



A U S T R A L I A N
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GEOTECHNICAL & ENVIRONMENTAL SERVICES

REMEDIAL ACTION PLAN



Prepared For: Roselands Star Pty Ltd

Address: 892 - 906 Canterbury Road, Roselands, NSW, 2196

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List of Abbreviations

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

ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
bgs	below ground surface
CSM	Conceptual site model
BTEX	Benzene, toluene, ethylbenzene and xylenes
B(a)P	Benzo(a)pyrene
CCA	Copper Chromate Arsenate
COC	Contaminants of Concern
DEC	NSW Department of Environment and Conservation
DECCW	NSW Department of Environment, Climate Change and Water
DQI	Data quality indicator
DQOs	Data Quality Objectives
DWE	NSW Department of Water and Energy
EPA	NSW Environment Protection Authority
ESA	Environmental Site Assessment
ha	Hectare
HIL	Health based investigation level
IAA	Recommendations from Interim Auditor Advice
LOR	Limit of Reporting
OEH	Office of Environment and Heritage
PAHs	Polycyclic aromatic hydrocarbons
PID	Photo-ionisation Detector
PCB	Polychlorinated Biphenyl
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling, Analysis and Quality Plan
TRH	Total Recoverable Hydrocarbons (previously Total Petroleum Hydrocarbons)
TSS	Total Suspended Solids
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Australian GeoEnviro Pty Ltd (AG) was engaged by ROSELANDS STAR PTY LTD to prepare a Remedial Action Plan (RAP) for 892-906 CANTERBURY ROAD, ROSELANDS, NSW, 2196 (the site).

A Contamination Assessment prepared by this office (refer to report number AG-662_1 dated 12-08-2021), which involving on-site inspections and chemical testing to determine whether contamination has occurred from historic site usage. Contamination was detected during the investigation and recommended preparation of a remedial action plan detailing remedial methodology and subsequent validation assessment criteria.

AG concluded that the subject site can be made suitable for its proposed use, following remediation of areas of environmental concern (AECs) in accordance with this RAP, and subsequent validation of and preparation of a stage 4 validation report.

Based on an evaluation of feasible remediation options, off-site disposal of the contaminated impacted material is considered the preferred option for the site. The RAP sets out remediation, validation, site management and health and safety requirements for remediation and validation.

All excavated material transported off site should be classified in accordance with NSW EPA 2014 - Waste Classification Guideline Part 1; Classifying Waste.

Subject to the successful implementation of the measures detailed in this RAP, it is considered the site can be made suitable for the intended residential land use with no requirement for ongoing management.

1.0 INTRODUCTION

AG has been engaged by Roselands Star Pty Ltd to prepare a Remedial Action Plan (RAP) to address previously identified contaminated material and facilitate the removal of any contamination for the site; 892-906 CANTERBURY ROAD, ROSELANDS, NSW, 2196 (the site).

This report has been prepared in general accordance with the following regulatory requirements;

- Contaminated Land Management Act 1997,
- State Environmental Planning Policy No.55 – Remediation of Land 1998,
- Guidelines for Consultants Reporting on Contaminated Sites 2020,
- Guidelines for the NSW Site Auditor Scheme, 4rd Edition 2020,
- National Environmental Protection (Assessment of Site Contamination) Measure 1999 as amended 2013.

1.1 Previous Investigations

- Australian GeoEnviro Pty Ltd. *Contamination Assessment, 892-906 CANTERBURY ROAD, ROSELANDS, NSW, 2196 (Ref. AG-662_1, dated 12th August 2021);*

A *Contamination Report* was prepared by this office (Ref. AG-662_1, dated 12th August 2021) with relevant information presented below:

The Contamination Assessment comprised:

- Site inspection and excavation of seven (7) bore holes in a systematic based pattern to identify the subsurface profile and identify material impacted by contamination;
- The investigation identified uncontrolled fill to a depth of up to 1.8m BGL;
- Fourteen (14) samples including one (1) duplicate, one (1) split sample, a rinsate, one (1) groundwater sample and trip spike/blank were sent to a NATA accredited laboratory; and
- The concentrations of samples analysed revealed levels below the relevant assessment criteria, with the exception of BH5-0.5m which presented Chrysotile and Crocidolite asbestos found as 8-9mm x 1mm loose in sample and asbestos found in approximately 2x2x1mm cement sheet fragment.

2.0 SITE DESCRIPTION AND OBJECTIVES

The subject site is approximately rectangular in shape, legally defined as Lot 1 and Lot 2 in deposited plan 511598 and Lot X 418488. The site is bounded by Canterbury Road to the north, two (2) storey units constructed of brick and tile to the east, rendered shop building and units to the west with Flora Street situated to the north. The site measures approximately 50.29m along the Flora Street road frontage and up to 44.34m across Canterbury Road, encompassing a total area of 2211.89m² based on the site survey.

The objectives of this RAP are to:

- To determine whether the remaining onsite material meets National Environment Protection Council (NEPC) National Environment Protection Measure (Assessment of Site Contamination) 2013 criteria; and
- If the material fails to meet the assessment criteria, provide guidance for additional remediation of impacted soils.

