RAW EARTH
ENVIRONMENTAL

Remediation Action Plan

Eileen O'Connor Catholic School:
84 Gavenlock Road, Mardi, NSW 2259

December 2024

RAWEARTHENVIRONMENTAL.COM.AU

REPORT DISTRIBUTION

Report Title	Remediation Action Plan
Site Address	Eileen O'Connor Catholic School: 84 Gavenlock Road, Mardi, NSW 2259
Lot/Deposited Plan	Lot 9 / DP 3368
Project Reference	S00400
Document Number	3
Author	Gonzalo Serna Diaz Senior Environmental Consultant SafeWork NSW Licensed Asbestos Assessor
Reviewed by	Daniel Taylor Director SafeWork NSW Licensed Asbestos Assessor
Date	10th December 2024
Raw Earth Environmental Pty Ltd ACN: 635 583 327	Enquiries: hello@rawearthenvironmental.com.au www.rawearthenvironmental.com.au

DOCUMENT REVISIONS

Revision	Date	Created by	Short Description of Changes
2	10/12/2024	Gonzalo Serna Diaz	Address comments made by NSW EPA Accredited Site Auditor (Louise Walkden)
3	1st July 2025	Gonzalo Serna Diaz	Changed client name

Table of Contents

Appendices

1 Introduction

1.1 Background

Raw Earth Environmental (Raw Earth) have been engaged to develop a Remedial Action Plan (RAP) to establish remediation strategies relating to the potential for in situ soil contamination during proposed demolition and redevelopments works to both the 'fill platform' area and the 'playing court' area, situated within a northwestern section of the Eileen O'Connor Catholic School, of 84 Gavenlock Road, Mardi, NSW 2259 (the site). The fill platform area has an approximate area of 650m^2 while the playing court area has an approximate area of 1,100m^2. The site is located approximately 15.5 km north-east of Gosford Central Business District (CBD), within the Local Government Area of Central Coast Council (CCC). The fill platform and playing court areas within the site are shown in **Figures 2** and **3** in **Appendix A**.

In July of 2024, Raw Earth undertook a Detailed Site Investigation (DSI) (S00360_Stanton Dahl Architects_DSI_Eileen OConnor_V02) across areas of the north-west portion of the site surrounding the fill platform and playing court areas and limited sampling within the fill platform. As part of this investigation, 24 sample locations were advanced to varying depths via the use of both an excavator - to provide test pit excavation - as well as a hand auger and shovel to collect samples by hand. Within the fill platform, sampling was limited due to the presence of buildings sitting atop concrete slabs. The inability to collect more samples with the fill platform and playing court areas during the DSI poses a potential contamination risk considering the soils making up each area may consist of 'uncontrolled' fill – i.e., without any paper trail and proof of contamination status. As such, the fill platform and playing court areas are considered data gap areas.

While the DSI concluded the site poses a low risk to the environment and human health and can be made suitable for ongoing educational use, this RAP considers the fill platform and playing court areas as having the potential for soil contamination – specifically, asbestos-containing material (ACM). Disturbing the uncontrolled fill material within each area during future redevelopment works could present potential risks to human health and the environment, which this RAP will mitigate while also developing adequate removal and off-site disposal options for any contaminated soils that do not meet the adopted site-specific NEPM 1999 (as amended in 2013) Residential A land use criteria, and are unable to remain on site.

1.2 Objective

This RAP was prepared to provide a remediation and validation methodology to render the site suitable for the proposed Eileen O'Connor Catholic School use if contamination is identified following the demolition of structures in the fill platform and playing court areas. The objectives of the RAP were to:

- Document the procedures and standards to be followed in order to manage any risk posed if soil contamination identified, considering the proposed future land use as the Eileen O'Connor Catholic School;
- Outline the remedial and validation strategy to ensure the site is remediated to a satisfactory standard; and
- Outline a contingency plan to address issues which may arise during implementation of the preferred remedial scope.

2 Scope of Works

To complete this RAP, Raw Earth undertook the following scope of works:

- Establish the extent and nature of the data gap areas requiring assessment and outline the asssment approach;
- Establish potential remedial goals and criteria for the site;
- Evaluate potential appropriate remediation strategies available;
- Outline site operations including site based soils investigation works, stockpiling, management and disposal of soil materials, environmental controls, and a contingency plan to manage additional unexpected contamination that may be identified during any potential remedial and validation works;
- Advise processes for the unexpected finds of contaminated material including an Unexpected Finds Protocol (UFP); and
- Establish a sampling strategy for any potential validation works.

3 Regulatory Framework

This RAP was undertaken in accordance with the following regulatory framework and guidelines:

- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC Care), National Remediation Framework, *Guideline on Performing Remediation Options Assessment, 2018*;
- Contaminated Land Management Act 1997;
- Department of Urban Affairs and Planning, NSW Environmental Protection Authority, Managing Land Contamination – Planning Guidelines – SEPP 55 – Remediation of Land, 1998;
- Environmental Planning and Assessment Act 1979;
- Guidelines for the Assessment and Management of Groundwater Contamination (NSW Department of Environment and Conservation [DEC], 2007);
- Managing Land Contamination Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning & NSW Environment Protection Authority [EPA], 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 Department of Planning and Environment, State Environmental Planning Policy (Resilience and Hazards) Chapter 4, 2022;
- 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, 2022;
- NSW Environmental Protection Authority, Excavated Natural Material Order and Exemption, 2014;
- NSW Environmental Protection Authority, Waste Classification Guidelines Parts 1-4: Classifying Waste, 2014;
- NSW Environmental Protection Authority, Consultants Reporting on Contaminated Land. Contaminated Land Guidelines, 2020;
- Protection of the Environment Operations (Waste) Regulation 2014;
- Water Management Act 2000;
- 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; and
- Work Health and Safety Regulation, 2017.

4 Summary of Previous Investigations

Previous investigations conducted at the subject site are summarised below:

4.1 Raw Earth Environmental: *Acid Sulfate Soils Investigation, 2023.*

In October of 2023, Raw Earth conducted an Acid Sulfate Soil (ASS) Investigation (ASSI) at the site to assess the subsurface soil conditions and to determine the presence of ASS. The investigation included the advancement of 6 boreholes to a maximum depth of 2.5m BGL, soil characterisation, sampling, and analysis for field pH, pH FOX and the Chromium Reducible Sulfur (CRS) analysis. The key findings are described below:

- Groundwater was intercepted within boreholes HA04, HA05 and HA06, all located on the north portion of the development area.
- The soil analytical results indicate presence of ASS within soils greater than 2.0 m mark. However, soils beyond 1.8m bgl are not to be disturbed with respect to the current (August 2024) development design plans.

4.2 Raw Earth Environmental: *Preliminary Site Investigation, 2024.*

In March of 2024, Raw Earth conducted a Preliminary Site Investigation (PSI) at the site to assess the presence of potential contamination from former and current land uses. The investigation included a site inspection, and a desktop assessment with reviews of land zoning, historical aerial photographs, geology, hydrogeology, and contaminated land register. Key findings are described below:

- The desktop assessment indicated that the site has remained as a private school since 1983.
- No soil sampling was undertaken as part of the PSI.
- The PSI concluded that the use of potential uncontrolled fill was the main potential source of contamination and environmental concern for the site.

4.3 Raw Earth Environmental: *Salinity and Aggressivity Assessment, 2024.*

In March of 2024, Raw Earth conducted a Salinity and Aggressivity Assessment at the site to assess in-situ soils for salinity and aggressivity. The investigation included the advancement of 15 boreholes to a maximum depth of 1.8m, soil sampling, and analysis. The key findings are described below:

- The site soil conditions were classified as non-saline.
- The pH analyses indicated acidic soil conditions, ranging from 3.7 to 5.7. This is noted however to be lower than pH levels presented in the ASSI (2023) and soils analysed within this DSI, obtained across site to varying depths.
- Site soils were found to be non-aggressive to mildly aggressive to steel and non-aggressive to severely aggressive to concrete according to AS 2159-2009 - Piling – Design and Installation criteria.

