8	-
T46_E2	15/12/2021	46	Non-Operational Corridor	Corridor Boundary	722108.7481	6071950.211			37.4	-	45.6	-
T46_W1	15/12/2021	46	Non-Operational Corridor	Mid Corridor	722099.0899	6071952.559	D03_211215	ES2146882	9061	11200	***11200.0***	14.8
T46_W2	15/12/2021	46	Non-Operational Corridor	Mid Corridor	-	-			959	-	1169.1	-
T46_W3	15/12/2021	46	Non-Operational Corridor	Corridor Boundary	722073.8963	6071950.964			43.8	-	53.4	-
T47_B	15/12/2021	46	Non-Operational Corridor	Between Tracks	722285.6719	6071282.111			6108	-	***7446.4***	-
T47_E1	15/12/2021	47	Non-Operational Corridor	Mid Corridor	722290.4537	6071277.219			216	-	263.3	-
T47_E2	15/12/2021	47	Non-Operational Corridor	Corridor Boundary	722296.4871	6071278.845			40.5	-	49.4	-
T47_W1	15/12/2021	47	Non-Operational Corridor	Mid Corridor	722281.5525	6071280.77			267	-	325.5	-
T47_W2	15/12/2021	47	Non-Operational Corridor	Corridor Boundary	722275.5664	6071288.356			132.8	-	161.9	-
T48_B	15/12/2021	48	Non-Operational Corridor	Between Tracks	722307.8499	6070899.142			650	-	792.4	-
T48_E1	15/12/2021	48	Non-Operational Corridor	Mid Corridor	722308.3229	6070899.907			316	-	385.2	-
T48_W1	15/12/2021	48	Non-Operational Corridor	Mid Corridor	722305.3697	6070901.645			381	-	464.5	-
T48_W2	15/12/2021	48	Non-Operational Corridor	Corridor Boundary	722300.4944	6070902.766			132.3	-	161.3	-
T49_B	15/12/2021	49	Non-Operational Corridor	Between Tracks	-	-			3502	-	***4269.3***	-
T49_E1	15/12/2021	49	Non-Operational Corridor	Mid Corridor	-	-			1221	-	1488.5	-
T49_W1	15/12/2021	49	Non-Operational Corridor	Mid Corridor	-	-			294	-	358.4	-
T49_W2	15/12/2021	49	Non-Operational Corridor	Corridor Boundary	-	-			184.1	-	224.4	-
T50_B	15/12/2021	50	Non-Operational Corridor	Between Tracks	722226.1181	6069820.076			2511	-	***3061.2***	-
T50_E1	15/12/2021	50	Non-Operational Corridor	Mid Corridor	722225.4471	6069818.649			1227	-	1495.9	-
T50_E2	15/12/2021	50	Non-Operational Corridor	Mid Corridor	722228.1059	6069819.693			1952	-	***2379.7***	-
T50_E3	15/12/2021	50	Non-Operational Corridor	Mid Corridor	722229.6731	6069820.653			2848	-	***3472.0***	-
T50_W1	15/12/2021	50	Non-Operational Corridor	Mid Corridor	722217.672	6069823.616			42	-	51.2	-
T51_B	15/12/2021	51	Non-Operational Corridor	Between Tracks	721978.2966	6069400.406			12400	-	***15117.0***	-
T51_E1	15/12/2021	51	Non-Operational Corridor	Mid Corridor	721981.5654	6069396.772			732	-	*892.4*	-
T51_E2	15/12/2021	51	Non-Operational Corridor	Corridor Boundary	721986.7311	6069389.096			15.5	-	18.9	-
T51_W1	15/12/2021	51	Non-Operational Corridor	Mid Corridor	721973.4221	6069397.863	D04_211215	ES2146882	4220	3330	***4220.0***	13.4
T51_W2	15/12/2021	51	Non-Operational Corridor	Mid Corridor	721972.2812	6069399.445			1184	-	*1443.4*	-
T51_W3	15/12/2021	51	Non-Operational Corridor	Corridor Boundary	721964.3137	6069400.309			80.6	-	98.3	-
T52_B	15/12/2021	52	Non-Operational Corridor	Between Tracks	721741.0053	6068822.396			31500		***38398.5***	
T52_E1	15/12/2021	52	Non-Operational Corridor	Mid Corridor	721746.2066	6068819.825			1987	-	***2422.4***	-
T52_E2	15/12/2021	52	Non-Operational Corridor	Corridor Boundary	-	-			21.1	-	25.7	-
T52_W1	15/12/2021	52	Non-Operational Corridor	Mid Corridor	721740.8102	6068829.172			594	-	*724.2*	-
T52_W2	15/12/2021	52	Non-Operational Corridor	Mid Corridor	-	-			1742	-	***2123.7***	-
T52_W3	15/12/2021	52	Non-Operational Corridor	Corridor Boundary	-	-			41.2	-	50.2	-
T53_B	15/12/2021	53	Non-Operational Corridor	Between Tracks	721582.5889	6068078.248			4540	-	***5534.8***	-
T53_E1	15/12/2021	53	Non-Operational Corridor	Mid Corridor	721585.8931	6068079.72			365	-	445.0	-
T53_E2	15/12/2021	53	Non-Operational Corridor	Corridor Boundary	-	-			5250	-	***6400.4***	-
T53_W1	15/12/2021	53	Non-Operational Corridor	Mid Corridor	721579.0813	6068079.556			44.4	-	54.1	-
T53_W2	15/12/2021	53	Non-Operational Corridor	Corridor Boundary	721573.2207	6068081.145			3019	-	***3680.5***	-
T54_B	15/12/2021	54	Non-Operational Corridor	Between Tracks	721634.7739	6067393.264			6787	-	***8274.1***	-
T54_E1	15/12/2021	54	Non-Operational Corridor	Mid Corridor	721638.3637	6067395.284			39.7	-	48.4	-
T54_E2	15/12/2021	54	Non-Operational Corridor	Corridor Boundary	721642.7148	6067391.402			227	-	276.7	-
T54_W1	15/12/2021	54	Non-Operational Corridor	Mid Corridor	721631.6487	6067395.34			70	-	85.3	-
T54_W2	15/12/2021	54	Non-Operational Corridor	Corridor Boundary	721629.6724	6067396.166			42.4	-	51.7	-
T55_B	15/12/2021	55	Non-Operational Corridor	Between Tracks	721509.1269	6066875.534			3525	-	***4297.4***	-
T55_E1	15/12/2021	55	Non-Operational Corridor	Mid Corridor	-	-			298	-	363.3	-
T55_W1	15/12/2021	55	Non-Operational Corridor	Mid Corridor	-	-	D05_211215	ES2146882	951	278	*951.0*	4
T56_B	16/12/2021	56	Non-Operational Corridor	Between Tracks	721827.8656	6066363.657			8201	-	***9998.0***	-
T56_E1	16/12/2021	56	Non-Operational Corridor	Mid Corridor	721834.2885	6066362.831			378	-	460.8	-
T56_E2	16/12/2021	56	Non-Operational Corridor	Mid Corridor	721836.5421	6066362.22			423	-	*515.7*	-
T56_E3	16/12/2021	56	Non-Operational Corridor	Mid Corridor	721847.673	6066360.945			88.9	-	108.4	-
T56_W1	16/12/2021	56	Non-Operational Corridor	Mid Corridor	721825.8373	6066362.375			116.8	-	142.4	-
T56_W2	16/12/2021	56	Non-Operational Corridor	Mid Corridor	721821.9867	6066360.806			148.8	-	181.4	-
T57_B	16/12/2021	57	Non-Operational Corridor	Between Tracks	721841.132	6065943.942			6315	-	***7698.7***	-
T57_E1	16/12/2021	57	Non-Operational Corridor	Mid Corridor	721843.7919	6065937.77			207	-	252.4	-
T57_W1	16/12/2021	57	Non-Operational Corridor	Mid Corridor	721841.3189	6065944.159			62.2	-	75.8	-
T58_B	16/12/2021	58	Non-Operational Corridor	Between Tracks	721816.3525	6065417.383			7164	-	***8733.7***	-
T58_E1	16/12/2021	58	Non-Operational Corridor	Mid Corridor	721819.991	6065417.737			250	-	304.8	-
T58_E2	16/12/2021	58	Non-Operational Corridor	Mid Corridor	721826.5229	6065414.022			173	-	210.9	-
T59_B	16/12/2021	59	Non-Operational Corridor	Between Tracks	721775.5828	6064444.194			5510	-	***6717.3***	-
T59_E1	16/12/2021	59	Non-Operational Corridor	Mid Corridor	-	-			156	-	190.2	-
T59_W1	16/12/2021	59	Non-Operational Corridor	Mid Corridor	721774.1292	6064444.119			27700	-	***33769.5***	-
T59_W2	16/12/2021	59	Non-Operational Corridor	Mid Corridor	721775.7944	6064445.41			3542	-	***4318.1***	-
T59_W3	16/12/2021	59	Non-Operational Corridor	Corridor Boundary	721771.1892	6064446.301			210	-	256.0	-
T60_B	16/12/2021	60	Non-Operational Corridor	Between Tracks	721687.8373	6064279.417			6196	-	***7553.6***	-
T60_E1	16/12/2021	60	Non-Operational Corridor	Mid Corridor	721690.9258	6064279.562			2190	-	***2669.9***	-
T60_E2	16/12/2021	60	Non-Operational Corridor	Corridor Boundary	721699.0263	6064284.246			496	-	*604.7*	-
T60_W1	16/12/2021	60	Non-Operational Corridor	Mid Corridor	721687.6314	6064282.086			3148	-	***3837.8***	-
T60_W2	16/12/2021	60	Non-Operational Corridor	Corridor Boundary	721680.5945	6064283.704			215	-	262.1	-
T61_B	16/12/2021	61	Non-Operational Corridor	Between Tracks	721729.1253	6063895.971			7201	-	***8778.9***	-
T61_E1	16/12/2021	61	Non-Operational Corridor	Mid Corridor	-	-			556	-	*677.8*	-
T61_E2	16/12/2021	61	Non-Operational Corridor	Corridor Boundary	721735.085	6063898.487			139.5	-	170.1	-
T61_W1	16/12/2021	61	Non-Operational Corridor	Mid Corridor	721723.2925	6063902.221			4642	-	***5659.1***	-
T61_W2	16/12/2021	61	Non-Operational Corridor	Corridor Boundary	-	-			422	-	*514.5*	-
T62_B	16/12/2021	62	Non-Operational Corridor	Between Tracks	721496.6668	6063065.188	D01_211216	ES2146882	8585	12400	***12400.0***	19
T62_E1	16/12/2021	62	Non-Operational Corridor	Mid Corridor	721497.3645	6063064.06	D02_211216	ES2146882	2875	1090	***2875.0***	12.5
T62_E2	16/12/2021	62	Non-Operational Corridor	Corridor Boundary	721499.8344	6063064.887			1257	-	*1532.4*	-
T62_W1	16/12/2021	62	Non-Operational Corridor	Mid Corridor	721494.6832	6063065.681			5986	-	***7297.6***	-
T62_W2	16/12/2021	62	Non-Operational Corridor	Corridor Boundary	721485.9851	6063066.119			83.5	-	101.8	-
T63_B	16/12/2021	63	Non-Operational Corridor	Between Tracks	721541.0958	6062461.203			196	-	238.9	-
T63_E1	16/12/2021	63	Non-Operational Corridor	Mid Corridor	721543.2605	6062460.705			531	-	*647.4*	-
T63_W1	16/12/2021	63	Non-Operational Corridor	Mid Corridor	721537.9942	6062460.503			269	-	327.9	-
T64_B	16/12/2021	64	Non-Operational Corridor	Between Tracks	721379.1582	6062065.593	D03_211216	ES2146882	6329	11000	***11000.0***	29.7
T64_E1	16/12/2021	64	Non-Operational Corridor	Mid Corridor	721376.9879	6062062.206			40.3	-	49.1	-
T64_E2	16/12/2021	64	Non-Operational Corridor	Corridor Boundary	721383.6633	6062064.372			75.7	-	92.3	-

									Lead			Moisture
									XRF Reading	Laboratory Result	Corrected Data Set*	Moisture Content
EQL									ppm 1-4	mg/kg 5	mg/kg 1-4	% 0.1
NEPM 2013 Table 1A(1) Commercial & Industrial (HIL D)											1500	
NEPM 2013 Table 1A(1) Open Space (HIL C)											600	
NEPM 2013 Table 1A(1) Residential (HIL A)											300	
NEPM 2013 Table 1B(4) EIL Commercial and Industrial											**1800**	
NEPM 2013 Table 1B(4) EIL Urban Residenitial and Public Open Space											1100	
NEPM 2013 Table 1B(4) EIL Areas of Ecological Significance (Applicable to T51-T66 Only)											*470*	
Sample Point	**Date**	**Transect**	**Site Area**	**Location inTransect**	**Easting**	**Northing**	**Laboratory Sample**	**Lab Report Number**				
T64_W1	16/12/2021	64	Non-Operational Corridor	Mid Corridor	721373.6945	6062068.393	D04_211216/ T01_211216	ES2146882 / 859898	654	1110	*1110.0*	48.3
T64_W2	16/12/2021	64	Non-Operational Corridor	Corridor Boundary	721372.2	6062066.654			88.8	-	108.3	-
T65_B	16/12/2021	65	Non-Operational Corridor	Between Tracks	721290.77	6061712.894	D05_211216	ES2146882	4661	6860	***6860.0***	26.9
T65_E1	16/12/2021	65	Non-Operational Corridor	Mid Corridor	721293.5748	6061716.266			3591	-	***4377.8***	-
T65_E2	16/12/2021	65	Non-Operational Corridor	Corridor Boundary	721292.7809	6061717.174			455	-	*554.7*	-
T65_W1	16/12/2021	65	Non-Operational Corridor	Mid Corridor	-	-	D06_211216 / /T01_211216	ES2146882 / 859898	3638	1190***	***3638.0***	5.4
T65_W2	16/12/2021	65	Non-Operational Corridor	Corridor Boundary	721285.2022	6061718.805			63.8	-	77.8	-
T66_B	16/12/2021	66	Non-Operational Corridor	Between Tracks	721137.9	6060961.389			5663	-	***6903.9***	-
T66_E1	16/12/2021	66	Non-Operational Corridor	Mid Corridor	721138.5816	6060974.249			1216	-	*1482.4*	-
T66_E2	16/12/2021	66	Non-Operational Corridor	Corridor Boundary	721140.5755	6060970.536			151.5	-	184.7	-
T66_W1	16/12/2021	66	Non-Operational Corridor	Mid Corridor	721131.9508	6060966.532			1668	-	***2033.5***	-
T66_W2	16/12/2021	66	Non-Operational Corridor	Corridor Boundary	721125.2131	6060965.478			31.9	-	38.9	-
Count									282	17	282	18
Exceedences									-	-	156	-
Average									-	-	2395.4	-
95% UCL									-	-	3211.0	-
Standard Deviation									-	-	3891.0	-

* Moisture correction has been applied using exact moisture where lab data is available. Where lab data is not available, average lab moisture has been used to account for the variability in moisture content observed across the Site.
*Moisture Corrected XRF Lead = XRF Lead/(100 – moisture content %)*100
*** Where laboratory duplicate analysed by primary and secondary laboratories, the higher of the analytical results is shown.

APPENDIX C DATA QUALITY OBJECTIVES

C1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) were developed to define the type and quality of data required to achieve the project objectives outlined in *Section 1.2*. The DQOs have been prepared in line with the seven-step approach outlined in National Environment Protection (Assessment of Site Contamination) Measure (the ASC NEPM) (NEPC, 1999) (as amended 2013), and with reference to relevant guidelines published by the ACT EPA, specifically the Contaminated Sites Environment Protection Policy (December 2017).

The DQO process is validated, in part, by the quality assurance and quality control (QA/QC) procedures and assessment presented in *Appendix G* of this report. The seven steps of the DQO process, and how they were applied to this assessment, are presented in the following subsections.

C1.1 STEP 1: STATE THE PROBLEM

The Site is currently owned by the Transport for NSW (TfNSW). Management of the Site falls under the rail operations and maintenance services of the Country Regional Rail Network (CRN), which was formerly managed by JHR and currently managed by UGL on behalf of TfNSW. ERM understands that TfNSW and JHR would like to understand the likelihood of the presence of contamination near the Site and whether any contamination exists at the Site and if so, does it present a risk to on or offsite receptors.

C1.2 STEP TWO: IDENTIFY THE DECISIONS

Overall the principal decision to be made is whether potential risk to human health or the environment exists as a result of historical site activities. In order to inform this decision, the following questions need to be considered:

- What potential sources of contamination are or were present at the site?
- Is the sampling pattern adequate to collect the required data to achieve the survey objectives?
- What is the nature and extent of the COPC in near surface soils at the site?
- Is contamination in excess of relevant guideline values present?
- What receptors are potentially at risk of exposure?
- What potential exposure scenarios should be considered?
- Does the contamination likely warrant notification under the Environment Protection Act 1997?

