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CAPTAINS FLAT
LEAD ABATEMENT PLAN – SOUTHERN END OF FOXLOW STREET

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ABBREVIATIONS

Measures	Description
%	per cent
km	Kilometres
m	Metre
mAHD	Metres Australian Height Datum
mbgl	Metres below ground level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
ppm	Parts Per Million
AHD	Australian Height Datum
BoQ	Bill of Quantities
CEMP	Construction Environmental Management Plan
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
CSM	Conceptual Site Model
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
EMP	Environmental Management Plan
ENM	Excavated Natural Material
Envirolab	Envirolab Services Pty Ltd
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
HIL	Health Investigation Level
LAP	Lead Abatement Plan
LEP	Local Environment Plan
LMP	Lead Management Plan
LOR	Limit of Reporting
LTEMP	Long Term Environmental Management Plan
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
NATA	National Association of Testing Authorities
ND	Not Detected
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NL	Non-Limiting
n	Number of Samples
pH	A measure of acidity, hydrogen ion activity
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
REF	Review of Environmental Factors
RPD	Relative Percent Difference
RRO/RRE	Resource Recovery Order/Exemption
SAQP	Sampling Analysis and Quality Plan
SEPP (Resilience and Hazards) 2021	Former State Environmental Planning Policy 55 – Remediation of Land, Now Chapter 4 Remediation of Land in State Environmental Planning Policy (Resilience and Hazards) 2021

Measures	Description
SSTL	Site Specific Trigger Level
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VENM	virgin excavated natural material
-	On tables is "not calculated", "no criteria" or "not applicable"

EXECUTIVE SUMMARY

Ramboll Australia Pty Ltd (Ramboll) was retained by the Department of Regional NSW (Regional NSW) to prepare the Lead Abatement Plan to address exposure risks from lead located at the southern end of Foxlow Street, Captains Flat, New South Wales (NSW) (the site). This Lead Abatement Plan forms part of the Captains Flat Lead Management Plan (LMP).

Potential for human health risks from exposure to lead in soil was identified as moderate or high in seven areas of Captains Flat. Risks were generally limited to the southern part of Captains Flat and public land near the northern bank of the Molonglo River though also included Foxlow Parklet. Assessment of lead concentrations at the southern end of Foxlow Street against a site-specific trigger level (SSTL) protective of human health is summarised below.

Lead concentrations exceeding the SSTL were observed in 25 of the 49 soil samples obtained in the southern end of Foxlow Street area, varying from a minimum below the analytical limit of reporting (LOR) in two samples to a maximum concentration of 10,592 mg/kg in near surface soil.

The objectives of this abatement plan are:

- to define an abatement strategy to reduce community exposure risks
- to provide a detailed design including a separable bill of quantities and relevant drawings to allow abatement to be approved and implemented
- to provide an abatement works plans to guide execution of the nominated strategy

The preferred abatement strategy for the southern end of Foxlow Street includes excavation of shallow soils to a depth of 0.1 m to allow capping with hardstand pavement to reinstate current landform levels. Further removal of 300 m^3 is included to allow for drainage tie-ins, in-situ tree / plant boxes etc. This option includes:

- offsite disposal at the mine site containment cell or immobilisation and landfill disposal of contaminated excavation spoil (subject to Principal confirmation)
- construction of hardstand pavement along both sides of Foxlow Street from the Molonglo River bridge, south to Jerangle Road
- a $225k (ex GST) provision for drainage and street landscaping. This provision is included to mitigate potential increase in runoff from proposed hardstand to adjacent private properties

The contaminated soil will remain at a depth of at least 0.1 m below the final capped surface and remnant contamination will be managed under an overarching long-term environmental management plan (LTEMP) for the Captains Flat Lead Management Precinct.

The effectiveness of remediation at mitigating exposure risks associated with site contamination in the receiving environment will be assessed through validation of the cap construction.

It is anticipated that the proposed abatement strategy will appropriately mitigate risks associated with site contamination and that the LTEMP will effectively manage risks from residual contamination.

1. INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was retained by the Department of Regional NSW (Regional NSW) to prepare the Lead Abatement Plan to address exposure risks from lead at the Southern end of Foxlow Street, Captains Flat, New South Wales (NSW) (the site).

1.1 Background

This Lead Abatement Plan forms part of the Captains Flat Lead Management Plan (LMP) and the site is located within the Captains Flat Lead Management Precinct (the Precinct). The Precinct was defined in the Conceptual Site Model (Ramboll 2021a) and encompasses built areas of the Captains Flat community, the legacy Lake George Mine site and the Molonglo River from upstream of the water supply dam to a waterhole approximately 1.5 km downstream of the mine. The Precinct includes roads accessing Captains Flat (to a distance of at least 400 m), the rail corridor (to a distance of 1 km) and bushland areas at the perimeters of the community.

The Precinct boundary and site locality are presented on **Figure 1, Appendix 1**.

1.2 Conceptual Site Model Summary

Potential human health risks for lead in soil are considered to be high in the following areas:

- The Old Mine Site and rail corridor
- Public spaces south of the Molonglo River including the former preschool, Foxlow Street and the eastern embankment of the Old Mine Site
- Areas where fill appears to have been applied north of the Molonglo River including flood berms adjacent the River and embankments beneath the tennis courts as well as Foxlow Parklet

Potential human health risks for lead in soil are considered to be moderate in the following areas:

- The Southern Smelter Area and Keating's Collapse
- Beneath the southern playing field off Foxlow Street
- The southern end of the school playing fields including the new preschool

Potential human health risks for lead in soil are considered to be low in the following areas:

- In natural soil to depths of greater than five metres beneath the northern end of Foxlow Street
- In shallow soils in bushland hillside east of the Molonglo River near the southern end of town
- At several other locations in surface soils north of the Molonglo River at concentrations which marginally exceed the health investigation levels.

Interim water use guidelines have been developed and define measures to mitigate risks from public water related to exposure to contaminants from historical mining at Captains Flat. The interim guidelines integrate information on current usage based on a survey completed by Regional NSW and it is anticipated they will be reviewed after mine site rehabilitation and abatement measures proposed for public lands within Captains Flat. The potential risk to human health due to environmental impacts in groundwater is relatively low based on the water use survey where no groundwater users were identified.

