Sydney Environmental Group

Remedial Action Plan

55 MacDonald Street, Lakemba NSW

Crawford Architects Pty Ltd

Report No: 1747-RAP-01-041122.v1f
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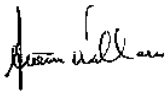
Author Signature		**Reviewer Signature**	
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Prepared by Sydney Environmental Group Pty Ltd ABN: 14 631 026 214

EXECUTIVE SUMMARY

Sydney Environmental Group (SE) were engaged by Crawford Architects (the client), to prepare a Remedial Action Plan (RAP) for the property located at 55 MacDonald Street, Lakemba NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

SE has the following project appreciation:

- The entirety of the site covers an area of approximately 1000 m^2;
- The site is proposed for redevelopment comprising demolition of existing structures and construction of school classrooms for Rissalah College;
- A Stage 1 Preliminary and Stage 2 Detailed Site Investigation was carried out for the site in September 2022 by Sydney Environmental Group, which identified three (3) Areas of Environmental Concern (AECs); and
- A Remedial Action Plan (RAP) is required to address the identified AECs within the site.

The objectives of this project are to:

- Prepare a Remedial Action Plan (RAP) to address identified AECs within the site and to provide a strategy to mitigate the potential unacceptable human health and environmental risks from residual soil by exploring available remediation options that will effectively and efficiently provide this outcome; and
- Achieve an acceptable outcome that is technically, logistically and financially feasible.

The scope of the RAP has been established on the basis of findings from the previous contamination investigation completed, with the RAP aimed at providing:

- An appropriate remedial strategy, which comprises a supplementary contamination assessment and localised remedial actions so as to render the site suitable for the proposed urban residential land-use;
- Appropriate requirements for any further investigation requirements, the validation and verification of the successful implementation of the remediation strategy and the remediation acceptance criteria to be adopted;
- Appropriate environmental safeguards required to conduct the remediation works in an environmentally acceptable manner; and
- OH&S procedures required to conduct the remediation works in a manner that will not pose a threat to the health of site workers or users.

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AECs) and contaminants of potential concern (COPC) which have the potential to be present on site. The AECs identified are presented in attached **Figure 2** and associated COPC are presented in **Table 5.1** below.

Table 1.1 AECs and Contaminants of Concern

ID	Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC01	Fill Materials Beneath Hardstand Footprints	Uncontrolled Filling / Demolition	Heavy metals, TRH, BTEX, PAH, OCP, PCB & Asbestos	Soil	Human Health and Aesthetics
AEC02	On-site Structures	Hazardous Building Materials	Asbestos, Lead, SMF and PCBs	Soil	Human Health
AEC03	Shallow Fill Materials in the vicinity of 'BH01' and 'BH07'	Uncontrolled Filling	Zinc	Soil	Ecological Health

The remedial goal for this site is to remediate potential contamination (where identified) to a level that does not present an unacceptable human health exposure and environmental risks, based on the proposed land use setting. SE notes that the client, would prefer that the remedial works be undertaken in a manner that does not result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long-term environmental management plan (EMP).

The extent of contamination within the site is presented within **Table 9.1** below.

Table 1.2 Approximate Remedial Extents

ID	Area of Environmental Concern	Dimensions / Area	Depth / Height	Volume / Mass
AEC01	Fill Materials Beneath Hardstand Footprints	600 m^2	TBC [a]	TBC [a]
AEC02	On-site Structures	400 m^2	NA	NA
AEC03	Shallow Fill Materials in the vicinity of 'BH01' and 'BH07'	100 m^2	0.3 m	30 m^3 / 50 tonnes

Notes to Table: *N/A: Not Applicable, TBC: To Be Confirmed, [a] Unable to estimate volume and mass of waste due to complex mixture of items, [b] Area in active use, unable to determine vertical extents during walkover.*

Refer to **Figure 2**, for an indication of the areas and lateral extents that will be subject to remediation.

It is noted that the lateral extent of remediation may be altered during remedial works based on site observations and validation soil sample analytical laboratory results.

Taking into consideration the client's objectives for the site, and the nature and extent of the proposed site redevelopment works, the preferred remedial options are outlined in **Table 8.1** below.

Table 1.3 Selected Remediation Strategies

Contamination Type	Preferred Remediation Strategy
Ecological / Terrestrial exceedances	Excavation and placement at depth beneath proposed hardstand areas and / or disposal off-site
Soil materials impacted by non-friable asbestos. (*If identified*)	On-site containment and management and/or off-site landfill disposal
Direct contact risks (BTEX, Heavy Metals, PAH, PCBs, & TRH) (*if identified*)	Removal and disposal off-site
Hazardous building materials (*if identified)*	Removal and disposal off-site

Based on the information presented in the historical contamination assessment reports, SE concludes that the remedial goal can be achieved, and the site made suitable for the proposed land use setting, subject to:

- Completion of an additional supplementary contamination assessment to address significant data-gaps identified in previous contamination assessments undertaken for the site;
- Implementation of the strategies, methodologies and measures set out in this remedial action plan;

- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum or modification and revision to this RAP will be required. Any amendments are to be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant; and
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant.

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LIST OF ABBREVIATIONS

A list of the common abbreviations used throughout this report is provided below:

AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Aboveground storage tank
Bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CoC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
GS	Geological Survey of NSW
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
LOR	[Laboratory] Limit of reporting
NATA	National Association of Testing Laboratories
N/A	Not applicable
ND	Not detected
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW EPA	NSW Environment Protection Authority
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PID	Photo-ionisation detector
PSI	Preliminary Site Investigation
QA/QC	Quality assurance/Quality control
RPD	Relative percentage difference
SAQP	Sampling Analysis and Quality Plan
SE	Sydney Environmental Group Pty Ltd
SVOC	Semi-volatile organic compound
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UST	Underground storage tank
VOC	Volatile organic compound

1 INTRODUCTION

1.1 Background

Sydney Environmental Group (SE) were engaged by Crawford Architects (the client), to prepare a Remedial Action Plan (RAP) for the property located at 55 MacDonald Street, Lakemba NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

SE has the following project appreciation:

- The entirety of the site covers an area of approximately 1000 m^2;
- The site is proposed for redevelopment comprising demolition of existing structures and construction of school classrooms for Rissalah College;
- A Stage 1 Preliminary and Stage 2 Detailed Site Investigation was carried out for the site in September 2022 by Sydney Environmental Group, which identified three (3) Areas of Environmental Concern (AECs); and
- A Remedial Action Plan (RAP) is required to address the identified AECs within the site.

1.2 Proposed Development

SE understand the site is proposed for redevelopment comprising demolition of existing structures and construction of school classrooms for Rissalah College.

The redevelopment scenario is consistent with the definition of 'HIL A – Low-density residential with garden/accessible soil' per ASC NEPM 2013.

Currently under the *State Environmental Planning Policy (SEPP) (Resilience & Hazard)*, a consent authority must not consent to the carrying out of any redevelopment unless it has considered whether the land is contaminated. This report has been prepared to satisfy Clause 7 (2) and (3) of SEPP and local council planning policies.

1.3 Objectives

The objectives of this project are to:

- Undertake an additional Detailed Site investigation (DSI) to address data gaps identified in previous contamination assessments undertaken for the site;
- Prepare a Remedial Action Plan (RAP) to address the issues that have been identified on the site and to provide a strategy to mitigate the potential unacceptable human health and environmental risks from residual soil by exploring available remediation options that will effectively and efficiently provide this outcome; and
- Achieve an acceptable outcome that is technically, logistically and financially feasible.

1.4 Scope of Remedial Action Plan

The scope of the RAP has been established on the basis of findings from the previous contamination investigation, with the RAP aimed at providing:

- Provision to undertake as supplementary detailed site investigation to address significant data gaps identified in previous contamination assessments;
- An appropriate draft remedial strategy (to be informed by the yet to be completed supplementary detailed site investigation) to render the site suitable for the proposed urban residential land-use;
- Appropriate requirements for the validation and verification of the successful implementation of the remediation strategy and the remediation acceptance criteria to be adopted;
- Appropriate environmental safeguards required to conduct the remediation works in an environmentally acceptable manner; and
- OH&S procedures required to conduct the remediation works in a manner that will not pose a threat to the health of site workers or users.

2 SITE IDENTIFICATION

The site identification details and associated information are presented in **Table 2.1**.

Table 2.1 Site Identification Information

Attribute	Description
Street Address	55 MacDonald Street, Lakemba NSW
Lot and Deposited Plan (DP)	Lot 1 in DP 948945
Geographical Coordinates	33°54'55.31"S 151°4'18.94"E (Centre of site)
Site Area	1,000 m^2
Local Government Area (LGA)	Canterbury-Bankstown City Council
Parish	St George
County	Cumberland
Zoning	R4 – High Density Residential *Local Environmental Planning Policy (Canterbury Local Environmental Plan) 2012*

The locality of the site is set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

3 GEOLOGY, ACID SULFATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

Regional geology, topography, soil landscape and hydrogeological information are presented in **Table 3.1.**

Table 3.1 Regional Setting Information

Attribute	Description
Climate	A review of the closest weather station to the site (Canterbury Racecourse AWS, Station Number: 66194) indicated that the climate is relatively mild with average maximum temperatures ranging from 23.5 – 27.3 °C and minimum temperatures ranging from 5.9 – 17.8 °C. Rainfall is relatively varied across the year, ranging from 3.5 days of rain per month in August, to 8.9 average days of rainfall per month in March. Average monthly rainfall varied from 16.6 mm in April up to 403.2 mm in March.
Geology	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 26 September 2022), indicated that the majority of the site is likely to be underlain by Ashfield Shale consisting of laminate and dark grey siltstone and Bringelly, derived from Wianamatta Group shales and Hawksbury shales.
Acid Sulfate Soils	A review of the Environment NSW 'eSpade V2.2' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 26 September 2022), indicates that the site lies in an area mapped as ***'No Known Occurrence'*** with respect to acid sulfate soils. This infers that land management activities are not likely to be affected by acid sulfate soil materials. Further assessment of acid sulfate soils in the context of this investigation is considered by SE as not warranted.
Topography	Gently undulating rises on Wianamatta Shale with local relief 10–30 m and slopes generally <5%, but up to 10%. Crests and ridges are broad (200–600 m) and rounded with convex upper slopes grading into concave lower slopes. The site topography slopes towards the northeast of site. SE understands that the site is located at an elevation approximately 20 m to 26 m Australian Height Datum (AHD).
Hydrology and Hydrogeology	Surface water courses proximal to the site includes Coxs Creek, which is located 230 m northeast of the site. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the site is considered likely to be towards the northeast. A review of the NSW Office of Water groundwater database undertaken on 26 September 2022 indicated there were no registered groundwater features located within a 500m radius of the site.
Adjacent Sensitive Receptors	A review of the Bureau of Meteorology Groundwater Dependent Ecosystem Map was undertaken to determine the closest sensitive ecological receptors. The closest ecological receptor is Cox's Creek, located approximately 230 m to the north of site. The closest sensitive human receptors are the residential properties surrounding the site's boundary and any future onsite construction workers/ builders.