C1.3 STEP 3: IDENTIFY INPUTS TO DECISION

The primary inputs required to make the above decisions are as follows:

- general observations of the Site;
- review of historical information pertaining to the site;
- the type, number and location of sampling points;
- direct measurement and observation of environmental variables;

- XRF measurements for surface soils for lead
- laboratory measurement of soil samples for lead;
- field and laboratory quality assurance/quality control data;
- assessment of concentrations of the COPC against relevant published human health and ecological risk screening criteria; and
- Likelihood of identified receptors being exposed to concentrations of COPCs above the relevant adopted criteria.

C1.4 STEP 4: DEFINE THE STUDY BOUNDARIES

C1.1.1 Spatial Boundaries

The spatial boundary of the investigation is surrounding the site, specifically the soil investigation locations presented on *Figures 3.1-3.31, Appendix A*. The investigation included the surface soils (to ~0.05m) within the investigation area.

C1.1.2 Temporal Boundaries

Temporally, the investigation was intended to provide a preliminary assessment the nature and extent of potential soil lead contamination across the investigation area. The survey occurred on the 22-24th November, and 15-17 December 2021.

C1.5 STEP FIVE: DEVELOP A DECISION RULE

The DQOs have been developed to facilitate the collection of adequate soil data to address the decisions outlined in Step 2 of the DQO process. The potential significance of field observations / measurement have been considered throughout this investigation, however the primary decision rule utilised for this assessment was comparison of analytical data with relevant published human health and ecological risk screening criteria, and consideration of background conditions.

Individual soil data were compared to the relevant screening criteria. Exceedance of the screening criteria does not necessarily indicate the requirement for remediation or a risk to human health and / or the environment through the qualitative assessment of the potential linkage between the source and the receptor via a pathway and described through the initial conceptual site model (CSM). If individual concentrations exceeded the screening criteria, consideration of the extent of the impact, the potential for receptors to be exposed and regulatory compliance was considered.

C1.5.1 Screening Criteria

The Tier 1 screening criteria for soil data has been selected based on a review of the following reference documents:

Relevant screening criteria selected for comparison against the soil results are discussed in *Section 4.1* of this report.

C1.5.2 Appropriateness of Laboratory Limit of Reporting

XRF and laboratory analytical techniques have limits to their precision, and the Limit of Reporting (LOR) describes the lowest concentration that can be reported with confidence. Where a given assessment criteria is lower than the LOR concentration, a meaningful comparison generally cannot be made.

This investigation has employed standard LORs. Comparison of the LOR with the assessment criteria will be undertaken to confirm that the assessment criteria are less than the laboratory LOR and any exceptions to this shall be appropriately noted and justified.

C1.6 STEP 6: SPECIFY LIMITS ON DECISION ERRORS

The acceptable limits on decision errors applied during the review of the results will be based on the Data Quality Indicators (DQIs) of Precision, Accuracy, Representativeness, Comparability and Completeness (PARCC) in accordance with the ASC NEPM, Schedule B(3) - Guidelines on Laboratory Analysis.

The potential for significant decision errors will be reduced by:

- Ensuring the laboratory data is comparable to the XRF data, and if not determine if standard corrections to the XRF data set may be required;
- completing a robust QA/QC assessment of the data, requiring that 95% of data satisfy the DQIs and therefore placing a limit on the decision error of 5% (see *Appendix G*);
- assessing whether appropriate sampling and analytical density has been achieved for the purposes of meeting the project objectives; and
- ensuring that the assessment criteria selected are appropriate for the current and future commercial/industrial and open space land uses, as well as potential ecological and residential receptors.

C1.7 STEP 7: DEVELOP (OPTIMISE) THE PLAN FOR COMPLETING THE WORKS

The investigation scope was tailored to match DQOs with project objectives, to combine targeted investigation based on existing knowledge and discussions with JHR and TfNSW. During the site inspection and fieldworks the scope was continuously reviewed to accommodate new information such as potential sources of site contamination and the results obtained through the use of the XRF device.

APPENDIX D CALIBRATION CERTIFICATES AND FIELD DOCUMENTATION

CERTIFICATE OF CALIBRATION

• **Model:**	DPO-4000-CX-A-EN-EN-SEV
• **Serial Number:**	541500
• **Customer:**	Enqip
• **Notification Number:**	300128815
• **Temperature:**	23 ℃
• **Humidity:**	36 %
• **Calibration Date:**	27 April 2020
• **Recommended Calibration Due Date:**	27 April 2021
• **Calibration Procedure:**	OIX-610159 REV.C
• **Status After Calibration:**	**Pass**

Calibrated Modes:

Soil Mode	----------
Lead Paint Mode	----------
----------	----------

Certified Reference Materials used:

Soil Certified Reference Materials : produced by National Institute of Standards and Technology (NIST), Geostats PTY LTD and Ore Research PTY LTD
Lead Paint Certified Reference Materials : produced by Lead Paint Certified Reference Materials National Institute of Standards and Technology (NIST) SRM 2570-SRM 2575
Choose an item.
Choose an item.
Choose an item.

This instrument was calibrated according to the manufacturer's calibration procedure. The calibration was verified using certified reference materials. This instrument conforms to Olympus Australia Quality Assurance standards.

Tested by: **Jack Zhu**

Date: 27 April 2020

OLYMPUS AUSTRALIA PTY. LTD.
PO Box 985 Mount Waverley Victoria 3149 Australia
Australia-wide Customer Service: 1300 132 992
ABN 90 078 493 295

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-08 7.

Date: 22/11/21

transect

Location ID	#	Run time	Reading	Dup	Description
T7_B	1087	7	2.07 ± 0.1		Brown silty sand overlain by gravels & ballast. Damp.
T7_E1	1088	7	1380 ± 7 ppm		Brown silt w sand & gravel, damp. Grass.
T7_E2	1089	7	21.9 ± 1.3		yellow / brown clayey silt w gravels. Bare. Damp.
T7_W1	1090	7	22.8 ± 1.1		Brown / orange sandy silt w gravels.
T7_W2	1091	7	14.9 ± 1.0		Light brown silt, damp, gravels.
T6_W1	1092	6	73.2 ± 1.8		Light brown silt with ballast. wet.
T6_W2	1093	6	39.2 ± 1.4		" " no ballast, grass.
T6_E1	1094	6	76.5 ± 1.5		Light brown sandy silt w ballast, moist.
T6_E2	1095	6	230 ± 3		" " top of clothing.
T5_E1	1096	5	386 ± 3.		Brown sandy silt w gravel & ballast. Bare, damp.
T5_E2	1097	5	16.4 ± 1.2		Light brown & orange clayey silt w minor gravels. Bare. Drainage.
T5_W1	1098	5	265 ± 3.		" "
T5_W2	1099	5	33.5 ± 1.3.		" " no ballast, grass.
T4_W1	1100	4	168 ± 8		Dark brown sandy silt w gravels. Bare, damp.
T4_W2	1101	4	24.6 ± 1.4		Brown w orange silt. Gravels. Grass. Damp.
T4_E1	1102	4	79.2 ± 1.5		orange / brown sandy silt under ballast.
T4_E2	1103	4	98.7 ± 1.5.		Dark brown silt w gravel under grass, wet.
T3_E1	1104	3	69.1 ± 1.6		Orange / brown sandy silt w gravel & ballast under dead grass.
T3_W1	1105	3	24.9 ± 1.2		Brown gravelly sandy silt next to ballast. Damp.
T3_W2	1106	3	6.7 ± 1.2		Gravelly sandy silt orange/brown. Damp.
001_211122				D.	T3_W2.

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-057

Date: 22/11/21

Location ID	#	Run time	Reading	Dup	Description
T2_E1	1107		82.2±1.5		Sandy clayey silt, brown. Among Ballast. ~~root~~, damp.
T2_E2	1108		45±1.1		Brown silt, damp, under grass.
T2_W1	1109		50.3±1.4		Brown silt with sand & minor gravels. Damp
T2_W2	1110		19±1.0		Brown silt w gravels & sand, damp. Bare.
TL_E1	1111		110.9±1.8		Red/brown silty sand w ballast. Damp.
~~T1_E2~~	~~1112~~		8.8±0.9		Brown silt underlain by light brown sand. Damp. Bare w Ballast.
T1_W1	1113		↓		↓
T1_W2	1113		41.9±1.2		" ", bare patch next to ballast stockpile
T1_W3	1114		29.7±1.2		" " , " "
T16_B	1115		141.7±1.9		orange brown clayey silt w gravels. Damp.
T16_W1	1117		25.9±1.4		" "
T16_W2	1118		19.5±1.2		" "
T16_E1	1119		5416±18		orange brown silt underlain by dark grey/black gravels
T16_E2	1120		27.1±1.2		Brown silt w gravels, grass, damp.
T17_B	1121		1.12% ±0.1		Dark grey slag gravel sand mix
002_211122					T17_B.
T17_E1	1122		1665±8		Black & orange/brown sandy silts Bare, gravels.
T17_E2	1123		161.1±1.9		Green/brown gravelly silt among grass
T17_W1	1124		1488±8		Brown silty gravelly sand under grass next to drainage.
T17_W2	1125		191±2		" "
T18_~~B~~W2	1126		286±3		Edge of road. Brown silt w gravels.

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

Date: 22/11/21
23/11/21

ERM

from ref

Location ID	#	~~Run time~~	Reading	Dup	Description
T18_W1	1127	18	16.6 ±1		Braun sandy gravelly silt. Drainage, grass, wet.
T18_E1	1128	18	40.1±1.2		Braun/orang crumbly SILT, damp; grass
T18_E2	1129	18	17.6±1		Braun sandy silt under grass, damp, minor gravels.
T19_B.	1130	19.	2849±11		B Stn Black/grey slag gravelly sand. Damp.
T19_E1	1131	19	1574±7		Braun sandy silt, crumbly, bare, gravels. Next to slag ballast.
T19_E2	1132	19	200±2		Grey braun silt w organics under grass. Damp.
T19_W1	1133	19	636 ±4		Braun gravelly sandy silt. Bare patch.
T19_W2	1134	19	699±4		Light braun silt with fine sand. Gravels on surface. Bare patch.
T20_B	1135	20	6606 ±24		Black gravel and slag ballast.
T20_E1	1136	20	3186 ± 14		" underlain w braun silt, bare, damp.
T20_E2	1137	20	95.8 ± 1.5		Braun silt w organics under grass. damp.
T20_W1	1138	20	1.06% ±0.1		Black gravelly sand, dry. Bare patch near grass, bare
T20_W2	1139	20	1470±6		Braun silt under grass w dark gravels. Damp.
~~T20~~					End of day.
T12_B	1140	12	75.9±1.7		Braun/light braun sandy silt. Dry, hard, bare; under bridge.
T12_E1	1141	12	2187±10		Braun sandy silt w gravels on top. Dry/damp. Bare.
T12_E2	1142	12	74.9±1.6		Braun silt w sandy gravels. Bare on mound next to grass
T12_W1	1143	12	1113±7.		Braun sandy silt w gravel amongst grass. Damp.
T12_W2	1144	12	48.6 ±14		" w clay & rocks, more grass
T11_B	1145	12	3561±13		Dark braun sandy silt with black gravels. Damp. Organics.
1001_211123					XRF TR_B T11_B.

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

ERM

W Not possible, fence in middle

Date: 23/11/14

Location ID	#	Run time	Reading	Dup	Description
T11_E1	1146	11	1.09% ± 0.1		Brown silt w gravels. Bare, damp.
T11_E2	1147	11	104 ± 1.7		orange/red brown sandy silt w gravels. road.
T10_B	1148	10	1205 ± 6		Dark grey/black sandy gravel 'ballast material'. Damp.
T10_E1	1149	10	422 ± 3		Dark grey brown organic silt. under grass, damp.
T10_E2	1150	10	199 ± 2		Brown silt near some large gravel. Damp, near grass.
T10_W1	1151	10	57 ± 1.4		Brown clayey silt under grass. Damp.
T10_W2	1152	10	35.7 ± 1.3		" " dry, no grass. / bare patch.
T9_B	1153	9	2336 ± 9		Dark brown silt under grass w organics. Damp.
T9_W1	1154	9	211.8 ± 2		Brown silt under grass w gravels. Damp.
T9_W2	1155	9	22.2 ± 1		Brown silt under grass, damp.
T9_E1	1156	9	126.5 ± 1.4		Dark brown silt under grass w organics, damp.
T9_E2	1157	9	150.2 ± 2.0		" " small bare patch in thick grass.
T8_B	1158	8	3555 ± 14.		Dark brown silt w 'ballast' gravels. Damp. some grass
T8_W1	1159	8	1061 ± 5		Brown silt w dark grey gravel. under grass
T8_W2	1160	8	24.5 ± 1.0		Brown silt under dead/live grass Damp.
T8_E1	1161	8	312 ± 3		" " slightly bare.
T8_E2	1162	8	72.6 ± 1.5		" "
T13_B.	1163	13	21 ± 1.1		Brown sandy silt w organics under grass
T13_E1	1164	13	27.7 ± 1.1		" "
T13_E2	1165	13	14.7 ± 1.1		" "
T13_W1	1166	13	262 ± 2		" " gravels.

* Lords requested to remain anonymous

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

Date: 23/11/21

Location ID	#	Run time	Reading	Dup	Description
T13_W2	1167	13	83±1		Bram silt under grass, damp.
T14_B	1168	14	4222±18	D.	Bram silt ± gravel undulan by fine black gravels. Some grass.
002_211123		14			T14_B.
T14_W1	1169	14	1118±7		Bram silt surranded by grass. Bare. Damp.
T14_W2	1170	14	407±3		Bram silt under grass ± organics, moist
T14_E1	1171	14	1855±9		Bram sandy gravelly silt, bare, next to grass.
T14_E2	1172	14	846±5		Bram silt w minor gravel under grass, damp.
T15_B	1173	15	1047±6		Same as T14_B.
T15_W1	1174	15	23.2±1.2		Bram silt w med-lge gravels, Bare patch.
T15_W2	1175	15	24.4±1.4		" " w some grass
T15_E1	1176	15	66.1±1.6		Bram silt w gravels. Damp. Bare, some grass
T15_E2	1177	15	13.7±4.7.		Bram silt, under grass, damp.
T21_B.	1178	21	8186±14		Same as T14_B.
T21_E1	1179	21	1017±1.7		dk Bram clayey silt & minor gravels in drainage next to grass. Bare
T21_E2	1180	21	305±3		Bram silt, bare, damp.
T21_W1	1181	21	260±3		" "
T21_W2	1182	21	152.5±2		" " under grass
T22_B	1183	22	4018±18		as T14_B.
T22_E1	1184	22	993±6		Bram silt ± gravels. Bare, moist.
003_211123					T22_E1
T22_E2	1185	22	70±1.4.		Bram silt, under grass. ~~dry~~ moist

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

Date: 28/11/21

transect (ppm)

Location ID	#	Run time	Reading	Dup	Description
T22_W1	1186	22	775±6		silt & gravels Brown, bare, damp
T22_W2	1187	22	57.3±1.2		Brown silt under grass, moist
T23_B	1188	23	2400±11		same as T14_B.
T23_E1	1189	23	113.1±1.9		Brown silt w minor gravels. Bare. Damp.
T23_E2	1190	23	23.2±1.2		" " , grass
T23_W1	1191	23	172±2		~~Silty~~ Brown silt, bare, minor gravels. Damp.
T23_W2	1192	23	32.5±1.3.		Brown silt under grass, damp.
T24_B	1193	24	4454±17		same as T14_B
T24_E1	1194	24	414±3.		Brown silt with 'ballast' gravels. Damp. Bare.
T24_E2	1195	24	57.1±1.1		Brown silt w organics under grass. Moist.
T24_W1	1196	24	416±3		Brown silt w gravels. Damp. Bare
T24_W2	1197	24	59.5±1.4.		Firm brown silt w gravel & clay Bare, damp.
T25_B	1198	25.	1747±9		Iron orange brown silt underlain by grey/black slag 'ballast'
T25_E1	1199	25	1270±8		Brown silt, bare patch, gravels, moist
T25_E2	1200 ~~1250~~	25	193±2		↳ Brown silt w organics under grass.
T25_W1	~~1251~~ 1201	25	11.3±1.2		Brown silt w gravels, bare patch.
T25_W2	~~1252~~ 1202	25	14.6±1.2		" " ~~gravels~~ grass.
T26_B	~~1253~~ 1203	26.	3809±21		as T14_B.
T26_W1	1204	26	1370±8		Brown gravelly silt w med to black gravels. Bare. Damp.
T26_W2	1205	26	869±5		Brown clayey silt. Small bare patch in grass Damp.
T26_E1	1206	26	1236±8		Brown silt w gravels. Bare. Near grass. Damp.
T26_E2	1207	26	558±4		Brown silt w organics. Under grass, damp.