1.3 Objectives

This abatement plan has been prepared specifically for the southern end of Foxlow Street. The objectives are:

- To define an abatement strategy to reduce community exposure risks
- To provide a detailed design including a separable, costed bill of quantities and relevant drawings to allow abatement to be approved and implemented
- To provide an abatement works plans to guide execution of the nominated strategy

Public Space abatement plans target remediation of lead in soil in areas where potential risks to human health are moderate or high however it is noted that elevated concentrations of other metals are co-located with lead and present potential risks particularly to ecology. Implementation of the abatement plan could be expected to mitigate risks from other metals and the scope of long-term monitoring in receiving environments is intended to inform evaluation of management outcomes related to ecological risk.

2. SITE DESCRIPTION

2.1 Site Identification

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

Table 2-1: Site Identification

Information	Description
Street Address:	Foxlow Street between Jerangle Road and Braidwood Road, Captains Flat, NSW
Identifier:	QPRC road reserve
Site Area:	Approximately 1.19 Ha. This includes paved road surfaces and unpaved adjacent footpaths. The unpaved footpaths occupy approximately 6,000 m^2. The entire site will be subject to an LTEMP
Local Government:	Queanbeyan-Palerang Regional Council (QPRC)
County and Parish:	County of Murray, Parish of Ballallaba
Owner:	QPRC
Leased by:	-
Site boundaries:	The site is bounded by Molonglo River at Braidwood Road to the north, Jerangle Road to the south and the residential/commercial properties along Foxlow Street to the east and west
Current Site Use:	Public open space and recreational use

2.2 Site Details

The site comprises the southern end of Foxlow Street including the road reserve and kerb and gutter. The site elevation is approximately 850 m above Australian Height Datum (m AHD).

2.3 Land Use

The site comprises the southern end of Foxlow Street adjacent to a mix of commercial and residential properties (Bowling Club, Captains Flat Hotel, shops, former Preschool, Captains Flat Community Hall).

2.4 Site Condition and Surrounding Environment

Site details observed during the site inspection during June 2021 are outlined in **Table 2-2**.

Table 2-2: Site Condition and Surrounding Environment

Site	Description
Topography	The site comprises relatively flat vacant land (footpath) adjacent commercial and residential properties along Foxlow Street
Conditions at Site Boundary	The site is bounded by commercial and residential properties to the east and west, Molonglo River to the north and the southern smelter and Jerangle Road to the south
Visible Signs of Contamination	The site appears to be filled slightly above the road level. Bare soil patches were present between the road and footpath along Foxlow Street
Visible Signs of Plant Stress	During the site inspection, the site was observed to be covered with grass. No notable plant stress was observed
Presence of Drums, Wastes and Fill Material	It's understood the site has been filled slightly above the main road level, the groundwater monitoring well logs noted fill comprising clay, sand and gravel present to a depth of 0.4 m in the area. No presence of other anthropogenic waste material was observed at the site
Odours	No odours were noted onsite during the inspection

3. ABATEMENT CRITERIA

Site specific trigger levels (SSTLs) protective of human health were developed for lead in soil. The bio-accessibility of lead assumed in Health Investigation Levels (HIL) generically applicable in Australia HILs was replaced with site specific bio-accessibility determined through representative sampling and analyses of Captains Flat soils. All other parameters used in the HIL models were retained. The resulting lead in soil concentrations were adopted as SSTLs for human health risk assessment across the land use scenarios that occur in public spaces of Captains Flat. A technical note describing the development of these SSTLs is presented in the CSM report (Ramboll, 2021a). The SSTL technical note was reviewed and approved by the Captains Flat LMP Taskforce integrating the NSW EPA and NSW Department of Planning, Industry and Environment (DPIE) Contaminants and Risks Team.

The adopted remediation criteria for the site are presented in **Table 3-1** based on the public open space land use at the site.

Table 3-1: Soil Assessment Criteria (mg/kg)

Contaminant	Human Health SSTL (C)
Lead	700

Criteria presented are in mg/kg

The 95% upper confidence limit of the arithmetic mean lead reading (as measured by fpXRF in the field) will be assessed against the criteria nominated in **Table 3-1** where the following conditions are met:

- the standard deviation of the results is less than 50% of the criteria, and
- no single value should exceed 250% of the criteria

Where these conditions are not met absolute lead readings will be adopted.

4. SITE CHARACTERISATION

Soil descriptions from the recent investigations (Ramboll, 2021a) indicate the site is underlain by fill comprising sand, clay and gravel overlying natural clay.

Concentrations of lead in soil ranged between <LOR to 10,592 mg/kg and an average concentration of 1,698 mg/kg was reported in the 49 soil samples from 26 sampling locations nearby or within the site. The sampling locations comprised of 22 surface sampling locations and four boreholes (GW03, R_S51b, SAQP10-BH01 and SAQP10-BH02). The maximum concentration was in near surface soil at location GW03. Lead concentrations exceeding the SSTL occurred in 25 of the 49 soil samples obtained in the southern end of Foxlow Street area, including at 12 of the 22 surface sample locations. The depth of lead impacts was delineated in all four boreholes and ranged between 0.25 and 3.0 m BGL however the full depth of impacts may vary across the site. Therefore, the depth of impacts is assumed to be associated with the fill profile.

The extent of lead concentrations exceeding the adopted assessment criteria and requiring remediation is presented on **Figure 2**, **Appendix 1**.

5. ABATEMENT OPTIONS ASSESSMENT AND ABATEMENT STRATEGY

An abatement options assessment was prepared in consultation with the Captains Flat LMP Taskforce to identify preferred strategies for public spaces identified as having moderate or high potential human health exposure risks from lead in soil (Ramboll 2022).