4.4 Raw Earth Environmental: *Sampling and Analysis Quality Plan, 2024.*

Prior to undertaking works as part of this DSI and in June of 2024, Earth Environmental developed a Sampling and Analysis (SAQP) to present sampling methodologies and analysis relating to in situ soil and surface water sampling works to be undertaken prior to undertaking site works The SAQP was developed with consideration to National Environment Protection Council, *NEPM 1999 (as amended in 2013)*, the NSW Environment Protection Authority (NSW EPA) *Sampling Design Guidelines (2022)*

and the NSW EPA Resource Recovery Framework, *the Excavated Natural Material (ENM) Order and Exemption (2014).* The key objectives outlined in the SAQP to be addressed were:

- Visually assess in situ soils for the presence of anthropogenic forms of waste, specifically PACM, via the process of test pit excavations to maximum depths of 1.8 m bgl.
- Gravimetric quantification of soils from within each test pit to be prepared in the field by passing 10 L of soil through a 7 mm sieve, or alternatively, spread across a contrasting background for visual analysis. A 500 ml sample was to be collected from the soils excavated from the test pit before being passed through the 7mm sieve or after spread across the contrasting background. Any PACM fragments remaining atop the 7 mm sieve or contrasting background were to be double bagged in zip lock plastic bags and sent to the NATA accredited laboratory for asbestos ID analysis.
- Analysis of both in situ soils and surface water samples for CoPCs across the site.
- Potential classification of in situ soils for offsite disposal as ENM in accordance with the requirements of the material-specific Order and Exemption published by the NSW EPA under the Resource Recovery Framework.
- Describe the rationale and Data Quality Objectives (DQOs) for the proposed sampling program.
- Specify the procedures and protocols that will be adopted for the DSI.
- Identify assessment criteria.
- Identify potential contamination source- pathway- receptor chains associated with the site which will make up the Conceptual Site Model (CSM).
- Document data quality indicators (DQIs).
- Detail the sampling program.
- Detail the field methodologies for sample collection.

4.5 Raw Earth Environmental: Detailed Site Investigation, 2024

In July 2024, Raw Earth conducted a Detailed Site Investigation (DSI) at the site to assess potential contamination, attempt to classify soils for offsite disposal as Excavated Natural Material (ENM), against the NSW EPA Beneficial Reuse, Resource Recovery Framework (2014) and to assess surface waters from an on site dam. The investigation included 24 test pits a maximum depth of 1.8 m BGL, with 24 primary soil samples analysed for 8 metals, BTEXN, TRH, PAH, and asbestos.

Key findings from the DSI include:

- While no ACM was encountered, fill material was observed within in situ soils in several locations, particularly around existing sheds and southern boundary, containing foreign anthropogenic materials such as terracotta tiles, ceramic tiles, bricks, plastic, and concrete.
- On site soils were noted to meet requirements to remain on site, with analytical concentrations reported by the NATA accredited laboratory (Eurofins) as being less than the NEPM (2013) Residential A Health Investigation Levels (HIL-A).
- On site soil results were also compared against the NSW EPA NSW (2014) criterion to allow soils to be beneficially reused offsite under the NSW EPA Beneficial Reuse, Resource Recovery Framework (2014), with the exception of nickel concentrations in S19 (0.5 m bgl) and S23 (0.3 m bgl) (both areas where fill materials were encountered) which exceeded the Maximum Average and Absolute Max, respectively.

- Asbestos was not detected in analysed samples, with samples obtained where fill material was clearly present to be analysed for asbestos ID in soils and asbestos w/w% quantification analysis. It should be noted however that fill materials were also encountered within TP11, TP16, TP23 and TP24, yet asbestos ID and asbestos w/w% quantification was unable to be undertaken due to the significant amount of rain that fell during excavation works at these locations – causing 10L visual analysis and sampling unachievable.
- Surface water samples obtained from the on-site dam were within or exceeded the highest protection levels for copper, lead, zinc, nitrates, pH, and coliforms when compared to ANZECC (2018) guidelines.
- Data gap identified beneath existing sheds (unassessed fill material).

It was concluded that site could be made suitable for its proposed use, subject to:

- Further investigation was suggested for the data gap area (the fill platform and playing court areas), including validation after demolition of existing structures and concrete foundational slabs.
- Implementation of Acid Sulfate Soils Management Plan for excavations beyond 2.0 m BGL (if warranted).
- Preparation of Remediation Action Plan to address potential contamination and unexpected finds during demolition works of previously inaccessible ground areas beneath the shed concrete slab and sports court.

5 Site Condition and Environmental Setting

5.1 Site Identification

A Site Location Plan is shown in **Figure 1**, with a detailed Site Layout Plan shown in **Figure 2** in **Appendix A**. A summary of the Site Details is shown below in **Table 1**.

Table 1: Site Details	
Site Address	84 Gavenlock Road, Mardi NSW 2259
Lot Description	Lot 9 Section 4 DP 3368
Site Location Plan	Figure 1
Site Layout Plan	Figure 2
Investigation Plan	Figure 3
Investigation Area (m^2)	645
Local Government Council	Central Coast Council
Current Land Zoning	R2: Low Density Residential and C3: Environmental Management
Surrounding Land Zoning	R1: General Residential C2: Environmental Conservation and Management
Previous Land Use	R2: Low Density Residential

5.2 Site Description

Key observations noted during the inspections are summarised below in **Table 2**.

Table 2: Site Layout and Current Use	
Site Layout and Use	**Details**
Current use	Facilities for educational related activities.
Surface cover type and condition	Small portions of grass and gravels are present across soils within the fill platform and playing court areas
Building construction	The fill platform and playing court areas consists of hardstand foundations and several rectangular steel sheds (fill platform only).
Water runoff flow direction and drain/ pit location	The area outlying the site slopes downhill from southwest to northeast of the property, water runoff will follow this direction travelling across the site, likely to bypass the site.
Depth, size and flow of any water features which may include creeks, rivers, lakes, ponds and lagoons	There is a topographical depression that dams and holds water, at various levels and times, approximately 8 to 10 m north from the closest part of the foundations underlying the northern-most shed's awning.
Presence and location of groundwater monitoring wells, soil bores	No groundwater bores observed to be present onsite, water table was not encountered above
Waste/ rubble	Bricks and concrete cobbles/boulders were visible within the fill platform. Several test pit excavation locations were noted to contain anthropogenic forms of waste material (i.e., rubble).
Areas of restricted access	Building interiors.

6 Data Gap Investigation Area

Based on the information presented in the DSI, the data gap areas have been identified as the soils beneath the fill platform and playing court as they are the potential for soil contamination to be present in in-situ soils. The fill platform area has an approximate area of 650m^{2,} while the playing court area has an approximate area of 1,100m^2. Refer to **Figure 3** in **Appendix A** for fill platform and playing court areas location.

While limited sampling in shallow soils was undertaken within the fill platform during the DSI, much of the in-situ soils in this area were not accessible and could not be investigated. Therefore, the lateral extent of contaminated soils comprises the in-situ soils beneath the fill platform and playing court areas which have not been established. This presents issues for establishing specific areas of the fill platform and playing court areas that may require remediation, followed by potential validation.