XRF Sampling

ERM

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

Date: 23/11/21
24

transect (AM)

Location ID	#	Run time	Reading	Dup	Description
~~T27~~ T27_B	1208	27	2524±10		T14_B.
T27_W1	1209	27	2547±12		Braun silt with gravels & sand. Bare, damp.
T27_W2	1210	27	330±3		Braun silt under grass damp.
T27_E1	1211	27	3892±14		Dark grey silty sand/gravel. Damp. Bare.
T27_E2	1212	27	69.1±1.4		Braun silt under grass, damp.
T28_B	1213	28	453±3		Dark braun silt, patchy grass, gravel
T28_E1	1214	28	266±3		Braun silt & gravel next to grass.
T29_B	1215	29	868±5		Braun clayey silt under grass & rocks. Damp.
T29_E1	1216	29	239±3		" "
T29_E2	1217	29	67.8±1.3		" "
T29_W1	1218	29	347±3	D.	" "
T29_W2	1219	29	235±2		" " moist, grass
DUP_211123					~~T29~~ T29_W1
					End of day.
T30_B	1220	30	3637±13		Black gravelly sand 'ballast' Dry.
T30_W1	1221	30	5772±24		Dark brown silt & black gravel. Bare patch. Damp.
T30_W2	1222	30	35.9±1.1		Braun silt & organics Damp under grass.
T30_E1	1223	30	306±3		" " ~~Dark grey fine~~
T30_E2	1224	30	44.7±1.2		" "
T31_B	1225	31	2261±8		Same as T30_B.
T31_W	1226	31	4217±18		Braun silt & organics & gravel Bare, damp.

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-057

Date: 24/11/21

Location ID	#	Run time	Reading (ppm)	Dup	Description
T31_E1	1227		3529 ±14		Dark grey/brown sandy silt w organics under grass, damp.
T31_E2	1228		131 ± 1.7		" "
T32_B	1229		7796±13		Dark grey sandy gravel ballast. some grass, damp
T32_W1	1230		169±2		Brown silt w gravels Bare, damp.
T32_E1	1231		348±3		" "
T33_B	1232		6752±25	D.	as T32_B.
D01_211124					~~T32_B~~ T33_B
T33_W1	1233		1108±6		Brown silt w large gravels & sand damp.
T33_W2	1234		33.2±1.2		" " grass
T33_E1	1235		2894±14		Brown silt w sand & gravels Bare, damp.
T33_E2	1236		5727±22		" "
T34_B	1237		686±4		Brown silty grass underlain by black grey ballast/sand
T34_W1	1238		89.5±1.6		Brown silt w gravels, scattered grass.
T34_W2	1239		54.3±1.5		orange/brown ~~silt~~ clayey silt w gravels. Bare.
T34_E1	1240		72.6±1.3		Brown silt w gravels Bare, damp.
T34_E2	1241		777±5.		" " orange tint.
T35_B	1242		6960±27	D.	& as T33_B.
D02-211124					T35_B
T35_W1	1243		2691±12		Brown sandy gravelly silt underlain w black gravel. Bare.
T35_W2	1244		38±1		Brown silt w sand under grass. damp.
T35_E1	1245		8324±33		Grey brown. sandy silty gravel. DRY. Bare

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-05

Date: 24/11/11

(transect) / Apm

Location ID	#	Run time	Reading	Dup	Description
T36_E2	~~1245~~ 1245	35	477 ± 3		Brown silt w minor gravels. Bare patch in grass. damp.
T36_B	1247	36	6802 ± 25		Dark grey brown sandy silty gravel ballast. Bare / damp.
T36_W1	1248	36	3669 ± 16		Red brown gravelly sandy silt. Bare ; damp
T36_W2	1249	36	27.5 ± 1.4		Light brown silt w gravel. Bare, dry.
T36_E1	1245 50	36	771 ± 5		" "
T36_E2	1246 51	36	140 ± 2.		" " white / beige brown. w clay.
T37_B	1247 52	37	58.7 ± 14		Light brown silt w clay. Damp, soft, grass
T37_W1	1248 53	37	100.2 ± 1.8		Brown / orange silt w white gravels. Bare.
T37_W2	1249 54	37	29.1 ± 1.1		" " brown, less orange.
T37_E1	1250 55	37	44.7 ± 1.4		Light brown silt w gravels. Dry. Bare.
T37_E2	1251 56	37	16.1 ± 1.8		Brown silt, under grass, damp.
T38_B	1257	38	1604 ± 7		Dark grey ballast sand w white gravels. Dry.
T38_W1	1258	38	29.8 ± 1.2		Brown silt w gravel. Bare. Damp
T38_W2	1259	38	101.4 ± 1.9		Brown silt, dry, organics
T38_E1	1260	38	231 ± 3		Silty sand w gravels & rocks. Brown, damp.
T38_E2	1261	38	1098 ± 6		Brown silt w gravel & organics. under grass. damp
T39_B	1262	1 39	9759 ± 37		"Ballast" dust
T39_W1	1263	39	4620 ± 18		

Runway direction

* 37 - track sedimented over in cutting.

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 15/12/21

Location ID	#	Run time	Reading	Dup	Description
T40_B	1264	120.	49.7±1.3	✓ D.	Brown silt to clay ~~for~~ underlain by 'ballast' fill. Damp.
T40_W1	1265	120	22.4±1.1		Brown SILT w large quartz/marble rocks. Bare, damp.
T40_W2	1266	120	15.2±1.1		Brown silt under grass. damp.
T40_E1	1267	120	67.6±1.6		Bare brown/orange silt with large rocks. damp.
T40_E2	1268	120	50.6±1.2		Brown silt under grass Damp.
DOL_211215					T40_B
T41_B	1269	120	8038+-32		Dark brown/grey silty gravel. underlain w 'ballast' fill.
T41_E1	70. 1268	120	69.1±4		light brown silt, heavily washed out. damp / crumbly.
T41_E2	1271 ~~1270~~	120	~~69±64~~ 129 ±2		" "
T41_DAM	1272	120	18.2±1.1		" " hard.
T41_W1	W 17.	1273	28.2±1.1		Brown silt in uphill drainage channel. Damp.
T41_W2	1274	120	28.8±1		Damp brown silt w organics under grass.
T42_B	1275	120	3803±14		Dark grey/brown silt underlain by 'ballast'. Some grass.
T42_W1	1276	120	31.4		Brown silt. small bare patch in grass. Damp.
T42_W2	1277	120	13.2±1.2		" " under grass.
T42_E1	1278	120	19±2		Brown silt under gravels. Bare damp.
T42_E2	1279	120	244±3.		" " w grasses, moist
T43_B	1280	120.	1.20% ±0.1		Gravel/sand 'ballast'
T43_W1	1281	120.	2037±12		" "
T43_E1	1282	120	3469±12	D/E	" "
DO2_211215					T43_E1

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 15/12/21

Location ID	#	Run time	Reading	Dup	Description
~~T01_211215~~					~~T42_E1~~
T43_E2	1283	120	~~1285~~ 1105±5		Brown silt w dark gravels under grass. moist.
T44_B	1284	120	934±17		dry brown silt underlain by black gravel ballast.
T44_E1	1285	120	465±4		light brown silt. dry, with small gravel.
T44_E2	1286	120	142.1±2		Brown clayey silt under grass. damp.
T44_W1	1287	120	411±4		dry brown silt w shaley gravels.
T44_W2	1288	120	103.2±1.4		Brown silt under live + dead grass w organics, damp.
T45_B.	1289	120.	1717±8.		Light brown silt, dry, underlain by black ballast silt.
T45_E1	1290	120	806±5		Light brown silt w minor gravels, bare, next to grass.
T45_E2	1291	120	725±5		" " under grass, damp.
T45_W1	1292	120	350±3		light brown silt, dry, bare, next to grass
T45_W2	1293.	120	32.5±1.3		" "
T46_BW1	1294	120	9061±36	D.	Dark brown/grey gravelly sand. Moist, bare.
T46_E1	1295	120	33.5±1.2		Brown silt under grass. damp.
T46_E2	1296	120	37.4±1.3		bare brown silty hard
T46_B	1297	120	86.0±1.6		Brown silt under grass underlain by black gravel @ 0.15m bgl
T46_W2	1298	120	959±5		Brown damp silt w gravels near grass.
T46_W3	1299	120	43.8±1.3		Brown silt w organics, damp.
T47_B.	1300	120	6108±25		Brown silt underlain by black ballast.
T47_E1	1301	120	216±2		Brown silt under grass, damp.
T47_E2	1302	120	40.5±1.2		orange/brown silt w large gravels + rocks, near grass

003_211215

* Tailings dam broke in the 50's, flooded dam to melange (T40 etc).

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 5/12/21

Location ID	#	Run time	Reading	Dup	Description
T47_W1	1303	120	267±3		clayey silt w gravels. bare, near grass.
T47_W2	1304	120	82.8±1.9		Brown silt, damp. near grass
T48_B	1305	120	650±5.		Brown gravelly silt, dry, underlain w ballast. some grass.
T48_E1	1306	120	316±3		Brown silt w organics near grass. damp.
T48_W1	1307	120	381±3		Brown silt w gravels, bare patch
T48_W2	1308	120	132.3±1.6		" " under grass.
T49_B	1309	120	3502±13		Gravelly silt, undercut w ballast.
T49_E1	1310	120	1221±7		Dry brown silt w shale gravels Near to grass. Dry.
T49_W1	~~1227~~ 1311	120	294±3.		Grey dry silt w shale. next to grass.
T49_W2	1312	120	184.1±1.9		Brown silt under grass, damp.
T50_B	1313	120	2511±10		Brown silt underlain by black ballast.
T50_E1	1314	120	1227±6		Brown silt w gravels, bare,
T50_E2	1315	120	1952±9		" "
T50_E3	1316	120	2848±13		" "
T50_W1	1317	120	42±1.4		Light brown silt w gravel. windrow/ bare.
~~T50_W2~~					
T51_B	1318	120	1.24% ±0.1		Brown silt w gravel underlain w ballast
T51_E1	1319	120	782±5		Light brown silt w grey gravel. Dry.
T51_E2	1320	120	~~782±5~~ 115.5±1.1		" "
T51_W1	1321	120	4220±19	D.	Black/grey sandy gravel ballast. Dry.
D04_211215					T51_W1

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 15/12/21

Location ID	#	Run time	Reading	Dup	Description
TS1_W2	1322	8	1184±6		" " w braun silt next to grass
TS1_W3	1323	120	20.6±1.5		Braun silt under grass, damp.
TS2_B	1324		3.15% ±0.1		grey silt underlain by grey ballast.
TS2_E1	1325		1987±11		orange/braun dry silt w gravels
TS2_E2	1326		21.1±1.2		Light braun " "
TS2_W1	1327		594±4		" " black gravels
TS2_W2	1328		11747±10		Braun silt under grass. damp.
TS2_W3	1329		41.2±1.0		" "
TS3_B	1330		15401±19		silt w large gravels underlain by black 'ballast'
TS3_W1	1331		3019±12		Braun/grey silt underlain by gravels
TS3_W2	1332		44.4±1.0		Braun silt w gravel under grass damp.
TS3_E1	1333		5250±21		Braun/grey silt underlain w black gravels.
TS3_E2	1334		365±3.		Braun silt w organics under grass. damp.
TS4_B	1335		6787±30.		standard.
TS4_W1	1336		70±3.		silt braun under grass w gravel damp.
TS4_W2	1337		42.4±1		" "
TS4_E1	1338		39.7±1.4		light braun silt w gravels. dry. bar
TS4_E2	1339		227±3.		" "
TS5_B	1340		3525±15		standard
TS5_W1	1341		951±5	D.	light braun silt w gravels. Base dry.
DOS_211215	~~1342~~				TS5_W1

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 15/12/21
16/12/21

Location ID	#	Run time	Reading	Dup	Description
T55_E1	1342	120	258 ± 3		Silt under grass w organics
					end of day
T56_B	1343	120	8201 ± 36		Standard 'bankat'
T56_W1	1344	120	116.8 ± 2		Brown / red silt w gravels w sand. Bare, damp.
T56_W2	1345	170	148.8 ± 1.7		Brown / red silt - under grass w organics. moist
T56_E1	1346	120	378 ± 3		Brown silt, moist, organics. grass.
T56_E2	1347	120	423 ± 3		" " with up larger gravels.
T56_E3	1348	120	88.9 ± 1.6		Brown silt under gravel mix to ants nest. Damp. Bare.
T57_B	1349	120	6315 ± 25		Standard ballast
T57_E1	1350	120	207 ± 3		Brown silt under shrubs.
T57_W1	1351	120	62.2 ± 1.6		" "
T58_B	1352	120	7164 ± 26		~~Standard~~ ballast w normal bonus smell.
T58_E1	1353	120	250 ± 3		Brown silt w stab gravel. dry bare.
T58_E2	1354	120	178 ± 2		Brown silt under grass. damp.
~~T58_W1~~					
T59_B	1355	120	5510 ± 22		Std. ballast.
T59_W1	1356	120	2.77% ± 0.1		Dark grey dry silt w minor organics
T59_W2	1357	120	3542 ± 15		Light brown silt w gravels
T59_W3	1358	120	210 ± 3		Silt, brown under grass w organics
T59_E1	1359	120	156 ± 2		orange / brown silt w gravels. dry.
T59_E2	1360	120			

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750-07

Date: 16/12/21

Location ID	#	Run time	Reading	Dup	Description
T60_B	1360	120	6196±25		Std. Ballast.
T60_E1	1361	120	2190±9		Std. Ballast (spalled conf)
T60_E2	1362	120	496±3		Dark grey silt, gravels.
T60_W1	1363	120	3148±18		silt as T60_E1
T60_W2	1364	120	215±2		Silt under grass, damp.
T61_B	1365	120	7201±28		Std ballast w dark grey silt. dry.
T61_E1	1366	120	568±4		Light brown silt under gravels
T61_E2	1367	120	139.5±1.4		Silt w. gravels.
T61_W1	1368	120	4642±21		Orange/grey silt w mino gravels. dry.
T61_W2	1369	120	422±3		Brown silt w organics under grass.
T62_B	1370	120	8585±32	0.	Std ballast w grey brown silt organics
DOI_211216		~	~		T62_B
T62_E1	1371	120	2875±13.	0.	Brown silt w mino small gravels. dry.
DO2-211216		~	~		T62_W1
T62_E2	1372	120	1257±5		Brown silty sand w organics under grass damp.
T62_W1	1373	120	5986±24		Brown, silt w gravels grey.
T62_W2	1374	120	83.5±1.4		
T63_B	1375	120	196±3.		Brown silt w gravels, dry.
T63_E1	1376	120	581±3		Dark grey/brown silt w organics, damp.
T63_W1	1377	120	269±2		Brown silt w organics & gravels/ roadbase

XRF Sampling

Field Sampling Sheet
Bungendore Lead Invesitgation
Offsite XRF 0608750~~-07~~

Date: 17/12/21

Location ID	#	Run time	Reading	Dup	Description
T66_B	~~1360~~ 1378	120	5663 ± 21		Std 'ballast'
T66_W1	~~1368~~ 1379	120	1668 ± 8		" "
T66_W2	1380	120	31.9 ± 1.3		Dry brown silt w gravel.
T66_E1	1381	120	1216 ± 7.		light brown silt w gravel next to 'ballast'
T66_E2	1382	120	151.5 ± 2.		silt w organic ~~fi~~ & gravels,
T64_B.	1383	120	6329 ± 22	D.	dark brown silt w organic damp.
DO3_211216					T64_B
T64_W1	1384	120	654 ± 3	D.	Brown silt w organics under leaf litter
DO4 211116					T64_W1
T64_W2	1385	120	88.8 ± 1.9		Gravelly silt Grey, w shale inclusions. dry.
T64_E1	1386	120	40.3 ± 1.3		Clayey silt brown to light brown. shale damp, loose.
T64_E2	1387	120	75.7 ± 1.4		" " reddish
T65_B	1388	120	4661 ± 17	D.	~~red~~ "Std ballast"
DO5_211215	1389	120			~~T64_B~~ T65_B.
T65_W1	1390	120	3638 ± 12	D.	organic silt, dry, loose, brown, leaf litter
T65_W2	1391	120	63.8 ± 2.0		" " w/ shales
T65_E1	1392	120	3591 ± 14		~~Dark brown~~ Dark grey gravelly silty sand. Leaf litter organics
T65_E2	1393	120	455 ± 4		Brown sandy silt some gravel
					NG.
DO6_211215					T65_W1

APPENDIX E PHOTOGRAPHIC LOG

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
1	

Direction Photo Taken:
NA

Description:
The typical larger grain ballast-like fill that was noted under the tracks along the length of the line.

Photo No.	Date:
2	

Direction Photo Taken:
W

Description:
An eroded section of the line where ballast material has been washed into a drainage channel.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
3	

Direction Photo Taken:
NA

Description:
Typical damp silty soil under grass in the rail corridor.

Photo No.	Date:
4	

Direction Photo Taken:
NW

Description:
Ballast next to the rail line.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
5	

Direction Photo Taken:
SE

Description:
A section of the line where the rail has folded outwards and is holding in dark grey fill material. Spilled fill material is also noted at the foot of the slope in the bottom right corner of the image.

Photo No.	Date:
6	

Direction Photo Taken:
W

Description:
The XRF device in operation sampling a bare patch east of the rail line.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
7	

Direction Photo Taken:
NW

Description:
Private fencing placed through the rail line. Vegetation is also noted growing out of sediment between the tracks.

Photo No.	Date:
8	

Direction Photo Taken:
NA

Description:
An indicator of the depth of fill material observed directly underneath the rail along the line.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
9	

Direction Photo Taken:
N

Description:
A section of the line where the rails have folded outwards and are containing dark fill material. An amount of the material has also spilled outwards. Vegetation is lacking through this section of corridor.