This RAP has been prepared to address the above objectives, with the following scope of work undertaken:

- Review of previous investigation reports detailed in section 4.2;
- Preparation of an updated CSM for the remaining site material and subsequent site validation;
- Identification of data gaps and data quality issues from the previous investigations;
- Preparation of the DQO and QA/QC documentation in accordance with NEPM (NEPC 2013) as required; and
- Design of a suitable investigation programme for the site validation in accordance with the requirements of AG Remedial Action Plan and NEPM (NEPC 2013).

2.1 Land Use and Remediation Goal

Information provided by the client indicates the proposed development comprises demolition of the existing building and infrastructures on the site, followed by construction of a five-storey residential building, overlying two basement levels for car parking and storage. Finished Floor Level (FFL) for basement 2 will be located at approximate reduced level 48.3m.

Based on this information and existing site topography and levels, maximum excavation depths of approximately 6.1m (varying throughout) are expected for construction of the proposed development, with locally deeper excavation for the proposed car lift, lift shaft, footings and service trenches.

Areas of Environmental Concern detailed in the AG report, likely as a result of importation of filling material, are to be delineated where required and remediated in accordance with relevant assessment criteria.

2.2 Site Condition

At the time of the site inspection, the following observations were made:

A qualified environmental consultant inspected the site on the 8th July 2021. Observations noted during the inspection are summarised below:

- Lot 2 in deposited plan 511598 contained rendered shop building with metal roof. The site is being used for the sale of uniforms.
- Lot 1 in deposited plan 511598 contained a single and double story brick structure. The eastern portion of this lot contained a single storey brick structure utilised by a sign writing business.
- The site was generally concrete and asphaltic concrete covered in poor condition, some staining was observed across the site surface.
- There were no obvious features associated with any underground tanks (bowzers, breather pipe, inlet valve and piping) or odour that would indicate the potential for contamination.
- A retaining structure can be seen across the southern boundary, approximately 1.3m high.

3.0 SUMMARY OF CONTAMINATION ASSESSMENT REPORT

AG conducted an intrusive soil investigation on the site to identify any potential sources of contamination before continued development works. The following items were considered as part of the site investigation:

- Site History and description of the current site conditions;
- Assessment of unidentified contamination within the site;
- Statement of works undertaken in accordance with the relevant assessment criteria, with recommendations for remediation where required.

A total of seven (7) bore holes were excavated across the site in a systematic based pattern within the site in a systematic sampling pattern, to identify and delineate the extent of contamination.

Samples were forwarded to SGS NATA accredited laboratories, under strict chain of custody (COC) conditions. The COC identified the date, location, sampler and sample ID of material collected.

3.1 Heavy Metals

Heavy metal concentrations for Arsenic, Cadmium, Copper, Zinc, Chromium, Lead, Mercury, and Nickel are presented in Appendix B. The concentrations of all metals were below the relevant assessment criteria (HILs B, EIL).

Exceedance of the groundwater investigation levels were identified for the concentrations of arsenic, cadmium, nickel and zinc achieving 0.014mg/L, 0.0022mg/L, 0.12mg/L and 0.49mg/L respectively. However, the concentrations appear to be representative of, or at least consistent with, background conditions for urban (Sydney metropolitan) areas, including Roselands. It was considered that the metal levels did not pose an immediate environmental or human health concern given the distance to the surrounding receiving water bodies and attenuation or groundwater quality changes that can occur between the site and the receiving water bodies. However, further groundwater analysis is required in order adequately characterise groundwater conditions and flow direction.

3.2 OCP, OPP, PCB

The OCP, OPP and PCB concentrations, were less than the relevant assessment criteria adopted, and therefore the chemical analyses indicate that the site is not contaminated with OCP, OPP, PCB.

3.3 Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAH) and BTEX

The TPH, PAH and BTEX concentrations, presented in Appendix B, were less than the relevant assessment criteria adopted.

3.4 Asbestos Test Results

No asbestos was detected within screening samples at the limit of reporting <0.01%w/w, with the exception of BH5-0.5m which presented Chrysotile and Crocidolite asbestos found as 8-9mm x 1mm loose in sample and asbestos found in approximately 2x2x1mm cement sheet fragment.

3.5 Groundwater

During site works, a standpipe piezometer was installed to a depth of approximately 10m (to RL44.8m AHD). Following installation of the standpipe piezometer and initial bailing, groundwater present within the piezometer, indicates the groundwater to be entering the piezometer at a depth of approximately 3.7m (RL51.1m AHD). Groundwater was observed in BH1 at a depth of 4.5m (RL50.3m AHD).

Groundwater measurements carried out on the 8th, 9th and 10th July 2021 within piezometer GW1 and BH1 indicates groundwater levels to be present at a depth of approximately 3.7m (RL51.3m AHD) and 4.5m (RL50.3m AHD), below the existing ground level within the site at the measured location, at the time of the measurements.

3.6 Extent of impacted material

The contamination assessment has concluded that additional areas of environmental concern (AEC) contain contamination above the adopted assessment criteria. The AEC identified are:

- The extent of remedial action is limited to borehole numbered 5.

4.0 RELIABILITY OF PREVIOUS DATA

The data provided in the previous report has been assessed and, based on information regarding quality assurance and quality control, it is considered that the quality objectives for field procedures and laboratory results are reliable and of an acceptable quality.

5.0 REMEDIATION ASSESSMENT CRITERIA

This office has established applicable remediation criteria in order to demonstrate that the site is suitable (with respect to land contamination) for future land use.