The Detailed Site Investigation (DSI) provides specific information regarding limited sampling conducted in the shallow soils of the fill platform area (samples S23 and S24) and soil samples taken around the perimeter of the fill platform (samples S11, S17, S19, and S20) and from the playing court area (samples S14, S15, and S18). All the collected samples were reported by the laboratory to have analytical concentrations below the site-specific Residential A land use criteria established by the National Environmental Protection Measure (NEPM) 1999, as amended in 2013.

However, it was observed that the fill material identified in nearby test pits—comprising bricks, concrete cobbles, and rubble—indicates a heterogeneous composition, as mentioned in the DSI. This

suggests that there is uncontrolled fill and potential of contamination present within the in-situ soils of the fill platform and playing court areas.

7 Conceptual Site Model

In accordance with the 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 making up the fill platform and playing court areas. 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.

7.1 Potential Contamination

Based on previous environmental investigations, the following data gap areas of potential contamination were identified:

- Fill platform: 645 m^2; and
- Playing Court Area: 1,100 m^2.

Potential anthropogenically deposited heterogeneous fill material has the potential to host contaminants. Refer to **Figure 3** in **Appendix A** for fill platform and playing court areas location.

7.2 Contamination Sources, Exposure Pathways & Receptors

Potential contamination sources, exposure pathways, and human and ecological receptors considered relevant for this assessment are summarised with a qualitative assessment of the potential risks posed by complete exposure pathways in **Table 3.**

Table 3: Conceptual Site Model					
Fill Platform and Playing Court Areas					
Source	**Potential Receptor**	**Potential Exposure Pathway**	**Complete Connection**	**Risk**	**Justification**
Unexamined fill material making underlying the fill platform and playing court areas.	Site construction workers, students, staff, ecological receptors (plants, soil organisms)	Direct dermal contact, inhalation of contaminated dust, primary and secondary ingestion of soil particles.	Expected to be complete during demolition works.	Moderate to high - potential for isolated areas of contamination in fill platform.	Potential fill may be present beneath the hardstand, with the origin of soils and date of deposition unknown. Limited soil testing showed results to be less than relevant criteria in surrounding sampled areas. Site history indicates a low likelihood of major contamination sources. However, heterogeneous characteristics of the fill material observed in nearby test pits (bricks, concrete cobbles & rubble) described in the DSI suggest that the composition and potential presence of

					further uncontrolled fill and potential ACM may be present within in situ soils of the fill platform and playing court areas.

7.3 Overview

The conceptual site model for fill platform and playing court areas focuses on potential contamination associated with fill material of unknown origin beneath existing hardstand foundations. The DSi identified potential contamination sources, including the fill material itself and possible historical contamination from past agricultural and residential use.

Based on typical urban fill constituents, observed fill composition, and previous site testing results from the DSI, the contaminants of potential concern (CoPC) include:

- Heavy Metals;
- Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene (BTEXN);
- Total Recoverable Hydrocarbons (TRH);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- OCP/OPP – Organochlorine, organophosphate pesticides; and
- Asbestos (AF/FA).

Primary exposure pathways are direct contact with contaminated soil, dust inhalation, incidental soil ingestion, and potential vertical leaching. The main receptors are students and staff of the school, as well as construction or maintenance workers who plan to disturb the fill.

Based on the DSI investigation results and CSM, the overall contamination risk once the current structures are demolished and the soil beneath is exposed, it will be assessed as moderate to high. However, the potential for isolated areas of contamination in the fill material cannot be ruled out.

8 Gata Gap Sampling Plan and Methodology

8.1 Data Quality Objectives

In accordance with the US EPA (2006) Data Quality Assessment and the NSW EPA (2017) 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 site may be contaminated as a result of former and current land use at and surrounding the site, which may impact the suitability of the site for the proposed land-use.

Step 2: Identify the decision.

Undertake a soil investigation following the completion of the demolition of the current structures in the fill platform and playing court areas to identify any potential contamination which may pose a risk to human health and/or the environment. If contamination is identified within the areas, can the site be made suitable for its intended 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;

- A targeted and grid-based soil sampling and analysis program across the site in known areas undertaking soil disturbances;
- Visual inspection of potentially contaminating waste materials, including asbestos, soil odours and staining;
- Visual inspection of soil samples for the presence of asbestos-containing material (ACM);
- Screening sample analytical results against appropriate assessment criteria for the intended land use.

Step 4: Define the boundaries of the site.

The boundaries of the site and data gap investigation area are those outlined in **Figure 2** in **Appendix A.**

Step 5: Develop a decision rule.

To accept the assessment decision, the following decision rules apply. For a targeted based soil sampling, the sampling data must meet the following qualifiers:

- Assess soil analytical results with consideration of the adopted criteria and site-specific factors;
- There is no visible identification of ACM in soil samples or on the ground surface; and
- There is no laboratory detection of asbestos in soil samples.

Step 6: Specify acceptable limits on decision errors.

The field sampling methodology, sample preservation techniques, and laboratory analytical procedures must be appropriate to provide confidence in data quality so any comparison against assessment criteria can be considered reliable. This is achieved by defining and comparing results against the Data Quality Indicators (DQIs).

Step 7: Optimise the design for obtaining data.

This is achieved with a sampling plan design in consideration of the available site history information, area of investigation, contaminant behaviour in the environment, and likely spatial distribution of contamination.

8.2 Sample Density

Table 2 of the *EPA Sampling Design Part 1* indicates that for areas (m^2) less than 0.4 hectares (ha), 8 sample points are required for soil investigation purposes. As such, 8 sample locations will be required to be advanced in the fill platform area (with a grid size of 11m) and the playing court area (with a grid size of 16m). **Figure 3** in **Appendix A** illustrates the approximate location of the proposed test pit to be undertaken for each area after the demolition works.

Samples will be collected from each location along the soil profile at various depths to characterise the soil profiles encountered. A minimum of 16 soils samples should be collected from each area.

8.3 Sample Methodology

Test pits will be advanced using a hand auger or machinery into natural soil profile. Soil materials will be logged, including visual and olfactory observation of foreign material inclusions and any odours or staining. A PID will be used to screen for VOCs during soil sampling, with a reading taken for each soil sample collected.

All soil samples will be placed into laboratory supplied glass jars/sample bags provided by the primary laboratory. The jars need to be filled with zero headspace and labelled with the date, borehole number and sampler information. The sample containers must immediately be placed in an esky with ice and transported to the primary and secondary laboratories under Chain of Custody (COC) procedure.

On completion of the investigation, the test pit locations will be backfilled with displaced material and nominally compacted.

9 Assessment Criteria

The fill platform and playing court areas were not accessible for soil testing during the DSI, creating data gaps. Soil contamination sampling will be necessary once the existing structures are demolished, allowing access to the in-situ soil in each area.

The data gap assessment will be required to be undertaken in accordance with the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999, as amended in 2013 for soils.

Soil sample analytical results collected from the fill platform and playing court areas will be compared against the most conservative Residential A land use guideline values. These values are applicable since primary schools are included in the same criteria, as outlined in the NEPM 1999 (amended in 2013). The appropriate site-specific land use assessment criteria are as follows:

- HIL A – Health Investigation Levels – Primary School;
- HSL A – Health Screening Levels – Primary/Secondary School (sand);
- EIL – Ecological Investigation Levels - Residential and public open space land use (coarse soil); and
- ESL – Ecological Screening Levels - Residential and public open space land use (coarse soil).

HILs are Tier 1 risk-based generic assessment criteria used to assess potential risks to human health from chronic exposure to contaminants in soil. They are intentionally conservative and based on a reasonable worst-case scenario for generic land use settings.