Photo No.	Date:
10	

Direction Photo Taken:
NA

Description:
The soil profile beneath the rail line; natural clays gathered from beside the line and imported dark grey ‘ballast’ fill on top.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
11	

Direction Photo Taken:
S

Description:
A section of the line where the rails have folded outwards and are containing dark fill material. Note the lack of vegetation through the corridor and on the left hand side of the image where an amount of the material has migrated down the slope.

Photo No.	Date:
12	

Direction Photo Taken:
S

Description:
The soil profile beneath the rail line; natural clays gathered from beside the line and imported dark grey ‘ballast’ fill on top.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.:
JHR/TfNSW	Bungendore – Captains Flat	0608750

Photo No.	Date:
13	

Direction Photo Taken:
N

Description:
The XRF device in operation between sleepers of the rail line.

APPENDIX F LABORATORY DOCUMENTATION

Eurofins

Fadi Soro

From: Olivia Barbato
Sent: Friday, 28 January 2022 1:10 PM
To: Fadi Soro
Cc: Samples Sydney
Subject: FW: [EXTERNAL] - ES2146882

Hi Fadi,

Can you please check whether we still have sample volume for Sample #013 of work order ES2146882?

If so the client would like to forward it on to Eurofins

Kind Regards,

Olivia Barbato

Client Services Officer, Environmental
Sydney

D +61 2 8784 8511

F +61 2 8784 8500
olivia.barbato@alsglobal.com
277-289 Woodpark Road
Smithfield NSW 2164 AUSTRALIA

L-m 31/1/22 5:49 pm 14.6° #859898

Right Solutions · Right Partner
www.alsglobal.com

From: Max Galbraith <Max.Galbraith@erm.com>
Sent: Friday, 28 January 2022 11:41 AM
To: Olivia Barbato <olivia.barbato@ALSGlobal.com>
Subject: [EXTERNAL] - ES2146882

Hi Olivia,

I've noticed that I made a mistake filling out the COC for ES2146882 and forgot to indicate that T01_211216 needed to be passed on to eurofins for analysis.

Is there any chance you could check if that sample is still being held?

Cheers,
Max Galbraith
Environmental Analyst

Environmental Resources Management
Level 1, Watt Street Commercial Centre | 45 Watt Street, Newcastle NSW 2300
PO Box 803, Newcastle NSW 2300
T +61 2 4903 5500
E max.galbraith@erm.com | **W** www.erm.com

L-M 31/1/22 5:49pm 14.6° #859898

L-M 31/1/22 5:49 pm 14.6° #859898

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee mail@alsglobal.com
NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 8448 E: samples.newcastle@alsglobal.com
NOWRA 4/15 Terry Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: ERM	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) — Standard TAT (7 days)
OFFICE: Newcastle	ALS QUOTE NO.: National Price Discount
PROJECT: 0608750 - 07 Captains flat line	
ORDER NUMBER: 0608750-07	COC SEQUENCE NUMBER (Circle): COC: 1 2 3 4 5 6 7 — OF: 1 2 3 4 5 6 7
PROJECT MANAGER: Matthew Crow	CONTACT PH: 0402652889
SAMPLER: Max Galbraith	SAMPLER MOBILE: 0468384969
COC emailed to ALS?	EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed): PM	
Email Invoice to (will default to PM if no other addresses are listed): PM	

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact? Yes No N/A
Ice/Ice Bricks present upon receipt? Yes No N/A
Random Sample Temperature on Receipt: °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Max Galbraith	JN 0900	TOB	Rasheed
DATE/TIME:	DATE/TIME: 22/12/21	DATE/TIME: 22/12/21 5PM	DATE/TIME: 22/12/21 7240

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY — SAMPLE DETAILS — MATRIX: SOLID (S) WATER (W) — CONTAINER INFORMATION — ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). — Additional Information

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	HOLD	W-3 (15 Metals)							Additional Information
1	D01_211215	15/12/2021	soil				x							
2	D02_211215	15/12/2021	soil				x							
3	D03_211215	15/12/2021	soil				x							
4	D04_211215	15/12/2021	soil				x							
5	D05_211215	15/12/2021	soil				x							
6	R01_211215	15/12/2021	soil				x							
7	D01_211216	16/12/2021	soil				x							
8	D02_211216	16/12/2021	water				x							
9	D03_211216	16/12/2021	soil				x							
10	D04_211216	16/12/2021	soil				x							
11	D05_211216	16/12/2021	soil				x							
12	D06_211216	16/12/2021	soil				x							
13	T01_211216	16/12/2021	soil				x							
14	R01_211216	16/12/2021	water				x							

Environmental Division Sydney
Work Order Reference
ES2146882

RECEIVED
LAB OF ORIGIN: NEWCASTLE

L-M 31/1/22 5:49pm 22/12/21 14.6° #859898

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www.eurofins.com.au EnviroSales@eurofins.com

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

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

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Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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NATA # 2377 Site # 2370

Eurofins Environment Testing NZ Limited
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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

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

Sample Receipt Advice

Company name:	ERM Sydney
Contact name:	Max Galbraith
Project name:	0608750 - 07 CAPTAINS FLAT LINE
Project ID:	Not provided
Turnaround time:	5 Day
Date/Time received	Jan 31, 2022 5:49 PM
Eurofins reference	859898

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.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

John Nguyen on phone : or by email: JohnNguyen@eurofins.com

Results will be delivered electronically via email to Max Galbraith - max.galbraith@erm.com.

Note: A copy of these results will also be delivered to the general ERM Sydney email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
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Phone : +64 9 526 45 51
IANZ # 1327

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

Company Name: ERM Sydney
Address: Level 15, 309 Kent St
Sydney
NSW 2000

Project Name: 0608750 - 07 CAPTAINS FLAT LINE

Order No.: 0608750-07
Report #: 859898
Phone: 02 8584 8888
Fax: 02 8584 8800

Received: Jan 31, 2022 5:49 PM
Due: Feb 8, 2022
Priority: 5 Day
Contact Name: Max Galbraith

Eurofins Analytical Services Manager : John Nguyen

Sample Detail						NEPM 1999 Metals : Metals M15	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254							
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
Brisbane Laboratory - NATA # 1261 Site # 20794							
Mayfield Laboratory - NATA # 1261 Site # 25079							
Perth Laboratory - NATA # 2377 Site # 2370							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	T01_211216	Dec 15, 2021		Soil	S22-Fe02559	X	X
Test Counts						1	1

ERM Sydney
Level 15, 309 Kent St
Sydney
NSW 2000

Attention: **Max Galbraith**

Report **859898-S**
Project name 0608750 - 07 CAPTAINS FLAT LINE
Received Date Jan 31, 2022

Client Sample ID			**T01_211216**
Sample Matrix			**Soil**
Eurofins Sample No.			**S22-Fe02559**
Date Sampled			**Dec 15, 2021**
Test/Reference	LOR	Unit	
Chromium (hexavalent)	1	mg/kg	< 1
Chromium (trivalent)	5	mg/kg	19
% Moisture	1	%	4.5
Heavy Metals			
Arsenic	2	mg/kg	12
Barium	10	mg/kg	210
Beryllium	2	mg/kg	< 2
Boron	10	mg/kg	< 10
Cadmium	0.4	mg/kg	0.5
Chromium	5	mg/kg	19
Cobalt	5	mg/kg	8.0
Copper	5	mg/kg	110
Lead	5	mg/kg	540
Manganese	5	mg/kg	300
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	14
Vanadium	10	mg/kg	22
Zinc	5	mg/kg	2500

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Chromium (hexavalent)	Sydney	Feb 03, 2022	28 Days
- Method: In-house method E057.2			
Chromium (trivalent)	Sydney	Feb 03, 2022	28 Days
- Method: E043 /E057 Total Speciated Chromium			
Heavy Metals	Sydney	Feb 03, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Feb 03, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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IANZ # 1327

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

Company Name:	ERM Sydney	**Order No.:**	0608750-07	**Received:**	Jan 31, 2022 5:49 PM
Address:	Level 15, 309 Kent St Sydney NSW 2000	**Report #:**	859898	**Due:**	Feb 8, 2022
		Phone:	02 8584 8888	**Priority:**	5 Day
		Fax:	02 8584 8800	**Contact Name:**	Max Galbraith
Project Name:	0608750 - 07 CAPTAINS FLAT LINE				

Eurofins Analytical Services Manager : John Nguyen

Sample Detail						NEPM 1999 Metals : Metals M15	Moisture Set
Melbourne Laboratory - NATA # 1261 Site # 1254							
Sydney Laboratory - NATA # 1261 Site # 18217						X	X
Brisbane Laboratory - NATA # 1261 Site # 20794							
Mayfield Laboratory - NATA # 1261 Site # 25079							
Perth Laboratory - NATA # 2377 Site # 2370							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	T01_211216	Dec 15, 2021		Soil	S22-Fe02559	X	X
Test Counts						1	1

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.

Units

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

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
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.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

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. 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.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. 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							
Chromium (hexavalent)	mg/kg	< 1			1	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Barium	mg/kg	< 10			10	Pass	
Beryllium	mg/kg	< 2			2	Pass	
Boron	mg/kg	< 10			10	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Cobalt	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Manganese	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Vanadium	mg/kg	< 10			10	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Chromium (hexavalent)	%	93			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	102			80-120	Pass	
Barium	%	113			80-120	Pass	
Beryllium	%	93			80-120	Pass	
Boron	%	86			80-120	Pass	
Cadmium	%	95			80-120	Pass	
Chromium	%	97			80-120	Pass	
Cobalt	%	113			80-120	Pass	
Copper	%	93			80-120	Pass	
Lead	%	96			80-120	Pass	
Manganese	%	114			80-120	Pass	
Mercury	%	81			80-120	Pass	
Nickel	%	95			80-120	Pass	
Vanadium	%	114			80-120	Pass	
Zinc	%	92			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	N22-Fe02928	NCP	%	118			75-125	Pass	
Barium	N22-Ja38611	NCP	%	91			75-125	Pass	
Beryllium	N22-Ja38611	NCP	%	105			75-125	Pass	
Boron	N22-Fe02928	NCP	%	82			75-125	Pass	
Cadmium	N22-Fe02928	NCP	%	109			75-125	Pass	
Chromium	N22-Fe02928	NCP	%	108			75-125	Pass	
Cobalt	N22-Ja38611	NCP	%	91			75-125	Pass	
Copper	N22-Fe02928	NCP	%	102			75-125	Pass	
Lead	N22-Fe02928	NCP	%	106			75-125	Pass	
Manganese	N22-Ja38611	NCP	%	108			75-125	Pass	
Mercury	N22-Fe02928	NCP	%	107			75-125	Pass	
Nickel	N22-Fe02928	NCP	%	104			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Vanadium	N22-Ja38611	NCP	%	91			75-125	Pass	
Zinc	N22-Fe02928	NCP	%	96			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chromium (hexavalent)	S21-Jn06496	NCP	mg/kg	< 1	< 1	<1	30%	Pass	
% Moisture	S22-Fe02559	CP	%	4.5	4.3	6.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	N22-Fe02937	NCP	mg/kg	6.1	5.7	7.0	30%	Pass	
Barium	N22-Ja38617	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Beryllium	N22-Ja38617	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Boron	N22-Fe02937	NCP	mg/kg	< 10	< 10	<1	30%	Pass	
Cadmium	N22-Fe02937	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	N22-Fe02937	NCP	mg/kg	54	49	9.0	30%	Pass	
Cobalt	N22-Ja38617	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Copper	N22-Fe02937	NCP	mg/kg	26	27	2.0	30%	Pass	
Lead	N22-Fe02937	NCP	mg/kg	37	34	9.0	30%	Pass	
Manganese	N22-Ja38617	NCP	mg/kg	17	21	25	30%	Pass	
Mercury	N22-Fe02937	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	N22-Fe02937	NCP	mg/kg	41	41	1.0	30%	Pass	
Vanadium	N22-Ja38617	NCP	mg/kg	28	18	42	30%	Fail	Q15
Zinc	N22-Fe02937	NCP	mg/kg	120	110	7.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	No
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
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

John Nguyen	Analytical Services Manager
Charl Du Preez	Senior Analyst-Inorganic (NSW)
John Nguyen	Senior Analyst-Metal (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

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

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **CA2107572**

Client	: **Environmental Resources Management Australia Pty Ltd**	Laboratory	: ALS Water Resources Group
Contact	: Matthew Crow	Contact	: Client Services
Address	: Level 15, 309 Kent St. Sydney 2000	Address	: 16B Lithgow Street Fyshwick ACT Australia 2609
E-mail	: matthew.crow@erm.com	E-mail	: ecowisecustomerservice@alsglobal.com
Telephone	: ----	Telephone	: +61 2 6202 5404
Facsimile	: ----	Facsimile	: +61 2 6202 5404
Project	: 0608750-07 Bungendore to Captains Flat	Page	: 1 of 3
Order number	: ----	Quote number	: ----
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Max Galbraith		

Dates

Date Samples Received	: 26-Nov-2021 11:00	Issue Date	: 01-Dec-2021
Client Requested Due Date	: 07-Dec-2021	Scheduled Reporting Date	: **07-Dec-2021**

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 22.3°C
Receipt Detail	:	No. of samples received / analysed	: 11 / 11

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Please refer to the Proactive Holding Time Report table below which summarise breaches of recommended holding times that have occurred. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding time for the analysis requested.
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Canberra.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Samples for Amoeba should be transported at ambient temperature. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

CA2107572-001	: [22-Nov-2021]	:
CA2107572-002	: [22-Nov-2021]	:
CA2107572-003	: [23-Nov-2021]	:
CA2107572-004	: [23-Nov-2021]	:
CA2107572-005	: [23-Nov-2021]	:
CA2107572-006	: [23-Nov-2021]	:
CA2107572-007	: [23-Nov-2021]	:
CA2107572-008	: [24-Nov-2021]	:
CA2107572-009	: [22-Nov-2021]	:
CA2107572-010	: [23-Nov-2021]	:
CA2107572-011	: [24-Nov-2021]	:

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOLID**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOLID - EG020T Total Recoverable Metals - Extended Screen
CA2107572-001	22-Nov-2021 00:00		✓
CA2107572-002	22-Nov-2021 00:00		✓
CA2107572-003	23-Nov-2021 00:00		✓
CA2107572-004	23-Nov-2021 00:00		✓
CA2107572-005	23-Nov-2021 00:00		✓
CA2107572-006	23-Nov-2021 00:00		✓
CA2107572-007	23-Nov-2021 00:00		✓
CA2107572-008	24-Nov-2021 00:00		✓

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EG020A-F ENV Dissolved Metals by ICPMS - Suite A	WATER - XTERNAL External report
CA2107572-009	22-Nov-2021 00:00		✓	✓
CA2107572-010	23-Nov-2021 00:00		✓	✓
CA2107572-011	24-Nov-2021 00:00		✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Matthew Crow

- A4 - AU Sample Receipt Notification - Environmental (WRG) (SRN)	Email	matthew.crow@erm.com
- A4 - AU Tax Invoice (INV)	Email	matthew.crow@erm.com
- Attachment - Report (SUBCO)	Email	matthew.crow@erm.com
- AU Certificate of Analysis - NATA (WRG) (AU_COA_2_A4_ENV_NATA)	Email	matthew.crow@erm.com
- Chain of Custody (CoC) (COC)	Email	matthew.crow@erm.com
- WRG Legacy Format (XTAB_WRGLEG)	Email	matthew.crow@erm.com

ALS Water

CERTIFICATE OF ANALYSIS

Work Order	: **CA2107572**	Page	: 1 of 5
Amendment	: **2**		
Client	: **Environmental Resources Management Australia Pty Ltd**	Laboratory	: ALS Water Resources Group
Contact	: Matthew Crow	Contact	: Client Services
Address	: Level 15, 309 Kent St. Sydney 2000	Address	: 16B Lithgow Street Fyshwick ACT Australia 2609
Telephone	: ----	Telephone	: +61 2 6202 5404
Project	: 0608750-07 Bungendore to Captains Flat	Date Samples Received	: 26-Nov-2021 11:00
Order number	: ----	Date Analysis Commenced	: 02-Dec-2021
C-O-C number	: ----	Issue Date	: 09-Mar-2022 09:57
Sampler	: Max Galbraith		
Site	: ----		
Quote number	: ERM National Quotation (EN/114/21)		
No. of samples received	: 11		
No. of samples analysed	: 11		

Accreditation No. 992
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Clare Kennedy	Analyst	Inorganics, Fyshwick, ACT
Joel Nicholson	Laboratory Manager	ALS Environmental, Fyshwick, ACT
Titus Vimalasiri	Metals Teamleader	Inorganics, Fyshwick, ACT

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- **For samples collected by ALS WRG, sampling was carried out in accordance with Procedure EN67**
- Client Error Amend: Moisture content not requested on original CoC for 001 - 0008. Client requested analysis to be conducted as at 11.01.21. Noting that the analysis will be conducted out of holding time and suitable storage, with results being indicative only - TR 12.01.21
- EG020A-F Performed at ALS Sydney