This RAP outlines the site specific validation assessment criteria (VAC). The VAC have been derived from The National Environment Protection Council (NEPC) National Environment Protection Measure (Assessment of Site Contamination) 2013. Additionally, Schedule B1 of NEPM documents the acceptance criteria for asbestos in soil (section 4.7 and 4.8).

The assessment criteria has been adopted in accordance with the following, and are:

- The National Environment Protection (Assessment of Site Contamination) Measure (NEPM, 2013). This document presents risk-based Health Investigation Levels based on a variety of exposure settings for a number of organic and inorganic contaminants. To assess the risk to human health the results of the laboratory analysis are compared against the Health Investigation Levels ("HIL B") for the exposure setting.
- Ecological Investigation Levels (EIL's) for metals are applicable for assessing the risk to terrestrial ecosystems. For arsenic and lead, generic EIL are adopted for urban residential land use for aged contamination. For other metals, where available, EIL are calculated using the EIL calculator developed by CSIRO for NEPC. For this assessment, the analytical results were assessed against the available SQG/EIL for urban residential land use for aged contamination.
- Health Screening Levels (HSL's) have been developed for selected petroleum compounds and fractions and are applicable to assessing human health risk via the inhalation and direct contact pathways. The HSL's depend on specific soil physicochemical properties, land use scenarios, and the characteristics of building structure.
- Ecological screening levels (ESL's) have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon (TPH) fractions and are applicable for assessing risk to terrestrial ecosystems. ESL's broadly apply to coarse and fine grained soils and various land uses. They are generally applicable to the top 2m of soil. Urban Residential and Public Open Space guidelines were adopted from NEPM Schedule B1, table 1B (5).

- Aquatic Ecosystems: The ANZECC & ARMCANZ (2000) water quality guidelines have been replaced by the ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, August 2018.

Table 1 – Remediation Assessment Criteria

Contaminant	Assessment Criteria (mg/kg)				
	Health Based Investigation Level (HIL'B')	Ecological Investigation Levels (EIL's)**	Health Screening Levels (HSL's)*	Ecological screening levels (ESL's)	NEPM 2013 Table 1C GILs, Fresh Waters (mg/L) PFAS National Environmental Management Plan Version 2.0
Inorganics (Heavy Metals)					
Arsenic (total)	500	20			
Cadmium	150	3			
Chromium (VI)	500	400			
Copper	30 000	60			0.0014
Lead	1200	600			0.0034
Mercury	120	1			0.00006
Nickel	1200	15			0.011
Zinc	60 000	200			0.008
Organics					
TPH					
C6 to C10			50	180	
>C10 to C16			130	120	
>C16 to C34				300	
>C34				2800	
Benzene			0.6	50	
Toulene			190	85	
Ethylbenzene			390	70	
BaP				20	
BaP (TEQ)	4				
Xylene			45	105	
Napthalene		170	3		
Phenol	45 000				
PAH	400				
OCP					
Aldrin + Dieldrin	10				
Chlordane	10				
Heptachlor	600	180^			
DDD+DDE+D					
DT	-				
OPP	-				
Diazinon	-				
Ethion	1				
Fenitrothion					
PCB					
Asbestos	0.01% bonded ACM	-	-		

Notes: * Sandy texture 0m-0.5m has been adopted for assessing the upper fill soil horizon.

** Conservative and generic EIL adopted.

^DDT only

6.0 CONCEPTUAL SITE MODEL

6.1 Potential Areas of Environmental Concern

BH5-0.5m which presented Chrysotile and Crocidolite asbestos found as 8-9mm x 1mm loose in sample and asbestos found in approximately 2x2x1mm cement sheet fragment.

6.2 Potential for Migration

Potential contaminant migration at the site include:

- Wind-blown dust;
- Surface water run-off and infiltration.

The proposed remediation of contaminated material, following successful validation of impacted material, will remove the potential for offsite migration as impacted material is to be removed from site.

6.3 Potential Exposure Pathways

Based on the COPCs identified, potential exposure pathways at the site include:

- Potential dermal, inhalation and oral exposure to impacted soils present at shallow depths and/or accessible by future interaction and excavations at the site;

6.4 Data Gaps

The data gaps identified as part of the review of the previous investigation and identified as part of this investigation, have been incorporated and are presented below:

- Areas beneath on-site structures have not been completely assessed; and
- Vertical and lateral delineation of contamination;
- Based on a review, there is uncertainty with regard to the quality and extent of on-site fillings beneath site structures, and the groundwater quality and flow direction.
- Safe Work NSW dangerous goods search and Council records.

7.0 REMEDIAL ACTION PLAN

7.1 Remediation Objective

The goal for the remediation and/or ongoing management of potential environmental concerns is outlined below in order to prevent exposure of human populations working on and using the site or impacting soils within the site;

- Remove asbestos contamination from BH5-0.5.
- Determine material classification of material generated from AEC excavations for offsite disposal including TCLP analysis;
- Validate the exposed underlying and surrounding soil within the remaining AEC and stockpile locations, post excavation, to identify any potential impact as a result of site contamination;
- Document the validation process;
- Classify spoil being removed prior to offsite disposal in accordance with NSW EPA 2014 - Waste Classification Guidelines Part 1; Classifying Waste; and
- Preparation of a validation report documenting remedial works undertaken and assessment of remaining site material in accordance with the adopted assessment criteria, in relation to the proposed development works outlined in the RAP.