The preferred abatement strategy for the site includes:

- Excavation of the top 0.1 m of soil within unsealed areas of the footpath of Foxlow Street within the site. Where tree pits, insitu planter boxes or similar are constructed the depth of excavation to facilitate plant growth shall be nominated by the Principal based on species selection. Typical tree pit depths range from 0.5 – 1.5 mbgl
- Excavated soils will be disposed of offsite at either the mine site containment cell or to an appropriately licensed waste facility (subject to Principal confirmation).
- Survey of the site prior to capping to obtain the base level for the capping layer
- Placement of a geofabric marker layer on the top of the contaminated soil surface to act as a visual and physical barrier. The geofabric should line the base and sides of any tree pit excavations. In these areas geofabric should be selected to ensure adequate drainage and still provide a visible marker layer
- Placement of a clean hardstand capping layer with a minimum of 0.1 m thickness (including any base / subgrade layers) over the extent of the site to reinstate current landform levels. The entire depth of tree pits should be backfilled with clean soils
- The abatement strategy will tie in with street landscaping and drainage
- Construction of footpaths and other hardstand surfaces in accordance with Principal specifications
- Survey of the top surface of the capping layer (X, Y, Z co-ordinates) to ensure that the required thickness has been achieved
- Importation of fill for landscaping planter boxes and placement and establishment of vegetation in accordance with Principal specifications

5.1 Bill of Quantities for Preferred Abatement Option

A bill of quantities (BoQ) for the preferred abatement option for the site was prepared and summarised in **Table 5-1**.

Table 5-1: Bill of Quantities for Preferred Abatement Option

Description	Unit	Estimated Qty
Preliminaries and Management Plans	Item	1
Mobilisation and site establishment	Item	1
Project Management	Week	6
Detailed Landform / Drainage Design	Item	1
Bench-scale trial and obtain SIA	Item	1
Excavation and transport of impacted material to local landfill	m^3	900
Earthworks and drainage to achieve design / drainage objectives	Item	1
Immobilisation of impacted material	Tonne	1,620
Disposal of immobilised material	Tonne	1,620
Supply and construct permanent hardstand pavement	m^2	6,000
Landscaping and drainage tie-ins	Item	1
Demobilisation	Item	1
Validation	Item	1
Financial Assurance	Item	1
Estimated Total		

Notes:
A $225,000 preliminary provision is made under all abatement options for improvement of roadside drainage to reduce potential for run-off from increased hardstand area to adversely affect adjacent private properties. This provision can be refined after drainage objectives are determined and after detailed design to achieve these objectives is completed.
Areas are estimates based on information provided by DRNSW checked by Ramboll through review of Spatial Information Exchange
Excavation masses estimated based on volume to mass ratio of 1 m^3:1.8 tonnes.
The abatement area quantities are based on the area of the road reserve that is unsealed (approximately 6,000 m^2) and does not include abatement of the sealed roads.

6. ABATEMENT WORKS PLAN

6.1 Key Personnel

All site personnel have the responsibility of protecting human health and the environment. Key personnel and their roles and responsibilities are outlined in **Table 6-1**.

Table 6-1: Key Personnel roles and Responsibilities

Personnel	Name and Contact Details	Role / Responsibility
Principal	QPRC	Responsible for implementing the lead abatement plan (LAP)
Principals' Environmental Representative	TBC	Personnel employed by QPRC or sub-contracted to QPRC to oversee / provide technical advice on remediation works and ensure works are completed in accordance with relevant guidelines
Contractor	TBC	Company contracted to undertake remediation works. Responsible for supplying all plant and personnel to conduct the works as outlined in this LAP and as required under local, state and federal legislation
Contractor's Supervisor or Project Manager	TBC	Responsible person appointed by contractor to supervise / coordinate all aspects of remedial works on behalf of the contractor. The primary point of contact for the project

6.2 Licenses and Approvals

As a precursor to licensing and approvals specific to remediation, Land Owner Consent (LOC) will be required as will an assessment of Native Title.

SEPP (Resilience and Hazards) 2021 defines a framework for management of contamination in NSW. It defines requirements for engagement with consent authorities and local councils according to whether remediation is considered Category 1 (requiring development consent) or Category 2 (requiring notification 30 days before remediation). Ramboll consider the long-term management of contamination associated with the southern end of Foxlow Street to be Category 2 remediation. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 9 of SEPP (Resilience and Hazards) 2021.

The proposed remediation works do not trigger the criteria in clause 4.8 (a) – (f) and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under SEPP(Resilience and Hazards) 2021. The Notification Letter included in **Appendix 2** must be provided to QPRC a minimum of 30 days before commencement of remediation.

Abatement includes offsite chemical immobilisation followed by disposal as immobilised General Solid Waste at an appropriately licensed landfill. A waste facility capable of receiving the volume and type of material proposed to be generated during onsite remediation has not yet been identified. A pathway for offsite disposal exists however through amendment to the Environment Protection License (EPL) of a local landfill to allow treatment (where lead concentrations warrant treatment) as a precursor to disposal as GSW. This pathway would include:

- Assessment of other potential contaminants of potential concern in the projected waste streams which may affect waste classification
- A treatability trial to confirm an optimal treatment process

- Application for an immobilisation approval for disposal of treated waste as immobilised GSW
- Environmental planning and approvals to allow chemical immobilisation at the waste facility or at a suitable interim location
- Mixing of soils with immobilising reagents
- Stockpiling to allow confirmatory sampling to assess success of immobilisation
- Confirmation of waste classification and disposal as immobilised GSW

6.3 Community Relations

QPRC will manage community relations through abatement at the southern end of Foxlow Street according to a formalised community relations plan.

6.4 Protection of Infrastructure, Heritage and Vegetation

The Contractor's methodology will include measures to ensure the protection of surrounding infrastructure, heritage and vegetation immediately surrounding the site.

The Principal will provide current service plans covering proposed areas of excavation. The Contractor will make provision for onsite location of services and measures to ensure services are not disturbed. Notification should be given to any service providers to ensure the excavation does not damage service assets.

6.5 Site Establishment

The Contractor will be responsible for site establishment including:

- survey of road reserve boundaries with adjacent private properties and other points of interest such as telecom pits
- notification to WorkSafe NSW of lead risk work before mobilisation to site
- communication of the requirements of the LAP to all workers. This requirement must be embedded in commercial agreements with the Contractor and in Contractor management plans
- establishment of site access restrictions and ancillary provisions for site access such as traffic control
- mobilisation and management of all Contractor personnel and plant that are required

The Principal's Environmental Representative will refine excavation extents through fpXRF measurement of surface lead concentrations in/around proposed excavation areas and work with the Contractor during abatement to confirm the extent of capping required.

Site boundaries are presented on **Figure 2**, **Appendix 1**.