HSLs are Tier 1 risk-based generic soil assessment criteria used for the assessment of potential risks to human health from chronic inhalation exposure of petroleum vapour emanating off petroleum-contaminated soils (Vapour Risk). They are intentionally conservative and based on a reasonable worst-case scenario for generic soil types, contamination depth and land use settings, including Residential (HSLs A/B), Open Space/Recreational (HSLs C) and Commercial Industrial (HSLs D). HSLs A soil assessment criteria for coarse soil from 0 to 4 m was adopted on the basis that the site use is a primary/secondary school, and on-site soil in this area is comprised of predominantly sand with minor silt and clay content.

Ecological Screening Levels (ESLs) are also presented in Schedule B(1) of the NEPM and have been developed for selected petroleum hydrocarbon compounds and are applicable for assessing risk to terrestrial ecosystems. ESLs are generally applicable to the top 2 m of soil and apply to coarse- and fine-grained soils and various land uses.

Asbestos quantification analysis will be compared against the Health Screening Level (w/w) Residential A land use scenario levels. The adopted assessment criteria are included in the soil analytical results in **Table 5**.

Table 5: Asbestos in Soil Screening Levels	
Site Use	Soil Asbestos Screening Criteria
All site uses – Fibrous Asbestos (FA)	10 mg/kg (0.001 %) w/w asbestos
All site uses – Asbestos Fines (AF)	10 mg/kg (0.001 %) w/w asbestos
Residential A- Bonded ACM	100 mg/kg (0.01 %) w/w asbestos

9.1.1 NEPM Aesthetic Considerations

Aesthetic guidelines in the NEPM 1999 (as amended in 2013) also need to be considered. The NEPM 1999 (as amended in 2013) indicates 'aesthetic issues generally relate to the presence of low concern or non-concern inert foreign material (refuse) in soil or fil resulting from human activity.' As there are aesthetic numeric guidelines available, the assessment of the type, quantity and distribution of foreign material or odours at the site should be considered in combination with the specific land use and its sensitivity.

Aesthetic Guidelines will need to be considered during any further investigative or remedial works considering the presence of potential uncontrolled fill material on site.

10 Remediation Strategy

This RAP outlines remediation methods if contamination is identified in the in-situ soils beneath the fill platform and playing court areas after demolishing the existing structures.

Since the actual extent of soil contamination in the fill platform and playing court areas has not yet been determined, it is recommended that Raw Earth be present on-site during the demolition work in both areas. This will help identify visible forms of contamination, such as asbestos-containing material (ACM), particularly in areas where hard surfaces, like concrete slabs, interface with the underlying soil, as well as any potential ACM adhered to the bottoms of the concrete slabs and within the in-situ soils.

10.1 Remediation Objectives

The objective of the remediation program is to eliminate potential contamination source – pathway - receptor linkages at the sites and reduce the risk of exposure to site receptors: Occupants, neighbours, workers, students, the public, and ensure the sites are suitable for residential land use.

The remediation process outlined below should be implemented if contamination is identified and confirmed through laboratory analysis after the demolition of structures within the data gap investigation areas. These remediation strategies are presented as potential solutions to be implemented.

10.2 General Remedial Process

Should potential presence of fill material with contaminant reported to be greater than the adopted, site specific NEPM 1999 (as amended in 2013) Residential A land use criteria, cautionary removal conditions and controls will be implemented. Any excavation of the fill material must be carried out by an experienced civil contractor under the supervision of a Raw Earth consultant.

All excavated fill material unsuitable to remain on site is to be adequately classified for removal to a suitably licensed facility based on its waste classification. Once excavation is completed, a Raw Earth Environmental Consultant will undertake validation sampling and visual inspections of the site. Should imported fill benecessary, it must be certified Virgin Excavated Natural Material (VENM) or Excavated

Natural Material (ENM) by the supplier and documentation of this saved to be included in the Validation Site Report (SRV).

Remediation works will be finalised and validated by a Raw Earth consultant in the form of an SVR. If any contamination is found to exist on site and remain in situ, an Unexpected Finds Protocol (UFP) has been devised, as presented in **Appendix B**. This RAP must be adhered to by all personnel and subcontractors involved in the remediation program. A hard copy of the RAP must be accessible on-site for all remediation personnel.

10.3 Remedial Options

The remediation options have been proposed and assessed based upon the likelihood of achieving the anticipated end land use and their suitability against the remediation hierarchy presented in the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013). This hierarchy includes the following:

- On-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site; or,
- If the above are not practicable,
  - Consolidation and isolation of the soil on site by containment with a properly designed barrier;
  - and
  - Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material;
  - or,
  - Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

When deciding which option to choose, the sustainability (environmental, economic and social) of each option should be considered, in terms of achieving an appropriate balance between the benefits and effects of undertaking the option.

10.3.1 Option 1: Total Excavation and Off-Site Disposal

This method would involve excavation of all contaminated fill materials down to natural soils and offsite disposal to an appropriately licensed landfill facility. The method may also require backfilling excavations with validated imported soils to satisfy final design levels.

- Advantages: Removing contaminated soils from site (to an extent practicable) and removing land use restrictions associated with contaminated soils, with no long-term implications or management obligations. Long-term contamination risks are mitigated. The approach is well understood / effective and would likely be accepted by all relevant stakeholders.
- Disadvantages: Large expense associated with off-site disposal of asbestos-impacted fill and importation of backfill, greater disturbance of contaminated soils which requires risk control during the works program, longest timeframe to complete the works. From a sustainability perspective, the option generates waste which requires transport and off-site disposal, and the removal of large trees and vegetation may be required.

10.3.2 Option 2: Partial Excavation and Off-site Disposal & Partial On-site Containment

This method would involve partial excavation and offsite disposal of contaminated fill materials combined with on-site containment, managed under a Long-Term Environmental Management Plan (LTEMP).

The approach would involve the removal of contaminated fill materials down to a nominated level to satisfy the final design level, and any contamination below will remain in situ. Placement of a permeable surface marker layer (geo-fabric material, to the extent practicable) across the in situ fill is required followed by the installation of a suitable capping layer above the geo-fabric.

- Advantages: Less time to complete the works and less disturbance of contaminated soils as compared to Option 1. Reduced cost and sustainability impact associated with disposal and importation of materials. The approach is more sustainable than Option 1 in the context of the remediation hierarchy in the National Environmental Protection (Assessment of Site Contamination) Measure. Long-term contamination risks are largely mitigated.
- Disadvantages: Long-term liabilities and costs by imposing LTEMP, associated notification obligations on the land title and ongoing monitoring and management for LTEMP compliance. Additional cost associated with the design and installation of marker layer and capping layer as well as all the associated reporting. Limitations on land-use that may impact future development plans. Potential adverse perception with retaining impacted soils onsite. Future sale value potentially affected with the contamination legacy on title deed. Option still requires the excavation and removal of waste to a licenced facility which has cost implications, as well as issues regarding ecological sustainable development (ESD) principles.

10.3.3 Option 3: On-site Containment and Management

On-site containment and management would involve the placement of a permeable surface marker layer (geo-fabric material) across all identified contaminated fill materials and then capping the contaminated material with clean soil or hardstand. The site would then require a LTEMP to mitigate potential contamination exposure / exposure risks for future site users or workers.

- Advantages: Less time to complete the works, as compared to Options 1 and 2. Minimal disturbance of contaminated soils and no material requiring off-site disposal, thus reducing costs for waste disposal and enhancing sustainability (reduced transport and enhanced impacts to landfill airspace and lifespan of receiving facility). No fill material is required to be disposed of off-site, however, material would still be required to be imported for construction of the capping layer. The approach is more sustainable than Options 1 and 2 in the context of the remediation hierarchy in the National Environmental Protection (Assessment of Site Contamination) Measure. Capping and management is a proven remediation approach.
- Disadvantages: Long-term liabilities and costs by imposing LTEMP, associated notification obligations on the land title and ongoing monitoring and management for LTEMP compliance. Additional cost associated with installation of marker layer and capping layer. Limitations on land-use that may impact future development plans. Potential adverse perception with retaining asbestos impacted soils onsite. Future sale value potentially affected with the contamination legacy on title deed.

