



REMEDIATION ACTION PLAN

74 Fern Avenue

Bradbury


NSW 2560

April 2021

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REPORT DISTRIBUTION

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Figure 3 Site Plan and Areas of Environmental Concern

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Appendix B – Unexpected Finds Protocol



1. INTRODUCTION

1.1 BACKGROUND

Raw Earth Environmental Pty Ltd (REE) were engaged by Capital Developments to prepare a Remediation Action Plan (RAP) for the property located at 74 Fern Avenue, Bradbury NSW 2560 (the site).

As shown in **Figure 1**, the site is located approximately 44 km south-west of the Sydney Central Business District, within the Local Government Area of Campbelltown City Council. The site covers an approximate area of 2.3 Ha (as shown in **Figure 2**) and is identified as Lot 101 DP 1168971.

The site is currently occupied by one two-storey structure, one single-storey structure, one carparking area and associated driveway, a tennis court, 2 cleared areas, 2 infilled pools, a pool pump shed, with trees, gardens and landscaping throughout the site.

This RAP outlines the remedial and validation objectives required of the developer to support the Development Application (DA) to Campbelltown City Council. Completing the objectives set out in the RAP will ensure the developer meets its obligations under the Contaminated Land Management Act 1997 (CLM Act) and ensures that the site is suitable for the proposed future land use.

1.2 PROPOSED DEVELOPMENT

REE understand that site is proposed to be subdivided and developed to allow for the completion of residential lots in the form of dwelling houses which may involve the following works:

- Tree removal and demolition of existing structures;
- Subdivision of existing allotments;
- Civil works including the construction of new roads and excavation of land; and
- Construction of new dwellings.



Site photographs are included in the **Photographic Log** in **Appendix A**.

1.3 REGULATORY FRAMEWORK

The following regulatory framework and guidelines were considered during the preparation of this report:

- Department of Urban Affairs and Planning, NSW Environmental Protection Authority, *Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land*, 1998;
- National Environment Protection (Assessment of Site Contamination) Measure 1999, *Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater*, 2013;
- National Environment Protection (Assessment of Site Contamination) Measure 1999, *Schedule B2 – Guideline on Site Characterisation*, 2013;
- NSW Department of Environment and Conservation, *Guidelines for the Assessment and Management of Groundwater Contamination*, 2007;
- NSW Environmental Protection Authority, *Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, 2017;
- NSW Environmental Protection Authority, *Guidelines on the Duty to Report Contamination under Contaminated Land Management Act*, 1997;
- NSW Environmental Protection Authority, *Sampling Design Guidelines*, 1995;
- NSW Environmental Protection Authority, *Waste Classification Guidelines Part 1: Classifying Waste*, 2014;



- NSW Office of Environment & Heritage, *Guidelines for Consultants Reporting on Contaminated Sites*, 2011;
- Protection of the Environment Operations (Waste) Regulations, 2014;
- State Environment Protection Policy 55 (SEPP 55). *Remediation of Land Under the Environmental Planning and Assessment Act*, 1998;
- Western Australia Department of Health, *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, 2009;
- Work Health and Safety Act, 2011;
- Work Health and Safety Regulation, 2017;

1.4 PROJECT OBJECTIVES

The objectives of this RAP are to guide the sites remediation and validation process by providing a strategy and site operation outline for the following:

- The removal of contaminated soil material used to backfill in-ground swimming pools in the southern portion of the site, forming soil contamination hotspot HS3; and
- The validation of remediated areas to comply with applicable guideline criteria for the sites intended land use.

1.5 SCOPE OF WORKS

To achieve the above listed project objectives, the following scope of works were undertaken to produce this RAP.

- Review all current and previous environmental investigations for the site;



- Establish remediation goals and criteria;
- Evaluate remediation technologies and select appropriate remediation strategies;
- Provide guidance on licences, an Environmental Management Plan, Work Health & Safety Plan and other relevant site plans required for the remedial works;
- Outline necessary site operations including excavation, stockpiling, management and disposal of soil materials, environmental controls and supply an Unexpected Finds Protocol (**Appendix B**) and a Contingency Plan in (**Section 16**) to manage additional identified contamination that may be discovered during remediation and validation works;
- Advise processes for the unexpected finds of suspicious materials and an Unexpected Finds Protocol (**Appendix B**);
- Address recommendations made in previous environmental investigations and outline additional investigations which may need to be undertaken for the site; and
- Establish a sampling, analysis and quality control plan for remediation and validation works.



2. SITE INFORMATION

2.1 SITE IDENTIFICATION

The location of the site is shown in **Figure 1** with a detailed site plan shown in **Figure 2**.

Table 1: Site Details

Site Address	74 Fern Avenue, Bradbury NSW 2560
Lot & Deposited Plan	Lot 101 DP 1168971
Locality Map	Figure 1
Site Plan	Figure 2
Site Photographs	Appendix A
Site Area	2.3 ha
Local Government Area	Campbelltown City Council
Current Land Use	Vacant, unoccupied parklands, recreational open space
Surrounding Land Use	Residential
Previous Land Use	Parklands, recreational open space

2.2 SITE DESCRIPTION

A REE Environmental Scientist inspected the site on 19th February 2021. Observations noted during the inspection are summarised below.

At the time of the site inspection, the site contained the following structures and features:

- One residential dwelling;
- One two-storey structure;
- One single-storey structure,



- One carparking area and associated driveway,
- One tennis court,
- Two cleared parkland areas,
- Two infilled pools,
- A pool pump shed, and
- Trees, gardens and landscaping throughout the site;
- On-site vegetation showed no signs of decay and/or stress; and
- There were no indicators of other aboveground and/or underground storage tanks.

Refer to **Appendix A Photographic Log** for site photographs.

2.3 GEOLOGY

The Geological Map of Wollongong- Port Hacking (Geological Series Sheet 9029-9129, Scale 1:100,000, Edition 1, 1985), published by the Department of Primary Industries indicates the residual soils within the site to be underlain by fine to medium grained lithic sandstone of the Wianamatta Group.

2.4 HYDROLOGY

A groundwater bore search was conducted on 27th February 2021 and one registered groundwater bore was detected within 500 m of the site. The nearest groundwater bores to the site are summarised in **Table 2** below.



Table 2: Nearest Registered Groundwater Bore Data

GW Bore ID	Location	Intended Purpose	Distance from site boundary (m)	Drill Depth (mbgl)	Standing Water Level (mbgl)	Drillers Log (mbgl)
GW103996	34°04'55.7"S; 150°48'44.5"E	Monitoring Bore	Approx. 390	3.87	-	0.00 – 0.1: Asphalt. 0.1 – 0.8: Clayey sand, brown and grey. 0.8- 3.87: Sandstone, orange

2.5 ACID SULFATE SOILS

To determine whether there is a potential for acid sulphate soils to be present at the site, an indicative review of available Acid Sulphate Soils (ASS) risk maps was undertaken. The site is located within an area which suggests there is no known occurrence regarding the presence of ASS.

2.6 SURFACE WATER RECEPTORS

The nearest surface water body is Fishers Ghost Creek, approximately 300m to the east. Given the distance to this surface water body, it is not considered to be a potential receptors of groundwater contamination sourced from the site (if any).

Based on regional topography and the nearest surface water sources, groundwater is expected to flow towards the east.

2.7 ABOVE AND UNDERGROUND STORAGE TANKS

Above and/or underground storage tanks (ASTs/ USTs) were not identified on-site at the time of the inspection.



2.8 ASBESTOS CONTAINING MATERIAL

Asbestos was detected in soil samples S1 and S2, the latter exceeding the applicable guideline criteria (WA DoH). The estimated asbestos fibres (%w/w) were calculated at <0.01 in sample S1 and >0.01 in sample S2.

ACM in soil and/or ground surfaces was not visually identified by REE during the site inspection however Noel Arnold & Associates Pty Ltd (NAA) Limited Soil Investigation in March 2012 did note ACM within the soil profile of the infilled pool.

2.9 SITE VEGETATION

On-site vegetation did not show any notable signs of stress or decay. Most mature trees appear to be in reasonable condition and ground surfaces are primarily covered with overgrown grasses and weeds.