6.6 Management Plans

Prior to commencing works at the site management plans are required to be developed and approved by the Principal. A Construction Environment Management Plan (CEMP) has been prepared that describes minimum requirements for management of environmental impacts expected during abatement. The CEMP shall be supplemented by the contractor with sub-plans specific to the construction schedule and methodology. As a minimum sub-plans shall include those outlined in **Section 6.7** to **6.11.**

A worker health and safety plan specific to the construction methodology must also be preparead by the contractor.

Plans are to be reviewed and approved by the Principal prior to the commencement of abatement works.

6.7 Earthworks Management Plan

The contractor will prepare an earthworks management plan to describe the systems, equipment and methodologies that will be utilised to implement the abatement plan. It is anticipated that this will describe direct excavation of contaminated soils to trucks for transport to an off site immobilisation compound at a licensed disposal facility. It is noted that the constrained site area and adjacency to surrounding residential properties limit capacity for stockpiling on site. At a minimum the earthworks management plan will satisfy the following requirements:

- All earthworks shall be completed in accordance with AS3798-2007
- Remnant surfaces after excavation of contaminated soils shall be finished to provide a uniform surface free of defects that may adversely affect the overlying layers
- Footpaths and other hardstand surfaces including any base or subgrade layers shall be constructed in accordance with Principal specifications
- Fill material used in landscaping (planter boxes etc) shall not contain:
    - Contaminated material harmful to the receiving environment
    - Silts or materials that adversely affect capacity to achieve compliance with AS3798-2007
    - Deleterious material that limits geotechnical or aesthetic suitability, or that is not compliance with assessment criteria for imported material described elsewhere in this abatement plan
    - Actual or potential acid sulphate soils
- Placement and establishment of vegetation in accordance with Principal specifications

6.8 Soil and Water Management Plan

The Remediation Contractor will prepare a Soil and Water Management Plan to manage soil and water during the works. The Remediation Contractor must define and implement controls to prevent offsite contaminant migration above criteria protective of the receiving environment.

6.9 Noise Management Plan

The remediation contractor will prepare a noise management plan to manage noise during the works. The following noise control measures should be considered:

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

Hours of operation described in **Section 6.14** must be observed.

6.10 Dust Management Plan

The remediation contractor will prepare a dust management plan to manage dust during the works. The Contractor must define and implement dust controls to prevent offsite contaminant migration above criteria protective of the receiving environment. Controls will prevent offsite migration of dust. The following dust control measures should be considered:

- Regularly water vehicle routes and work areas with a watercart
- Maintain and sweep roads where deposited dust or spillage is visible
- Avoid unnecessary use of and access to unsealed surfaces

- Limit vehicle and mobile plant speeds within the work area e.g. 10 km/h
- Modify or cease operations during adverse meteorological or dust generating conditions
- Consider use of wind breaks or shielding around material and/or stockpiles
- Maintain stockpiles at defined height, where the lowest practicable height is preferable
- Avoid double-handling of material and optimise transfers to limit time stockpiled or handled
- Visually observe dust levels to adapt operations
- Cover all loads when transporting material
- Identify and allocate sufficient resources to manage dust risks
- Facilitate training and tool-box-talks addressing air quality management objectives, hazards, risks, controls, behaviours and consequences for inappropriate behaviour

The Dust Management Plan should include onsite air quality monitoring specific to the Remediation Contractor's methodology. There is no available method to measure deposited dust or lead in TSP in real-time so monitoring will include sampling of airborne dust at the site boundaries. The monitoring equipment should be capable of measuring TSP, PM_{10} and $PM_{2.5}$ continuously. The equipment should be capable of alerting to trigger values through telemetry and software that allows alerting at averaged set-points to email and/or SMS. The instrumentation should be maintained in accordance with the manufacturers specifications and hold a current factory calibration certificate.

A three-level air quality alert system is proposed. The trigger levels should be based on real-time monitoring from the Precinct collected prior to remediation. The alert values should be based on the 98%, 99.9% and 100% percentile of the 15-minute averages of measurements over a minimum 12-month period. These values are considered appropriate when considering what is acceptable in the community, the low airborne lead measured in absence of remediation and when considered against the air quality criteria at longer averaging periods. Trigger values should be reviewed following the first month of data and potentially revised with consideration of the air quality criteria, monitoring technique and positioning of monitors.

- Alert Level:
  - Elevated levels of dust measured for one 15-minute averaging period.
  - Initial trigger values set at 98 percentile 15-minute average
  - Observe the operation to identify dust generating activities. Consider further action to minimise dust generation or continue to observe closely.
- Action Level 1:
  - Elevated levels of dust measured for two consecutive 15-minute averaging periods.
  - Initial trigger values set at 99.9 percentile 15-minute average
  - Immediately action additional dust mitigation measures and communicate requirement to reduce dust levels to all operational staff.
- Action Level 2:
  - Elevated levels of dust measured for three consecutive 15-minute averaging periods.
  - Initial trigger values set at 100 percentile 15-minute average
  - Cease operation and prioritise dust mitigation measures. Operation can recommence once subsequent alert levels are at Action Level 1 or below.

The Dust Management Plan is to consider historical activities completed in the Captains Flat area and the sensitivities of neighbouring properties to impacts from dust.

6.11 Material Tracking

All material handled during excavation of lead impacted materials is to be tracked to verify appropriate movement and handling. The system will track materials from cradle-to-grave, and will provide detailed information on the origin, quantity and fate of all materials excavated during abatement. Records will be maintained by Contractor site personnel defining chainage of origin, material types loaded, and material fate.

6.12 Survey

The Contractor will co-ordinate survey to ensure all capped areas and remnant contamination is accurately defined.

This survey forms part of the validation requirements described in **Table 7-1**.

6.13 Abatement Schedule

The final remediation schedule will be discussed with the Remediation Contractor. A proposed indicative schedule up to the completion of a draft validation report is outlined in **Table 6-2**.

Table 6-2: Remediation Schedule

Task	Estimated Duration
Planning, engagement of Remediation Contractor and receiving facility	12 – 24 weeks
Establishment of Site	1 week
Excavation and capping	3 – 4 weeks
Total Duration	16 – 29 weeks

6.14 Hours of Operation

The Remediation Contractor shall only undertake works associated with validation works that may generate an audible noise at the closest residential receptors (6-90 and 15-59 Foxlow Street) during the following hours, unless under direction from relevant authority for safety reasons or in the event of an emergency:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 6:00 pm Saturdays
- At no time on Sundays or Public Holidays

6.15 Contingency Plan

The contingencies presented in **Table 6-3** are to be implemented where unexpected site conditions or circumstances occur.