Analytical Results

Sub-Matrix: SOLID (Matrix: SOLID)			Sample ID	---- D01_211122	---- D02_211122	---- D01_211123	---- D02_211123	---- D03_211123
			Sampling date / time	22-Nov-2021 00:00	22-Nov-2021 00:00	23-Nov-2021 00:00	23-Nov-2021 00:00	23-Nov-2021 00:00
Compound	CAS Number	LOR	Unit	CA2107572-001	CA2107572-002	CA2107572-003	CA2107572-004	CA2107572-005
				Result	Result	Result	Result	Result
EA030CA: Total Solids								
ø Total Solids	----	1.0	%	85.3	83.9	74.0	87.1	87.7
EA055CA: Moisture Content								
ø Moisture Content (dried @ 105°C)	----	1.0	%	14.7	16.1	26.0	12.8	12.3
EG005CA: Total Metals by ICP-OES								
ø Boron	7440-42-8	20	mg/kg	<20	<20	<20	<20	<20
ø Chromium	7440-47-3	5	mg/kg	17	12	20	21	44
ø Manganese	7439-96-5	1	mg/kg	274	52	155	99	610
ø Nickel	7440-02-0	5	mg/kg	7	<5	<5	17	6
ø Vanadium	7440-62-2	5	mg/kg	34	7	21	37	72
ø Zinc	7440-66-6	5	mg/kg	15	263	656	1170	1380
EG020CA: Total Metals by ICP-MS								
Arsenic	7440-38-2	1	mg/kg	3	41	35	76	10
Barium	7440-39-3	1	mg/kg	48	86	68	131	47
Beryllium	7440-41-7	0.1	mg/kg	0.6	0.3	0.5	0.5	0.7
Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.2	1.9	1.3	5.4
Cobalt	7440-48-4	1	mg/kg	12	<1	2	3	8
Copper	7440-50-8	1	mg/kg	10	268	254	493	100
Lead	7439-92-1	0.2	mg/kg	15.8	8610	8020	11000	1580
ø Mercury	7439-97-6	0.1	mg/kg	<0.1	0.5	0.4	0.8	0.1
Selenium	7782-49-2	1	mg/kg	3	4	4	8	2

Analytical Results

Sub-Matrix: SOLID (Matrix: SOLID)			Sample ID	---- D04_211123	---- D01_211124	---- D02_211124	----	----
			Sampling date / time	23-Nov-2021 00:00	23-Nov-2021 00:00	24-Nov-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	CA2107572-006	CA2107572-007	CA2107572-008	--------	--------
				Result	Result	Result	----	----
EA030CA: Total Solids								
ø **Total Solids**	----	1.0	%	**84.5**	**80.1**	**83.3**	**----**	**----**
EA055CA: Moisture Content								
ø **Moisture Content (dried @ 105°C)**	----	1.0	%	**15.4**	**19.9**	**16.6**	**----**	**----**
EG005CA: Total Metals by ICP-OES								
ø **Boron**	7440-42-8	20	mg/kg	<20	<20	<20	**----**	**----**
ø **Chromium**	7440-47-3	5	mg/kg	**24**	**12**	**16**	**----**	**----**
ø **Manganese**	7439-96-5	1	mg/kg	**862**	**80**	**278**	**----**	**----**
ø **Nickel**	7440-02-0	5	mg/kg	**13**	**8**	**10**	**----**	**----**
ø **Vanadium**	7440-62-2	5	mg/kg	**46**	**19**	**24**	**----**	**----**
ø **Zinc**	7440-66-6	5	mg/kg	**1150**	**395**	**393**	**----**	**----**
EG020CA: Total Metals by ICP-MS								
Arsenic	7440-38-2	1	mg/kg	**4**	**52**	**54**	**----**	**----**
Barium	7440-39-3	1	mg/kg	**192**	**59**	**62**	**----**	**----**
Beryllium	7440-41-7	0.1	mg/kg	**0.7**	**0.4**	**0.6**	**----**	**----**
Cadmium	7440-43-9	0.1	mg/kg	**4.5**	**0.4**	**0.4**	**----**	**----**
Cobalt	7440-48-4	1	mg/kg	**13**	**2**	**4**	**----**	**----**
Copper	7440-50-8	1	mg/kg	**81**	**397**	**376**	**----**	**----**
Lead	7439-92-1	0.2	mg/kg	**629**	**8770**	**9140**	**----**	**----**
ø **Mercury**	7439-97-6	0.1	mg/kg	<0.1	**0.6**	**0.4**	**----**	**----**
Selenium	7782-49-2	1	mg/kg	**5**	**5**	**5**	**----**	**----**

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	---- R01_211122	---- R01_211123	---- R01_211124	----	----
				Sampling date / time	22-Nov-2021 00:00	23-Nov-2021 00:00	24-Nov-2021 00:00	----	----
					CA2107572-009	CA2107572-010	CA2107572-011	--------	--------
					Result	Result	Result	----	----
EG020CA: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	----	----
Boron	7440-42-8	0.05	mg/L		<0.05	<0.05	<0.05	----	----

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: newcastle.enviro@alsglobal.com

NOWRA 4/91 Kinghorne Street Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: ERM	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	Standard TAT (7 days)	FOR LABORATORY USE ONLY (Circle)
OFFICE: Newcastle			Custody Seal Intact? Yes No N/A
PROJECT: 0608750-07 Bungendore to Captains Flat	ALS QUOTE NO.: National Price Discount / ERM Quote	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 22.3 °C
PROJECT MANAGER: Matthew Crow	CONTACT PH: 0402652889	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Max Galbraith	SAMPLER MOBILE: 0468384969	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS?	EDD FORMAT (or default):	*Dean Santi*	TR
Email Reports to (will default to PM if no other addresses are listed): PM		DATE/TIME: 26//11/2021	DATE/TIME: 26.11.21 @ 11:00
Email Invoice to (will default to PM if no other addresses are listed): PM		RELINQUISHED BY:	RECEIVED BY:
		DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: - COC received @ 12:30

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS		W-3 (15 Metals)	Lead Bioavailability 24093					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	D01_211122	22·11	Soil				x						
	D02_211122	22·11	Soil				x	x					
	D01_211123	23·11	Soil				x						
	D02_211123	23·11	Soil				x						
	D03_211123	23·11	Soil				x						
	D04_211123	23·11	Soil				x						
	D01_211124	23·11	Soil				x						
	D02_211124	24·11	Soil				x						
	R01_211122	22·11	WATER				x						
	R01_211123	23·V	WATER				x						
	R01_211124	24·11	WATER				x						

ALS Water Resources Group
Canberra
Work Order Reference
CA2107572

Telephone : +61 2 6202 5404

ALS Water

QUALITY CONTROL REPORT

Work Order	: **CA2107572**	Page	: 1 of 3
Client	: **Environmental Resources Management Australia Pty Ltd**	Laboratory	: ALS Water Resources Group
Contact	: Matthew Crow	Contact	: Client Services
Address	: Level 15, 309 Kent St. Sydney 2000	Address	: 16B Lithgow Street Fyshwick ACT Australia 2609
Telephone	: ----	Telephone	: +61 2 6202 5404
Project	: 0608750-07 Bungendore to Captains Flat	Date Samples Received	: 26-Nov-2021
Order number	: ----	Date Analysis Commenced	: 02-Dec-2021
C-O-C number	: ----	Issue Date	: 10-Jan-2022
Sampler	: Max Galbraith		
Site	: ----		
Quote number	: ----		
No. of samples received	: 11		
No. of samples analysed	: 11		

Accreditation No. 992
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Joel Nicholson	Laboratory Manager	ALS Environmental, Fyshwick, ACT
Titus Vimalasiri	Metals Teamleader	Inorganics, Fyshwick, ACT

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOLID**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005CA: Total Metals by ICP-OES (QC Lot: 4050163)									
CA2107383-004	Anonymous	EG005T: Manganese	7439-96-5	1	mg/kg	2810	2800	0.3	0% - 20%
		EG005T: Boron	7440-42-8	20	mg/kg	<20	<20	0.0	No Limit
		EG005T: Chromium	7440-47-3	5	mg/kg	28	27	0.0	No Limit
		EG005T: Nickel	7440-02-0	5	mg/kg	11	10	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	45	46	2.4	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	51	50	0.0	0% - 50%
EG020CA: Total Metals by ICP-MS (QC Lot: 3928240)									
CA2105932-001	Anonymous	EG020X-T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG020CA: Total Metals by ICP-MS (QC Lot: 4050164)									
CA2107547-004	Anonymous	EG020T: Beryllium	7440-41-7	0.1	mg/kg	0.2	0.2	0.0	No Limit
		EG020T: Cadmium	7440-43-9	0.1	mg/kg	0.3	0.3	0.0	No Limit
		EG020T: Lead	7439-92-1	0.2	mg/kg	93.7	96.5	3.0	0% - 20%
		EG020T: Arsenic	7440-38-2	1	mg/kg	7	7	0.0	No Limit
		EG020T: Barium	7440-39-3	1	mg/kg	264	263	0.5	0% - 20%
		EG020T: Cobalt	7440-48-4	1	mg/kg	3	3	0.0	No Limit
		EG020T: Copper	7440-50-8	1	mg/kg	119	120	0.0	0% - 20%
		EG020T: Selenium	7782-49-2	1	mg/kg	1	2	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOLID**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005CA: Total Metals by ICP-OES (QCLot: 4050163)								
EG005T: Boron	7440-42-8	20	mg/kg	<20	15.2 mg/kg	82.6	49.0	151
EG005T: Chromium	7440-47-3	5	mg/kg	<5	82 mg/kg	100	60.0	140
EG005T: Manganese	7439-96-5	1	mg/kg	<1	241 mg/kg	99.8	87.0	113
EG005T: Nickel	7440-02-0	5	mg/kg	<5	17.8 mg/kg	99.9	54.0	146
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	25.3 mg/kg	93.8	53.0	147
EG005T: Zinc	7440-66-6	5	mg/kg	<5	57 mg/kg	102	78.0	122
EG020CA: Total Metals by ICP-MS (QCLot: 3928240)								
EG020X-T: Mercury	7439-97-6	0.1	mg/kg	<0.1	11.7 mg/kg	109	80.0	120
EG020CA: Total Metals by ICP-MS (QCLot: 4050164)								
EG020T: Arsenic	7440-38-2	1	mg/kg	<1	17.2 mg/kg	102	48.0	152
EG020T: Barium	7440-39-3	1	mg/kg	<1	28.4 mg/kg	86.3	41.0	159
EG020T: Beryllium	7440-41-7	0.1	mg/kg	<0.1	0.59 mg/kg	104	49.0	151
EG020T: Cadmium	7440-43-9	0.1	mg/kg	<0.1	9.33 mg/kg	96.5	79.0	121
EG020T: Cobalt	7440-48-4	1	mg/kg	<1	9.16 mg/kg	99.1	64.0	136
EG020T: Copper	7440-50-8	1	mg/kg	<1	23.2 mg/kg	100	75.0	125
EG020T: Lead	7439-92-1	0.2	mg/kg	<0.2	40.4 mg/kg	94.2	80.0	120
EG020T: Selenium	7782-49-2	1	mg/kg	<1	11 mg/kg	113	62.0	138

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **CA2107572**	Page	: 1 of 4
Client	: **Environmental Resources Management Australia Pty Ltd**	Laboratory	: ALS Water Resources Group
Contact	: Matthew Crow	Telephone	: +61 2 6202 5404
Project	: 0608750-07 Bungendore to Captains Flat	Date Samples Received	: 26-Nov-2021
Site	: ----	Issue Date	: 10-Jan-2022
Sampler	: Max Galbraith	No. of samples received	: 11
Order number	: ----	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **SOLID**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Total Recoverable Metals by ICP-MS - X	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOLID**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container* / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005CA: Total Metals by ICP-OES							
Metals in Soils (EG005T)	**22-Nov-2021**	**02-Dec-2021**	----	----	**06-Dec-2021**	----	----
Metals in Soils (EG005T)	**23-Nov-2021**	**02-Dec-2021**	----	----	**06-Dec-2021**	----	----
Metals in Soils (EG005T)	**24-Nov-2021**	**02-Dec-2021**	----	----	**06-Dec-2021**	----	----
EG020CA: Total Metals by ICP-MS							
Metals in Soils (EG020X-T)	**22-Nov-2021**	**02-Dec-2021**	----	----	**07-Dec-2021**	----	----
Metals in Soils (EG020X-T)	**23-Nov-2021**	**02-Dec-2021**	----	----	**07-Dec-2021**	----	----
Metals in Soils (EG020X-T)	**24-Nov-2021**	**02-Dec-2021**	----	----	**07-Dec-2021**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOLID**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Total Recoverable Metals by ICP-MS	EG020T	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-MS - X	EG020X-T	1	20	**5.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-OES	EG005T	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Recoverable Metals by ICP-MS	EG020T	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-MS - X	EG020X-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-OES	EG005T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Recoverable Metals by ICP-MS	EG020T	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-MS - X	EG020X-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Recoverable Metals by ICP-OES	EG005T	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Recoverable Metals by ICP-OES	* EG005T	SOLID	USEPA 3050 - 6020. Samples are digested by USEPA 3005 prior to analysis. The ICP-OES technique ionises the sample atoms emitting a characteristic spectrum. This spectrum is then compared against matrix matched standards for quantification.
Total Recoverable Metals by ICP-MS	EG020T	SOLID	(APHA 3125; USEPA SW846 - 6020) (ICPMS) Metals in solids are determined following an appropriate acid digestion. The ICPMS technique ionizes selected elements. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass / charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM Schedule B(3)
Total Recoverable Metals by ICP-MS - X	* EG020X-T	SOLID	(APHA 3125; USEPA SW846 - 6020) (ICPMS) Metals in solids are determined following an appropriate acid digestion. The ICPMS technique ionizes selected elements. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass / charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Performed at ALS Sydney	EG020A-F	WATER	(APHA, 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): Samples are 0.45 um filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOLID	USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3) (Method 202)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2143866**	Page	: 1 of 4
Client	: **ALS WATER AND HYDROGRAPHICS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS FYSHWICK	Contact	: Sepan Mahamad
Address	: 16B LITHGOW STREET FYSHWICK ACT, AUSTRALIA 2609	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6202 5431	Telephone	: +61 2 8784 8555
Project	: CA2107572	Date Samples Received	: 02-Dec-2021 09:00
Order number	: ----	Date Analysis Commenced	: 03-Dec-2021
C-O-C number	: ----	Issue Date	: 09-Dec-2021 13:44
Sampler	: ----		
Site	: ----		
Quote number	: EN/109/18 - ALS CANBERRA BQ FOR ES		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	CA2107572-002 D02_211122	----	----	----	----
				Sampling date / time	22-Nov-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2143866-001	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**17.6**	**----**	**----**	**----**	**----**
EG005(ED093)T: Total Metals by ICP-AES									
Lead	7439-92-1	5	mg/kg		**10600**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	CA2107572-009 R01_211122	CA2107572-010 R01_211123	CA2107572-011 R01_211124	----	----
			Sampling date / time	22-Nov-2021 00:00	23-Nov-2021 00:00	24-Nov-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2143866-002	ES2143866-003	ES2143866-004	--------	--------
				Result	Result	Result	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2143866**	Page	: 1 of 5
Client	: **ALS WATER AND HYDROGRAPHICS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS FYSHWICK	Contact	: Sepan Mahamad
Address	: 16B LITHGOW STREET FYSHWICK ACT, AUSTRALIA 2609	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: +61 02 6202 5431	Telephone	: +61 2 8784 8555
Project	: CA2107572	Date Samples Received	: 02-Dec-2021
Order number	: ----	Date Analysis Commenced	: 03-Dec-2021
C-O-C number	: ----	Issue Date	: 10-Jan-2022
Sampler	: ----		
Site	: ----		
Quote number	: EN/109/18 - ALS CANBERRA BQ FOR ES		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4054947)									
ES2144126-012	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	12	11	11.5	No Limit
ES2144126-054	Anonymous	EG005T: Lead	7439-92-1	5	mg/kg	9	6	37.5	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4054951)									
ES2144126-031	Anonymous	EA055: Moisture Content	----	0.1	%	11.1	10.9	1.8	0% - 50%
ES2144126-060	Anonymous	EA055: Moisture Content	----	0.1	%	18.4	18.7	1.8	0% - 50%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4058667)									
ES2142314-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.093	0.093	0.0	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.058	0.060	0.0	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2143866-002	CA2107572-009 R01_211122	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4058667) - continued									
ES2143866-002	CA2107572-009 R01_211122	EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 4058668)									
ES2143627-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2143866-002	CA2107572-009 R01_211122	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4054947)								
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	92.0	82.0	119

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4058667)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	96.1	85.0	114
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	91.8	85.0	115
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	95.1	82.0	110
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	93.5	84.0	110
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	93.3	85.0	111
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	94.1	82.0	112
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.2	81.0	111
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	93.5	83.0	111
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	92.5	82.0	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	94.2	82.0	112
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	88.8	85.0	115
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	95.4	83.0	109
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	95.0	81.0	117
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	98.7	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 4058668)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	100	83.0	105