4 PREVIOUS CONTAMINATION ASSESSMENTS

The following reports were reviewed during the project:

- Sydney Environmental Group (SE 2022), 'Stage 1 Preliminary and Stage 2 Detailed Site Investigation, 55 MacDonald Street, Lakemba NSW ', dated 27 September 2022, Ref No: 1747-PSIDSI-01-270922.v1f

4.1 SE (2022)

Sydney Environmental Group Pty Ltd (SE) was engaged by Crawford Architects Pty Ltd (hereafter referred to as 'the client'), to undertake a Stage 1 Preliminary Site Investigation of the property located at 55 MacDonald Street, Lakemba NSW (hereafter referred to as 'the site').

SE has the following project appreciation:

- The site covers an area of approximately 0.1 ha;
- The site is proposed for redevelopment comprising demolition of existing structures and construction of school classrooms for Rissalah College; and
- A contamination assessment of the site is required to identify any contamination that may be present and provide advice on the suitability of the site for any proposed future land-use.

The objectives of this project were to:

- Assess the potential for contamination to be present on the site as a result of past and current land use activities;
- Provide advice on whether the site would be suitable (in the context of land contamination) for the continued residential land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

SE undertook the following activities to address the project objectives:

- A desktop review of relevant information pertaining to the site;
- A site walkover to understand current site conditions;
- The preparation of a Sampling and Analysis Quality Plan (SAQP);
- Conduct an intrusive site investigation to establish ground conditions and to facilitate the collection of representative soil samples;
- Laboratory analysis of selected samples collected during the field investigation; and
- An assessment of the contamination status of the site and the recommendation of any further remedial requirements associated with the redevelopment of the site (if necessary).

Based on SE's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment scenario, SE makes the following conclusions:

- There was no asbestos detected within the assessed soils;
- The detected concentrations of the contaminants of potential concern addressed in the soils assessed are considered unlikely to present:
    - An unacceptable direct contact human health exposure risk; or
    - An unacceptable inhalation / vapour intrusion human health exposure risk.
- The detected concentrations of the contaminants of potential concern addressed in the soils assessed are considered unlikely to present a petroleum hydrocarbon management limit risk;
- The detected concentrations of the contaminants of potential concern addressed in the soils assessed are considered unlikely to present an unacceptable ecological contamination risk with the exception of soils present within AEC03;
- No significant surface water / groundwater receptor risk was identified within the site; and
- Based on the assessments undertaken as part of this investigation, SE have concluded that the site can be made suitable (from a contamination perspective) for the proposed land use scenario with the implementation of a remedial action plan to address unacceptable contamination risks.

Based on the conclusions stated above and the background data gathered during the course of this investigation, SE recommend the following:

- A Remedial Action Plan (RAP) is to be prepared by a suitably qualified environmental consultant detailing the steps required to remediate the site to a level suitable for the proposed land use scenario;
- Undertake a hazardous building materials survey of the structures present on-site prior to demolition;
- Following removal of hazardous building materials (if identified) and subsequent demolition of the building materials, a clearance inspection should be carried out by an appropriately qualified occupational hygienist / NSW LAA;
- Following removal of hardstand areas the base of excavations should be visually inspected for contamination indicators by a suitably experienced environmental consult; and
- A waste classification assessment should be carried out on any soil materials proposed for disposal off-site as per the NSW EPA Waste Classification Guidelines (2014).

5 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 Areas of Environmental Concern and Contaminants of Concern

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AECs) and contaminants of concern which have the potential to be present on site. The AECs identified are presented in attached **Figure 2** and associated contaminants of concern are presented in **Table 5.1** below.

Table 5.1 AECs and Contaminants of Concern

ID	Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC01	Fill Materials Beneath Hardstand Footprints	Uncontrolled Filling / Demolition	Heavy metals, TRH, BTEX, PAH, OCP, PCB & Asbestos	Soil	Human Health and Aesthetics
AEC02	On-site Structures	Hazardous Building Materials	Asbestos, Lead, SMF and PCBs	Soil	Human Health
AEC03	Shallow Fill Materials in the vicinity of 'BH01' and 'BH07'	Uncontrolled Filling	Zinc	Soil	Ecological Health

The potential contamination pathways are considered to be as follows:

- Inhalation/ingestion of contaminants released in dust during redevelopment by site workers;
- Direct contact, ingestion or inhalation of soil by future site inhabitants; and
- Migration of contaminants within surface and groundwater to neighbouring properties and water bodies.

Relevant potential receptors are considered to include:

- Onsite construction and maintenance workers;
- Third parties during construction (adjacent site users and adjacent residents);
- Onsite flora and fauna;
- Groundwater and surface water;
- Future residents/end users; and
- Neighbouring residential land users).

5.2 Land Use Setting

SE understand the site is proposed for redevelopment comprising demolition of existing structures and construction of school classrooms for Rissalah College.

Based on the proposed development works and guidance provided in NEPM ASC 2013, SE considers it reasonable to adopt the *'HIL A – urban residential'* land use setting for the purpose of assessing land contamination exposure risks. Urban residential land use includes residential premises with garden/accessible soil as well as children's day care centres, preschools and primary schools.

SE notes that the proposed development includes a mix of hardstand, open space turfed areas and landscaped areas across the site.

5.3 Direct Contact – Human Health

SE understands that a future proposed development will mostly consist of school classrooms across the majority of the site, which would act as a direct contact barrier between potential land contamination and onsite receptors during operation of the site. The rest of the site would generally consist of open space landscaped areas. In these areas, it is considered that a direct contact exposure pathway may be present between potential contamination and onsite receptors.

SE recommends a pragmatic approach during the course of any required intrusive / excavation works. If contamination is suspected, works should stop, an unexpected finds protocol should be followed, and further investigation of the fill materials should be carried out by a suitably qualified environmental consultant.

5.4 Inhalation / Vapour Intrusion – Human Health

In order for a potentially unacceptable inhalation / vapour intrusion human health exposure risk to exist, a primary vapour source (e.g. underground storage tank) or secondary vapour source (e.g. significantly contaminated soil or groundwater) must be present onsite. The historical evidence reviewed indicated a very low likelihood for a potential primary source to be present on the site.

Potential sources of groundwater contamination in the immediate vicinity of the site was not observed. A groundwater source of vapours was therefore considered unlikely at the site.

As a conservative measure, SE consider the need for further inhalation / vapour intrusion human health risk assessment to be warranted.

5.5 Management Limits for Petroleum Hydrocarbon Compounds

NEPM ASC 2013 notes that there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosive hazards; and
- Effects on buried infrastructure (e.g. penetration of or damage to, in-ground services by hydrocarbons).

Schedule B1 of NEPM ASC 2013 includes 'management limits' to avoid or minimise these potential effects. Application of the management limits requires consideration of site-specific factors such as the depth of building basements and services and depth to groundwater, to determine the maximum depth to which the limits should apply. NEPM ASC 2013 also notes that management limits may have less relevance at operating industrial sites which have no or limited sensitive receptors in the area of potential impact, and when management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

5.6 Aesthetics

Section 3.6.3 of NEPM ASC 2013 advises that there are no specific numeric aesthetic guidelines, however site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

SE notes that the proposed development includes building footprints and hardstand pavement areas across some of the site, which would act as a direct contact barrier. The open space turfed areas would act as a direct contact barrier assuming intrusive disturbance of the physical barrier was not undertaken following installation.

During construction, the public and construction employees, may complete an aesthetics exposure pathway between potential contamination and receptors. Further consideration of this value is considered necessary.

5.7 Terrestrial Ecosystems – Ecological Health

Section 3.4.2 of Schedule B1 NEPM ASC 2013, advises a pragmatic risk-based approach should be taken when assessing ecological risks in residential and commercial / industrial land use settings.

SE notes that the proposed development would include landscaped areas on site as it is understood majority of the site will remain undeveloped.

SE understand that the proposed development will include school classrooms across the majority of the site, which would act as a direct contact barrier between potential land contamination and onsite receptors during operation of the site. The rest of the site would generally consist of open space and landscaped areas. In these

areas, it is considered that a direct contact exposure pathway may be present between potential contamination and onsite receptors.

Due to the presence of these open space areas further ecological assessment is considered warranted.

5.8 Aquatic Ecosystems (Ground and Surface Water)

Surface water courses proximal to the site included Coxs Creek, located approximately 230 m north of the site.

Expected poor regional water quality as a result of historical regional agricultural land use activities and disturbance, is considered likely to prevent groundwater from being a drinking water resource of value.

There are no groundwater bores onsite or within a 500 m radius of the site or down-gradient between Kemps Creek and the site, registered for drinking water use. It is noted that a reticulated mains potable water supply is available in the area.

There is potential, albeit low, that the usage of these surface water courses within proximity to the site would include swimming, fishing for consumption and/or water sports. As a precautionary measure, this pathway should be considered and further assessed based on the results of the supplementary contamination assessment, in the event contamination is identified.

6 Supplementary Contamination Assessment

In light of data-gaps identified within SE (2022), it has been concluded that a supplementary contamination assessment is required to sufficiently characterise the site and meet statutory requirements per relevant legislation and guidelines. The areas requiring supplementary contamination assessment includes:

- AEC01 – Fill Materials Building Footprints/Hardstand; and
- AEC02 – On-Site Structures.

6.1 Objectives and Scope of Work

The objectives of the supplementary contamination assessment are to:

- Assess data-gaps identified in previous contamination assessment undertaken for the site by SE (2022);
- Undertake an intrusive site investigation to facilitate the collection of representative soil samples;
- Engage a NATA accredited laboratory to analyse selected samples collected during the field investigation; Provide a thorough and conclusive assessment of the contamination status of the fill materials within the site; and
- Provide updated advice to inform this RAP and detail any further investigation, management and/or remediation (if warranted).

