Sydney Environmental Group

Addendum Remedial Action Plan

Western Sydney University - Milperra Campus
Horsley Road & Bullecourt Avenue, Milperra NSW

Mirvac Pty Ltd

Report No: 2300-RAP-02-101024.v1f
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EXECUTIVE SUMMARY

Sydney Environmental Group (SE) were engaged by Mirvac Pty Ltd, to prepare a Remedial Action Plan (RAP) for the proposed residential development within the former Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

SE has the following project appreciation:

- The entire site covers an area of approximately 18.83 ha;
- The site is proposed for redevelopment, comprising construction of low-density residential dwellings and associated roadways and infrastructure;
- A Phase 2 Environmental Site Assessment was undertaken within the student residence development area in 2011 by Coffey (Coffey 2011);
- A Soil Contamination Investigation was undertaken across the site by Noel Arnolds and Associates in 2011 (NAA 2011);
- A Preliminary Conamination Screening and Waste Classification Assessment was undertaken across the proposed oval facilitates within the property boundary by Environmental Investigation Services in 2016 (EIS 2016);
- A Phase 1 Environmental Assessment Report was undertaken across the site in 2020 by JBS&G Australia (JBS&G 2020);
- A Detailed Site Investigation was undertaken across the site in 2020 by Alliance Geotechnical in 2020 (AG 2020);
- A Remedial Action Plan was prepared for the site in 2020 by Alliance Geotechnical (AG 2022);
- A Supplementary Stage 2 Detailed Site Investigation was undertaken within portions of the site by SE in 2024 (SE 2024a);
- A Hazardous Building Material Survey was undertaken at the site in 2023 and reported by SE 2024 (SE 2024b); and
- An Remedial Action Plan (RAP) is required to update and compliment the site's existing RAP (AG 2022) and address the remediation and validation of identified Areas of Environmental Concern (AEC) within the site.

The objectives of this project are to:

- Undertake a supplementary contamination assessment 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.

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

- Provision to undertake a supplementary contamination assessment to address data gaps identified in previous contamination assessments;
- An appropriate draft remedial strategy (to be informed by the yet to be completed supplementary contamination assessment) 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.

SE note that this RAP is to be read and actioned in conjunction with the AG 2022 RAP.

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 (COC) which have the potential to be present within the site. The AECs identified are presented in attached **Figure 4** and associated contaminants of concern are presented in **Table 5.1.1.**

Table 1.1.1 AECs and COC

ID	Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC01	Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Friable Asbestos	Soil	Human Health & Aesthetics
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	Uncontrolled Filling	Lead, Cadmium and Zinc	Soil	Human Health and Ecological Health
AEC02	Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Friable Asbestos	Soil	Human Health & Aesthetics
	Non-Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Non-Friable Asbestos	Soil	Human Health & Aesthetics
AEC03	Non-Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Asbestos	Soil	Human Health & Aesthetics

The available site data was assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified potential areas of environmental concern (PAECs) and contaminants of potential concern (COPC) which have the potential to be present within the broader property and the site and require further assessment. The PAECs identified are presented in attached **Figure 3** and associated contaminants of concern are presented in **Table 5.2.1.**

Table 1.1.2 PAECs and COPC

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC04	Underground Storage or Petroleum-Based Product Onsite	Unleaded Petrol & Diesel Tanks	Heavy Metals, TRH, PAH, VOC/SVOC, Phenols	Soil & Groundwater	Human Health, Ecological Health & Aesthetics
AEC05	Soil Materials Beneath Existing Building Footprints	Uncontrolled Demolition/Filling	Heavy Metals, TRH, BTEX, PAH, OCP, Asbestos (0.001%)	Soil	Human Health, Ecological Health & Aesthetics
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	Landfill Activities South of the Site	Methane, Carbon Dioxide, Carbon monoxide, Hydrogen sulphide	Ground Gas	Human Health
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Industrial Activities North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP/OPP, PCB, PFAS, inorganic compounds	Groundwater	Human 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 10.2.1** below.

Table 10.2.1 Approximate Remedial Extents

AEC ID	Area of Environmental Concern	Approximate Extent
AEC01	Friable Asbestos Impacted Fill Soils	Total Area: ≈ 3,315 m^2 x 0.5 m bgsl 1,658 m^3 / 2,985 tonnes
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils (and potentially asbestos)	Total Area: ≈ 1,000 m^2 x 0.25 m bgsl 250 m^3 / 450 tonnes *(Extent of AEC may be altered following supplementary assessment)*
AEC02	Friable Asbestos Impacted Fill Soils	Total Area: ≈ 100 m^2 x 0.5 m bgsl (EBH24, Coffey 2011) Total Area: ≈ 100 m^2 x 0.5 m bgsl (EBH25, Coffey 2011) 170 m^3 / 306 tonnes
	Non-Friable Asbestos Impacted Fill Soils	Total Area: ≈ 10,425 m^2 x 0.5 m bgsl 5,212.5 m^3 / 9,382.5 tonnes
AEC03	Non-Friable Asbestos Impacted Fill Soils	Total Area: ≈ 1,815 m^2 x 0.5 m bgsl 910 m^3 / 1,645 tonnes
AEC04	Underground Storage or Petroleum-Based Product Onsite	*TBC following supplementary assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*TBC following supplementary assessment*
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*TBC following supplementary assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*TBC following supplementary assessment*

Refer to **Figure 3**, 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 9.4.1** below.

Table 9.4.1 Selected Remediation Strategies

AEC ID	Contamination Risk	Selected Remediation Strategy
AEC01	Friable Asbestos Impacted Fill Soils	On-Site Containment and Management OR Excavation and Off-Site Disposal
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	*To be determined following the supplementary contamination assessment*
AEC02	Friable Asbestos Impacted Fill Soils	On-Site Containment and Management OR Excavation and Off-Site Disposal

AEC ID	Contamination Risk	Selected Remediation Strategy
	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use OR Excavation and Off-Site Disposal
AEC03	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use OR Excavation and Off-Site Disposal
AEC04	Underground Storage or Petroleum-Based Product Onsite	*To be determined following the supplementary contamination assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*To be determined following the supplementary contamination assessment*
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*To be determined following the supplementary contamination assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*To be determined following the supplementary contamination assessment*
-	Direct Contact Risks in Soil Materials (*if identified*)	Excavation and Off-Site Disposal
-	Ecological Risks in Soil Materials (only) (*if identified*)	Excavation and Beneficial Re-Use
-	Aesthetic Risks (*if identified*)	Excavation and Off-Site Disposal

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:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan;
- Should newly identified unacceptable land contamination risks be identified during the supplementary assessment and/or remediation works, a revision to this RAP may be required. The revision should 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;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- Following the completion of the remediation and validation work, the environmental consultant needs to prepare a site remediation and validation report that documents both the remediation and validation work as required by the EPA (2020) reporting guidelines.

This report must be read in conjunction with the limitations set out in **Section 15.**

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FIGURES

LIST OF ABBREVIATIONS

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

AHD	Australian Height Datum
AST	Aboveground storage tank
bgs	Below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
Btoc	Below top of casing
CoC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EC	Electrical conductivity
EIL	Ecological Investigation Level
EPA	Environment Protection Authority
HIL	Health Investigation Levels
HSL	Health Screening 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

1. INTRODUCTION

1.1. Background

Sydney Environmental Group (SE) were engaged by Mirvac Pty Ltd, to prepare a Remedial Action Plan (RAP) for the proposed residential development within the former Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

SE has the following project appreciation:

- The entire site covers an area of approximately 18.83 ha;
- The site is proposed for redevelopment, comprising construction of low-density residential dwellings and associated roadways and infrastructure;
- A Phase 2 Environmental Site Assessment was undertaken within the student residence development area in 2011 by Coffey (Coffey 2011);
- A Soil Contamination Investigation was undertaken across the site by Noel Arnolds and Associates in 2011 (NAA 2011);
- A Preliminary Conamination Screening and Waste Classification Assessment was undertaken across the proposed oval facilitates within the property boundary by Environmental Investigation Services in 2016 (EIS 2016);
- A Phase 1 Environmental Assessment Report was undertaken across the site in 2020 by JBS&G Australia (JBS&G 2020);
- A Detailed Site Investigation was undertaken across the site in 2020 by Alliance Geotechnical in 2020 (AG 2020);
- A Remedial Action Plan was prepared for the site in 2020 by Alliance Geotechnical (AG 2022);
- A Supplementary Stage 2 Detailed Site Investigation was undertaken within portions of the site by SE in 2024 (SE 2024a);
- A Hazardous Building Material Survey was undertaken at the site in 2023 and reported by SE 2024 (SE 2024b); and
- A site wide Remedial Action Plan (RAP) is required to update and compliment the site's existing RAP (AG 2022) and address the remediation and validation of identified Areas of Environmental Concern (AEC) within the site.

1.2. Proposed Development

SE understands that the proposed development within the site will comprise demolition of existing campus structures and roadways, and construction of residential infrastructure within a low-density residential land use setting.

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) No. 55 – Remediation of Land*, a consent authority must not consent to the carrying out of any redevelopment unless it has considered whether the land is contaminated.

1.3. Objectives

The objectives of this project are to:

- Undertake a supplementary contamination assessment 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 investigations completed, with the RAP aimed at providing:

- Provision to undertake a supplementary contamination assessment to address data gaps identified in previous contamination assessments;
- An appropriate draft remedial strategy (to be informed by the yet to be completed supplementary contamination assessment) 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.

SE note that this RAP is to be read and actioned in conjunction with the AG 2022 RAP.

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	271 Horsley Road & 2 Bullecourt Avenue, Milperra NSW
Lot and Deposited Plan (DP)	Lot 2 DP1291984
Geographical Coordinates	-33.940603698 S, 150.991352534 E (centre of site)
Site Area	18.83 ha
Current Owner(s) / Occupier(s)	Mirvac Pty Ltd
Local Government Area (LGA)	City of Canterbury-Bankstown
Parish	Bankstown
County	Cumberland
Zoning	R1 General Residential (majority of the site) RE1 Public Recreation (northern, central and southern portions of the site) B1 Neighbourhood Centre (north-eastern portion of the site) C2 Environmental Conservation (north-eastern corner of the site) *Canterbury Bankstown Local Environmental Plan 2023*

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
Geology	A review of the Environment NSW 'eSpade V2.1' web application (environment.nsw.gov.au/eSpade2WebApp, accessed 30 September 2024), indicated that the site is likely to be underlain by Wianamatta Group Ashfield Shale defined as laminite and dark grey siltstone, Bringelly Shale defined as shale with occasional calcareous claystone, laminite and infrequent coal, and Minchinbury Sandstone defined as fine to medium-grained quartz lithic sandstone.
Acid Sulfate Soils	A review of the acid sulfate soil risk mapping layer accessed on the Environment NSW 'eSpade V2.1' web application (accessed 30 September 2024), indicated 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	Generally, the local landscape consists of gently undulating rises on Wianamatta Group Shale with local relief 10 – 30 m and slopes generally >5% but occasionally up to 10%. The site topography slopes downwards from the north-east to south-west corner. SE understands that the site is located at an elevation approximately 3 m to 22 m Australian Height Datum (AHD).
Hydrology and Hydrogeology	Surface water courses proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site. Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the subject area within the site is considered likely to be towards the south-west. A review of the NSW Office of Water groundwater database undertaken on 30 September 2024 indicated there are seven (7) registered groundwater features located within a 500m radius of the north-eastern portion of the site; • GW113993 – groundwater monitoring bore, final drill depth 4.00 metres below ground level (mBGL), standing water level (SWL) not specified, located approximately 105 m east of the site; • GW113998 – groundwater monitoring bore, final drill depth 4.50 mBGL, SWL not specified, located approximately 150 m east of the site; • GW113994 – groundwater monitoring bore, final drill depth 5.20 mBGL, SWL not specified, located approximately 145 m east of the site; • GW113997 – groundwater monitoring bore, final drill depth 12.50 mBGL, SWL not specified, located approximately 240 m east of the site; • GW113999 – groundwater monitoring bore, final drill depth 7.00 mBGL, SWL not specified, located approximately 250 m east of the site; • GW113995 – groundwater monitoring bore, final drill depth 4.00 mBGL, SWL not specified, located approximately 278 m east of the site; and • GW113996 – groundwater monitoring bore, final drill depth 4.00 mBGL, SWL not specified, located approximately 307 m east 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 highly dependent groundwater ecosystem was the Georges River, located approximately 1.3 km south-west of the 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:

- Coffey (Coffey 2011), 'Phase 2 Environmental Site Assessment – Student Residence Development University of Western Sydney, Bankstown Campus', dated 25 August 2011, Ref: GEOTLCOV24163AG-AB;
- Noel Arnolds and Associates (NAA 2011), 'Soil Contamination Investigation, University of Western Sydney – Bankstown Campus Bullecourt Avenue, Milperra NSW', dated October 2011, Ref: SJ0085:95458;
- Environmental Investigation Services (EIS 2016), 'Preliminary Contamination Screening and Waste Classification, Proposed Oval Facilities, UWS Bankstown Campus, 2 Bullecourt Avenue, Milperra' dated 7 April 2016, no report ref provided;
- JBS&G (JBS&G 2018), 'Phase 1 Environmental Assessment Report, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;
- Alliance Geotechnical (AG 2020), 'Detailed Site Investigation, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;
- Alliance Geotechnical (AG 2022), 'Remedial Action Plan, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-2-1;
- Sydney Environmental Group (2024a), 'Supplementary Detailed Site Investigation, Western Sydney University – Milperra Campus, Milperra NSW', dated 22 February 2024, Ref: 2300-DSI-01-220224.v1f; and
- Sydney Environmental Group (2023b), 'Hazardous Building Material Survey, Western Sydney University – Milperra Campus, Milperra NSW', dated 27 February 2024, Ref: 2300-HBMS-01-081123.v1f.