10.3.4 Option 4: Removal of Surface Contamination by Emu Picking ACM

When only bonded ACM contamination has been identified and confirmed, and the impact is confined to the surface soils, surface remediation will be sufficient to achieve site clean-up goals.

All surface-level visual ACM fragments are to be removed by hand as done by an 'Emu Pick'. All surface ACM will need to be removed from the site in accordance with the NSW *Work Health and Safety Act*

(2011) and *Regulations (2017)* and comply with Class-B asbestos removal conditions as defined in the Code of Practice *How to Safely Remove Asbestos* (current 2020 version).

The following controls will need to be considered:

- All visual ACM is to be removed by hand by an accredited asbestos removalist in accordance with the NSW *Work Health and Safety Act (2011)* and *Regulations (2017)* and comply with Class-B asbestos removal conditions as defined in the Code of Practice *How to Safely Remove Asbestos* (current 2020 version);
- All ACM is to be double bagged and removed from the site;
- Due to the sensitive receptors at the site, daily supervision and airborne fibre monitoring must be undertaken during all removal works under the supervision of a Raw Earth Environmental Licensed Asbestos Assessor (LAA), and at any other time, there is a possibility of disturbing ACM;
- Very small fragments may be evidence that the material has been crushed, smashed or pulverised, and collection of a soil surface scrape of the visible material and immediately surrounding surface soils would remove and eliminate any potential AF impacts that may have occurred from any in situ breakage; and
- Any ACM waste must be managed for off-site disposal to an appropriately licensed landfill facility.

Following the completion of the removal work, a site walkover must be undertaken by the Raw Earth LAA to confirm that no visible asbestos materials are present outside the asbestos work area or across the surface. Clearance certificates should be provided and issued for the site following clearance inspections.

10.4 Preferred Remediation Strategy

Raw Earth believes that any of the presented options could be successfully implemented to make the site suitable for the proposed use. After investigating the areas with data gaps and depending on the level of contamination identified, it is recommended that all parties involved assess each option and choose the preferred strategy for inclusion as an addendum to this Remedial Action Plan (RAP). This decision should take into account human health, environmental impact, financial implications, long-term effects, and associated risks and liabilities.

10.5 Supervision

Remediation works will focus on removing potentially contaminated soil identified during the subsurface investigation following the completion of the demolition works. It is recommended that – if asbestos contamination is identified - an experienced Licenced Asbestos Assessor (LAA) be appointed to the project to ensure the following:

- Undertake air monitoring to validate the effectiveness of asbestos control measure.
- Further contamination can be identified.
- 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.

Completion of remediation works without the supervision of a suitably qualified LAA 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.

11 Remediation Methodology

The remedial option is yet to be selected and once it has been, it will require an addendum to this RAP. Regardless of the final decision, any fill materials that require excavation and removal to support the site's repurposing will be managed through standard protocols for waste classification and disposed of off-site at a licensed facility. Additionally, any remaining contaminated in-situ material must be capped and contained appropriately to prevent contact between contamination and site users, with minimum capping requirements.

The following minimum capping requirements:

- Capping works must place a permanent barrier between site users and remaining contaminated material;
- A visual marker indicator layer (geofabric) is to be placed above all residual fill material as a minimum;
- Unpaved surfaces are to have minimum 300 mm of capping material. The total capping depth is the sum depth of all approved materials above the marker layer and includes 100 mm of horticultural soils and mulches.
- Where minimum capping depths in softscape areas cannot be achieved, such as in critical rootzones (CRZ), or at site boundaries, detail on these areas are to be documented and approved in the final landscape plans. This may include shallower mulch layers in CRZ and tapering capping depths graded to meet site boundaries/swales etc.
- Hardscape/hardstand landscape elements such as footpaths, sandstone log walls, or rubber softfall require a 100mm capping depth alone but do not need any further capping depth below it. This is because the hardscape/hardstand forms a suitable barrier to prevent any passive interaction with the contaminated materials.

11.1 Remediation Area

The fill platform and playing court areas were identified as data gap areas during the Detailed Site Investigation (DSI) and may potentially contain contaminated fill material. The surfaces of these remediation areas are covered with concrete (fill platform) and bitumen (playing court area) hardstands. Each area is slightly elevated compared to the adjacent natural ground surface; however, the exact thickness of the fill material above ground level is unknown, which also means that the total volume of material comprising the fill platform and playing court areas remains undetermined.

11.2 Site Preparation

For any remediation works to occur following the test pit excavations within the fill platform and playing court areas, the contractor is responsible for implementing fences, signs, and environmental controls in accordance with relevant Australian Standards and guidelines.

For site preparation, it is essential to create a detailed plan for the loading and transportation of soil and waste materials to be disposed of offsite. This process should be carefully managed and monitored to prevent cross-contamination of the soil, as outlined below.:

- Establish the stockpile staging area at each of the sites to be remediated with enough area for the required number of stockpiles to be temporarily stockpiled;
- Placement of high-density polyethylene (HDPE) sheeting or Geofabric across the surface of the stockpile areas, prior to stockpiling the contaminated material, to prevent cross-contamination;

- Heavy vehicle access to and from the stockpile staging areas and to and from the site must be established; and
- Construction of silt fencing where required.

11.3 Excavation and Offsite Disposal

If contaminated materials are to be excavated and disposed of off-site to a licensed facility, the following methodology must be implemented:

- Environmental Consultant to prepare waste classification certificates for the soils planned to be disposed of off-site in accordance with the NSW Waste Classification Guidelines;
- Excavation of soils should occur utilising plant equipment (excavator or similar);
- Ideally, soil proposed for off-site disposal should be loaded directly into awaiting trucks. Alternatively, a stockpiling area can be established where excavated soils will be stockpiled awaiting off-site disposal. If stockpiling is required, this will be in a designated area with appropriate stockpile controls;
- Spoil materials are to be loaded into trucks under dust suppression procedures and transported to a licensed landfill suitable for accepting the wastes; and
- Details of all materials removed from the site must be provided to the validating Environmental Consultant by the Remediation Contractor for incorporation into the Validation Report. Information required to be recorded in waste tracking registers include: date, time, truck registration, classification, estimated volume, Integrated Waste Tracking Solution (IWTS-WasteLocate) records and tip dockets.

11.4 On-Site Management

Where fill materials are to remain on-site within the remedial extent, they are to be retained beneath validated imported materials to isolate the identified contaminated materials, mitigating the risks posed to future site users/occupiers and reducing the potential for mobilisation of contaminants due to water infiltration. Materials are to be isolated by encapsulating contaminated materials utilising a geotextile marker layer and imported capping materials. Refer to **Section 11** for minimal capping requirements.