7.2 Extent of Remediation

The contamination assessment has concluded that multiple areas of environmental concern (AEC) contain contamination above the adopted assessment criteria. The AEC identified are:

- BH5 at 0.5m below existing surface level.

Validation sampling will be carried out to confirm that remaining in-situ material within structures/hardstand footprints and remaining in-situ soil locations, post-excavation and offsite disposal, is within the adopted assessment criteria.

Excavations and stripped areas should be left open and fenced off to prevent access until validation results have been obtained. The contractor will need to maintain the excavations and stripped areas according to NSW Safe Work regulations.

Once validation sample results confirm that the concentrations of residual contamination are below the adopted remediation criteria, the remaining material will comprise either Virgin Excavated Natural material (VENM), Excavated Natural material (ENM) or existing site soils that have been validated as suitable for reuse on site. It is noted that significant portions of the site, which will be disturbed during proposed development works, have not been stripped and visually assessed. AG advises that an environmental consultant inspect the exposed underlying material following stripping of grass, with additional samples collected as determined by the environmental consultant. If potential contamination is detected, samples will be collected within 0.2m of surface impacted material and every 0.5m below the impacted material or as determined by the environmental consultant.

7.2.1 Remediation Process

To remediate the site for the proposed land use, AG has determined the process for remediation will be:

1. Hot Spot excavations and removal of material will be undertaken at the identified locations (see figure 1 attached) by suitably licenced contractor. The hot spot excavations will initially be 3m x 3m by up to 0.8m in depth. Excavated material will be temporarily stored for material classification and offsite disposal. The hot spot will be screened for asbestos as clean up goals must meet National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 2013.
2. In the event of validation samples collected exceeding the adopted assessment criteria, controlled excavation is to continue under the direction of AG environmental consultant, with additional samples collected as per section 10.2. In the event of unexpected finds, section 9.4 procedures are to be followed.

7.3 Data Quality Objectives

The DQO derived for this RAP have been developed in accordance with AS4482.1-2005, “Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil” and from data gaps identified from previous site investigation. The DQO process is outlined as follows:

- **State the Problem-** Borehole numbered 5 presented Chrysotile and Crocidolite asbestos found as 8-9mm x 1mm loose in sample and asbestos found in approximately 2x2x1mm cement sheet fragment.
- **Identify the Decision-** Will the proposed remedial works remove identified contaminated material and, what is the extent of excavation and validation required prior to construction works commencing.
- **Identify Inputs to the Decision-** Site specific Validation Assessment Criteria (VAC) has been derived from The National Environment Protection Council (NEPC) National Environment Protection Measure (Assessment of Site Contamination) 2013. Additionally, Schedule B1 of NEPM documents the acceptance criteria for asbestos in soil (section 4.7 and 4.8).

Assessment Criteria has been adopted in accordance with the NEPM, and are:

- Health Investigation Levels (“HIL B”) for the exposure setting;
- Health and Ecological Screening Levels;
- **Define the Study Boundaries-** Site investigation is limited to the site boundaries with samples collected from the exposed fill/natural material within AEC excavations and stockpiled material generated during remedial works. The extent of potential contaminated is to be determined during remedial works as part of the RAP validation process and subsequent waste classification of fill material and underlying natural material.

- **Develop a Decision Rule-** The results obtained from previous investigation will be compared to the site assessment regulatory criteria as outlined above. Material for off-site disposal will include previous analytical data to determine material classification;
- **Specify Limits on Decision Errors-** Use of laboratory duplicate results, recovery of matrix spikes, RPD and laboratory quality assurance targets are to be met. Sampling rate is to be determined using industry standards. The methodology, sampling procedures and QA/QC procedures are to be reviewed to determine their suitability for use in previous site investigations. If inconsistencies are identified, they will be recorded as a data gap and will need to be sufficiently addressed as part of this investigation.
- **Optimize the Design for Obtaining Data-** Samples are to be collected within the proposed development, post excavation and stockpiling of material prior to offsite disposal. Laboratory analysis will be required to determine the extent, if any, of contamination migration post excavation.

8.0 REGULATORY AND PLANNING REQUIREMENTS

8.1 Planning Context

Environment Planning and Assessment Act 1979 / SEPP55

The remediation works are classified as Category 1 Remediation Works as per the meaning provided in *Statement Environmental Planning Policy 55 – Remediation of Land* (SEPP 55) and will require development consent under the *Environmental Planning and Assessment Act 1997*. The nature of remediation works is relatively straightforward and it is considered most appropriate that development applications for remediation works are included with development application documentation for the associated earthworks as ancillary to other development.

Protection of the Environment Operations Act 1997

The proposed remediation/validation activities are not required to be licensed under the *Protection of the Environment Operation Act 1997*. None of the individual work stages are found to be greater than 3 hectares in area and hence do not trigger the licensing requirements.