A summary of the previous cotanmination assessments is provided in **Sections 4.1** to **4.8**.

4.1. Phase 2 Environmental Site Assessment (Coffey 2011)

For the purposes of the Phase 2 Environmental Site Assessment (P2 ESA), Coffey assumed the assessment boundary comprised approximately 1.5 ha. At the time of reporting, it was subsequently understood that the proposed student residence development was to extend further to the east and cover an area of approximately 3 ha.

Coffey understood that UWS required a P2 ESA to support a development application (DA) to Bankstown City Council.

The objectives of the assessment were to:

- Assess the acid sulfate soil status of the site based on a review of risk map and field observations;
- Assess the contamination status of the site by undertaking sampling and testing of soil; and
- Provide recommendations for further investigation/remediation requirements (if any) for the site to be suitable for the proposed student accommodation development.

The scope of work undertaken included:

- Fieldwork including soil sampling;
- Laboratory testing; and
- Data assessment and reporting.

Based on the site history information and visual observations, a number of Areas of Environmental Concern (AECs) and Chemicals of Potential Concern (COPCs) were identified. The identified AECs and associated CoPCs are presented in **Table 4.1.1** overleaf.

Table 4.1.1 AECs and associated COPC

Potential Areas of Concern	Chemicals of Potential Concern	Extent of Contamination
Southern end of the site – building rubble burial	TPH, PAH, Metals, Asbestos	Building rubble was buried up to 3 m to 4 m below the site surface.
Former farm dam – potential contaminated fill	TPH, BTEX, PAH, OCP, Metals, Asbestos	Potentially contaminated fill could have been used to backfill the dam
Whole site – use of pesticides for pest/weed control	OCP, Metals	Chemical application (such as pesticides) was commonly used in historical farming activities. Contamination, if present, is likely to be localised near the surface and minor.
Whole site – hazardous building materials	Asbestos, Lead	Historical fam sheds/houses could contain asbestos and lead paint. Weathering, leaching and spreading (during demolition) of material would likely to be localised in the near surface.
Existing Building Footprints (inaccessible)	Uncontrolled Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos

A total of twenty-five (25) boreholes were cored across the site on 11 and 12 July 2011, and samples submitted to a NATA accredited laboratory for analysis of CoPC.

Analytical results indicated the contaminant concentrations were less than the adopted site criteria, with the exception of:

- Asbestos, which was detected at six (6) locations across the site.

Coffey recommended additional assessment to be undertaken to further characterise the asbestos impact and to assist in the selection of remedial/management options.

4.2. Soil Contamination Investigation (NAA 2011)

NAA was commissioned by JDH Architects to undertake a Soil Contamination Investigation (SCI) in an area in the northeast of the Bankstown Campus at the University of Western Sydney - Bankstown Campus located at Bullecourt Avenue, Milperra NSW. The portion of the site investigated in NAA (2011) was approximately 2,500 m^2 in area and resided to the north of the existing P2 car park at the Bankstown Campus. The proposed redevelopment comprised construction of a single storey childcare facility with adjacent car parking facilities.

The objectives of the SCI were to provide information on the extent and nature of contamination (if any) within the fill/soil material at the site and to assess the suitability of the site for the proposed land-use as a childcare facility.

NAA undertook the following scope of works to achieve the project objectives:

- Prepare a safe work method statement for works to be conducted at the site;
- Complete a site inspection and a comprehensive site walkover;
- Conduct grid-based sampling pattern by the hand augering of eight locations within the boundaries of the site. Hand augering was undertaken to a maximum depth of approximately 1.2 m below ground surface with sampling conducted at varying depths through the fill/soil profile;
- Collect seventeen (17) soil samples;
- Conduct NATA-certified laboratory-based analysis of soil; and
- Prepare a SCI report.

Based on the findings of the investigation, NAA concluded the following:

- Hotspots of lead contamination at locations BH3 0.0-0.2 m and S2 0.0-0.1 m were identified during an intrusive investigation previously undertaken by Coffey (AG were not provided this report);
- Concentrations of cadmium (BH3 0.0-0.2 m) and zinc (BH3 0.0-0.2 m, S2 0.0-0.1 m and S7 0.0-0.1 m) have been found to exceed the adopted Provisional Phytotoxicity Investigation Levels (PPIL);
- The site was unsuitable for the proposed land use as a childcare facility due to the presence of hotspots of lead contamination which may present a risk to human health if not appropriately managed;
- Exceedances of PPILs have also been reported at these locations and can be addressed as part of the management of the lead hotspots; and
- A marginal exceedance of zinc concentrations when compared with the PPIL was recorded at S7 0.0-0.1 m. Given the marginal nature of this exceedance, it does not impact upon the suitability of the site for the proposal land use as a childcare facility.

Based on these conclusions, NAA 2011 made the following recommendations:

- Given the shallow nature of the impacted material, it was assumed that this material will be excavated and removed from site during the course of site preparation works (e.g. stripping back of topsoil material) for the purposes of redevelopment;
- Fill/soils to be removed offsite for disposal should be classified in accordance with NSW EPA Waste Classification Guidelines (2014) and should be disposed of at an appropriately licenced landfill facility;
- Following site preparation works, a suitably qualified Environmental Consultant should return to site to collect validation samples of the area of concern (in vicinity of BH3, S2 and S7) in order to confirm acceptable residual concentrations of heavy metals are present with respect to the adopted HIL and PPIL and that the site is suitable for the intended land use; and
- If it is determined that site preparation works will not result in the excavation and removal of the shallow material at BH3 0.0-0.2 m and S2 0.0-0.1 m, remediation works will be required. In this event, it is recommended that a Remedial Action Plan (RAP) be developed to address remediation of the hotspots of contamination identified.

4.3. Preliminary Contamination Screening and Waste Classification (EIS 2016)

Burtenshaw Scoufis Architecture + Interiors commissioned Environmental Investigation Services (EIS) to assign a waste classification to in-situ soil adjacent to the west of the athletics track located at 2 Bullecourt Avenue, Milperra NSW.

The aim of the investigation was to assess soil contamination issues at the site and to provide a waste classification for the material to be excavated for the proposed oval development.

The scope of work included the following:

- Review of available geological information;
- Soil sampling from three boreholes;
- Interpretation of the analytical results against the adopted Site Assessment Criteria (SAC); and
- Preparation of a letter report presenting the results of the investigation.

All results were below the site assessment criteria (SAC) adopted for the site. Overlying fill soils were classified as General Solid Waste (Non-putrescible) and underlying natural soils were classified as Virgin Excavated Natural Material (VENM). Based on this data, EIS concluded that the risk of widespread significant soil contamination in the development area was relatively low. The fill and natural soil material assessed was considered by EIS to be suitable for re-use on the subject site, provided it meets geotechnical and earthwork requirements.

4.4. Phase 1 Environmental Assessment Report (JBS&G 2018)

JBS&G Australia Pty Ltd (JBS&G) were engaged by Western Sydney University (WSU) (the client) to prepare a Phase 1 Environmental Assessment Report for the WSU Milperra Campus located off Bullecourt Avenue, Milperra NSW. Based on current Master Plan concepts for the Milperra Campus, JBS&G understood WSU intended to

create an integrated living and working precinct with a range of land uses including medium to high density residential, mixed use, retail, community, open space and conservation areas at the site.

The objective of the investigation was to assess the potential for contamination relating to historical and current land use activities at the site to constrain the intended development objectives, and to make recommendations for further investigations and or remediation to achieve intended land uses of the development.

To meet the project objectives, JBS&G carried out the following scope of works:

- Review of available council documentation, aerial photographs, legal title information, EPA records and heritage records to identify areas of environmental concern (AECs) and associated contaminants of potential concern (CoPC);
- Review of site setting including topography, hydrology, hydrogeology and geology;
- Review of records of environmental incidents or former environmental licenses held by the NSW EPA;
- A detailed site inspection of accessible areas to identify potential AECs and CoPC not identified in the historical record review;
- Development and documentation of a conceptual site model (CSM);
- Limited soil sampling and analysis of soil samples for a range of CoPC;
- Assessment of soil sampling and analysis results against EPA endorsed guideline criteria for residential land use; and
- Preparation of the Phase 1 Environmental Site Assessment report in general accordance with guidelines made or approved by the NSW EPA.

Surrounding land use at the time of JBS&Gs site walk over was comprised of the following:

- North: Bullecourt Avenue with commercial / industrial land-use beyond including a service station to the north-west;
- East: Mount Saint Joseph's High School and Horsley Road with commercial / industrial land-use beyond;
- South: The South Western Motorway (M5) with Kelso Landfill beyond; and
- West: Ashford Avenue with residential land-use beyond.

A SafeWork NSW search of the Stored Chemical Information Database (SCID) and the microfiche records held by SafeWork was requested. Information provided by SafeWork NSW included details on a number of abandoned (2) underground storage tanks (USTs) formerly located in the central eastern section of the site. Review of the SafeWork NSW documentation indicated the 2 x 2,500L USTs were removed on Friday 19 December 1997 by Email Petroleum Systems.

Based on site history review and observations during the site walkover, JBS&G identified the following AEC and associated CoPC presented in **Table 4.4.1** below.

Table 4.4.1 AECs and associated COPCs

Areas of Environmental Concern (AECs)	Contaminants of Potential Concern (CoPCs)
Demolition of historical site structure that may have contained hazardous building materials	Heavy metals, lead and asbestos
Surface soils impacted with herbicides/pesticides due to the maintenance of site from noxious weeds/pests	OCPs
Fill materials across the site, potential imported to site	Heavy metals, TRH, BTEX, PAH, OCPs, PCBs and asbestos
Burial area (fill material)	Heavy metals, TRH, BTEX, PAH, VOCs
Landfill gas along the southern boundary adjacent the Kelso Landfill	Methane and other landfill gases (LFG)

Based on the unidentified sources of fill material potentially imported to the site to backfill/raise topographic features and the potential for fill material at the site to contain waste materials associated with demolition of historical buildings potentially containing asbestos and/or lead paint, fill materials must be considered a potential contaminated medium. Due to the age of some existing site structures, it is possible that they may contain hazardous building materials including asbestos and lead based paints. Soils immediately surrounding buildings are considered as potentially contaminated medium.

In addition, buildings containing asbestos and / or lead paint which may have been demolished without appropriate controls may have also impacted surface soils. Surface soils must also therefore be considered a potential contaminated medium.

Based on the suspected depth of groundwater >8 m bgs, the likelihood of contamination of groundwater as a result of activities at the site is considered to be low. Based on the presence of the landfill site to the south and the nearby commercial/industrial properties to the north and east, there is potential for groundwater to be impacted as a result of offsite activities.

Given the relatively close proximity of the landfill to the south of the site, landfill gas has the potential to be a contaminated medium in the southern portion of the site.

JBS&G carried out a limited detailed site inspection and investigation. During the detailed site inspection JBS&G noted the observation of topography for potential adjustments in ground levels due to filling, presence of waste material such as asbestos containing material (ACM) on the ground surface and on external surfaces of structures and potential chemical/fuel storage, use or spillage.

On 23 August 2017, ten (10) surface samples were collected from the site using a hand auger and forwarded to a NATA accredited laboratory for analysis of heavy metals, PAH, asbestos (NEPM 500ml) and OCPs. During soil sampling, a geotechnical fabric layer was identified below the ground surface at sampling point SS10.

Analytical results indicated the contaminant concentrations were less than the adopted site criteria, with the exception of:

- SS10 – asbestos fibres/fibrous asbestos (AF/FA) detected at 0.02% w/w above the adopted HSL site criteria 0.001% w/w.

Based on the findings of this investigation, JBS&G made the following conclusions:

- The site has historically been used for a combination of agricultural and residential uses prior to development of the university;
- There is the potential for impacts to soil as a result of the demolition of former building structures potentially containing hazardous building materials, including asbestos and lead paint. This was confirmed by the identification of asbestos at sampling point SS10 and review of the Coffey 2011 Phase 2 Environmental Site Assessment Report, which also identified and recommended management of asbestos in soil;
- There is the potential for presence of imported fill material of unknown origin to have been used during historical construction activities at the site; and
- Based on the presence of the landfill site to the south and the nearby commercial industrial properties to the north, northwest and east, there is considered to be a potential for contaminated groundwater and landfill gas migration to have impacted the site.

Based on these conclusions, JBS&G recommended a detailed site investigation (DSI) is undertaken for the site in order to assess the extent and degree of contamination at the site and to provide an assessment of risk posed by site contaminants to human and environmental health. In addition to the DSI, JBS&G recommended a hazardous building material survey be completed prior to commencement of redevelopment works such that materials identified as comprising lead paint and or asbestos may be appropriately managed with regard to exposure risks to site workers and future building occupants.

4.5. Detailed Site Investigation (AG 2020)

Alliance Geotechnical Pty Ltd (AG) was engaged by Mirvac Pty Ltd to conduct a Stage 2 Detailed Site Investigation (DSI) for the site located at Western Sydney University – Milperra Campus, Milperra NSW.

AG had the following project appreciation:

- The site was an active campus of Western Sydney University;
- The investigation was limited to areas outside of building structures and discretion was required in active areas of the site;
- The site was proposed for rezoning and subdivision to facilitate residential development. It was understood that this will comprise demolition of the existing university campus and construction of a low-density residential development; and
- A Detailed Site Investigation was required to accompany the development application.

The primary objectives of this investigation were;

- To assess the potential for contamination to be present on the site in available / accessible areas as a result of past and current land use activities;
- To provide advice on whether the site would be suitable (in the context of land contamination) for the proposed land use setting; and
- To provide recommendations for further investigation, management and/or remediation (if warranted).