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4054947)							
ES2144126-012	Anonymous	EG005T: Lead	7439-92-1	250 mg/kg	93.2	70.0	130

Sub-Matrix: **WATER**

		Matrix Spike (MS) Report			
		Spike	SpikeRecovery(%)	Acceptable Limits (%)	

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 4058667)							
ES2143627-001	Anonymous	EG020A-F: Arsenic	7440-38-2	1 mg/L	99.1	70.0	130
		EG020A-F: Beryllium	7440-41-7	1 mg/L	90.2	70.0	130
		EG020A-F: Barium	7440-39-3	1 mg/L	97.7	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.25 mg/L	93.8	70.0	130
		EG020A-F: Chromium	7440-47-3	1 mg/L	94.1	70.0	130
		EG020A-F: Cobalt	7440-48-4	1 mg/L	96.2	70.0	130
		EG020A-F: Copper	7440-50-8	1 mg/L	95.5	70.0	130
		EG020A-F: Lead	7439-92-1	1 mg/L	92.9	70.0	130
		EG020A-F: Manganese	7439-96-5	1 mg/L	92.5	70.0	130
		EG020A-F: Nickel	7440-02-0	1 mg/L	93.2	70.0	130
		EG020A-F: Vanadium	7440-62-2	1 mg/L	94.5	70.0	130
		EG020A-F: Zinc	7440-66-6	1 mg/L	95.1	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 4058668)							
ES2143627-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	92.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2143866**	Page	: 1 of 4
Client	: **ALS WATER AND HYDROGRAPHICS PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: RESULTS ADDRESS FYSHWICK	Telephone	: +61 2 8784 8555
Project	: CA2107572	Date Samples Received	: 02-Dec-2021
Site	: ----	Issue Date	: 10-Jan-2022
Sampler	: ----	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
CA2107572-002 - D02_211122	**22-Nov-2021**	**----**	----	----	**03-Dec-2021**	06-Dec-2021	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
CA2107572-002 - D02_211122	**22-Nov-2021**	**03-Dec-2021**	21-May-2022	✓	**06-Dec-2021**	21-May-2022	✓

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
CA2107572-009 - R01_211122	**22-Nov-2021**	**----**	----	----	**07-Dec-2021**	21-May-2022	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
CA2107572-010 - R01_211123	**23-Nov-2021**	**----**	----	----	**07-Dec-2021**	22-May-2022	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
CA2107572-011 - R01_211124	**24-Nov-2021**	**----**	----	----	**07-Dec-2021**	23-May-2022	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
CA2107572-009 - R01_211122	**22-Nov-2021**	**----**	----	----	**07-Dec-2021**	20-Dec-2021	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
CA2107572-010 - R01_211123	**23-Nov-2021**	**----**	----	----	**07-Dec-2021**	21-Dec-2021	✓
Clear Plastic Bottle - Nitric Acid; Filtered (EG035F)							
CA2107572-011 - R01_211124	**24-Nov-2021**	**----**	----	----	**07-Dec-2021**	22-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2146882**	Page	: 1 of 6
Client	: **ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)**	Laboratory	: Environmental Division Sydney
Contact	: MR MATTHEW CROW	Contact	: Monica Wright
Address	: LEVEL 1 45 WATT STREET NEWCASTLE NSW 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 0608750 - 07 CAPTAINS FLAT LINE	Date Samples Received	: 22-Dec-2021 09:01
Order number	: 0608750-07	Date Analysis Commenced	: 24-Dec-2021
C-O-C number	: ----	Issue Date	: 06-Jan-2022 17:33
Sampler	: MAX GALBRAITH		
Site	: ----		
Quote number	: EN/114		
No. of samples received	: 14		
No. of samples analysed	: 14		

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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	D01_211215	D02_211215	D03_211215	D04_211215	D05_211215
			Sampling date / time	15-Dec-2021 00:00	15-Dec-2021 00:00	15-Dec-2021 00:00	15-Dec-2021 00:00	15-Dec-2021 00:00
Compound	CAS Number	LOR	Unit	ES2146882-001	ES2146882-002	ES2146882-003	ES2146882-004	ES2146882-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	15.3	16.1	14.8	13.4	4.0
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	6	21	70	28	<5
Barium	7440-39-3	10	mg/kg	110	180	140	100	60
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	19	6	6	9	14
Cobalt	7440-48-4	2	mg/kg	4	2	<2	3	<2
Copper	7440-50-8	5	mg/kg	15	213	272	389	54
Lead	7439-92-1	5	mg/kg	246	4900	11200	3330	278
Manganese	7439-96-5	5	mg/kg	112	75	93	126	52
Nickel	7440-02-0	2	mg/kg	8	8	6	11	3
Selenium	7782-49-2	5	mg/kg	<5	<5	5	<5	<5
Vanadium	7440-62-2	5	mg/kg	31	8	12	14	27
Zinc	7440-66-6	5	mg/kg	105	1070	433	1060	204
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	0.4	0.5	0.3	<0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	D01_211216	D02_211216	D03_211216	D04_211216	D05_211216
			Sampling date / time	16-Dec-2021 00:00	16-Dec-2021 00:00	16-Dec-2021 00:00	16-Dec-2021 00:00	16-Dec-2021 00:00
Compound	CAS Number	LOR	Unit	ES2146882-007	ES2146882-008	ES2146882-009	ES2146882-010	ES2146882-011
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	19.0	12.5	29.7	48.3	26.9
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	72	10	93	7	75
Barium	7440-39-3	10	mg/kg	90	40	50	100	90
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	2	<1	3	<1
Chromium	7440-47-3	2	mg/kg	10	12	7	12	7
Cobalt	7440-48-4	2	mg/kg	<2	5	<2	39	<2
Copper	7440-50-8	5	mg/kg	408	80	262	73	228
Lead	7439-92-1	5	mg/kg	12400	1090	11000	1110	6860
Manganese	7439-96-5	5	mg/kg	71	148	122	666	174
Nickel	7440-02-0	2	mg/kg	7	9	6	46	8
Selenium	7782-49-2	5	mg/kg	<5	<5	6	<5	<5
Vanadium	7440-62-2	5	mg/kg	12	15	10	13	14
Zinc	7440-66-6	5	mg/kg	419	471	365	872	444
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	0.8	<0.1	0.8	0.1	0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	D06_211216	T01_211216	----	----	----
			Sampling date / time	16-Dec-2021 00:00	16-Dec-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2146882-012	ES2146882-013	--------	--------	--------
				Result	Result	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**5.4**	**5.6**	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**14**	**7**	----	----	----
Barium	7440-39-3	10	mg/kg	**470**	**240**	----	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	----	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	----	----	----
Chromium	7440-47-3	2	mg/kg	**13**	**12**	----	----	----
Cobalt	7440-48-4	2	mg/kg	**6**	**6**	----	----	----
Copper	7440-50-8	5	mg/kg	**155**	**77**	----	----	----
Lead	7439-92-1	5	mg/kg	**1190**	**378**	----	----	----
Manganese	7439-96-5	5	mg/kg	**254**	**243**	----	----	----
Nickel	7440-02-0	2	mg/kg	**10**	**9**	----	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	----	----	----
Vanadium	7440-62-2	5	mg/kg	**20**	**18**	----	----	----
Zinc	7440-66-6	5	mg/kg	**4140**	**2220**	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	R01_211215	R01_211216	----	----	----
			Sampling date / time	15-Dec-2021 00:00	16-Dec-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	ES2146882-006	ES2146882-014	--------	--------	--------
				Result	Result	----	----	----
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	----	----	----
Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	----	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	----	----	----
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2146882**	Page	: 1 of 7
Client	: **ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)**	Laboratory	: Environmental Division Sydney
Contact	: MR MATTHEW CROW	Contact	: Monica Wright
Address	: LEVEL 1 45 WATT STREET NEWCASTLE NSW 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 0608750 - 07 CAPTAINS FLAT LINE	Date Samples Received	: 22-Dec-2021
Order number	: 0608750-07	Date Analysis Commenced	: 24-Dec-2021
C-O-C number	: ----	Issue Date	: 06-Jan-2022
Sampler	: MAX GALBRAITH		
Site	: ----		
Quote number	: EN/114		
No. of samples received	: 14		
No. of samples analysed	: 14		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4102045)									
ES2146881-010	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	70	80	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	14	12	18.7	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	3	3	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	4	3	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	80	70	12.7	0% - 50%
		EG005T: Copper	7440-50-8	5	mg/kg	16	15	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	525	556	5.7	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	201	188	7.1	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	21	18	14.7	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	186	184	1.5	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
ES2146882-011	D05_211216	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	90	80	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	7	6	0.0	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	8	6	16.5	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	75	65	14.4	0% - 50%
		EG005T: Copper	7440-50-8	5	mg/kg	228	216	5.6	0% - 20%
		EG005T: Lead	7439-92-1	5	mg/kg	6860	6190	10.3	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	174	180	3.0	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4102045) - continued									
ES2146882-011	D05_211216	EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	14	14	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	444	381	15.3	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4098495)									
ES2146169-004	Anonymous	EA055: Moisture Content	----	0.1	%	25.4	25.6	0.9	0% - 20%
ES2146882-001	D01_211215	EA055: Moisture Content	----	0.1	%	15.3	14.5	5.5	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4102048)									
ES2146882-008	D02_211216	EA055: Moisture Content	----	0.1	%	12.5	11.6	7.4	0% - 50%
ES2146901-006	Anonymous	EA055: Moisture Content	----	0.1	%	18.7	18.4	1.7	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4102044)									
ES2146881-010	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.2	0.2	0.0	No Limit
ES2146882-011	D05_211216	EG035T: Mercury	7439-97-6	0.1	mg/kg	0.5	0.6	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG020T: Total Metals by ICP-MS (QC Lot: 4104348)									
ES2146944-086	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.004	0.004	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2146724-001	Anonymous	EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Barium	7440-39-3	0.001	mg/L	0.010	0.010	0.0	No Limit
		EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.0	No Limit
		EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.027	0.027	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG020T: Total Metals by ICP-MS (QC Lot: 4104348) - continued									
ES2146724-001	Anonymous	EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Zinc	7440-66-6	0.005	mg/L	0.008	0.009	0.0	No Limit
		EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
		EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 4104356)									
ES2146869-002	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES2146966-001	Anonymous	EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4102045)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	121.1 mg/kg	111	88.0	113
EG005T: Barium	7440-39-3	10	mg/kg	<10	90.5 mg/kg	135	65.0	136
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.5 mg/kg	126	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	----	----	----	----
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	0.74 mg/kg	129	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	19.6 mg/kg	126	68.0	132
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	10.4 mg/kg	116	83.0	117
EG005T: Copper	7440-50-8	5	mg/kg	<5	52.9 mg/kg	107	89.0	111
EG005T: Lead	7439-92-1	5	mg/kg	<5	60.8 mg/kg	119	82.0	119
EG005T: Manganese	7439-96-5	5	mg/kg	<5	534 mg/kg	116	83.0	117
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.3 mg/kg	118	80.0	120
EG005T: Selenium	7782-49-2	5	mg/kg	<5	----	----	----	----
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	58.6 mg/kg	122	75.0	125
EG005T: Zinc	7440-66-6	5	mg/kg	<5	139.3 mg/kg	109	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4102044)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.087 mg/kg	121	70.0	125

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG020T: Total Metals by ICP-MS (QCLot: 4104348)								
EG020A-T: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	91.4	82.0	114
EG020A-T: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	86.8	79.0	119
EG020A-T: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	87.8	84.0	116
EG020A-T: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	90.1	84.0	112
EG020A-T: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	88.5	86.0	116
EG020A-T: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	90.5	84.0	116
EG020A-T: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	88.8	83.0	118
EG020A-T: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	88.1	85.0	115
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	88.4	85.0	113
EG020A-T: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	89.6	84.0	116
EG020A-T: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	91.5	68.0	126
EG020A-T: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	88.1	85.0	113
EG020A-T: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	89.1	79.0	117
EG020A-T: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	95.9	75.0	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4104356)								
EG035T: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	96.0	77.0	111

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4102045)							
ES2146881-010	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	73.4	70.0	130
		EG005T: Cadmium	7440-43-9	50 mg/kg	79.8	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	90.4	68.0	132
		EG005T: Copper	7440-50-8	250 mg/kg	73.4	70.0	130
		EG005T: Lead	7439-92-1	250 mg/kg	75.5	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	90.9	70.0	130
		EG005T: Zinc	7440-66-6	250 mg/kg	82.2	66.0	133
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4102044)							
ES2146881-010	Anonymous	EG035T: Mercury	7439-97-6	5 mg/kg	86.7	70.0	130

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 4104348)							
ES2146724-002	Anonymous	EG020A-T: Arsenic	7440-38-2	1 mg/L	90.2	70.0	130
		EG020A-T: Beryllium	7440-41-7	1 mg/L	90.0	70.0	130
		EG020A-T: Barium	7440-39-3	1 mg/L	88.6	70.0	130
		EG020A-T: Cadmium	7440-43-9	0.25 mg/L	91.6	70.0	130
		EG020A-T: Chromium	7440-47-3	1 mg/L	92.1	70.0	130
		EG020A-T: Cobalt	7440-48-4	1 mg/L	89.6	70.0	130
		EG020A-T: Copper	7440-50-8	1 mg/L	89.7	70.0	130
		EG020A-T: Lead	7439-92-1	1 mg/L	88.1	70.0	130
		EG020A-T: Manganese	7439-96-5	1 mg/L	91.1	70.0	130
		EG020A-T: Nickel	7440-02-0	1 mg/L	90.1	70.0	130
		EG020A-T: Vanadium	7440-62-2	1 mg/L	90.4	70.0	130
		EG020A-T: Zinc	7440-66-6	1 mg/L	89.3	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 4104356)							
ES2146870-001	Anonymous	EG035T: Mercury	7439-97-6	0.01 mg/L	97.0	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2146882**	Page	: 1 of 5
Client	: **ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)**	Laboratory	: Environmental Division Sydney
Contact	: MR MATTHEW CROW	Telephone	: +61-2-8784 8555
Project	: 0608750 - 07 CAPTAINS FLAT LINE	Date Samples Received	: 22-Dec-2021
Site	: ----	Issue Date	: 06-Jan-2022
Sampler	: MAX GALBRAITH	No. of samples received	: 14
Order number	: 0608750-07	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) D01_211215, D02_211215, D03_211215, D04_211215, D05_211215	**15-Dec-2021**	**----**	----	----	**24-Dec-2021**	29-Dec-2021	✓
Soil Glass Jar - Unpreserved (EA055) D01_211216, D02_211216, D03_211216, D04_211216, D05_211216, D06_211216, T01_211216	**16-Dec-2021**	**----**	----	----	**29-Dec-2021**	30-Dec-2021	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) D01_211215, D02_211215, D03_211215, D04_211215, D05_211215	**15-Dec-2021**	**29-Dec-2021**	13-Jun-2022	✓	**31-Dec-2021**	13-Jun-2022	✓
Soil Glass Jar - Unpreserved (EG005T) D01_211216, D02_211216, D03_211216, D04_211216, D05_211216, D06_211216, T01_211216	**16-Dec-2021**	**29-Dec-2021**	14-Jun-2022	✓	**31-Dec-2021**	14-Jun-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) D01_211215, D02_211215, D03_211215, D04_211215, D05_211215	**15-Dec-2021**	**29-Dec-2021**	12-Jan-2022	✓	**31-Dec-2021**	12-Jan-2022	✓
Soil Glass Jar - Unpreserved (EG035T) D01_211216, D02_211216, D03_211216, D04_211216, D05_211216, D06_211216, T01_211216	**16-Dec-2021**	**29-Dec-2021**	13-Jan-2022	✓	**31-Dec-2021**	13-Jan-2022	✓

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
R01_211215	**15-Dec-2021**	**31-Dec-2021**	13-Jun-2022	✓	**31-Dec-2021**	13-Jun-2022	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
R01_211216	**16-Dec-2021**	**31-Dec-2021**	14-Jun-2022	✓	**31-Dec-2021**	14-Jun-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
R01_211215	**15-Dec-2021**	**----**	----	----	**04-Jan-2022**	12-Jan-2022	✓
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG035T)							
R01_211216	**16-Dec-2021**	**----**	----	----	**04-Jan-2022**	13-Jan-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Total Mercury by FIMS	EG035T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Total Mercury by FIMS	EG035T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Mercury by FIMS	EG035T	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **ES2146882**		
Client	: **ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)**	Laboratory	: Environmental Division Sydney
Contact	: MR MATTHEW CROW	Contact	: Monica Wright
Address	: LEVEL 1 45 WATT STREET NEWCASTLE NSW 2300	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: matthew.crow@erm.com	E-mail	: monica.wright@alsglobal.com
Telephone	: ----	Telephone	: +61-2-8784 8555
Facsimile	: ----	Facsimile	: +61-2-8784 8500
Project	: 0608750 - 07 CAPTAINS FLAT LINE	Page	: 1 of 3
Order number	: 0608750-07	Quote number	: EP2020ENVRES0018 (EN/114)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: MAX GALBRAITH		

Dates

Date Samples Received	: 22-Dec-2021 09:01	Issue Date	: 23-Dec-2021
Client Requested Due Date	: 06-Jan-2022	Scheduled Reporting Date	: **06-Jan-2022**