2.10 SOIL STAINING & ODOURS

No soil staining and/ or odours were identified within the investigation area at the time of the inspection.

2.11 ANECDOTAL EVIDENCE

No anecdotal evidence was collected during the site investigation.

3. PREVIOUS INVESTIGATIONS

Previous environmental investigations for the site were recorded under the following reports:

- Noel Arnold & Associates Pty Ltd, *Preliminary Site Investigation and Limited Soil Investigation*, dated March 2012; and



- Raw Earth Environmental Pty Ltd, *Detailed Site Investigation – 74 Fern Ave. Bradbury NSW 2560*, dated 1st March 2021.

The detailed site investigation (DSI) was prepared to identify Areas of Environmental Concern (AEC) within the site and assess potentially contaminating activities which may have impacted these areas.

A site inspection was conducted by REE on 19th February 2021. Four AECs were identified and subject to a soil investigation program. The AECs are shown in **Table 3**.

Table 3: Areas of Environmental Concern

Area of Environmental Concern Reference	Figure	Description
AEC 1	3	Cleared Area 1. North-west portion of the site. Park area appeared to have fill imported to the site in order to make the ground surface level.
AEC 2	3	Cleared Area 2. North-east portion of the site. Park area appeared to have fill imported to the site in order to make the ground surface level.
AEC 3	3	Pool Area. Southern portion of the site. It is understood in-ground swimming pools were back-filled with soil materials.
AEC 4	3	Carparking area.

3.1 CONTAMINATION HOTSPOT IDENTIFICATION

Soil contamination reported by REE (2021) identified a contamination hotspot at the site. This hotspot has been delineated to the southern portion of the site (refer to **Figure 2** for a detailed location of this hotspot):



- AEC 3 was subject to soil sampling implemented by REE (2021), soil samples S1 and S2. Soil sample results indicated exceedances over applicable guideline criteria for benzo(a)pyrene and asbestos in sample S1 and asbestos in sample S2. These soil sample exceedances now form hotspot location HS3;

Table 4: Contamination Hotspots

Contamination Hotspot (HS) Reference	Figure	Description
HS3	2	Soil samples S1 and S2 excavated during previous REE (2021) investigation.

3.2 CONTAMINATION HOTSPOT REMEDIATION

REE (2021) recommended the site can be made suitable for the proposed development subject to identified areas of contamination be remediated and validated through implementation of the following:

- A Remediation Action Plan (RAP) should be developed for the site detailing the objectives and processes for remediating contaminated soils; and
- Preparation of a final Site Validation Report concluding that the site has been remediated to allow for the proposed development.

4. REMEDIATION CRITERIA

Health Investigation Levels (HIL)

To assess the contamination status of soils at a site, the National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (Amendment 2013) is used. The site will be



assessed against the NEPM contamination criteria 'HIL - Residential A' the most suitable and conservative criteria relevant to the sites intended land use.

Health Screening Levels (HSLs)

HSLs A soil assessment criteria for clay and sandy soils from 0 to <1 m was adopted on the basis that the proposed site use is for residential dwellings with gardens/ landscaped areas and onsite topsoil/ fill comprised predominantly clays with minor gravel, sand and silt.

NEPM Management Limits

Management Limits for petroleum have been developed for prevention of explosive vapour accumulation, prevention of the formation of observable Light Non-Aqueous Phase Liquids (LNAPL) and protection against effects on buried infrastructure. Commercial and industrial limits have been adopted based on the proposed land use.

Asbestos

Health screening for asbestos in soil, which is based on scenario-specific likely exposure levels, are adopted from the WA DoH guidelines and will be compared to the most suitable yet conservative criteria, being 'residential, minimal soil access (0.01% w/w)' (refer to **Table 5** below).

Table 5: Health Screening Levels – Residential, minimal soil access

Form of Asbestos	Health Screening Level – Residential, minimal soil access (%w/w)
Bonded ACM	0.01
FA and AF (Friable Asbestos)	0.001
All forms of asbestos	No visible asbestos for surface soil

Off-Site Transport of Waste

Soil material requiring off-site disposal must be analysed against the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*.



5. CONCEPTUAL SITE MODEL

In accordance with NEPM (2013) *Schedule B2 – Guideline on Site Characterisation* and to aid in the assessment of data collection for the site, a Conceptual Site Model (CSM) assesses plausible pollutant linkages between potential contamination sources, migration pathways and receptors. The CSM provides a framework for the review of the reliability and useability of the data collected and to identify data gaps in the existing site characterisation. The CSM can be seen in **Table 6** below.

5.1 POTENTIAL CONTAMINATION

Based on the findings of the site investigations reported by REE on the 1st of March 2021, a desktop review of the site, neighbouring properties, and nearby ecological receptors, the Chemicals of Potential Concern (COPC) at the site were considered to be:

Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Organochlorine Pesticides (OCPs), Polychlorinated Biphenyls (PCBs), Heavy Metals and/or Asbestos.

5.2 CONTAMINATION SOURCES, EXPOSURE PATHWAYS & RECEPTORS

Potential contamination sources, exposure pathways and human and environmental receptors that were considered relevant for this assessment are summarised along with a qualitative assessment of the potential risks posed by complete exposure pathways in **Table 6**.



Table 6: Conceptual Site Model

Potential Sources of Contamination	Potential Receptor	Potential Exposure Pathway	Complete Connection	Risk	Justification
Contaminated soil from importation of uncontrolled fill across the site.	Site occupants, neighbours, workers, general public.	Dermal contact, inhalation/ingestion of particulates.	Limited (Current)	Low	Direct contact with potentially contaminated soil is limited (if any).
			No (Future)	-	If present, impacted soils are likely to be remediated and/or disposed of off-site.
ACM in site structures and soil materials.	Ecosystems of Fishers Ghost Creek.	Migration of impacted sediment, groundwater and surface water run-off.	Limited (Current)	Low	Due to distance to surface water bodies, they are not considered to be receptors of groundwater/ surface water contamination sourced from the site (if any).
			No (Future)	-	If present, impacted soils are likely to be remediated and/or disposed of off-site.
Hydrocarbons from fuel and oil spills / leaks from vehicle parking on-site	Underlying aquifer	Leaching and migration of contaminants through groundwater infiltration.	Limited (Current)	Low	Due to expected shallow bedrock, leachability of COPC and migration of COPC is likely to be limited.
			No (Future)	-	If present, contaminated soil and/or groundwater is likely to be remediated.



Based on the CSM in **Table 6**, potential contamination sources and receptors have been identified. The possibility of contamination exists in the following receptors:

- Site occupants, neighbours, workers, general public.

5.3 ADDRESSING DATA GAPS

Based on information on the site history and the site investigation on 19th February 2021, potential contamination sources, exposure pathways and human and environmental receptors identified in the CSM, the following data gaps were identified and addressed:

- The contamination status of on-site soils within AECs due to historical importation of fill to the site and vehicle parking. A combination of visual inspections and soil sampling within accessible areas of the AECs was undertaken to identify any potential on-site contamination.

6. REMEDIATION STRATEGY

6.1 REMEDIATION OBJECTIVE

The remediation program objective is to remove primary and secondary sources of contamination from the site in order to reduce the risk posed to site occupants, neighbours, workers, general public and classify the site suitable for its intended land-use.

6.2 NSW EPA HIERARCHY OF OPTIONS FOR SITE REMEDIATION

The NSW EPA hierarchy of options for site remediation and/or management are listed below:

- If practical, on-site treatment of the contamination so that it is depleted, and the associated risk is reduced to an acceptable level; and



- Off-site treatment of excavated soil, so that the contamination is depleted, and the associated risk is reduced to an acceptable level.

If the above is not practical:

- Consolidation and isolation of the soil on-site by containment with a properly designed barrier;
- Removal of contaminated material to an appropriately licensed facility to receive such waste, and if necessary, replacement with appropriate materials; or
- Where the assessment indicates remediation would have no overall environmental benefit or would have an adverse effect, implementation of an appropriate management strategy.