AG 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;
- Conduct an intrusive site investigation via hydraulic excavator, drill rig and hand auger to establish ground conditions, facilitate the collection of representative soil and groundwater samples and install groundwater monitoring wells;
- Laboratory analysis of selected soil and groundwater samples collected during the field investigation; and
- An assessment of the contamination status of the site and preparation of a DSI in accordance with the Guidelines for Consultants Reporting on Contaminated Sites, 2011.

Based on evidence assessed as part of the investigation, AG made the following conclusions;

- The detected concentrations of contaminants of potential concern in groundwater are considered unlikely to present a risk to surrounding aquatic environments;
- The detected concentrations of contaminants of potential concern in groundwater are considered unsuitable for discharge to municipal stormwater without further treatment / assessment;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable direct contact human health exposure risk;
- The detected concentrations of asbestos fines / friable asbestos and non-friable asbestos containing materials in the soil samples analysed are considered likely to present a risk an unacceptable direct contact human health exposure risk;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable inhalation / vapour intrusion exposure risk;
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable TPH management limit exposure risk; and
- The detected concentrations of contaminants of potential concern in the soil samples analysed are considered unlikely to present a risk an unacceptable aesthetic risk.

The following areas of environmental concern were identified:

Table 4.5.1 Areas of Environmental Concern (AG 2020)

ID	Area of Environmental Concern	Land Use Activity	Contaminants of Potential Concern
AEC01	Friable / Non-Friable Asbestos and Heavy Metal impacted Surficial and Fill Soils	Uncontrolled Filling	Asbestos, Lead, Cadmium and Zinc
AEC02	Friable Asbestos impacted Fill Soils	Uncontrolled Filling	Asbestos
AEC03	Non-Friable Asbestos impacted Surficial and Fill Soils	Uncontrolled Filling	Asbestos
AEC04	Potential Underground Storage of Petroleum Products Onsite (JBS&G 2018)	Uncontrolled Fuel / Oil Spillage	Metals, PAH, BTEX and TRH
AEC05	Existing Building Footprints (inaccessible)	Uncontrolled Filling	Metals, PAH, BTEX, TRH, PCB, OCP/OPP, Phenols and Asbestos

Based upon conclusions made, AG recommended the following;

- A further supplementary contamination assessment should be considered to further understanding of nature and extent of contamination identified onsite and address data gaps presented by building footprints, inaccessible areas and building footprints;
- Preparation of a Remedial Action Plan (RAP) is required to detail the works needed to adequately delineate, remediate and validate the areas of concern that present an unacceptable contamination risk;
- If groundwater is expected to be encountered during the proposed development, a groundwater management plan would be required;
- The preparation of any supplementary contamination assessments, remedial action plans and/or groundwater management plans should be completed by an appropriately experienced environmental consultant;
- As per NSW WHS Regulations, any removal of friable asbestos requires the engagement of a Class A licensed asbestos removalist and a pre-notification to SafeWork NSW, with accompanying air monitoring during the works and clearances post completion to be conducted by a licensed asbestos assessor (LAA);
- Following remediation of the identified contamination, validation sampling and a site validation report will be required to confirm the effectiveness of the remedial works; and
- Any soil proposed for disposal should be classified and disposed of as per the NSW EPA Waste Classification Guidelines, 2014 with all disposal documentation retained by the client for inclusion within the site validation report.

4.6. Remedial Action Plan (AG 2022)

Alliance Geotechnical Pty Ltd (AG) was engaged by Mirvac Pty Ltd to prepare a Remedial Action Plan (RAP) for the site located at Western Sydney University – Milperra Campus, Milperra NSW.

AG had the following project appreciation:

- The site was an active campus of Western Sydney University;
- The investigation was limited to areas outside of building structures and discretion was required in active areas of the site;
- The property was understood to be proposed for rezoning and subdivision to facilitate residential development. It was understood that this will comprise demolition of the existing university campus and construction of a low-density residential development; and

- A Detailed Site Investigation (DSI) was carried out for the site by AG in 2020, which recommended a supplementary contamination assessment to understand the nature and extent of contamination identified onsite and address data gaps presented by building footprints, previous contamination assessments and inaccessible areas of environmental concern; and
- The DSI also concluded that a RAP be prepared in order to detail the works needed to adequately delineate, remediate and validate the areas of concern that present an unacceptable contamination assessment.

The following Sampling Analysis Quality Plan (SAQP) was prepared for the data gap assessment required prior to remediation works.

Table 4.6.1 Data Gap Assessment SAQP (AG 2022)

ID	Area of Environmental Concern	Area (m^2)	Methodology	Analytes
Detailed Asbestos Gravimetric Assessment				
AEC01	Friable / Non-Friable Asbestos impacted Surficial and Fill Soils	12,800	Forty-six (46) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
AEC02	Friable Asbestos impacted Fill Soils	17,100	Fifty-four (54) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
AEC03	Non-Friable Asbestos impacted Surficial and Fill Soils	18,240	Eighty-four (84) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
Remaining areas of site	Potential Asbestos impacted Soils	80,000	Forty-seven (47) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Asbestos
Heavy Metal / Asbestos Gravimetric Assessment				
AEC01a	Heavy Metal impacted Surficial and Fill Soils	1,000	Six (6) sampling points, 10 L sample required every 1 m from surface, 500 ml sub-sample for quantitative asbestos analysis.	Lead, Cadmium and Zinc
Chemical Characterisation / Asbestos Gravimetric Assessment				
AEC05	Post Demolition Assessment	37,000		

Based on the data reviewed during the preparation of the RAP, AG concluded the land could be made suitable for the proposed future land use subject to completion of the following;

- Preparation of a SAQP prior to commencement of data gap assessment;
- Implementation of the strategies, methodologies and measures set out in this RAP;
- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum to this RAP may be required. The addendum should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, waste classification for those soils should be prepared by a suitably experienced environmental consultant. Residual impacted fill materials must also be appropriately characterised as per the strategy outlined in this RAP;

- AG recommends that any waste classifications, remediation monitoring and validation works be undertaken by a suitably experienced environmental consultant;
- It is recognised that contamination risks may remain on the site. If so, a LT-EMP will document areas where residual contamination is present on the site, and information on management measures that have been adopted. Provisions contained in the LT-EMP will need to have a mechanism to be legally enforceable and will be publicly notified. A revised RAP will be prepared to document where and how management measures will be implemented, and how a LTEMP can be made legally enforceable.

4.7. Supplementary Detailed Site Investigation (SE 2024a)

Sydney Environmental Group (SE) was engaged by Mirvac Pty Ltd (the client), to undertake a Supplementary Detailed Site Investigation within portions of the site located at Western Sydney University – Milperra Campus, Milperra NSW.

SE had the following project appreciation:

- The entirety of the property covers an area of approximately 18.83 ha;
- The site currently comprises of infrastructure with residential and education establishment purposes;
- The site proposed for redevelopment comprising a low-density residential land use setting;
- Historically the site has been utilised for agricultural activities with rural-residential structures;
- A Detailed Site Investigation (DSI) was carried out for the site in December 2019 and January 2020 by Alliance Geotechnical (AG), which identified five (5) areas of environmental concern;
- A Remedial Action Plan (RAP) was prepared for the site by AG in January 2020, which identified four (4) data gaps requiring further assessment; and
- A Supplementary Detailed Site Investigation is required to address data gaps identified within AG 2022.

The objectives of the project were to:

- Assess the potential for contamination to be present within the cleared portion of 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 proposed land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

SE undertook the following scope of works to achieve the project objective:

- Review of the previous contamination assessment prepared for the site;
- The preparation of a Sampling and Analysis Quality Plan (SAQP);
- Laboratory analysis of selected samples collected during the field investigation; and
- An assessment of the contamination status of the fill materials within 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 made the following conclusions:

- AEC01a was not accessible at the time of this data gap assessment and requires assessment within a future assessment prior to the start of remediation works;
- Friable Asbestos Containing Materials (ACM) were identified within AEC01 during this assessment and previous contamination assessments undertaken;
- Friable and Non-Friable Asbestos Containing Materials (ACM) were identified within AEC02 during this assessment and previous contamination assessments undertaken;
- Non-Friable Asbestos Containing Materials (ACM) were identified within AEC03 during this assessment and previous contamination assessments undertaken;
- Surficial asbestos identified within all three (3) AECs assessed currently present an unacceptable aesthetics risk and require further management/remediation;

- Based on the assessments undertaken as part of this investigation, SE has concluded that the site has friable and non-friable asbestos impacted soil materials requiring remediation and further management; and
- An addendum to the existing Remedial Action Plan (AG 2022) is required to outline the remediation methodologies required to remediate the newly identified extents of contamination identified.

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

- An addendum to the existing Remedial Action Plan prepared by AG (2022) is required to outline the remediation methodologies required to remediate the newly identified extents of asbestos contamination identified.
- Following removal of hazardous building materials (if identified) and subsequent demolition of the onsite structures, a clearance inspection should be carried out by an appropriately qualified occupational hygienist / NSW LAA;
- A supplementary contamination assessment is required within AEC01a prior to the start of remedial works at the site;
- Additional contamination assessments are required to be undertaken per the site RAP (AG 2022) prior to the start of remediation works at the site; 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).

4.8. Hazardous Building Material Survey (SE 2024b)

Sydney Environmental Group Pty Ltd (SE) was engaged by Mirvac Pty Ltd (the client), to undertake a Hazardous Building Materials Survey of structures located within the Western Sydney University – Bankstown Campus, Milperra NSW prior to the commencement of demolition works.

SE had the following appreciation:

- The structures within the site are proposed for demolition; and
- A hazardous building material survey is required prior to demolition works to identify and document hazardous building materials within the structures situated within the site.

The objectives of the investigation were to:

- Identify hazardous building materials (HBM) within accessible areas of the structures on site;
- Provide a qualitative risk assessment of the hazardous building materials identified (if any);
- Provide recommendations on control measures and strategies for removal; and
- Prepare a Hazardous Materials Register for the site to ensure legislative compliance.

The scope of works undertaken to address the investigation objectives, included:

- Fieldwork, including investigation of subject areas;
- Collection of suspect hazardous building materials;
- Analysis of suspected hazardous building materials samples by a NATA accredited laboratory;
- Provide recommendations for the removal of hazardous building materials where identified; and
- Prepare a Hazardous Building Materials Register for the site, detailing location and type of HBMS present within the site.

For the report, HBM were limited to the following:

- Asbestos Containing Materials (ACM);
- Lead Containing Paint (LCP);
- Lead Containing Dust (LCD);
- Polychlorinated Biphenyls (PCBs);

- Synthetic Mineral Fibres (SMF); and
- Ozone Depleting Substances (ODS).

Table 4.8.1 Summary of Hazardous Building Materials Identified

Item	Areas Identified
Asbestos Containing Materials (ACM)	The following were inaccessible at the time of investigation for safety reasons and must be presumed to contain asbestos containing materials until further assessment is undertaken: • Building 05, exterior, white fibre cement panelling, asbestos containing fibre cement panelling; and • Buildings 01-05, 7-12, 20-24 interior, electrical distribution boxes, presumed non-friable asbestos containing fibre cement insulation board.
Lead Containing Paint (LCP)	LCP was identified, presumed, or suspected to be present on site withing the following locations: • Site-wide, exterior and interior, fire sprinkler system, lead based red paint system, 0.19% w/w; • Building 01 - room G.157, interior, railing, lead based white paint system, 0.14% w/w; • Building 01 - room G.157, interior, doorframes, lead based red paint system, 04% w/w; and • Building 05, exterior, beams, lead based yellow paint system, 1.1% w/w. All detected led were observed to be in good condition and low concentrations (< 2% w/w) and can be disposed of as general solid waste with no management required.
Lead Containing Dust (LCD)	No LCD was identified, presumed, or suspected to be present within the site
Polychlorinated Biphenyls (PCB)	All fluorescent light fittings are presumed to contain PCB capacitors. Any refurbishment works are to be undertaken by trained and licensed electricians. Fluorescent capacitors should be disposed of separately.
Synthetic Mineral Fibres (SMF)	SMF was identified, presumed, or suspected to be present on site withing the following locations: • Buildings 01-05, 7-12, 14, 20-24, fire door inner core, SMF detected; • Buildings 01-05, 7-12, 14, 20-24, air conditioning units, presumed to contain SMF insultation; and • Buildings 01-05, 7-12, 14, 20-24, hot water system, presumed to contain SMF insulation.
Ozone Depleting Substances (ODS)	All air conditioning units are presumed to contain ODS. Any refurbishment or removal works are to be undertaken by trained refrigerant technicians.

5. 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 (COC) which have the potential to be present within and the site. The AECs identified are presented in attached **Figure 4** and associated contaminants of concern are presented in **Table 5.1.1.**

Table 5.1.1 AECs and COC

ID	Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC01	Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Friable Asbestos	Soil	Human Health & Aesthetics
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	Uncontrolled Filling	Lead, Cadmium and Zinc	Soil	Human Health and Ecological Health
AEC02	Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Friable Asbestos	Soil	Human Health & Aesthetics
	Non-Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Non-Friable Asbestos	Soil	Human Health & Aesthetics
AEC03	Non-Friable Asbestos Impacted Fill Soils	Uncontrolled Filling	Asbestos	Soil	Human Health & Aesthetics

The potential contamination pathways are considered to be as follows:

- Inhalation/ingestion of contaminants released in dust during future development by site workers; and
- Inhalation of contaminants during future use by site occupiers.