6.2 Site Assessment Criteria

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section 5** of this project, the following assessment criteria have been adopted for this project:

- Human health direct contact – HILs in Table 1A (1) in NEPM ASC 2013 and HSLs in Table B4 of Friebel, E & Nadebaum, P (2011);
- Human health inhalation/vapour intrusion – HSLs in Table 1 (A) in NEPM ASC 2013;
- Human health (asbestos) – absence / presence for preliminary screening, and no visible ACM on surface;
- Petroleum hydrocarbon compounds (management limits) – Table 1 B (7) of NEPM ASC 2013;
- Ecological Investigation and Screening Levels as calculated per NEPM ASC 2013 Table 1 (B) 1-6; and
- Aesthetics – no highly malodorous site media (e.g. strong residual petroleum hydrocarbon odours, hydrogen sulphide in site media, organosulfur compounds), no hydrocarbon sheen on surface water, no discoloured chemical deposits or soil staining with chemical waste other than of a very minor nature, no large monolithic deposits of otherwise low risk material (e.g. gypsum as powder or plasterboard, cement kiln dust), no presence of putrescible refuse including material that may generate hazardous levels of methane such as a deep-fill profile of green waste or large quantities of timber waste, and no soils containing residue from animal burial (e.g. former abattoir sites).

7 Supplementary Contamination Assessment Data Quality Objectives

Appendix B of NEPM ASC 2013 provides guidance on the development of data quality objectives (DQO) using a seven-step process.

The DQO for this project are set out in **Sections 7.1** to **Section 7.7** of this report.

7.1 Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- The site is the subject of proposed redevelopment works;
- Historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health and ecological exposure risk in the context of the proposed land use setting; and
- Previous investigations undertaken within the site were considered insufficient to characterise the site.

The project team identified for this project includes Sydney Environmental Group Pty Ltd, the client and the planning consent authority.

The regulatory authorities identified for this investigation include NSW EPA and the Local Council.

7.2 Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the environmental data collected for the project, suitable for assessing relevant land contamination exposure risks?
- Do concentrations of identified contaminants of potential concern (COPC) present an unacceptable exposure risk to identified receptors, for the proposed land use setting?
- Have the contaminated soils been effectively isolate by the remedial strategy?
- Is the site suitable for the proposed land use setting, in the context of land contamination as a result of the chosen remedial strategy?

7.3 Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 7.2** for this investigation, will include:

- Data obtained in previous contamination assessments;
- The nature and extent of sampling at the site, including both density and distribution;
- Samples of relevant site media;
- The measured physical and/or chemical parameters of the site media samples (including field screening and laboratory analysis, where relevant); and
- Assessment criteria adopted for each of the media sampled.

7.4 Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The temporal boundaries of the project include:

- The project timeframes by SE for this project, and subsequent remediation contractor works program;
- Unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- Access availability of the site (to be defined by the site owner/representative); and
- Availability of SE field staff (typically normal daylight working hours, Monday to Friday).

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment. SE understand that the lateral extent of contamination will be limited to the site boundaries.

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the previously identified areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this investigation may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

7.5 Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

7.5.1 Rinsate Blank

Only disposable sampling equipment will be used during the field works on the day. As such, no rinsate blank will be collected.

7.5.2 Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C_6-C_{10}).

7.5.3 Field Duplicates and Field Triplicates

Field duplicate and field triplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates and triplicates collected will be analysed for at least one of the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relative percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate/triplicate will be calculated.

7.5.4 Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

7.5.5 If/Then Decision Rules

SE has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and
- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer **Section 8.3**), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then SE will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 6.2**), SE will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

7.6 Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and
- Contamination exposure risks for a specific land use setting are not acceptable, when they are.

SE will mitigate the risk of decision error by:

- Calculation of the 95% upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern (excluding asbestos);
- Assignment of fieldwork tasks to suitably experienced SE consulting staff, and suitably experienced contractors;
- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories; and
- Assignment of data interpretation tasks to suitably experienced SE consulting staff, and outsourcing to technical experts where required.

SE will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Table 7.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 7.4**	Critical samples analysed according to DQO	Refer **Section 7.7.2**
Critical samples collected	Refer **Section 7.4**	Analytes analysed according to DQO	Refer **Section 7.7.2**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 7.7.2**
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis
Sample Holding Times	Laboratory holding times provided by laboratory	Sample extraction and holding times complied with	Refer **Section 7.7.8**
Comparability			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer **Section 7.7.2**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 7.7.2**
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in 500ml zip-lock bags	Same laboratory for primary sample analysis	All primary samples to Eurofins | Environmental Testing
Analytical measurement units consistent	All measurement units the same between same analytes	Same analytical measurement units	Refer **Section 7.7.8**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 7.4**	Samples analysed according to SAQP	Refer **Section 7.7.2**
Media identified in SAQP sampled	Refer **Section 7.4**	Nil	Nil
Precision			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Field duplicate / triplicate RPD (Metals & PAH only)	Minimum 5% duplicates No limit for results <10 times LOR 50% for results 10-20 times LOR 30% for results >20 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%	Nil	Nil
Accuracy (bias)			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Rinsate blank	*Disposable sampling equipment used. No rinsate blanks required.*		
Field trip spikes (BTEX only)	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of acceptance criteria
Field trip blanks (BTEX only)	Analyte concentration <LOR None collected for asbestos.	Surrogate spike recovery	No exceedances of acceptance criteria

7.7 Step 7: Develop the plan for obtaining data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

7.7.1 Supplementary Contamination Assessment Sampling and Methodology

Table A in NSW EPA (2022) provides guidance on minimum sampling point densities required for site characterisation, based on detecting circular hot spots of defined diameter using a systematic sampling pattern. This guidance assumes the investigator has little knowledge about the probable locations of the contamination, the distribution of the contamination is expected to be random (e.g. land fill sites) or the distribution of the contamination is expected to be fairly homogenous (e.g. agricultural lands).

However, Section 3.1 of NSW EPA (2022) states that a judgemental sampling pattern can be used where there is enough information on the probable locations of contamination. Further to this, Section 6.2.1 of NEPM ASC 2013 states that the number and location or sampling points is based on knowledge of the site and professional judgement. Sampling should be localised to known or potentially contaminated areas identified from knowledge of the site either from site history or an earlier phase of site investigation. Judgemental sampling can be used to investigate sub-surface contamination issues in site assessment.

Table 4 in WA DOH (2021) indicates that where the 'likelihood of asbestos' is assessed as "possible" or "suspect", the investigation regimen should include a sampling density that is either judgemental or the same as that set out in Table A of NSW EPA (2022) for assessing asbestos.

As this project has included gathering data which provides a reasonable understanding of site history (in the context of potential areas of environmental concern on the site) and taking into consideration Table 4 in WA DOH (2021), it is considered reasonable to adopt a judgemental sampling pattern. A preliminary sampling plan is provided in **Figure 3**.

The location of actual sampling points will be recorded by hand on a site plan.

The supplementary DSI assessment and hazardous building material survey sampling arrangements for this project are presented in **Table 7.2** below.

Table 7.2 Supplementary Contamination Assessment Methodology

AEC	Contamination Risk	Supplementary DSI Assessment Methodology
AEC01	Building Footprints/ Hardstand	Test Pit to 1.0 m, practical refusal or 0.3m into natural material, whichever occurs first. One (1) sample minimum per test-pit location
AEC02	On-site Structures	Undertake a hazardous building materials survey

7.7.2 Sampling Methodology

Soil samples will be obtained by excavating test-pits with the use of a hydraulic excavator. Grab soil samples will be collected at each required sampling point directly from the base and walls of the excavation. Depending on the depth of the excavation footprint, an excavator may be required to obtain samples. In these instances, samples will be collected from soils in the centre of the excavator bucket, to avoid cross contamination from the excavator bucket.

Sampling will be guided by a combination of visual evidence (e.g. visible ACM, staining, etc), olfactory evidence (hydrocarbon odours) and field analytical instrumentation (e.g. portable PID soil headspace screening) where applicable.

Observations of the materials encountered during sampling will be recorded on the relevant field observation log with photographic record.

7.7.3 Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the AEC, the number of samples collected and the depth/interval the sample was collected from, e.g. a sample collected from AEC01 from the excavation footprint base, would be identified as AEC01-Base.

Project samples will be stored in laboratory prepared glass jars or zip-lock bags (if collected for asbestos).

Soil samples in glass jars will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

- SE project identification number
- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

7.7.4 Headspace Screening

Where the contaminants of potential concern include volatiles, project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on a field sampling point log and presented in test-pit logs.

7.7.5 Decontamination

In the unlikely event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

7.7.6 Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

7.7.7 Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;
- Headspace screening results (where available); and
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on the site history, SE has adopted the laboratory analytical schedule for the supplementary DSI assessment. Project specific information is presented in **Table 7.3** below.

Table 7.3 Laboratory Analytical Schedule (Supplementary Contamination Assessment)

ID	Area of Environmental Concern	Analytical Schedule	No. of samples
AEC01	Building Footprints/Hardstand	Heavy Metals, TRH/BTEX, PAH, PCBs, & Asbestos	5 x soil samples
AEC02	On-site Structures	Asbestos Bulk ID, Lead (Paint/Dust), PCBs, and SMF	To be determined by the occupational hygienist

7.7.8 Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented in **Table 7.4** and **Table 7.5**.

Table 7.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos Bulk ID	No limit	AS4964:2004	0.01% w/w
Asbestos Quantitative	No limit	WA DOH 2021 / NEPM 2013	0.001% w/w
BTEX and TRH C_6-C_{10}	14 days	NEPM Schedule B3	0.1-20
Metals	6 months	USEPA 6010, 6020	0.1-5
TRH >C_{10}-C_{40}	14 days	NEPM Schedule B3	20-100
OCP	14 days	USEPA 8081	0.2
PAH	14 days	USEPA 8270	0.1-0.5
VOC	14 days	USEPA 8260	0.1-0.5

Table 7.5 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (SGS).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
PAH	14 days	SGS Method AN002	0.1-0.5
Metals	6 months	SGS Method AN040/AN320/AN312	0.05 – 2

8 REMEDIATION STRATEGY OPTIONS DISCUSSION

A range of soil remediation options have been considered for the site. The options considered based solely on SE's 2022 site walkover include only those which are proven to be effective on past remediation or related projects. The following section comprises a review of each of the soil remediation options considered and outlines the selection process used.

8.1 Remediation Strategy Development Rationale

Given the distribution of contamination is within defined areas and thus visually identifying and delineating the areas of contamination can be considered possible, it is recommended that various remediation options should be considered.

Due to the nature and distribution of the contaminants in the underlying soil matrix and building materials, an effective remediation approach for the site must be tailored towards the key impacted sources, which is the impacted / reworked / imported fill material and identified hazardous building materials within the site. A discussion of remediation options for these areas is provided in the below sections.

8.2 Remediation Options for Impacted Soil

The potential list of remediation options associated with impacted soil is extensive. Consequently, only relevant remediation strategies that have been considered which include the following:

- On-site treatment and beneficial reuse; and
- Off-site landfill disposal – excavation / removal and disposal.

A summary of the advantages and disadvantages to these remediation options is provided overleaf in **Table 8.2**.