6.3 REMEDIATION OPTIONS

6.3.1 AVAILABLE REMEDIATION & MANAGEMENT STRATEGIES

There are different remediation and management strategies for use on contaminated sites applicable to the contamination identified in **Section 3**. A review of the available soil remediation methods and management strategies indicated that the following strategies may be applicable to the remediation of soil material at concentrations exceeding applicable guideline criteria:

- Excavation and off-site disposal of contaminated soil to an appropriately licensed landfill facility;
- Treatment (on-site or off-site); and
- Managing the risks posed by contaminants by preventing any direct exposure pathway between the known and potential contaminated soil and users of the proposed development, through implementing physical barriers such as concrete/ synthetic material liners (geofabric)/ clean soil capping.



6.3.2 EXCAVATION & OFF-SITE DISPOSAL

This method involves the excavation of contaminated materials and disposal of these materials off-site to an appropriately licensed landfill facility. Excavated materials must be classified according to the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. Depending on the level of contamination, excavated materials may need to be pre-treated to reduce or immobilise contaminants prior to off-site disposal.

6.3.3 TREATMENT

Soil treatment strategies depend on the type of contaminant identified and where the soil is in-situ or ex-situ. Most applied strategies are applied to ex-situ soils through excavation of the contaminated soil material. In-situ treatments usually require longer a timeframe for completion than ex-situ strategies. Most of the treatment strategies which require the soil material to be excavated can be undertaken on or off-site, subject to obtaining licences.

6.3.4 ON-SITE CAPPING

Capping can be a suitable strategy for managing health risks associated with soil contamination by preventing any direct exposure pathway between contaminated soil and site users. Capping is used to isolate areas in the subsurface from the surrounding uncontaminated environment. A physical barrier such as concrete, asphalt, synthetic material liners (geo-fabric), and/or clean soil may be installed to cap the contaminated material. A cap is employed to remove exposure to the contaminated soils, where the contaminated soils are not mobile and there is no contact with groundwater and/or groundwater is not contaminated.

A Site Management Plan is required with any capping strategy. The Site Management Plan identifies the personnel responsible for adhering to the plan and includes commitments for on-going monitoring and maintenance of the cap as well as control of future excavations, which must be minimised or if required, the appropriate occupational health and safety procedures are adopted, and permits acquired before works are carried out.



6.4 RATIONALE FOR SELECTION OF REMEDIATION STRATEGY

Considerations in selecting and implementing a suitable remediation strategy for a site include:

- Proven strategy: the remediation method should have a proven track record of success;
- Reliability: The remediation method should succeed in meeting the site remediation goals in the short and long term;
- Regulatory Approvals: The remediation method must be supported by the relevant regulatory authorities;
- Cost: Financial budgets provide an indication as to the likelihood of implementing a particular remediation strategy;
- Implementation Time: Timeframes associated with implementing particular strategies will govern the likelihood of their application;
- Land-Use Restrictions: If contaminated soil material is left on-site, regulatory authorities may place restrictions on the land use and/or require notification of the contamination on the property title;
- Liabilities: Maintenance and monitoring of an applied remediation strategy which does not involve complete removal of all contaminated materials from the site will necessitate some form of on-going maintenance and/or monitoring to ensure the long-term integrity of the remediation strategy. Any remediation strategy that does not involve the complete removal of all contaminants from the site will result in future liability for the landowner;
- Contractor Experience: The effectiveness and success of a remediation strategy partially depends on the experience of contractors implementing the applied remediation strategy;



- Space Requirements: Some remediation strategies require large amounts of space to spread soil and will only be feasible if sufficient land is available. In addition, if contaminated materials come into direct contact with (or are spread across) clean soils, the clean soils may also be subject to remediation once contaminated materials have been removed;
- Disturbance to Operations: Remediation for the site is likely to cause disruption to usual operations undertaken at the site;
- Human Health Risks: Remediation workers, site users and the general public may be exposed to hazards posed by contamination during the remediation (i.e. through dust generation); and,
- Availability of Landfill Facilities: Excavation and off-site disposal of contaminated materials are only feasible if the appropriately licensed landfill facility is capable to receive such waste is a reasonable distance from the site.

6.4.1 PREFERRED REMEDIATION STRATEGY

For this site, on-site and off-site treatment of contaminated materials, were decided against for the following reasons:

- The site requires a reduction in soil volume as excavation is required for the intended development;
- The cost of reuse and treatment of the contaminated soils in order to make the materials suitable for their intended land use, is considered to be substantially expensive;
- An on-site capping strategy would result in the contaminated material remaining on-site. This material would require on-going management during construction excavations and would constrain the depth of the construction design;



- Any remediation strategy that does not involve the complete removal of all contaminants from the site will result in future liability for the landowner.

A NSW EPA remediation strategy of reducing the level of on-site contaminated soil material is to remove contaminated soil material to an appropriately licensed landfill facility, known as 'excavate and dispose'. This method of remediation has been deemed most suitable for the site for the following reasons:

- The costs associated with off-site disposal to landfill are considerably less than treatment costs;
- The method fits in with the proposed development design, as a net reduction of soil is required;
- The method is proven to be suitable for the type of contaminants identified at the site and most likely to be approved by regulatory bodies;
- The method can be completed in a shorter timeframe than other considered remediation methods;
- The potential for groundwater impact and vapour/ odour issues is reduced as the contamination source is removed from site;
- No storage and/or treatment problems; and,
- 'Excavate and dispose' requires limited (if any) on-going monitoring and maintenance.

6.4.2 SUPERVISION

It is recommended an experienced Environmental Scientist who is a qualified NSW Licensed Asbestos Assessor (LAA) be appointed to the project to ensure:

- ACM can be visually identified;



- The on-site presence of asbestos impacted soil is managed in the most appropriate manner;
- The coordination of the stages for remediation and validation are appropriately implemented;
- Any deviations from the works outlined in this RAP are documented and approved as required under OE&H (2011) *Guidelines for Consultants Reporting on Contaminated Sites*;

Completion of remediation works without the supervision of a qualified Environmental Scientist may result in additional requirements imposed by a third party to confirm the contamination, remediation and/or validation status of the site.

Any soil and/or waste materials removed or acquired to the site without sufficient classification may lead to regulatory action. This could result in project delays and additional costs imposed on the client.

7. REMEDIAITON PROGRAM

The remediation goal is to make the site suitable for its proposed development by reducing identified on-site contamination to an acceptable level for its intended land-use. This is possible by remediating previously identified hotspots located in the areas outlined in **Section 3** and located on **Figure 2**, in accordance with relevant Australian standards and guidelines. It is noted, this RAP may need to be revised and re-issued subject to the findings of additional investigations, visual inspections, any unexpected finds and/or remediation strategy changes requested by the client.

7.1 STAGE ONE – SITE PREPARATION

The Principal Contractor is responsible for implementing fences, signs and environmental controls in accordance with the Environmental Management Plan (**Section 12**) and relevant Australia standards and guidelines. Five days prior to the removal of asbestos contamination (friable and non-friable), notice must be given to SafeWork NSW.



As part of site preparation, the Principal Contractor should establish a staging plan for the stockpiling, loading and transport of soil and waste material to leave the site. This includes but is not limited to:

- Staging of areas to be excavated, beginning with contaminated areas;
- Areas designated for waste segregation, screening and stockpile storage (staging area), amenities and soil treatment (if required); and
- Truck and vehicle roads, access and parking.

7.2 STAGE TWO - REMEDIATION ACTIVITIES

All unauthorised soil materials deposited at the site including asbestos contaminated materials will be removed from site in accordance with the NSW *Work Health and Safety Act (2011)* and *Regulations (2017)* and comply with Class-A and/or Class-B asbestos removal conditions as defined in the Code of Practice *How to Safely Remove Asbestos* (current 2020 version);

- The lateral extents of HS3 will be confirmed by the on-site Environmental Scientist. The unauthorised fill material will be excavated and removed from site by the Principal Contractor under Class B asbestos removal conditions.
- Validation sampling by the on-site Environmental Scientist will determine if further remediation is required.
- Water suppression for dust during all asbestos removal works must be undertaken.
- Daily supervision and airborne fibre monitoring must be undertaken by a NSW Licenced Asbestos Assessor during all asbestos removal works, and at any other time there is a possibility to disturb ACM.



Contamination at hotspot HS3 will be vertically and horizontally delineated during remediation works via soil sample analysis and visual inspection.