Relevant potential receptors are considered to include:

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

5.2. Potential 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 potential areas of environmental concern (PAECs) and contaminants of potential concern (COPC) which have the potential to be present within the broader property and the site and require further assessment. The PAECs identified are presented in attached **Figure 4** and associated contaminants of concern are presented in **Table 5.2.1.**

Table 5.2.1 PAECs and COPC

ID	Potential Area of Environmental Concern	Source	Contaminants of Concern	Affected mediums	Exposure risk
AEC04	Underground Storage or Petroleum-Based Product Onsite	Unleaded Petrol & Diesel Tanks	Heavy Metals, TRH, PAH, VOC/SVOC, Phenols	Soil & Groundwater	Human Health, Ecological Health & Aesthetics
AEC05	Soil Materials Beneath Existing Building Footprints	Uncontrolled Demolition/Filling	Heavy Metals, TRH, BTEX, PAH, OCP, Asbestos (0.001%)	Soil	Human Health, Ecological Health & Aesthetics
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	Landfill Activities South of the Site	Methane, Carbon Dioxide, Carbon monoxide, Hydrogen sulphide	Ground Gas	Human Health
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Industrial Activities North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP/OPP, PCB, PFAS, inorganic compounds	Groundwater	Human Health

5.3. Land Use Setting

SE understands that the site currently utilised as an educational establishment with on-site residential facilities. The site is proposed for demolition and redevelopment within a low-density residential land use setting.

As the proposed future site use is redevelopment under a low-density residential land use setting, SE considers it reasonable to adopt the 'HIL A – Low-Density Residential' per guidance provided in Section 2.2 of Schedule B (1) of the National Environment Protection Measure (Assessment of Site Contamination) 2013 (NEPM ASC 2013), in order to conservatively assess the site for any future proposed land use as well as the current land use.

5.4. Direct Contact – Human Health

SE understand that the site is proposed for development of low-density residential dwellings, associated roadways and infrastructure. SE further notes that demolition of structures within the site and importation of filling materials may complete a direct contact exposure pathway for residential receptors.

Known direct contact human health exposure risks are present within AEC01a requiring further assessment prior to the start of remedial works within a future stage of the project. A supplementary contamination assessment is required beneath the existing building footprints following demolition works. As such, further consideration of this value is required.

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.

5.5. 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 were observed immediately south and north/north-east of the site, associated with landfill activities to the south and industrial land use activities to the north/north-east of the site. A supplementary groundwater assessment will be undertaken at the site to further assess these sources.

Potential sources of vapour intrusion were observed within the western portion of the site, associated with former petroleum and diesel underground storage tanks that are understood to have been removed from the site, landfill activities south of the site and industrial land uses to the north/north-east of the site. As such, further vapour intrusion assessment is warranted.

Asbestos containing materials are also understood to be present across the site footprint, requiring remediation and as such, further inhalation human health consideration is warranted during the remedial and validation works at the site.

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.

5.6. 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.

Further consideration of this value is warranted with respect to the former petroleum underground storage tank assessment and in the event any unexpected finds are encountered as part of this assessment.

5.7. Aesthetics

Section 3.7 of Schedule B1 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.

As demolition works are yet to occur at the site and asbestos containing materials are understood to be present within the site, further consideration to aesthetics management is warranted.

5.8. 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 understand that the proposed development would include a residential subdivision with comprising construction of low-density residential dwellings, associated roadways and infrastructure. The rest of the site would generally consist of open space and landscaped areas. In these areas, it is considered that an ecological 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.

5.9. Drinking Water Use

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 down-gradient of the site, registered for drinking water use. It is noted that a reticulated mains potable water supply is available in the area. No further consideration of this value is deemed necessary as drinking water will not be sourced from the site as part of the future redevelopment plans.

5.10. Recreational Water Use

Surface water courses within and proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site.

Based on observations, it is considered unlikely that surface water courses within close proximity to the site would be used recreationally for swimming, fishing, consumption, or water sports. Potential receptors of groundwater extraction and subsequent recreational use as part of irrigation systems may include future residents, maintenance workers, and ecological receptors.

There is a potential, albeit low, that the usage of groundwater within the site, would be utilised for irrigation across the site footprint following redevelopment and as such, further consideration of this value may be warranted pending the findings of the supplementary contamination assessment.

5.11. Aquatic Ecosystems

Surface water courses within and proximal to the site include an unnamed tributary of Kelso Creek, located approximately 300 m south of the site, Kelso Creek located approximately 600 m south of the site, and Georges River located approximately 1.3 km south-west of the site.

Based on the observations made by AG (2022) and SE (SE 2024), there is a moderate potential for groundwater contamination at the site, related to surrounding landfill and/or industrial activities. Further consideration of this value may be required pending the findings of a supplementary contamination to be undertaken.

6. SITE ASSESSMENT AND REMEDIATION ACCEPTANCE CRITERIA

6.1. 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, a summary of the assessment criteria adopted for this project are presented in **Table 6.1.1** below.

Table 6.1.1 Assessment Criteria

AEC ID	Risk	Criteria	Reference
AEC01a **AEC04** **AEC05** **AEC07**	Human Health Direct Contact	HIL A – Residential	Table 1A(1) in NEPC (2013) Table B4 in Friebel, E & Nadebaum P (2011) Table 2 in HEPA (2020)
AEC04 **AEC05** **AEC06** **AEC07**	Human Health Inhalation/Intrusion	HSL A – Residential	Table 1A(2) in NEPC (2013) Table 1A(3) in NEPC (2013) Table 1A(4) in NEPC (2013) Table 1A(5) in NEPC (2013)
AEC01 **AEC02** **AEC03** **AEC05**	Human Health (Asbestos)	HSL A – Residential	Table 7 in NEPC (2013)
AEC01 **AEC02** **AEC03** **AEC04** **AEC05**	Aesthetics	Residential	Characteristics and processes in Section 3.6.2 and 3.6.3 in NEPC (2013)
AEC01a **AEC04** **AEC05**	Soil – Ecological	Urban residential / public open space	Table 1B(1) in NEPC (2013) Table 1B(2) in NEPC (2013) Table 1B(3) in NEPC (2013) Table 1B(4) in NEPC (2013) Table 1B(5) in NEPC (2013) Table 1B(6) in NEPC (2013)
AEC04 **AEC05**	Management Limits (petroleum hydrocarbons)	Residential, parkland and public open space	Table 1B(7) in NEPC (2013)
AEC04 **AEC06** **AEC07**	Ground Gas	-	Section 3.6.2 in NSW EPA (2020a)

7. SUPPLEMENTARY CONTAMINATION ASSESSMENT

In light of data-gaps identified within AG (2022) and SE (2024), 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.

7.1. Objectives and Scope of Work

The objectives of the DSI are to:

- Assess data-gaps identified in previous contamination assessments undertaken for the site (AG 2022 & SE 2024);
- Undertake an intrusive site investigation to facilitate the collection of representative soil samples;
- Undertake an intrusive site investigation to facilitate the installation of groundwater monitoring wells and collection of representative groundwater samples;
- Undertake an intrusive site investigation to facilitate the installation of ground gas monitoring wells and collection of representative ground gas 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;
- Provide updated advice to inform this RAP and detail any further investigation, management and/or remediation (if warranted);

7.2. Site Assessment Criteria

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section** Error! Reference source not found. of this project, the assessment criteria within **Section 6** h ave been adopted for this project.

8. 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 8.1** to **8.7** of this report.

8.1. 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 within 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.

8.2. 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 isolated 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?

8.3. 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.

8.4. 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.

8.5. 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.

8.5.1 Rinsate Blank

One rinsate blank sample will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable equipment is used during the sampling works. Rinsate blank samples will be analysed for at least one of the analytes that the parent sample is being scheduled for analysis for (with the exception of asbestos).

8.5.2 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}).

8.5.3 Intra-Laboratory and Inter-Laboratory Duplicates

Intra-laboratory and inter-laboratory field duplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates 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 relevant percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate will be calculated.

8.5.4 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.

8.5.5 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 7.2**), 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.

8.6. 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 8.6.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 8.4**	Critical samples analysed according to DQO	Refer **Section 8.7.2**
Critical samples collected	Refer **Section 8.4**	Analytes analysed according to DQO	Refer **Section 8.7.2**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 8.7.2**
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 8.7.12**
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 8.7.2**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 8.7.2**
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 8.7.12**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 8.4**	Samples analysed according to SAQP	Refer **Section 8.7.2**
Media identified in SAQP sampled	Refer **Section 8.4**	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 blanks	Analyte concern <LOR None collected for asbestos.	Nil	No exceedances of acceptance criteria
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

8.7. 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.

8.7.1 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 4**.

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 8.7.1** below.

Table 8.7.1 Supplementary Contamination Assessment Methodology

AEC	Contamination Risk	Supplementary Contamination Assessment Methodology
AEC01a	Fill Materials impacted by lead, cadmium and zinc with the potential for asbestos containing materials to be present.	Six (6) test pits are to be advanced by an excavator to facilitate the collection of six (6) 10L samples screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos. Sampling is to be undertaken every 1 m vertically, starting with the top 100 mm of soil and extending 0.3 m into natural materials. A grid-based walkover across the AEC footprint, to assess whether the top 100 mm of soil is visually free of asbestos is to be undertaken.

AEC	Contamination Risk	Supplementary Contamination Assessment Methodology
AEC04	Soil and groundwater potentially impacted by formerly decommissioned and removed underground storage tanks	Six (6) boreholes are to be advanced by a track-mounted drill rig to facilitate the collection of discrete soil samples, with two (2) boreholes to be advanced to groundwater to facilitate the installation of groundwater monitoring wells. Soil samples are to be collected from near surface and at ~0.5 m intervals within the soil profile or with changes in strata. Boreholes will be advanced to a maximum 4 m bgsl or 0.3 m into natural materials (whichever occurs first). Boreholes utilised for groundwater monitoring well installation are to be advanced to a target depth of 6 m bgsl, 2 m below inferred standing water level or practical refusal (whichever occurs first).
AEC05	Soil materials beneath building footprints that have not yet been assessed	Following demolition works at the site, a total of forty-seven (47) test pits are to be advanced across existing building footprints within the site via excavator. Test pits are to be advanced 0.3 m into natural materials and samples are to be collected from near surface and at ~0.5 m intervals within the soil profile or with changes in strata. To assess for asbestos, collection of one (1) 10L samples screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos are to be collected from each test pit, totalling forty-seven (47).
AEC06	Hazardous ground gas migration from the adjacent Kelso landfill	Two (2) ground gas monitoring wells are to be installed along the southern boundary of the site via track-mounted drill rig. The wells are to be installed to depths ranging 3.5 – 6.0 m bgsl depending upon the gauged depth to groundwater, as detected in existing MW02 and MW03 prior to installation.
AEC07	Groundwater impacted by adjacent industrial land uses north and north-east of the site	Re-development and sampling of the existing groundwater monitoring wells at the site (MW01-MW08) will be undertaken. If groundwater wells MW06 and MW07 are observed to be dry during the sampling event, additional groundwater monitoring wells may need to be installed.

8.7.2 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.

8.7.3 Groundwater Monitoring Well Installation Methodology

Groundwater monitoring wells are to be advanced to depths of groundwater where natural materials are not encountered prior. Groundwater monitoring wells are to be drilled at least two (2) metres below inferred standing water level (SWL), or practical refusal, whichever occurs first.

Monitoring wells will be constructed using 50 mm Class 18 PVC machine slotted screen and casing, gravel pack from the base to approximately 0.2 m above the top of the screen, followed by approximately 0.5 m of hydrated bentonite and grout to the surface.

8.7.4 Groundwater Monitoring Event Methodology

Depths to groundwater and the presence or absence of non-aqueous phase liquids are to be gauged using an interface probe prior to the monitoring event.

Low flow sampling will be adopted and groundwater will be extracted from the monitoring well at a rate so that the drawdown of water is minimised. Water quality meters will be used for stability to indicate the change from stagnant well water to representative formation water. The depth of sampling will be the middle of the water column, as determined prior to sampling.

Groundwater parameters will be monitored every 5 minutes for a minimum of three (3) rounds until concentrations have stabilised. If readings are still fluctuating, the concentrations will continue to be monitored for additional 5 minute intervals until conditions have stabilised. Field filtering of groundwater samples will be undertaken using 0.45 micron filters for metals analysis.

8.7.5 Ground Gas Monitoring Well Installation Methodology

Ground gas monitoring wells are to be advanced to depths approximately 1 m above the SWL at the site. The gauged SWL in surrounding groundwater monitoring wells will infer the depth of ground gas monitoring well installation.

Monitoring wells will be constructed using 50mm Class 18 PVC machine slotted screen and casing, gravel pack from the base to approximately 0.1 m above the top of screen, followed by approximately 0.3 m hydrated bentonite, grout to the surface and standpipe sticking above ground with gas cap tapped to take a quick-connect nipple.

Following installation, the monitoring wells will be developed using a landfill gas meter (or similar). Each well will be developed for a minimum of three (3) minutes.

8.7.6 Ground Gas Monitoring Event Methodology

Leak testing will be undertaken after 48 hours following installation of the ground gas monitoring wells.

Ground gas monitoring will be undertaken during falling atmospheric pressure using a landfill gas analyser. Prior to the sampling event, the ground gas meter will run for approximately 1 minute in ambient air and ambient air readings recorded. The ground gas meter will then be attached to the monitoring well and the relative and atmospheric pressure readings recorded.

The monitoring event will be undertaken by tapping a quick-connect nipple fitted with airtight tubes onto the gas cap at each well. Readings will be collected every 30 seconds for approximately 5 minutes at each gas well until the concentrations have stabilised. If readings are still fluctuating, the pump will continue to run and concentration readings recorded at one minute intervals until equilibrium is reached.

If high ground gas concentrations are recorded on the meter, then monitoring of the bore will be extended a further two (2) minutes to further assess the persistence of the gas detected within the bore. Ground gas parameters to be measured will include methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide, VOCs, differential pressure and borehole gas flowrate.