Table 6-3: Contingency Plan

Contingency Event	Contingency Action	Personnel Responsible
Receival of a dust complaint	Stop Work Identify dust source and review control measures. Assess requirements for additional monitoring or investigation of impact. Review trigger alert system to determine if unacceptable impact measured at site boundary.	Contractor responsible for receiving complaint and informing Principal and Principal's Environmental Representative. Contractor responsible for stop work and review working environment. Principal and Principal's Environmental Representative responsible for responding to complaint. This will be completed in accordance with the Community Relations Plan
Exceedance of dust trigger levels (defined in Section 6.10)	Alert level trigger received – observe the operation to identify dust generating activities. Consider further action to minimise dust generation or continue to observe closely. Action Level 1 – Immediately action additional dust mitigation measures and communicate requirement to reduce dust levels to all operational staff. Action Level 2 - Cease operation and prioritise dust mitigation measures. Operation can recommence once subsequent alert levels are at Action Level 1 or below.	Contractor responsible for receiving complaint and informing Principal and Principal's Environmental Representative. Contractor responsible for stop work and review working environment. Principal and Principal's Environmental Representative responsible for responding to complaint. This will be completed in accordance with the Community Relations Plan
Discovery of unexpected materials	Contact the Principal's Environmental Representative, sort materials into a segregated stockpile and discuss possible disposal options with the Principal or the Principal's Environmental Representative	Principal, following notification from the Contractor.
Discovery of asbestos telecom pit	Stop Work Barricade area off and wet down area if deemed safe Contact the Principal's Environmental Representative and confirm material is asbestos Remove asbestos by appropriately licensed contractors. Clear area by Principal's Environmental representative	Principal, following notification from the Contractor.
Receival of a noise complaint	Identify noise source and implement noise control measures	Contractor responsible for receiving complaint and informing Principal and Principal's Environmental Representative. Contractor

		responsible for stop work and review working environment. Principal and Principal's Environmental Representative responsible for responding to complaint. This will be completed in accordance with the Community Relations Plan

6.16 Long Term Environmental Management Plan

A LTEMP will be required to provide guidance for ongoing maintenance of remnant contamination. The LTEMP will include survey of landform prior and post capping. A legal requirement to implement the LTEMP should be defined through a covenant to the land title.

The report should include the following headings as a minimum:

- Title
- Purpose
- Background
- Description of existing/residual contamination
- Management activities
- Inspection, maintenance, environmental sampling, analysis and reporting
- Monitor and review of environmental management plan
- Communications and notifications

7. VALIDATION PLAN

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

7.1 Validation Data Quality Objectives

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

7.1.1 Step 1: State the Problem

Lead impacted soil exists at the site. Remediation is required to mitigate potential exposure risks into the future and validation is required to demonstrate that abatement works have been successfully completed.

7.1.2 Step 2: Identify the Decisions

The validation SAQP is to ensure that abatement of the site occurs such that potential exposure risks are isolated from the potential future receptors. The decisions that are required to address the problem include:

- Has the contamination been isolated such that it doesn't present an exposure risk to current and future occupants of the site?

7.1.3 Step 3: Identify Inputs to the Decision

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

- Validation of imported capping material
- Survey of initial and final landform to define contaminated soils remaining onsite and to validate capping thickness
- Contractor records demonstrating compliance with capping specifications

7.1.4 Step 4: Define the Study Boundary

The study boundary includes Foxlow Street between Jerangle Road and Braidwood Road, Captains Flat, NSW as defined in **Figure 1.**

7.1.5 Step 5: Development of Decision Rules

Data will be considered reliable if it satisfies the limits of decision error defined in **Section 7.1.6**.

Potential for offsite contaminant migration after remediation will be considered to be satisfactorily low if contaminants are isolated below a suitable capping material at a minimum thickness of 0.1 m.

7.1.6 Step 6: Specify Performance Criteria

Validation performance criteria are defined to assess potential for a false positive or false negative in validation data. Performance criteria are presented in **Table 7-1** below.

Table 7-1: Performance Criteria for Validation Sampling

Category	Sampling of Imported Soils / Landscape Materials
Accuracy: Accuracy in the collection of field data will be controlled by:	It is envisaged that imported soils may be limited to landscaping products. Sampling for laboratory analyses will occur in general accordance with *AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil - Non-volatile and semi-volatile compounds* and *AS 1141.3.1 – 2012 Methods for Sampling and Testing Aggregates, Method 3.1: Sampling – Aggregates*
Precision: The degree to which data generated from replicate or repetitive measurements differ from one another due to random errors. Precision of field data will be maintained by:	In the field, precision will be maintained by: • Using standard operating procedures for the collection of soil samples. • Collection of soil samples by suitably experienced environmental scientists. • Use of disposable nitrile rubber gloves between sampling locations. • Placement of samples directly into designated single use sampling containers. • Collection of intra-laboratory and inter-laboratory duplicate samples at a rate of 1 in 20 primary samples. • Collection of one rinsate sample on reusable sampling equipment at the end of each day. • Recording of sample identification and analytical requirements on chain of custody documents. • Samples transported to the laboratory under chain of custody conditions to a laboratory with NATA accreditation for the analytical methods prescribed. In the laboratory, precision will be assessed using blind duplicate samples and split duplicates.
Completeness: The completeness of the data set shall be judged by:	• All locations sampled as outlined in **Section 7.1.7**. • Sampling completed by experienced personnel • Field documentation completed correctly
Representativeness: The representativeness of the field data will be judged by:	• Non-disposable sampling equipment, such as the hand auger, will be thoroughly decontaminated between locations using Decon®90 solution and deionised rinsate water. • At each location, a pair of disposable nitrile gloves will be worn while sampling and handling the sample; gloves will be replaced between each successive sample. • Soil analytical samples will be collected directly into the sampling containers.
Comparability: Comparability to existing field data will be maintained by:	• Use of the same appropriate sampling methodologies • Same sampling depths will be used (where practical) • Analytical samples will be collected for submission to the laboratory • Photographs will be taken of sampling location conditions at the time of sampling.