Protection of the Environment Operations (Waste) Regulation and POEO Amendment (Scheduled Activities and Waste) Regulation 2008

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the site will not require to be licensed. Section 48 of the Reg. requires that wastes are stored in an environmentally safe manner. It is also stipulates that vehicles used to transport waste must be covered when loaded. Provision is provided in the Regulation and DECCW (2014) guidelines for the NSW EPA to approve the immobilisation of contaminants in waste (if required with unexpected finds). The 2008 Regulation also imposes requirements for the transportation, disposal re-use or recycling of asbestos containing waste including that asbestos contaminated soil must be wetted down and transported in a covered leak-proof vehicle. Asbestos waste must be disposed of to a facility lawfully able to accept the waste and cannot be reused or recycled. Transportation of the waste is required to be tracked.

Waste Classification Guidelines (DECCW 2014)

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to off-site disposal (to reduce waste classifications) an immobilisation approval shall be sought. Immobilisations are only anticipated to be required with unexpected finds.

9.0 REMEDIAL PLAN

9.1 Remedial Options

The *Contaminated Sites Guidelines for the NSW Auditor Scheme* (2020) lists the following order of preference for soil remediation and management:

1. On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated soil to an approved site or facility followed, where necessary, by replacement with clean fill; and
4. Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

In addition, it is also a requirement that remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed. And, where there are large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed.

Following assessment of remedial strategies detailed above and from review of previous investigation works undertaken, removal of contaminated soil (preference 3) to an approved site or facility was considered the suitable option.

9.2 Selected Remedial Option

9.2.1 Evaluation of Remedial Option (IAA)

On-site Treatment

It is possible to treat hydrocarbon impacted soil onsite, however the presence and extent of ACM impacted soil presents potential risk to surrounding properties and site workers during the treatment process.

Metal impacted soil can be treated on site, however; treatment options for metals (i.e. washing) generally result in significant waste by-products generated which would require management. Additionally, the cost effectiveness of treatment is not practical.

Off-site Treatment

It is possible to transport and treat the hydrocarbon and metal impacted soil to an appropriately licenced facility for treatment and, following successful treatment, return to site for re-use. However, due to the considerable amount of handling and treatment required, this option is not considered cost-effective.

Removal of Contaminated Soil

Off-site disposal of impacted areas to an approved licenced facility is less sustainable, due to material being transported to landfill, however; due to the limited volume of material to be generated and the cost of disposal, this option is considered reasonably cost-effective and practical to implement. Additionally, following successful off-site disposal and validation, the site does not require ongoing monitoring and assessment.

Consolidation and Isolation

The ACM could be contained on-site, adopting a 'capping' methodology, however; the site would require long term management, involving an environmental management plan (EMP) which would be added to the title deed of the property. An EMP is not the preferred option for site remediation.

9.2.2 Preferred Remedial Option (IAA)

Based on the information available, the preferred remedial strategy is Removal of Contaminated Soil. Contaminated soil is to be excavated and disposed of at an approved waste facility.

Material excavated during the remediation of contaminated areas outlined in section 7.2 will be checked visually and chemically assessed. Soil excavated is to be stockpiled and covered with plastic sheeting to avoid contamination migration as a result of rainfall or surface runoff. Material is to be assessed in accordance with NSW EPA 2014 - Waste Classification Guidelines Part 1; Classifying Waste.

While the excavation works are being undertaken, a suitably qualified environmental professional will guide the excavation of potentially contaminated soils. The excavations will be extended until visual, olfactory and chemical and physical analysis, undertaken by an environmental professional, indicate that the contaminated soil above the site remediation criteria is likely to have been removed.

Soils excavated that are not considered to be impacted may be further assessed for on-site reuse. Soils considered to be impacted will be disposed offsite at a licensed waste disposal facility following waste classification including TCLP analysis where required.

9.3 Extent of Remediation/Management

The extent of contaminated soil detected through excavation, site observations and analysis are outlined in section 7.2 above. The excavated and stockpiled material is to be assessed and classified in accordance with NSW EPA 2014 - Waste Classification Guidelines Part 1; Classifying Waste. In-situ classification of overlying fill material may be considered following demolition of onsite structures and hardstand, with assessment undertaken of underlying soils, at the discretion of the environmental consultant.

9.4 Unexpected Finds

It is acknowledged that this RAP was created and implemented based off chemical analysis and historical review undertaken during previous investigations. It is possible that ground conditions may vary between sampling locations and areas not previously assessed.

If contamination or suspected contamination is identified during site works, such as construction waste, chemicals, ACM >10m², or any staining or detectable odours identified, the following 'Unexpected Finds Procedure' should be implemented:

- Work is to immediately cease;
- The site foreman is to be notified immediately and is to arrange an inspection by a suitably qualified environmental consultant;
- Detailed inspection and sampling is to be undertaken by an environmental consultant;
- Environmental consultant is to provide short term management instructions as required of the potentially identified waste;
- Environmental consultant is to produce a report in accordance with relevant assessment criteria, documenting the findings of the investigation, including methodology and provide appropriate controls/remediation strategies to manage the waste.

In the unforeseen event that the proposed remediation works do not meet the validation criteria, or if the selected remedial strategy is unsuccessful, the following actions will be considered to ensure firstly the safety and health of people and the environment and secondly that the overall project objectives are achieved:

- Continued controlled excavation and off-site disposal of impacted material until validation is achieved;
- Removal of ACM impacted materials in accordance with the code of practice "How to Safely Remove Asbestos" published by Safework NSW (September 2016) in the event ACM is identified during remediation works; and
- Reassessment of remedial options for excavated materials, including:
 - Alternate on-site treatment options; and/or
 - Onsite containment.