The ground gas meter will be purged between monitoring well sampling events to avoid cross contamination.

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

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)

8.7.8 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.

8.7.9 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.

8.7.10 Laboratory Selection

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

8.7.11 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 contamination assessment. Project specific information is presented in **Table 8.7.2** below.

Table 8.7.2 Laboratory Analytical Schedule (Supplementary Contamination Assessment)

ID	Area of Environmental Concern	Analytical Schedule	No. of samples
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils with the potential for asbestos impacted soils to be present	Asbestos (0.001%)	Minimum six (6) soil samples
AEC04	Underground Storage or Petroleum-Based Product Onsite	Heavy Metals, TRH, PAH, VOC, SVOC, Phenols	Minimum six (6) soil samples Two (2) groundwater samples
AEC05	Soil Materials Beneath Existing Building Footprints	Heavy Metals, TRH, BTEX, PAH, OCP and Asbestos (0.001%)	Minimum forty-seven (47) soil samples
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of Site	Nil (refer to **Section 8.7.6**)	N/A
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	Heavy Metals, TRH, BTEX, PAH, VOC, OCP, OPP, PCB, PFAS and inorganic compounds	Eight (8) groundwater samples

8.7.12 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 8.7.3** to **Table 8.7.6**.

Table 8.7.3 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins – Soil).

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 8.7.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS – Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	PLM/Disp. Stain.	Absence / presence
Asbestos	No limit	WA-DER	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	USEPA 8260	0.2-0.5
Metals	6 months	USEPA 200.8/3050/6010B	0.1-3
TPH >C_{10}-C_{40}	14 days	USEPA 8270	20-100
OCP/OPP	14 days	USEPA 8270	0.1-0.2/0.2-1
PAH	14 days	USEPA 8270	0.1
VOC	14 days	USEPA 8260	0.2-0.5
E.Coli	3 days	AS/NZS 4276.7	10 (cfu/g)
Faecal Coliforms	3 days	AS/NZS 4276.5	10 (cfu/g)

Table 8.7.5 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins – Water).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/L)
BTEX and TRH C_6-C_{10}	14 days	USEPA 5030, 8260B and 8020	0.001-0.02
TRH >C_{10}-C_{40}	7 days	USEPA 8015B & C	0.1
VOC	14 days	USEPA 8260	0.001-0.005
SVOC	14 days	USEPA 8260	0.001-0.005
PAH	7 days	USEPA 8270	0.001
OCP	7 days	USEPA 8081	0.0002-0.005
Metals	6 months	USEPA 8015B & C	0.0001-0.005
Cyanide	14 days	USEPASW 8469010	0.005
PCB	7 days	USEPA 8270	0.005
Phenols	7 days	USEPA 8260	0.001-0.005

Table 8.7.6 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS – Water).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/L)
BTEX and TRH C_6-C_{10}	14 days	EP080	0.001-0.02
TRH >C_{10}-C_{40}	7 days	EP080 and EP071	0.05-0.1
VOC	14 days	EP074E	0.005-0.05
SVOC	14 days	EP074E	0.005-0.05
PAH	7 days	EP075(SIM)B	0.0005-0.001
OCP	7 days	EP068A	0.0005
Metals	6 months	EG020F and EG035F	0.0001-0.005
PCB	7 days	EP066	0.001
Phenols	7 days	EP074E	0.005-0.05

9. REMEDIATION STRATEGY OPTIONS DISCUSSION

A range of soil remediation options have been considered for the site. The options considered 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.

9.1. 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. A discussion of remediation options for these areas is provided in the below sections.

9.2. 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;
- On-site Containment and Management ("Cap and Contain"); 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 9.4.2** overleaf.

9.3. Remediation Options for Impacted Groundwater and Ground Gas

As a supplementary contamination assessment for groundwater and ground gas at the site is required, remediation options have not been assessed as the current contamination status and requirement of remediation is currently unknown. If the assessment of ground gas and/or groundwater risks indicates that remediation and/or management is required, preparation of a revised RAP setting out remedial/management options for those contamination risks will be undertaken.

9.4. Preferred Remediation Option

Based on SE's assessment detailed above, the most suitable remedial strategy will comprise of a combination of treatment options consistent the ultimate end land use of the site. **Table 9.4.1** below summarises the preferred remediation strategies with regards to the identified contamination within the site.

Table 9.4.1 Selected Remediation Strategies

AEC ID	Contamination Risk	Selected Remediation Strategy
AEC01	Friable Asbestos Impacted Fill Soils	On-Site Containment and Management OR Excavation and Off-Site Disposal
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils	*To be determined following the supplementary contamination assessment*
AEC02	Friable Asbestos Impacted Fill Soils	On-Site Containment and Management OR Excavation and Off-Site Disposal

AEC ID	Contamination Risk	Selected Remediation Strategy
	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use OR Excavation and Off-Site Disposal
AEC03	Non-Friable Asbestos Impacted Fill Soils	On-Site Treatment and Beneficial Re-Use OR Excavation and Off-Site Disposal
AEC04	Underground Storage or Petroleum-Based Product Onsite	*To be determined following the supplementary contamination assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*To be determined following the supplementary contamination assessment*
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*To be determined following the supplementary contamination assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*To be determined following the supplementary contamination assessment*
-	Direct Contact Risks in Soil Materials (*if identified*)	Excavation and Off-Site Disposal
-	Ecological Risks in Soil Materials (only) (*if identified*)	Excavation and Beneficial Re-Use
-	Aesthetic Risks (*if identified*)	Excavation and Off-Site Disposal

Areas subject to remediation are provided in **Figure 3.**

Table 9.4.2 Remedial Options Summary

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
On-site Treatment	Soil raked and picked of physical contaminants. Treated and validated materials beneficially reused within the site.	Direct access to soil will be restricted by local roadways, foot paths and park areas with the appropriate mitigation measures	Potentially lower costs through with efficient / strategical methodology	Moderate excavation is required to remove all the AECs across the entire site Limited environmental management required during the works (e.g. dust, noise)	Treated and validated materials would remain on-site. Materials to be beneficially re-used within limited access areas (beneath roadways, parks, and footpaths)	Moderate to high labour costs during raking / picking of soils	Treated and validated material would remain on-site indefinitely.
Cap and Contain	Soil capping and isolation to restrict direct access to soil. Impacted soil buried in-situ within a design 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 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 to presence of residual contamination on-site.	Impacted material would remain on-site indefinitely. Future works may require 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.

10. REMEDIAL ACTION PLAN

10.1. 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 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).

10.2. Remediation Extents

The extent of contamination within the site is considered to is outlined within **Table 10.2.1** below.

Table 10.2.1 Approximate Remedial Extents

AEC ID	Area of Environmental Concern	Approximate Extent
AEC01	Friable Asbestos Impacted Fill Soils	Total Area: ≈ 3,315 m^2 x 0.5 m bgsl 1,658 m^3 / 2,985 tonnes
AEC01a	Lead, Cadmium and Zinc Impacted Fill Soils (and potentially asbestos)	Total Area: ≈ 1,000 m^2 x 0.25 m bgsl 250 m^3 / 450 tonnes *(Extent of AEC may be altered following supplementary assessment)*
AEC02	Friable Asbestos Impacted Fill Soils	Total Area: ≈ 100 m^2 x 0.5 m bgsl (EBH24, Coffey 2011) Total Area: ≈ 100 m^2 x 0.5 m bgsl (EBH25, Coffey 2011) 170 m^3 / 306 tonnes
	Non-Friable Asbestos Impacted Fill Soils	Total Area: ≈ 10,425 m^2 x 0.5 m bgsl 5,212.5 m^3 / 9,382.5 tonnes
AEC03	Non-Friable Asbestos Impacted Fill Soils	Total Area: ≈ 1,815 m^2 x 0.5 m bgsl 910 m^3 / 1,645 tonnes
AEC04	Underground Storage or Petroleum-Based Product Onsite	*TBC following supplementary assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*TBC following supplementary assessment*
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*TBC following supplementary assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*TBC following supplementary assessment*

Refer to **Figure 3**, which indicates the areas which will be subject to remediation.

The extent of remediation identified in **Table 10.2.1** represents the known contamination at the site based on the previous contamination assessments undertaken at the site. There may be a risk of additional, presently unknown contamination being present at the site that may need to be remediated. Unknown contamination may be uncovered during the supplementary contamination assessment and bulk earthworks, requiring 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. SE further note that the extent of remediation required in AEC01a will be confirmed following the supplementary contamination assessment.

10.3. Phased Remediation Works

The remediation works will be separated into phases to allow for the remediation contractor and the environmental consultants to plan the work. The staged remediation works will be as follows:

- Phase 1: Early Works
- Phase 2: Demolition Works
- Phase 3: Supplementary assessment within AEC01a, AEC04, AEC05, AEC06 & AEC07
- Phase 4: Remediation of asbestos contamination & heavy metal contamination
- Phase 5: Management of contamination risks during bulk earthworks

The phases are detailed below.

10.3.1. Phase 1: Early Works

Prior to any works being undertaken at the site, a site-specific Safe Work Method Statement (SWMS) will need to be developed for the site tasks. A site-specific Work Health & Safety (WHS) Plan will need to be prepared for the site by the Principal Contractor. A Construction Environmental Management Plan (CEMP) will need to be developed for the site as required by Condition 8.3.4 of the Land and Environment Court (LEC) approval.

All environmental and WHS measures will need to be established and implemented at the site (e.g. erosion sediment control measures). The Principal Contractor will also need to establish a material tracking system to track all contaminated soil and sediment materials from cradle-to-grave.

Based on the extent and complexity of soil materials treatment, an estimated timeframe for remedial works is considered to be 6-8 months 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.

10.3.1.1. 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 SEPP55, 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.

The Principal Contractor will need to obtain specific related approvals as necessary to implement the works. A notification will be submitted to SafeWork NSW at least 5 days in advance to undertaking any asbestos removal works. 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.

10.3.2. Phase 2: Demolition Works

Phase 1 will need to be completed prior to the start of phase 2 works.

A pre-demolition hazardous building materials survey was undertaken for the site by SE (2024b). Prior to the demolition of structures, the structures should be inspected by an occupational hygienist to confirm the removal of hazardous building materials. Written documentation (including photographs) should be provided by the occupational hygienist to the Principal Contractor and the Environmental Consultant.

Following written documentation by an occupational hygienist, demolition and removal off-site of the structures will be undertaken by the Principal Contractor or the Remediation Contractor. Transport and disposal records for all demolition wastes removed off site will need to be retained and will be appended to the site validation report.

10.3.3. Phase 3: Supplementary Contamination Assessment within AEC01a, AEC04, AEC05, AEC06 & AEC07

Phases 1 and 2 will need to be undertaken and completed prior to the start of phase 3 works.

A supplementary contamination assessment will be undertaken within AEC01a, within the previously identified lead, cadmium and zinc area to determine whether asbestos is also a contaminant of concern associated with AEC01a requiring additional controls and assessment during the remediation and validation scope of works.

A supplementary contamination assessment will be undertaken within AEC04, within the footprint of the previously decommissioned and removed underground storage tanks (UST). Six (6) boreholes will be advanced within the vicinity of AEC04 with two (2) extended to depths of groundwater as part of the supplementary assessment. Soil materials up to 4 m bgsl and groundwater will be assessed in the vicinity of the current extent of AEC04 to determine whether any residual contamination presides within the AEC as a result of the former UST.

A supplementary contamination assessment will be undertaken within AEC05, beneath the hardstand footprints following demolition of the existing structures. Forty-seven (47) test pits will be advanced across the hardstand footprints as part of the supplementary assessment.

A supplementary contamination assessment will be undertaken within AEC06 to determine whether migration of off-site hazardous ground gases are migrating onsite requiring further management. Two (2) ground gas monitoring wells will be installed within the southern portion of the site and will undergo a gas monitoring event to determine whether further management is required.

A supplementary contamination assessment will be undertaken to address AEC07 and determine whether migration of contaminants associated with off-site industrial activities are migrating onsite requiring further management. The existing eight (8) groundwater monitoring wells will undergo a groundwater monitoring event as part of the supplementary assessment.

Pending the results of the supplementary assessment, further remediation areas may be identified and remediated under an unexpected finds protocol or may be outlined within an additional addendum letter.

10.3.4. Phase 4: Remediation of Asbestos Contamination

Phases 1-3 will need to be undertaken and completed prior to the start of phase 4 works.

Following the supplementary contamination assessment of AEC01a, AEC04, AEC05, AEC06 and AEC07, the remediation areas for known asbestos contamination identified within AEC01, AEC02 and AEC03 (and

potentially AEC05) will need to be marked out by the Environmental Consultant in conjunction with the Remediation Contractor.

10.3.4.1. AEC01 – Friable Asbestos Impacted Fill Materials

Fill soils in vicinity of structures present on-site are impacted with friable asbestos and require remediation. The fill materials should be excavated using an excavator, or similar, to the depth of impact (0.5 m bgs).

SE understand that the asbestos contamination is likely to be limited to fill clayey sand materials overlying fill CLAY materials.

The soil materials will be excavated and disposed off-site to a licensed waste receiving facility in line with the NSW EPA Waste Classification Guidelines 2014. A SafeWork NSW Licensed Asbestos Assessor will need to provide a visual clearance certificate of the excavation footprint.

Validation samples will need to be collected from the base of the excavation footprint and analysed for quantitative asbestos analysis (0.001%) to confirm the removal of asbestos containing materials. If asbestos is observed or detected within the samples submitted, additional scraping of the ground surface and additional validation samples will need to be collected until no asbestos remains across the remediation area.