It is understood the client has chosen the method of 'excavate and dispose' as the most suitable method of remediation for the asbestos impacted soils. The remediation method of excavate and dispose is outlined below.

- Soils requiring excavation must be stockpiled in an appropriately designated stockpile staging area (further discussed in **Section 10**). Stockpiles must be staged in accordance with relevant Australian standards and guidelines. Procedures for handling stockpiles are outlined in **Section 10** and **Section 12**;
- The volume of material requiring management in HS3 will be confirmed via site observations by the on-site Environmental Scientist and validation sample analysis;
- Contaminated soils must be managed for off-site disposal to an appropriately licensed landfill facility and classified in accordance with NSW EPA (2014) Waste Classification Guidelines.

7.3 STAGE THREE – EXCAVATION AND CLASSIFICATION

In accordance with the NSW EPA (2014) Waste Classification Guidelines, all soils and waste scheduled for off-site disposal must be appropriately classified. Soils may be classified in-situ and/or ex-situ.

Soils requiring off-site disposal and/or on-site relocation must be excavated and stockpiled in an appropriately designated stockpile staging area (further discussed in **Section 10**). Stockpiles must be staged in accordance with relevant Australian standards and guidelines. Procedures for handling stockpiles are outlined in **Section 10** and **Section 12**.

Following the complete removal of all soils forming HS3, the ground surface beneath the footprint of HS3 is to undergo a 100mm soil scrape to ensure the complete removal of any residual soils which



may have been impacted via cross contamination of overlying soils. The scraped soils must be classified for disposal and/or relocation.

7.4 STAGE FOUR – VALIDATION

Upon completion of the final soil scrape mentioned above, a validation soil sampling program of the final ground surface must be applied. Soil samples will be analysed for COPCs including: Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs), Heavy Metals and/or Asbestos Containing Material (ACM).

Soil validation samples from the various surfaces of remedial excavations will be collected and analysed for asbestos using the following frequencies as a minimum:

- Base of excavation: 1 sample per 25m², or one per floor <25m²;
- Walls of excavation: 1 sample per 5 linear metres, or one per wall <5 linear metres;
- Stockpiled materials refer to **Section 9.3**; and/or
- Final ground surface: 1 sample per 100m² (10m x 10m), with a minimum of 3 samples collected.

HS3 will most likely be subject to excavation validation (base and walls), mentioned above.

Hotspots will be validated with the appropriate QA/QC sampling procedures (refer to **Section 11**). If contaminated materials are found during remediation works, these must be further delineated and remediated in the same process as mentioned above and until field observations and validation sample analysis indicate compliance with applicable guideline criteria.

A final Site Validation Report will be prepared detailing the remedial and validation works undertaken, confirming the remediation goals have been achieved and that identified contamination on site has



been reduced to an acceptable level for the sites intended redevelopment.

7.5 LICENSED LANDFILL FACILITY

The soil excavated as part of the 'excavate and dispose' method of remediation must be deposited at an appropriately licensed landfill facility. Approval from the facility is required prior to the transport of such material.

Disposal of contaminated liquids requires the engagement of a licensed contractor capable of working with such waste.

All weighbridge receipts must be retained by the Principal Contractor for future reference and supplied to the on-site Environmental Scientist for documentation in the final Validation Report.

7.6 GROUNDWATER & SURFACE WATER CONDITIONS

A review of groundwater conditions at the site have not yet been undertaken.

If necessary, any dewatering activities must be done so in accordance with relevant Australian standards and guidelines.

If groundwater is encountered during remediation and/or excavation activities, REE must be contacted immediately to undertake an assessment of the potential impact the development may have on groundwater.

In the event groundwater contamination is encountered, remedial strategies include source removal, bioremediation, recovery using active pumping, groundwater permeability barriers, in-situ oxidation/stabilisation, and/or natural attenuation.

8. DATA QUALITY OBJECTIVES



In accordance with the US EPA (2006) Data Quality Assessment and the DEC (2006) Guidelines for the NSW Site Auditor Scheme, the process of developing Data Quality Objectives (DQO) was used to determine the appropriate level of data quality needed for the specific data requirements of the project. The DQO process that was applied for this assessment is documented below.

- Step 1: State the problem.

The subject site is contaminated as a result of previous activities which has impacted suitability of the site for its intended land-use. As outlined in previous environmental investigations by REE (2021), hotspot soil contamination areas require remediation. These locations are identified in **Section 3** and **Figure 2**.

- Step 2: Identify the decision.

The site can be made suitable for its intended residential land use with the requirement for remediation and/or management if necessary.

- Step 3: Identify inputs into the decision.

- Identification of issues of potential environmental concern.
- Appropriate identification of COPC.
- Soil sampling and analysis programs of shallow fill and soil materials across the site.
- Visual inspection of soil samples for presence of ACM.
- Appropriate Quality Assurance / Quality Control to enable an evaluation of the reliability of the analytical data.
- Screening sample analytical results against appropriate assessment criteria for the intended land use.

- Step 4: Define the boundaries of the site.



The project boundary is defined as the area within the site boundary of the proposed development. Hotspot areas have also been defined (refer to **Figure 2**).

- Step 5: Develop decision rules.

Table 7 Summarises developing decision rules.

Table 7: Decision Rules

Decisions	Decision Rule
Do risks to on-site receptors from soil and groundwater exist?	Control measures are required to manage the risk.
Are there contaminant combinations present on-site?	Two types of contaminants are present on-site.
Are there visually appealing issues?	Visually identifiable contamination is present on-site.
Is on-site contamination capable of migrating off-site?	The potential for contamination to migrate off-site is possible (i.e. surface water run-off, windblown dust particles).
Is the site suitable for its intended land-use?	Soil material samples compared to applicable guideline criteria suggest the site is not suitable for its intended land-use.
Have excess soil materials been disposed of at an appropriately licensed landfill facility?	Soil analytical data will be compared to applicable guideline criteria. Documentation from the facility is required to facilitate the decision.

8.1 LIMITS OF DECISION ERROR

The decision makers tolerable limits on decision errors are used to establish quality goals for limiting uncertainty in the data.



In order for decisions to be made with confidence, the data collected and generated applicable to this project must be considered appropriate. Limits of this project have been applied in accordance with the NSW EPA, NEPM (2013), appropriate indicators of quality (Data Quality Indicators), and standard operating procedures.

8.2 VALIDATION DATA

Validation data is collected to confirm the following:

- The effectiveness of the implemented remediation methods and strategies;
- If any contaminated soils on site are sufficiently contained/capped.;
- Any imported soils to be used as clean backfill are classified as appropriate for the sites intended land-use; and
- Record the site as being suitable for its intended land-use.

The proposed validation soil sampling program is outlined in **Section 9**.

9. VALIDATION METHODOLOGY & SAMPLING PLAN

9.1 SOIL VALIDATION METHODOLOGY

Soil samples will be collected directly from the excavator bucket, placed in laboratory prepared 250mL soil jars, labelled appropriately and placed on ice in an esky for transport under chain of custody (COC) to a NATA accredited laboratory for the analysis of the COPC. All reusable equipment in the sampling program must be decontaminated between each excavation with Decon90 and potable water, including the excavator bucket.



Following excavation of contamination hotspots to target dimensions, one floor sample and four wall samples (i.e. north, east, south, west walls) are required to be collected for each hotspot. If hotspots increase in size due to wall collapse or accumulation of an adjacent hotspot, the minimum samples required are listed in **Section 7.3**.

9.2 HOTSPOT EXCAVATIONS

The remediation activities of the asbestos contaminated areas identified in **Section 3** and **Figure 2** will be considered validated once the following objectives have been met:

- It is recommended the minimum dimensions to be excavated around HS3 are 30m (length) x 18m (width) x depth to be confirmed by on-site Environmental Scientist;
- Visual inspection and sample analytical data indicate compliance and asbestos contamination has been remediated;
- If contamination is visually identified and/or sampled and identified via laboratory analysis, remediation excavations will continue to beyond the boundary of contamination impact mentioned above and until the validation samples analytical data fall within the applicable guideline criteria; and
- Any imported soil materials to be used for backfilling are required to be suitable for the sites intended land-use and will require validation for confirmation.