The following outlines the remediation method for On-site Management:

- Conduct a site survey (pre-capping) to compare pre-and post-survey records to demonstrate cap thickness. The survey should also be carried out on the walls of the excavation area. The survey must be undertaken by a suitably qualified professional;
- A permeable geo-textile marker layer (such as Bidim or Profab®) must be placed atop contaminated fill materials across the encapsulation area. When installing the marker layer, the fabric must be pegged down. Where sheets of the fabric overlap, a 30 cm overlap should be used to ensure no gaps in the coverage of the layer. The specifications of the selected marker layer must be provided to and approved by the Environmental Consultant prior to installation across the encapsulation area;
- The marker layer can be placed directly on existing site soils. There is no requirement for stripping of topsoil prior to placement of marker layer or capping unless specifically detailed in the civil and engineering plans;
- Following the installation of the marker layer, a site survey must be undertaken by a suitably qualified professional to record the extent of the capped materials. This information is required for the preparation of the LTEMP for the site (if required following validation);
- Once the marker layer is correctly installed (and inspected by Environmental Consultant) and surveying is completed, capping materials must be installed atop the marker layer. Capping

materials must consist of imported fill materials ENM or VENM or commercially quarried product or appropriately validated topsoil product. Consideration should be given for the intended use of the topsoil materials (i.e. turf underlay) from a horticultural perspective, but also meet the adopted criteria. Imported engineering fill must meet the Excavated Natural Material Order 2014 or VENM definition of the POEO Act 1997. Imported soils shall be subject to review of source facility information and further laboratory analysis to confirm intended use suitability and compliance with the adopted criteria. Imported materials will require assessment (inclusive of documentation review and sampling) on a 'per source site' or 'material type' basis;

- Imported materials must also be assessed for aesthetic value and suitability for proposed land use as a public open space. This is particularly important for ENM, that carry a risk of the presence of foreign materials, in particular sharp materials such as glass and demolition waste;
- Capping materials must be installed to a thickness no less than 0.5 m across encapsulated areas;
- The surface of the capping materials must be re-surveyed to demonstrate that the minimum capping thickness has been achieved. It is suitable for this site that capping soils form part of the horticultural design depth, i.e. planting into the capping soils is acceptable. Compaction of capping soils in areas of soft landscaping is not necessary, though will be required in areas of hardstand as per engineering requirements;
- Variations of the minimum thickness may occur in some areas of the site, where there are restrictions in allowable capping thickness (i.e. tree protection zones) or where a transition is required to meet existing ground levels at boundaries. Variation in thicknesses can be discussed with the Remediation Contractor, design team and the Environmental Consultant and will need to be updated within this RAP;
- The Environmental Consultant is required to validate the remedial works conducted at various stages throughout the remediation of the site. Details of the validation procedure and requirements of the Environmental Consultant are provided in Section 12; and
- Details of all materials imported on-site must be provided to the validating Environmental Consultant by the Remediation Contractor for incorporation into the Site Validation Report (SVR), to be prepared at the conclusion of the remedial and validation works. Information required to be recorded in imported soil tracking registers include: date, time, truck registration, classification, estimated volume and final site survey data.

11.5 Waste Classification

Material proposed for off-site disposal must be assessed in accordance with the *NSW EPA Waste Classification Guidelines (EPA,2014)* and *NSW EPA Sampling Design Guidelines – Part 1 and 2, 2002 (EPA, 2022)*, and accompanied by a waste classification certificate to provide the receiving waste facility prior to their acceptance of the waste.

11.6 Licenced Landfill Facility

Any soil excavated as part of the remediation must be disposed of to an appropriately licensed landfill facility unless the material has been classified otherwise. Approval from the facility is required prior to the transport of the material.

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

All weighbridge receipts must be retained by the Principal and Head Contractor for future reference for inclusion in the final SVR.

11.7 Verification of Imported Virgin Excavated Natural Material and Commercially Quarried Products

The verification of imported materials is required to confirm that the materials meet the adopted criteria. Where certification is provided to the Environmental Consultant, the consultant must undertake a verification of the report and ensure it adequately assessed the classified material. This verification must:

- Be conducted on a 'per source' basis;
- For virgin imported materials, a minimum of three samples per source site (if deemed required). This will ideally be in representative samples from controlled stockpiles once imported onsite or at the source site (preference is to undertake sampling at the source site);
- A clear statement confirming the adequacy of the report for the classified material, or comment otherwise with additional gaps or testing which may be required. The Environmental Consultant may conduct the gap assessment or collect additional samples to assure themselves the material is suitable for import.;
- Complete a visual assessment of the materials once imported to validate the materials are consistent with supplied documentation. Visual assessment will include the collection of photographs and written fieldnotes; and
- Incorporation of the validation results and site observations into the SVR.

11.8 Verification of Materials Prepared under a Resource Recovery Order

In the event that materials do not meet the definition of VENM that require importation onto site (e.g., recycled fill materials, ENM, topsoil, aggregate), approval and assessment must be undertaken of such materials due to the increased risk of asbestos and other contaminants. The required assessment must be satisfactory in confirming site suitability to ensure materials meet the adopted RAC.

For aggregate, the assessment must be designed on a case-by-case basis, based on the nature and potential risk posed by the materials. Commercial recovered aggregate suppliers produce a variety of product types typically distinguished by the aggregate mix or sizing, these products are created at the commercial facility which receives raw aggregate materials from a multitude of source sites, which are then blended and crushed. Moreover, a commercial recovered aggregate supplier may have multiple production/batch facilities across a city area which they distribute products from. This complexity makes it nearly impossible to validate 'the source' site. In this instance, the validation process for aggregates will be on a 'per supplier' basis. Provided the supplier issues a statement of compliance for all their products, and it can be demonstrated through sampling on a representative selection of the products that the material complies with the adopted criteria, products provided by that supplier are considered validated. Periodical testing at the following frequencies (whichever the sooner) must be conducted to ensure quality is maintained:

- Three samples once per month on a selected product imported (during months where materials are imported); and
- Three samples per 250 m^3 of import.

For VENM/topsoil, the assessment should include details for the source, including material specifications, source-site history and any available chemical assessment. Collection of confirmatory samples along with relevant QA/QC samples from the source for analysis of the following parameters:

- Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn);
- TRH (always do silica gel cleanup as part of analysis preparation);
- BTEX;

- PAH;
- OCP;
- PCB; and
- Asbestos (presence/absence).

The VENM/Topsoil Characterisation Criteria are detailed in **Table 6** below.

Table 6: VENM/Topsoil Characterisation Criteria	
Chemical	Trigger Value (mg/kg)
Arsenic	20
Copper	60
Chromium (Total)	75
Lead	50
Nickel	30
Zinc	70
Mercury	0.5
Total Recovery Hydrocarbons (TRH)	<LOR
Polycyclic Aromatic Hydrocarbons (PAH)	<LOR
Organochlorine Pesticides (OCP)	<LOR
Organophosphorus Pesticides (OPP)	<LOR
Polychlorinated Biphenyls (PCB)	<LOR
Asbestos	Non Detect

Because the topsoil will be a commercial product and the results of a continuous process only a limited sampling density will be required. A total of primary three samples per source location are to be collected to validate the material along with relevant QA/QC samples. The results will be compared to the Imported VENM criteria.

Preparation of the report detailing:

- Aspects of the source site including history and existing land use;
- Product detail and intended usage;
- Tabulated analytical results compared against relevant criteria; and;
- Conclusion of suitability of material imported from the source-site.

The environmental consultant will require all details of the source-site assessment, any chemical analysis and results comparison and the verification inspection records to assess the suitability of the material and incorporate them into the final validation report.

12 Validation Program

Validation samples will be collected to confirm the following:

- The effectiveness of the implemented remediation methods and strategies;
- Ensure remaining soil at the site is deemed suitable for the intended land-use; and
- Any imported soils at site meet the intended land-use.

For any remediation works to occur, excavations will be extending into natural soils within the potentially contaminated fill platform.

To validate any remediation works, a Raw Earth consultant will supervise the excavation works and conduct validation sampling and provide a Site Validation Report and an Asbestos Clearance Certificate (if asbestos was remediated) upon completion of the works.