Following removal of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

10.3.4.2. AEC02 – Friable Asbestos Impacted Fill Materials

Two (2) defined hotspots in the southern portion of the site are understood to contain friable asbestos and require remediation. The fill materials should be excavated using an excavator, or similar, to the depth of impact (0.5 m bgs).

SE understand that the asbestos contamination is likely to be limited to fill clayey sand materials overlying fill CLAY materials.

The soil materials will be excavated and disposed off-site to a licensed waste receiving facility in line with the NSW EPA Waste Classification Guidelines 2014. A SafeWork NSW Licensed Asbestos Assessor will need to provide a visual clearance certificate of the excavation footprint.

Validation samples will need to be collected from the base of the excavation footprint and analysed for quantitative asbestos analysis (0.001%) to confirm the removal of asbestos containing materials. If asbestos is observed or detected within the samples submitted, additional scraping of the ground surface and additional validation samples will need to be collected until no asbestos remains across the remediation area.

Following removal of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

10.3.4.3. AEC02 – Non-Friable Asbestos Impacted Fill Materials

Fill soils in the southern portion of the site are impacted with non-friable asbestos (with the exception of the two (2) friable hotspots) and require remediation. The fill materials should be excavated using an excavator, or similar, to the depth of impact (0.5 m bgs).

SE understand that the asbestos contamination is likely to be limited to fill clayey sand materials overlying fill CLAY materials.

The soil materials will be treated on site on site via a method of spreading out the soil materials to a thickness of approximately 100 mm on a 'treatment pad'. The soil materials will then be raked, and any fragments of presumed asbestos picked by a suitably appropriate asbestos removalist. The footprint of the excavation will need to be visually assessed to ensure no fragments of non-friable asbestos are present. An occupational hygienist will need to provide a visual clearance certificate of the excavation footprint.

Validation samples will need to be collected from the base of the excavation footprint and analysed for quantitative asbestos analysis (0.001%) to confirm the removal of asbestos containing materials. If asbestos is observed or detected within the samples submitted, additional scraping of the ground surface and additional validation samples will need to be collected until no asbestos remains across the remediation area.

The soil materials will then be stockpiled in 30 m^3 volumes and re-assessed against the adopted site assessment criteria. A visual inspection of the stockpiles and validation samples submitted for quantitative asbestos analysis (0.001%) will need to be collected from the treated soil material stockpiles. If the materials meet the adopted site assessment criteria, the soil materials will be retained onsite. The soil materials will be buried beneath proposed roadways or within open spaces planned for the site. Treated asbestos soil materials are not to be buried beneath a residential lot.

In the event that soil materials exceed the adopted site assessment criteria, a waste classification based on NSW EPA Waste Classification Guidelines 2014 must be prepared for disposal offsite to a licensed waste receiving facility.

Following removal/treatment of impacted materials, validation sampling (per **Section 11**) is to be undertaken.

10.3.4.4. AEC03 – Non-Friable Asbestos Impacted Fill Materials

Fill soils in vicinity of structures present on-site are impacted with non-friable asbestos and require remediation. The fill materials should be excavated using an excavator, or similar, to the depth of impact (0.5 m bgs).

SE understand that the asbestos contamination is likely to be limited to fill clayey sand materials overlying fill CLAY materials.

The soil materials will be treated on site on site via a method of spreading out the soil materials to a thickness of approximately 100 mm on a 'treatment pad'. The soil materials will then be raked, and any fragments of presumed asbestos picked by a suitably appropriate asbestos removalist. The footprint of the excavation will need to be visually assessed to ensure no fragments of non-friable asbestos are present. An occupational hygienist will need to provide a visual clearance certificate of the excavation footprint.

Validation samples will need to be collected from the base of the excavation footprint and analysed for quantitative asbestos analysis (0.001%) to confirm the removal of asbestos containing materials. If asbestos is observed or detected within the samples submitted, additional scraping of the ground surface and additional validation samples will need to be collected until no asbestos remains across the remediation area.

The soil materials will then be stockpiled in 30 m^3 volumes and re-assessed against the adopted site assessment criteria. A visual inspection of the stockpiles and validation samples submitted for quantitative asbestos analysis (0.001%) will need to be collected from the treated soil material stockpiles. If the materials meet the adopted site assessment criteria, the soil materials will be retained onsite. The soil materials will be buried beneath proposed roadways or within open spaces planned for the site. Treated asbestos soil materials are not to be buried beneath a residential lot.

In the event that soil materials exceed the adopted site assessment criteria, a waste classification based on NSW EPA Waste Classification Guidelines 2014 must be prepared for disposal offsite to a licensed waste receiving facility.

Following removal/treatment of impacted materials, validation sampling (per **Section 11**) is to be undertaken

10.3.4.5. Remediation Contingencies

10.3.4.5.1. AEC01, AEC02, AEC03 – Validation Results Above Site Adopted Criteria

Should validation samples indicate further contamination, additional remediation will be required. The additional vertical and lateral extents will be determined by the environmental consultant in attendance. Generally, a further 0.2-0.3 m of depth to be excavated vertically and 0.2-0.3 m of additional lateral excavation is considered reasonable prior to additional validation sampling. Following further removal of material, additional validation samples will be taken. This will be continued until validation samples meet the validation criteria.

10.3.4.5.2. AEC01a, AEC04, AEC05, AEC06, AEC07 – Supplementary Assessment Results Above Site Adopted Criteria

Should results from the supplementary contamination assessment indicate the need for further assessment or remediation, the environmental consultant would decide if treatment under the unexpected finds protocol is sufficient or if there was a need to develop an addendum letter to report on site specific methodology to remediate the newly identified AEC. The decision will be based on the extent of impact, access constraints, and any other observations.

SE note if any contamination is identified within groundwater or ground gases at the site during the supplementary assessment, an addendum letter will be provided to the Site Auditor for approval prior to remediation works commencing.

10.3.5. Phase 5: Management of Contamination Risks During Bulk Earthworks

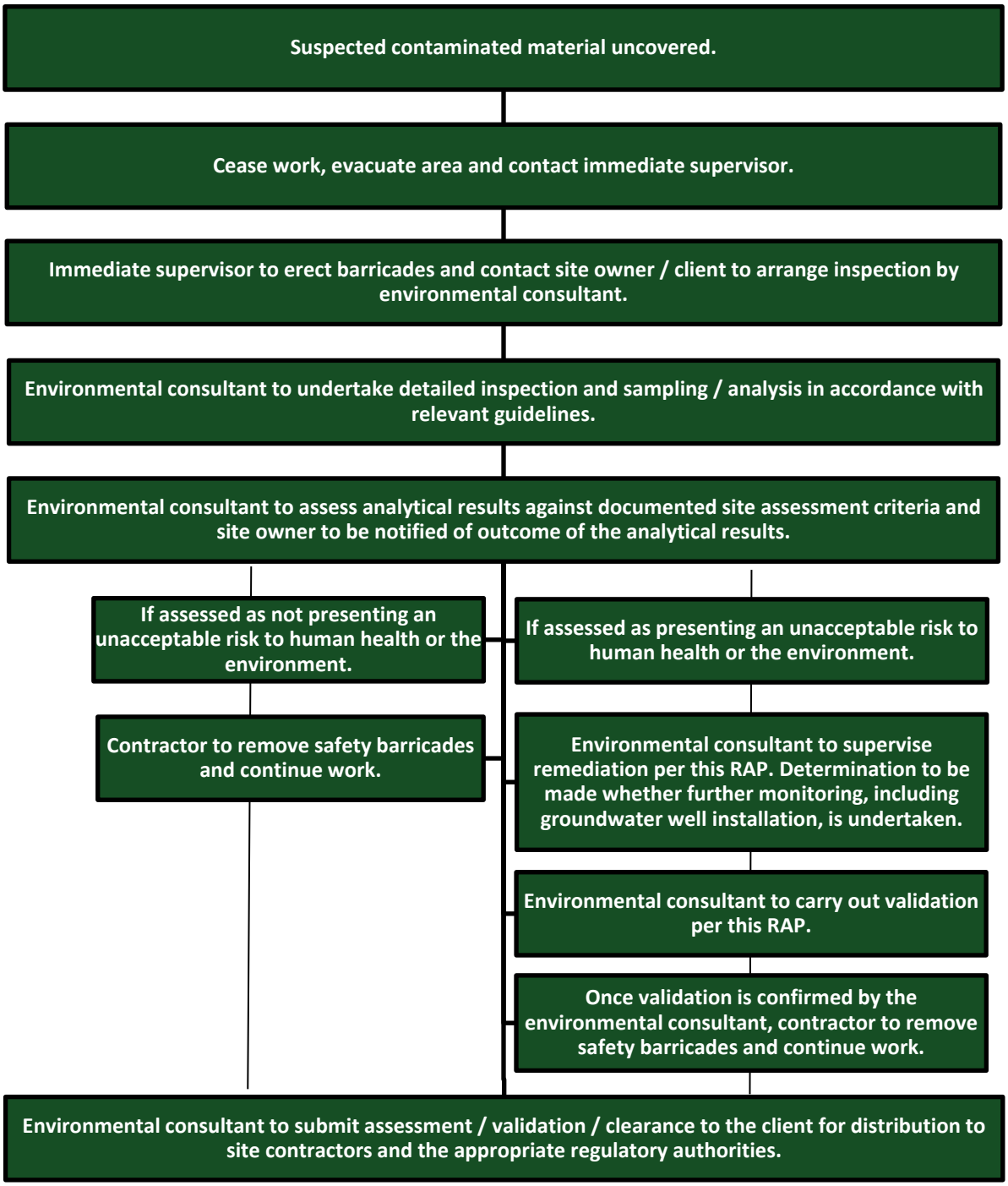
Due to the large size of the site and the proposed low-density residential redevelopment works, SE understand that a large bulk earthworks program will be implemented at the site, which may uncover any currently unknown contamination. This risk will be addressed by following an unexpected finds protocol.

Prior to bulk earthworks starting at the site, all workers are to be advised of the potential presently unknown contamination which they may come across. Presently unknown contamination may include:

- 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;
- ACM impacted fill materials;
- Buried ACM conduits;
- Waste burial pits; 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



10.3.6. Roles and Responsibilities

The main parties involved in carrying out the remediation works at the site are the Project Manager, Remediation Contractor and the Environmental Consultant. The roles and responsibilities of all parties involved is specified in Section 10.5 of the AG RAP (2022). A table of role and responsibilities of all parties has been outlined below in **Table 10.3.1.**

Table 10.3.1 Roles and Responsibilities for the Remediation Works

Roles	Responsibility
Property Owner or Site Developer	• Overall responsibility of site and key liaison for council. Appoints site contractors, including all other members of the Remediation Works Team.
Project Manager	• Overall site manager and day to day decision maker. Key communicator between site owner / developer • Ensures relevant control plans are developed and implemented.
Remediation Contractor	• Site Preparation including establishment of management plan requirements, importation of suitable landscaping material (if required) waste classification and disposal, as well as ensuring the remediation is conducted in accordance with this plan. • Ensure consultant is up to date with work schedules and is engaged to complete key components of the work (i.e. waste classification assessments, etc) • Implementation of measures required to mitigate any adverse effects resulting from the remediation • Ensure all spoil removed from site is classified by the environmental consultant and is diposed of at a suitable facility • Tracking of waste between the site and deposition facility, including collection of all waste documentation to be provided to the environmental consultant. • Reporting any environmental issues, complaints or unexpected finds to the project manager and environmental consultant
Environmental Consultant	• Development of the remediation objectives and strategy • Support all other members of the Remediation Works Team in understanding the requirements of the RAP and the potential risk posed should measures not be implemented • Updating all other members of the Remediation Works Team following receipt of results from the supplementary contamination assessment • Monitoring of key remediation components, collection of all environmental samples, and provide guidance to ensure the remediation is understood, and effective • Complete site validation tasks and detail the works in a validation report concluding on site suitability
Local Government Authority	• Responsible for granting all consents and ensuring the recommendations of environmental reports are implemented

10.4. 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 10.4.1**, is based on data available at the time of preparing this RAP.

The validation strategy for each identified AEC is outlined in **Section 11**.

10.4.1. Overview of Remediation Methodologies

The following method presents a guide for a qualified environmental consultant and specialised civil works and/or remediation contractor engaged to undertake the remediation works. The following sections do not provide sufficient detail to be used as specification for civil works or water treatment works undertaking.

All remediation works should be performed under the on-site guidance of a contaminated land consultant with sufficient experience in soil remediation activities.

Table 10.4.1 Proposed Remedial Works

AEC	Contamination Risk	Proposed Remedial Strategy
AEC01 **AEC02**	Friable ACM in soil	Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.
AEC02 **AEC03**	Non-friable ACM in or on soil	Fill soils will be excavated, spread out to a maximum thickness of 100mm on a suitably prepared pad (e.g. concrete slab, or a cleared area onsite with a suitable barrier layer between underlying soils and the spread soils) and subjected to raking (where practical) to a depth of 100mm below the surface, using a rake with teeth spaced ≤7mm apart and >100mm long, and fragments of bonded ACM handpicked. At least two passes of raking and picking shall be undertaken, with a 90° direction change between each pass, and using a grid pattern. SE notes that remediation of non-friable asbestos contaminated soils for re-use may not be suitable due to the high clay content observed within the fill materials. All reasonable attempts will be made to remediate the soils; however, if deemed unfeasible by the supervising environmental consultant with consideration to adequacy of remediation methodology and timing, consultation with the client will be made to discuss the requirement for off-site disposal. Following successful validation, soil materials will be buried a minimum of 2 m below the finishing surface level (FSL). 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. The remediation contractor will retain transport and disposal records for all wastes removed off site.
AEC04	Underground Storage or Petroleum-Based Product Onsite	*Requires supplementary contamination assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*Requires supplementary contamination assessment*

AEC	Contamination Risk	Proposed Remedial Strategy
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*Requires supplementary contamination assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*Requires supplementary contamination assessment*
-	Direct Contact Risks in Soil (*if identified*)	Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.
-	Ecological Risks in Soil (only) (*if identified*)	Excavation vertically to the base of impacted fill and laterally to the AEC edge or site boundary (whichever occurs first). Soil materials will be buried a minimum of 2 m below the finishing surface level (FSL).
-	Aesthetic Risks (*if identified*)	Removal of aesthetic risks and disposal offsite to a licensed waste receiving facility as per NSW EPA Waste Classification Guidelines. The remediation contractor will retain transport and disposal records for all wastes removed off site.