9.3 STOCKPILE SAMPLING

Stockpile sampling will be done so in accordance with the NEPM (2013), *Schedule B2, Guideline on Site Characterisation*, outlined in **Table 8**.



Table 8: Stockpile Sampling Frequencies

Stockpile Volume (m ³)	Number of Samples
<75	3
75-100	4
100-125	5
125-<150	6
150-<175	7
>200	8

9.4 LABORATORY QUALITY ASSURANCE & QUALITY CONTROL (QA/QC)

The NATA accredited laboratory contracted to conduct analytical reporting on the samples collected will conduct in-house QA/QC procedures involving spike recoveries, blanks, intra-laboratory duplicates and analysis.

9.5 SOIL VALIDATION REPORTING

All fieldwork, sample analysis, remediation findings, conclusions and recommendations will be provided in a final Site Validation Report for the site. The Validation Report will be prepared in accordance with the NSW OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* and the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme* (3rd Edition) and will confirm the site has been remediated as per project objectives and is suitable for its intended land-use.

10. VALIDATION PROGRAM

The validation program is undertaken as confirmation that remedial works are complete and successful in making the site suitable for its intended land-use.



Table 9 below summarises each hotspot, the contaminant(s) requiring remediation, each on-site location, anticipated hotspot excavation dimensions and validation sampling required.

Following the excavation of soils at the hotspot location, a photographic record of the floor and walls of the excavation pit will be collected for reference in the Site Validation Report.

If levels of contamination in validation samples exceed applicable guideline criteria, excavation in the area of that exceeding sample must be continued until new validation sample analytical results are below applicable guideline criteria indicating compliance (i.e. if the western wall of a hotspot excavation exceeds applicable criteria, the wall must be excavated 0.3m further west and re-sampled, until validation results indicate criteria compliance).

Table 9: Validation program

Hotspot Reference	Validation Sampling Type (refer Section 9.1)	Hotspot Dimensions (m) (length x width)	Analytes Requiring Remediation
HS3	Excavation: 1 floor, 4 walls	30 x 18 x 0.1 into natural ground surface	Asbestos, BTEX, TRH, PAH, Heavy Metals.

10.1 TEMPORARY STOCKPILE STAGING AREA VALIDATION

If contaminated soil materials are to be temporarily stockpiled on-site, 2-layers of impermeable heavy-duty virgin plastic sheeting with a minimum thickness of 200-microns is to cover the ground surface where the stockpile is to be staged, in an allocated location on-site and/or upon removal of the stockpile a 100mm soil scrape is to be undertaken with the excavator bucket to remove any potential residual contaminated soils. Once the stockpile has been disposed of off-site the soil directly beneath the location of the stockpile and/or scraped area will be sampled (at the rate outlined in **Section 9.1**) to confirm cross-contamination has not occurred after disposal of the stockpile off-site. If soil analytical results indicate cross-contamination has occurred, REE will implement remediation and validation procedures as outlined in this RAP, for the decontamination of the area.



Provision should be made to allow for expansion of the stockpile staging area should this be required during the works.

10.2 IMPORTED SOIL MATERIAL VALIDATION

If soil materials are required to be imported onto the site, it must be classified as virgin excavated natural material (VENM) or excavated natural material (ENM) soils and will also be analysed in accordance with the requirement of the NSW EPA (2014) *Waste Classification Guidelines* at a rate of one sample per 25m³ by a NATA accredited laboratory.

Should excavated soil materials be identified as potentially suitable for on-site reuse, the following procedures must be undertaken.

- The subject soil material must be capable of being physically separated from other on-site potentially contaminated material and appropriately stockpiled using the methods outlined above;
- Classification sampling and NATA accredited laboratory analysis is to be undertaken on the subject soil material at a rate of 1 sample per 25m³ of subject soil material; and
- Subject to analytical results indicating compliance within applicable guideline criteria, isolated 'clean' materials may be reused on-site.

Prior to any soil materials being imported on-site, VENM/ ENM classification documentation must be submitted for review to the appointed Environmental Consultant.

10.3 DURATION OF REMEDIATION & VALIDATION WORKS

Based on the proposed scope of remediation and validation works for the site, it can be expected the works will take approximately 10 days following receipt of all regulatory approvals. This timeframe does not include the reporting of works which could be expected to be completed approximately 4 weeks after completion of the remediation and validation works.



11. QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

The Quality Assurance/ Quality Control (QA/QC) procedures ensure the data collected is sufficiently accurate, precise, and reproducible to be used for the Validation Report. QA/QC should be done so in accordance with NEPM (2013) and relevant Australian standards and guidelines.

The frequency for QA/QC samples are summarised in **Table 10**.

Table 10: QA/QC Frequencies

	Intra-laboratory (primary duplicate)	Inter-laboratory (secondary triplicate)	Rinsate	Spikes and Blanks
Sample Frequency	1 in 20	1 in 20	1 per day of fieldwork	1 set per batch of samples

Soil samples are to be collected using laboratory prepared glass jars with Teflon lid inserts. Standard identification labels are to be used which state the following: project reference, sample reference, sample depth, date, sampler/ personnel.

All reusable sampling equipment is to be decontaminated between sampling locations to prevent cross-contamination. Decontamination involves:

- Washing equipment with potable water.
- Scrubbing equipment in a solution of Decon90.
- Rinsing equipment in demineralised water and wiping dry with a clean lint free cloth.



11.1 LABORATORIES

All samples will be couriered to a NATA accredited laboratory under suitable chain of custody (COC). The COC will clearly state the project reference, sample reference, analytes to be tested, date, sampler, project manager and all relevant contact details.

All samples are to be placed within an iced esky once collected and remain below 4°C at all times. Asbestos samples are not required to be kept on ice.

Inter-laboratory QA/QC samples are to be forwarded from the primary laboratory to a secondary NATA accredited laboratory for analysis.

The primary laboratory will conduct in-house routine QA/QC procedures including:

- Reagent blanks;
- Spike recoveries;
- Intra-laboratory duplicates;
- Calibration standards;
- QC statistical data; and
- Control standards and recovery plans.

11.2 ACHIEVEMENT OF DATA QUALITY OBJECTIVE

Based on the analysis of quality control samples (i.e. duplicates and in-house QA/QC procedures), the following data quality objectives are required to be achieved:



- Conformance within specified holding times.
- Accuracy of spiked samples will be in the range of 60-140%.
- Field and laboratory duplicate samples will have a precision average relative percentage difference (RPD) of +/- 30% for inorganic and +/-50% for organic analytes.
- Field duplicate samples will be collected at a frequency of 10% (i.e., 1 inter-laboratory sample and 1 intra-laboratory sample for every 20 field samples collected).

An assessment of the overall data quality should be represented in the final Validation Report in accordance with DEC (2006) *Guidelines for the NSW Site Auditor Scheme*.

12. ENVIRONMENTAL MANAGEMENT PLAN

A site-specific Environmental Management Plan (EMP) will be produced for the remediation works. The EMP will be monitored by an Environmental Scientist who will be on-site during all critical remediation and validation works. The EMP is outlined below and will detail the following:

- Site access;
- Working hours;
- Stormwater and soil management;
- Traffic management;
- Dust and odour control.;
- Noise Control.
- Work health and safety.



All remediation and validation works must be carried out in accordance with relevant Australian standards and guidelines.

12.1 GENERAL

The site manager for the Principal Contractor should have a thorough understanding of the content of the RAP, associated EMP, Work Health & Safety Plans and should ensure all workers and sub-contractors involved in the remediation and validation works understand the contents of these documents.

12.2 SITE ACCESS

The Principal Contractor is responsible for securing the site with adequate barriers and warning signs to prevent unauthorised access. All workers must sign in daily, and visitor must sign a visitor logbook outlining the purpose of the visit, representing company and time-on/ time-off site.

12.3 WORKING HOURS

Site operating hours for remediation and validation works will be between 7:00am and 5:00pm Monday to Friday and 8:00am to 1:00pm on Saturdays. No site works are to be undertaken on Sundays and Public Holidays.

12.4 DEMOLITION & ASBESTOS MANAGEMENT

All demolition works are to be carried out in accordance with relevant SafeWork NSW Codes of Practice. Any asbestos identified within soil and/or building materials should be managed in accordance relevant SafeWork NSW Codes of Practice.