8.3 Preferred Remediation Option

Based on SE's assessment detailed above, the most suitable remedial strategy will comprise of a combination of 'on-site treatment (in-situ / ex-situ raking / picking)' and 'off-site removal / disposal' as it will be consistent the ultimate end land use of the site. **Table 8.1** below summarises the preferred remediation strategies with regards to the identified contamination within the site.

Table 8.1 Selected Remediation Strategies

Contamination Type	Preferred Remediation Strategy
Ecological / Terrestrial exceedances	Excavation and placement at depth beneath proposed hardstand areas and / or disposal off-site
Soil materials impacted by non-friable asbestos. (*If identified*)	On-site containment and management and/or off-site landfill disposal
Direct contact risks (BTEX, Heavy Metals, PAH, PCBs, & TRH) (*if identified*)	Removal and disposal off-site
Hazardous building materials (*if identified)*	Removal and disposal off-site

Areas subject to remediation are provided in **Figure 2**.

Table 8.2 Remedial Options Summary

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
Cap and Contain	Soil capping and isolation to restrict direct access to soil. Impacted soil buried in-situ within a designed containment cell.	Protective of human health including construction/ maintenance workers. Direct access to soil will be restricted and can be isolated with the appropriate mitigation measures.	Significantly lower costs with no off-site disposal costs (transport and waste levy fee).	Moderate excavation is required to remove all the AECs across the entire site (< 1 month of remediation time). Limited environmental management required during the works (e.g. dust, noise)	Impacted material would remain on-site indefinitely.	Land value may be reduced due to presence of residual contamination on-site.	Impacted material would remain on-site indefinitely. Future works may requie additional measures if likely to intercept the containment cell.
Excavation and Offsite Disposal	Removal of contaminated soil to an EPA licensed facility. Validation sampling to demonstrate the conditions of the residual soil impact. Reinstatement of excavated areas with material validated as suitable for the intended land use.	Protective of human health including future tenants and construction workers. Facilitate future development of the entire site. No long-term EMP will be required.	No onsite operation and maintenance required.	No ongoing management required as the impacted soil will have been removed offsite.	Based on the soil investigation results, for off-site disposal purposes, the impacted soil to be excavated and removed offsite would require waste classification in accordance with the NSW EPA *Waste Classification Guidelines 2014.*	High remedial cost incurred to remediate the entire site.	Major excavation is potentially required. Odour, vapour and dust management required during the excavation works. May increase truck traffic in area to transport contaminated soil for a short period of time.

9 REMEDIAL ACTION PLAN

9.1 Remedial Goal

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure and environmental risks, based on the proposed land use setting. SE notes that the client may prefer that the capping / containment of the contaminated materials within the site, noting that this remedial approach will result in the need for:

- Notation on a planning certificate for the site;
- A covenant registered on the title to the land; or
- A long-term environmental management plan (EMP).

9.2 Remediation Extent

The extent of contamination within the site is considered to is outlined within **Table 9.1** below.

Table 9.1 Approximate Remedial Extents

ID	Area of Environmental Concern	Dimensions / Area	Depth / Height	Volume / Mass
AEC01	Fill Materials Beneath Hardstand Footprints	600 m^2	TBC [a]	TBC [a]
AEC02	On-site Structures	400 m^2	NA	NA
AEC03	Shallow Fill Materials in the vicinity of 'BH01' and 'BH07'	100 m^2	0.3 m	30 m^3 / 50 tonnes

Notes to Table: *N/A: Not Applicable, TBC: To Be Confirmed, [a] Unable to estimate volume and mass of waste due to complex mixture of items, [b] Area in active use, unable to determine vertical extents during walkover.*

Refer to **Figure 2**, which indicate the areas which will be subject to remediation.

It is noted that the lateral extent of remediation may be altered, during remedial works based on site observations and validation soil sample analytical laboratory results.

9.3 Sequence of Works for Remediation

9.3.1 Remediation Schedule

Based on the extent and complexity of soil materials treatment, an estimated time-frame for remedial works is considered to be less than 1 month following the commencement of works. Referral to a remediation contractor should be made to better estimate remediation timeframes. It is expected that remediation timeframes will be further refined following appointment of the remediation contractor, and the staging of the remediation tasks in the contractor's works program.

9.3.2 Notifications and Approvals

Notification of an intention to undertake remediation works on the site, will be submitted to the relevant planning consent authority, 30 days prior to remediation works commencing. The proposed remediation works would likely be classed as Category 2 under State Environmental Planning Policy (SEPP) 55, which do not require consent from the planning authority.

The following information will also be provided to the planning consent authority, 14 days prior to the commencement of remediation works:

- Copies of the contamination assessment report and this RAP; and
- Contact details of the contractor appointed to undertake the remediation works; and
- Contact details of the parties responsible (if not the remediation contractor) for ensuring remediation works comply with relevant regulatory requirements.

A notification will be submitted to SafeWork NSW prior to undertaking asbestos removal works (where applicable). The removal works will be undertaken by a suitably licensed contractor.

It should be noted that:

- Removal of friable asbestos will require the contractor to hold a Class A licence; and
- Removal of non-friable asbestos will require the contractor to hold a Class B licence.

Within one month of completion of remediation and validation works, a notification will be submitted to the planning consent authority.

9.3.3 Demolition

A pre-demolition hazardous building materials survey is to be undertaken prior to any demolition of on-site structures. Above ground structures and hardstand pavements will be demolished by a suitably licensed contractor, and associated wastes removed from site for recycling and/or disposal. The remediation contractor will retain transport and disposal records for all demolition wastes removed off site.

9.3.4 Remedial Works

Remedial works will be guided and monitored by the environmental consultant. The environmental consultant will assist the remediation contractor in setting out the inferred lateral extent of the identified AEC. The environmental consultant will monitor remedial works and provide guidance to the remedial contractor on:

- When to pause remedial works in an AEC, to allow validation works to be undertaken; and
- Where to extend remedial works in an AEC beyond the inferred extent (if observations or analytical results indicate a need for 'chasing out' additional contamination).

The following remediation works outlined in **Table 9.2**, is based on data available at the time of preparing this RAP.

The validation strategy for each identified AEC is outlined in **Section 8**.

Table 9.2 Proposed Remedial Works

Contamination Risk	Proposed Remedial Strategy
ACM in fill	Asbestos impacted soils to be excavated vertically to base of fill and laterally to the edge of fill or to the site boundary (whichever occurs first). Excavated soils are to be placed in an appropriately designed containment cell and capped (Refer to **Section 7.3**) OR Excavation vertically to base of fill and laterally to the edge of fill or to the site boundary (whichever occurs first). Disposal off-site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines (following waste classification of asbestos impacted soil materials). The remediation contractor will retain transport and disposal records for all wastes removed off site.
Direct Contact (Metals, PAHs, TRH, BTEX, PCBs, Pathogens)	Excavation vertically to base of fill (0.1 into natural) and laterally to edge of fill (or site boundary) and offsite disposal. The remediation contractor will retain transport and disposal records for all wastes removed off site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines (2014).
Ecological Exceedances	Soils to be excavated vertically to base of fill and laterally to the edge of fill or to the site boundary (whichever occurs first). Excavated soils are to be placed at depth or beneath hardstand areas. OR Excavation vertically to base of fill and laterally to the edge of fill or to the site boundary (whichever occurs first). Disposal off-site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines (following waste classification of asbestos impacted soil materials). The remediation contractor will retain transport and disposal records for all wastes removed off site.
Hazardous Building Materials	Removal of identified hazardous building materials and separately prior to main demolition works. Subsequent off-site disposal of identified hazardous building materials (if identified) to a licensed waste receiving facility. The remediation contractor will retain transport and disposal records for all wastes removed off site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines (2014).
Aesthetic Impacts	Offsite disposal of rubbishes and wastes. The remediation contractor will retain transport and disposal records for all wastes removed off site to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines (2014).

9.3.5 Backfilling

Should remedial excavations require backfilling, then backfill soils will be limited to:

- Virgin excavated natural material (VENM);
- Excavated natural material (ENM);

- Other material that is the subject of a resource recovery exemption and the placement of that material is within the lawful constraints of the resource recovery exemption (and does not present an unacceptable exposure risk to human health or the environment, within the context of the proposed land use setting); or
- Site won natural soil materials. I.e. soil materials excavated from approximately 0.5 m bgs and deeper from within the site.

Consideration will be given to geotechnical engineering requirements associated with backfilling; however, those requirements will be specified by others elsewhere.