10.4.2. Backfilling

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

- Virgin excavated natural material (VENM);
- Excavated natural material (ENM); or
- Other material subject to 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).

11. REMEDIATION AND 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. In line with AG (2022), the following DQO for this project are set out in **Sections 11.1** to **11.7** of this report.

11.1. 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 comprising subdivision for residual land use; and
- Historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health 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.

11.2. 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 sampling adequate to determine the risk of contamination at the site, including any potential offsite migration?
- If the data does not provide enough information, what data gaps require closure to enable the suitability of the site to be determined, or selection and design of an appropriate remedial strategy.

11.3. 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 11.2** for this investigation, will include:

- Data obtained in previous contamination assessments and the proposed development plans;
- Understanding of the current site use and historic activities that have occurred;
- Geological and hydrogeological data relevant to the area, including physiochemical parameters for calculating ecological criteria;
- Site observations for the presence of visual/olfactory contamination indicators;
- Contaminant concentrations in soil at the site indicating the distribution of contaminants; and
- Further input to the decision will be sample collection and handling, field and laboratory QAQC and confirmation that data quality indicators (DQIs) were achieved.
- Survey dimensions of remediated areas and stockpiled quantities;
- Documentation tracking excavation of contaminated materials from cradle-to-grave (e.g. stockpile movements, trucking records, waste disposal records); and

- Waste classification assessment.

Assessment criteria are provided in **Section 6**.

11.4. 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 results will be valid on the day samples are collected and will remain valid if no changes to site use occur, and contamination (if present) does not migrate on to site from off-site sources;
- 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.

11.5. 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.

11.5.1. Rinsate Blanks

One rinsate blank will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable sampling equipment was used on that day. The rinsate blank will be analysed for the analytes the sample/s collected that day are being scheduled for analysis for (with the exception of asbestos).

For the purpose of waste classification assessment, collection / analysis of rinsate blank samples will not be required.

11.5.2. 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}).

For the purpose of waste classification assessment, collection / analysis of trip spike/blank samples will not be required.

11.5.3. Intra-Laboratory and Inter-Laboratory Duplicates

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

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

11.5.4. 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.

11.5.5. 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 11.3**), 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 11.2**), 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.

11.6. 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 11.6.1 Performance and Acceptance Criteria Summary

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 11.4**	Critical samples analysed according to DQO	Refer **Section 11.7.8**
Critical samples collected	Refer **Section 11.4**	Analytes analysed according to DQO	Refer **Section 11.7.8**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 11.7.8**
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 11.7.8**
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 11.7.8**
Climatic conditions	Samples stored in 500ml zip-lock bags	Same LORs at primary laboratory	Refer **Section 11.7.8**
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 11.7.8**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer **Section 11.4**	Samples analysed according to SAQP	Refer **Section 11.7.8**
Media identified in SAQP sampled	Refer **Section 11.4**	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 analytical results <10 times LOR 50% for analytical results 10-20 times LOR 30% for analytical 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	Analyte concentration <LOR. None collected for asbestos.		No exceedances of acceptance criteria
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

11.7. 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.

11.7.1. Remediation Monitoring Records

A daily record is to be maintained by the remediation contractor and supervising environmental consultant detailing daily remedial activities, estimated treatment quantities, and all bulk soil movements.

11.7.2. 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 25m^2) and one soil sample collected from each wall (per 5 linear meters) of the remedial excavation footprints.

The validation sampling arrangements for this project are presented in **Table 11.7.1.**

Table 11.7.1 Validation Methodology

AEC ID	Contamination Risk	Validation Methodology
AEC01 **AEC02**	Friable ACM in Fill Soils	1 x 500 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation footprint.
AEC02 **AEC03**	Non-friable ACM in or on Fill Soils	Visual inspection of at least one pass of treated material, using a rake with teeth spaced ≤7mm apart and >100mm long. 1 x 10L sample per 30 m^3 of treated material, screened for fragments of ACM >7mm and a subsequent 500 mL sample for quantitative asbestos analysis. Visual inspection of excavation footprint to confirm removal of fill. Following removal: 1 x 500 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 500 mL soil sample per 25 m^2 of excavation footprint Photographic record of treated soils. Photographic record of excavation. SE notes that all reasonable attempts will be made to remediate the soils; however, if deemed unfeasible by the supervising environmental consultant with consideration to adequacy of remediation methodology and timing, consultation with the client will be made to discuss the requirement for off-site disposal. A spatial survey must be undertaken by a certified surveyor following beneficial re-use of soil materials within the placement area.
AEC01 **AEC02**	Airborne Asbestos Fibres	Airborne asbestos monitoring is to be undertaken by a suitably qualified occupational hygienist or SafeWork NSW licensed asbestos assessor for the duration of asbestos

AEC03		removal and treatment works. Copies of results are to be included in the site validation report.
AEC04	Underground Storage or Petroleum-Based Product Onsite	*Requires supplementary contamination assessment*
AEC05	Soil Materials Beneath Existing Building Footprints	*Requires supplementary contamination assessment*
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*Requires supplementary contamination assessment*
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*Requires supplementary contamination assessment*
-	Direct Contact Risks in Soil (*if Identified)*	1 x 250 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation footprint.
-	Ecological Risks in Soil (only) (*if identified*)	1 x 250 mL soil sample per 5 linear metres of excavation wall, with a minimum of 1 per wall and one 250 mL soil sample per 25 m^2 of excavation footprint. Photographic record of excavation footprint. A spatial survey must be undertaken by a certified surveyor following beneficial re-use of soil materials within the placement area.
-	Aesthetic Risks (*if identified*)	Photographic record of former aesthetic risk footprint.
-	Imported Fill (VENM/ENM)	Formal review of the waste classification report to be undertaken by the environmental consultant engaged followed by visual inspection on receipt of material to site OR 1 soil sample per 500 tonnes of imported material (minimum 3 samples) submitted for analysis of Asbestos (Bulk ID), Metals (8), BTEX, TRH, PAH, OCP and PCB.

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.

11.7.3. 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.

11.7.4. 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)

11.7.5. 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.

11.7.6. 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.

11.7.7. Laboratory Selection

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

11.7.8. 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 contamination assessment and the validation sampling. Project specific information is presented in **Table 11.7.2.**

Table 11.7.2 Laboratory Analytical Schedule (Validation Sampling)

AEC ID	Area of Environmental Concern	Analytical Schedule	Sample Quantity
AEC01	Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC02	Friable and Non-Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC03	Non-Friable Asbestos Impacted Fill Soils	Quantitative Asbestos (0.001%)	Per **Section 11.7.2**
AEC04	Underground Storage or Petroleum-Based Product Onsite	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
AEC05	Soil Materials Beneath Existing Building Footprints	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
AEC06	Deep Uncontrolled Filling Adjacent to Southern Portion of the Site	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
AEC07	Adjacent Industrial Land Use to the North and North-East of the Site	*TBC Following receipt of the supplementary assessment*	Per **Section 11.7.2**
Imported Fill – VENM	Imported soils (if required)	In absence of a VENM validation report, each sample will be subjected to TRH, BTEX, PAH, 8 metals, OCP and asbestos.	Per **Section 11.7.2**
Imported Fill – ENM	Imported soils (if required)	In absence of an ENM validation report, each sample will be subjected to TRH, BTEX, PAH, 8 metals, EC, pH, foreign materials and asbestos.	Per **Section 11.7.2**

11.7.9. 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 below in **Table 11.7.3** and

Table 11.7.4.

Table 11.7.3 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (Eurofins - Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	AS4964:2004	Absence / presence
Asbestos	No limit	Inhouse Method	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	NEPM Schedule B3	0.1-20
Metals	6 months	USEPA 6010, 6020	0.1-5
TPH >C_{10}-C_{40}	14 days	NEPM Schedule B3	20-100
OCP/OPP	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 11.7.4 Laboratory Holding Times, Analytical Methods, and Limits of Reporting (ALS - Soil).

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
Asbestos	No limit	PLM/Disp. Stain.	Absence / presence
Asbestos	No limit	WA-DER	0.001% w/w
BTEX and TPH C_6-C_{10}	14 days	USEPA 8260	0.2-0.5
Metals	6 months	USEPA 200.8/3050/6010B	0.1-3
TPH >C_{10}-C_{40}	14 days	USEPA 8270	20-100
OCP/OPP	14 days	USEPA 8270	0.1-0.2/0.2-1
PAH	14 days	USEPA 8270	0.1
VOC	14 days	USEPA 8260	0.2-0.5

12. REPORTING

12.1. 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:

- Document control;
- 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;
- Conceptual site model;
- Validation criteria;
- Information on the remediation works undertaken;
- The results of field and laboratory work;
- An assessment of field and laboratory quality assurance / quality control data;
- Waste management (waste classification reports, tipping dockets, and review of import fill (if applicable);
- A discussion on site validation;
- Information on ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

The site validation report will be completed within 4 weeks following the remediation and validation of the site and will be provided to the site auditor for review and approval.

13. SITE MANAGEMENT PLAN

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

13.1. Soil and Stormwater Management

13.1.1. 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).

13.1.2. 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.

13.1.3. 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 ANZ (2018), excavation water may be discharged to stormwater. Further assessment would be required should these levels be exceeded.

SE note that the principal contractor may have additional obligations (i.e. permitting) to fulfill prior to discharge. SE recommend consultation with the relevant authority (local council) prior to any discharge occurring.

Should analytical results exceed ANZ (2018) 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.

13.1.4. 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.

13.2. 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.

13.3. Asbestos Management

For non-friable asbestos removal works, a SafeWork NSW Class A or B licensed asbestos removalist contractor must be engaged to undertake the works. Works should be supervised by a suitably qualified and experienced occupational hygienist.

For friable asbestos removal works, a SafeWork NSW Class A licensed asbestos removalist contractor must be engaged to undertake the works. Works must be supervised by a SafeWork NSW licensed asbestos assessor.

SE note that based on the current conditions at the site, at the time of this RAP, both friable and non-friable asbestos has been identified within the site.

13.4. Regulatory Notification

A notification of intent to remove asbestos containing materials must be submitted to the regulator (SafeWork NSW) at least 5 days prior to commencing asbestos removal works.

An Asbestos Removal Control Plan is to be prepared by the asbestos removalist contractor engaged for the works.

13.5. Airborne Asbestos Monitoring

For non-friable asbestos removal works, airborne asbestos monitoring is to be undertaken by a suitably experienced occupational hygienist.

For friable asbestos removal works, airborne asbestos monitoring must be undertaken by a SafeWork NSW licensed asbestos assessor.

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 (2022) *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.

The following actions are to be undertaken based on the results of daily air monitoring.

Table 13.1 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.

13.6. Clearance Inspection and Certificates

Following the successful removal of asbestos impacted soils, the occupational hygienist or licensed asbestos assessor (as must be the case for any friable asbestos removal works) will undertake a visual inspection of the works area and provide an asbestos materials clearance report detailing that the asbestos has been successfully removed. Further in the case of friable asbestos, validation samples will be taken and analysed for quantitative asbestos per NEPM/WA DoH and will form part of the clearance report.

Clearance reports are to be included in the site validation report.

13.7. 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.

13.8. 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).

13.9. 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.

13.10. 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.

13.11. 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 13.17**;
- 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.

13.12. 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.

13.13. 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 (2022). ENM certification will be undertaken with reference to NSW EPA Excavated Natural Material Exemption (2014).

All waste classification reports for proposed fill to be imported to the site are to be formally reviewed by the environmental consultant prior to importation to 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.

13.14. Work Health and Safety

13.14.1. 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.

13.14.2. 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 13.14.1**) 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.

13.14.3. 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).

13.15. 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).

13.16. 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.

13.17. 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.

13.18. 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.

13.19. 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 13.20**.

13.20. Register of Contacts

A register of contacts for the project is presented in **Table 13.20.1** below.

Table 13.20.1 Register of Contacts

Project Role	Person	Organisation	Contact
Emergency Services	-	Fire / Police / Ambulance	000
Site Owner	TBC	Mirvac Pty Ltd	TBC
Project Manager	Nibraas Ahmad	Mirvac Pty Ltd	0406 006 792
Planning Consent Authority	-	City of Canterbury-Bankstown	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

13.21. 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.

14. 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:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan;
- Should newly identified unacceptable land contamination risks be identified during the supplementary assessment and/or remediation works, a revision to this RAP may be required. The revision should 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;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- Following the completion of the remediation and validation work, the environmental consultant needs to prepare a site remediation and validation report that documents both the remediation and validation work as required by the EPA (2020) reporting guidelines.

This report must be read in conjunction with the limitations set out in **Section 15**.

15. 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.