12.5 STORMWATER & SOIL MANAGEMENT



Appropriate measures must be taken to ensure that potentially contaminated sediment and water does not leave the site. This should include, but is not limited to:

- Stormwater flowing through the site should be avoided, if possible, stormwater should be diverted to runoff outside the site.
- Construction of stormwater diversion channels and linear drainage sumps with catch pits in the remediation area to divert and isolate stormwater from any contaminated areas.
- Discharge of any groundwater and/or surface water to drains or water bodies must meet the appropriate discharge consent conditions under relevant Australian standards and guidelines.
- Installation of sediment traps such as sediment fencing should be installed where stormwater may flow off-site.

Soil material to be stockpiled on-site must be done in such a way that the material is well contained and surrounded with adequate erosion controls such as sediment fencing. If stockpiles are to remain on-site for an extended period, they must be covered with geo-fabric or heavy-duty plastic to avoid erosion. Stockpiles must be maintained to allow for identification in the case of them being reused on site.

12.6 TRAFFIC MANAGEMENT

All vehicular traffic is to use only the routes approved by the Council to and from the approved landfill. All loads are to be covered and wetted to ensure no material or dust escape the load. Prior to leaving site, each truck must be inspected for cleanliness. If trucks have sediment on the wheels, chassis and/or body they must be washed down within the designated wash bay until confirmed 'clean'. No sediment track marks are to be visible on public roads.

12.7 DUST & ODOUR CONTROL



Dust and odour shall be monitored during the remediation and validation works and must be managed by the Principal Contractor. Management options include, but are not limited to:

- Water carts to wet dust-prone surfaces;
- Mist cannons/ dust suppression sprinklers on stockpiles and excavation activities which generate dust;
- Covering stockpiles with plastic sheeting/ geo-fabrics;
- Restricting stockpile heights to a maximum height of 2m above ground level;
- Ceasing remediation and validation works during extreme weather events such as high winds and heavy rain;
- Odorous materials may be placed in a bunded area and covered with impermeable plastic sheeting; and
- Airborne fibre monitoring during Class A and Class B asbestos removal and site monitoring by an Environmental Scientist.

If odours are reported on site, the on-site Environmental Scientist will use a photoionisation detector (PID). If the PID readings exceed >30ppm appropriate breathing masks must be worn by site workers. If reading exceed >300ppm odour suppressants must be employed.

12.8 NOISE CONTROL

Noise and vibration will be restricted to a reasonable level. All machinery on-site must ensure noise levels do not exceed statutory levels. Working hours are restricted to the above-mentioned times. 30 days prior to remediation and validation works commencing, every owner and occupier of land within 100m of all site boundaries are to be notified.

12.9 WORK HEALTH & SAFETY PLAN



The Principal Contractor is responsible for implementing a site-specific Work Health & Safety Plan (WHS Plan) prior to remediation and validation works in accordance with relevant Australian standards and guidelines. The WHS Plan must identify hazards and assess risks which may be imposed on site workers, occupants and the public. The WHS Plan should detail subjects such as vehicle decontamination, suitable Personal Protective Equipment (PPE) and safety controls. The WHS Plan must be read and understood by site workers as part of their site induction, prior to beginning any remediation and validation works.

13. WASTE TRACKING & DISPOSAL

All transport and disposal of waste must be done so in accordance with relevant Australian standards and guidelines. All licenses and approvals required for disposal of the material will be obtained prior to removal of the materials from the site.

Details of all soils removed from the site must be documented by the Principal Contractor and soils containing asbestos (>100kgs) are to be tracked using the EPA WasteLocate System. Weighbridge dockets, landfill receipts and consignment disposal confirmation are to be provided to the on-site Environmental Scientist and Principal Contractor.

A truck log will be kept by the remediation contractor detailing disposed loads against on-site origin.

All soil material to be removed from the site must be classified in accordance with NSW EPA (2014) *Waste Classification Guidelines*. No soil material is to leave the site without such classification.

14. DUTIES OF ON-SITE ENVIRONMENTAL SCIENTIST

The duties of the on-site Environmental Scientist include:

- Ensure the Remediation Action Plan, Work Health & Safety Plan, Environmental Management Plan and any other plans or processes are strictly followed.



- Supervise all contaminated material excavations, handling, stockpiling and loading.
- Supervise the environmental compliance of contractors and site workers.
- Undertake asbestos air monitoring in accordance with SafeWork NSW Codes of Practice when ACM is expected to be disturbed, including removed from building components, ACM contaminated hotspots or suspected ACM contaminated soils are to be excavated, handled, stockpiled and/or loaded for transport.
- If strong odours are reported, regularly monitor the open excavation with a PID.
- Inspect sediment and stormwater controls.
- Inspect the roadway in the vicinity of the site for soil materials being tracked off-site.
- Report non-compliances to the Principal Contractor representative who will report to the appropriate regulatory body.
- Conduct validation sampling in accordance with the validation program as requested by the principal environmental representative.
- Maintain a daily site log which will keep record of the following:
 - o Date.
 - o Contractors and sub-contractors on-site.
 - o Weather conditions in a daily site log, including direction and velocity of wind and rain activity.
 - o Locations of asbestos air monitors.
 - o Odour occurrences.
 - o PID (photoionisation detector) readings for volatile organic chemicals (VOC's).
 - o Details of materials excavated.
 - o Details of any unexpected finds.
 - o Accidents, near-misses and/or incidents.



- Details of environmental incidents.
- Any matter relating to environmental and/or health issues.
- Site visitors.

14.1 NON-COMPLIANCES

If any works are suspected of not following procedures outlined in the RAP, WHS Plan or any other document which governs the remediation and validation work procedures, this must be reported immediately to the on-site Environmental Scientist. The on-site Environmental Scientist has the authority to cease all remediation and validation works until the issue is resolved.

15. UNEXPECTED FINDS

In the event that any unexpected materials, contamination and/or underground storage tanks (USTs) are discovered, all remediation and validation works must cease, the on-site Environmental Scientist is to be notified and refer to the **Unexpected Finds Protocol** in **Appendix B**.

If during remediation or validation works, significant contamination and/or odours are discovered, works in that area must cease immediately, the on-site Environmental Scientist must be notified, and management of cross-contamination must be established. If required, the administering authority will be notified within 2 working days of a significant unexpected discovery and informed of the remediation actions taken.

The sampling strategy for unexpected material which could potentially be contaminated will be designed by REE. The objective of the strategy will be to determine the nature of the material, whether it is hazardous, and if so, apply appropriate guideline criteria for its classification, remediation and/or validation.

The sampling frequency for the unexpected materials will meet the following minimum requirements:

- Excavation Floor
 - 1 sample per 25m², with a minimum of 3 samples collected.



- Samples will be analysed for COPC as determined by the Environmental Scientist.
- Excavation Wall
 - 1 sample every 5m (from each horizon/ material type, within the impacted area).
 - Samples will be analysed for COPC as determined by the Environmental Scientist.

The on-site Environmental Scientist will be required to document and report all discoveries of unexpected materials.

16. CONTINGENCY MANAGEMENT

Because subsurface conditions can vary over limited distance, the remediation and validation plan must be dynamic and capable of adapting to any unexpected condition and materials. Unexpected conditions and materials can result in harm to human and environmental health and must be managed appropriately. **Table 11** below summarises conditions and materials which may be discovered during remediation and validation works.

Table 11: Contingency Plan



Unexpected Condition/ Material	Remedial Action
Excessive dust	Use mist cannons over dust generating activities; employ water cart to wet site roads.
Excessive Rain	Maintain stormwater diversion channels and drainage sumps; maintain site roads and cover high traffic areas with gravel; cover stockpiles with heavy-duty plastic and surround with sediment fencing; shut down site until stormwater is manageable.
Excessively wet materials	Leave in-situ; if already stockpiled, dewater; surround with sediment fencing.
Sediment pond water for discharge, analytical exceedance	Perform in-situ water treatment methods until acceptable analytical levels are reported. Arrange off-site disposal by appropriately licensed contractor.
Excessive odours	On-site Environmental Scientist is to continually monitor with PID; remediation contractor is to upgrade PPE if necessary.
Excessive noise	Identify source of noise, inspect equipment and repair; accordingly, provide noise silencers if necessary.
Complaint management	Notify Principal Contractor and on-site Environmental Scientist. Report complaints as per internal/ WHS Plan procedures.
Sediment fence failures	Cease works and repair; change sediment control method (haybales, geo-fabric).