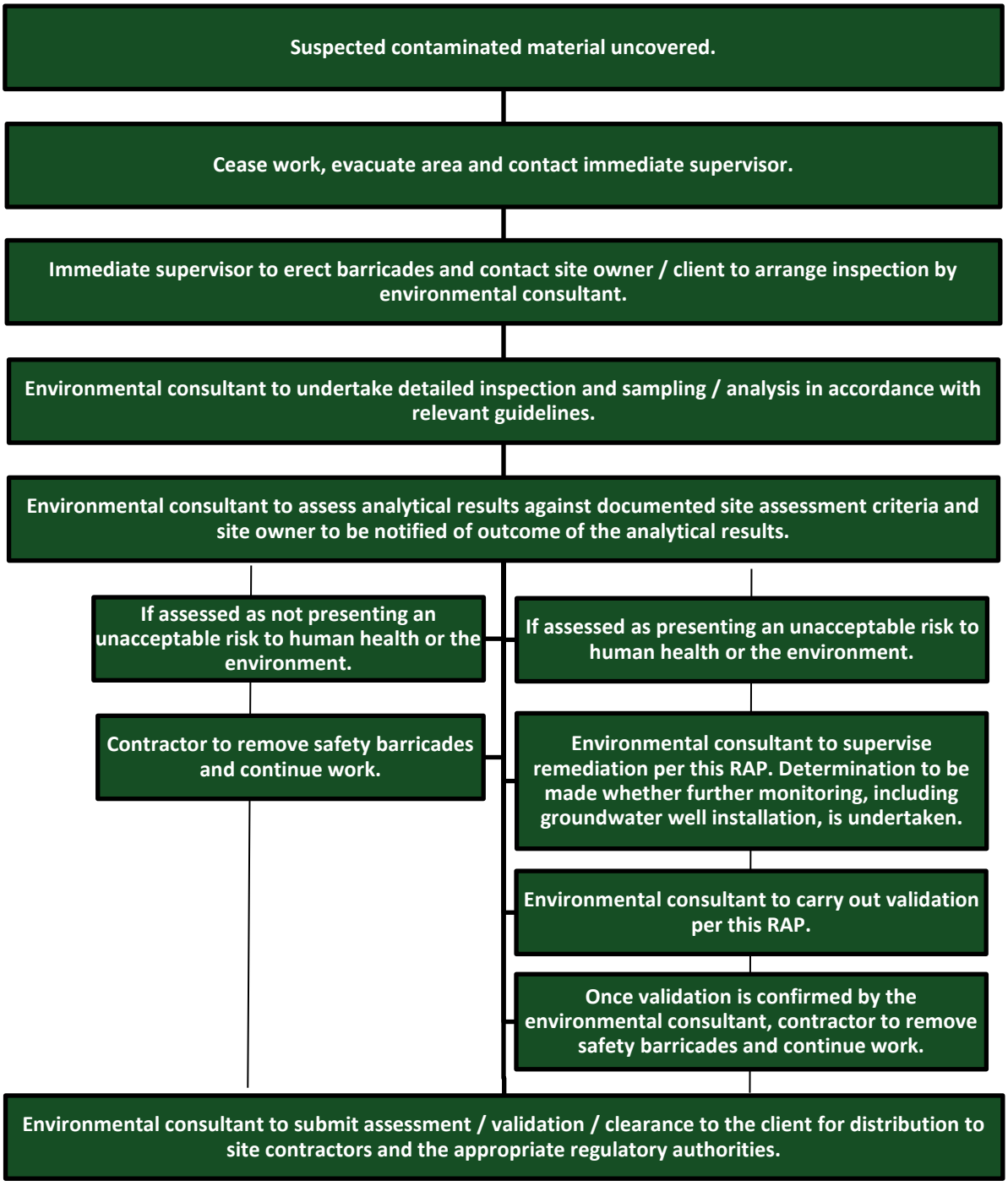
9.3.6 Unexpected Finds Protocol

The contamination assessments to date have not indicated the presence of significant soil and groundwater contamination that is unacceptable for the proposed land use beyond the area of remediation described in this RAP. However, it is possible that unexpected finds may be present within the fill material. To this end, an Unexpected Finds Protocol has been compiled, and is summarised herein. Unexpected finds could include, but are not limited to:

- Other underground storage tanks that are previously not identified;
- Buried containers and drums;
- Phase separated hydrocarbons;
- Powders and other suspicious buried material;
- Potentially hazardous materials; and
- Evidence of contamination including significant staining, odours and discolouration.

In the event that any material suspected of containing potentially hazardous substances is found during remediation works, the following Unexpected Finds Protocol is to be followed:

Unexpected Finds Protocol



10 VALIDATION DATA QUALITY OBJECTIVES

Appendix B of NEPM ASC 2013 provides guidance on the development of data quality objectives (DQO) using a seven-step process.

The DQO for this project are set out in **Sections 10.1** to **10.7** of this report.

10.1 Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- The site is the subject of redevelopment works; and
- Historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health and ecological exposure risk in the context of the proposed land use setting.

The project team identified for this project includes Sydney Environmental Group Pty Ltd, the client and the planning consent authority.

The regulatory authorities identified for this investigation include NSW EPA and the Local Council.

10.2 Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the environmental data collected for the project, suitable for assessing relevant land contamination exposure risks?
- Do concentrations of identified contaminants of potential concern (COPC) present an unacceptable exposure risk to identified receptors, for the proposed land use setting?
- Have the contaminated soils been effectively isolate by the remedial strategy?
- Is the site suitable for the proposed land use setting, in the context of land contamination as a result of the chosen remedial strategy?

10.3 Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 8.2** for this investigation, will include:

- Data obtained in previous contamination assessments;
- The nature and extent of sampling at the site, including both density and distribution;
- Samples of relevant site media;
- The measured physical and/or chemical parameters of the site media samples (including field screening and laboratory analysis, where relevant); and
- Assessment criteria adopted for each of the media sampled.

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section 4.1** of this project, the following assessment criteria relevant to the proposed land use setting have been adopted for this investigation:

- Human health direct contact – HILs in Table 1A (1) in NEPM ASC 2013 and HSLs in Table B4 of Friebel, E & Nadebaum, P (2011);
- Human health inhalation/vapour intrusion – HSLs in Table 1 (A) in NEPM ASC 2013;
- Human health (asbestos) – HSLs in Table 7 of NEPM ASC 2013;
- Petroleum hydrocarbon compounds (management limits) – Table 1 B(7) of NEPM ASC 2013; and
- Aesthetics – no highly malodorous site media (e.g. strong residual petroleum hydrocarbon odours, hydrogen sulphide in site media, organosulfur compounds), no hydrocarbon sheen on surface water, no discoloured chemical deposits or soil staining with chemical waste other than of a very minor nature, no large monolithic deposits of otherwise low risk material (e.g. gypsum as powder or plasterboard, cement kiln dust), no presence of putrescible refuse.

10.4 Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The temporal boundaries of the project include:

- The project timeframes by SE for this project, and subsequent remediation contractor works program;
- Unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- Access availability of the site (to be defined by the site owner/representative); and
- Availability of SE field staff (typically normal daylight working hours, Monday to Friday).

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the previously identified areas of environmental concern (AEC) and may be altered based on the data collected during the supplementary contamination assessment.

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this investigation may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

10.5 Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

10.5.1 Rinsate Blank

Only disposable sampling equipment will be used during the field works on the day. As such, no rinsate blank will be collected.

10.5.2 Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C_6-C_{10}).

10.5.3 Field Duplicates and Field Triplicates

Field duplicate and field triplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates and triplicates collected will be analysed for at least one of the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relative percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate/triplicate will be calculated.

10.5.4 Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

10.5.5 If/Then Decision Rules

SE has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and
- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer **Section 8.3**), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then SE will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 10.2**), SE will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

10.6 Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and
- Contamination exposure risks for a specific land use setting are not acceptable, when they are.

SE will mitigate the risk of decision error by:

- Calculation of the 95% upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern (excluding asbestos);
- Assignment of fieldwork tasks to suitably experienced SE consulting staff, and suitably experienced contractors;
- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories; and
- Assignment of data interpretation tasks to suitably experienced SE consulting staff, and outsourcing to technical experts where required.

SE will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Table 10.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 10.4**	Critical samples analysed according to DQO	Refer **Section 10.7.1**
Critical samples collected	Refer **Section 10.4**	Analytes analysed according to DQO	Refer **Section 10.7.1**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 10.7.1**
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis
Sample Holding Times	Laboratory holding times provided by laboratory	Sample extraction and holding times complied with	Refer **10.7.8**
Comparability			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer **Section 10.7.1**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 10.7.1**
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in 500ml zip-lock bags	Same laboratory for primary sample analysis	All primary samples to Eurofins | Environmental Testing
Analytical measurement units consistent	All measurement units the same between same analytes	Same analytical measurement units	Refer **Section 10.7.1**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 10.4**	Samples analysed according to SAQP	Refer **Section 10.7.1**
Media identified in SAQP sampled	Refer **Section 10.4**	Nil	Nil
Precision			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Field duplicate / triplicate RPD (Metals & PAH only)	Minimum 5% duplicates and triplicates No limit for results <10 times LOR 50% for results 10-20 times LOR 30% for results >20 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%	Nil	Nil
Accuracy (bias)			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Rinsate blanks	*Disposable sampling equipment used. No rinsate blanks required.*		
Field trip spikes (BTEX only)	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of acceptance criteria
Field trip blanks (BTEX only)	Analyte concentration <LOR None collected for asbestos.	Surrogate spike recovery	No exceedances of acceptance criteria

10.7 Step 7: Develop the plan for obtaining data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

10.7.1 Validation Sampling

Validation should focus on collecting clear evidence to assess whether the key objectives have been met. Validation sampling programs should identify and delineate the lateral and vertical extent of contamination (if any) and arrive at a scientifically defensible and statistically valid data set which characterises the chemical concentrations and human health risk present at the site.

An appropriately experienced environmental consultant should be present onsite at all stages of the remediation works, to assess the extent of remediation required to render the site suitable for the proposed development. Site observations and field screening equipment can be used to assist in decision-making in relation to:

- The location and extent of any excavations to trace contamination or whether to remove additional soil;
- Create a more focused sample collection (number and location) and laboratory analysis; and
- The need to consider (or implement) any specific health and safety measures.

A judgemental validation sampling pattern will be carried out, with one soil sample collected from the floor (per 25 m^2) and one soil sample collected from each wall (per 5 lineal meters) of the remedial excavation area.

The validation sampling arrangements for this project are presented in **Table 10.2.**

Table 10.2 Validation Methodology

Contamination Risk	Validation Methodology
Direct Contact / Ecological Risks in Fill	Visual inspection of excavation footprint to confirm removal of fill. One 250mL soil jar sample per 25 m^2 of excavation footprint. 1 x 250mL jar sample per 10 lineal metres of excavation wall (if present), with a minimum of 1 per wall. Photographic record of excavation.
ACM in fill	Visual inspection of excavation footprint to confirm removal of fill. Following removal: 1 x 500mL asbestos NEPM (0.001%) soil sample per 10 lineal metres of excavation wall, with a minimum of 1 per wall and one 500mL soil sample per 100 m2 of excavation footprint, with a minimum of 3 per base. Photographic record of excavation.
Hazardous Building Materials	Visual inspection of residual soil surface following demolition by a suitably qualified environmental consultant / NSW SafeWork Licensed Asbestos Assessor to confirm the absence of hazardous building materials.
Airborne Asbestos Fibres	Airborne asbestos monitoring is to be undertaken for the duration of any asbestos remediation works by a suitably qualified occupational hygienist. The results of airborne asbestos monitoring are to be included in the site validation report.
Imported Fill (VENM)	1 soil sample per 100 m^3 or 3 samples per stockpile / site.
Imported Fill (ENM)	Quantity dependent – refer to the NSW EPA 2014 *'Excavated Natural Material (ENM) exemption/order'* for further detail.

The quantity and movement of all waste materials excavated and removed offsite with be tracked by the remedial contractor. All waste disposal dockets issued by the suitably licensed waste receiving facility will be retained by the remedial contractor for reconciliation against the material tracking records, and for inclusion in the validation report. This will demonstrate that the waste was appropriately disposed to licensed facilities.

If visual or olfactory observations indicated a potential for soil contamination to be present, then collection of additional validation samples will be considered.

10.7.2 Validation Sampling Methodology

Grab soil samples will be collected at each required sampling point directly from the base and walls of the excavation. Depending on the depth of the excavation footprint, an excavator may be required to obtain samples. In these instances, samples will be collected from soils in the centre of the excavator bucket, to avoid cross contamination from the excavator bucket.

Sampling will be guided by a combination of visual evidence (e.g. visible ACM, staining, etc), olfactory evidence (hydrocarbon odours) and field analytical instrumentation (e.g. portable PID soil headspace screening) where applicable.

Observations of the materials encountered during sampling will be recorded on the relevant field observation log with photographic record.

10.7.3 Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the AEC, the number of samples collected and the depth/interval the sample was collected from, e.g. a sample collected from AEC01 from the excavation footprint base, would be identified as AEC01-Base.