10.0 VALIDATION

Validation of the remedial works is required to demonstrate that remedial works have been undertaken in accordance with the requirements outlined in this RAP, and that the remediation objectives have been achieved.

In broad terms, validation will be required to address the following aspects of the remedial works:

- Removal and screening of impacted overlying fill material where encountered;
- Characterisation of material stockpiled during remedial excavation works;
- Assessment of stockpiled material for off-site disposal in accordance with NSW EPA 2014 - Waste Classification Guidelines Part 1; Classifying Waste.; and
- Validation sampling confirming the contaminated soil has been removed from site and, soil remaining onsite meets the National Environment Protection (Assessment of Site Contamination) Measure (NEPM, 2013) Health Investigation Levels (HILB).

10.1 Validation Plan

Validation data is required to be collected to verify the effectiveness of the remedial works and document the final site condition as being suitable for the proposed future use. Where validation programs are required to be designed for additional unexpected finds, then consideration shall be given to the validation sampling requirements identified below.

10.2 Sampling Methodology

Following removal of contaminant locations identified in section 7.2, the number and location of soil samples collected from excavated base and excavation walls will be in accordance with industry standards.

Samples will be collected from the base of the excavation with a minimum sampling frequency of 1 sample per 25m² (2 samples minimum) and 1 sample will be collected laterally every 5m along excavation walls per soil profile with a minimum of 4 samples. Samples are to be collected using new pair of nitrile disposable gloves.

Soil samples will be collected from the upper soil profile (i.e. at a depth ranging between 0-0.2m) and at the base and will be placed immediately into laboratory prepared glass jars. However, if a distinct change in the underlying geology is noted, additional soil samples will be collected from these horizons.

Samples collected from areas where uncontrolled fill has been stripped will be collected from the upper soil profile (i.e. at a depth ranging between 0-0.2m), with a minimum of nine samples collected as per NSW EPA Sampling Design Guidelines.

Sample labels shall record sample identification number and date and time of sampling. Sample containers shall be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory. If contamination is detected above the Remediation Assessment Criteria (section 5.0 above), the non-conforming area is to be excavated an additional 0.2m (base, wall etc.) and another sampling round conducted as per the above mentioned frequency until contaminant levels are within the adopted assessment criteria.

10.3 Sampling QA/QC

A chain of custody form shall be completed and forwarded with the samples to the testing laboratory, containing the following information:

Sample identification;

- Signature of sampler;
- Date of collection;
- Type of sample;
- Number and type of container;
- Inclusive dates of possession; and
- Signature of receiver.

Duplicate samples will be collected at a rate of one per 20 samples, with triplicate samples collected at a rate of one per 20 samples. Duplicate and triplicate samples will be split in the field and placed in respective jars to be transported for analysis.

NATA accredited laboratories shall be used for all analysis of samples. Appropriate methods and LORs are required for comparison to relevant criteria. Laboratory methods and laboratory limits of reporting (LOR) as summarised are proposed to be adopted for analysis of soil samples collected during remediation/validation activities.

10.4 Validation Criteria

Soil validation criteria to be applied in the validation of the site will be, as identified in the decision rules, based on the applicable human health and ecological investigation levels published in NEPM (2013):

- Health Investigation Levels (“HIL B”)
- Ecological Investigation Levels (EIL);
- Health and Ecological Screening Levels

10.5 Reporting

A Validation assessment report shall be prepared at the cessation of all works. This report shall:

- Present all sampling field notes and laboratory data;
- Undertaken an assessment of quality assurance / quality control (QA/QC) of analytical data generated by the works and identify data that is reliable for use in characterising the Site;
- Sort data into data sets as required by the decision rules;
- Assess whether sufficient data has been obtained to meet required limits on decision error; and undertake assessment to the decision rules and identify any environmental data which causes decision rules to be failed.

11.0 Site Management Plan

The Principal Contractor is responsible for the preparation and implementation of a Site Management Plan (SMP) for the proposed remedial works. The SMP is to comply with relevant council requirements and relevant legislation. The following describes controls required to minimise the potential exposure to the environment and surrounding community. This section is a guide provided by AG, however the principal contractor is required to ensure all works undertaken are in accordance with relevant legislation.

11.1 Hours of Operation

Remediation and construction works are to comply with council hours of operation. It is the responsibility of the Principal Contractor to identify and conform to the relevant council operating hours.

11.2 Ex-situ Treatment

Material being excavated for offsite disposal is to be temporarily stockpiled and screened for foreign and deleterious material on-site on an impervious surface waiting for laboratory analysis and subsequent waste classification, or will be loaded directly onto trucks for offsite disposal to a licensed landfill facility. Sediment erosion control are to be installed and maintained during remediation works.

11.3 Air Emissions

It is anticipated that air emissions, most likely odours from excavations, stockpiles, transport etc. will be generated during remediation activities. AG are to be onsite during the works to monitor the emissions and odour controls. Options for odour control and minimising emissions are:

- Reduce the area exposed during investigation at any one time;
- Application of odour suppressants;
- Cover stockpiles and place stockpiles as far as possible from sensitive receptors;
- Watering of stockpiles to reduce emissions.