Oil/ fuel spill	Cease work, refer to WHS Plan, utilise spill kit; move source to above impermeable surface (plastic sheeting/ waste drum).
Chemical spill	Cease work, refer to WHS Plan, notify Principal Contractor and on-site Environmental Scientist immediately.
Equipment/ machinery failures	Maintain spare parts; maintain alternate rental options; shut down affected operations until repairs are made.
Discovery of cultural and/or building heritage items	Cease work, contact on-site Environmental Scientist immediately.
Discovery of drummed material	Cease work and contact on-site Environmental Scientist immediately.
Discovery of Underground Storage Tank (UST)	Cease work and contact on-site Environmental Scientist immediately.
Excavation extends below water table into soil materials confirmed to consist of Potential Acid Sulfate Soils (PASS) and/or Actual Acid Sulfate Soils (AASS)	Cease work, contact on-site Environmental Scientist immediately.
Asbestos Containing Material (ACM)	Excavations must cease immediately. Notify on-site Environmental Scientist immediately. Employ appropriate PPE, wet the area to limit dust generation, cover with heavy duty plastic and create a 10m exclusion zone around excavation.



Non-spadeable sludge	Contact Principal Contractor and on-site Environmental Scientist; employ appropriate PPE; segregation and bunding of discovered material; use of odour suppressant; cover with heavy duty plastic; Environmental Scientist to employ appropriate sampling of material; off-site disposal will require appropriate waste classification.
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16.1 UNDERGROUND STORAGE TANKS (UST's)

Any discovered USTs within the site should be removed in accordance with relevant Australian standards, guidelines and the POEO (2014) UPSS Regulation. Due to the hazardous nature of petroleum storage tanks, it is recommended an experienced contractor be responsible for the excavation and disposal processes.

Once the UST and associated stained and/or odorous soils have been removed, validation processes must be implemented by the on-site Environmental Scientist including but not limited to in-situ sampling of the walls and floor of the excavation. Samples must be collected as per standard procedures and submitted to a NATA accredited laboratory under appropriate COC. The minimum target analytes include BTEX, TPH, PAH and heavy metals.

The minimum sampling requirements for UST and associated system areas include:

- 1 sample per spill box.
- 1 sample per tank line.
- 1 sample per vent pipe area.
- 3 samples per UST sand backfill per pit.



- 2 floor samples and 8 wall samples (2 samples per wall) of each tank pit.

16.2 GROUNDWATER CONTINGENCY

If groundwater is discovered during the remediation and validation works, an assessment into the impact on the proposed development is recommended.

17. REGULATORY APPROVALS & LICENCES

17.1 DUTY TO REPORT

Under Section 60 of the Contaminated Land Management Act 1997, the owner of land which has become contaminated, whether before or during the owner's ownership, must notify the EPA in writing.

17.2 STATE OF THE ENVIRONMENT OPERATIONS (UPSS) REGULATION 2014

UPSS regulation states that if a UPSS is decommissioned, a report prepared by a suitably qualified Environmental Scientist must be prepared in accordance with NSW EPA guidelines and submitted to the relevant authorities within 60 days of decommissioning or completion of remediation.

17.3 STATE ENVIRONMENTAL PLANNING POLICIES

The State Environmental Planning Policy No 55 (SEPP 55) – Remediation of Land sets the regulatory framework for contaminated land and remediation works for NSW. SEPP 55 defines the requirements for remediation work to be carried out. The remediation works to be carried out at the site meet Category 2 criteria. **Section 17.3** may be subject to change.

17.4 CAMPBELLTOWN CITY COUNCIL



All remediation and validation works are to be undertaken in accordance with Campbelltown City Council Development Control Plans and any other requirements issued by the Campbelltown City Council.

17.5 ASBESTOS REGULATIONS

Asbestos must be managed in accordance with the Work Health and Safety Act (2011), the Work Health and Safety Regulation (2017), *How to Safely Remove Asbestos: Code of Practice (2019)*, SafeWork NSW Codes of Practice and NSW EPA (2014) *Waste Classification Guidelines*.

Asbestos removal must be completed under the supervision of a NSW Licensed Asbestos Assessor (LAA) and by a licensed asbestos removalist appropriately licensed to carry out Class A (friable) or Class B (non-friable) removals.

SafeWork NSW must be notified by the licensed asbestos removalist contractor 5 days before the asbestos removal work is scheduled to commence.

Asbestos air monitoring must be undertaken at the site while asbestos removal works and/ or excavation works within areas suspected to be contaminated with asbestos are being completed. All asbestos removal work must cease if the airborne fibre count reaches 0.01 fibres/mL of air, and the source of the high fibre count investigated. The asbestos removal contractor is required to notify SafeWork NSW if respirable asbestos fibre levels reach or exceed 0.02 fibres/mL. Asbestos air monitoring must be undertaken in accordance with SafeWork NSW Code of Practice *How to safely remove asbestos* and the Guidance Note on *The Membrane Filter Method for the Estimation of Airborne Asbestos Fibres, 2nd Edition, 2005 NOHSC:3003 (2005)]*.

If a structure or plant is suspected of containing asbestos and must undergo emergency demolition, notification to SafeWork NSW must be made. This is to be done by the Principal Contractor on site and/or the licensed asbestos removalist.



17.6 PROTECTION OF THE ENVIRONMENT OPERATIONS (WASTE)

REGULATIONS 2014

Section 42 of the POEO (Waste) Regulations 2014, details the special requirements relating to asbestos waste and must be followed when dealing with asbestos waste activities and transporting.

The necessary requirements for the transport of various types and occurrences of asbestos include:

- Bonded (non-friable) asbestos must be securely packed at all times (i.e. wrapped in a double layer of heavy-duty plastic);
- Friable asbestos must be kept in a sealed container;
- Asbestos contaminated soils must be wetted down; and
- All asbestos waste including asbestos contaminated soils must be transported as a covered load in in a leak-proof vehicle.

All asbestos waste must be disposed of according to relevant Australian guidelines and standards, including:

- Only appropriately licensed landfill facilities are allowed to receive asbestos waste;
- The person transporting the asbestos waste must notify the landfill facility manager that the load contains asbestos;
- Unloading the asbestos waste must be done so that no dust is generated and employ dust suppression techniques;
- Once deposited at the licensed landfill facility, asbestos waste is to be stored in an environmentally safe manner; and



- The landfill facility must ensure the process of unloading asbestos waste are done so in accordance with NSW EPA guidelines.

17.7 ADDITIONAL LICENSING

Transporters of contaminated waste are required to be appropriately licensed to transport such wastes.

Waste classification documentation and landfill facility receipts must be kept on file for the site validation program.

Appropriate dewatering licenses must be obtained if water is to be discharged from the site.

The Principal Contractor should prepare an appropriate Construction Environmental Management Plan (CEMP), WHS Plan and other plans required by a Campbelltown City Council Development Application.

18. CONCLUSION & RECOMMENDATIONS

The property located at 74 Fern Avenue, Bradbury NSW 2560 can be made suitable for its intended residential redevelopment subject to implementing remediation and validation works in accordance with this RAP.

It is recommended that a qualified Environmental Scientist, who is also an accredited NSW Licensed Asbestos Assessor (LAA), experienced in the visual identification of ACM supervises all remediation and validation activities, whilst undertaking daily asbestos air monitoring.

The RAP must be adhered to by all personnel and sub-contractors involved in the remediation program. There must also be a hard copy of the RAP accessible on site for all remediation personnel.

In addition, a final Site Validation Report must be prepared for the site detailing the successful methodology of remediation and validation works to make the site suitable for its intended land use.



19. REFERENCES

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20. LIMITATIONS

Raw Earth Environmental Pty Ltd (REE) understands to the best of our knowledge, the information within this report is accurate at the date of issue. However, due to the irregularity and dynamic nature of subsurface conditions, soil and groundwater characteristics are capable of change over a short period of time. No warranties, expressed or implied, are made. The contents of this report must be read in full.