Performance criteria for analyses of soil duplicates are defined as follows:

- Data will be analysed adopting RPD control limits of +/- 30%.
  Where concentration levels are less than two times the Practical Quantitation Limit (PQL), the Absolute Difference (AD) shall be calculated. Data will be considered acceptable if: AD <2.5 times the PQL.

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

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

The laboratory will additionally undertake a method blank with each analytical batch of samples. Laboratory method blank analyses are to be below the PQLs.
Positive results may be acceptable if sample analyte concentrations are significantly greater than the amount reported in the blank (ten times for laboratory reagents such as methylene chloride, chloroform, and acetone etc., and five times for all other analytes). Alternatively, the laboratory PQL may be raised to accommodate blank anomalies provided that regulatory guidelines are not compromised by any adjustment made to the PQL.

Decision Error Protocol

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

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

Rectifying Non-conformances

If any of the validation procedures or criteria identified are not followed or met, this will constitute a non-conformance. The significance of the non-conformance will determine if rectification is required and should be assessed by the Landowner's Environmental Representative.

7.1.7 Step 7: Optimise the Design for Obtaining Data

All validation samples are to be collected in accordance with the DQOs outlined in this Section.

Validation samples, frequency of collection, the analysis required, and justification is presented in **Table 7-2**.

Table 7-2: Validation Plan

Validation Method	Validation Requirements	Measurement / Analyses
Validation of soils immobilised offsite for offsite disposal	Immobilised soils will be considered suitable for disposal as immobilised GSW if the 95% UCL of lead leachate (TCLP) is less than the limit for lead leachate in GSW defined in the NSW EPA Waste Classification Guidelines (TCLP1 – 5 mg/L). Validation sampling of immobilised soil stockpiles will be completed by the Principal's environmental representative. Sampling will occur to achieve a density of 1/25 m^3 with a minimum of three samples.	Laboratory analyses of immobilised soils for total lead and immobilised fines for lead leachate (TCLP).
Validation of construction or landscaping materials	Capping/backfill material will be considered suitable if it meets the definition of VENM or ENM or an RRO/RRE. Samples should be tested at a frequency of 1 sample per 25 m^3 or in accordance with the relevant RRO.	Certification of the suitability of backfill materials for proposed use (eg: VENM/ENM or similar for topsoil certifying compliance with the NSW EPA Resource Recovery framework described in the POEO (Waste) Regulation). Laboratory analyses of capping/backfill material for COPC including those specified in the ENM Order or other resource recovery order or at a minimum TRH, BTEXN, PAH, OCP, OPP, heavy metals and asbestos as well as any other potential contaminants of concern from the materials origin site.

Validation Method	Validation Requirements	Measurement / Analyses
Validation of cap construction	Cap construction including hardstand footpaths and landcaping planter boxes, tree pits or similar will be considered suitable if underlain by geofabric marker layer, applied to encompass the enitre road reserve excluding existing pavements and compliant with Principal specifications.	Contractor records demonstrating compliance with Principal specifications. The Contractor must provide as built drawings demonstrating cap contruction to address the validation requirements including registered survey of the road reserve extent, all cap features including X, Y, Z coordiantes for marker layer and top of cap including top of landscaping materials.

7.1.7.1 Validation Reporting

A validation Report will be prepared in general accordance with the relevant sections of NSW EPA (2020) Contaminated Land Guidelines: *Consultants Reporting on Contaminated Land* and the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*. The Validation Report will include:

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

7.1.7.2 Long Term Environmental Management Plan

A long term EMP will be prepared to define the location of remnant contamination and management measures required to mitigate risks associated with future disturbance of these areas. The Long Term EMP will be prepared in accordance with NSW EPA (2020) *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land*) and will include:

- Purpose
- Background
- Definition of remnant contamination integrating survey data presented on site plans
- Management activities
- Monitoring and inspection requirements
- Triggers for review of the LTEMP
- Mechanism for enforceability

8. CONCLUSIONS

The preferred abatement strategy includes excavation of contaminated soils, immobilisation and disposal at a landfill to accommodate hardstand capping at the site to match the surrounding ground level to minimise exposure to future users of the land. The contaminated soil will remain at a depth of at least 0.1 m below hardstand capping and remnant contamination will be managed under a LTEMP.

The effectiveness of remediation at mitigating exposure risks associated with site contamination in the receiving environment will be assessed through validation of the cap construction.

It is anticipated that the proposed abatement strategy will appropriately mitigate risks associated with site contamination and that the LTEMP will effectively manage risk from residual contamination.

9. LIMITATIONS

Ramboll Australia Pty Ltd (Ramboll) prepared this report in accordance with the scope of work as outlined in our proposal to Department of Regional NSW and in accordance with our understanding and interpretation of current regulatory standards.