Project samples will be stored in laboratory prepared glass jars or zip-lock bags (if collected for asbestos).

Soil samples in glass jars will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

- SE project identification number
- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

10.7.4 Headspace Screening

Where the contaminants of potential concern include volatiles, project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on a field sampling point log and presented in test-pit logs.

10.7.5 Decontamination

In the unlikely event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

10.7.6 Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

10.7.7 Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;
- Headspace screening results (where available); and
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on the site history, SE has adopted the laboratory analytical schedule for validation sampling. Project specific information is presented in **Table 10.3** below.

Table 10.3 Laboratory Analytical Schedule (Validation Sampling)

AEC	Analytical Schedule	No. of samples
AEC01	TBC following the supplementary contamination assessment	Per **Section 10.7.1**
AEC02	Nil	Nil
AEC03	Heavy Metals	Per **Section 10.7.1**
Imported Fill – VENM	TRH, BTEX, PAH, 8 metals, OCP and Asbestos Bulk ID.	1 / 500 tonnes
Imported Fill – ENM	Per NSW EPA ENM Order [b]	Per ENM Order [b]

Notes to Table: [b] *NSW EPA 2014 'Excavated Natural Material Order / Exemption.*

10.7.8 Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented in **Table 10.4** and **Table 10.5**.

Table 10.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos Bulk ID	No limit	AS4964:2004	0.01% w/w
Asbestos Quantitative	No limit	WA DOH 2021 / NEPM 2013	0.001% w/w
BTEX and TRH C_6-C_{10}	14 days	NEPM Schedule B3	0.1-20
Metals	6 months	USEPA 6010, 6020	0.1-5
TRH >C_{10}-C_{40}	14 days	NEPM Schedule B3	20-100
OCP	14 days	USEPA 8081	0.2
PAH	14 days	USEPA 8270	0.1-0.5
VOC	14 days	USEPA 8260	0.1-0.5

Table 10.5 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (SGS).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
PAH	14 days	SGS Method AN002	0.1-0.5
Metals	6 months	SGS Method AN040/AN320/AN312	0.05 – 2

11 REPORTING

11.1 Site Validation Report

At the completion of remediation works, a site validation report will be prepared with reference to the relevant sections of NSW EPA 2020, 'Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'. The site validation report must include:

- An executive summary;
- The scope of reporting work undertaken;
- Site identification details;
- A summary of site history;
- A summary of site condition and the surrounding environment;
- A summary of geology and hydrogeology;
- Information on the remediation works undertaken;
- The results of field and laboratory work;
- An assessment of field and laboratory quality assurance / quality control data;
- A discussion on site validation;
- Information on ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

12 SITE MANAGEMENT PLAN

The following site management plan will apply during undertaking of the remediation tasks.

12.1 Soil and Stormwater Management

12.1.1 Site Access/Egress

Vehicle access and egress to the site will be stabilised to prevent tracking of sediment onto roads and footpaths. Soil, mud and other similar materials will be removed from the roadway adjacent the access/egress point by sweeping, shovelling or a means other than washing, on a daily basis, or as required.

Trucks will be loaded adjacent to the remediation excavation (where practical). Spills of excavated soil will be scraped / swept up and combined with the soil being disposed offsite.

Soil and sediment will be broomed or washed off vehicle/plant tyres and tracks, prior to vehicles/plant leaving the remediation works zone. This soil and sediment will be scraped / swept up and managed onsite or disposed of, depending on its contamination status.

A site-specific sediment and erosion control plan will be prepared and maintained by the remediation contractor, to suit staging of the remediation works. Erosion and sediment control measures will be maintained in a functional condition. Sediment laden stormwater runoff will be controlled using measures outlined in Landcom 2004, '*Managing Urban Stormwater - Soils and Construction*' (the Blue Book).

12.1.2 Stockpiles

Stockpiles of soil or other materials:

- Will not be placed on footpaths or nature strips, unless approved by Council;
- Will be placed away from gutters, stormwater pits and other drainage lines;
- Will be stored in a secure area and be covered if remaining on site for more than 24 hours; and
- Will generally be constructed as low elongated mounds on level surfaces.

12.1.3 Excavation Pump Out

Should excavations require pumping out, water will be analysed for total suspended solids, pH, metals and petroleum hydrocarbons. Should analytical results be less than relevant marine ecosystem groundwater investigation levels in ANZECC (2000), excavation water may be discharged to stormwater.

Should analytical results exceed ANZWQG (2019) criteria, other options for disposal will be considered, including:

- Discharge to sewer (with prior approval from Sydney Water with a Trade Waste Agreement); and
- Removal and offsite disposal by a liquid waste contractor.

12.1.4 Rehabilitation and Landscaping

Stabilisation of exposed areas on the site, where required, will be undertaken in a progressive manner, as stages of remediation works are completed. Stabilisation will be maintained until such time as site redevelopment works commence.

As site redevelopment works are expected to be undertaken in conjunction with remediation works, revegetation of the site is considered unlikely to be required.

12.2 Waste Management

Removal of materials from site for recycling and/or disposal, will be undertaken with reference to the relevant provisions of the *Protection of the Environment Operations Act* (1997) and NSW EPA *Waste Classification Guidelines* (2014).

If waste classification is required for site material, the following is required (as a minimum):

- Waste classification documentation;
- Material source and description;
- Sampling density, pattern, COPCs;
- Result summary, including appropriate table with comparison to acceptance criteria; and
- Waste classification.

If offsite disposal is required for site material, the following is required (as a minimum):

- Source location;
- Estimated volume (based on excavation size;
- Actual volume of disposal;
- Waste classification;
- Transporter;
- Final destination, POEO license;
- Reconciliation of waste dockets with actual disposal volume; and
- Reconciliation of actual disposal volume and the estimated volume of disposal (based on excavation size.

The remediation contractor will maintain detailed records of materials removed from the site, including date/time of removal, quantities of materials, transport company details and vehicle registration details.

The remediation contractor will retain records verifying lawful disposal of the materials, including date / time the waste left site, approximate volume per load, the classified of the waste contained in each individual load, transport vehicle registration details, weighbridge / tipping dockets with receipt dates / times and tipped waste classification from the waste receiving facility.

Material placed onsite (stockpiles or moved to other location) must be tracked so that the source of material can be identified should unexpected finds be encountered.

12.3 Groundwater Management

Should dewatering of the site be required, development consent may be required from the planning consent authority. Dewatering may also require approvals from the NSW Department of Planning and Infrastructure, and the NSW Department of Primary Industry – Water.

Further, should unexpected significant contamination be encountered during remediation that may affect groundwater (e.g. the presence of unknown underground storage tanks), additional groundwater assessment will be required.

12.4 Noise Control

Noise levels from the site during the project will not exceed the limits indicated in AS2436-1981.

No ‘offensive noise’ as defined under the Protection of the Environment Operations Act 1997 will be created during remediation works/activities.

Plant and equipment will be fitted with noise attenuation devices (e.g. mufflers on exhausts). Consideration will be given to use of reversing alarms other than the standard pulsed tonal alarms.

Vehicle access roads will be designed in such a way to minimise the need for plant and vehicles to reverse (e.g. provision of a turning circle adjacent to the remediation works zone).

12.5 Dust Control

Dust may be generated during remediation works and associated tasks. To mitigate risk of dust emissions migrating beyond the site boundary, consideration will be given to implementing the following procedures:

- Erection of dust screens around the perimeter of the site (e.g. fencing with shade cloth attached);
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Covering stockpiles of contaminated soil remaining on site for more than 24 hours;
- Keeping excavation surfaces moist;
- Wetting down of placed fill material during spreading;
- Sweeping of hardstand surfaces;
- Minimising soil disturbance works during windy days; and
- Retaining stabilised site access/egress points for vehicles.

Airborne fibre monitoring will be implemented during all remedial works involving friable asbestos at the site, and will be carried out in accordance with SafeWork NSW (2019) *Code of Practice – How to Safely Remove Asbestos*. SE recommend that airborne fibre monitoring be implemented during works involving non-friable asbestos within the site, this however is not explicitly required but is highly recommended by SafeWork NSW.

Portable battery-operated air monitors are to be placed within static positions approximately 1.5m above the ground surrounding the work/removal area. The air sample analysis shall be carried out by a NATA-accredited laboratory. The results of asbestos air monitoring should be provided to the Site Project Management Representative the day following the removal or handling works. Project management will display results of air monitoring on the site's safety notice board for a period of 24hr.

Concentrations of asbestos fibres shall be dealt with as follows:

Table 12.1 Airborne Asbestos Fibre Concentration Action Levels

Action Level (airborne asbestos fibres/ml)	Action
< 0.01 fibres/ml	Continue with control measures
≥ 0.01 fibres/ml **< 0.02 fibres/ml**	Review control measures, Investigate the cause, Implement new controls to prevent further release.
≥ 0.02 fibres/mL	Stop removal works, Notify the relevant regulator that work has ceased, Investigate the cause, Extend the isolation area and implement controls to minimise further exposure, Do not recommence work until fibre levels are at or below 0.01 fibres/ml.

12.6 Odour Control

Generation of significant odours during the remediation works is considered to be unlikely.

If odours are generated, odours will be monitored at the site boundary. Should unacceptable odours be detected at the site boundary, consideration will be given to implementing the following procedures:

- Use of appropriate covering techniques such as plastic sheeting to cover excavation faces or stockpiles;
- Use of fine mist sprays (which may incorporate deodorizing agents);
- Use of hydrocarbon mitigating agents on impacted areas/materials; and
- Adequate maintenance of equipment and machinery to minimise exhaust emissions.

A record of unacceptable odours and corrective/preventative action taken, will be maintained by the remediation contractor.

12.7 Traffic Management

Haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site will be selected by the remediation contractor and will meet the following objectives:

- Compliance with all traffic road rules;
- Minimisation of noise, vibration and odour to adjacent premises; and
- Utilisation of state roads and minimisation of use of local roads.

The remediation contractor will ensure that site vehicles:

- Conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work identified in **Section 12.13**;
- Securely cover all loads to prevent dust or odour emissions during transportation;
- Exit the site in a forward direction; and
- Do not track soil, mud or sediment onto the road.

12.8 Vibration Management

Vibration emissions during remediation works will be controlled to mitigate risk of potential damage to assets on adjacent properties, and to mitigate unreasonable loss of amenity to nearby residents.

12.9 Fill Importation

Material proposed to be imported to site as engineered fill, will be limited to materials certified as:

- Virgin Excavated Natural Material (VENM); or
- Excavated Natural Material (ENM).

VENM certification will be undertaken with reference to NSW EPA (1995). ENM certification will be undertaken with reference to NSW EPA Excavated Natural Material Exemption (2014).

The concentrations of potential contaminants in VENM and ENM proposed to be imported to site, will be less than the human health assessment criteria adopted for the site.