During remediation excavation works, a PID meter is to be used to obtain and document VOC concentrations. If worker breathing zones exceed 10ppm, the site is to be evacuated and an odour suppressant is to be used. Action to be taken may be use of appropriate PPE, covering of stockpiles/excavation area or use of natural ventilation. Records of air monitoring conducted during excavation works will be kept.

11.4 Asbestos Management and Controls

The following is an equipment register of required materials in preparation for works:

- Appropriate personal protective equipment; disposable suits, P2 and P3 respirators, disposable gloves and disposable boot covers;
- Asbestos warning signage and barricade taping;
- 200 µm thick polyethylene asbestos waste bags;
- Black 200µm plastic lining;
- Water system capable of generating a light mist at low pressure;

- General personal hygiene equipment (e.g. wipes, brushes etc);
- Airborne Asbestos Monitoring (AAM) equipment (provided by the qualified occupational hygienist); and Waste transport system.

11.5 Dust Control

During remedial works, civil contractors will be responsible for ensuring that excavation, stockpiling, transport and plant movement operations are dust and sediment free. Dust and sediment generation could potentially contaminate the surrounding environments. Control measures to control the dust and sediment are (but not limited to):

- 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.

Any remedial works associated with asbestos are to be carried out in accordance with SafeWork NSW (2019) Code of Practice – How to Safely Remove Asbestos.

11.5.1 Bulk Excavation

In regards to excavation, soil movement and placement of asbestos contaminated soil within the site (if required), AG recommends the following:

- At least 5 days prior to commencing works, a SafeWork Notification for Asbestos Removal Works will be lodged by the appointed Licensed Asbestos Removalist;
- All excavation, soil movement and capping of the asbestos contaminated soil should be carried out under the supervision of a LAA or suitably qualified occupational hygienist and Class A licensed removalist contractor team;
- The LAA or qualified occupational hygienist will supervise the removal works to ensure that all removal procedures are implemented in accordance with the NSW Code of Practice: How to Safely Remove Asbestos (2019) and requirements set out in this document;

- Asbestos Air Monitoring will be carried out for the entirety of asbestos works to ensure adequacy of control measures within the work site;
- A nominated decontamination area for plant and machinery will be erected outside the boundary of the removal areas during any friable asbestos removal / handling works;
- At the end of each shift, the source area and any temporary placement will be made safe using geofabric or appropriate plastic sheeting;
- At the end of each shift, the LAA or qualified occupational hygienist shall undertake an asbestos clearance / make-safe inspection to ensure that each area has been made safe. Records of these inspections will be provided to Spaceframe Constructions by the LAA / qualified occupational hygienist once completed;
- Following the removal of all asbestos contaminated soil, validation inspection and sampling of the source area will be carried out by a LAA, qualified occupational hygienist and / or Environmental Consultant;
- At the completion of asbestos works, all plant and machinery used during the works are to be decontaminated by the licensed removalist contractor;
- At the completion of the works, a validation report will then be prepared and issued in accordance with the appropriate legislation and guidelines (where required).

11.6 Erosion and Sediment Control

Remediation works may involve clearing of vegetation, exposing excavations and stockpiling of spoil which may result in increased erosion, creating sediment. Control measures to control sediment are (but not limited to):

- Construction of sediment fences and silt socks around the perimeter of the site, excavations, storm water pits and drainage lines;
- Limit the extent of cleared areas;
- Limit the extent of excavations and backfill as soon as practicable.

11.7 Noise Controls

Hours of operation are to comply with council requirements and allowable noise levels. It is the contractor's responsibility to be aware of, and comply to council regulations regarding noise pollution.

11.8 Soil and Water Management

Soil excavation works are to be conducted in a manner that minimises any potential migration of impacted soil and water offsite. Excavated material is to be removed using an excavator to be loaded onto a truck for offsite disposal. If the material is to be temporarily stockpiled, they will be placed on paved areas or impervious sheeting, and will be surrounded with silt barriers to ensure that any surface runoff is controlled.

All remediation works will cease during inclement weather. Storm water runoff must be controlled onsite to ensure that potentially impacted soil, sediment or water is not discharged to the surrounding area.

Any soil for offsite disposal needs to be tested and classified in accordance with NSW DECC (2008) Waste Classification Guidelines.

11.9 Traffic

The principal contractor is responsible for:

- Erecting safety signs;
- Maintaining signs and replacing them if they deteriorate or are damaged;
- Barricading stockpiles, excavations or other hazards;
- Excluding pedestrian access and traffic;
- Ensuring the site remains securely fenced at all times.

11.10 Occupational Health and Safety

The principal contractor is responsible for:

- Being aware of the potential contaminants exposure pathways and ensuring that all workers wear the appropriate PPE for the tasks performed;
- Restrict site access to appropriate and approved personnel;
- Approve work zones;
- Make workers and surrounding community aware of the remedial activities;
- Investigate and report hazards, emissions and controls.

11.11 Underground Services

The Principal Contractor will be responsible for the location and protection of any underground services which may be impacted by the proposed remediation works. Relevant stakeholders are to be contacted prior to any excavation works being undertaken, and guidance from the stakeholder sought in relation to:

- Service locating practices and procedures;
- Risks associated with interaction with located services;
- Procedures and PPE required with working underground services; and
- Approval to interact with any identified underground services.