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

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

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

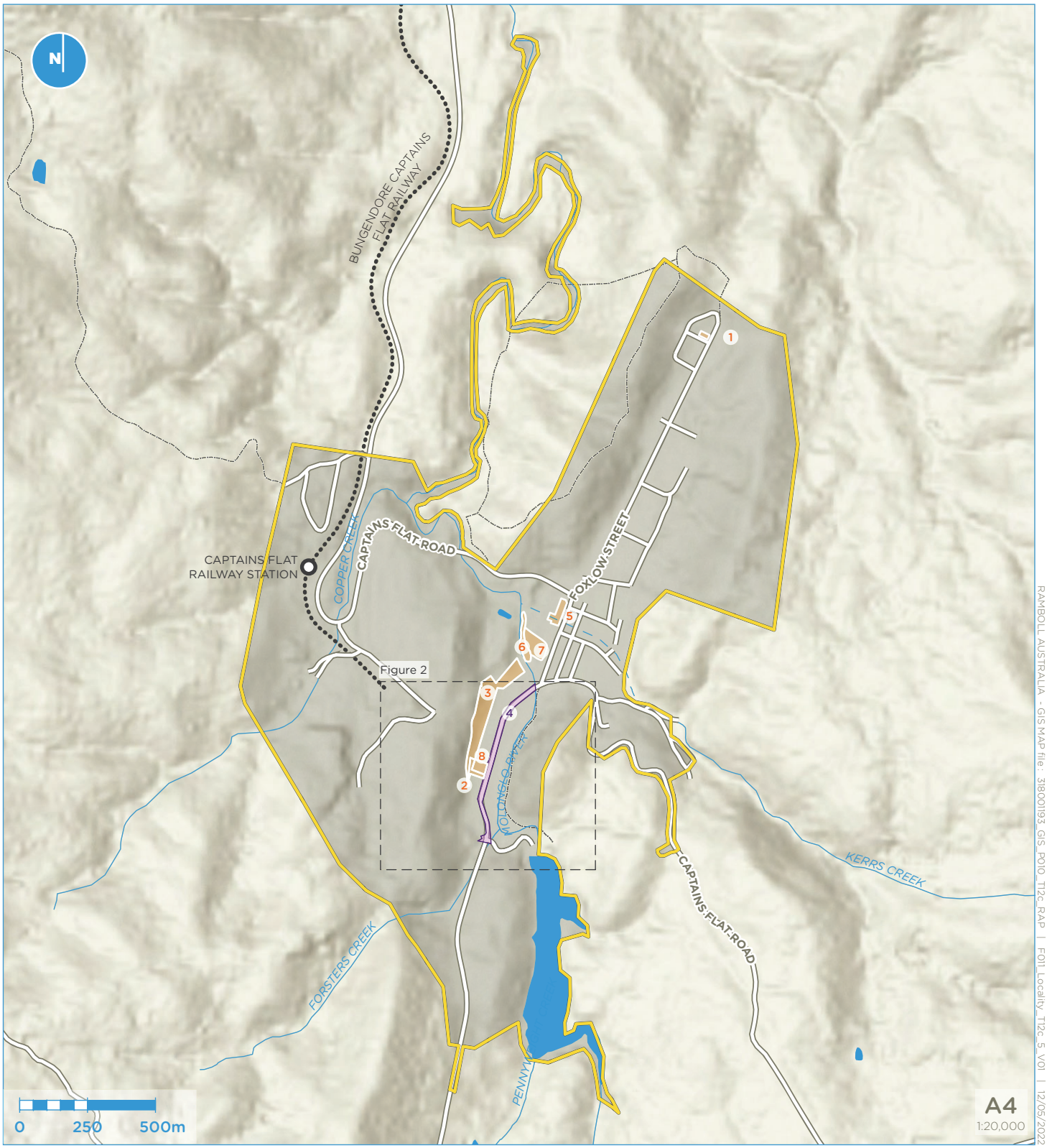
9.1 User Reliance

This report has been prepared exclusively for the Department of Regional NSW and may not be relied upon by any other person or entity without Ramboll's express written permission.

10. REFERENCES

NEPC. (2013). National Environment Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013.
NSW EPA. (2017). Guidelines for the Site Auditor Scheme (3rd Edition).
NSW EPA. (2020). Contaminated Land Guidelines: Consultants reporting on contaminated land.
Ramboll (2021a) Captains Flat Lead Management Plan, Conceptual Site model.
Ramboll (2022) Captains Flat Lead Management Plan, Abatement Options Assessment.
Standards Australia 2005 AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soil Part 1 - Non-volatile and Semi-Volatile Compounds and Part 2 – Volatile Compounds
Standards Australia (2007). Guidelines on earthworks for commercial and residential developments. Australian Standard AS 3978-2007 (Incorporating Amendment No. 1), 12 March 2007.
US EPA 2007 Method 6200 Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment.

APPENDIX 1
FIGURES



Esri, Geoscience Australia, NASA, NGA, USGS, Esri, HERE, Garmin, FAO, NOAA, USGS, Esri, USGS

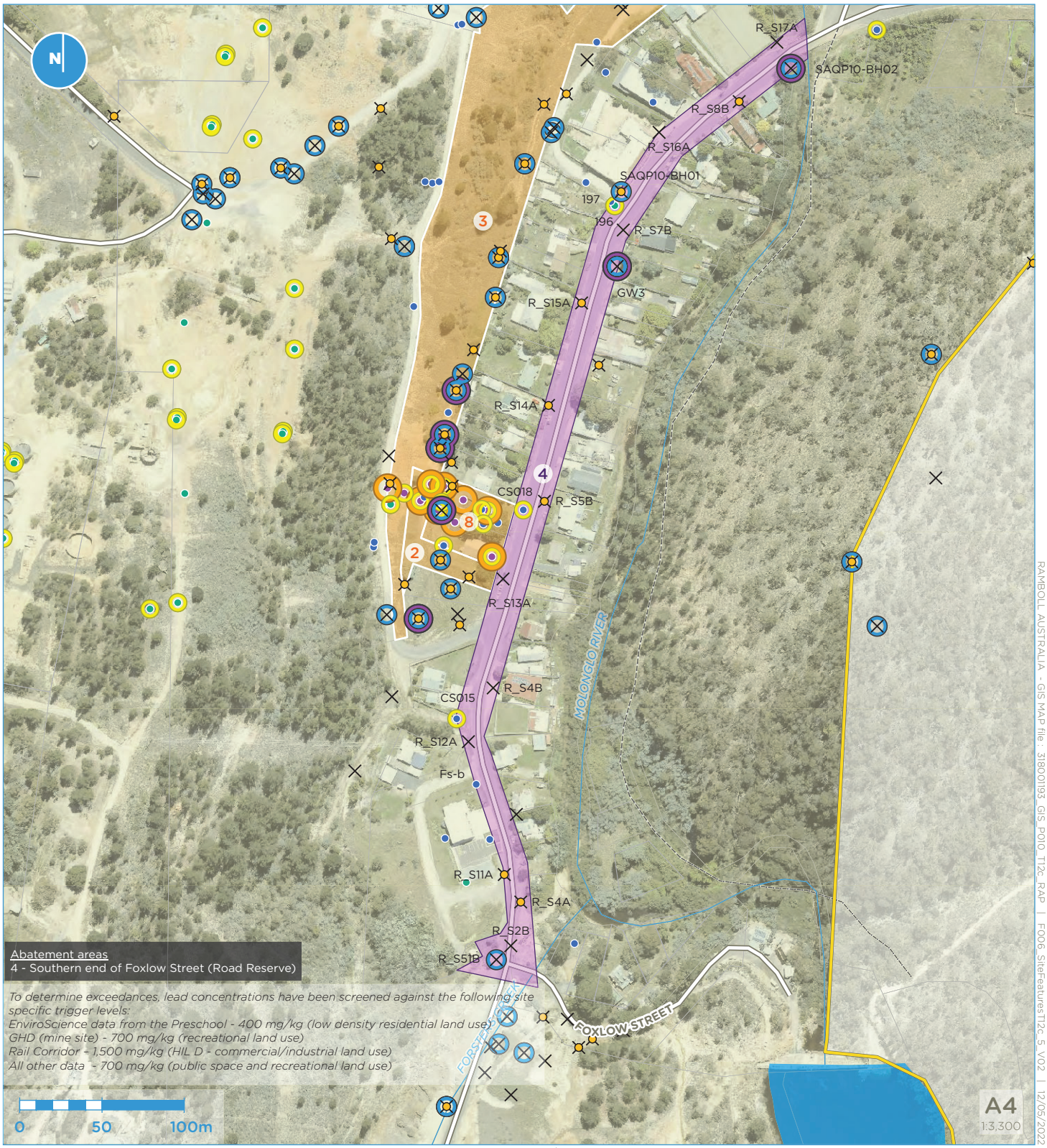
RAMBOLL AUSTRALIA - GIS MAP file: 318001193_GIS_P010_T12c_RAP | F011_Locality_T12c_5_V01 | 12/05/2022