The remediation contractor will maintain detailed records of all fill imported to the site, including details of the supplier, the source of the fill, the quantities of the fill, vehicle registration numbers and the dates/times the fill was received on site.

The remediation contractor will inspect every load of material imported to site, to check the material is consistent with the material described in the VENM/ENM certification and each load is free of visual anthropogenic materials, staining or odours. The remediation contractor will maintain a documented record of each inspection.

12.10 Work Health and Safety

12.10.1 Safe Work Method Statement

Each contractor and sub-contractor undertaking remediation works, or working within a remediation works zone, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:

- The tasks to be undertaken;
- Hazards identified for each of the tasks to be undertaken;
- An assessment of risk for each hazard, considering likelihood and consequence; and
- Control measures to eliminate or mitigate risks associated with each identified hazard.

12.10.2 Personal Protective Equipment

The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:

- Long sleeves and long pants;
- High visibility vests (or clothing);
- Safety boots;
- Hard hats;
- Gloves; and
- Eye protection (e.g. safety glasses).

Additional PPE may be required in accordance with task specific control measures in SWMS (refer **Section 12.10.1**) for asbestos handling and removal works.

The following minimum personal protective equipment (PPE) are be worn by any persons entering a non-friable asbestos impacted remediation works zone:

- Disposable coveralls;
- Minimum P2 respirator;
- Disposable boot covers; and
- Disposable gloves.

Should friable asbestos be identified during the works, the following minimum PPE are to be worn by any persons entering a friable asbestos impacted remediation works zone:

- Disposable coveralls;
- Minimum P3 half-face respirator (Higher protection may be required during works. Refer to the licensed asbestos assessor on-site for further details);
- Disposable boot covers; and
- Disposable gloves.

Additionally, a 3 stage (minimum) decontamination unit must be present at the egress point to the friable asbestos works area and used by all personnel entering and exiting the area.

12.10.3 Decontamination of Personnel, Plant and Equipment

Personnel undertaking remediation tasks, or entering the remediation works zone, will be required to decontaminate upon exiting the remediation works zone. Decontamination of plant and equipment used to remediate will also need to be decontaminated upon exiting the remediation work zones. Decontamination procedures will include:

- Removal of all disposable PPE;
- Cleaning down of protective footwear (including removal of soil from the soles);
- Washing of hands and exposed dermal areas; and
- Decontamination of plant and equipment (as applicable).

12.11 Site Signage

A sign will be posted on the boundary of the site, adjacent to the site access point, which will include 24-hour contact details of the remediation contractor and appropriate notification of asbestos contamination/remediation works (in progress).

12.12 Site Security

Site security will be maintained throughout the duration of the remediation works, with appropriate boundary fencing and gate locks. Other security measures may be implemented, if the need arises.

12.13 Site Hours of Operation

Remediation works will be undertaken on Monday to Friday between the hours of 7:00am to 5:00pm, and Saturday between the hours of 8:00am and 1:00pm.

Remediation works will not be undertaken outside the hours stated above, or on Sundays or public holidays.

12.14 Community Relations and Complaints

Owners, occupants and tenants of properties adjoining the site and across the road from the site, will be provided with notification of remediation works, at least two days prior to those works commencing.

Personnel undertaking remediation works on the site, will direct all third-party communications and/or complaints to the Project Manager. The Project Manager will arrange for the communication/complaint to be assessed, a response prepared, corrective/preventative actions implemented (if necessary).

A register will be maintained on site for the recording of communications / complaints from third parties, including but not limited to, local residents and local businesses.

12.15 Emergency Preparedness

An emergency assembly point will be established at the site egress point. This point will be communicated to all site workers and visitors, during relevant site induction processes.

In the event of an emergency, site workers and visitors will assemble here and await further instructions from the site supervisor, project manager or emergency services.

Spill control kits and fire extinguishers will be located on site, as and where required.

Contact details to be used in the event of an emergency, are presented in **Section 12.16**.

12.16 Register of Contacts

A register of contacts for the project is presented in **Table 12.16** below.

Table 12.16 Register of Contacts

Project Role	Person	Organisation	Contact
Emergency Services	-	Fire / Police / Ambulance	000
Site Owner	TBC	Rissalah College	
Project Manager	Tony Gray	Crawford Architects	TBC
Planning Consent Authority	-	Canterbury-Bankstown Council	9707 9000
WHS Regulatory Authority	-	SafeWork NSW	131 050
Environmental Regulatory Authority	-	NSW EPA	131 500
Remediation Contractor	TBC	TBC	TBC
Environmental Consultant	Steven Wallace	Sydney Environmental Group	0434 215 998

12.17 Interim Site Management Plan

Prior to the implementation of the remedial action plan, the following site management activities will be enforced to reduce the contamination risk to human health and the environment:

- Site Isolation:
  - Site access and egress will be limited to nil (if possible) to prevent the tracking of contaminants outside of the site boundaries.

- Appropriate boundary fencing with locked gates will be installed (if not already present), regularly maintained and remained locked when site is not in use.
- Signage will be posted on the boundary of the site, adjacent to the site access point, which will include 'keep out, asbestos contamination' (or similar).

- Safe Work Method Statement:
  - Each contractor and sub-contractor gaining access to the site, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:
    - The tasks to be undertaken;
    - Hazards identified for each of the tasks to be undertaken;
    - An assessment of risk for each hazard, considering likelihood and consequence; and
    - Control measures to eliminate or mitigate risks associated with each identified hazard.

- Personal Protective Equipment:
  - The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:
    - Hard hat;
    - Long sleeves and long pants;
    - High visibility vest (clothing);
    - Safety boots;
    - Gloves;
    - Eye protection (safety glasses); and
    - Respiratory protection (Only within asbestos impacted remediation areas).

- Decontamination of Personnel equipment:
  - Cleaning down of protective footwear (including removal of soil from the soles); and
  - Washing of hands.

13 CONCLUSIONS

Based on the information presented in the historical contamination assessment reports, SE concludes that the remedial goal can be achieved, and the site made suitable for the proposed land use setting, subject to:

- Completion of an additional supplementary contamination assessment to address significant data-gaps identified in previous contamination assessments undertaken for the site;
- Implementation of the strategies, methodologies and measures set out in this remedial action plan;
- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum or modification and revision to this RAP will be required. Any amendments are to be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant; and
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant.

This report must be read in conjunction with the limitations set out in **Section 14**.

14 STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Sydney Environmental Group Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, SE reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to SE's engagement. The report must not be used for any purpose other than the purpose specified at the time SE was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual SE consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, SE reserves the right to review and amend this report.

15 REFERENCES

Sydney Environmental Group (SE 2022), 'Stage 1 Preliminary and Stage 2 Detailed Site Investigation, 55 MacDonald Street, Lakemba NSW', dated 27 September 2022, Ref No: 1747-PSIDSI-01-270922.v1f

Australian and New Zealand (ANZWQG), '*Guidelines for Fresh and Marine Water Quality*';

Landcom 2004, '*Managing Urban Stormwater - Soils and Construction'* (the Blue Book).

National Environment Protection Council (NEPC), '*Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'*;

National Environment Protection Council (NEPC), '*Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'*;

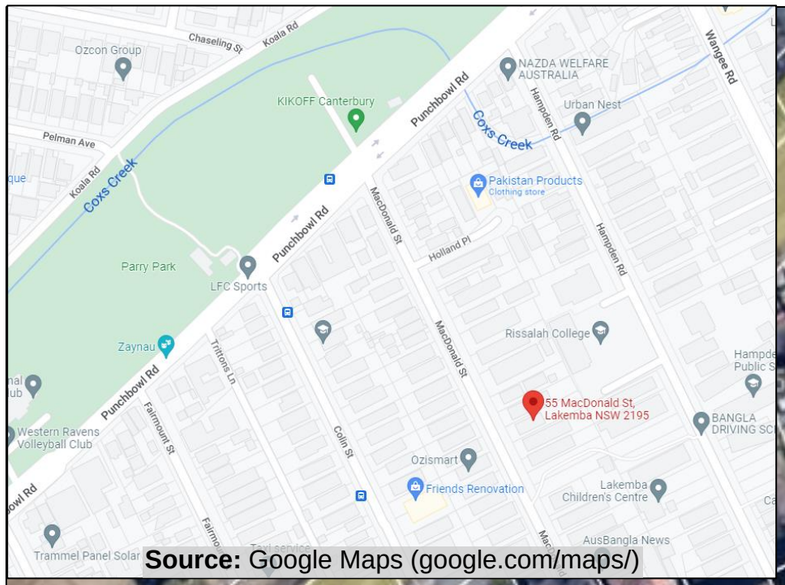
NSW EPA 2022, '*Contaminated Sites: Sampling Design Guidelines'*;

NSW EPA 2017, '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)*';

NSW EPA 2020, '*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'*; and

WA DOH 2021, *'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia'* dated 2021

FIGURES



Source: Google Maps (google.com/maps/)

Source: Nearmap (apps.nearmap.com/maps/)

Sydney Environmental Group

Scale:	50 m	Site Locality		
Client Name:	Crawford Architects Pty Ltd	N	Figure Number:	1
Project Name:	Remedial Action Plan		Figure Date:	04 November 2022
Project Location:	55 MacDonald Street, Lakemba NSW		Report Number:	1747-PSIDSI-01-041122.v1f

Sydney Environmental Group	Scale:	10 m	Site Layout & Remediation Extents	
	Client Name:	Crawford Architects Pty Ltd	Figure Number:	2
	Project Name:	Remedial Action Plan	Figure Date:	04 November 2022
	Project Location:	55 MacDonald Street, Lakemba NSW	Report Number:	1747-RAP-01-041122.v1f

Sydney Environmental Group	Scale:	10 m	Supplementary Contamination Assessment Sampling Plan	
	Client Name:	Crawford Architects Pty Ltd	Figure Number:	3
	Project Name:	Remedial Action Plan	Figure Date:	04 November 2022
	Project Location:	55 MacDonald Street, Lakemba NSW	Report Number:	1747-RAP-01-041122.v1f