Delivery Details

Mode of Delivery	: Undefined	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 14 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please direct any queries you have regarding this work order to the above ALS laboratory contact.
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months ± 1 week) from receipt of samples.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - S-03 15 Metals (NEPM 2013 Suite - incl. Digestion)
ES2146882-001	15-Dec-2021 00:00	D01_211215	✓	✓
ES2146882-002	15-Dec-2021 00:00	D02_211215	✓	✓
ES2146882-003	15-Dec-2021 00:00	D03_211215	✓	✓
ES2146882-004	15-Dec-2021 00:00	D04_211215	✓	✓
ES2146882-005	15-Dec-2021 00:00	D05_211215	✓	✓
ES2146882-007	16-Dec-2021 00:00	D01_211216	✓	✓
ES2146882-008	16-Dec-2021 00:00	D02_211216	✓	✓
ES2146882-009	16-Dec-2021 00:00	D03_211216	✓	✓
ES2146882-010	16-Dec-2021 00:00	D04_211216	✓	✓
ES2146882-011	16-Dec-2021 00:00	D05_211216	✓	✓
ES2146882-012	16-Dec-2021 00:00	D06_211216	✓	✓
ES2146882-013	16-Dec-2021 00:00	T01_211216	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - W-03T 15 Metals (Total) (NEPM)
ES2146882-006	15-Dec-2021 00:00	R01_211215	✓
ES2146882-014	16-Dec-2021 00:00	R01_211216	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	au.accounts@erm.com

MATTHEW CROW

- *AU Certificate of Analysis - NATA (COA)	Email	matthew.crow@erm.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	matthew.crow@erm.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	matthew.crow@erm.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	matthew.crow@erm.com
- A4 - AU Tax Invoice (INV)	Email	matthew.crow@erm.com
- Chain of Custody (CoC) (COC)	Email	matthew.crow@erm.com
- EDI Format - ENMRG (ENMRG)	Email	matthew.crow@erm.com
- EDI Format - EQUIS V5 ERM (EQUIS_V5_ERM)	Email	matthew.crow@erm.com
- EDI Format - ESDAT (ESDAT)	Email	matthew.crow@erm.com

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 24 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
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☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: ERM	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	Standard TAT (7 days)	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Newcastle			Custody Seal Intact? Yes No N/A
PROJECT: 0608750 - 07 Captains flat line	**ALS QUOTE NO.:** National Price Discount	**COC SEQUENCE NUMBER (Circle)**	Eskies / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 0608750-07		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Matthew Crow	**CONTACT PH:** 0402652889	OF: 1 2 3 4 5 6 7	Other comment:
SAMPLER: Max Galbraith	**SAMPLER MOBILE:** 0468384969	**RELINQUISHED BY:** Max Galbraith	**RECEIVED BY:** JN 0900
COC emailed to ALS?	**EDD FORMAT (or default):**	DATE/TIME:	DATE/TIME: 22/12/21
Email Reports to (will default to PM if no other addresses are listed): PM		**RELINQUISHED BY:** TOB	**RECEIVED BY:** Rasheed
Email Invoice to (will default to PM if no other addresses are listed): PM		DATE/TIME: 22/12/21 5PM	DATE/TIME: 22/12/21 7240

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	HOLD	W-3 (15 Metals)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	D01_211215	15/12/2021	soil				x							
2	D02_211215	15/12/2021	soil				x							
3	D03_211215	15/12/2021	soil				x							
4	D04_211215	15/12/2021	soil				x							
5	D05_211215	15/12/2021	soil				x							
6	R01_211215	15/12/2021	soil				x							
7	D01_211216	16/12/2021	soil				x							
8	D02_211216	16/12/2021	water				x							
9	D03_211216	16/12/2021	soil				x							
10	D04_211216	16/12/2021	soil				x							
11	D05_211216	16/12/2021	soil				x							
12	D06_211216	16/12/2021	soil				x							
13	T01_211216	16/12/2021	soil				x							
14	R01_211216	16/12/2021	water				x							

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LAB OF ORIGIN: NEWCASTLE

Environmental Division Sydney
Work Order Reference
ES2146882

Telephone : +61-2-8784 8555

22/12/21

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
☐BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
☐MELBOURNE 2 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
☐NOWRA 4/5 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
☐MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee mail@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples perth@alsglobal.com
☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: ERM	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	Standard TAT (7 days)	**FOR LABORATORY USE ONLY (Circle)**
OFFICE: Newcastle			Custody Seal Intact? Yes No N/A
PROJECT: 0608750 - 07 Captains flat line	**ALS QUOTE NO.:** National Price Discount	**COC SEQUENCE NUMBER (Circle)**	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: 0608750-07		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: Matthew Crow	**CONTACT PH:** 0402652889	OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: Max Galbraith	**SAMPLER MOBILE:** 0468384969	**RELINQUISHED BY:** *Max Galbraith*	**RECEIVED BY:** JN 0900	**RELINQUISHED BY:** TOB
COC emailed to ALS?	**EDD FORMAT (or default):**	DATE/TIME:	DATE/TIME: 22/12/21	DATE/TIME: 22/12/21 5PM
Email Reports to (will default to PM if no other addresses are listed): PM				
Email Invoice to (will default to PM if no other addresses are listed): PM				

RECEIVED BY:	
Rasheed	
DATE/TIME: 22/12/21	1240

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL CONTAINERS	HOLD	W-3 (15 Metals)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	D01_211215	15/12/2021	soil				x							
2	D02_211215	15/12/2021	soil				x							
3	D03_211215	15/12/2021	soil				x							
4	D04_211215	15/12/2021	soil				x							
5	D05_211215	15/12/2021	soil				x							
6	R01_211215	15/12/2021	soil				x							
7	D01_211216	16/12/2021	soil				x							
8	D02_211216	16/12/2021	water				x							
9	D03_211216	16/12/2021	soil				x							
10	D04_211216	16/12/2021	soil											
11	D05_211216	16/12/2021	soil				x							
12	D06_211216	16/12/2021	soil				x							
13	T01_211216	16/12/2021	soil				x							
14	R01_211216	16/12/2021	water				x							

Environmental Division
Sydney
Work Order Reference
ES2146882

Telephone : - 61-2-8784 8555

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LAB OF ORIGIN:
NEWCASTLE

22/12/21

APPENDIX G QAQC REPORT

G - QUALITY ASSURANCE AND QUALITY CONTROL ASSESSMENT

The objective of this data assessment is to evaluate the quality of data gathered during the investigation detailed in the main body of this report. This process has been undertaken to assess whether the sample data is of a suitable standard to be utilised in this report. The data assessment consists of comparing field and laboratory QA/QC results to documented guidelines. The data assessment has been prepared in accordance with the ASC NEPM – Schedule B2: Guideline on Site Characterisation. Particular reference is made to the PARCC parameters (precision, accuracy, representativeness, completeness and comparability) in evaluating the data quality.

Table G1 presents the degree of QA/QC pertinent to the field investigations.

Table G1 Field QA/QC Assessment

QA/QC Criterion	Comments
QA/QC program includes duplicate samples.	In order to demonstrate the suitability of the 305 primary XRF samples analysed, field quality control samples included the collection of 20 duplicate samples for comparison to the XRF data. The laboratory data was compared to the XRF result from the same location in order to assess the validity of the results. The target rate for laboratory duplicates to field measurements was 1:10, however a lower rate of 1:15 was achieved. The reduction in frequency was due to miscalculation within the field team. Although the ideal rate remains at 1:10, given the large number of measurements ultimately taken, the 20 laboratory duplicates are considered sufficient to make judgements on the potential for any systematic biases in the XRF dataset. Of the 20 Relative Percentage Difference (RPDs) of soil sample duplicate, 16 uncorrected XRF pairs were outside the acceptance limits (*Table G4*). The overall average RPD was -13%, indicating that on average the XRF data was 13% lower than the laboratory data. Although these differences may be explained by potential heterogeneities in the samples media, it is more likely that moisture content within the sampled media influenced the results. In order to further assess the potential for moisture to have influenced the XRF measurements, the data set was corrected by the average moisture content in samples (18% w/w). When the data set was moisture corrected, the average RPD was 4%, indicating that the corrected XRF results were on average 4% higher than the laboratory data. Correlation coefficients were then calculated for lead in both the uncorrected and corrected data sets and are presented in *Figure G1*. Therefore, the moisture corrected data was used to base conclusions of this report on as a conservative measure to ensure the XRF data has not been under reported. In order to confirm the suitability of the laboratory data, an additional inter-laboratory duplicates were collected and sent to a secondary laboratory post analysis for comparison. On two occasions the inter-laboratory duplicate was analysed by both the primary and secondary laboratory and the results were compared. The calculated RPD for this sample is summarised in *Table G.6*. The lead, barium, and zinc RPD for this sample were outside the acceptable criteria, however, the difference may be explained by heterogeneities in the sampled media however are not expected to effect the data set.
Appropriate calibration	According to manufacturer recommendations, the Olympus Delta Handheld XRF Analyser was appropriately calibrated prior to delivery of the unit, and daily calibration was undertaken on the handheld XRF device and logged internally

QA/QC Criterion	Comments
procedures were undertaken.	with all calibrations adequate for device use. Daily calibration was performed using a known standard (alloy 416 stainless steel) where the analyser compares a variety of parameters with the factory pre-set values. These values were not recorded in the field and therefore cannot be confirmed. Calibration certificates are provided in *Appendix D*). It is noted that whilst the calibration certificate indicates a manufacturer calibration was due on 27 April 2021, such a calibration is deemed unnecessary by the manufacturer unless the daily calibrations are failing.
Appropriate decontamination procedures were adopted.	Decontamination procedures were implemented between collections of duplicates. Soil samples were collected for laboratory analysis in accordance with ERM SOPs. Samples were collected from a trowel, which was decontaminated between each sample location. All non-dedicated sampling equipment was decontaminated between sampling locations where designated disposable materials were not used. Decontamination procedures were as follows: ■ all loose soil removed with a stiff brush; ■ washed in potable (tap) water and brush scrubbing using tap water and a non-phosphate detergent (Decon 90®); ■ rinsed with potable water; and ■ air dried. Field QAQC measures (including the use of new disposable nitrile gloves between samples, and decontamination of sampling tools) were considered appropriate to minimise cross-contamination between samples. The XRF analyser window was wiped with dedicated paper towel moistened with deionised water in between XRF readings. Five rinsate blank samples were collected during the sampling, and none provided readings above the EQL (*Table G5*) which indicates that decontamination measures appropriately mitigated cross contamination.
All relevant media assessed	XRF readings and soil samples were taken from ground surface. This was considered appropriate due to windblown dust being the most plausible offsite transport mechanism and was considered appropriate for the preliminary nature of the investigation.
Appropriateness of sampling strategy	The primary objective of the investigation was to establish a preliminary assessment of soil conditions at the Site in relation to lead and provide an initial assessment of whether any lead concentrations present exceed relevant tier one screening criteria. Sample locations were distributed across the area of investigation in 500m transects to achieve spacial coverage along the rail corridor. XRF was selected as the primary data collection tool due to its flexibility and ability to collect larger data sets in real time than traditional soil sampling alone. XRF allows Site characterisation for metals in a shorter timeframe and facilitates better hotspot identification and delineation.
Sample collection, handling and transportation procedures.	Samples were collected, handled and transported in line with ERM SOP's and XRF readings were taken in general accordance with USEPA (2007) Method 6200 – Field Portable X-Ray Florescence Spectrometry for the Determination of Element Concentrations in Soil and Sediment. XRF analysis was undertaken for 120 seconds per location and results were logged instantly. It is noted that samples were not homogenised, sieved or dried prior to XRF measurement in

QA/QC Criterion	Comments
	order to afford the timeframe to collect a larger data set. This was offset by the analysis of laboratory duplicates to confirm the accuracy of the measurements. Soil samples which were intended for laboratory analysis were placed in laboratory supplied sample bags, stored in a cool box, and forwarded to the NATA accredited laboratory under COC conditions. Note that the COC and SRN relating to ES2146881 references samples collected on separate residential sites. ES2146881 was issued as a split report such that only data pertinent to this Site were included on certificates of analysis. The methods used to collect the samples, the types of sample containers, preservation techniques and custody protocols were documented appropriately.
Field QA/QC plan	The sampling team was suitably qualified and experienced to conduct the required works. Field reports describing the media sampled, any indication of potential contamination, duplicate samples and sampling locations were completed. Note that original field notes included sampling information pertinent to sample collection on separate residential sites. The non-relevant information has been redacted from the field notes.

Table G2 presents the degree of QA/QC pertinent to the laboratory program.

Table G2 Laboratory QA/QC Assessment

QA/QC Criterion	Comments
Appropriate methodologies used for sample analyses	The laboratory used for the investigation works were NATA accredited All laboratory reports were NATA stamped and signed by a NATA signatory. All methodologies were considered appropriate for the identified contaminants of concern in the matrix. The analysis of primary lab samples was verified using three inter-laboratory duplicates. The RPD values calculated from comparing lab results are presented in table G6. No values were outside the acceptability limits.
Appropriate Limit of Reporting (LOR)	The laboratory LOR for each analyte is presented in the laboratory reports and summary tables. Soil samples results were reported with LORs below the relevant Site assessment criteria.

QA/QC Criterion	Comments
Laboratory QA/QC plan	Copies of signed chain of custody forms were returned by the laboratory. The primary laboratory and secondary laboratory were both NATA accredited. All laboratory certificates are provided in *Appendix F.* It is noted that the analytical methods completed were NATA approved as documented on the laboratory reports. Samples were received and analysed within specified laboratory holding times. The types of QA/QC samples analysed by the laboratory for the documented samples were considered sufficient to assess the precision and accuracy of the laboratory methods used. The statistical data presented in the laboratory QA/QC report was considered adequate in demonstrating the precision and accuracy of the methods used to analyse field samples. Any QA/QC outliers are reported in laboratory documentation included in *Appendix F* and were considered appropriate by the laboratory.

Table G3 below summarises the QA/QC results in relation to the data quality indicators of precision, accuracy, representativeness, comparability and completeness for the investigation sampling program.

Table G3 Overall Sampling and Analysis Methodology Assessment

Field Considerations	Laboratory Considerations
Precision Requirements	
The soil sampling was conducted following ERM SOPs and relevant industry standards. Any variations from these procedures were documented.	Analysis of the following were reported: ■ Laboratory duplicates; and ■ Intra-laboratory duplicates; and ■ Inter-laboratory duplicates; and ■ Rinsate blanks.
Precision Comments	
Aside from sampling soils in-situ rather than sieving, drying, and homogenising, no significant variations from ERM SOPs or USEPA (2007) Method 6200 were noted. As reported in Table G4, discrepancies were noted between the XRF samples and laboratory duplicates and therefore the data set was adjusted to remove systematic data biases.	
Accuracy Requirements	
The soil sampling was conducted following ERM SOPs and XRF readings were taken in general accordance with USEPA (2007) Method 6200, with the exception of sampling soils in-situ rather than sieving, drying, and homogenising. These changes were documented.	Analysis of the following were reported where applicable: ■ Laboratory duplicates; ■ Intra-laboratory duplicates; ■ method blanks; ■ Laboratory control samples.
Accuracy Comments	
No significant variations from ERM SOPs or USEPA (2007) Method 6200 with the exception of sampling soils in-situ rather than sieving, drying, and homogenising were undertaken. Changes that were undertaken were noted. Laboratory QA/QC samples were generally reported within the acceptance limits specified in the laboratory reports with the exception of those noted above.	