Subsurface conditions across a site cannot be fully defined by an investigation. Soil and/or groundwater samples were analysed for common contaminants and/or indicators of contamination only. Sample analytical results obtained during the investigation may not be representative of the extremes of contamination which could be present at the site. Therefore, there is not guarantee that other toxic compounds and/or hazardous materials do not exist within the site.

If the unexpected finds of materials suspected to be hazardous or toxic occur, all site works must cease, and REE must be immediately contacted for further instruction.

REE performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental consulting profession. There is no investigation thorough enough to dismiss a particular material, which presently or in the future is considered hazardous at the site. Regulatory criteria are subject to change, where concentrations of a particular contaminant currently considered low, could be subject to review and fall under different regulatory standards and criteria and may require remediation in the future.

The results of this assessment are based on the site conditions and regulatory criteria identified at the time of the site inspection. REE will not be liable to revise the report to account for any changes in site characteristics, regulatory requirements, assessment criteria or the availability of additional information, subsequent to the issue date of this report. The scope and period of REE's services are subject to restrictions and limitations. REE did not perform a complete assessment of all possible conditions that may exist at the site.

REE takes no responsibility or liability for errors in any data obtained from scientific laboratories, regulatory agencies, statements from sources outside of REE, or developments resulting from situations outside the scope of this project.



All conclusions and recommendations regarding the site are the opinion of REE. Opinions are judgements, which are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions.

We trust the information contained within this document meets your requirements. Should you have any queries, please do not hesitate to contact the REE.



FIGURES



Source: Google Earth 2020

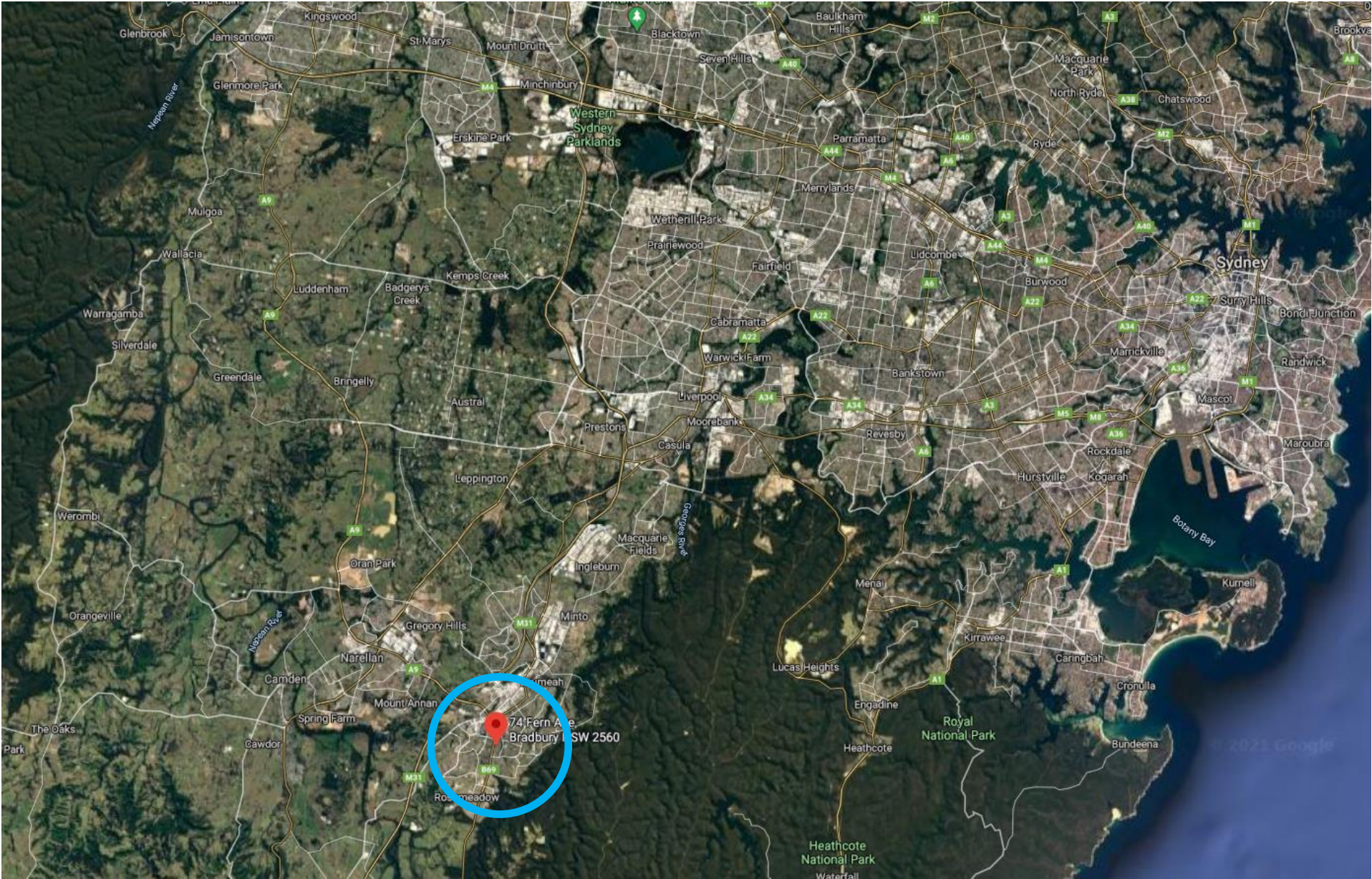


Figure 1	Locality Map
Project	74 Fern Ave, Bradbury NSW



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- Hotspot HS3 – Pool Area
- Site boundary



Figure 2	Site Plan with Hotspot Contamination Locations
Project	74 Fern Ave, Bradbury



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-  AEC 1 – Cleared Area 1
-  AEC 2 – Cleared Area 2
-  AEC 3 – Pool Area
-  AEC 4 – Carparking Area
-  Site boundary



Figure 3	Site Plan with Areas of Environmental Concern
Project	74 Fern Ave, Bradbury



APPENDIX A

Photographic Log



Photograph 1: AEC 1 looking south.



Photograph 2: AEC 1 looking west.



Photograph 3: AEC 1 looking north-west.



Photograph 4: AEC 2 looking east.



Photograph 5: Pump shed adjacent pool area (AEC 3).



Photograph 6: AEC 3, pool area, looking south.



Photograph 1: AEC 3, pool area, looking east towards pool pump shed.



Photograph 2: AEC 4, carparking area.



Photograph 3: Main structure onsite. Security fencing surrounds the perimeter of the building. Area was inaccessible at the time of the inspection.



Photograph 4: Secondary structure onsite.



APPENDIX B

Unexpected Finds Protocol



UNEXPECTED FINDS PROTOCOL

In the event that contaminated soils and/or groundwater (suspected or known), asbestos containing material (ACM) or underground storage tanks (USTs) are discovered during remediation or validation works, all works are to cease and notification must be made to the on-site Environmental Scientist until further instruction is given. All on-site workers must be made familiar with this Unexpected Finds Protocol.

Once unexpected finds have been discovered the steps below must be followed.

STOP WORK AND ISOLATE

All works must cease immediately. All workers are to be made aware of the incident and leave the immediate area of the potentially hazardous material. A 10m exclusion zone around the area of the potentially hazardous material is to be established and no worker is to enter the exclusion zone.

CONTACT

As soon as reasonably practical, Raw Earth Environmental must be notified. The nature of the discovery must be clearly detailed. All workers are to await the instruction of Raw Earth. Raw Earth are to immediately investigate the nature the discovery.

INSTALL WARNING SIGNS & PPE

The exclusion zone is to display warning signs appropriate to the nature of the discovery. Workers must employ appropriate Personal Protective Equipment (PPE) including but not limited to, appropriate coveralls and P2 respiratory masks.

AIR MONITORING

If asbestos is suspected to be present, asbestos air monitoring must be employed to determine the extent of contamination. An adequate number of asbestos air monitor are to be set up on the exclusion zone under the instruction of Raw Earth.

REMEDiate

The contaminated area must be evaluated by Raw Earth field technicians and appropriate remediation techniques must be employed. The remediation and removal processes must be undertaken by a suitably licensed contractor.