The Principal Contractor will be responsible for ensuring interaction with underground services in undertaken in accordance with relevant industry codes and practices.

12.0 Health and Safety Management

This health and safety plan contains procedures and requirements that are to be implemented as a minimum during the remediation works. Prior to any remediation activity, the Principal Contractor and Subcontractors are to determine the potential risks from the remediation and construction works, be familiar with the RAP and be familiar with the health and safety plan (HSP).

The objectives of the health and safety plan are:

- To apply standard procedures, safety practices and allow adequate training for proposed tasks that reduce risks resulting from onsite remediation works;
- Identify hazards and report incidents and accidents;
- Assign roles and responsibilities;
- Ensure workers are aware of the HSP and RAP and have access to them if required.

It is the responsibility of contractors to prepare their own Safe Work Method Statements (SWMS) for proposed work activities in accordance with NSW WHS regulations. Workers should be aware of their site specific SWMS and the HSP before works commence.

12.1 Responsibilities

The principal contractor is responsible for ensuring work is carried out in accordance with (but not limited to) the health and safety plan. Individuals are responsible for conducting their assigned tasks in a safe and responsible manner and must leave their work area in such a condition as will not be hazardous for future occupants.

12.2 Personal Protective Equipment (PPE)

All workers who may come into direct contact with contaminated soil, or may be exposed by contaminants exposure pathways, will be required to wear (and be trained in the use of) the following (but not limited to) personal protective equipment:

- Overalls or long sleeved collared shirt;
- Heavy duty outer gloves (eg. leather) where there is a risk of cuts or abrasions, otherwise nitrile gloves if in direct contact with contaminated soil;
- Steel capped boots;
- Safety glasses;
- High visibility vest or jacket;
- Hard hat;
- Hearing protection.
- Disposable coveralls (type 5, category 3 (EN ISO 13982–1) or equivalent that would meet this standard (if required).

- Coveralls worn should be made from either 100% synthetic material or a mixed natural / synthetic fabric capable of providing adequate protection against fibre penetration. All fabrics must be capable of preventing the penetration of asbestos fibres down to a diameter of 0.5µm and to a maximum 1% penetration of all airborne asbestos fibres. Once worn, disposable overalls are not to be reused or laundered.
- Disposable half-face particulate respirator (P2 or P3 rated dependant on type of removal): The respirator must conform to the requirements of AS/NZS 1716:2009 Selection, Use and Maintenance of Respiratory Protective Devices or its equivalent

12.3 Management of Asbestos Encountered During Excavation

If additional and suspected asbestos containing material (ACM) is encountered, all excavation works must cease and AG be notified. Inspection and testing will be undertaken to confirm the presence of ACM and provide guidance on the management and disposal of ACM affected soils.

12.4 Emergency Response

In the event of an emergency, site evacuation procedures should be followed. In the event of an accident:

- Evaluate the seriousness of the injury, and contact emergency services, if necessary;
- Provide first aid, as appropriate;
- If safe to do so, evacuate the injured person;
- Make the area as safe as possible without jeopardising safety.

If a serious accident occurs, do not disturb the scene, except to make safe and prevent further injury or damage, and keep all unauthorised people out, and report all accidents to the principal contractor.

13.0 CONCLUSION

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of the Contaminated Sites Guidelines for the NSW Site Auditor Scheme (4th Edition, 2020) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP, it is concluded that the site can be made suitable for the intended use and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

For and on behalf of
Australian GeoEnviro Pty Ltd

A handwritten signature in black ink, appearing to be 'J. Lu', written in a cursive style.

J. Lu
Geotechnical Engineer

Limitations

AG has performed its services for this project in accordance with current industry codes and practices. When assessing the nature and extent of contamination, this type of investigation (as per our commission) is not designed or capable of locating all ground conditions, (which can vary even over short distances).

The advice given in this report is based on the assumption that the test results are representative of the overall ground conditions. However, it should be noted that actual conditions in some parts of the site might differ from those found. If excavations reveal ground conditions significantly different from those shown in our findings, AG must be consulted.

The actual presence of contaminated material at the site may potentially differ from that referred to or inferred herein, since no sampling program, no matter how complete, can reveal all anomalies and hot spots that may be present. Furthermore, our opinions and judgments expressed herein, which are based on our analysis of current industry codes and practices, should not be interpreted as legal opinions.

The scope and the period of AG services are described in the report and are subject to restrictions and limitations. AG did not perform a complete assessment of all possible conditions or circumstances that may exist at the Site. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by AG in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by AG for incomplete or inaccurate data supplied by others.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

REFERENCES:

Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites. NSW Environment Protection Authority (EPA) 2020.

Contaminated Sites – Sampling Design Guidelines. NSW Environment Protection Authority (EPA) 1995

Managing Land Contamination: Planning Guidelines SEPP55 – Remediation of Land - Department of Urban Affairs and Planning and Environment Protection Authority (DUAP and EPA) 1998.

National Environment Protection (Assessment of Site Contamination) Measure – National Environmental Protection Council 2013.

AS4482.1-2005 Guide to the Sampling and Investigation of Potentially Contaminated Soil Part 1

APPENDIX A

FIGURE 1 – REMEDIAL AREA AND PLANS

Drawing source: Site Survey prepared by Urbanex Surveyors Pty Ltd