APPENDIX A

LABORATORY SUMMARY TABLES

Group	Analyte	Units	PQL	Site Adopted Criteria Residential A 0 m to <1 m | CLAY: Health Investigation / Screening Level (HIL / HSL)	Site Adopted Criteria Residential A 0 m to <1 m | CLAY: Environmental Investigation / Screening Level (EIL / ESL)	Site Adopted Criteria Residential A 0 m to <1 m | CLAY: Petroleum Hydrocarbon Management Level (PHML)	# Samples	# Detects	Minimum	Average	Standard Deviation	95% UCL	Maximum	Sample ID: TP01-0.1-0.2	TP02-0.2-0.3	TP03-0.1-0.2	TP04-0.1-0.2	TP05-0.1-0.2	TP06-0.1-0.2	TP07-0.1-0.2	TP08-0.5-0.6-EIL	DUP01	DUP01A
	Reference / Sample Date													522-SG401100 06/09/22	522-SG401101 06/09/22	522-SG401102 06/09/22	522-SG401103 06/09/22	522-SG401104 06/09/22	522-SG401105 06/09/22	522-SG401106 06/09/22	522-SG401107 06/09/22	522-SG401108 06/09/22	# 230383101 01/09/22
Metals	Arsenic	mg/kg	2	100	100	-	8	8	2	19	14	-	42	18	13	13	42	16	8.8	39	2.2	19	6
	Cadmium	mg/kg	0.4	20	-	-	8	3	ND	0	1	-	1.7	0.5	< 0.4	< 0.4	< 0.4	< 0.4	0.8	1.7	< 0.4	0.8	0.7
	Chromium (Total)[1]	mg/kg	5	100	423	-	8	8	6	21	9	-	32	26	18	17	32	18	18	32	5.5	25	11
	Copper	mg/kg	5	6000	144	-	8	8	9	18	10	-	39	15	10	11	12	17	39	27	9.4	18	17
	Lead	mg/kg	5	300	1100	-	8	8	20	119	119	-	350	57	86	64	66	45	350	260	20	65	63
	Mercury (Inorganic)	mg/kg	0.1	40	-	-	8	4	ND	0	0	-	0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.2	0.1	0.1	< 0.1	<0.05
	Nickel	mg/kg	5	400	176	-	8	2	ND	2	1	-	7	< 5	< 5	< 5	< 5	< 5	7	5.2	< 5	< 5	2.4
	Zinc	mg/kg	5	7400	340	-	8	8	47	216	216	-	620	620	47	74	110	61	320	430	64	990	1000
PAH	Acenaphthene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Acenaphthylene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Anthracene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Benzo(a)anthracene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Benzo(a)pyrene	mg/kg	0.5	-	0.7	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	0.1
	BaP TEQ - Low[2]	mg/kg	0.5	3	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.2
	BaP TEQ - Medium[2]	mg/kg	0.6	3	-	-	7	7	0.6	0.6	0.0	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	-	0.6	<0.3
	BaP TEQ - High[2]	mg/kg	1.2	3	-	-	7	7	1.2	1.2	0.0	-	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	-	1.2	<0.2
	Benzo(b&j)fluoranthene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	0.1
	Benzo(ghi)perylene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Benzo(k)fluoranthene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Chrysene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	0.1
	Dibenzo(ah)anthracene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Fluoranthene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	0.2
	Fluorene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Indeno(1,2,3-cd)pyrene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Naphthalene	mg/kg	0.5	-	170	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Phenanthrene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.1
	Pyrene	mg/kg	0.5	-	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	0.2
	Total PAH (18)	mg/kg	0.5	300	-	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	< 0.5	<0.8
TRH	TRH C10-C36 Total	mg/kg	50	-	-	-	7	1	ND	25	NC	-	175	< 50	< 50	< 50	< 50	< 50	175	< 50	-	-	-
	TRH C10-C14	mg/kg	20	-	-	-	7	1	ND	3	NC	-	21	< 20	< 20	< 20	< 20	< 20	21	< 20	-	-	-
	TRH C15-C28	mg/kg	50	-	-	-	7	1	ND	14	NC	-	100	< 50	< 50	< 50	< 50	< 50	100	< 50	-	-	-
	TRH C29-C36	mg/kg	50	-	-	-	7	1	ND	8	NC	-	54	< 50	< 50	< 50	< 50	< 50	54	< 50	-	-	-
	TRH C6-C9	mg/kg	20	-	-	-	7	0	ND	NC	NC	-	ND	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	-	-
	Naphthalene	mg/kg	0.5	-	170	-	7	0	ND	NC	NC	-	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-
	TRH >C10-C16 (F2)	mg/kg	50	-	120	1000	7	1	ND	7	NC	-	50	< 50	< 50	< 50	< 50	< 50	50	< 50	-	-	-
	TRH >C10-C16 (F2) - Naphthalene	mg/kg	50	280	-	-	7	1	ND	7	NC	-	50	< 50	< 50	< 50	< 50	< 50	50	< 50	-	-	-
	TRH C10-C40 Total (F bands)	mg/kg	100	-	-	-	7	1	ND	21	NC	-	150	< 100	< 100	< 100	< 100	< 100	150	< 100	-	-	-
	TRH >C16-C34 (F3)	mg/kg	100	-	1300	3500	7	1	ND	14	NC	-	100	< 100	< 100	< 100	< 100	< 100	100	< 100	-	-	-
	TRH >C34-C40 (F4)	mg/kg	100	-	5600	10000	7	0	ND	NC	NC	-	ND	< 100	< 100	< 100	< 100	< 100	< 100	< 100	-	-	-
	TRH C6-C10	mg/kg	20	-	180	800	7	0	ND	NC	NC	-	ND	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	-	-
	TRH C6-C10 minus BTEX (F1)	mg/kg	20	50	-	-	7	0	ND	NC	NC	-	ND	< 20	< 20	< 20	< 20	< 20	< 20	< 20	-	-	-
BTEX	Benzene	mg/kg	0.1	0.7	65	-	7	0	ND	NC	NC	-	ND	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-
	Ethylbenzene	mg/kg	0.1	NL	125	-	7	0	ND	NC	NC	-	ND	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-
	m/p-xylene	mg/kg	0.2	-	-	-	7	0	ND	NC	NC	-	ND	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	-	-	-
	o-xylene	mg/kg	0.1	-	-	-	7	0	ND	NC	NC	-	ND	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-
	Toluene	mg/kg	0.1	480	105	-	7	0	ND	NC	NC	-	ND	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-
	Total Xylenes	mg/kg	0.3	110	45	-	7	0	ND	NC	NC	-	ND	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	-	-	-
OCP	4.4 - DDD	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	4.4 - DDE	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	4.4 - DDT	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	a-HCH	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Aldrin	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Aldrin + Dieldrin (total)	mg/kg	0.5	6	-	-	3	0	0.00	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	b-HCH	mg/kg	0.5	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Chlordanes (total)	mg/kg	0.1	50	-	-	3	0	ND	NC	NC	-	ND	-	< 0.1	-	< 0.1	-	< 0.1	-	-	-	-
	d-HCH	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	DDT + DDE + DDD (total)	mg/kg	0.1	240	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Dieldrin	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endosulfan 1	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endosulfan 2	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endosulfan sulphate	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endosulfan (Total)	mg/kg	0.1	270	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endrin	mg/kg	0.1	10	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endrin Aldehyde	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Endrin Ketone	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	g-HCH (Lindane)	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Heptachlor	mg/kg	0.1	6	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Heptachlor epoxide	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Hexachlorobenzene	mg/kg	0.1	10	-	-	3	0	ND	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Methoxychlor	mg/kg	0.2	300	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.05	-	< 0.05	-	< 0.05	-	-	-	-
	Vic EPA IWRG 621 OCP (total)	mg/kg	0.1	-	-	-	3	0	ND	NC	NC	-	ND	-	< 0.1	-	< 0.1	-	< 0.1	-	-	-	-
	Vic EPA IWRG 621 Other OCP (total)	mg/kg	0.2	-	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.1	-	< 0.1	-	< 0.1	-	-	-	-
PCBs	Total PCBs	mg/kg	0.5	1	-	-	3	0	0.0	NC	NC	-	ND	-	< 0.1	-	< 0.1	-	< 0.1	-	-	-	-

General Notes to Table: | - = Not Analysed | BTEX = Benzene, Toluene, Ethylbenzene, and Xylene | OCP = Organochlorine Pesticides | NC = Not Calculated | ND = Non-Detect | NL = Not Limiting | PAH = Polyaromatic Hydrocarbon | | PCBs = Polychlorinated Biphenyls | PQL = Practical Quantification Limit | TRH = Total Recoverable Hydrocarbons | TEQ = Toxicity Equivalence Quotient | UCL = Upper Confidence Limit |

Notes to Statistical Calculations: The average and Standard Deviation are calculated with non-detects replaced with a null (0) proxy value. Where all values are non-detect, a "NC" value is ouputted.

Additional Notes: [1] HIL limits are for Chromium (VI) only, and EIL limits are for Chromium (III) only, total Chromium measured for initial screening [2] Non-detect values are replaced with a proxy value with the proxy value being, Low: 0, Medium: 1/2 PQL, and High: PQL

Value — Highlighted concentration exceeds the site adopted criteria (HIL/HSL)
Value — Highlighted concentration exceeds the site adopted criteria (EIL/ESL)
Value — Highlight concentration exceeds the site adopted criteria (Petroleum Management Limit)
Value — Highlighted concentration exceeds multiple site adopted criterion

		Group	Asbestos		
		Analyte	Asbestos Sample Mass/Dimensions	Asbestos Sample Description	ACM
		Units	-	-	% w/w
		PQL	-	-	0.01
		Health Sceening Level (HSL)	-	-	0.01
	Site Adopted Criteria Residential A				
Sample ID	Reference / Sample Date			# Samples	7
				# Detects	0
				Minimum	ND
				Average	NC
				Standard Deviation	NC
				Maximum	ND
TP01-0.1-0.2	S22-Se0011500 06/09/22		101g	Brown fine-grained soil, charcoal and rocks	< 0.01
TP02-0.2-0.3	S22-Se0011501 06/09/22		116g	Brown fine-grained soil, charcoal and rocks	< 0.01
TP03-0.1-0.2	S22-Se0011502 06/09/22		146g	Brown fine-grained soil, charcoal and rocks	< 0.01
TP04-0.1-0.2	S22-Se0011503 06/09/22		89g	Brown fine-grained soil, charcoal and rocks	< 0.01
TP05-0.1-0.2	S22-Se0011504 06/09/22		114g	Brown fine-grained soil, charcoal and rocks	< 0.01
TP06-0.1-0.2	S22-Se0011505 06/09/22		83g	Brown fine-grained soil, charcoal, glass and rocks	< 0.01
TP07-0.1-0.2	S22-Se0011506 06/09/22		89g	Brown fine-grained soil, charcoal and rocks	< 0.01

General Notes to Table: | - = Not Analysed | ACM = Asbestos Containing Material | AF = Asbestos Fines | FA = Fibrous Asbestos | NC = Not Calculated | ND = Non-Detect |

| NL = Not Limiting |PQL = Practical Quantification Limit

Notes to Statistical Calculations: The Average and Standard Deviation are calculated with non-detects replaced with a null (0) proxy value. Where all values are non-detect, a "NC" value is ouputted.

Value Highlighted concentration exceeds the site adopted criteria (HIL)