16. REFERENCES

Coffey (Coffey 2011), 'Phase 2 Environmental Site Assessment – Student Residence Development University of Western Sydney, Bankstown Campus', dated 25 August 2011, Ref: GEOTLCOV24163AG-AB;

Noel Arnolds and Associates (NAA 2011), 'Soil Contamination Investigation, University of Western Sydney – Bankstown Campus Bullecourt Avenue, Milperra NSW', dated October 2011, Ref: SJ0085:95458;

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JBS&G (JBS&G 2018), 'Phase 1 Environmental Assessment Report, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;

Alliance Geotechnical (AG 2020), 'Detailed Site Investigation, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-1-1;

Alliance Geotechnical (AG 2022), 'Remedial Action Plan, Western Sydney University – Milperra Campus, Bullecourt Avenue, Milperra NSW', dated 30 January 2020, Ref: 9996-ER-2-1; and

Sydney Environmental Group (2024), 'Supplementary Detailed Site Investigation, Western Sydney University – Milperra Campus, Milperra NSW', dated 22 February 2024, Ref: 2300-DSI-01-220224.v1f.

ANZG 2018, '*Australian and New Zealand Guidelines for Fresh and Marine Water Quality*', 2018;

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, '*Sampling Design Guidelines for Contaminated Land*';

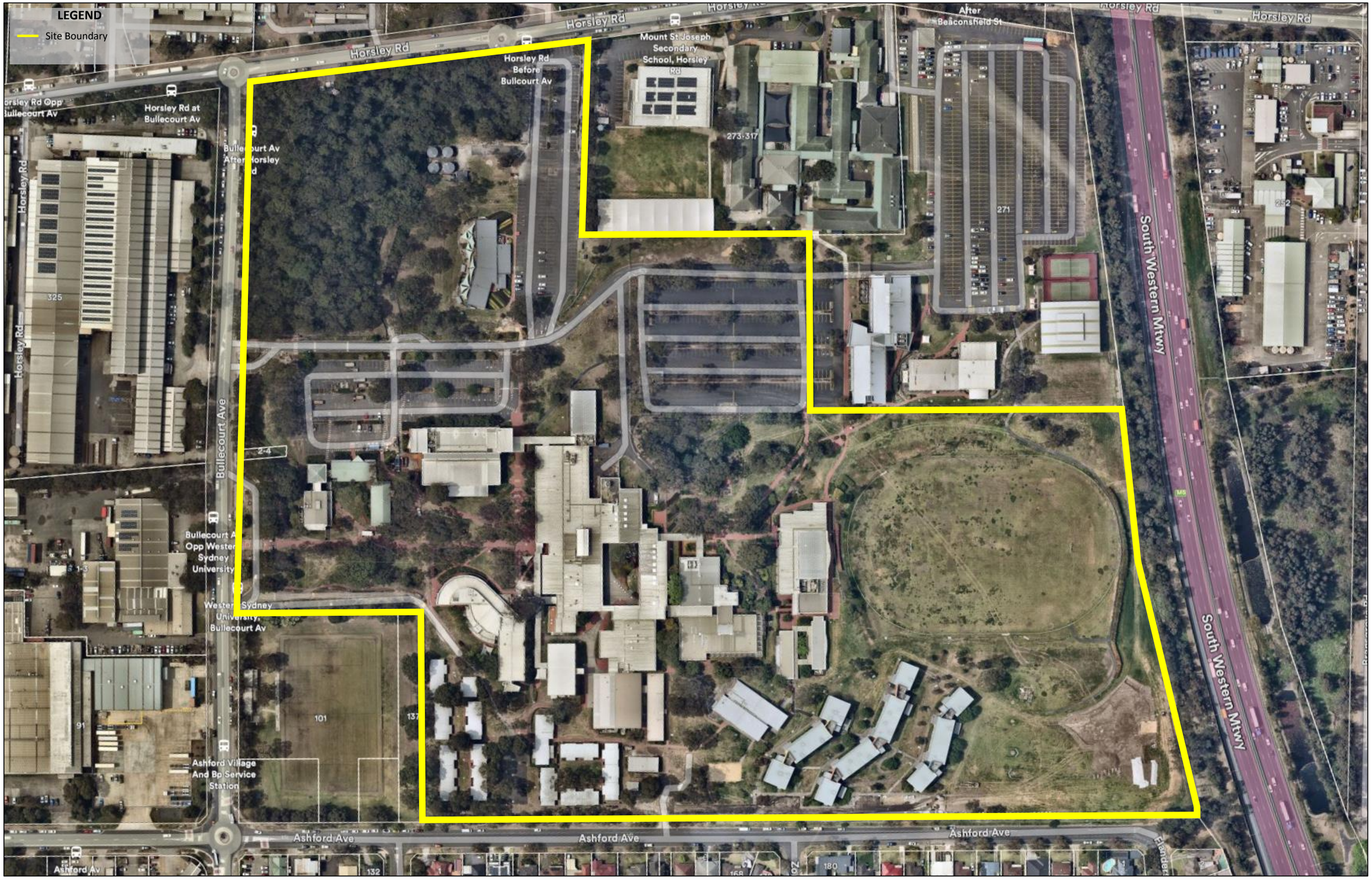
NSW EPA 2017, '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)*';

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'*.

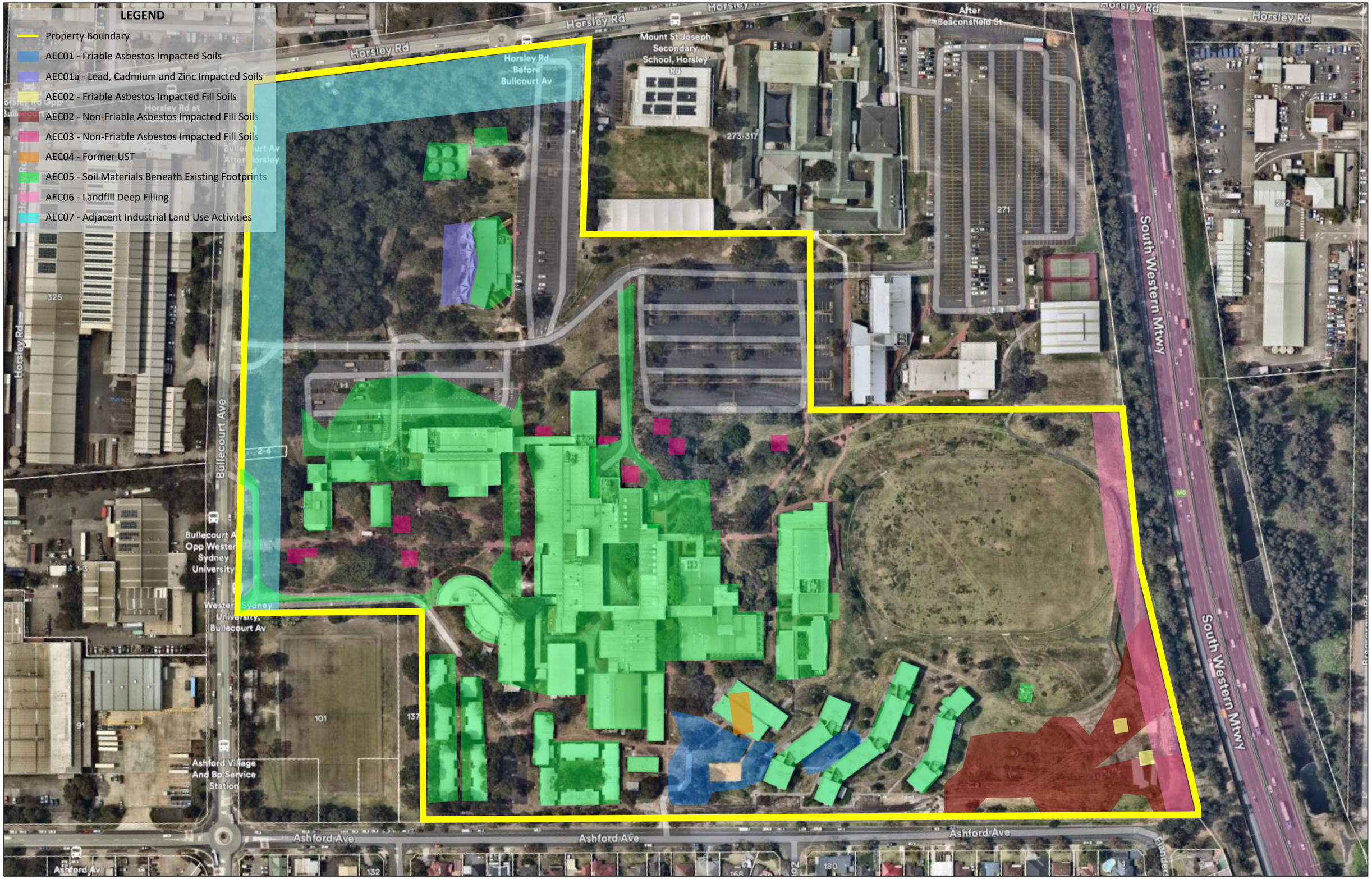
FIGURES

Sydney Environmental Group	Scale:	150 m	Site Locality	
	Client Name:	Mirvac Pty Ltd	N	Figure Number: 1
	Project Name:	Addendum Remedial Action Plan		Figure Date: 10 October 2024
	Project Location:	Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW		Report Number: 2300-RAP-01-101024.v1f

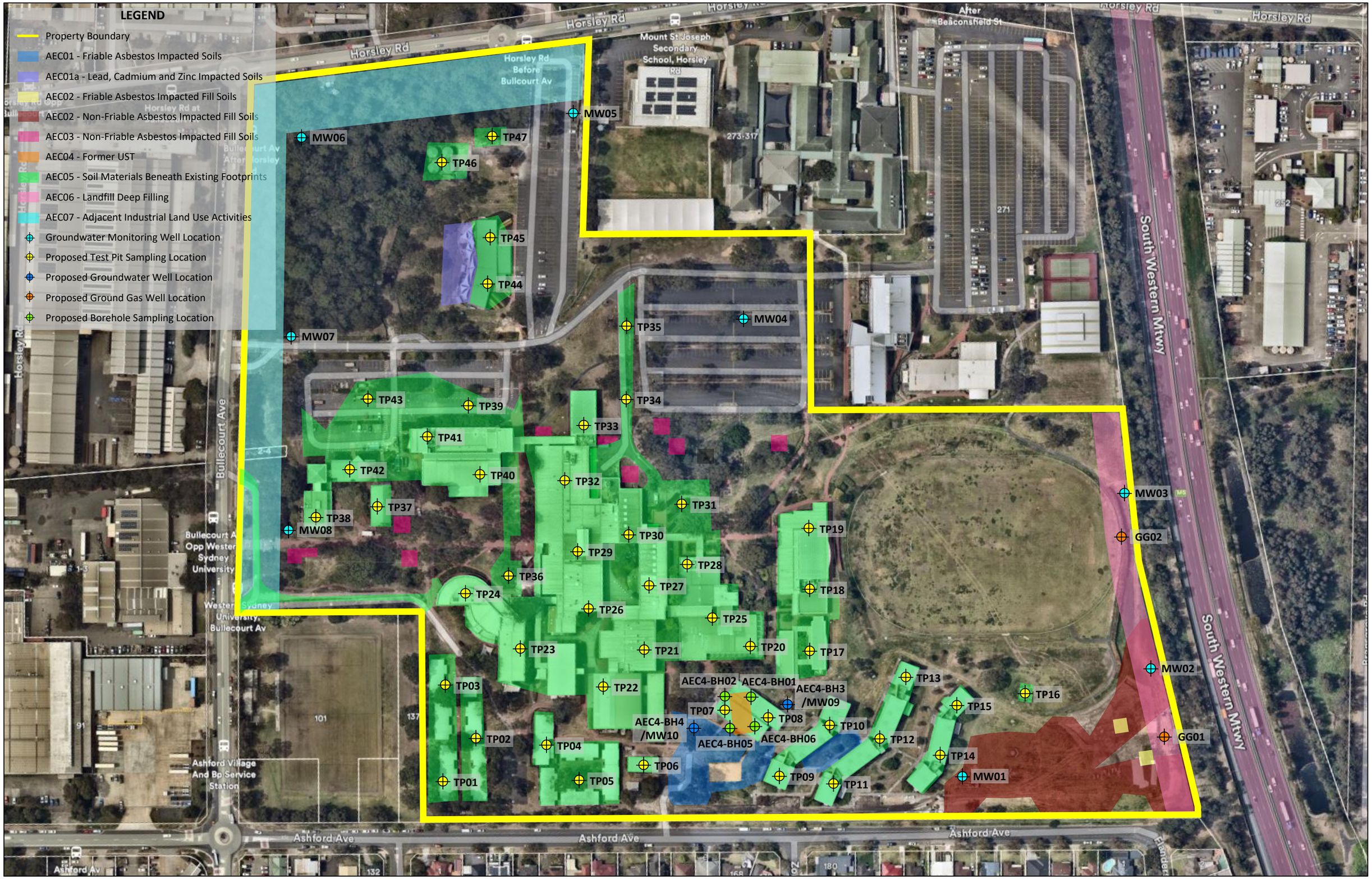


Scale:	100 m — Site Layout		
Client Name:	Mirvac Pty Ltd	Figure Number:	2
Project Name:	Addendum Remedial Action Plan	Figure Date:	10 October 2024
Project Location:	Stage 1, Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW	Report Number:	2300-RAP-01-101024.v1f

Sydney Environmental Group



Sydney Environmental Group	Scale:	100 m	Site Layout & Areas of Environmental Concern	
	Client Name:	Mirvac Pty Ltd	Figure Number:	3
	Project Name:	Addendum Remedial Action Plan	Figure Date:	10 October 2024
	Project Location:	Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW	Report Number:	2300-RAP-01-101024.v1f



Scale:	100 m	Supplementary Contamination Assessment	
Client Name:	Mirvac Pty Ltd	Figure Number:	4
Project Name:	Addendum Remedial Action Plan	Figure Date:	10 October 2024
Project Location:	Western Sydney University – Milperra Campus, Horsley Road & Bullecourt Avenue, Milperra NSW	Report Number:	2300-RAP-01-101024.v1f

Sydney Environmental Group