12.1 Validation Soil Sampling Plan

The sampling frequency for the validation sampling program will meet the following minimum requirements:

- Excavation Floor, where contamination is contained to a depth of <0.5 m:
  - 1 sample per 25 m^2, with a minimum of 5 samples collected in accordance with NEPM 1999 (as amended 2013) and WA DoH, 2021;
  - Soil contamination samples will be analysed for heavy metals, BTEXN, TRH, OCP/OPP and PAHs;
  - Asbestos samples will be analysed for quantitative (w/w %) asbestos in soil.
- Excavation Wall:
  - 1 sample per 5 linear metres, or 1 per wall <5 linear metres, minimum of 4 wall samples (i.e. north, east, south, and west walls) (from each horizon/ material type, within the impacted area);
  - Soil contamination samples will be analysed for metals, BTEXN, TRH and PAHs; and
  - Asbestos samples will be analysed for quantitative (w/w %) asbestos in

All sample results will be reported against the NEPM (1999, as amended in 2013) and WA DoH, 2021 guidelines. Any validation samples which exceed the guidelines will require further excavation and re-sampling.

12.2 Validation Sampling methodology

Samples shall be collected using the following methodology:

- Soil samples will be recovered from accessible soils in each sampling location utilising hand or plant equipment where required, ensuring QA procedures are adhered to;
- Soil samples will be collected in sampling containers provided by the analysing laboratory, ensuring sufficient sample is collected for the required analysis;
- All containers will be clearly labelled with unique sample identification; and
- All samples will be stored on ice prior to dispatch (for chemical samples) and during transportation to the nominated laboratory under chain of custody procedures.

12.3 Site Validation Report (SVR)

Following the conclusion of the remedial works, the Environmental Consultant must prepare a SVR. This SVR must meet the requirements of the *EP Act 1994* and detail:

- The methodologies used in the remediation of the subject redevelopment;
- Site validation inspection and sampling events conducted throughout the remedial works;
- Compliance of the remedial works with adopted criteria; and
- The findings of the validation assessments.

The SVR must come to a conclusion as to whether the site can be considered suitable for the ongoing use following the completion of the remedial works, in accordance with the adopted legislative guidelines.

To verify the validation works conducted, the SVR must include:

- Visual inspection by the Environmental Consultant of the remediation area pre and post remediation, including photographic evidence;
- Validation sampling and analysis in accordance with the RAP; ▪
- Validation evidence, including photographic evidence of remedial works;
- Validation of documentation and analytical data for all imported materials;
- Summary tables of analytical results compared with adopted criteria;
- All waste classification certificates (if applicable);
- Evidence of waste disposal; and
- Reconciliation summary identifying waste classification certificate, disposal volume from dockets, disposal permits, and licence number of receiving site.

13 Waste Tracking & Disposal

All transport and disposal of waste must be done so in accordance with relevant Australian standards and guidelines utilising the NSW EPA, 2024, *Integrated Waste Tracking Solution* (ITWS). 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 if any soils containing ACM (>100 kgs) are to be tracked using the EPA *Integrated Waste Tracking Solution* (ITWS). Weighbridge dockets, landfill receipts and consignment disposal confirmation are to be provided to the on-site LAA and Principal Contractor.

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

All soil material to be excavated as part of the development and requiring offsite disposal, needs to be classified in accordance with NSW Environmental Protection Authority, Waste Classification Guidelines Part 1: Classifying Waste, 2014. No soil material is to leave the site without such classification.

14 Duties of an On-site Licensed Asbestos Assessor

For any asbestos related investigation or remediation based works, an on-site LAA will need to be involved. Their duties will include:

- Ensure the RAP, WHS Plan, EMP 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 if 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 reported concentrations of airborne asbestos fibres are above SafeWork NSW guidelines of 0.01 fibres/ml, works will stop, followed by an investigation from the LAA with additional measures of control to be put in place. If concentrations are above 0.2 fibres/ml, work will stop and SafeWork NSW will be notified.
- 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:
    - Date.
    - Contractors and sub-contractors on-site.
    - Weather conditions in a daily site log, including direction and velocity of wind and rain activity.
    - Locations of asbestos air monitors.
    - Odour occurrences.
    - PID readings for Volatile Organic Chemicals (VOC's).
    - Details of materials excavated.
    - Details of any unexpected finds.
    - Accidents, near-misses and/or incidents.
    - Details of environmental incidents.
    - Any matter relating to environmental and/or health issues; and,
    - 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 LAA. The on-site LAA has the authority to cease all remediation, and validation works until the issue is resolved.

15 Unexpected Finds

If any unexpected materials, contamination and/or USTs are discovered, all remediation and validation works must cease, Raw Earth is to be notified and refer to the Unexpected Finds Protocol in **Appendix B.**

If contamination, hydrocarbon staining and/or odours are discovered during remedial or validation works, works in that area must cease immediately, Raw Earth and Principal's Representative must be notified, and management of potential 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 Raw Earth. 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 25 m^2, with a minimum of 3 samples collected; and,
    - Samples will be analysed for CoPC as determined by Raw Earth.
- Excavation Wall:
    - 1 sample per 5 linear metres, or 1 per wall <5 linear metres, minimum of 4 wall samples (i.e. north, east, south, and west walls, from each horizon/ material type, within the impacted area)
    - Samples will be analysed for CoPC as determined by Raw Earth.

Any other unexpected finds outside of ACM where the nature of the substance is hazardous at concentrations which pose an unacceptable risk to human health or the environment, the sampling frequency of the identified substance/areas shall meet the minimum requirements under the *NSW EPA Sampling Design Guidelines (2022)*. Raw Earth will be required to document and report all discoveries of unexpected materials.

16 Regulatory Approvals & Licences

16.1 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.

16.2 State Environmental Planning Policies

NSW Department of Planning and Environment, State Environmental Planning Policy (Resilience and Hazards) Chapter 4, 2022 – Remediation of Land sets the regulatory framework for contaminated land and remediation works for NSW. The resilience and hazards document 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 20.3** may be subject to change.

16.3 Central Coast Council

All remediation and validation works are to be undertaken in accordance CCC Development Control Plans and any other requirements issued by CCC.

16.4 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 (2021)*, SafeWork NSW Codes of Practice and NSW EPA (2014) *Waste Classification Guidelines*.

Asbestos removal must be completed under the supervision of a LAA and by a licensed asbestos removalist appropriately licensed to carry out Class A (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 (2021)* 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.

16.5 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:

- Non-friable asbestos must always be securely packed (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 while excavated and loaded into trucks.
- All asbestos waste including asbestos contaminated soils must be transported as a covered load or 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.
- The landfill facility must ensure the process of unloading asbestos waste is done in accordance with NSW EPA guidelines.

16.6 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 Head Contractor should prepare an appropriate Construction Environmental Management Plan (CEMP), WHS Plan and other plans required by the Principal.

17 LONG TERM ENVIRONMENTAL MANAGEMENT PLAN

When contaminated material is intended to remain on site, a site-specific LTEMP is required. The objective of an LTEMP is to document mitigation measures and/or monitoring requirements, where full clean-up is not feasible, or on-site containment of the contamination is proposed.

The LTEMP is required to outline the as-built site condition, type and location of contamination, and management strategies for monitoring and maintenance of the site. The LTEMP must state its objectives and describe:

- The nature and location of contamination remaining on site;
- What long-term site management is needed to ensure the ongoing protection of human health and the environment on- and offsite; and
- A mechanism for enforcement of the monitoring.

This LTEMP is required to ensure the site remains suitable for the ongoing land use, detailing methodologies for engaging with encapsulated subsurface materials in the future, should it be required. The LTEMP should be prepared with reference to *NSW EPA (2022), Practice Note: Preparing Environmental Management Plans for Contaminated Land*.