Legend

- Precinct boundary
- Southern End of Foxlow Street
- Abatement areas

Figure 1 : Site location

Captains Flat Lead Management Plan - Lead Abatement Plan – Southern End of Foxlow Street



Vicmap, Esri, HERE, Garmin, METI/NASA, USGS, Esri, Geoscience Australia, NASA, NGA, USGS, Aerial Imagery from Metromap 21.07.2021

Legend

- Southern End of Foxlow Street
- Abatement areas

Samples (Ramboll 2021)
- Soil sample

Lead exceedance at depth
- Surface (<0.05 m)
- 0.05 m-0.5 m
- >0.5 m

Previous soil samples
- EnviroScience (2021)
- GHD (2017)
- EPA

Lead exceedance at depth
- Surface
- 0.4-0.5 m

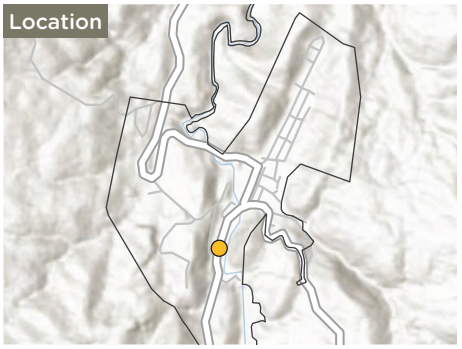


Figure 2 : Site features plan

Captains Flat Lead Management Plan - Lead Abatement Plan – Southern End of Foxlow Street

APPENDIX 2
RESILIENCE AND HAZARDS SEPP 55 NOTIFICATION LETTER

ENVIRONMENT
& HEALTH

Queanbeyan-Palerang Regional Council
PO Box 90
Queanbeyan NSW 2620
Attention: The General Manager

Date XX/XX/XXXX

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Australia

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Ref 318001193

SOUTHERN END OF FOXLOW STREET CAPTAINS FLAT NOTIFICATION OF CATEGORY 2 REMEDIATION WORKS

INTRODUCTION

Ramboll Australia Pty Ltd (Ramboll) was retained by Department of Regional NSW (DRNSW) on behalf of the landowner to prepare a Lead Abatement Plan (LAP) for contamination identified at the southern end of Foxlow Street at Captains Flat. This area is presented on **Figure 1**, **Appendix 1** and is here-in referred to as the site.

Queanbeyan-Palerang Regional Council (QPRC) respectfully notify QPRC of planned Category 2 remediation works, as defined by *State Environmental Planning Policy (Resilience and Hazards) 2021* that will occur at the site.

REMEDIATION WORK

The preferred remedial strategy comprises recontouring application of a clean cap across the site to mitigate contaminant exposure risks.

CATEGORY 2 REMEDIATION WORKS

This project is deemed to be Category 2 remediation work in accordance with the Resilience and Hazards SEPP. Category 2 remediation work is deemed remediation work that is not Category 1 remediation as described in Clause 4.8 of the Resilience and Hazards SEPP. The triggers for Category 1 remediation work are evaluated in **Table 1**.

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

Table 1: Evaluation of Category 1 Triggers

Clause 4.8 Trigger	Evaluation
a) Designated development	The project is not designated development. Schedule 3 Clause 15 of the *Environmental Planning and Assessment Regulation 2000* describes conditions under which contaminated soil treatment works are deemed designated development. Of specific relevance to this project: • The volume of contaminated material falls below 30,000 m^3 (estimated at < 1000 m^3) The area of contaminated soil to be disturbed is less than 3 hectares.
b) carried out or to be carried out on land declared to be a critical habitat, or	The project would not be carried out on land declared to be a critical habitat.
c) likely to have a significant effect on a critical habitat or a threatened species, population or ecological community, or	The site is used as flood berms and playing fields and is void of any native vegetation or wildlife. It will not require disturbance of critical habitat or a threatened species, population or ecological community.
d) development for which another State environmental planning policy or a regional environmental plan requires development consent, or	No State Environmental Planning Policy or Regional Environmental Plan identifies the proposed remediation as an activity requiring development consent.
e) carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument: (i) coastal protection, (ii) conservation or heritage conservation, (iii) habitat area, habitat protection area, habitat or wildlife corridor, (iv) environment protection, (v) escarpment, escarpment protection or escarpment preservation, (vi) floodway, (vii) littoral rainforest, (viii) nature reserve, (ix) scenic area or scenic protection, (x) wetland, or	The project is located on land zoned RE1 Public Recreation under the *Queanbeyan Local Environment Plan 2012*. No other environmental planning instrument prescribes the project site as one of the areas listed in point (e).
f) carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated (or if the land is within the unincorporated area, the Western Lands Commissioner).	The *Queanbeyan Development Control Plan 2012* includes guidance that applies to Contaminated Land. The proposed remediation complies with the guidance.

The proposed remediation works do not trigger the criteria in clause 4.8 (a) – (f) as outlined in **Table 1**, and the proposed remediation works are not ancillary to any other current development requiring Development Consent. Based upon the above information and criteria the remediation works are deemed to be Category 2 works under the Resilience and Hazards SEPP.

It is anticipated that remediation of the activities associated with Lead Abatement at the southern end of Foxlow Street would commence in late …….. and be completed ……..

Yours sincerely