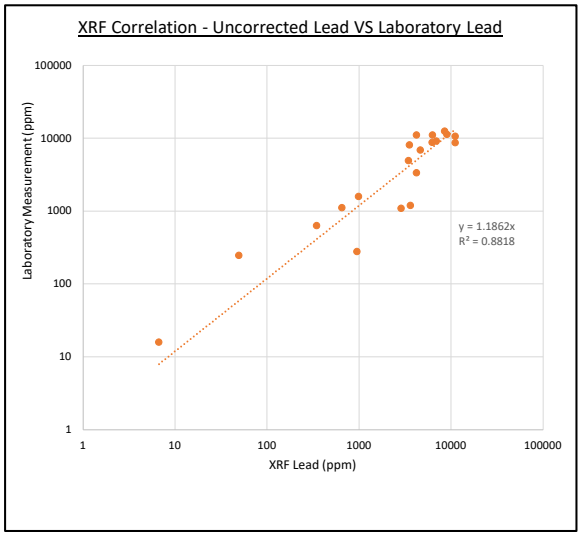
Field Considerations	Laboratory Considerations
Representativeness Requirements	
Appropriate media were identified and sampled according to ERM SOPs and laboratory standards.	All primary samples were analysed according to the proposed Sampling and Analysis Plan
Representativeness Comments	
The number and type of samples collected as part of investigation works was considered to be representative of the areas of concern. Given the investigation density achieved over the Site ERM considers that sufficient data is available to establish a suitable assessment of near surface soil conditions at the offsite areas under assessment.	
Comparability Requirements	
The same SOPs and XRF methodology were used during each sampling event. All sampling was conducted by an appropriately qualified and experienced sampler. The types of samples collected were consistent.	Analytical methods suitable for the target media were used. The laboratory LORs used to report analyte concentrations were generally less than the adopted investigation criteria for significant contaminants of concern. XRF reported concentrations in ppm whilst laboratory reported concentrations in mg/kg. This is considered suitably comparable for the purposes of this investigation. XRF results were moisture corrected using following formula; *Corrected XRF Lead = XRF Lead/(100 – moisture content)*100)* Exact moisture was used where available, otherwise average moisture was applied. Correlation coefficients were then calculated for lead and are presented in *Figure G1*. Results of laboratory analysis were generally comparable with field screening results. 12 of 20 pairs were outside the acceptable criteria, however, this may be explained due to the heterogeneity of the media sampled.
Comparability Comments	
No significant outliers from the requirements were noted. Any RPD outliers have been recognised and considered when interpreting the data set.	
Completeness Requirements	
All relevant locations were sampled. All sampling was conducted by an appropriately qualified and experienced sampler. Documentation of field works was provided.	All critical samples were analysed according to the proposed Sampling and Analysis Plan, with the exception of the lower field duplicate rate of 1:16. Appropriate analysis methods and laboratory LORs were used. Sample documentation was provided. Sample holding times were complied with.
Completeness Comments	

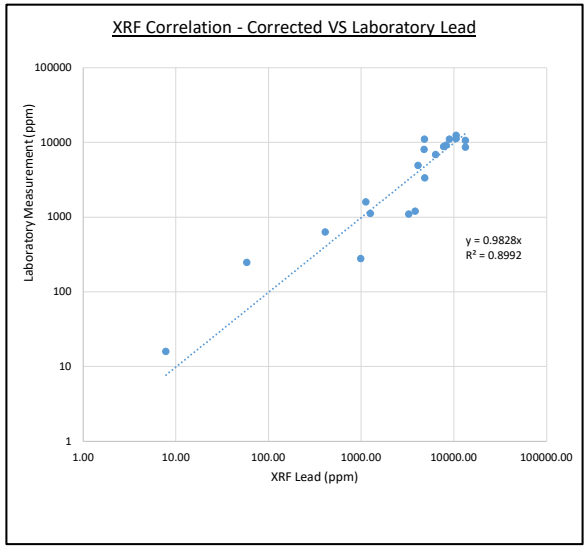
Field Considerations	Laboratory Considerations
The specified requirements for completeness of the dataset were met. The quality of the dataset and overall outcomes of the investigation remain unaffected by the noted RPD and laboratory QA/QC outliers and is considered suitable for the purposes of this investigation.	

Figure G1. Laboratory Moisture Corrected XRF Lead Correlation
Bungendore to Captains Flat Line XRF Site Investigation
Bungendore Rail Precinct - 0608750

Lab Lead (ppm)	XRF Lead (ppm)	Corrected XRF Lead (ppm)
15.8	6.7	7.85
8020	3561	4812.16
11000	4222	4841.74
8610	11200	13349.23
10600	11200	13349.23
1580	993	1132.27
629	347	410.17
8770	6252	7805.24
9140	6950	8333.33
246	49.7	58.68
4900	3469	4134.68
11200	9061	10634.98
3330	4220	4872.98
278	951	990.63
12400	8585	10598.77
1090	2875	3285.71
11000	6329	9002.84
1110	654	1264.99
6860	4661	6376.20
1190	3638	3845.67

Corrected XRF Lead =
XRF Lead/(100 – moisture content %)*100





		Lab Report Number		CA2107572			CA2107572			CA2107572			CA2107572			ES2143866			CA2107572			CA2107572			CA2107572			CA2107572			ES2146882			ES2146882	
		Field ID	T3_W2	D01_211122	**RPD**	T11_B	D01_211123	**RPD**	T14_B	D02_211123	**RPD**	T17_B	D02_211122	**RPD**	T17_B	D02_211122	**RPD**	T22_E1	D03_211123	**RPD**	T29_W1	D04_211123	**RPD**	T33_B	D01_211124	**RPD**	T35_B	D02_211124	**RPD**	T40_B	D01_211215	**RPD**	T43_E1	D02_211215	**RPD**
		Sampled Date/Time																																		
Chem_Group	**ChemName**	**Units**	**EQL**																																	
	Moisture Content	%	1		14.7			26			12.8			16.1						12.3			15.4			19.9			16.6			15.3			16.1	
Metals	Lead	mg/kg	5	6.7	15.8	**-80.89**	3561	8020	**-77.01**	4222	11000	**-89.06**	11200	8610	26.15	11200	10600.00	5.50	993.00	1580	**-45.63**	347	629	**-57.79**	6252	8770	**-33.52**	6950	9140	-27.22	49.7	246	**-132.77**	3469	4900	**-34.20**
	Lead - *Corrected*	mg/kg	5	7.85	15.8	-67	4812.16	8020	**-50**	4841.74	11000	**-78**	13349.23	8610	**43**	11200.00	10600.00	6	1132.27	1580	**-33**	410.17	629	**-42**	7805.24	8770	-12	8333.33	9140	-9	58.68	246	**-123**	4134.68	4900	-17

		Lab Report Number		ES2146882			ES2146882			ES2146882			ES2146882			ES2146882			ES2146882			ES2146882			ES2146882			ES2146882			859898					
		Field ID	T46_W1	D03_211215	**RPD**	T51_W1	D04_211215	**RPD**	T55_W1	D05_211215	**RPD**	T62_B	D01_211216	**RPD**	T62_E1	D02_211216	**RPD**	T64_B	D03_211216	**RPD**	T64_W1	D04_211216	**RPD**	T65_B	D05_211216	**RPD**	T65_W1	D06_211216	**RPD**	T65_W1	T01_211216	**RPD**			
		Sampled Date/Time																																		
Chem_Group	**ChemName**	**Units**	**EQL**																																	
	Moisture Content	%	1		14.8			13.4			4			19			12.5			29.7			48.3			26.9			5.4			4.5				
Metals	Lead	mg/kg	5	9061	11200	-21	4220	3330	24	951	278	**110**	8585	12400	**-36**	2875	1090	**90**	6329	11000	**-54**	654	1110	**-52**	4661	6860	**-38**	3638	1190	**101**	3638	540	**148**			
	Lead - *Corrected*	mg/kg	5	10634.98	11200	-5	4872.98	3330	**38**	990.63	278	**112**	10598.77	12400	-16	3285.71	1090	**100**	9002.84	11000	-20	1264.99	1110	13	6376.20	6860	-7	3845.67	1190	**105**	3809.42	540	**150**			

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL))

			Lab Report Number	ES214688-AE	ES214688-AE	ES214688-AE	ES2146882	ES2146882
			Field ID	R01_211122	R01_211123	R01_211124	R01_211215	R01_211216
			Sampled_Date/Time	22/11/2021 0:00	23/11/2021 0:00	24/11/2021 0:00	15/12/2021 0:00	16/12/2021 0:00
			Sample Type	Rinsate	Rinsate	Rinsate	Rinsate	Rinsate
Chem_Group	**ChemName**	**Units**	**EQL**					
Metals	Arsenic	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Barium	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Beryllium	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Boron	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Cadmium	mg/l	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Chromium (III+VI)	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Cobalt	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Copper	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Lead	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Manganese	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Mercury	mg/l	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Nickel	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Selenium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Vanadium	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Zinc	mg/l	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

	Lab Report Number	CA2107572	ES2143866		ES21468882	859898 - S		ES21468882	ES21468882		ES21468882	859898 - S	
	Field ID	D02_211122*	D02_211122*	**RPD**	D06_211216	T01_211216*	**RPD**	D06_211216	T01_211216*	**RPD**	T01_211216*	T01_211216*	**RPD**
	Sampled Date/Time	21/11/2021	21/11/2021		16/12/2021	16/12/2021		16/12/2021	16/12/2021		16/12/2021	16/12/2021	
Chem_Group	**ChemName**	**Units**	**EQL**										
	Moisture Content	%	1	16.1	17.6	9	5.4	4.5	18	5.4	5.6	4	5.6	4.5	22
Metals	Arsenic	mg/kg	5 (Primary): 2 (Interlab)				14	12	15	14	7	67	7	12	53
Metals	Barium	mg/kg	10				470	210	**76**	470	470	**0**	470	210	**76**
Metals	Beryllium	mg/kg	1 (Primary): 2 (Interlab)				<1	<2		<1	<1		<1	<2	
Metals	Boron	mg/kg	50 (Primary): 10 (Interlab)				<50	<10		<50	<50		<50	<10	
Metals	Cadmium	mg/kg	1 (Primary): 0.4 (Interlab)				<1	0.5		<1	<1		<1	0.5	
Metals	Chromium (III+VI)	mg/kg	2 (Primary): 5 (Interlab)				13	19	38	13	13	0	13	19	38
Metals	Cobalt	mg/kg	2 (Primary): 5 (Interlab)				6	8	29	6	6	0	6	8	29
Metals	Copper	mg/kg	5				155	110	34	155	155	0	155	110	34
Metals	Lead	mg/kg	5	8610	10600	19	1190	540	**75**	1190	378	**104**	378	540	**35**
Metals	Manganese	mg/kg	5				254	300	17	254	254	0	254	300	17
Metals	Mercury	mg/kg	0.1				<0.1	<0.1		<0.1	<0.1		<0.1	<0.1	
Metals	Nickel	mg/kg	2 (Primary): 5 (Interlab)				10	14	33	10	10	0	10	14	33
Metals	Vanadium	mg/kg	5 (Primary): 10 (Interlab)				20	22	10	20	20	0	20	22	10
Metals	Zinc	mg/kg	5				4140	2500	**49**	4140	4140	**0**	4140	2500	**49**

*Sample Y01_211216 was analysed by both laboratories due to an error on the COC whereby the sample was not forwarded to the secondary lab until after analysis at the primary lab
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 80 (1-10 x EQL); 50 (10-30 x EQL); 30 (> 30 x EQL)

APPENDIX H 95% UCL CALCULATIONS

	A	B	C	D	E	F	G	H	I	J	K	L
1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3				User Selected Options								
4				Date/Time of Computation	25/03/2022 1:14:52 PM							
5				From File	WorkSheet.xls							
6				Full Precision	OFF							
7				Confidence Coefficient	95%							
8				Number of Bootstrap Operations	2000							
9												
10												
11	**Active Corridor**											
12												
13	**General Statistics**											
14						Total Number of Observations	23			Number of Distinct Observations	23		
15										Number of Missing Observations	0	
16						Minimum	10.7			Mean	182.7	
17						Maximum	1992			Median	61.3	
18						SD	410			Std. Error of Mean	85.48	
19						Coefficient of Variation	2.244			Skewness	4.268	
20												
21	**Normal GOF Test**											
22						Shapiro Wilk Test Statistic	0.406			**Shapiro Wilk GOF Test**		
23						5% Shapiro Wilk Critical Value	0.914			Data Not Normal at 5% Significance Level		
24						Lilliefors Test Statistic	0.372			**Lilliefors GOF Test**		
25						5% Lilliefors Critical Value	0.185			Data Not Normal at 5% Significance Level		
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29						**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**		
30						95% Student's-t UCL	329.5			95% Adjusted-CLT UCL (Chen-1995)	404.6	
31										95% Modified-t UCL (Johnson-1978)	342.1	
32												
33	**Gamma GOF Test**											
34						A-D Test Statistic	1.756			**Anderson-Darling Gamma GOF Test**		
35						5% A-D Critical Value	0.79			Data Not Gamma Distributed at 5% Significance Level		
36						K-S Test Statistic	0.252			**Kolmogrov-Smirnoff Gamma GOF Test**		
37						5% K-S Critical Value	0.19			Data Not Gamma Distributed at 5% Significance Level		
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41						k hat (MLE)	0.666			k star (bias corrected MLE)	0.608	
42						Theta hat (MLE)	274.4			Theta star (bias corrected MLE)	300.5	
43						nu hat (MLE)	30.62			nu star (bias corrected)	27.96	
44						MLE Mean (bias corrected)	182.7			MLE Sd (bias corrected)	234.3	
45										Approximate Chi Square Value (0.05)	16.9	
46						Adjusted Level of Significance	0.0389			Adjusted Chi Square Value	16.27	
47												
48	**Assuming Gamma Distribution**											
49						95% Approximate Gamma UCL (use when n>=50))	302.3			95% Adjusted Gamma UCL (use when n<50)	313.8	
50												
51	**Lognormal GOF Test**											
52						Shapiro Wilk Test Statistic	0.948			**Shapiro Wilk Lognormal GOF Test**		
53						5% Shapiro Wilk Critical Value	0.914			Data appear Lognormal at 5% Significance Level		
54						Lilliefors Test Statistic	0.135			**Lilliefors Lognormal GOF Test**		
55						5% Lilliefors Critical Value	0.185			Data appear Lognormal at 5% Significance Level		
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											

59	Minimum of Logged Data					2.37	Mean of logged Data					4.293
60	Maximum of Logged Data					7.597	SD of logged Data					1.19
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					301.1	90% Chebyshev (MVUE) UCL					264.4
64	95% Chebyshev (MVUE) UCL					320.1	97.5% Chebyshev (MVUE) UCL					397.3
65	99% Chebyshev (MVUE) UCL					549.1						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					323.3	95% Jackknife UCL					329.5
72	95% Standard Bootstrap UCL					318.7	95% Bootstrap-t UCL					775
73	95% Hall's Bootstrap UCL					787.4	95% Percentile Bootstrap UCL					341.8
74	95% BCA Bootstrap UCL					431.4						
75	90% Chebyshev(Mean, Sd) UCL					439.1	95% Chebyshev(Mean, Sd) UCL					555.3
76	97.5% Chebyshev(Mean, Sd) UCL					716.5	99% Chebyshev(Mean, Sd) UCL					1033
77												
78	**Suggested UCL to Use**											
79	95% Chebyshev (Mean, Sd) UCL					555.3						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation	25/03/2022 1:16:03 PM										
5	From File	WorkSheet_a.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	**Non-Operational Corridor**											
12												
13	**General Statistics**											
14	Total Number of Observations	281			Number of Distinct Observations	270						
15					Number of Missing Observations	0						
16	Minimum	10.1			Mean	2199						
17	Maximum	33770			Median	424.3						
18	SD	3891			Std. Error of Mean	232.1						
19	Coefficient of Variation	1.769			Skewness	3.603						
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic	0.616			**Shapiro Wilk GOF Test**							
23	5% Shapiro Wilk P Value	0			Data Not Normal at 5% Significance Level							
24	Lilliefors Test Statistic	0.287			**Lilliefors GOF Test**							
25	5% Lilliefors Critical Value	0.0529			Data Not Normal at 5% Significance Level							
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**							
30	95% Student's-t UCL	2582			95% Adjusted-CLT UCL (Chen-1995)	2634						
31					95% Modified-t UCL (Johnson-1978)	2590						
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic	7.19			**Anderson-Darling Gamma GOF Test**							
35	5% A-D Critical Value	0.84			Data Not Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic	0.13			**Kolmogrov-Smirnoff Gamma GOF Test**							
37	5% K-S Critical Value	0.058			Data Not Gamma Distributed at 5% Significance Level							
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)	0.426			k star (bias corrected MLE)	0.424						
42	Theta hat (MLE)	5160			Theta star (bias corrected MLE)	5186						
43	nu hat (MLE)	239.5			nu star (bias corrected)	238.3						
44	MLE Mean (bias corrected)	2199			MLE Sd (bias corrected)	3377						
45					Approximate Chi Square Value (0.05)	203.6						
46	Adjusted Level of Significance	0.0491			Adjusted Chi Square Value	203.4						
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))	2574			95% Adjusted Gamma UCL (use when n<50)	2576						
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic	0.939			**Shapiro Wilk Lognormal GOF Test**							
53	5% Shapiro Wilk P Value	3.220E-15			Data Not Lognormal at 5% Significance Level							
54	Lilliefors Test Statistic	0.0733			**Lilliefors Lognormal GOF Test**							
55	5% Lilliefors Critical Value	0.0529			Data Not Lognormal at 5% Significance Level							
56	**Data Not Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											

59	Minimum of Logged Data					2.313	Mean of logged Data					6.167
60	Maximum of Logged Data					10.43	SD of logged Data					1.961
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					4685	90% Chebyshev (MVUE) UCL					5055
64	95% Chebyshev (MVUE) UCL					5895	97.5% Chebyshev (MVUE) UCL					7061
65	99% Chebyshev (MVUE) UCL					9351						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data do not follow a Discernible Distribution (0.05)**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					2581	95% Jackknife UCL					2582
72	95% Standard Bootstrap UCL					2591	95% Bootstrap-t UCL					2667
73	95% Hall's Bootstrap UCL					2705	95% Percentile Bootstrap UCL					2582
74	95% BCA Bootstrap UCL					2644						
75	90% Chebyshev(Mean, Sd) UCL					2895	95% Chebyshev(Mean, Sd) UCL					3211
76	97.5% Chebyshev(Mean, Sd) UCL					3648	99% Chebyshev(Mean, Sd) UCL					4508
77												
78	**Suggested UCL to Use**											
79	95% Chebyshev (Mean, Sd) UCL					3211						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

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