The LTEMP must be prepared in accordance with *NSW EPA Consultants Reporting on Contaminated Sites, 2020*. The LTEMP must be made to be legally enforceable and publicly notifiable. The LTEMP must present a suitable enforcement and notification mechanism.

18 Conclusions

This Remediation Action Plan (RAP) has been developed to address the potential contamination that may be present in the in-situ soils following the demolition of structures in the fill platform and playing court areas located in the northwestern section of the Eileen O'Connor Catholic School at 84 Gavenlock Road, Mardi, NSW 2259 (the site).

If contamination is encountered and the measures outlined in this RAP are successfully implemented, along with appropriate validation assessments and reporting after successful remediation and validation work, the site can be deemed suitable for future use as the Eileen O'Connor Catholic School.

Documentation demonstrating the success of the remediation will be required in a subsequent Site Validation Report (SVR) at the conclusion of the remedial work. Additionally, documented ongoing management procedures will be established within a Long-Term Environmental Management Plan (LTEMP) for any residual contaminated materials that remain onsite.

19 Limitations

Raw Earth Environmental Pty Ltd (Raw Earth) 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.

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

Raw Earth 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 a desktop review of available information and regulatory criteria identified at the time of the site inspection. Raw Earth 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, after the issue date of this report. The scope and period of Raw Earths' services are subject to restrictions and limitations. Raw Earth did not perform a complete assessment of all possible conditions that may exist at the site.

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

All conclusions and recommendations regarding the site are the opinion of Raw Earth. 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 Raw Earth.

20 References

- Google Earth, https://www.google.com/earth.
- National Environment Protection (Assessment of Site Contamination) (NEPC) Measure 1999, Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater, 2013.
- National Environment Protection (Assessment of Site Contamination) (NEPC) 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 Department of Planning and Environment, State Environmental Planning Policy (Resilience and Hazards) Chapter 4, 2022.
- 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, Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019.
- NSW Environmental Protection Authority, Sampling Design Guidelines, 2022.
- 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.
- Six Maps, https://www.maps.six.nsw.gov.au.
- WaterNSW, waternsw.com.au.
- Western Australia Department of Health, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, 2021.
- Work Health and Safety Act, 2011.
- Work Health and Safety Regulation, 2017.

21 Abbreviations

Abbreviation	Full Description
ACM	Asbestos Containing Material
AEC	Areas of Environmental Concern
ASS	Acid Sulfate Soils
BTEXN	Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene
CCC	Central Coast Council
CoPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DA	Development Application
DSI	Detailed Site Investigation
ENM	Excavated Natural Material
EPA	Environment Protection Agency
NSW CLR	New South Wales Contaminated Land Register
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulfate Soil
PID	Photoionisation Detector
PSI	Preliminary Site Investigation
RAP	Remediation Action Plan
TPH	Total Petroleum Hydrocarbons
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Compounds

Appendix A: Figures

RAW EARTH
ENVIRONMENTAL

N

Site Location

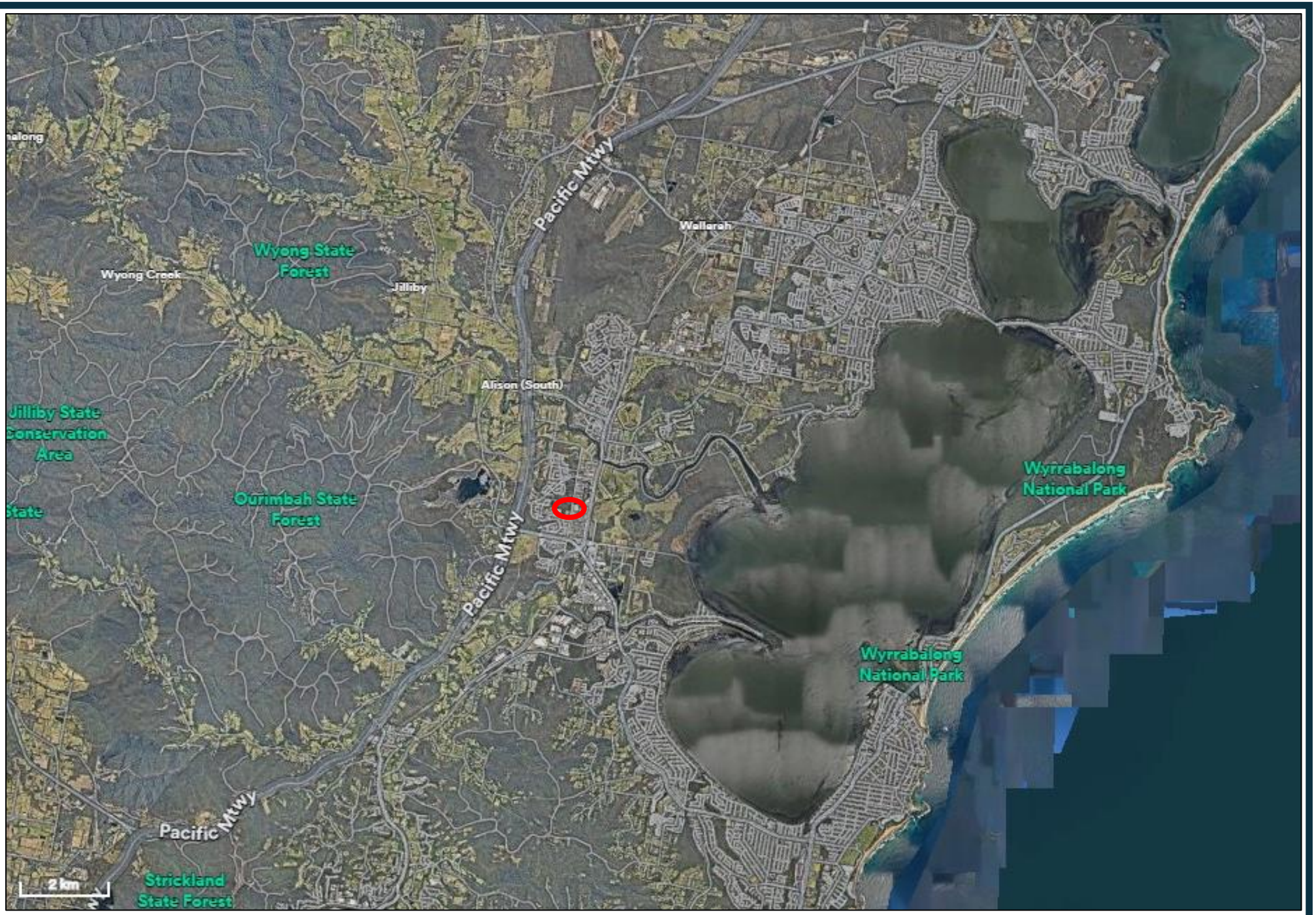

Figure 1:
Site Location Plan

Project:
Remediation Action Plan:

84 Gavenlock Road, Mardi NSW 2259.

RAW EARTH
ENVIRONMENTAL

N

St Peters Catholic College Boundary

Site Boundary

Data Gap Investigation Area

Figure 2:
Site Layout Plan

Project:
Remediation Action Plan:

84 Gavenlock Road, Mardi NSW 2259.

RAW EARTH
ENVIRONMENTAL

N

Site Boundary

Data Gap
Investigation Areas

Proposed Test Pit
Sample Location

Figure 3:
Investigation Plan

Project:
Remediation Action Plan:

84 Gavenlock Road, Mardi NSW 2259.

Appendix B: Unexpected Finds Protocol

UNEXPECTED FINDS PROTOCOL

In the event that contaminated soils and/or groundwater (suspected or known) 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.

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.